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SDC SWISS AGENCY FOR DEVELOPMENT AND COOPERATION
COSUDE AGENCIA SUIZA PARA EL DESARROLLO Y LA COOPERACIÓN

INTEGRATED WATER RESOURCES MANAGEMENT IN FERGHANA VALLEY

The Baseline Survey

of 3 pilot Water User Associations in the Ferghana Valley

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INTRODUCTION

This baseline survey report studies the current situation with water management and other pertinent issues, which has been gradually developing in the pilot areas of the Integrated Water Resources Management in the Ferghana Valley (IWRM-Ferghana) project since launched in May, 2002. The project covers pilot sites in 3 countries sharing the Ferghana Valley – Kyrghyzstan, Tajikistan and Uzbekistan.

The baseline survey carried out in August-September, 2003 has focused on the 3 pilot water user associations (WUAs) newly set up in the project areas of the Ferghana Valley - WUA “Akbarabad” in the Ferghana Province of Uzbekistan, WUA “Zarafshan” in the Soghd Province of Tajikistan and WUA “Kerme-Too Akburasi” in the Osh Province of Kyrghyzstan. The survey was designed and administered to target farmer water users from the above 3 sites and collect the baseline data to be used for benchmarking on-farm irrigation and other measures over time, identify farmers’ concerns, perceptions and attitudes on a whole range of issues related to irrigation water use and management, thought crucial to the success of the project, as well as to test and verify a number of hypothesized assumptions. With this in mind farmers have been sampled, interviewed and their pertinent data collected and analyzed using an SPSS application program. The survey administered on a household basis has particularly studied the water management situation pertinent to the vegetative and non-vegetative seasons of 2002-03, i.e. at the onset of the project right before the above mentioned WUAs were formally established, and collected both quantitative and qualitative data on farmers and their households including their socio-demographic profiles, farm areas, land use rights, water sources, hydraulic location, irrigated crops, crop areas and yields, water requested and actually received, any water charges paid, contribution to canal maintenance, agricultural incomes, production costs, perceptions about quality of irrigation services received, the status of system maintenance and repairs etc.

In addition, to provide some gender perspective the survey technicians were instructed to include all women farmers, if any, in their respective study areas who were the heads of their households (though, by best guess there was very few of them).

Since the survey was a part of ongoing social mobilization campaign it was also used for building better awareness among local farming communities about IWRM, WUA and PIM (participatory irrigation management). Though the interview ethics suggested that the sampled water users be notified of impending interviews beforehand, sometimes it was not the case, so the farmers were approached and interviewed right away on spot. This was possible because the field team members were not outsiders to the local communities and had had already some local exposure as social mobilizers when holding awareness meetings, so there had been a bit of a word of mouth already spread around. Thus following the adopted sampling design the field teams at times would approach potential farmers wherever and whenever possible and if agreed would interview them straight away. In most such cases it did work, though there were some cases when interviews were refused once and for all, so initially sampled respondents had to be replaced.

Keeping in view the importance and complexity of social mobilization effort and institutional reforms, which are in progress in all the 3 pilot WUAs, as well as their impact on the farming community the survey conducted tried to find out the realities of the reforms and identify concerns at the grassroots level in order to help in better implementation of the proposed reforms. The study was also to find out the awareness level of farmers and their views on the reforms and study the existing level of participation of farmers in the reforms. However, use of the survey data collected can be

so far mainly for descriptive purposes. More interpretive statistical analysis can be done for subsequent data after more intervention occurs and impacts begin to happen.

Following this introductory chapter this report is organized into the following topic areas: methodology used in the baseline survey is presented in Chapter 1; baseline demographic data on farmer water users and their households are included in Chapter 2; main sources of agricultural income including crop production on farm and backyard gardens, livestock as well as the approximation of the total agricultural income by different land use categories and countries are included in Chapter 3. Chapters 4 and 5 discuss crops cultivated and cropping patterns by main and backyard plots, farmers' concerns about choosing what crops to grow as well as the overall yield and profitability trends. Chapters 6, 7, 8 and 9 present results on the quality of irrigation service and farmers' concerns about water level stability, water disputes, repairs and maintenance status. The last three chapters look into the efficiency of farmer participation and awareness building campaign run in the pilot WUAs before they were formally established (Chapter 10), farmers' attitudes and perceptions of various conceptual issues related to IWRM and PIM for different hydraulic levels (Chapter 11) and what additional support services farmers need to improve their performance and sustainability (Chapter 12). For further and more detailed statistical reference with regard to the issues discussed in this report and in addition to the tables provided throughout the main text there are also other pertinent frequency and contingency tables enclosed in the Annexes.

Figure 1. Map of the Ferghana Valley

1. METHODOLOGY

1.1. Process Overview

A number of required steps preceded the launching of the survey: hiring and training relevant field staff, pre-testing and finalizing the survey. Each interview was designed to be taken by 2 field survey technicians in tandem – interviewer and recorder. Once initial survey questionnaire was prepared it was pre-tested at all 3 sites to make sure it was properly worded, understood and data-sufficient or needed some improvement; also it allowed to estimate the time required for the interview. The pretest was also useful in terms of training the survey technicians in the methodology of taking and recording field interviews.

The survey, comprising a total of 139 questions, was launched in early August, 2003 and took about one month to complete. At the start of the survey based on pretest estimations the field teams were assigned to complete on average 3 questionnaires a day with about 3 – 3.5 weeks in total time required to have the whole job done by end-August, 2003. It was advised that the teams work on average 7 hours daily and one day of 5 hours 6 days a week to make it 40 hours weekly. However, this schedule had to be somewhat extended because at times despite appointments made the farmers failed to show up or couldn't be found anywhere for some reasons. All in all the total time period required for 60 interviews to complete at each site including some follow-up visits to sample farmers for required corrections and clarifications was as follows: in Uzbekistan – 37 days; in Kyrghyzstan – 25 days; in Tajikistan – 28 days.

1.2. Survey Pre-test

Before launched the survey questionnaire as mentioned above was pre-tested in the second half of July, 2003. The number of farmer interviews pre-tested at each site varied from 6 to 10:

10 farmers in WUA 'Akbarabad'
7 farmers in WUA 'Zarafshan'
6 farmers in WUA 'Kerme-Too Akburasi'

After the pretest Tajik and Uzbek field teams were instructed to include into those sampled also the chairmen of all big quasi-state cooperative farms (*shirkat* in Uzbekistan and *kolkhoz* in Tajikistan) in their respective service areas to obtain a better overall picture of the farms in question and because it is rather them than individual shirkat or kolkhoz farmers who will pay the irrigation service fee to the WUA. Since there was a bit of a fear from Uzbek and Tajik field staff to interview the big farm chairmen due to their perceived high hierarchical rankings it was decided to take those interviews with the participation of the field team Supervisor.

The pretest showed that some questions needed rewording to make them more simple, explicit and understandable. Besides, additional questions were introduced to make data collected more comprehensive, so there was a total of 139 questions in the finalized questionnaire. To minimize the interviewing time which sometimes took more than 3 hours to get through at the pre-test stage, the field teams were instructed to have the questionnaire, which was initially prepared in Russian, translated into their local languages, or at least those questions that were fairly long and complicated. This helped to whittle the time down to an average of 105 minutes per an interview:

Table 1. Interview duration by pilot WUAs (in minutes)

		Minim	Maxim	Mode	Mean	Net work days
WUA of respondent	*Akbarabad*	60	170	105	97	12.2
	Zarafshon	55	140	100	107	13.4
	Kerme-Too Akburasy	20	140	110	111	13.8
	Group Total	**20**	**170**	**110**	**105**	**13.3**

1.3. Follow-up during and after the survey

To make sure the field teams performed properly while implementing the survey the field Supervisor paid regular follow-up visits (at least once a week) to each of the pilot sites. After all questionnaires were completed they were collected and checked once again for any flaws. Quite a number of omissions and unanswered questions were found especially where questions required multiple answers and rankings. In Uzbekistan and Tajikistan there was also some mix-up in the numbering of questionnaires. So to fill the gaps and make corrections all questionnaires were given back to the field teams and when ready verified again.

1.4. Target Population

The target population of the baseline survey comprised all households living and working their land parcels and/or backyard gardens within the service areas of the 3 pilot WUAs: Uzbek *WUA "Akbarabad"* with 2820 ha in the service area located in the Kuva District, Ferghana Province set up in March; Tajik *WUA "Zarafshan"* with 1050 ha in the service area in the Jabbar-Rasulov District of Soghd Province set up in May, 2003; and Kyrghyz *WUA "Kerme-Too Akburasi"* in the Aravan District of Osh Province set up in June, 2003 to service 3050 ha in the total area.

1.5. Sample and Sampling Design

The survey involved a random sample of *60 agricultural water users* at each of the 3 pilot WUAs making a total of *180 farmers* for all the sites. The sampling design was developed in consultations with local project staff, WUA leaders and field teams to obtain as an optimal and representative sample of all land use categories at each site as possible. The sampling was limited to farmers, tenants and/or backyard garden keepers who were supposed to be household heads stratified by the location of their main land holdings along watercourse and distributary canals (head, middle or tail). In the Uzbek WUA, additionally, stratification was also made by farm types[1] due to

[1] To be more specific about farm types in the study areas it is worth noting that large cooperative farms in Uzbekistan imply *Shirkat Farms* (*shirkat kho'jaligi,* in Uzbek) which are still quasi-governmental in nature though formally collectively owned by their farm members, while in Tajikistan they are still referred to as *Kolkhozes,* both constituting the largest farming entities available with thousands of hectares in the farmland area and thousands of farm workers in membership*;* private production Cooperatives in Tajikistan are normally referred to as *Dehqan Farms (Khojagi-ee-Dehqon,* in Tajik*),* while in Kyrghyzstan they are known as joint *Peasantry Farms (Krestyanskoe khozyaystvo,* in Russian*),* both combining different households, the number of which ranges from few, as in Kyrgyzstan, to dozens, as in Tajikistan; the term 'Proprietary Farm' has also different rendition in Uzbekistan (*fermer kho'jaligi,* in Uzbek*, i.e. Sole Proprietary Farm*) and Kyrghyzstan (*chastnoye khozyaystvo,* in Russian*,i.e. Private Farm*).

completely different farming systems coexisting in this WUA: large quasi-state cooperatives and much smaller proprietary farms. In the table below respondents of all 3 pilot WUAs are set out by their farm types:

Table 2. Respondents by farming systems by WUAs

Households representing		WUA of respondent						Total	
		Akbarabad		Zarafshon		Kerme-Too Akburasy			
		N	%	N	%	N	%	N	%
Farm system	Quasi-state Cooperative	23	38%	7	12%			30	17%
	Private Cooperative			53	88%	29	48%	82	46%
	Proprietary Farm	33	55%			30	50%	63	35%
	Kitchen garden	4	7%					4	2%
	Short-term Tenancy					1	2%	1	1%
Total		60	100%	60	100%	60	100%	180	100%

1.5.1. WUA "Akbarabad"

The following structural data served the basis for sampling in this Uzbek WUA:

BASIC UNITS	TOTAL NO	AREA IRRIGATED, HA
Distributories	4	2820.8
Watercourses	105	2820.8
Proprietary Farms	33	414.7
Shirkat Farms	3	1862.1
Shirkat Work Brigades	26	1862.1
WUA Assembly membership	40+8	*NA*
Mahalla-neighborhoods	5	544
Households & Home plots	3,609	544
Families	3,798	544
Total population	16,034	544

As was mentioned earlier to obtain an optimal and representative sample of 60 respondents, the household heads to be sampled in WUA "Akbarabad" were stratified two-fold - by their hydraulic location and property rights. This was done to ensure, in the first instance, inclusion of the household heads representing all locally available 33 proprietary farm households, with the rest of the respondents to be sampled from 26 work brigades comprising 3 local *shirkat* farms and multiple keepers of backyard gardens – all of them to be evenly picked up from the head, middle and tail of distributaries and/ or watercourses of the WUA. After finding out where all those proprietary farms, shirkat work brigades and backyard garden keepers belonged to along the distributory and watercourse canals, an ultimate sample of 60 water users in WUA "Akbarabad" based on the head – middle - tail principle was identified as follows:

As far as *seasonal tenants* are concerned, farmers of this category change places frequently and move every year either within the country or across countries where conditions to the best of their judgment are most favorable in terms of both farming and selling the produce. Such farmers usually spend the entire vegetative season right in the field living in makeshift tents, wagons or trailers from sowing till harvesting. As a rule they come in whole clans (from one to several families in each one), renting land of 1-3 ha from local farmers or landowners and growing crops such as onion, potato, capsicum, melons, water melons or whatever they think there is going to be a good market for. For weeding and harvesting they might hire additional labor which is normally cheap and abundant everywhere around. Usually such seasonal farmers are very experienced and know how to get high yields which are quite often much higher than those received by local farmers. Korean community representatives from Uzbekistan, Kazakhstan and other Central Asian states are famous with that kind of entrepreneurial farming activities

Figure 2. Map of WUA "Akbarabad"

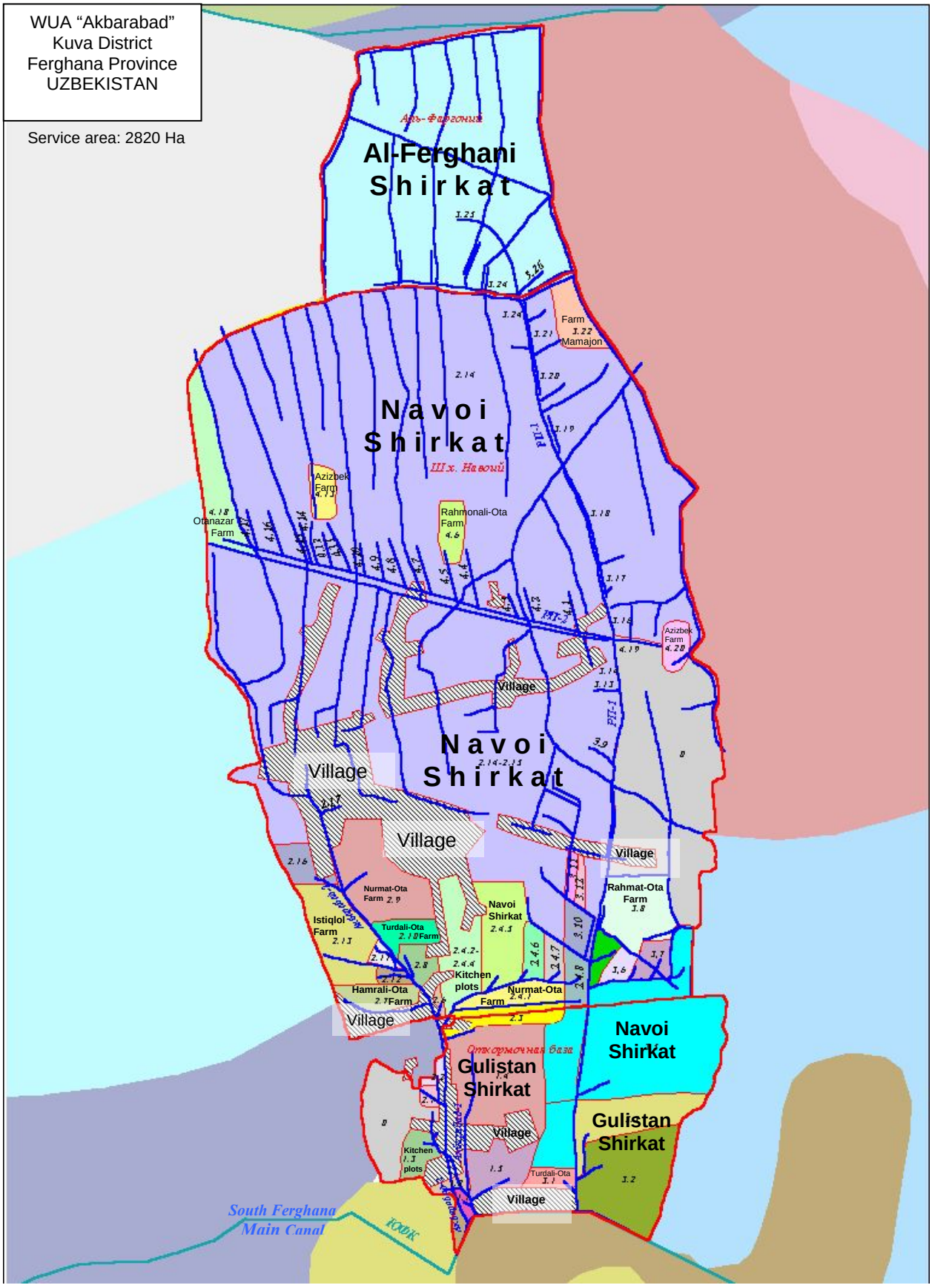


Table 3. Sampling Layout in WUA "Akbarabad"

Canal Reach	**Distributory-1** (RP-1, *11.9 km*)		**Distributory-2** (RP-2, *3.7 km*)		**Distributory-3** (Akbarabad-1, *1.5 km*)		**Distributory-4** (Akbarabad-2, *4.7 km*)		**Total**
	Farms	No sampled	Farms	Number sampled	Farms	Number sampled	Farms	Number sampled	
Head	Proprietary Farms 1, 2 & 3; 3 Shirkat-2 teams	3+3	Shirkat-1	6	Proprietary Farms 14,15 & 16	3	Proprietary Farms 19,20,21,22, 23,24 & 25; Mahalla	7+2	**24**
Middle	Proprietary Farms 4, 5, 6, 7, 8 & 9	6	Proprietary farms 11 & 12	2	---	---	Proprietary farms 26,27,28, 29 & 30	5	**13**
Tail	Proprietary Farms 9 & 10; 6 Shirkat-1 teams, Mahalla dwellers	1+4+2	Proprietary Farm 13 & 11; Shirkat-1 teams	1+5	Proprietary Farms 17 & 18; 3 Shirkat-3 work teams	2+3	2 Shirkat-1 work teams; 1 Shirkat-3 work team	5	**23**
Total:		19		14		8		19	**60**
TOTAL SAMPLE:									

1.5.2. WUA "Kerme-Too Akburasy"

60 water users in the Kyrghyz WUA were sampled using the following basic data:

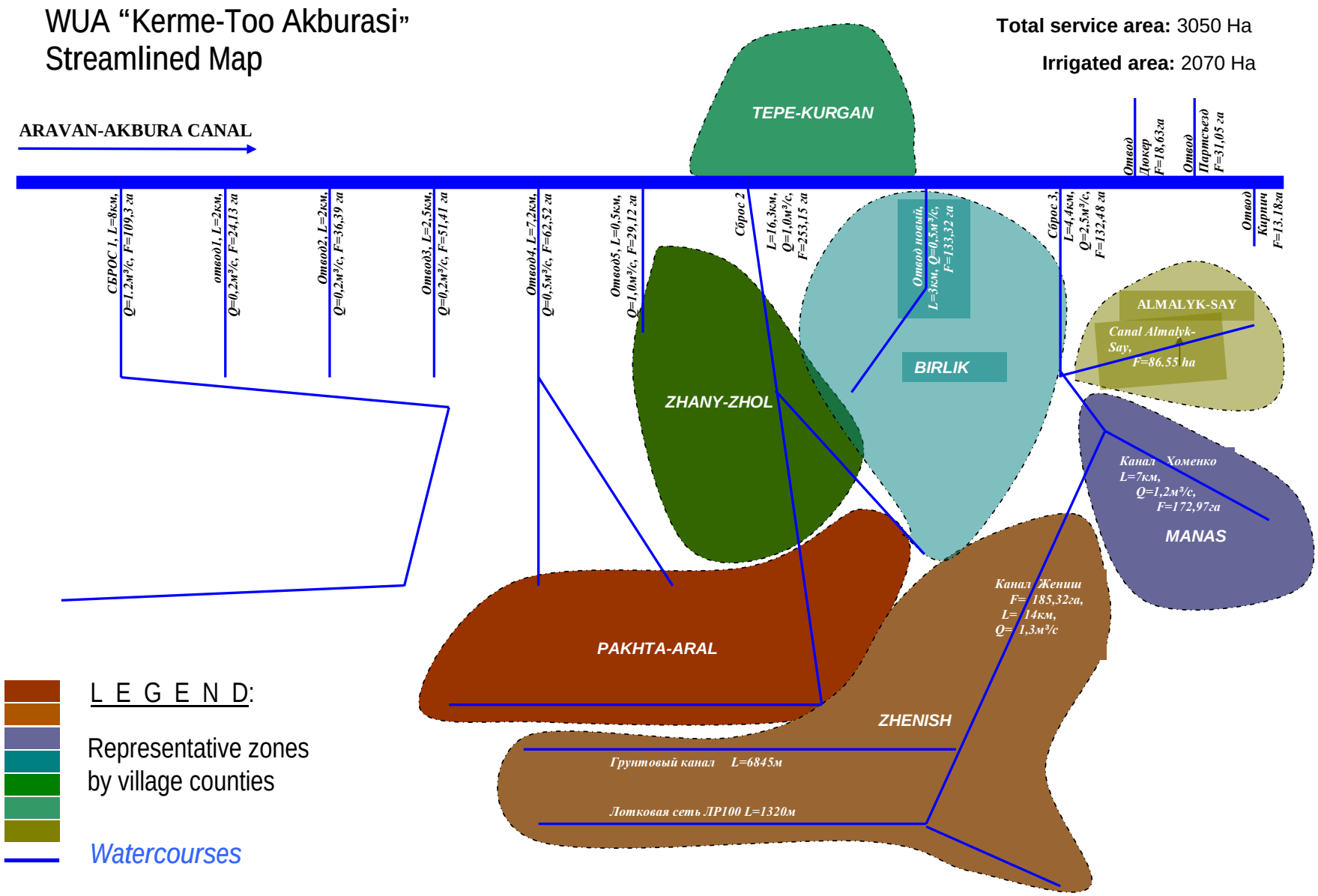
Basic Units	Total No	Area irrigated, ha
Branch canals from the main AAC	1	132
Secondary canals	14	1938
Private individual & joint family farms	985	1915
Village counties	6	155
Households/Home gardens	1010	155
WUA Assembly membership	66	1 per 22 ha
Total population	5585	155

With land use categories and farm sizes being fairly uniform the sampling in WUA 'Kerme-Too Akburasy' was more straightforward.

7 out of 10 direct off-takes from the main Aravan-Akbura Canal at the WUA "Kerme-Too Akburasi" are relatively smaller canals (0.5 – 7.2 km). So from each one of them 3 water users representing the head, the middle and the tail were randomly selected for the interview to make a total of 21 farmers. Another two diversions in the WUA service area are much longer (8 and 16.3 km) and serve much more water users along them, so from there another 20 farmers were picked up: 10 from each canal evenly distributed between the head, middle and tail. The longest and most branchy internal subsystem here is represented by the off-take 'Sbros-3' which further branches out into the Almalyk-Say and Zhenish Canals, the Canalette Network as well as the Khomenko Minor from which another 20 smaller watercourses stem out. So the remaining 19 farmers were evenly picked up from this subsystem, out which 9 people were evenly sampled from the head, middle and tail of the Khomenko Minor. Thus, the sampling schematic for 60 farmers to be interviewed in WUA 'Kerme-Too Akburasi' was as follows:

3 Farmers from each of *7* smaller WCs (Distributories 1, 2, 3, 4, 5, Noviy & Kirpichniy) = **21**
10 Farmers from each of 2 bigger canals ("Sbros-1", "Sbros-2") = **20**
19 Farmers from the longest subsystem (Sbros-3, Zhenish Canal, Khomenko Minor) = **19**
T O T A L = **60**

Figure 3. Map WUA "Kerme-Too Akburasi"



1.5.3. WUA "Zarafshan"

Given uniformity in local farm systems and land use categories, the sizes and lengths of distributary canals, the procedure for sampling 60 water users in WUA "Zarafshan" was even more straightforward than in the above mentioned 2 pilot WUAs using the following base information:

Basic Units	Total No	Area irrigated, ha
Distributories	2	1050
Watercourses	28	1050
Private Cooperative Farms	12	748.8
Kolkhoz team-brigade	1	105
Households & Home gardens	1010	201.2
Villages	5	201.2
WUA Assembly members	65	5 per each farm
Total certified land users	1966	1050

To make sure the quality of survey data to be collected is fair enough the sample of 60 in WUA "Zarafshan" included among other farmers the Chairmen of all 12 cooperative farms plus a foreman of the kolkhoz "Leningrad" work brigade, because it was rather them to be likely more knowledgeable about water use and production details in their respective farms than any other of their fellow farmers. The remaining 48 water users were evenly selected from the head, middle and tail of 2 distributories, i.e. 24 farmers per each distributory. The general layout for sampling of water users by distributories and farms was as follows:

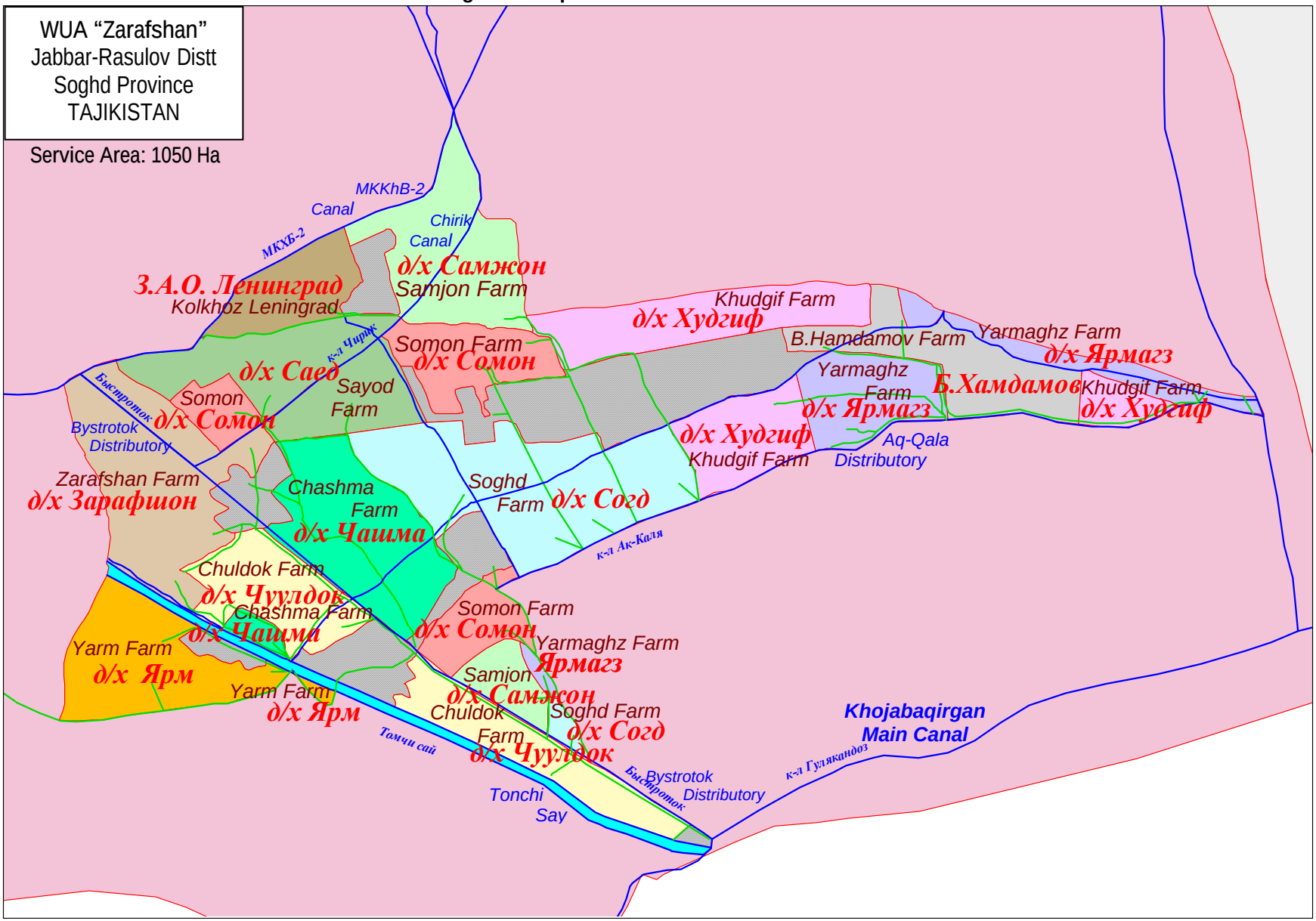
Table 4. Sampling Layout in WUA "Zarafshan"

Canal Reach	**Distributory-1 "*Aq-Kala",*** *5 km*		**Distributory-2 "*Bystrotok",*** *5.2 km*		**Total**
	Farms	Number sampled	Farms	Number Sampled	
Head	Private Cooperatives *1, 2 and 3*	*10*	Private Cooperatives 7 and 8	*10*	***21***
Middle	Private Cooperatives *4 and 3*	*10*	Private Cooperatives 9, 10, 11 & 12	*12*	***22***
Tail	Private Cooperatives *5 and 6*	*11*	1 Kolkhoz Work Brigade	*7*	***18***
	T O T A L:	***31***		***29***	***60***

1.6. Challenges When Conducting The Survey

Unfortunately, as is the case with many other similar surveys, not all quantitative data could be collected in full, due to a poor response rate among farmers for some questions related to crop production and irrigation water use such as yields, prices per unit, agricultural costs, water volumes requested or received, etc. Especially this was the case with the respondents from large quasi-state and private cooperative farms in Uzbekistan and Tajikistan where member farmers are treated rather as paid farm labor. So their attitudes are rather those of dependent people who lack sense of ownership and power to influence or change things even with regard to their cooperative farms let alone the newly set up water user associations - participatory organizations of a new

Figure 4. Map of WUA "Zarafshan"



type that require from their members completely different thinking, mindsets and attitudes.

Nevertheless, majority of water users did provide answers for the number of irrigations actually received and those received on time which allowed making some judgments on the quality of irrigation service before WUAs were in place.

Another issue that required some caution, when conducting the survey and interpreting the results is attitudes and perceptions expressed by farmers on different conceptual issues of IWRM and PIM. Such questions were asked in the second part of the questionnaire and at times were quite difficult for farmers to properly understand. With this in mind the conceptual part of the questionnaire during each interview was preceded with the detailed narration by the interviewer of the basics, reasons and principles of IWRM and what service providers and governing bodies might be there in place to manage water at each particular hydraulic level. Surprisingly the response rate for this part of the questionnaire turned out to be fairly high despite the complexity of the notions and issues involved.

2. HOUSEHOLD DEMOGRAPHICS

Normally a rural household in the Ferghana Valley is a nucleus (extended) family with several sub-families living in each one of them and sharing common food and other expenses. On average every third household in the study areas had 2 to 4 sub-families inside it. An average household across all WUAs would have a little bit more than 7 family members with about half of them being women. Normally about 90% of the working age household members are primarily occupied in agriculture with half of them being women. Every other household would have at least one member in the working age (16-65 years) working in an area outside agriculture.

Table 5. Basic Household Demographics by WUAs

WUA of respondent		Total people in household	No. of females	No. of spousal couples	No. of those in the working age	Those in farming and home garden	No. of farming females
Akbarabad	Mean	6,98	3,20	1,47	4,17	3,68	1,78
	Minimum	3	1	1	2	1	0
	Maximum	18	8	4	12	12	5
Zarafshon	Mean	7,57	3,73	1,47	4,37	4,15	2,25
	Minimum	3	1	1	2	2	1
	Maximum	14	9	4	10	10	6
Kerme-Too Akburasy	Mean	7,17	3,48	1,35	4,55	4,12	2,00
	Minimum	1	1	0	1	1	0
	Maximum	16	11	3	10	8	6
Total	Mean	7,24	3,47	1,43	4,36	3,98	2,01
	Minimum	1	1	0	1	1	0
	Maximum	18	11	4	12	12	6

Only 8 females across all WUAs were identified in the capacity of household heads making up an insignificant 4% of the total sample: 2 in WUA “Akbarabad”, 1 in WUA “Zarafshan” and 5 in WUA “Kerme-Too Akburasy”. Therefore, an average farmer household head for all 3 WUAs was a male in his early 40s:

Table 6. Age of Respondents by WUAs

		WUA of respondent			
		Akbarabad	Zarafshon	Kerme-Too Akburasy	Group Total
Age of respondent (in years)	Minimum	26	20	20	20
	Maximum	81	63	75	81
	Mode	36	39	40	40
	Mean	43	42	44	43

Education background of the sampled household heads ranged from primary to higher. WUA "Zarafshan" turned out to be the most educated with the highest share of those who completed higher and secondary vocational education institutions, followed by WUA "Akbarabad" and WUA "Kerme-Too Akburasy". No illiteracy was found among farmer household heads:

Table 7. Education of Household Heads by WUAs

	WUA of respondent		
	Akbarabad	Zarafshan	Kerme-Too Akburasy
	%	%	%
Higher	22%	30%	7%
Incomplete higher	0%	0%	3%
Secondary Vocational	25%	35%	23%
Secondary	53%	35%	65%
Primary	0%	0%	2%

The status of farmers in the sample falls into one of the four categories: individual farmer or farm member, keeper of kitchen garden, both - farmer and kitchen gardener - at the same time and seasonal tenant. Almost all respondents across all WUAs were at the same time farmers or farm members and keepers of backyard gardens:

Table 8. Respondents' Status by WUAs

		WUA of respondent		
		Akbarabad	Zarafshon	Kerme-Too Akburasy
Status of respondent	Farmer/Farm member			10
	Kitchen gardener	4		
	Both	56	60	49
	Seasonal tenant			1

In terms of the relation to a farm people sampled were either heads or owners of farms, farm members, tenants or full-time workers.

Table 9. Respondents' Relation to Farm by WUAs

	Akbarabad	Zarafshon	Kerme-Too Akburasy
Head/Owner cultivator	39	11	50
Farm member	20	48	8
Tenant	0	0	1
Permanent worker	1	1	1
Total Respondents	**60**	**60**	**60**

Farms represented by those sampled specialized in one of the following agricultural production areas:

Table 10. Farm's Specialization by WUAs

		WUA of respondent		
		Akbarabad	Zarafshon	Kerme-Too Akburasy
Farm's specialization	Animal husbandry	0	0	1
	Crop cultivation	56	6	26
	Both	4	54	32
	Bee-farming	0	0	1

Traditions assign local women a special place as a homemaker and specific daily chores to be performed exclusively by women of a household. The table below presents what agricultural jobs are normally assigned to women. The busiest women across all WUAs turned out to be those in WUA "Zarafshan" where almost all households had them milking, weeding, picking cotton, caring for cattle and poultry and sowing crops:

Table 11. Agricultural Jobs Rather Performed by Women of a Household by WUAs

Agricultural jobs performed only by women of the household by WUAs	**WUA "Akbarabad"**		**WUA "Zarafshan"**		**"Kerme-Too Akburasy"**	
	N	% of total [a]	N	% of total	N	% of total
Milking	56	93%	60	100%	57	95%
Weeding	20	33%	55	92%	6	10%
Picking cotton	6	10%	59	98%		
Livestock and poultry care	5	8%	55	92%	21	35%
Sowing	9	15%	31	52%		
Picking fruits, vegie, grapes	2	3%	8	13%	6	10%
Selling goods at the market					25	42%

a. Total number of households assumed here is 60 which is 100%

3. SOURCES OF AGRICULTURAL INCOME

The survey has confirmed that agriculture was by far and large the main source of livelihood for most farmer households in the study WUAs. Only one person of the working age in every other household was likely to work outside agriculture. However, this survey had its main focus on the incomes earned from agricultural activity only. Most farmers in all the 3 WUAs associated their primary occupation with working on farm, be it a large quasi-state or private cooperative farm or a small private farming entity, whereas cultivating the backyard garden plot reported by most respondents as their secondary occupation. It is worth noting, though, that despite being secondary to working on farm the latter sometimes constituted a far more essential part in the total household revenues especially in the Uzbek WUA (see the subsection on the composition of agricultural income herein below).

Table 12. Primary and Secondary Occupations of Respondents by WUAs

Farmers' primary and secondary occupations by WUAs		Akbarabad	Zarafshon	Kerme-Too Akburasy	Total %
		%	%	%	
Primary occupation	Farming	95%	83%	82%	87%
	Kitchen gardening	2%	2%	-	1%
	Other	4%	15%	18%	1%
	Total Respondents (N=60)	**100%**	**100%**	**100%**	**100%**
Secondary occupation	Kitchen gardening	98%	88%	67%	84%
	Farming	-	10%	15%	8%
	None	2%	-	13%	5%
	Other	-	2%	5%	3%
	Total Respondents (N=60)	**100%**	**100%**	**100%**	**100%**

Thus, agricultural incomes of farmers in the study areas mainly came from the combination of the following sources: crop production both on main land parcels and backyard gardens, animal husbandry (for self-consumption and earning additional income from selling domestic animals and the derivatives) as well as in-kind and cash remuneration (as is the case with cooperative farm members in Uzbekistan and Tajikistan).

3.1. Crop production

As was mentioned above the income from crop production for comparative purposes is distinguished here between one generated from on farm activities and that from cultivating the backyard gardens. This is done to show the importance of the latter in overall household economics especially in the case of cooperative farming in Tajikistan and Uzbekistan where farm members, being rather employees than co-owners of their respective farms, working for wages, greatly rely in their livelihoods on their small-scale subsistence domestic farming activities.

While indicative data on the yields, areas, prices and sale proceeds for major crops grown in the 3 pilot WUAs as reported by the interviewees by main land holdings and kitchen gardens are set out in Annex 1 hereto, the table below shows average estimates for cultivated plot sizes, cropping intensities, gross and per area unit incomes by plot and farm types across all the WUAs studied.

Table 13. Average estimates for per-area unit earnings and cropping intensities by farm and plot types, by WUAs

WUA	*Farmer Type*	***Land parcel type***	***Average plot size cultivated, ha***	***Actual average area cropped, ha***	***Cropping intensity, %***	***Total average net earnings from crop production***	***Average earnings per area unit, US$***	***Typical cropping patterns***
AKBARABAD	**Proprietary Farmer** [**N=33**]	*Main*	13	15	117%	1043	$ 80 per ha	2-crop pattern: Orchards/cotton-winter wheat
		Kitchen	.09	.10	104%	163	$ 18 per .01 ha	3-crop pattern: Potato-veggie-orchards
	Shirkat Farmer [**N=20**]	*Main*	2.1	2.2	104%	175	$ 83 per ha	2-crop pattern: Cotton- winter wheat
		Kitchen	.10	.11	104%	180	$ 18 per .01 ha	3-crop pattern: Potato-veggie-orchards
ZARAFSHAN	**Cooperative Farmer** [N=60]	*Main*	1.4	1.6	113%	262	$187 per ha	4-crop pattern: Cotton-veggie-corn-winter wheat
		Kitchen	.10	.08	77%	100	$ 10 per .01 ha	4-crop pattern: Potato-tomato-corn-cucumber
ME-	**Proprietary Farmer** [N=60]	*Main*	1.14	1.5	135%	393	$345 per ha	3-crop pattern: corn-veggie-sunflower

		Kitchen	.10	.06	60%	87	$ 9 per .01 ha	2-crop pattern: Apples - vegetables

There are many factors to influence the level of income generated from crop production in the WUAs under study. Among the key ones are general resource availability including land size, water, funds, fertilizer and other inputs, selling crop prices, cropping patterns, cropping intensities, etc. In overall, many income generating problems experienced by farmers with regard to the above mentioned factors can be attributed to immature local agricultural markets, poor marketing facilities available and state regulation for some major cash crops produced. With all other things being equal across the WUAs in question, the main constraint for the Kyrghyz farmers to generate better income from their crop production is the tiny land size available to them on average, whereas in Tajikistan and Uzbekistan it is lack of discretionary power for the farmers to decide which crops to grow or cropping patterns to follow coupled with low selling prices for major cash crops. All this makes local farmers to look for some compensatory income generating strategies. Thus, in Tajikistan and Uzbekistan farmers, especially those in shirkats and private cooperatives, try to maximize their incomes by more intensively cultivating their backyard gardens coupled with grazing domestic livestock and poultry, whereas the Kyrghyz farmers by far and large live off their main land parcels giving less care to their home gardens. The figures in the table above suggest that per area unit incomes of the Uzbek farmers ($18 per .01 ha) from their backyard gardens were either twice or almost twice as higher than those of the Kyrghyz ($9 per .01 ha) and Tajik ($10 per .01 ha) farmers, respectively. At the same time the topmost per-hectare net income earners for the main plots were respondents ($345) from the Kyrghyz WUA, followed by those from Tajik ($187 per ha) and Uzbek (about $80 per ha each) WUAs. Different per-area unit incomes from crop production by WUAs can partly be explained by different cropping intensities (or how intensively land parcels were utilized throughout the year), which is the ratio of the cumulative area for all crops grown during the year to the cultivable area operated by the farmer. Despite being the topmost per-hectare earners with the highest estimated cropping intensity (at 135%) shown across all WUAs, the Kyrghyz farmers didn't do that well in terms of their overall cropping revenues due to the tininess of their parcels. It is also worth noting that such an intensive cropping is achieved by the Kyrghyz farmers by growing crops only in one vegetative season, with no crops reported for the non-vegetative period. At the same time the cropping intensities in Tajik (113%) and Uzbek (111%) WUAs were somewhat lower despite that most farmers here cultivated crops in both seasons.

Table 14. Cropping intensities for main land parcels by canal reaches by WUAs (in %)

Cropping intensities for main land parcels by WUAs		**Location of watercourse along distributory**			**Location of main land parcel within watercourse**				**Group Total**
WUA	Farmer type	*Head*	*Middle*	*Tail*	*Head*	*Middle*	*Tail*	*Scattered*	
AKBARABAD	Shirkat farmers N=23	103	102	106	105	111	97	84	104%
	Pty farmers (cotton) N=5	96	100	95	96	-	97	-	97%
	Pty farmers (fruits) N=26	100	123	134	106	124	131	-	122%
	All farm types	103	113	114	105	117	113	84	**111%**
ZARAFSHAN	All farm types	114	114	109	105	114	116	119	**113%**
KERME-TOO	All farm types	148	132	133	146	133	128	-	**135%**

As can be seen from the table above there was quite a difference in the cropping intensities inside the Uzbek WUA which was clearly related to a farm's specialization in crop production. It was lower with cotton growing farms and much higher with those growing orchards, which was possible due to the latter growing winter wheat between

the rows of fruit trees in winter season. With the Kyrghyz WUA it is evident that those in the head had about 15% higher cropping intensity than those in the middle and the tail. Possible explanation for such a difference may be poorer water availability or reachability with the farms in the middle and tail-end along both distributary and watercourse canals, since about 40% of the farmers with their fields in the middle and 60% of those in the tail of both distributories and watercourses had their fields 100 to 2000 m away from their field turnouts on the watercourse. In contrast, almost all of those in the head reaches of both distributary and watercourse canals had their fields in the immediate proximity from their watercourse turnouts.

Table 15. Proximity of respondents' fields from the watercourse by canal reaches in WUA "Kerme-Too Akburasi"

Proximity of your fields to the turnout in meters	Location of watercourse within distributory						Location of respondent's fields within watercourse canal						Total	
	Head		Middle		Tail		Head		Middle		Tail			
	N	Col %	N	Col %	N	Col %	N	Col %	N	Col %	N	Col %	N	Col %
Immediate	7	70%	11	50%	7	29%	11	69%	9	36%	5	33%	25	45%
Less than 50 m	2	10%	4	18%	4	13%	3	19%	5	20%	1	7%	10	18%
100 m to 2000 m	1	20%	7	32%	14	58%	2	12%	11	44%	9	60%	21	37%
Total	10	100%	22	100%	24	100%	16	100%	25	100%	15	100%	56	100%

3.2. Livestock

Another important source of income for farmers in the pilot areas was animal husbandry. This survey didn't ask farmers about the kind and the number of livestock in their possession. The question was rather straightforward asking them how much they earned from keeping livestock. The survey results show that livestock contributes essentially to farmers' income. It provides them an opportunity to satisfy not only their own needs in livestock derivatives (meat, milk, wool etc.) but also to sell some of it outside for cash. Though there were many in the sample across WUAs, except Tajikistan, who didn't report specializing in animal husbandry, especially in case of WUA "Akbarabad", almost all of the farmers normally did have their private livestock or poultry on their own from which they earned in some way or other:

Table 16. Farm's specialization by WUAs

Farm's specialization	WUA of respondent						Total	
	Akbarabad		**Zarafshon**		**Kerme-Too Akburasy**			
	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Crop/orchards cultivation	56	93%	6	10%	26	43%	88	49%
Animal husbandry					1	2%	1	1%
Both	***4***	***7%***	***54***	***90%***	***32***	***53%***	***90***	***50%***
Bee-farming					1	2%	1	1%
Total	***60***	***100%***	***60***	***100%***	***60***	***100%***	***180***	***100%***

The table below reveals that more than 40% (25 households) of those interviewed in the Uzbek WUA, almost all in the Tajik WUA and a third of those in the Kyrghyz WUA earned additional cash incomes from their livestock. In Uzbekistan incomes from livestock ranged from USD 100 to USD 2000 with 28% of all sampled farmers receiving up to USD 500. In WUA Zarafshan 90% of farmers reported having earned some income with 28% of them earning less than USD 100, 42% USD 100 to 200 and 17% USD 225 to 500. Worse-off in earnings from livestock were Kyrghyz farmers:

Table 17. Households' income from livestock by WUAs

Total income from livestock (in US$)	WUA of respondent						Total	
	Akbarabad		Zarafshon		Kerme-Too Akburasy			
	N	Col %	N	Col %	N	Col %	N	Col %
< $100			17	31%	7	35%	24	24%
$100 - 200	8	32%	25	46%	10	50%	43	43%
$201 - 500	9	36%	10	19%	3	15%	22	22%
$501 - 2000	8	32%	2	4%			10	10%
Total	**25**	**100%**	**54**	**100%**	**20**	**100%**	**99**	**100%**

Note: Whenever the total number in statistical data presented in this and other tables is less than 60 (which is a total number of respondents interviewed at each pilot WUA) it should be understood that the missing number of respondents either gave no any reply or a question was simply irrelevant to them so that they were coded correspondingly as NR (No reply) or NA (Not Appropriate) and consequently not included in the output table.

3.3. Cash and in-kind remuneration in Uzbek and Tajik cooperative farms

Notorious about cooperative farms and other quasi-state-run enterprises in rural areas both in Uzbekistan and Tajikistan is lack of ready cash. Quite often the situation is so bad that those in the work age envy their retired elderly neighbors or relatives who are on their tiny government pensions, but, nevertheless, paid at least on a regular basis. Farmers' replies confirm this situation revealing that a vast majority of farmer households (61% in Uzbek WUA and 75% in Tajik WUA) was paid cash wages in an equivalent of less than USD 100 a year (with more than half of such farmer households receiving even less than US$ 50) with the rest receiving slightly more than that amount - up to USD 220-260. There were only 3 farmers in the Tajik WUA who reported their families had received higher pays in cash - US$ 350 to US$ 800 a year. The average number of family members being members of cooperative farms was 2.2 out of a total 6.1 persons per an average shirkat farm household in the Uzbek WUA and 3.6 out of a total of 7.6 persons per an average collective farm household in the Tajik WUA.

Table 18. Cash remuneration of cooperative farmers from the Uzbek and Tajik WUAs.

Total cash received in 2002 working for farm	WUA "Akbarabad"		WUA "Zarafshan"			
	Shirkat Farm		*Kolkhoz*	*Pvt.Cooperative*	Total	%
	N	%	N	N		
< $50	5	22%	6	21	27	45%
$51 - 100	9	39%		18	18	30%
$110 - 200	5	22%		7	7	12%
$210 - 260	2	9%		2	2	3%
$350 - 500				2	2	3%
$700 - 800				1	1	2%
T o t a l	**21**	**92%**	**6**	**51**	**57**	**95%**

On average cooperative farmers received US$ 95 a year in Uzbekistan and US$ 97 in Tajikistan which translates into an average of US$ 8 a month received in cash by an average household.

Such a lack of ready cash is partly compensated by in-kind payments which cooperative farmers receive throughout the year. All respondents from cooperative farms both in Uzbekistan and Tajikistan reported having been paid as their in-kind compensation package with cotton seed oil (6 to 30 liters in Uzbekistan averaging to 15 l per family and 1 to 250 liters in Tajikistan with an average of 70 l per family) and wheat (40 to 1300 kg in Uzbekistan or 686 kg on average and 45 to 1500 kg in Tajik WUA making an average of 612 kg per family). Other popular in-kind remuneration products both in Uzbekistan and Tajikistan were feed stuff received by 36% of shirkat farmers in Uzbekistan with 100 to 1000 kg per family averaging to 396 kg, and almost 80% of

those in Tajik WUA receiving 16 to 800 kg per family, or, 290 kg on average. More than 60% of Uzbek cooperative farmers was also paid with pasta product (macaroni): 10 to 60 kg, or, 23 kg on average. Among other popular products to pay in Tajik WUA were onion and meat: almost 90% of all Tajik farmers received in compensation 70 to 1000 kg of onions averaging to 378 kg per family, and 28% of Tajik farmers received 2 to 10 kg of meat, or an average of 4.4 kg per family. Meat, potato, onion, rice, melons, carrot, soap and fabric were other compensation products in Uzbekistan which were received by very few farmers.

Thus, an average yearly compensation package of an Uzbek shirkat farmer household in 2002 amounted to US$ 95 in cash payments and 15 l of cotton seed oil, 686 kg of wheat, 396 kg of feed stuff (cotton seed cake), 23 kg of pasta products annually

The similar average yearly package for a Tajik cooperative farmer family amounted to US$ 97 in cash earnings, 70 l of cotton seed oil, 612 kg of wheat, 290 kg of feed stuff (cotton cake), 378 kg of onions, 4.4 kg of meat

3.4. Approximation of Total Agricultural Income by Sites and Farm Types

Based on average prices for products received by cooperative farmers as in-kind remuneration - cotton seed oil $1 per 1 liter, wheat $ 0.06/kg in Uzbekistan and $0.07/kg in Tajikistan, fodder (cotton cake) $0.05/kg, macaroni $0.2/kg, onion $0.1/kg, meat $2/kg - the above figures translate into a yearly total of about US$ 175 ($95+$80) received by an Uzbek household working for cooperative farm, or $ 15 a month, and about USD 262 ($97+$165) received by the vis-à-vis in Tajikistan, or $22 a month.

Besides, additional contributions to the income of cooperative farmers in Uzbek and Tajik WUAs were possible from grazing livestock and cultivating backyard gardens resulting, respectively, in an average of US$ 370 (for 55% of shirkat farm households who reported any income from livestock) and US$ 180 per each shirkat household in WUA ‘Akbarabad’ and US$ 180 and US$ 100, respectively, per each cooperative member family in the Tajik WUA.

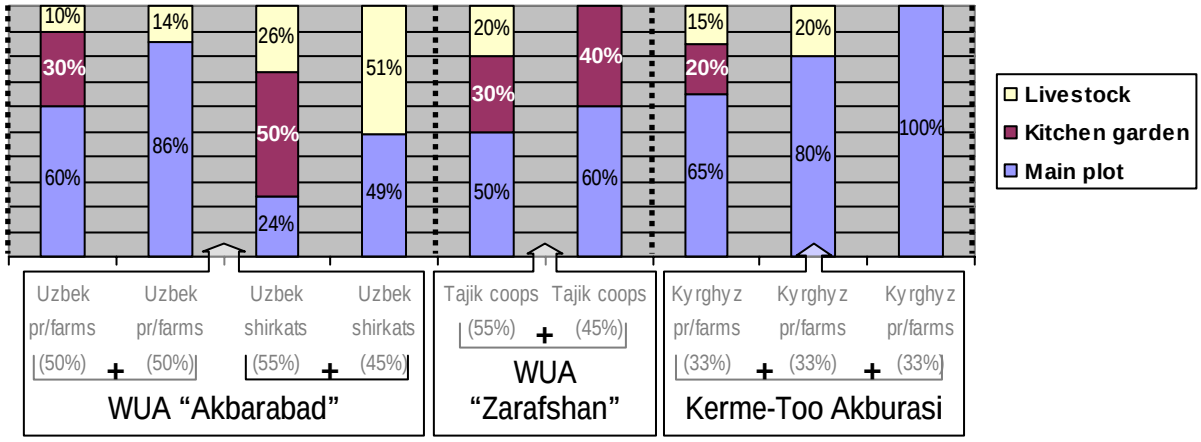
Thus, all in all an average family working for a quasi-state cooperative farm in Uzbekistan with an estimated total of 6.1 persons per household, of whom 55% work in agriculture and 2.2 persons being farm members, roughly earned from their agricultural activities a total of USD 725 ($175+$370+$180), whereas in Tajikistan, with an estimated total of 7.57 persons per family of whom 55% work in agriculture and 3.58 persons are farm members - USD 542 (262+180+100), which translates into US$ 60 and US$ 45 in total monthly earnings for a cooperative farm household, respectively, in Uzbekistan and Tajikistan.

Table 19. Tentative composition of agricultural income by farm types by WUAs.

	Farmer Type	Proceeds from main plot		Proceeds from livestock		Proceeds from home garden		Grand Total in yearly income		Monthly income
		US$	*% of yearly total*	*US$*	*% of yearly total*	*US$*	*% of yearly total*	*US$*	*% within the farmer type*	*US$*
UZB	*Private Farmer* **[N=25]**	1043	60%	544	30%	163	10%	$1750	50%	$145
			86%	0			14%	$1206	50%	$100
	Shirkat Farmer **[N=20]**	175	24%	370	50%	180	26%	$ 725	55%	$ 60
			49%	0			51%	$ 355	45%	$ 30
TAJ	*Coop. Farmer* [N=60]	262	50%	180	30%	100	20%	$ 542	55%	$ 45
			60%		40%	0		$ 442	45%	$ 37
KYR	*Private Farmer* [N=60]	393	65%	137	20%	87	15%	$ 617	33%	$ 50
			80%	0			20%	$ 480	33%	$ 40
			100%			0		$ 393	33%	$ 33

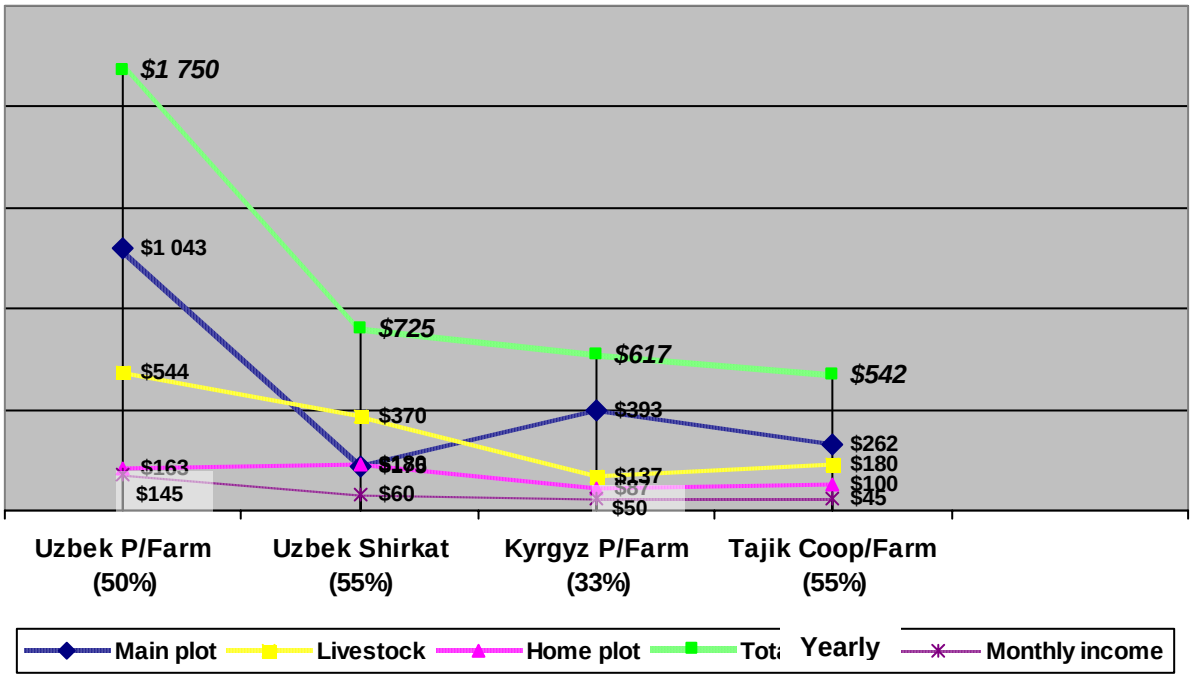
As for the Kyrghyz farmers all of whom are private cultivators of tiny land parcels with the size of their households averaging to 7.17 persons per family and 4.12 of those involved in agriculture, they earned a yearly average of US$ 393 from cultivating their main land parcels, US$ 137 from grazing livestock (a third of all the respondents) and US$ 87 (two thirds of the sample) from working their backyard gardens. In overall, the most successful third of the sampled farmers in the Kyrghyz WUA had earnings from all 3 sources as mentioned above making a total average of US$ 617 a year, or US$ 51 a month, with lesser successful third earning US$ 480 from 2 sources (main land parcel and home garden), or US$ 40 a month, while the least fortunate third earned only from their main plots having about US$ 393 a year or US$ 33 in monthly average income.

Chart 1. Tentative composition of agricultural income by farm types by WUAs



The survey also suggests that the top earners of agricultural income out of all farm categories by countries were the owners of proprietary farms in the Uzbek WUA with one half of them making on average a total of US$ 1750 annually from all three sources of agricultural income, while another half made US$ 1200 from 2 sources – main and backyard plots.

Chart 2. Upper half of agricultural income earners by farm types by WUAs



4. CROPPING

4.1. Crops and Cropping Patterns for Main Land Holdings

Different political, economic and land and water use contexts in all three countries of the valley by far and large dictate local farmers what crops to grow and what cropping patterns to stick to. The survey results show that cropping patterns by different countries vary significantly in terms of variety, diversity and number of crops grown. An average cropping pattern for the main land parcels in the vegetative season would have 1 staple crop or more rarely 2 different crops (in 10% of cases for shirkat farms and 20% of cases for proprietary farms) in the Uzbek WUA and 3 crops in either of the Tajik and Kyrgyz WUAs. In the Uzbek WUA the primary crop for half of the surveyed respondents (who were normally shirkat farm members) was cotton, while another half (all of them were private farmers) had fruit orchards as such crop. 30% of all farmers in the Uzbek WUA grew 2 crops, 13% 3 crops and only one private farmer 5 different crops. The second crop in shirkat farms for those who grew cotton was normally potato or corn, while for those who grew fodder crop it was vegetables (onion or potato). The second crop in proprietary farms for those who grew cotton was normally fruit orchard or corn, while for those who grew orchards it was either another orchard with different fruits or vegetables. As for cropping pattern during the non-vegetative season for WUA "Akbarabad" it was mainly one crop which is winter wheat (reported by 73% of all the interviewed farmers). Only 4 farmers reported having cultivated the second crop during the non-vegetative season 2002-03 such as orchards, barley and strawberries.

In WUA "Zarafshan" where the main crop for all farms is cotton, the cropping pattern consisting normally of 3 different crops in the vegetative season was either cotton-vegetables-corn or cotton-corn-vegetables. 5 respondents (1%) in the Tajik WUA also reported growing the fourth crop – either fodder or orchard. In the non-vegetative season there was only one crop grown across all farms - winter wheat.

In WUA "Kerme-Too Akburasy" where farmers' land holdings were the tiniest (50% of the surveyed farmers had less than 1 ha, 40% had 1 to 2 ha and 10% - 5 to10 ha) the main crop for 61% of all the respondents in the vegetative season 2002 was corn, while the second most popular crop was vegetables (22% of the sample) including mainly capsicum, tomato and potato. The number of crops grown in the vegetative season was normally 3 with one of the following 4 possible cropping patterns:

- corn – vegetables - sunflower (or in reverse order for the last 2 crops);
- vegetable 1 – corn – vegetable 2 or vegetable 1 – vegetable 2 – vegetable 3;
- spring wheat – vegetables – corn (or in reverse order for the last 2 crops);
- sunflower – corn - vegetables

The maximum number of crops grown in the vegetative season for WUA "Kerme-Too Akburasy" was 6 as reported by one of Kyrgyz farmers. As for the non-vegetative season no crops were reported by Kyrgyz farmers except for one who was growing fodder grasses.

4.2. Freedom of Choosing What Crops to Grow

3 pilot WUAs of the project represent 3 different countries of the Ferghana Valley with each of them enjoying different status of economic liberalization. Uzbekistan features

the most restricted economy in the Ferghana Valley, it is followed by Tajikistan which is more liberalized and Kyrghyzstan, as the most liberalized country in the region. This situation is perfectly reflected in answers provided by farmers by countries about their crop production. Farmers in the WUAs of "Akbarabad" (Uzbekistan) and "Zarafshan" (Tajikistan) are concerned with a lack of discretionary power to grow crops or stick to cropping patterns of their own choosing which they think would be more profitable, useful or appropriate as compared to what they currently grow. Almost two thirds of all the respondents in WUA "Akbarabad" and almost half of those interviewed in WUA "Zarafshan" (Tajikistan) reported they were somewhat restricted in opting for cropping patterns or crops of their own choosing. In terms of the implications for irrigation this can be seen as a significant constraint on motivation to invest more in irrigation system in Uzbekistan and Tajikistan.

Table 20. Freedom of choosing what crops to grow by farm types in WUA "Akbarabad"

WUA "Akbarabad"		Type of Farm				Total	
		Shirkat Farm		Proprietary Farm		N	% of total
		N	% of total	N	% of total		
Do you always grow whatever you want?	Yes			17	32%	17	32%
	No	22	42%	14	26%	36	68%
	Total	22	42%	31	58%	53	100%

Mainly it is the case with places where cotton is the main crop. From the farm type perspective, in Uzbekistan almost all the shirkat farmers surveyed reported their dissatisfaction with the current cropping pattern or crops grown. With cotton being the main crop in Uzbekistan and Tajikistan it is interesting to note that the nature of dissatisfaction with freedom of choosing crops or cropping patterns in these two countries considerably differs. Cotton production is far more profitable to farms in Tajikistan than in Uzbekistan due to cotton production quotas and low procurement prices which are still mandatory and dictated by the Uzbek state whereas in Tajikistan cotton trade is liberalized. Restrictions in Tajikistan apply only to cropping patterns in the areas where cotton is grown: cotton area should not exceed 70% of the total area. Thus each cotton growing farm normally has 70% of farmland sown with cotton and 30% with other crops.

Table 21. Freedom of choosing what crops to grow by farm types in WUA "Zarafshan"

WUA "Zarafshan"		Farm system				Total	
		Quasi-state Cooperative		Private Cooperative		N	%
		N	%	N	%		
Do you always grow whatever you want?	Yes	2	29%	29	55%	31	52%
	No	5	71%	24	45%	29	48%
TOTAL		**7**	**100%**	**53**	**100%**	**60**	**100**

In the case of Uzbekistan, it is quite obvious why a vast majority of cotton growing farmers reported that they were not free to opt for cropping patterns or crops of their liking. Most of the respondents in WUA "Akbarabad" were dissatisfied with the current cropping pattern in their farms and would otherwise decrease the current cotton area and start growing such alternative crops as vegetables (53% of dissatisfied farmers), potato (47% of farmers), wheat (41%), orchards (38%), melons and water melons (9%) and rice (3%). On the extreme side, there were 3 private farmers in WUA

"Akbarabad" reporting they would rather completely abandon their cotton production, while 8 other farmers would choose to increase their cotton area.

Table 22. Crop preferences by farm types in Uzbek WUA "Akbarabad"

		Type of Farm		Total
		Shirkat Farm	Private Farm	
Crops to get rid of	Current cropping patter	20	6	26
	Cotton		3	3
	Potato	1		1
	Wheat	1		1
	Total	**22**	**9**	**31**
Crops to grow	Potato	12	4	16
	Wheat	12	2	14
	Orchards	5	8	13
	Vegie	7	2	9
	Carrot	8	1	9
	Cotton	6	2	8
	Melon/Water melon	3		3
	Rice	1		1
	Total	**22**	**12**	**34**

As for almost half of those interviewed in the Tajik WUA who reported their dissatisfaction with current cropping choices, the following table provides some insights:

Table 23. Crop preferences by farm types in Tajik WUA "Zarafshan"

		Farm Type				Total	
		State cooperative		Private cooperative		N	%
		N	%	N	%		
Crops one would get rid of	Corn	4	14	8	28%	12	41%
	Wheat			8	28%	8	28%
	Potato			3	10%	3	10%
	Cotton			2	7%	2	7%
	Onion			2	7%	2	7%
	Tomato			1	3%	1	3%
	Alfalfa			1	3%	1	3%
	Total	4	14	25	86%	29	100%
Crops one would grow instead	Cotton	2	7%	17	59%	19	66%
	Onion			7	24%	7	24%
	Wheat	2	7%	1	3%	3	10%
	Total	4	14	25	86%	29	100%

A vast majority of those in WUA Zarafshan, who expressed dissatisfaction with the current cropping pattern or crops grown, would increase the area sown with cotton if given the chance due to the obvious reason: given free market prices for cotton it is far more profitable to grow it than any other crop locally produced. Local demand for onion which is the second most locally required alternative crop is also quite remarkable. A quarter of those who expressed dissatisfaction with the current cropping pattern would otherwise go for onion instead of wheat, tomato, corn, potato and even cotton. Advantage of onion is that it can be immediately turned into cash after harvested and sold, while with cotton it takes at least 3-4 months to cash in after the harvest.

In contrast to the above 2 pilot WUAs in Uzbekistan and Tajikistan, 100% of farmers interviewed in WUA "Kerme-Too Akburasy", Kyrgyzstan reported they were always free to choose whatever they wanted to grow.

4.3. Crops and Cropping Patterns for Backyard Gardens

Apart from the main land holdings each farmer household in the pilot areas has its own private backyard garden. Their role in the economics of a household is important but differs considerably by different countries. In Uzbekistan and Tajiikistan due to the existing cropping restrictions applied to the main land holdings as described above, the backyard gardens are not subject to such restrictions and play, especially in Uzbekistan, a major role in generating farmers' incomes. In Kyrgyzstan it is just additional source of income. The area of farmers' estates, including house and backyard gardens, as reported by the respondents in the pilot areas ranges from 0.08 to 0.35 ha in WUA "Akbarabad", 0.07 to 0.50 ha in WUA "Zarafshan" and 0.05 to 0.35 in WUA "Kerme-Too Akburasy", of which about 0.03-0.05 ha is normally occupied by the house. In 2002 the actual size of land where farmers grew their crops ranged from 0.04 to 0.25 ha in the Uzbek WUA with a majority (50%) of local home users having growing area of 0.10 to 0.15 ha; from 0.02 to 0.37 ha in the Tajik WUA with a majority of local farmers (60%) having 0.07-0.10 ha in growing area; in the Kyrgyz site the actual backyard area ranged from 0.03 to 0.27 ha with 45% of local home users having 0.03 to 0.06 ha and 42% of them having 0.10 to 0.15 ha. It is also noteworthy that all respondents in Uzbek and Tajik WUAs used their backyard gardens for crop production, while in the Kyrgyz WUA only 38 farmers (63% of the sample) used their home gardens for generating additional income.

The main crops for home gardens in 2002 were reported to be potato (53%), other vegetables (tomato, cucumber) (19%) and fruit orchards (20%) in WUA "Akbarabad"; potato (89%), tomatoes (65%) and corn (11%) in WUA "Zarafshan"; apples (61%), corn (7%), potato (5%) in "Kerme-Too Akburasy". About 40% of respondents in the Uzbek WUA grew at least 2 crops and 15% even 3 different crops in the vegetative season 2002. In the Tajik WUA 77% of all the respondents grew at least 2 crops, 20% at least 3 crops and 12% four different crops. In the Kyrgyz WUA absolute majority of farmers grew only one crop with an insignificant 8% of farmers growing the second crop. Typical cropping pattern for home gardens in the Uzbek WUA was one of the following:

a) potato – corn or carrot - orchard

b) veggie1 (tomato) – veggie2 – corn (or reverse for the last 2 crops)

c) orchard – veggie or beans or corn – orchard 2

Preferred cropping patterns in the Tajik WUA were:

a) potato – tomato or corn – cucumber or beans – cucumber

b) orchard – potato – corn – tomato

c) corn – potato – tomato

Observed cropping options for those who had 2 crops in the Kyrgyz WUA were:

a) apples – veggie or fodder

b) tomato – capsicum

3) potato - apples

As for the non-vegetative season backyard gardens for the most part were not used. There were only insignificant 3 farmers in WUA “Akbarabad” and 8 in WUA “Zarafshan” who reported any activity during off-season:

Table 24. Kitchen garden crops in the non-vegetative season by WUAs

Kitchen crops grown in the non-vegetative season (2002-03)	WUA of respondent		
	Akbarabad	Zarafshon	Total
Winter wheat	3	6	9
Kidney bean		2	2
Total	3	8	11

5. YIELD AND PROFITABILITY TRENDS

Despite the existing cropping restrictions in Uzbekistan and Tajikistan, the trend in yields for main crops was reported by a large majority of the interviewed farmers as getting higher for the last 3 years, while in “Kerme-Too Akburasy” considerable was the number of those who had their yields getting lower or remaining at the same level:

Table 25. Yield trend for main crops in the last 3 years by WUAs

		WUA of respondent		
		Akbarabad	Zarafshon	Kerme-Too Akburasy
		% of total	% of total	% of total
In the last 3 years what was the yield's trend for your main crops?	Lower	6%	2%	22%
	Same	10%	15%	47%
	Higher	83%	83%	31%
Total		100%	100%	100%

As far as the profitability of farming is concerned the proportion of those in all three WUAs who reported their farms making profit was almost identical at about 60% of all sampled farmers, however the number of those who break even in WUA “Kerme-Too Akburasy” turned out to be almost twice as high (37%) as compared to Tajik (18%) and Uzbek (24%) WUAs, while the proportion of those who reported their farms loss-making was significantly higher in the Tajik WUA (19%). Explanation for a larger proportion of the loss-making farms in the Tajik WUA might be that farmer cooperatives in Tajikistan when set up as a result of the fragmentation of former huge kolkhozes inherited also their bad debts which are still outstanding and due:

Table 26. Farm profitability as reported by WUAs

		WUA of respondent		
		Akbarabad	Zarafshan	Kerme-Too Akburasy
		% of sample	% of sample	% of sample
What would you rate your farm?	Profit-making	70%	63%	58%
	Loss-making	2%	19%	5%
	Breaking even	28%	19%	37%
Total		100%	100%	100%

6. QUALITY OF IRRIGATION SERVICE

A range of questions in the survey questionnaire was designed to address the irrigation service status during the 2002 vegetative and non-vegetative seasons for both main land holdings and backyard gardens of farmers in the project areas, particularly, in terms of water availability, adequacy, reliability, stability and timeliness of water supply, incidence of water disputes etc. Below is the analysis of what could be retrieved from the farmers' replies. As was already mentioned earlier, many farmers were unaware or ignorant about such details as how much water or how many irrigations they requested for irrigating their fields resulting in low response rates for these questions; anyway, the replies to other questions received allow some judgments on the quality of irrigation service before WUAs were in place.

6.1. Water adequacy for main land parcels

Conclusions as to the adequacy of water supply to meet farmers' needs were based on the ratio of the number of irrigations actually received versus those requested by farmers.

In WUA "Akbarabad" with the response rate for corresponding questions being at 80%, access to water along distributory and watercourse canals seems to be fairly good for most farmers.

Table 27. Water adequacy for main parcels in the vegetative season 2003 by WUAs

Vegetative season 2002		**WUA of respondent**					
		Akbarabad		Zarafshon		Kerme-Too Akburasy	
		N	%	N	%	N	%
Water adequacy	upto 50%			2	7%	1	5%
	51 thru 75%			5	17%	6	30%
	76 thru 90%	3	6%	10	33%	1	5%
	91 thru 100%	**45**	**94%**	**13**	**43%**	**10**	**50%**
	101 thru 150 %	-	-	-	-	2	10%
Total		48	100%	30	100%	20	100%

Less reliable irrigations were observed in WUA "Zarafshan". Given the response rate for the number of irrigations requested here at 50%, 43% of those responded (13 people) reported having received 91 to 100% of the requested irrigations with the rest farmers' water demand having been met to 50-90%.

Real situation with water adequacy in WUA Kerme-Too is difficult to figure out due to the response rate for this question here being only at 30% with all other farmers failing to provide any legitimate answer for the number of irrigations requested for the

vegetative season just because they didn't know or didn't care. Among those who did provide valid answer 50% of the farmers reported their needs in the number of irrigations were met in full whereas 10% irrigated more than requested with the remaining farmers having failed to receive requested irrigations by 10 to 50%. However, the number of irrigations actually received for this WUA suggests that water adequacy should be much better than in the other two pilot WUAs.

6.1.1. Water adequacy for kitchen gardens

Data for kitchen gardens for 2002 show better adequacy of water supply than for main land parcels by WUAs. Needs of 92% of keepers of kitchen gardens in WUA "Akbarabad" and 62% of those in WUA "Zarafshan" were fully met against the number of irrigations requested. Determining exact percentage for the Kyrgyz WUA is a bit of a problem since the majority of respondents failed to report the number of irrigations requested. However, the number of irrigations actually received for this WUA suggests that water adequacy should be at least 80%. It is noteworthy that keepers of backyard gardens are treated differently by countries. In Uzbekistan the village population as per the Water Law enjoys the highest priority in delivering water, so in Uzbek villages there is normally continuous water flow in the canals. In the service area of the Tajik WUA backyard gardens are treated at somewhat lower priority and delivered water only after the farms' needs are fully met.

Table 28. Water adequacy for kitchen plots in the vegetative season 2003 by WUAs

		WUA of respondent					
		Akbarabad		Zarafshan		Kerme-Too Akburasy	
		Responses	%	Responses	%	Responses	%
Water adequacy for home gardens	30 thru 50%			3	9%	2	33%
	51 thru 80%			4	12%		
	81 thru 90%	3	6%	5	16%		
	91 trhu 100%	**44**	**90%**	**18**	**56%**	**3**	**50%**
	101 thru 200%	2	4%	2	7%	1	17%
	Total	49	100%	32	100%	6	100%

6.2. Timeliness of Irrigation Service

The timeliness of irrigation service was calculated using the ratio of the number of irrigation received on time to those actually received.

6.2.1. Main Land Parcels in 2002 Vegetative Season

Response rate to assess the timeliness of irrigation service across all pilot WUAs turned out to be much better (83% in WUA Akbarabad, 87% in WUA Zarafshan and 92% in WUA Kerme-Too):

Table 29. Response rate for timeliness of irrigation service by WUAs

	WUA of respondent	Cases			
		Valid		Total	
		N	Percent	N	Percent
Response rate for Timeliness Ratio	Akbarabad	50	83%	60	100%
	Zarafshan	52	87%	60	100%
	Kerme-Too Akburasy	55	92%	60	100%

By WUAs, the best timely service was observed in "Kerme-Too Akburasy" with 70% of all the farmers receiving their scheduled irrigations on time and the rest enjoying their timely water deliveries to 25-75%. Significantly smaller proportion of water users (38%) fully enjoyed timely irrigation service in WUA "Akbarabad" with another 16% of water users enjoying it to 80-93% and the rest 46% to 13 - 77%. In WUA "Zarafshan" schedules of only 25% of local respondents were fully met with another 45% enjoying timely irrigations in 80 to 90% of cases and the remaining 30% of farmers having only 33 to 78% of their scheduled irrigations on time.

Table 30. Timeliness of irrigation service for main parcels in the vegetative season 2002 by WUAs

Vegetative season 2002		WUA of respondent						Total	
		Akbarabad		Zarafshan		Kerme-Too Akburasy			
		Responses	%	Responses	%	Responses	%	Responses	%
Timely service	Never	1	2%	1	2%	1	2%	3	2%
	10 thru 49%	2	4%	3	6%	2	4%	7	5%
	50 thru 75%	19	38%	9	17%	14	25%	42	27%
	76 thru 90%	8	16%	26	50%			35	21%
	91 thru 100%	**20**	**40%**	**13**	**25%**	**38**	**69%**	**70**	**45%**
	Total	50	100	52	100%	55	100%	157	100%

From the head-middle-tail perspective, in WUA Zarafshan with the worst timely service found for both levels - along distributory and within watercourse canals - 91% and 83% of those in the tail, 68 and 67% of those in the middle, and, 73 and 67% of those in the head of the distributory and watercourse canal, respectively, failed to receive timely service.

WUA "Akbarabad" with the second worst timely performance had 72% and 61% of those in the tail, 71% and 77% of those in the middle, and 27% and 46% of those in the head of distributories and watercourses, respectively, failing to receive their timely irrigations.

In contrast, in WUA "Kerme-Too Akburasy" with the best time-bound performance among the 3 sites, only 30% and 33% of those in the tail, 29% and 33% of those in the middle and 22% and 21% of those in the head of distributory and watercourse canals, respectively, failed to receive irrigation service as scheduled.

Common for all three sites is that timeliness of water delivery is less reliable in the middle and tail end watercourses along the distributary canals as well as for those in the middle and tail within the watercourse. By WUAs it looks to be more of a problem in "Akbarabad" and "Zarafshan" than in "Kerme-Too Akburasy", which given the latter's much worse repairs and maintenance status discussed later seems fairly odd.

6.2.2. Timeliness of Irrigation Service for Kitchen Gardens

Data reported by water users suggest that kitchen gardens enjoyed better timely performance of irrigation service as compared to the main land holdings. Those who

had all their scheduled irrigations on time amounted to 62% in WUA "Akbarabad", 32% in WUA "Zarafshan" and 83% of all those in WUA "Kerme-Too Akburasy" who farm their kitchen gardens. The worst timely water deliveries for backyard gardens were observed in the Tajik WUA where almost half of all sampled respondents had their irrigation schedules go down the drain in 25 to 75% of cases.

Table 31. Timeliness of service for home gardens by WUAs

		WUA of respondent					
		Akbarabad		Zarafshan		Kerme-Too Akburasy	
		Responses	%	Responses	%	Responses	%
Timeliness for home gardens	20 thru 50%	6	10%	4	7%	2	3%
	51 thru 75%	9	15%	21	35%	4	7%
	76 thru 90%	5	8%	12	20%	1	2%
	100%	**37**	**62%**	**19**	**32%**	**33**	**55%**
Total		57	100%	56	100%	40	100%

6.2.3. Non-Vegetative Season (2002-03)

The survey data show that timely performance of irrigation service during non-vegetative season takes completely reverse pattern, considerably improving in the Uzbek and Tajik WUAs (perhaps, due to generally less water required off-season and abundant water available in canals) and slightly deteriorating in the Kyrgyz WUA. If earlier during the spring-summer season only 40% of those surveyed in the Uzbek WUA and 25% in Tajikistan enjoyed full timely service, the share of fully satisfied users in the off-season almost doubled (77%) in WUA "Akbarabad" and more than tripled (81%) in WUA "Zarafshan", while getting somewhat lower from 69 to 51% in the Kyrgyz WUA:

Table 32. Timeliness of service in the non-vegetative season by WUAs

Timeliness of service in non-vegetative season	WUA of respondent		
	Akbarabad	Zarafshon	Kerme-Too Akburasy
50%-75%	7 (18%)[a]	1 (3%)	1 (2%)
100%	30 (77%)	26 (81%)	21 (51%)
Never	-	-	12 (29%)
Don't know	2 (5%)	5 (16%)	7 (17%)
TOTAL	39 (100%)	32 (100%)	41 (100%)

a. The number of respondents and their share in those who irrigated during off-season

As to the head-tail stand-off across all WUAs the pattern remained unchanged with a clear majority of those who had a bad luck with timely service considerably increasing towards the tail-end of both distributories and watercourses. It is also noteworthy that a remarkable 29% of farmers in WUA "Kerme-Too Akburasy", who irrigated during off-season, reported having never received their irrigations on time with most of such users farming in the tail-end of both distributories and watercourses.

Table 33. Hydraulic location of those who never enjoyed timely irrigation in WUA "Kerme-Too Akburasi"

WUA "Kerme-Too Akburasi": those who have never enjoyed timely irrigation in the non-vegetative season	Head		Middle		Tail		Total	
	N	%	N	%	N	%	N	%
Location of watercourse within distributory	2	17%	2	17%	8	67%	12	100%
Location of land parcel within watercourse	3	25%	3	25%	6	50%	12	100%

The possible reason for such failure is little water (flowing mainly to the *Aravan-sai,* a river at the receiving end) during off-seasons in the main AAC canal, which prevents water from reaching the tail end of fairly long and poorly maintained direct off-takes in this Kyrgyz WUA: only about quarter out of 41 farmers in WUA "Kerme-Too" who grew crops and irrigated during off-season reported they once cleaned their watercourse:

Table 34. Participation in canal cleaning during off-season in WUA "Kerme-Too Akburasi"

Non-vegetative season 2002-03		Kerme-Too Akburasi	
		N	%
Labor or cash contribution to maintenance	Once	10	25%
	110 Som	1	2%
	None	30	73%
	TOTAL	41	100%

7. STABILITY OF WATER LEVEL WITHIN WATERCOURSES

Another issue which was a matter of concern among a considerable part (30%) of those interviewed was stability of the water level in their watercourses. The following table demonstrates how often the level of water in one's watercourse was stable and constant by WUAs:

Table 35. Stability of water level in the watercourse in the 2002 vegetative season by WUAs

		Akbarabad		Zarafshon		Kerme-Too Akburasy	
		N	%	N	%	N	%
Was water level in watercourse while irrigating stable and constant?	Always	2	4%			25	42%
	Most of the time	28	55%	40	68%	27	46%
	Only some of the time	20	39%	19	32%	7	12%
	Never	1	2%				
	TOTAL	51	100%	59	100%	59	100%

A third of those interviewed in WUA "Akbarabad" and WUA "Zarafshan" reported that the level of water during the 2002 vegetative season was stable and constant in their watercourses only some of the time. In contrast to this, in Kyrghyzstan only 12% of respondents in WUA "Kerme-Too" reported having frequent problems with the water level. This partly proves the hypothesis about *basic asymmetry between countries in water supply versus demand* in the Ferghana Valley with Kyrghyzstan, as the most upstream country being better-off in terms of water availability. This is also suggested by the fact that nobody of those interviewed in the Kyrghyz WUA of "Kerme-Too Akburasy" with their fields in the head of watercourses and their watercourses in the head of distributories reported having had any problem with the water level as opposed to those in the Uzbek and Tajik WUAs:

Table 36. Water level stability in the 2002 vegetative season in "Kerme-Too Akburasi" by canal reaches

Was water level in watercourse while irrigating stable and constant?	Location of watercourse within distributory						Location of respondent's fields within watercourse canal						Total	
	Head		Middle		Tail		Head		Middle		Tail			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Always	7	70%	9	41%	9	35%	11	69%	7	28%	6	35%	24	41%
Most of the time	3	30%	12	55%	11	42%	5	31%	16	64%	6	35%	27	47%
Only some of the time			1	5%	6	23%			2	8%	5	29%	7	12%
Total	10	100	22	100	26	100	16	100	25	100	17	100	58	100

Completely different is the situation in the Uzbek and Tajik pilot WUAs, where even those with their fields in the head of watercourses and distributories reported having considerable problems with water level in their watercourses during irrigation:

Table 37. Water level stability in the vegetative season in "Akbarabad" and "Zarafshan" by canal reaches

Was WC water level while irrigating stable and constant? (Concolidated data for Uzbek and Tajik WUAs)	Location of respondent's fields within watercourse canal				Location of watercourse within distributory			Total
	Head	Middle	Tail	Scattered	Head	Middle	Tail	
Always	1	1	-	-	1	-	1	2
	1%	1%	-	-	1%	-	1%	2%
Most of the time	21	24	20	3	21	32	15	68
	19%	22%	18%	3%	19%	29%	14%	62%
Only some of the time	***8***	***12***	***18***	***1***	***10***	***12***	***17***	***39***
	7%	***11%***	***16%***	***1%***	***9%***	***11%***	***15%***	***35%***
Never	1	-	-	-	-	-	1	1
	1%	-	-	-	-	-	1%	1%
TOTAL	**31**	**37**	**38**	**4**	**32**	**44**	**34**	**110**
	28%	**34%**	**35%**	**4%**	**29%**	**40%**	**31%**	**100%**

Nevertheless, the general hypothesis about the propensity of water availability to worsen towards the tail-end of both watercourse and distributory canals holds perfectly true with more dramatic changes taking place at the watercourse level than at the distributory. This suggests that head-tail inequities in water distribution being equally relevant to both the watercourse and distributory levels are more severely felt at the watercourse level showing the need for developing better understanding and collaboration between farmers within the same watercourse.

Among the main reasons for poor water availability in the watercourse during the 2002 irrigation season a vast majority (two thirds) of the respondents in WUA "Akbarabad" who experienced such problems attributed it to water thefts by upstream users, with the rest farmers referring to general water shortage, unfair water distribution or pumping

failures as other such reasons. Remarkably, that no water thefts were reported by respondents of Tajik and Kyrgyz WUAs in this case. However, when specifically asked later about what people in their neighborhood normally do to obtain more water the most popular answer in the Krghyz WUA and second popular answer in the WUAs of Zarafshan and Akbarabad was stealing water:

Table 38. What do people normally do to obtain more water? (by WUAs)

	Akbarabad	Zarafshan	Kerme-Too Akburasy	Total
	% of N=51	% of N=60	% of N=58	%
Apply to WMO for more	50%	55%	28%	46%
Steal	21%	27%	57%	36%
Nothing	11%	15%	12%	13%
Dyke drainage canal to use its water	14%		5%	7%
Cleaning canals			16%	5%
Give bribes		3%	3%	2%
Employ water rotation			5%	2%
Jointly agree as on how to share water		2%		1%
Use tap water		2%		1%
Dig wells	2%			1%
Borrow turns from neighbors, if they don't need it	2%			1%
Total respondents	**[N=51]**	**[N=60]**	**[N=58]**	**[N=169]**

The above table is interesting in showing that the main strategy to get more water in WUA “Akbarabad” and “Zarafshan” as reported by 55% of all the respondents in each of the 2 WUAs is approaching the WMO, while in Kyrghyz “Kerme-Too Akburasy” stealing water was the most popular answer (58% of all the respondents) especially among middle and tail enders, with those who are more likely to approach the WUA or WMO to seek more water in this WUA constituting the second largest group (28%) of farmers. In WUAs of “Akbarabad” and “Zarafshan” the second most popular option for getting more water was stealing it. Other most popular answers also included “Doing nothing” (12% each in Akbarabad and Kerme-Too and 15% in “Zarafshan”) and dyking drainage canal to divert drainage water for irrigation (16% of respondents in “Akbarabad” mostly from middle and tail watercourses along the distributory and watercourse tail-enders) Head and middle farmers in WUA “Kerme-Too” are more likely than the tail-enders to clean their canals to ensure more water reaches their farms.

8. WATER DISPUTES

Dissatisfaction of farmers with poor water availability during vegetative season as described above is directly related to the incidence of water disputes. Quite remarkable that a third of all the respondents in WUA “Akbarabad” and WUA “Zarafshan” experiencing frequent problems with water level in their watercourses perfectly correlate with a third of all those interviewed in these 2 WUAs who were positive when asked whether they were aware about any disputes at their watercourses during 2002.

Table 39. Incidence of water disputes by WUAs

		WUA of respondent						Total	
		Akbarabad		Zarafshon		Kerme-Too Akburasy		N	%
		N	%	N	%	N	%		
Are you aware of any water disputes at your watercourse during 2002?	***Yes***	20	33%	21	36%	17	31%	58	34%
	No	40	67%	37	64%	37	69%	114	66%
	Total	60	100%	58	100%	54	100%	172	100%

At the same time in WUA "Kerme-Too Akburasy" where farmers' dissatisfaction with water availability was significantly less, the incidence of water disputes was surprisingly as high as elsewhere.

Further analysis of disputes by watercourse and distributory reaches shows the common tendency in all 3 WUAs for the number of disputes to increase dramatically towards the tail-end of the canal with the number of disputes at the head of canals being at its minimum. WUA Akbarabad is a good point in case here:

Table 40. Incidence of water disputes in WUA "Akbarabad" by canal reaches, by farm types

WUA "Akbarabad"		Location along distributory			Field location along the watercourse				Farm system		Total	
		Head	Middle	Tail	Head	Middle	Tail	Scattered	Shirkat	Pty Farm	N	%
		N=11	N=21	N=18	N=14	N=16	N=19	N=1	N=22	N=28		
Are you aware of any water disputes at your watercourse during 2002?	Yes	9%	24%	56%	21%	31%	37%	100%	45%	21%	16	32%
	No	91%	76%	44%	79%	69%	63%		55%	79%	34	68%
	Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	50	100

Another interesting piece of information reveals when analyzing the incidence of disputes by farm types in WUA "Akbarabad": it is significantly higher with shirkat farmers than with private ones. Looking for the reasons one may hypothesize that shirkat farmers might be located more tail-ward as compared to private farmers. To verify this let's look at the location of respondents along canals by farm types:

Table 41. Location of respondents by canal reaches in WUA "Akbarabad"

WUA "Akbarabad"	Location along distributory						Location along watercourse								Total	
	Head		Middle		Tail		Head		Middle		Tail		Scattered		N	%
	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Shirkat Farm	4	29%	9	38%	10	56%	6	35%	9	47%	7	37%	1	100	23	41%
Proprietary Farm	10	71%	15	63%	8	44%	11	65%	10	53%	12	63%			33	59%
Total	14	100	24	100	18	100%	17	100	19	100	19	100	1	100	56	100

The table above and the one below reveal that, indeed, it is rather the location of watercourse within the distributory which is more likely to matter in dispute incidence than location within the watercourse.

Table 42. Location by canal reaches of those in WUA "Akbarabad" who reported disputes in 2002

WUA "Akbarabad"	Location along distributory						Location along watercourse								Total	
	Head		Middle		Tail		Head		Middle		Tail		Scattered		N	%
	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Shirkat Farm	1	100	4	80%	5	50%	3	100	3	60%	3	43%	1	100	10	63%
Proprietary Farm			1	20%	5	50%			2	40%	4	57%			6	38%
Total	1	100	5	100	10	100	3	100	5	100	7	100	1	100	16	100

9. REPAIRS AND MAINTENANCE STATUS

The extent to which canals are properly and regularly maintained and/or repaired greatly influences the quality of irrigation service. To explore the maintenance status there was a number of questions in the survey to specifically address this issue at both the watercourse and distributary canal levels.

9.1. Watercourse level

The first thing that sticks out when looking into maintenance needs for the watercourse level across WUAs that farmers in the Uzbek and Tajik WUAs have far less repairs and maintenance problems than in the Kyrghyz WUA. Only 17% of respondents in WUA “Akbarabad” and 21% in WUA “Zarafshan” reported having had some repairs and maintenance problems left out unattended to within their watercourses during the 2002 vegetative season as compared to 50% of all respondents in WUA “Kerme-Too Akburasy” reporting so. In WUA “Akbarabad” those who did report having such problems belonged mainly to the middle and tail end watercourses along the distributory with the incidence of such problems being twice as higher in the middle of watercourse canals. Remarkably, no such problems were reported by those with their fields in the head of watercourse canals in the Uzbek WUA. In WUA “Zarafshan” it is far more of a problem for the tail end watercourses (the incidence here is more than twice as higher) as well as for the farmers having their fields in the middle and tail of watercourse canals. In WUA “Kerme-Too Akburasy” lack of repair and maintenance is mostly concentrated in the middle of both distributary and watercourse canals with those in the tail of distributory and watercourse canals being also heavily affected though to somewhat a lesser extent (see also relevant tables in Annex 2).

Table 43. Repairs and maintenance needs for watercourse canals by WUAs in 2002

During the 2002 vegetation season did your watercourse need some repairs or maintenance that it didn't get?	WUA of respondent						Total	
	Akbarabad		Zarafshon		Kerme-Too Akburasy		N	%
	N	%	N	%	N	%		
Yes	10	17%	12	21%	29	62%	51	31%
No	50	83%	45	79%	18	38%	113	69%
Total	60	100%	57	100%	47	100%	164	100%

More specifically the watercourse maintenance needs failed to be met in 2002 can be divided into 2 categories: those of routine nature (routine maintenance) and periodic ones (recurrent repairs or rehabilitation). Since the interviewees when responding were also asked to rank the unaddressed maintenance needs in the order of their importance, this allowed weighing such stated needs and identifying, whether the nature of the most urgent needs was short-term and immediate or longer-term and periodic.

The maximum number of needs stated by some farmers from the proposed list happened to be 6. Thus, the items chosen and ranked 1, 2, 3, 4, 5 and 6 were given reverse values – 6 to 1. Then the total score of each such top-chosen item was calculated across all cases. Finally all such scores were summed up to make the overall WUA index for each of the 2 categories of maintenance needs.

Table 44. Repairs and maintenance (RM) indices by WUAs

WUA of respondent		Routine maintenance for WC[a]	Periodic repairs for WC	Routine maintenance for DC[b]	Periodic repairs for DC
Akbarabad	N (Counts)[c]	5 (7)	8 (7)	1 (1)	6 (9)
	RM Index	**40**	**55**	**5**	**39**
Zarafshan	N (Counts)[c]	12 (20)	10 (5)	35 (61)	23 (30)
	RM Index	**110**	**65**	**261**	**125**
Kerme-Too Akburasy	N (Counts)[c]	27 (52)	28 (33)	21 (35)	19 (34)
	RM Index	**241**	**291**	**114**	**144**
Total	N (Counts)[c]	44 (79)	46 (45)	57 (97)	48 (73)
	RM Index	**391**	**411**	**380**	**308**

a. WC - watercourse canal

b. DC - distributary canal

c. N is the number of respondents while C is the actual number of maintenance needs cited

The analysis shows that in WUA "Akbarabad" with the least observed number of unattended needs and, consequently, best maintenance performance, those few reported refer equally to routine (with removal of vegetation along the canal bank as the most frequently stated need, followed by removal of silt from inside the watercourse canal) and longer-term periodic maintenance needs (with repairs of canalettes as the most needed, followed by repairs of the water control structure at the inlet to the watercourse, of measurement devices; straightening the canals). In WUA "Zarafshan" routine needs (with removal of vegetation along the canal bank and that of silt from inside the watercourse canal as most frequently stated) dominate periodic ones (lining of the watercourse with cement and repairs of the water control structure at the inlet to the watercourse canal) by a factor of 4, while in WUA "Kerme-Too Akburasy" periodic measures such as straightening the canal, lining of the watercourse with cement, installation of measurement devices, repairs of water control structure at the inlet to the WC clearly outweigh the urgency of routine needs, even though the latter are more frequently stated.

Table 45. Ratio of routine versus periodic maintenance needs for the watercourse level by WUAs

Routine vs. Periodic WC Maintenance Needs		WUA of respondent		
		Akbarabad	Zarafshan	Kerme-Too
Removal of vegetation along the canal bank		4	8	24
Removal of silt from inside the watercourse canal		3	8	26
Routine maintenance of the regulation structure at the WC inlet			4	2
	RM Count[a]	**7**	**20**	**52**
Straightening the canal		1		17
Lining of the watercourse with cement			3	11
Installation of measurement devices				3
Not everybody took part in repairs				1
Repair of measurement devices		1		
Repairs of canalettes		3		
Repair of the water control structure at the WC inlet		2	2	1
	PM Count[b]	**7**	**5**	**33**
	RM:PM	**1:1**	**4:1**	**1.5:1**

a. Total count of Routine Maintenance needs

b. Total count of Periodic Maintenance needs

Data for the amount of labor contributions by farmers to the maintenance of their watercourses during the vegetative season confirm the above differences in the maintenance status by WUAs.

Table 46. Labor contribution into watercourse maintenance in the vegetative season 2002 by WUAs

		WUA of respondent						Total	
		Akbarabad		Zarafshan		Kerme-Too Akburasy		N	%
		N	%	N	%	N	%		
Labor contribution to maintain canal in vegetative season	Once	11	37%	6	15%	27	96%	44	45%
	Twice	17	57%	34	85%	1	4%	52	53%
	4 times	2	7%	-	-	-	-	2	2%
	TOTAL	30	100%	40	100%	28	100%	98	100%

While the majority of farmers in Uzbek and Tajik WUAs reported having cleaned their watercourses at least twice per season, less than half of those sampled in the Kyrgyz WUA who reported labor contribution did so only once a season. Among possible reasons for poorer involvement of Kyrgyz farmers in the maintenance of their watercourses one may think of greater disconnect existing between local farmers, or lack of proper leadership, initiative or incentives for better organization and mobilization of farmer community or sheer indifference. Similarly, maintenance patterns for kitchen gardens by WUAs also confirm this situation:

Table 47. Labor contribution to maintain canal supplying water to kitchen garden by WUAs

Labor contribution to maintain canal supplying water to kitchen garden	WUA of respondent						Total	
	Akbarabad		Zarafshon		Kerme-Too Akburasy		N	%
	N	%	N	%	N	%		
Once	25	58%	5	9%	16	100%	46	41%
Twice	17	40%	43	81%	-	-	60	54%
3 times	-	-	5	9%	-	-	5	4%
4 times	1	2%	-	-	-	-	1	1%
Total	**43**	**100%**	**53**	**100%**	**16**	**100%**	**112**	**100%**

9.2. Distributory level

As for lack of care for maintenance needs at the distributory canal level the best maintenance performance across WUAs was again found in WUA Akbarabad with only 12% of all interviewees being positive about some needs unattended to. Distributary canals in WUA Zarafshan were found to be lacking proper maintenance care to the most extent: 76% of all the respondents reported the need for some repairs or maintenance in 2002 that failed. Existence of such problems in WUA Kerme-Too Akburasy was reported by a one third of the sampled farmers. In WUA Akbarabad those reporting lack of care for maintenance needs mainly belonged to the middle and tail-end watercourses with their fields mainly in the middle of watercourse canals. In WUA Zarafshan those providing positive answers about lack of maintenance care were equitably distributed across different locations, while in the Kyrghyz WUA it was far more of a problem for those located in the middle and tail of both distributories and watercourse canals.

Table 48. Repairs and maintenance needs for distributary canals by WUAs in 2002

During the 2002 vegetation season did the distributory canal that brings water to your farm need some repairs or maintenance that it didn't get?	WUA of respondent						Total	
	Akbarabad		Zarafshon		Kerme-Too Akburasy		N	%
	N	%	N	%	N	%		
Yes	7	12%	39	76%	21	50%	67	45%
No	50	88%	12	24%	21	50%	83	55%
Total	57	100%	51	100%	42	100%	150	100%

As for specific needs that were left out unattended to, in WUA Akbarabad with the least number of those dissatisfied with the maintenance status of their distributories found, a vast majority referred to the urgency of longer-term periodic needs such as repairs of canalettes (the most urgent periodic need), the water control structure at the inlet to the distributory or measurement devices, straightening the canal, lining of the watercourse with cement, with routine maintenance needs mentioned only once for removal of vegetation along the canal bank. Priorities for maintenance needs at distributories as set by respondents in WUA Zarafshan are completely different. Vast majority of the interviewed farmers ranked lack of routine maintenance care (such as removal of vegetation along the canal bank as the most frequently stated operation, routine maintenance of the regulation structure at the inlet to the distributory canal, removal of silt from inside the distributory) as far more urgent (by a factor of 2) than longer-term periodic needs (such as repairs of the water control structure at the inlet to the distributory, of measurement devices, lining of the watercourse with cement, installation of measurement devices). The assessment of needs for the distributory canal in WUA Kerme-Too Akburasy reveals more balance between longer term periodic and short term routine needs with a slight lead by the former. The highest ranked needs here include lining of the watercourse with cement followed by straightening the canal for

periodic needs and removal of vegetation along the canal bank and silt from inside the distributory canal for routine needs.

Table 49. Ratio of routine versus periodic maintenance needs for the distributory level by WUAs

Routine vs. Periodic DC Maintenance needs		WUA of respondent		
		Akbarabad	Zarafshan	Kerme-Too
Removal of vegetation along the canal bank		1	32	16
Removal of silt from inside the watercourse canal			10	18
Routine maintenance of the regulation structure at the DC inlet			19	1
	RM Count[a]	**1**	**61**	**35**
Repairs of canalettes		5		
Lining of the watercourse with cement		1	11	14
Straightening the canal		1		17
Repair of measurement devices		1	2	1
Installation of measurement devices			1	2
Repair of the water control structure at the DC inlet		1	16	
	PM Count[b]	**9**	**30**	**34**
	RM:PM	**1:9**	**2:1**	**1:1**

a. Total count of Routine Maintenance needs

b. Total count of Periodic Maintenance needs

10. AWARENESS ABOUT WUA PROCESSES

The baseline survey was also designed to obtain more insights on the results and effectiveness of ongoing intensive social mobilization campaign specially designed to nurture the initiative for required water management change within those who are at the grassroots of management hierarchy and launch rather a bottom-up process for setting up and further developing WUAs. To attain better sense of ownership among all WUA members, social mobilization aimed at building wide awareness and informing all water users in the service area about the purposes, functions and benefits of WUAs, making them actively involved in its organization, equitably share responsibilities and rip the benefits. As was mentioned earlier, by the date of conducting this survey all three pilot WUAs had been put in place and up and running. Not everything went as planned initially in terms of social mobilization. This had its bearing on the survey results as well with some places having it better and some places having it worse. The following results suggest that most farmers in "Akbarabad" and "Zarafshan" participated in WUA meetings and nearly half spoke, while less than half attended in "Kerme-Too Akburasy":

Table 50. Farmers' awareness and participation in WUA processes by WUAs

		WUA of respondent						Total	
		Akbarabad		**Zarafshon**		**Kerme-Too Akburasy**		N	Col %
		N	Col %	N	Col %	N	Col %		
Did you participate in the meetings to set up a WUA in your area?	***Yes***	**42**	**70%**	**49**	**82%**	**27**	**45%**	**118**	**66%**
	No	18	30%	11	18%	33	55%	62	34%
Are you a WUA member?	***Yes***	**52**	**87%**	**60**	**100%**	**37**	**62%**	**149**	**83%**
	Total	60	100%	60	100%	60	100%	180	100%

This also suggests that the establishment of the Kyrghyz WUA was rather half-cooked and far ahead of scheduled timeframes as compared to the other 2 pilot WUAs, though to say it went perfectly well with the latter two would be also rather an exaggeration and wishful thinking. The answers about WUA membership also confirm this situation at the

time of conducting this survey: almost 40% of respondents in the Kyrghyz WUA answered either negatively or didn't know whether they were WUA members as compared to almost all respondents confirming their membership in WUA "Akbarabad" and "Zarafshan".

Table 51. Farmers' participation in WUA establishment by WUAs

Did you have an opportunity to state your knowledge or opinions during those meetings?	WUA of respondent						Total	
	Akbarabad		Zarafshon		Kerme-Too Akburasy		N	Col %
	N	Col %	N	Col %	N	Col %		
Yes I spoke	21	50%	29	59%	11	41%	61	52%
Yes, but I did not speak	4	10%	3	6%	3	11%	10	8%
No opportunity to speak	17	40%	17	35%	13	48%	47	40%
No of those who participated	***42***	***100%***	***49***	***100%***	***27***	***100%***	***118***	***100%***

Remarkable is the trend across all WUAs that about half of those who participated in WUA meetings spoke or shared their opinions. The survey also reveals a high percentage of respondents in all three sites who were aware of the names of WUA office bearers and how much the irrigation fee was (apart from WUA "Zarafshan" where agreements for water delivery in the current year were signed by local cooperative farms directly with Rayvodkhoz):

Table 52. Farmers' awareness about WUA details by WUAs

Awareness about WUA matters (No and % of those who gave correct answers)	WUA of respondent						Total	
	Akbarabad		Zarafshon		Kerme-Too Akburasy		N	Col %
	N	Col %	N	Col %	N	Col %		
What is the name of your WUA Director?	50	83%	57	95%	56	93%	163	90%
Who is your rep in the WUA Reps Assembly?	37	62%	47	78%	19	32%	103	57%
How much is ISF in your WUA this year?	38	63%	1	2%	38	63%	77	43%

11. ATTITUDES TOWARDS THE IWRM CONCEPT

Before interviewing farmers on the conceptual issues related to IWRM including institutional, operational and other aspects of the concept, farmers were provided with detailed narration about IWRM, its basics and principles as well as different institutional options for managing and governing irrigation systems at different levels of irrigation management hierarchy including watercourse, distributory and main canals. Before presenting the outcomes it is worth noting that although the farmers were asked to provide answers from the entire Ferghana Valley perspective, there is a high probability that the answers received could have been constrained to some extent by the limits and context of their specific locations simply due to the lack of somewhat more global thinking among farmers. To explore and summarize perceptions and attitudes on some conceptual issues that required from farmers in addition to choosing from multiple choices to provide rank-ordering, scores and indices were calculated and employed in the analysis. For instance, farmers were asked to choose from a proposed list three most serious problems and rank them in the order of their importance. Thus, the items chosen and ranked 1, 2 or 3 were given reverse values – 3 to 1. Then the total score of each such top-chosen item was calculated across all cases. Finally all such scores were summed up to make the overall WUA index for each such top item.

11.1. Top Overall Water Management Problems in the Ferghana Valley

Farmers across all three pilot WUAs had mainly the same sense of priorities set about the top 3 overall water management problems in the Ferghana Valley which included seasonal shortage of water for farms (top-most) and kitchen gardens (top 2nd), followed by drinking and domestic water problems such as seasonal shortage (top 3rd) and poor quality (top 4th) of water for drinking and household use:

Table 53. Farmers' perception of top water management problems in the Ferghana Valley by WUAs

Top water management problems in FV	WUA of respondent						Total score	Total cases
	Akbarabad		Zarafshon		Kerme-Too Akburasy			
	Score	Rank	Score	Rank	Score	Rank		
Seasonal shortage of water for farms	122	1	135	1	121	1	**378**	156
Seasonal shortage of water for kitchen gardens	66	2	120	2	14	5	**200**	102
Seasonal shortage of water for drinking and household use	25	6	91	3	59	2	**175**	102
Poor water quality for drinking and household use	34	5	11	4	59	2	**104**	58
Poor water quality for farming	47	3			17	4	**64**	36
Underground water level is rising	41	4			12	6	**53**	29
Increasing competition between farming and other sectors	3	10	3	5	45	3	**51**	24
Total Respondents		**59**		**60**		**59**		**178**

Interesting enough are those topmost items featuring significant differences in the way they are deemed or treated in different WUAs. If in Tajik and Kyrghyz WUAs the problem of seasonal shortage of water for drinking and household use scored in top 3, in WUA Akbarabad it was only 6th important, or seasonal shortage of water for kitchen gardens which was the second important item in the Uzbek and Tajik WUAs and only fifth important in the Kyrghyz WUA. Similarly, increasing competition between farming and other sectors was far more important for respondents in Krghyz WUA (top 3rd) than it is in Uzbek (10th important) and Tajik WUAs (5th important).

11.2. Top Irrigation System Management Problems in the Ferghana Valley

Main findings from the farmers opinion poll suggest that the main irrigation system management problems in the Ferghana Valley region are by far and large dominated by maintenance problems such as poor maintenance of watercourse (top 1st) and distributary canals (top 3rd), inadequate funds for irrigation operation and maintenance (top 2nd), followed by poor water distribution (top 4th and 6th):

Table 54. Farmers' perception of top irrigation system management problems in FV by WUAs

Top irrigation system management problems in FV	WUA of respondent						Total score	Total cases
	Akbarabad		Zarafshon		Kerme-Too Akburasy			
	Score	Rank	Score	Rank	Score	Rank		
Poor maintenance of the watercourse canal	56	2	94	2	91	1	241	121
Inadequate funds to pay for irrigation O&M	51	3	86	3	78	2	215	94
Poor maintenance of the distributary canal	38	5	100	1	62	3	200	98
Poor distribution of water along the watercourse canal	74	1	6	7	26	5	106	35
Poor maintenance of the main canal	1	10	23	5	59	4	83	53
Poor distribution of water along the distributary canal	49	4	24	4	9	7	82	51
Total Respondents		60		59		59		178

It is worth noting, though, that the priorities set about the above problems when viewed by individual WUAs sometimes differ significantly. For instance, this was the case with priorities for the top-most problem by each WUA: in Akbarabad it was poor distribution of water along the watercourse canal, in Zarafshan – poor maintenance of distributory, while in Kerme-Too it was poor maintenance of watercourse canal. This is another confirmation that farmers could have given their answers rather dominated by their own locale-specific context than taking more global/regional stand.

11.3. Top Water Delivery Problems in the Ferghana Valley

As for the most serious water delivery problems, according to the respondents, they are lack of knowledge about how much water to use, wastage of water, inadequacy and untimeliness of water delivery to the farm, unfair water distribution between watercourse canals and inability to predict when water will be available.

Table 55. Farmers' perception of top water delivery problems in FV by WUAs

Top water delivery problems in FV	WUA of respondent						Total score	Total cases
	Akbarabad		Zarafshon		Kerme-Too Akburasy			
	Score	Rank	Score	Rank	Score	Rank		
Farmers don't know how much water to apply to crops	105	1	78	3	98	2	**281**	**126**
Too much water is wasted	10	6	114	1	121	1	**245**	**107**
Not enough water is delivered to the farm	89	2	86	2	28	4	**203**	**85**
Water is not delivered to the farm on time when it is needed	47	3	28	4	18	6	**93**	**54**
Water is not distributed fairly between watercourse canals	40	4	18	5	17	8	**75**	**47**
Cannot predict when water will come and when it be cut off	30	5	9	6	35	3	**74**	**46**
Water is not distributed fairly between farms	11	7	7	7	19	5	**37**	**23**
Total Respondents		**58**		**59**		**59**		**176**

Rankings of water delivery problems in the above table reveal better consistency or commonness across all WUAs as compared to the previous set of problems. This is because they are perhaps less abstract, more close, real and understandable to farmer water users than other problems discussed earlier. Nevertheless, there are some items in the above list that are viewed quite differently by WUAs in terms of their importance: thus, ranked as the topmost problem in the Tajik and Kyrghyz WUAs, wastage of water was found only the sixth important in the Uzbek WUA.

11.4. Attitudes Towards Irrigation Management at Different Hydraulic Levels

As mentioned earlier the creation of pilot WUAs was preceded by a thoroughly designed social mobilization process. So initial awareness about WUA, its functions, roles, benefits, hydrographic principle in water management had been already there for a while and the concept, per se, wasn't something completely new to local farmers. Therefore, surveying their perceptions and attitudes was in a way like revisiting, following up and verifying the status of earlier awareness built in the area. Farmers were asked a standard set of questions as to who should be responsible for different management functions including having main authority over operations and maintenance (1), operating gates to deliver water along the canal (2), doing maintenance and repair works (3), paying for O&M costs (4); settling disputes (5), making sure applicable rules are followed (6) at each hydraulic level from watercourse to distributory to main canal. (for more details please see relevant tables in Annex 2).

11.4.1. Managing Water at the Watercourse Level

The survey reveals different patterns by WUAs about farmers' attitudes towards watercourse management functions. Thus, respondents in WUA "Akbarabad" prefer informal water users groups (82-91%) with their leaders to play key roles in managing watercourse issues, respondents in WUA "Zarafshan" almost unanimously prefer individual farmers (80-85%) across the board and those in "Kerme-Too Akburasy" prefer WUA staff (37-61%), WUA Council (12-30%) or individual farmers (17-37%). Remarkably enough that almost no water users groups were reported for dealing with watercourse issues by farmers in the Kyrgyz and Tajik WUAs. Kyrghyz farmers are more likely to think that all watercourse functions including maintenance and repairs (52% of the local respondents) should be performed by WUA staff. About 30% of those interviewed in WUA "Akbarabad" with the most of them being private farmers, would prefer hired staff to deal with maintenance and repairs, paying OM costs, settling disputes and making sure WUG rules are followed at their watercourses (see Annex 2).

11.4.2. Managing Water at the Distributory Level

Large majority of respondents (60-83%) in Uzbek WUA believes that it is WUA staff that should have main authority over operation and maintenance for the DC, implement service tasks, pay for O&M, settle disputes etc. Contrary to that vast majority of respondents (90%) in WUA "Zarafshan" believes it is the WUA Council that should carry the most of these functions (including governance and service provision). In Kerme-Too respondents are split between WUA Council and WUA staff. This raises the question of to what extent respondents understood the difference between WUA Council which is a governing body and WUA staff hired by WUA to implement decisions. Given such a mix-up of governance and service delivery functions attributed to either one body, most likely that farmers across all WUAs are not really quite clear on who is doing what in a WUA. Hence, there is a need for better communication of WUA's organization with clear separation of governance and management roles when meeting farmers during ongoing social mobilization process. In addition, 18% of those interviewed in Kyrgyz WUA believe also that it is Rayvodkhoz who should pay for operation and maintenance of the distributary canal. It is also worth noting that in Uzbekistan and Tajikistan with their large cooperative farms still in place, all numerous members of such farms are considered to be also WUA members, while irrigation service fee is paid to WUA by entire cooperative rather than individually by farm members. This might hamper the process of nurturing a true sense of ownership among WUA members, because cooperative farmers generally lack that ownership feeling even towards their primary organization, let alone WUA.

11.4.3. Managing Water at the Main Canal Level

Taking a more general look at responses given across WUAs, a vast majority (86-90%) of respondents in WUA "Akbarabad" favors the Federation of WUAs (FWUA) to govern and manage the main canal across all proposed 6 functions; in WUA "Zarafshan" respondents were split between FWUA and Canal Water Committee with the odds 3 to 1 favoring FWUA across the board; preferences of farmers in WUA "Kerme-Too Akburasy" were also split, though with much closer margin, between 2 organizations - FWUA and Government agency, with the former in a slightly more favor. What is most remarkable about this stand-off in Kyrgyz WUA is that this margin being normally 12-15% across all management functions dramatically increased to almost 50% in favor of FWUA when it came to settling disputes and making sure WUAs or Distributory Canal Water Committees follow regulations applicable at the main canal level. More

specifically, responses in WUA Akbarabad show a majority preference for FWUA's hired staff (who are not governance body) which implies some misunderstanding about the authority status of FWUA staff. But farmers in Zarafshan prefer either the FWUA Council or Canal Water Committee which appear that they are more likely to understand that the councils are mainly for governance matters. However, it is not clear what they mean by having the FWUA Council or CWC operate gates, do maintenance and pay for the cost of O&M. Respondents in "Kerme-Too Akburasy" are also split over whether these functions should be handled by council, staff members or government agency. Another pattern that clearly stands out with the Kyrgyz WUA is that those from private farms prefer FWUA by far and large to govern and manage the main canal, while those from peasantry farms prefer mainly a Government agency to carry the role. However, when it comes to operating gates, settling disputes and ensuring, that WUAs follow applicable regulation, half of those from peasantry farms believe that FWUA is more likely to ensure equitable and fair treatment than a Government agency (see Annex 2).

11.5. Empowerment and Representation at Different Hydraulic Levels

The large majority of farmers in all three sites agree that the WUA should supervise irrigation service staff and that WUAs, Distributory or Main Canal Water Committees as the case may be should be controlled by a majority of farmers. This appears to support their view for greater empowerment and representation of farmers (see the relevant table in Annex 2).

It is noteworthy that farmers in more restricted economies of Uzbekistan and Tajikistan both did not support having non-farmers (government or non-government agencies) in the Distributory Canal Council in addition to the farmer WUA, whereas vast majority of farmers (90%) in more privatized Kyrgyz WUA felt just completely different. When looking for possible reasons to explain different feelings by Kyrgyz farmers, one of hypotheses can be that land in Kyrgyzstan was privatized in tiny parcels, resulting in the emergence of numerous tiny private farmers. So it is very likely that water distribution among that many tiny farmers becomes quite an issue during irrigation season even if water is abundant. This may partly explain that even though given far better water availability and timely service as discussed earlier, the incidence of disputes in the Kyrgyz WUA was anyway as high as in Tajik and Uzbek WUAs. So their appeal to a Government agency is a kind of desperation and desire to bring the situation back to normal like it was before when the system was managed by the state (see the relevant table in Annex 2). So it seems again there is a need for promoting a better organization, cooperation and understanding between farmers both within the watercourse and along the distributory.

As for criteria for water allocation along main canals, most farmers in Zarafshan and Kerme-Too prefer water to be allocated according to crop water requirement while in Akbarabad they prefer allocation on the basis of equal water per area adjusted for land/soil differences. This suggests that adjusting for soil type along South Ferghana Canal is far more important to ensure adequate water allocation than sharing water based on crop water requirement (see Annex 2)

11.6. Attitudes Towards Fines and Audits

Majority farmers (59-69%) in all three sites support having the WUA have the power to assign fines in cash payments against rule breakers with one third of all respondents even recommending having powers to cancel an irrigation turn (19%) and issue

warnings in public meetings (21%). Among most popular fines was also requiring to provide special labor for maintenance or repairs. (See Annex 2)

Findings from the survey also indicate that the high degree of autonomy for WUAs wanted by farmers in all three sites with Auditing unit to be appointed by WUA members (86%). (Q125). Though some 17% of farmers most of them from peasantry farms in WUA Kerme-Too Akburasy doubts the efficiency of internal audits and proposes instead the one appointed by FWUA.

11.7. Farmers' Willingness to Pay for the Costs of O&M and Rehabilitation

Before bringing any significant changes into the ways things used to be managed it is always useful to see to which extent those at the receiving end are ready to keep up and sustain those changes not only conceptually, but also financially. Operation and maintenance, let alone rehabilitation, of irrigation infrastructures requires considerable funds both in social and working capital. So the prospects of financial sustainability for a farmer managed WUA after irrigation management takeover greatly depends on farmers' own capacity and willingness to mobilize required resources and pay for relevant costs.

The survey significantly indicates that an absolute majority of farmers in WUA "Akbarabad" support the idea that farmers should fully pay for the cost of O&M and rehabilitation of the watercourse (98%,95%) and even distributary canals (76%, 68%). For the main canal, most respondents in the Uzbek WUA still favor full payment (59%,55%) though with only close margin versus those favoring partial payments (40%,43%). In WUA "Zarafshan" two thirds of the respondents support full payment for the watercourse, while one third thinks this should be partial. More than half of respondents in the Kyrgyz WUA feel they should bear partial costs at the watercourse canal with the remaining minority favoring full payment. Interestingly enough that partial payments here were mainly supported by those from peasantry farms (70% of all peasantry farm respondents). Views across Tajik and Kyrgyz WUAs become slightly divided for the distributary canal and even more so for the main one. Clear majority of those in Tajik (63%,53%) and Kyrgyz (83%,70%) WUAs are still ready to pay partially for O&M and rehabilitation costs with the remaining minority saying "No" to any costs by farmers. As for the main canal, an absolute majority (87%) in WUA "Zarafshan" refuses to pay any costs, while farmers in the Kyrgyz WUA are split between those who says "No" (51%, 59%) and those who would pay but partially (47%,39%).

Above discussed patterns are fairly consistent by location along both distributary and watercourse canals.

11.8. Attitudes Towards Marginal WUA Issues

Normally it is WUA members at large who jointly and through wide discussions develop and form WUA policies on different issues related to WUA business which once supported and approved by majority included into the WUA Charter or by-laws. Those issues can be of primary or secondary importance. The survey tried to find out farmers' perceptions on issues that sometimes are left out in day-to-day business and addressed only at somewhat later dates when suddenly emerged. From the first glance such issues might seem as taken for granted and to be handled by the WUA Direction. Nevertheless, securing assurances or disagreements from farmers in all such cases quite often helps increase farmers satisfaction and avoid many latent problems in future. Absolute majority of respondents across all three sites believe that WUAs should have authority to collect ISF from their members with the size of such ISF to be related to the

amount and quality of service provided. Likewise, the salaries, bonuses and rewards to irrigation service staff should also be related to their performance. No doubts were found among all the respondents across WUAs that keepers of kitchen gardens should be equally treated along with all other WUA members, enjoying the same status and vote. However, respondents were split over the rates that the keepers of kitchen gardens should pay for water service versus farms. Preferences by three sites show quite different patterns: in WUA "Akbarabad" the odds of those who support the same rates for all to those who want lower or higher rates for kitchen gardeners are 3 to1, in WUA Zarafshan majority is in favor of lower rates for kitchen gardens, while views in WUA "Kerme-Too Akburasy" are split almost equally between lower rates and same rates supporters. It is interesting that 12% in WUA Akbarabad believe that rates for kitchen gardens should be higher reasoning that keepers of kitchen gardens sell their produce at higher free market prices, while farms have to sell at lower state-fixed prices. As for gender issues, the absolute majority of farmers interviewed hold no prejudices against women holding land titles in the service area of a WUA considering them as equal members of the WUA as the men. Moreover, majority of farmers across all WUAs has nothing against the proportion of women as WUA office bearers to be the same as the proportion of women members of WUA, though with fairly significant opposition (40%) to that proposition from those in the Uzbek WUA who believe that it is one's ability and not gender that matters.

12. ADDITIONAL SUPPORT SERVICES FOR FARMERS

The main objective of bringing changes into the way water used to be managed is to ensure judicious and efficient distribution and use of water by farmers, thereby, improving their livelihoods. This, however, can not be achieved without taking into account some other supportive factors that help farmers to become more sustainable. Herein below is what farmers feel they additionally need to improve their performance.

Table 56. Farmers-required support services by WUAs

Support services required by farmers by pilot WUAs	Akbarabad		Zarafshan		Kerme-Too Akburasy		Ttl scr	Ttl rnk	Cases
	Scr	Rnk	Scr	Rnk	Scr	Rnk			
Provision of quality agricultural inputs at subsidized rates	**19**	8	**187**	2	**210**	1	**416**	1	107
Advice about water conservation	**222**	1	**30**	8	**75**	6	**327**	2	90
Cheaper loans for repair and maintenance of infrustructure	**62**	6	**157**	3	**92**	3	**311**	3	108
Credit	**32**	7	**193**	1	**81**	4	**306**	4	92
Development of agri-business opportunities	**14**	10	**144**	4	**118**	2	**276**	5	82
Advice about best ways to cultivate crops	**160**	2	**36**	7	**71**	7	**267**	6	81
Legal advice about land or water	**128**	3	**53**	5	**37**	9	**218**	7	93
Training in managing irrigation and drainage systems	**116**	4	**50**	6	**30**	10	**196**	8	94
Rehabilitation or upgrading of irr.and drain. infrastructure	**88**	5	**22**	9	**5**	12	**115**	9	37
Crop processing	**5**	11	**18**	10	**80**	5	**103**	10	43
Crop storage	**17**	9	**5**	11	**42**	8	**64**	11	26
Marketing crops	**4**	12	**3**	12	**26**	11	**33**	12	15
Timely payment of cash wages			**1**	13				13	1
Total Respondents	59		60		58				

The above list of support services mostly required by WUAs was made based on individual choices and rank-ordering by farmers for 5 most important services which allowed firstly to calculate total scores for each such service in each observation and

then transform them into support service indices by WUAs. The findings reveal different priorities set by WUAs about additional support they need. Thus, support services mostly required in WUA “Akbarabad” as reported include (1) Advice about water conservation (222), followed by (2) Advice about best ways to cultivate crops (160), (3) Legal advice about land or water (128), (4) Training in managing irrigation and drainage systems (116) and (5) Rehabilitation and upgrading of irrigation and drainage infrastructure (88). In WUA “Zarafshan” the top 5 services include (1) Credit (193), (2) Provision of quality agricultural inputs at subsidized rates (187), (3) Cheaper loans for repair and maintenance of infrastructure (157), (4) Development of agri-business opportunities (144), (5) Legal advice about land or water (53). In the Kyrgyz WUA the 5 top priorities were given to (1) Provision of quality agricultural inputs at subsidized rates (210), (2) Development of agri-business opportunities (118), (3) Cheaper loans for repair and maintenance of infrastructure (92), (4) Credit (81), (5) Crop processing (80).

The above results clearly suggest that farmers’ needs in the Uzbek WUA are more advice-oriented, whereas major concerns of those in Tajik and Kyrgyz WUAs are by far and large dominated by a lack of own funding for improvements, thus, looking for gearing on the outside.

SUMMARY

- The household demographics studied has shown that farming was the principle source of livelihoods for the majority of households living in the pilot areas of the IWRM-Ferghana Project with almost everybody in the working age (16-65 years) engaged in agriculture . Only one family member per every second household in the Uzbek and Kyrghyz WUAs and every fifth in the Tajik WUA was likely to work in an area outside agriculture. On average such households across all WUAs comprised about 7 persons per each extended family with half of them being females. Females constituted almost half of the workforce in agriculture, especially in the Tajik WUA where women’s share in farming was healthy 54% versus men.

- Farmer households have reported the 3 main sources of agricultural income for their livelihoods to rely on were proceeds from crop cultivation on their main land holdings or remuneration package from farming on cooperative farms, proceeds from backyard gardens and keeping livestock. The agricultural income of various farm households by countries, indicate substantial difference in the well-being status in favor of proprietary farm households in Uzbekistan as compared to households of any other farm categories across all the surveyed WUAs. Also remarkable is the role of backyard gardens in farmer household economics as the main source of subsistence and additional income especially in case of large cooperative farms (shirkats) in Uzbekistan, where the pace of economic reforms desires to be somewhat better and livelihoods of such farm households by far and large rely not on their primary occupations where they get a mix of wages paid in kind and cash, but rather on their subsistence production of basic foods from working their backyard plots, grazing livestock and petty trade of any surplus produced. Thus, in contrast to individual private farmers both in Kyrghyzstan and Uzbekistan whose major share of yearly income (about 80%) came from their primary farm operations, more than 50% of yearly income of shirkat farmers came from cultivating their kitchen plots. This figure dramatically increases, if proceeds from grazing domestic livestock are also taken into account.

- It is also noteworthy that all respondents in Uzbek and Tajik WUAs used their backyard gardens for crop production, while in the Kyrgyz WUA about 40% of

sampled farmers did not use their home gardens to generate additional income. In real terms, additional income of Uzbek farmers from their kitchen gardens both for cooperative and private farms is twice that of Kyrghyz farmers ((US$ 163-180 vs. US$ 87) and more than 50% higher than that of Tajik farmers. In overall, from any well-being perspective Uzbek proprietary farm households are at the top of the ladder, followed by Uzbek shirkat farmers, and then Kyrghyz farmers with the Tajik cooperative farmers bringing up the rear.

- Analysis of per area unit incomes by the 3 WUAs suggests that Uzbek farmers earned from their backyard gardens twice or almost twice as more than the farmers in the Kyrghyz and Tajik WUAs. At the same time the topmost per-hectare net income earners for the main plots were Kyrghyz respondents, followed by those from Tajik and Uzbek WUAs. Different per-area unit incomes from crop production by WUAs can partly be explained by different cropping intensities. Despite being the topmost per-hectare earners with the highest estimated cropping intensity for the main plots (at 135%) the Kyrghyz farmers didn't do that well in terms of their overall cropping revenues due to the tininess of their parcels. Also remarkable is that such an intensive cropping is achieved by the Kyrghyz farmers by growing crops only in one vegetative season, with no crops reported for the non-vegetative period. At the same time the cropping intensities in Tajik (113%) and Uzbek (111%) WUAs were lower despite that most farmers here cultivated crops in both seasons.

- The survey has shown that different economic settings, priorities and the pace of reforms in the countries in question had crucial bearing on the number of crops and cropping patterns followed. Farmers in the Uzbek WUA normally grew one crop (cotton or orchard) in the vegetative season and one crop (winter wheat) in the non-vegetative season, whereas cropping pattern for Tajik and Kyrghyz WUAs normally comprised 3 crops in the vegetative season - cotton-veggies-maize (Tajikistan) and maize-veggie-sunflower (Kyrghzystan). During winter time Tajik farmers grew 1 crop (winter wheat), while in Kyrghyz WUA no crops were reported. It is cropping pattern and freedom of choosing what crops to grow that have been major causes of dissatisfaction for majority of cotton growing farmers in Uzbek and Tajik WUAs. With the nature of such dissatisfaction somewhat differing in the 2 WUAs, this might poise a significant constraint on farmers' motivation to invest in their irrigation system or increase their crop productivity, despite that the yields for main crops were reportedly getting higher in the last 3 years. In Tajikistan this might also lead to fragmentation of large cooperative farms into smaller family-based farming units. In contrast to Uzbekistan and Tajikistan, everybody in the Kyrghyz WUA was free to choose whatever they wanted to grow.

- As for irrigation service there is a great potential for the performance of it to improve in the pilot areas through establishing and developing water user associations. Analysis of water adequacy, timeliness and stability before the pilot WUAs were set up, shows that water supply was fairly adequate in WUA "Akbarabad" and WUA "Kerme-Too Akburasi" with the Tajik site showing much poorer water adequacy. The timeliness of service was much of an issue in Tajik and Uzbek WUAs, with Kyrghyz WUA showing the best timely performance. Common for all three sites is that timeliness of water delivery is less reliable in the middle and tail-end watercourses along the distributary canals as well as for those in the middle and tail within the watercourse. In the non-vegetative season irrigation service performance considerably improved across the board. In contrast to main land holdings, kitchen gardens enjoyed much better irrigation service performance. Water level stability status has confirmed the general hypothesis about the propensity of water

availability to worsen towards the tail-end of both watercourse and distributary canals with more dramatic changes taking place rather at the watercourse level than at the distributory. Among the main reasons for poor water availability in the watercourse majority of the respondents across all WUAs attributed it to water thefts by upstream users.

- The survey reveals that poor water availability is directly related to the incidence of water disputes with common tendency for the number of disputes to increase dramatically towards the tail-end of the canal and the number of disputes at the head of canals being at its minimum.

- Among other important factors that have bearing on the above irrigation service indicators is the repairs and maintenance status of the WUAs in question. The survey has revealed that Uzbek and Tajik WUAs had far less repairs and maintenance problems than in the Kyrghyz WUA with the best maintenance performance and very few reported maintenance problems found in the Uzbek WUA both for watercourse and distributory levels. The survey has indicated that Tajik farmers need to put more efforts to organize themselves for short-term routine and longer-term periodic maintenance of distributory canals, while Kyrghyz farmers need to develop better internal cooperation and understanding to effectively tackle both routine and periodic maintenance problems both at the watercourse and distributory levels.

- The survey has revealed some insights into the efficiency of social mobilization campaign carried out before WUA were in place to nurture rather a bottom-up process for setting up and further developing WUAs. Awareness built about WUA processes was found to be somewhat better in the Uzbek and Tajik WUAs and worse in the Kyrghyz site. Overall awareness results suggest that sufficient internal demand within farmers of all the 3 sites, especially in Kerme-Too, Kyrghyzstan had not yet been sufficiently built and it was yet a bit preliminary to start formally establishing pilot WUAs.

- From the entire Ferghana Valley perspective, the survey has revealed that problems with irrigation water availability in the Valley were more urgent than those with drinking water though both being equally important. Respondents indicated overall priority of canal maintenance problems over water distribution problems. In the realm of water delivery the main problems reported were lack of knowledge about how much water to apply, water wastage, inadequate and untimely water supply, unfair water distribution.

- The survey has revealed different patterns by WUAs about farmers' attitudes towards managing water at different hydraulic levels. In contrast to Uzbek and Tajik water users, Kyrghyz farmers are more likely to think that all watercourse management functions including maintenance and repairs should be rather performed by WUA staff and not by farmers themselves. For distributory level respondents' attitudes towards management functions reveal that being in favor of a WUA they don't clearly understand the difference between governance and management functions. Hence, there is a need for better communication of WUA's organization with clear separation of governance and management roles when meeting farmers during ongoing social mobilization campaign. At the main canal level respondents across all WUAs preferred either Federations of WUAs (Uzbek respondents), or FWUA and Canal Water Committees (Tajik respondents) or FWUA or Governance agency (Kyrghyz respondents) to manage water. In overall, a large

majority of farmers in all three sites agree that the WUA should supervise irrigation service staff and that WUAs, Distributory or Main Canal Water Committees as the case may be should be controlled by a majority of farmers, suggesting that farmers want greater empowerment and representation.

- As for criteria for water allocation along main canals, most farmers in "Zarafshan" and "Kerme-Too" prefer water to be allocated according to crop water requirement while in "Akbarabad" they prefer allocation on the basis of equal water per area adjusted for land/soil differences. This suggests that adjusting for soil type along South Ferghana Canal is far more important to ensure adequate water allocation than sharing water based on crop water requirement.

- Majority of farmers (59-69%) in all three sites support that WUA have the power to assign fines in cash payments against rule breakers, another third of all respondents recommend that WUA have powers to cancel an irrigation turn and issue warnings in public meetings.

- An absolute majority of farmers in WUA "Akbarabad" support the idea that farmers should fully pay for the cost of O&M and rehabilitation of the watercourse, distributary and even main canals, though for the main canal there is close margin versus those favoring partial payments. In WUA "Zarafshan" and "Kerme-Too" respondents split between those who support full payment and those who support partial payments for the watercourse. Views across Tajik and Kyrgyz WUAs become slightly divided for the distributary canal and even more so for the main one. Clear majority of those in Tajik and Kyrgyz WUAs are still ready to pay partially for O&M and rehabilitation costs with the remaining minority saying "No" to any costs by farmers. As for the main canal, an absolute majority in WUA "Zarafshan" refuses to pay any costs, while farmers in the Kyrgyz WUA are split between those who says "No" and those who would pay but partially.

- Absolute majority of respondents across all three sites believe that WUAs should have authority to collect irrigation service fee (ISF) from their members with the size of such ISF to be related to the amount and quality of service provided. Likewise, the salaries, bonuses and rewards to irrigation service staff should also be related to their performance. No doubts were found among all the respondents across WUAs that keepers of kitchen gardens should be equally treated along with all other WUA members, enjoying the same status and vote. However, respondents were split over the rates that the keepers of kitchen gardens should pay for water service versus farms. Preferences by three sites show quite different patterns: in WUA "Akbarabad" the odds of those who support the same rates for all to those who want lower or higher rates for kitchen gardeners are 3 to1, in WUA "Zarafshan" majority is in favor of lower rates for kitchen gardens, while views in WUA "Kerme-Too Akburasy" are split almost equally between lower rates and same rates supporters. Majority of farmers across all WUAs has nothing against the proportion of women as WUA office bearers to be the same as the proportion of women members of WUA, though with fairly significant opposition (40%) to that proposition from those in the Uzbek WUA who believe that it is one's ability and not gender that matters.

- The findings about support services required by farmers reveal different priorities set by WUAs. The results clearly suggest that farmers' needs in the Uzbek WUA are more advice-oriented, whereas major concerns of those in Tajik and Kyrgyz WUAs are by far and large dominated by a lack of own funding for improvements, thus, looking for it on the outside.

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ANNEXES

ANNEX 1

CROPS GROWN IN THE PILOT WUAs

1. Crops Grown on Main Land Holdings

Cotton

30 respondents who reported growing cotton in ***Uzbekistan*** comprised 24 shirkat farm members and 6 private farmers. The cotton area of the respondents ranged from 4 to 29 ha for proprietary farms and 10 to 130 ha for shirkat farm work brigades (consisting on average of 61 farm members and 42 families, with each such family annually contracting from the shirkat and cultivating on average 1.3 ha of land) with the yields ranging 2.2 to 4.3 MT/Ha. Average yield across the Uzbek WUA in 2002 was 3.3 MT per ha. Farmers in Uzbekistan were paid USD 110 to 150 per each ton of raw cotton.

In ***Tajik WUA*** cotton area by farms ranged from 12 to 64 ha with the yields at 1.6 to 2.9 MT/ha resulting on average in 2.2 MT per ha. Tajik farms received for each ton of ginned cotton USD 800 to USD 950 subject to cotton grade (US$ 265 – 315 per 1 MT of raw cotton). Each farm in the WUA consisted of 50 to 530 members constituting 12 to 128 member families making an average of 287 farmers and 70 families per farm.

Corn

Corn, grown as the first crop by 33 ***Kyrghyz WUA*** farmers and as the second and third crop by another 13 local farmers, yielded 0.8 to 10 MT/ha with an average of 4 MT per ha. Individual areas sown with the crop ranged from 0.1 to 2 ha with 70% of those who grew corn had up to 0.5 ha in sown area. The selling prices ranged from USD 0.05 to 0.1 per kilo with the total value sold by different farmers amounting from USD 9.5 to USD 476 making an average of USD 114 in total corn revenues.

In ***WUA Zarafshan*** 22 farmers (37% of sample) reported corn as the second and third crop in their farms growing it on an area of 0.65 to 4 ha or 2 ha on average. Corn yields by different farms ranged from 5 to 25 tons per ha with an average of 16.2 MT/ha.

Orchards

26 private farmers (43% of the sample) in ***Uzbek WUA*** grew orchards (peaches, persimmons, apples, pomegranates, apricots), as the main crop, yielding 2.2 to 5 MT per ha (average of 3.4 t/ha) and selling at USD 0.07 to 0.14 per kilo which brought the farmers USD 150 to 20,000 in total revenues. Individual orchard areas here ranged 0.5 to 50 ha making an average of 9.5 ha.

Vegetables

12 farmers (20% of the sample) in the ***Kyrgyz WUA*** grew vegetables (potato, tomato, onion, capsicum) as the main crop with 0.19 to 2 ha in the crop area. Veggie yields ranged from 3.3 to 25 MT/ha averaging to 10.3 MT/ha. Vegetables in 2002 were selling locally at USD 0.02 to 0.07 per kilo resulting in total veggie revenues of USD 48 to USD 715 or USD 184 on average. Another 33 farmers in Kerme-Too grew veggies as the 2nd and 3rd crop on the area ranging from 0.05 to 1 ha or an average of 0.23 ha resulting in USD 11 to 1070 in total revenues averaging to USD 207. Different veggie crops featured the following yields: potato – 2.8 to 20 MT/ha (9.1 MT/ha on average); tomato -

7.7 to 60 MT/ha (17 MT/ha on average); capsicum – 2 to 13.3 /ha (6 MT/ha on average). Per–kilo prices for different vegetables were reported to be USD 0.08 to 0.14 for potato, USD 0.01 to 0.1 for tomato and USD 0.03 to 0.07 for capsicum.

Veggies (onion, potato, capsicum) in ***Uzbek WUA*** were grown by 13 farmers as the 2nd and 3rd crop. Areas dedicated to the crops varied from 0.1 to 42 ha bringing the farms USD 50 to 53000 in total revenues. Onion was selling at USD 90 per each ton, potato USD 100 to 150 per ton. Yields as reported by different crops were as follows: onion – 6 MT/ha; potato- 7 to 16 MT/ha averaging to 10.5 MT/ha.

In ***Tajik WUA*** 24 farmers (40%) reported growing potato and onions on the areas of 1.5 to 5 ha making an average of 2.8 ha. Yields for both were reported to be 15.8 to 20 MT/ha averaging to 19.5 MT/ha. No revenues were reported for vegetables produced because they were distributed among member farmers as in-kind payment for working on farm. Per-kilo prices ranged from USD 0.02 to 0.06 or USD 20 to 60 per each ton.

Sunflower

19 ***Kyrghyz farmers*** (32%) grew sunflower in 2002, of which 4 grew it as their main crop, 9 as the second and 6 as the third crop. Areas dedicated to the crop varied from 0.05 to 1.3 ha making an average of 0.38 ha. Yields obtained ranged from 0.5 to 4 MT/ha averaging to 1.8 MT/ha. The crop was selling locally in 2002 at USD 0.19 to 0.33 per kilogram or USD 190 to 330 per each ton resulting in total revenues of USD 21 to 1190 making an average of USD 213 earned by each farmer.

Tobacco

Tobacco was grown by a small number of farmers (4) exclusively in the ***Kyrghyz WUA*** as the second and 3rd crop. Areas dedicated to the crop ranged 0.04 to 0.25 ha with an average of 0.16 ha. The yields were at 2 to 2.5 MT/ha and it was selling at US$ 0.12 to 0.17 per each kilo or USD 120 -170 per ton. Overall it translated into USD 17 to 48 in total earnings from the crop.

Fodder

The number of those who grew fodder crops across WUAs was insignificant though areas involved under the crop were relatively huge. 3 farmers from the ***Uzbek WUA*** reported growing fodder on 10 to 174 ha (with 2 of them as the main crop), 3 ha was reported by 1 farmer in the ***Tajik WUA*** 3 ha and 0,2 ha by 1 farmer in the ***Kyrghyz WUA***. Yields in Uzbekistan were 20 to 33 MT/ha, while in Tajikistan it was at 10 MT/ha.

Spring wheat

Spring wheat was reported as the main crop by 4 farmers in the ***Kyrghyz WUA*** occupying 0.26 to 1 ha in sown area or an average of 0.55 ha. The local yields ranged 1 to 5.8 MT/ha averaging to 3.1 MT/ha and it was selling at USD 70 per each ton resulting in total earnings of USD 71 to 129 by different farmers or USD 102 on average.

In comparison, spring wheat in ***Uzbek WUA*** as reported by 1 farmer was yielding 5 MT per ha from 5 ha in the area sown and selling at USD 64 per each ton bringing the farmer USD 1600 in total revenues.

Winter wheat

This was the only crop across all WUAs grown during the non-vegetative season. Areas sown with the crop ranged 0.2 to 86 ha, or 20 ha on average, in the ***Uzbek WUA*** (as reported by 39 farmers or 65%); 9 to 18 ha, or, 13.3 ha on average, in the ***Tajik WUA*** (as reported by 31 farmers or 52%), and 0.1 to 3 ha, or 0.7 ha on average, in the ***Kyrghyz WUA*** (41 farmers or 68%). The best yields across WUAs were found in WUA 'Akbarabad' ranging from 2 to 6 MT/ha averaging to 4.3 MT/ha, it was followed by farmers from WUA 'Kerme-Too Akburasy' where the yields varied from 0.3 to 6.5 MT/ha averaging to 3.2 MT/ha. The Tajik WUA featured more uniformity in yields - 2.2 to 3 MT/ha, or, an average of 2.6 MT/ha. In Uzbekistan winter wheat was selling at USD 40 to 80 per ton, or USD 56 on average, in Tajikistan – at USD 60 to 80, or an average of USD 70, and in Kyrghyzstan - at USD 70 to 140 averaging to USD 80.

Crops grown in the vegetative season by yields, prices and incomes

		Cotton		Corn						Orchards			
		Akbd	Zrfn	Akbd	Zrfn	Zrfn3	KTA1	KTA2	KTA3	Akbd	Akbd2	Zrfn3	KTA
Area,ha	Range	4-130	12-64	7-15	0,65-3,84	0,45-3	0.1-2	0,1-0,4	0,1-0,5	0,5-50	0,05-15	1	0,3-1,73
	Average	39	45	11,3	2,4	1,6	0,47	0,24	0,27	9,5	6,3	1	
Yield, MT/ha	Range	2.2-4.3	1.6-2.9	10	5,5-25	5-25	0,8-8	2-10	4,2-8	2,2-5	0,5		3,5
	Average	3.3	2.2		16,4	16	3,5	4,8	6,7	3,4			
Price, $	Range	110-150	800-950		60	50	50-100	70-100	60-100	90-140	260		70
	Average	130	885				76	80	80	115			
Income $	Range	20-7605(	-				10-476	36-190		150-20000	50-1530		430
	Average	15830	-				122	84,5		4603	790		
No of respondents		30	33	3	10	12	33	9	4	26	8	1	2

		Onion		Potato			Vegies							Tomato
		Akbd	Zrfn	Akbd	Zrfn	KTA	Akbd	Akbd3	Zrfn	Zrfn3	KTA	KTA2	KTA3	KTA
Area,ha	Range	1-5	3	0,1-42	2	0,1-0,11	1,5-2,2	0,1-10	2-5	1,5-2	0,19-2	0,19-0,31	0,05-0,3	0,1-0,6
	Average	3	3	15,4	2	0,1	1,8	4,2	3,5	1,8	0,55	0,27	0,12	0,3
Yield, MT/ha	Range	6	20	7-16	20	2,8-20		7,5-16	18-21	15,8-20	3,3-25	6,4-16,7	0,8-50	7,7-60
	Average	6	20	10,5	20	9,1		11,7	19,9	18,7	10,3	10,9	9	17
Price, $	Range	90				80-140		100-150	60	20	20-70	20-50	20-150	10-100
	Average	90				100		125	60	20	50	35	67	50
Income $	Range	280-1500		50-53000		25-167	400-970				48-715	48-179		48-1070
	Average	890		25016		88	685				184	110		368
No of respondents		2	1	5	2	3	2	3	13	8	12	4	12	8

		Capsicum		Sunflower			Tobacco		Fodder				Spring wheat	
		Akbd	KTA	KTA	KTA2	KTA3	KTA	KTA3	Akbd	Akbd3	Zrfn3	KTA	Akbd	KTA
Area,ha	Range	1,5	0,1-1	0,28-0,78	0,05-1,3	0,14-1	0,04-,25		15-174	10-30	3	0,2	5	0,26-1
	Average	1,5	0,38	0,5	0,37	0,31	0,16		94,5	20	3	0,2		0,55
Yield, MT/ha	Range		2-13,3	1,1-2,6	0,5-4	0,5-2	2-2,5		20	33	10		5	1-5,8
	Average		6	1,7	2	1,5	2,2			33	10			3,1
Price, $	Range		30-70	200-310	190-310	190-330	120-170						60	70
	Average		47	240	245	238	145							
Income $	Range	350	11-298	64-619	21-1190		17-48						1600	71-129
	Average	350	115	248	198		32							102
No of respondents		1	6	4	9	6	3	1	2	1	1	1	1	4

Crops grown in the non-vegetative season

		Winter wheat		
		Akbd	Zrfn	KTA
Area,ha	Range	0,2-86	9-18	0,1-3
	Average	20	13,3	0,7
Yield, MT/ha	Range	2-6	2,2-3	0,3-6,5
	Average	4,3	2,6	3,2
Price, $	Range	40-80	60-80	70-140
	Average	56	70	80
Income $	Range			
	Average			
No of respondents		39	31	41

2. Kitchen Garden Crops

Potato

It was the main kitchen garden crop grown in WUA "Akbarabad" (58% of sample) and "Zarafshan" (85%). ***Uzbek home gardeners*** had 0.03 to 0.25 ha, or, an average, 0.1 ha, while those in the ***Tajik WUA*** - 0.03 to 0.2 ha, or an average of 0.08 ha, of their home yard area dedicated to this crop. Uzbek gardeners had yields of 3.1 to 23.5 MT/ha with an average of 11.4 MT/ha and those in Tajikistan – 10 to 30 MT/ha averaging to 20 MT/ha. Potato was selling at USD 70-100 per ton in Uzbekistan and at USD 60-100 in Tajikistan, bringing the Uzbek farmers USD 40 to 320 (average of USD 153) and the Tajik farmers USD 48-323 (average of USD 94) in total earnings from the crop.

As for the ***Kyrghyz WUA***, 3 home gardeners here grew it as the main crop on 0.05 to 0.2 ha with the yields of 3 to 5 MT/ha, the selling price of USD 70 to 80 per MT and the total revenues of USD 13 to 71.

Orchards

Most of all orchards were popular with kitchen gardeners in ***Kyrghyz WUA*** where 35 people (58% of the sample) grew apples as their main garden crop. They reported having their yields at 2 to 50 MT per ha (average of 14 MT/ha) and selling prices at USD 0.07 to 0.14 per 1 kilo (USD 0.1 on average) which translated into USD 7 to 286 in total revenues.

12 home gardeners from ***Uzbek WUA*** grew orchards (apricots, persimmons, pomegranates, apples) as their main kitchen crop. Orchards here were given 0.02 to 0.1 ha of kitchen yard area (0.05 ha on average). Fruits trees were yielding 2 to 2.2 MT/ha (2.1 MT/ha on average) and selling at 0.21 to 0.3 US Dollars (average of 25 US cents) per 1 kilo bringing the gardeners from USD 2.5 to USD 600 in total revenues (USD 120 on average).

Tomato

Tomato was the second most popular veggie with ***Tajik home gardeners***. 39 of them (65%) grew it as the second kitchen crop with yet another 7 farmers (12%) having it either as the first or third crop. Tomatoes occupied 0.01 to 0.07 ha (average of 0.01 ha) in home yard area yielding 10 to 50 MT/ha (or, 19 MT/ha on average) and were selling at USD 0.02 - 0.03 per 1 kilo. Mainly it was meant rather for home consumption than for sale.

Far less popular tomatoes were with Uzbek and Kyrghyz kitchen gardeners, areas dedicated to this crop were far bigger – 0.04 to 0.24 ha (average of 0.09 ha) in ***Uzbek WUA*** and 0.1 ha in ***Kyrghyz WUA***. Yields by Uzbek gardeners were reported at 10 MT/ha and those by Kyrghyz farmers – 15 MT/ha. Uzbek farmers sold tomatoes at 12.5 cents per 1 kilo while the Kyrghyz – at 7 cents/kilo.

Other vegetables

Among other less popular vegetables grown by farmers at their kitchen gardens across WUAs were *carrots* by 9 people in the Uzbek WUA (5 of which grew it as the main kitchen crop) with 0.03 to 0.1 ha (average of 0.07 ha) given in the backyard area,

adding to their family incomes USD 20 to 100 (US$63 on average). Other veggie crops included *capsicum*, *cabbages*, *cucumber*, *reddish*, *garlic, garden herbs* in the Uzbek WUA; cucumber in Tajik WUA, and capsicum in Kyrghyz WUA. These vegetables were allocated 0.02 to 0.3 ha in area yielding 3.3 to 18 Mt/ha.

Corn

9 ***Uzbek farmers*** with 0.02 to 0.12 ha (0.07 ha on average) in the area and 7 ***Tajik farmers*** with 0.01 to 0.25 ha (0.04 ha on average) in the area sown grew corn as feed stuff for their livestock. 4 ***Kyrghyz farmers*** grew corn as their main kitchen crop both for their own consumption and for sale, having the yields of 1 to 5.5 MT/ha (average of 3.2 MT/ha), selling it at 7 to 10 US cents per kilo (average of 8 cents) and earning a total of USD 7 to 86.

Kidney bean

This crop was grown by 2 ***Uzbek farmers*** as the main kitchen crop (0.06 and 1 ha) bringing additionally US$ 50 in family income and by 4 ***Tajik farmers*** as the 2nd and 3rd crop.(0.01-0.02 ha in the sown area). In Tajikistan the yield was reported at 2 MT/ha and it was selling at US$ 0.26 to 0.32 per 1 kilo.

Strawberry

1 farmer from the Uzbek WUA grew strawberry on 0.24 ha which allowed him to earn USD 1500.

Kitchen gardens		Potato						Orchards		
		Akbd	Akbd2	Zrfn	Zrfn2	KTA	KTA2	Akbd	Zrfn	KTA(Apl)
Area,ha	Range	0,03-0,25	0,02-0,06	0,03-0,2	0,02-0,1	0,05-0,2	0,05	0,02-0,1	0,05	0,03-0,25
	Average	0,1	0,04	0,08	0,06	0,14	0,05	0,05	0,05	0,08
Yield, MT/ha	Range	3,1-23,5	10-45	10-30	20	3-5	10	2-2,2	2	2-50
	Average	11,4	27	20,02	20	4	10	2,1	2	14
Price, $	Range	70-100		60-100		70-80		210-300		70-140
	Average	83		98		75		255		100
Income $	Range	40-320		48-323		13-71		2,5-600		7-286
	Average	153		94		42		120		95
No of respondents		35	3	51	2	3	1	12	2	35

Kitchen gardens		Tomato					Capsicum		Vegie	
		Akbd	Zrfn	Zrfn2	Zrfn3	KTA	Akbd	KTA	Akbd	Zrfn
Area,ha	Range	0,04-0,25	0,02-0,07	0,01-0,05	0,01-0,02	0,1	0,04	0,05-0,06	0,02-0,3	0,03
	Average	0,09	0,04	0,01	0,01	0,1		0,05	0,07	0,03
Yield, MT/ha	Range	10	20-30	15-50	10-15	15		10-16,7	3,3-18	10
	Average	10	25	19,2	13,8	15		13,3	7,2	10
Price, $	Range	125	30	20		70		40	160-300	50
	Average	125	30			70		40	230	50
Income $	Range	50 (1)	32			107			20-600(10)	
	Average	50	32			107			120	
No of respondents		5	2	39	5	1	1	2	20	2

Kitchen gardens		Corn			Strawberry	Fodder		Kid.bean	
		Akbd2,3	Zrfn1,3	KTA	Akbd	Akbd	KTA	Akbd	Zrfn
Area,ha	Range	0,03-0,04	0,01-0,25	0,1-0,22	0,25	0,02-0,12	0,08	0,06-0,1	0,01-0,02
	Average	0,03	0,04	0,13	0,25	0,08	0,08	0,08	0,02
Yield, MT/ha	Range			1-5,5			3,9		2
	Average			3,2			3,9		2
Price, $	Range			70-100					260-320
	Average			80					290
Income $	Range			7-86	1500			50	
	Average			34,25	1500			50	
No of respondents		2	7	4	1	7	1	2	4

ANNEX 2

OTHER TABLES NOT INCLUDED IN THE MAIN TEXT

Tables to Chapter 2 "HOUSEHOLD DEMOGRAPHICS"

WUA of respondent Akbarabad

Household averages for WUA "Akbarabad" by farm types	Farm system		
	Quasi-state Cooperative N=23	Proprietary Farm N=33	Kitchen garden N=4
Total No. of household members	6,1	7,8	4,8
No. of females in the household	2,9	3,5	2,8
No. of spousal couples in household	1,3	1,7	1,0
No. of family members in the working age	3,8	4,7	2,0
No.of family members in farming	3,3	4,2	1,8
No of family females in farming	1,6	2,0	,8

WUA of respondent Zarafshon

Household averages for WUA "Zarafshan" by farm types	Farm system	
	Quasi-state Cooperative N=7	Private Cooperative N=53
Total No. of household members	6,6	7,7
No. of females in the household	3,6	3,8
No. of spousal couples in household	1,4	1,5
No. of family members in the working age	4,3	4,4
No.of family members in farming	3,0	4,3
No of family females in farming	1,7	2,3

WUA of respondent Kerme-Too Akburasy

Household averages for WUA "Kerme-Too Akburasi" by farm types	Farm system		
	Proprietary Farm N=30	Joint Peasant Farm N=29	Season Tenancy N=1
Total No. of household members	8,0	6,3	6,0
No. of females in the household	4,2	2,8	2,0
No. of spousal couples in household	1,4	1,2	2,0
No. of family members in the working age	5,2	3,9	4,0
No.of family members in farming	4,5	3,7	4,0
No of family females in farming	2,2	1,8	2,0

Gender distribution by 3 pilot WUAs

			WUA of respondent			
			Akbarabad	Zarafshon	Kerme-Too Akburasy	Group Total
Gender of respondent	male	N	58	59	55	172
		Col %	97%	98%	92%	96%
	female	N	2	1	5	8
		Col %	3%	2%	8%	4%
Group Total		N	60	60	60	180
		Col %	100%	100%	100%	100%

Age distribution by WUAs

Age Group	WUA of respondent						Total	
	Akbarabad		Zarafshan		Kerme-Too Akburasy		N	Col %
	N	%	N	%	N	%		
20-29 yrs	6	10%	6	10%	8	13%	20	11%
30-45 yrs	31	52%	35	58%	29	48%	95	53%
46-59 yrs	22	37%	16	27%	18	30%	56	31%
60-66 yrs			3	5%	3	5%	6	3%
74-81 yrs	1	2%			2	3%	3	2%
Total	**60**	**100%**	**60**	**100%**	**60**	**100%**	**180**	**100%**

Tables to Chapter 3 "SOURCES OF AGRICULTURAL INCOME"

Farmers' occupation during the non-vegetative season by WUAs

What do you do during non-vegetative season?	Akbarabad	Zarafshon	Kerme-Too Akburasy
	[N]=60	[N]=60	[N]=60
Stick to primary occupation	98%	73%	30%
None	-	25%	55%
Make it to the city to earn money	2%	-	5%
Animal husbandry	-	-	5%
Other	-	2%	5%

Distribution of main land parcel sizes by WUAs

		WUA of respondent						Total	
		Akbarabad		Zarafshan		Kerme-Too Akburasy		N	Col %
		N	Col %	N	Col %	N	Col %		
Size of main land parcels	< 0.5 ha	4	7%			5	8%	9	5%
	0,51 -0,99	-	-	-	-	24	40%	24	13%
	1 - 1.5	3	5%	-	-	20	33%	23	13%
	1.51 - 1.9	-	-	-	-	5	8%	5	3%
	2-4 ha	7	12%	-	-	4	7%	11	6%
	5 - 9.80	7	12%	12	20%	2	3%	21	12%
	10 - 20	14	23%	2	3%	-	-	16	9%
	22 - 47	7	12%	-	-	-	-	7	4%
	50 - 70	2	3%	24	40%	-	-	26	14%
	71 - 97	7	12%	18	30%	-	-	25	14%
	100 - 120	1	2%	4	7%	-	-	5	3%
	500 - 800	5	8%	-	-	-	-	5	3%
	> 1000 ha	3	5%	-	-	-	-	3	2%
Total		**60**	**100%**	**60**	**100%**	**60**	**100%**	**180**	**100%**

The size of land cultivated by an individual cooperative farm member family

Family share in farmland (ha)	WUA of respondent				Total	
	Akbarabad		Zarafshon		N	Col %
	N	Col %	N	Col %		
0.37 - 0.74	1	5%	25	45%	26	34%
1 - 1.5	12	57%	14	25%	26	34%
1.7 - 2	4	19%	4	7%	8	11%
2.2 - 3	1	5%	9	16%	10	13%
3.3 - 4	1	5%	3	5%	4	5%
7- 10	2	10%			2	3%
Total	**21**	**100%**	**55**	**100%**	**76**	**100%**

Cropping intensities for main land parcels by WUAs

Cropping intensities for main parcels by WUAs (%)		Akbarabad / Shirkats	Akbarabad / proprietary cotton growing farms	Akbarabad / proprietary orchards growing farms	Zarafshan	Kerme-Too Akburasi
N	Valid	23	5	22	31	59
	Missing	0	0	4	29	1
Mean		***104***	***97***	***122***	***113***	***135***
Median		100,0000	100,0000	113,7258	118,7500	133,3333
Minimum		45,16	90,95	56,00	81,87	51,85
Maximum		150,00	100,00	200,00	123,06	200,00

Cropping intensities for backyard gardens by WUAs

Cropping intensities for home gardens by WUAs and farm types (%)		Akbarabad / Shirkats	Akbarabad / Proprietary farms	Zarafshan	Kerme-Too Akburasi
N	Valid	22	30	60	43
	Missing	1	3	0	17
Mean		***104***	***104***	***77***	***60***
Median		100,0000	100,0000	75,0000	58,8235
Minimum		50,00	38,10	28,57	23,81
Maximum		200,00	200,00	175,00	100,00

In-kind remuneration in shirkat farms in WUA "Akbarabad"

WUA Akbarabad / shirkat farmers		Wheat, kg	Seed oil, l	Pasta, kg	Feed, kg	Potato, kg	Meat, kg	Carrot, kg	Rice, kg	Onion, kg	Melons, kg	Soap (pcs)	Fabric, m
N	Valid	21	20	12	8	5	2	2	2	1	1	1	1
	Missing	2	3	11	15	18	21	21	21	22	22	22	22
Mean		686	15	23	396	384	18	250	10	600	120	8	18
Median		700	14	20	250	200	18	250	10	600	120	8	18
Minimum		40	6	10	100	20	5	100	10	600	120	8	18
Maximum		1300	30	50	1000	800	30	400	10	600	120	8	18
Percentiles	25	450	10	13	128	85	5	100	10	600	120	8	18
	50	700	14	20	250	200	18	250	10	600	120	8	18
	75	1000	20	29	725	775	30	400	10	600	120	8	18

WUA of respondent Akbarabad

		How many of your household are farm members?						Total
		1	2	3	4	5	7	
Cotton seed oil	1-10 liters		5		1			**6**
	11-25 liters	1	10	1		1	1	**14**
	26-50 liters	1	1					**2**
Total		**2**	**16**	**1**	**1**	**1**	**1**	**22**
Wheat	40 - 100 kg		2					**2**
	140-300 kg		2					**2**
	310-500 kg		2					**2**
	580-725 kg	1	4	1				**6**
	800-1000 kg		6	1	1			**8**
	1200-3000 kg					1	1	**2**
Total		**1**	**16**	**2**	**1**	**1**	**1**	**22**
Onion	600-1000 kg		1					**1**
Total			**1**					**1**
Feed stuff	70 - 100 kg		1					**1**
	120 - 300 kg		4					**4**
	320 - 500 kg		1					**1**
	600 -1000 kg		2					**2**
Total			8					**8**
Meat	5-10 kg		1					**1**
	30 kg		1					**1**
Total			**2**					**2**
Macaroni	10-20 kg	2	5	1	1			**9**
	25-60 kg		4				1	**5**
Total		2	9	1	1		1	**14**
Potato	< 50 kg		1					**1**
	150-200 kg		2					**2**
	750-800 kg		1			1		**2**
Total			**4**			**1**		**5**

In-kind remuneration in cooperative farms in WUA "Zarafshan"

WUA Zarafshan		Cotton seed oil, liters	Wheat, kg	Onion, kg	Feed stuff, kg	Meat, kg
N	Valid	59	58	53	48	17
	Missing	1	2	7	12	43
Mean		70	612	378	289	4
Median		50	540	300	250	4
Minimum		1	45	70	16	2
Maximum		250	1500	1000	800	10
Percentiles	25	28	308	200	128	2
	50	50	540	300	250	4
	75	100	825	500	395	6

WUA of respondent Zarafshon

		How many of your household are farm members?									Total
		1	2	3	4	5	6	7	8	9	
Cotton seed oil	1-10 liters		5	1	1						7
	11-25 liters		3	3							6
	26-50 liters	1	10	3		1		2			17
	60-90 liters		6	4	3	1					14
	100-150 liters			2	1		3	3	1		10
	160-250 liters				1		1	1	1	1	5
Total		**1**	**24**	**13**	**6**	**2**	**4**	**6**	**2**	**1**	**59**
Wheat	40 - 100 kg		1								1
	140-300 kg		11	2							13
	310-500 kg		7	5	2	1					15
	580-725 kg	1	5	2	1			2			11
	800-1000 kg			3	2	1	4	4			14
	1200-3000 kg			1					2	1	4
Total		**1**	**24**	**13**	**5**	**2**	**4**	**6**	**2**	**1**	**58**
Onion	70-150 kg		6	3		1					10
	170-300 kg	1	11	4	1	1					18
	400-550 kg		5	4	3		2	4			18
	600-1000 kg		1				2	1	2	1	7
Total		**1**	**23**	**11**	**4**	**2**	**4**	**5**	**2**	**1**	**53**
Feed stuff	15 - 50 kg		3	1							4
	70 - 100 kg		3			1					4
	120 - 300 kg	1	10	7	1		1	3	1		24
	320 - 500 kg		1		3		2	3	1		10
	600 -1000 kg			2	1		1			1	5
Total		**1**	**17**	**10**	**5**	**1**	**4**	**6**	**2**	**1**	**47**
Meat	2-4 kg		5	5	1						11
	5-10 kg		2		2		1			1	6
Total			**7**	**5**	**3**		**1**			**1**	**17**

WUA of respondent Akbarabad

		Total income from livestock					Total	Total income in cash				Total	Total value sold from home garden in US$						Total
		$100 - 150	$160 - 200	$225 - 500	$520 - 950	$1000 - 2000		< $50	$51 - 100	$110 - 200	$210 - 260		7-50	51-100	102-150	160-200	220-325	510-700	
Cotton seed oil	1-10 liters			1	1	1	3		3	1		4	2			2	1		5
	11-25 liters	4		5	1		10	3	7	3	1	14	2	3	1	2	3	2	13
	26-50 liters		1				1		1	1		2		1					1
Total		**4**	**1**	**6**	**2**	**1**	**14**	**3**	**11**	**5**	**1**	**20**	**4**	**4**	**1**	**4**	**4**	**2**	**19**
Wheat	40 - 100 kg			1			1		1	1		2		1			1		2
	140-300 kg	2					2	1	1			2	1				1		2
	310-500 kg			1			1									2			2
	580-725 kg	1		2	1		4	1	3	2		6	1	1	1			2	5
	800-1000 kg			1	1	1	3	2	4	2		8	2	1	1	1	1		6
	1200-3000 kg	1		1			2		1		1	2				1	1		2
Total		**4**		**6**	**2**	**1**	**13**	**4**	**10**	**5**	**1**	**20**	**4**	**3**	**2**	**4**	**4**	**2**	**19**
Feed stuff	70 - 100 kg	1					1		1			1					1		1
	120 - 300 kg			3			3	2		1		3		1		1		1	3
	320 - 500 kg								1			1			1				1
	600 -1000 kg			1			1		1	1		2					1		1
Total		**1**		**4**			**5**	**2**	**3**	**2**		**7**		**1**	**1**	**1**	**2**	**1**	**6**
Meat	5-10 kg								1			1	1						1
	30 kg									1		1							
Total									**1**	**1**		**2**	**1**						**1**
Macaroni	10-20 kg	2	1	3	2		8	2	4	2		8	3	3		1	1	1	9
	25-60 kg	1		1			2		3	1		4			1	2	1		4
Total		**3**	**1**	**4**	**2**		**10**	**2**	**7**	**3**		**12**	**3**	**3**	**1**	**3**	**2**	**1**	**13**
Potato	< 50 kg								1			1	1						1
	150-200 kg	1		1			2	1	1			2		1			1		2
	750-800 kg	1					1			1	1	2					1		1
Total		**2**		**1**			**3**	**1**	**2**	**1**	**1**	**5**	**1**	**1**			**2**		**4**
Onion	600-1000 kg									1		1							
Total										**1**		**1**							

WUA of respondent Zarafshon

		Total income from livestock						Total	Total income in cash received						Total	Total value sold from home garden					Total
		$16 - 50	$59 - 96	$100 - 150	$160 - 200	$225 - 500	$1000 - 2000		< $50	$51 - 100	$110 - 200	$210 - 260	$350 - 500	$700 - 800		7-50	51-100	102-150	160-200	220-325	
Cotton seed oil	1-10 liters	2			1			3	6						6	1					1
	11-25 liters	1		1	2	1	1	6	4	1					5	1	2				3
	26-50 liters	6	1	7	1	1		16	11	5	1				17	1	11	1			13
	60-90 liters	3	1	4	4	2		14	3	9	2				14		6	1			7
	100-150 liters	1		3	2	3	1	10	1	2	2	2	2		9		1	1	1	2	5
	160-250 liters	1	1			3		5	1	1	2			1	5		3	1			4
Total		**14**	**3**	**15**	**10**	**10**	**2**	**54**	**26**	**18**	**7**	**2**	**2**	**1**	**56**	**3**	**23**	**4**	**1**	**2**	**33**
Wheat	40 - 100 kg				1			1	1						1	1					1
	140-300 kg	2		5	2	1		10	10	2					12	1	6	1			8
	310-500 kg	5	1	4		1	1	12	10	1	3				14		3	1			4
	580-725 kg	4	1	1	3	2		11	3	8					11	1	7				8
	800-1000 kg	2	1	3	4	4		14	3	4	2	2	2		13		4	1	1	2	8
	1200-3000 kg	1		1		1	1	4		2	1			1	4		2				2
Total		**14**	**3**	**14**	**10**	**9**	**2**	**52**	**27**	**17**	**6**	**2**	**2**	**1**	**55**	**3**	**22**	**3**	**1**	**2**	**31**
Feed stuff	15 - 50 kg	1			2	1		4	1	2					3		3				3
	70 - 100 kg	1		2	1			4	3	1					4	1	3				4
	120 - 300 kg	4	2	8	5	4		23	9	12	2		1		24	2	11	2	1		16
	320 - 500 kg	4	1	1	2	2		10	3	2	1	1	1	1	9		3	1		2	6
	600 -1000 kg	1		1		2	1	5		1	3	1			5		1	1			2
Total		**11**	**3**	**12**	**10**	**9**	**1**	**46**	**16**	**18**	**6**	**2**	**2**	**1**	**45**	**3**	**21**	**4**	**1**	**2**	**31**
Meat	2-4 kg	3	1	1	5		1	11	6	3	1				10	1	6				7
	5-10 kg	1			1	1		3	3	1			1		5		1		1		2
	30 kg																				
Total		**4**	**1**	**1**	**6**	**1**	**1**	**14**	**9**	**4**	**1**		**1**		**15**	**1**	**7**		**1**		**9**
Onion recoded	70-150 kg	5		2	2			9	8	1					9	2	3				5
	170-300 kg	2	2	6	3	2	1	16	12	4	2				18		9	2			11
	400-550 kg	5	1	3	3	5	1	18	4	8	3	1	1		17		8	1			9
	600-1000 kg	1		2	2	2		7	1	3		1	1	1	7		2		1	2	5
Total		**13**	**3**	**13**	**10**	**9**	**2**	**50**	**25**	**16**	**5**	**2**	**2**	**1**	**51**	**2**	**22**	**3**	**1**	**2**	**30**

	Farmer Type	Proceeds from main plot		Proceeds from livestock		Proceeds from kitchen garden		Grand Total in yearly income		Monthly income
		US$	% of yearly total	US$	% of yearly total	US$	% of yearly total	US$	% within the farmer type	US$
UZB	**Private Farmers/N=25**	1043	60%	544	30%	163	10%	$1750	50%	$145
		1043	86%	0	0	163	14%	$1206	50%	$100
	Shirkat Farmers/N=20	175	24%	370	50%	180	26%	$ 725	55%	$ 60
		175	49%	0		180	51%	$ 355	45%	$ 30
TAJ	**Cooperative Farmers/N=60**	262	50%	180	30%	100	20%	$ 542	55%	$ 45
		262	60%	180	40%	0	0	$ 442	45%	$ 37
KYR	**Private Farmers/N=60**	393	65%	137	20%	87	15%	$ 617	33%	$ 50
		393	80%	0	0	87	20%	$ 480	33%	$ 40
		393	100%	0	0	0	0	$ 393	33%	$ 33

Chart A. Upper half of agricultural income earners by farm types, by countries

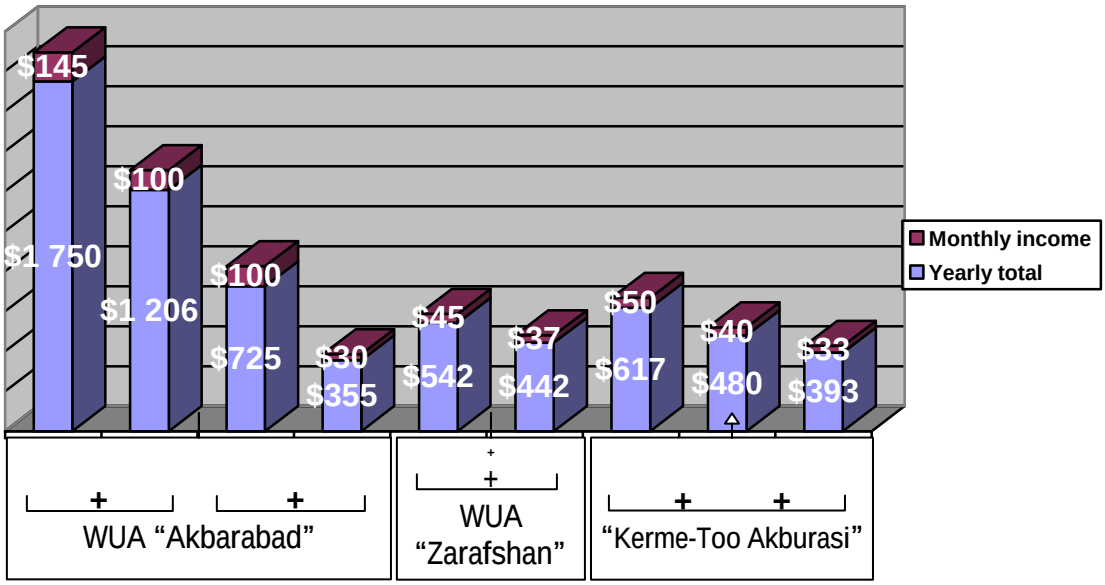
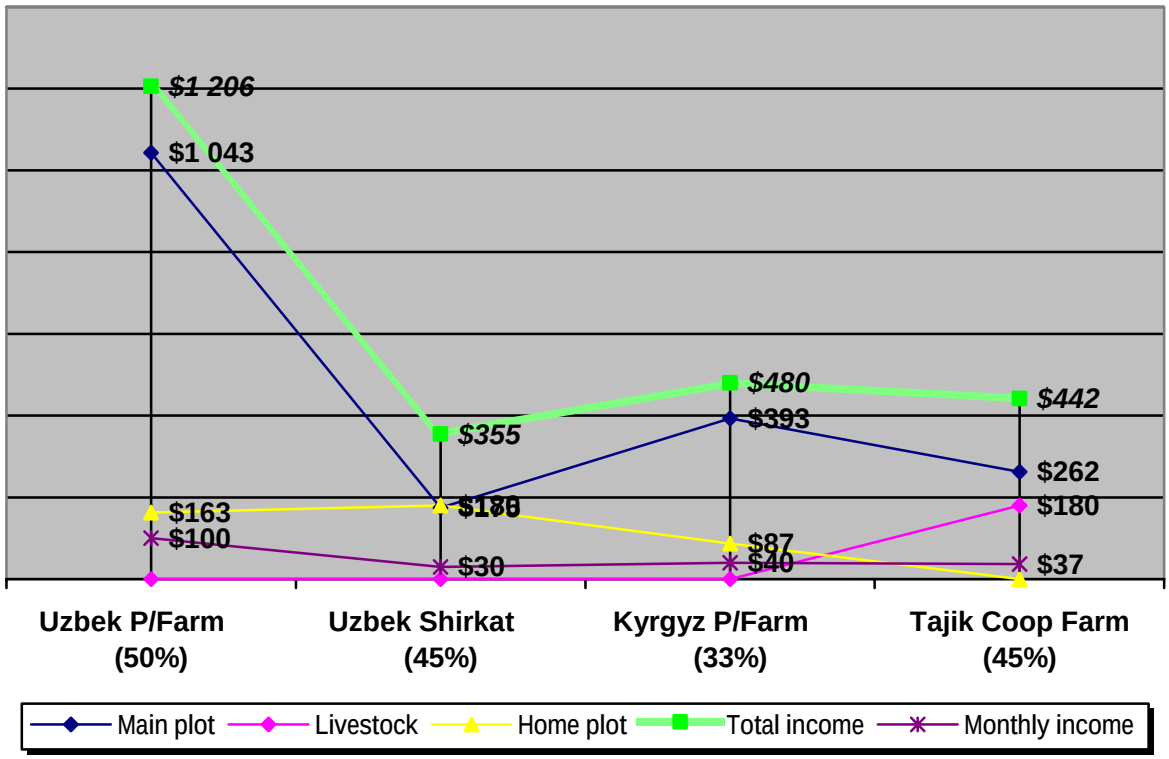


Chart B. Lower half of agricultural income earners by farm types, by countries



Tables to Chapter 4 "CROPPING"

WUA "Akbarabad"		*In the last 3 years what was the yield's trend for your main crops?*						Total	
		Lower		Same		Higher		N	Table %
		N	Table %	N	Table %	N	Table %		
Do you always grow whatever you want?	Yes			2	4%	13	28%	15	32%
	No	3	6%	3	6%	26	55%	32	68%
Total		3	6%	5	11%	39	83%	47	100%

WUA "Akbarabad'		*What would you rate your farm?*						Total	
		Profit-making		Loss-making		Breaking even			
		N	Table %	N	Table %	N	Table %	N	Table %
Do you always grow whatever you want?	Yes	14	29%			3	6%	17	35%
	No	20	41%	1	2%	11	22%	32	65%
	Total	34	69%	1	2%	14	29%	49	100%

Do you always grow whatever you want? (WUA "Zarafshan")	*In the last 3 years what was the yield's trend for your main crops?*						Total	
	Lower		Same		Higher		N	Table %
	N	Table %	N	Table %	N	Table %		
Yes			4	7%	27	46%	31	53%
No	1	2%	5	8%	22	37%	28	47%
Total	1	2%	9	15%	49	83%	59	100%

Do you always grow whatever you want? (WUA "Zarafshan")	*What would you rate your farm?*						Total	
	Profit-making		Loss-making		Breaking even		N	Table %
	N	Table %	N	Table %	N	Table %		
Yes	23	39%	3	5%	5	8%	31	53%
No	14	24%	8	14%	6	10%	28	47%
Total	37	63%	11	19%	11	19%	59	100%

Tables to Chapter 6 "QUALITY OF IRRIGATION SERVICE"

Adequacy and Timeliness of Water Supply in the Non-Vegetative Season by WUAs

Non-vegetative season 2002-03		WUA of respondent						Total	
		Akbarabad		Zarafshon		Kerme-Too Akburasy			
		Count	Col %	Count	Col %	Count	Col %	Count	Col %
Adequacy of water supply	upto 50%	1	2%	1	2%	2	3%	4	2%
	51%-75%	5	8%	5	8%			10	6%
	76%-83%			1	2%			1	1%
	100%	38	63%	33	55%	11	18%	82	46%
	NR/NA	16	27%	20	33%	47	78%	83	46%
	Total	60	100%	60	100%	60	100%	180	100%
Timeliness ratio	upto 50%	4	7%	2	3%			6	3%
	51 thru 75%	4	7%	1	2%	1	2%	6	3%
	76 thru 83%	1	2%					1	1%
	100%	38	63%	44	73%	26	43%	108	60%
	NR/NA	13	22%	13	22%	33	55%	59	33%
	Total	60	100%	60	100%	60	100%	180	100%

WUA of respondent Akbarabad

Vegetative season 2002		Location of respondent's fields within watercourse canal								Total	
		Head		Middle		Tail		Scattered			
		N	Col %	N	Col %	N	Col %	N	Col %	N	Col %
Timely service	Never					1	5%			1	2%
	13 thru 43%	1	8%			1	5%			2	4%
	50 thru 75%	3	25%	9	56%	7	37%			19	38%
	77 thru 93%	1	8%	3	19%	3	16%			9	18%
	100%	7	58%	4	25%	7	37%	1	100%	19	38%
Total		12	100%	16	100%	19	100%	1	100%	50	100%

WUA of respondent Zarafshon

Vegetative season 2002		Location of respondent's fields within watercourse canal								Total	
		Head		Middle		Tail		Scattered			
		N	Col %	N	Col %	N	Col %	N	Col %	N	Col %
Timely service	Never			1	5%					1	2%
	13 thru 43%			1	5%	2	11%			3	6%
	50 thru 75%	1	8%	1	5%	5	28%	2	67%	9	17%
	77 thru 93%	7	58%	10	53%	8	44%	1	33%	26	50%
	100%	4	33%	6	32%	3	17%			13	25%
Total		12	100%	19	100%	18	100%	3	100%	52	100%

WUA of respondent Kerme-Too Akburasy

Vegetative season 2002		Location of respondent's fields within watercourse canal								Total	
		Head		Middle		Tail		Scattered			
		N	Col %	N	Col %	N	Col %	N	Col %	N	Col %
Timely service	Never					1	6%			1	2%
	13 thru 43%			2	8%					2	4%
	50 thru 75%	3	21%	6	25%	5	31%			14	26%
	100%	11	79%	16	67%	10	63%			37	69%
Total		14	100%	24	100%	16	100%			54	100%

WUA Kerm-Too Akburasy		Location of respondent's fields within watercourse canal			Location of watercourse within distributory			Total
		Head	Middle	Tail	Head	Middle	Tail	
Percentage of timely irrigations	< 50%		8%			5%	4%	3%
	50-75%	19%	24%	28%	18%	23%	23%	22%
	100%	69%	64%	56%	64%	68%	62%	64%
	NR	13%	4%	17%	18%	5%	12%	10%
	Total	16	25	18	11	22	26	59
	%	100%	100%	100%	100%	100%	100	100%

Benefits expected from WUA establishment (WUA "Akbarabad")	Farm system						Total	
	State Cooperative		Proprietary Farm		Kitchen garden		N=56	%
	N=22	%	N=32	%	N=2	%		
Timely water delivery	11	50%	12	38%	2	100	25	45%
Stable and problem-free water supply	7	32%	12	38%	1	50%	20	36%
Access to clean river water	9	41%	11	34%			20	36%
Construction of a new watercourse from distributory	2	9%	3	9%			5	9%
No benefits expected	2	9%	2	6%			4	7%
Problem-free irrigation			2	6%			2	4%
Equitable water distribution	1	5%					1	2%
Good maintenance	1	5%					1	2%
Ensure at least 17 l/s of water when drought			1	3%			1	2%
Installation of water gages at each farmer's point			1	3%			1	2%
Delivery in required volumes			1	3%			1	2%
Using more clean than drainage water as is the case now	1	5%					1	2%
Maintain the current good situation			1	3%			1	2%
Timely and adeqate delivery of river water			1	3%			1	2%

Benefits expected from WUA establishment (WUA "Zarafshan")	Farm system				Total	
	State Cooperative		Private Cooperative		N=58	%
	N=5	%	N=53	%		
Equitable water distribution	4	80%	49	92%	53	91%
Timely water delivery	1	20%	32	60%	33	57%
No benefits expected	2	40%	22	42%	24	41%
Ensure at least 17 l/s of water when drought			11	21%	11	19%
Get canals repaired	2	40%	7	13%	9	16%
Delivery in required volumes	1	20%	8	15%	9	16%
Good maintenance			9	17%	9	16%
Access to clean river water			6	11%	6	10%
Installation of water gages at each farmer's point			3	6%	3	5%
Maintain the current good situation			3	6%	3	5%
Improved irrigation practices	1	20%	2	4%	3	5%
Less disputes			2	4%	2	3%
Good and real service			2	4%	2	3%
Stable and problem-free water supply			2	4%	2	3%
Take water charges			1	2%	1	2%
Problem-free irrigation			1	2%	1	2%
Using more clean than drainage water as is the case now			1	2%	1	2%
Timely and adeqate delivery of river water			1	2%	1	2%
Get canals cleaned			1	2%	1	2%
A helluva lot of good things	1	20%			1	2%
Participation by people at large in water distribution			1	2%	1	2%
Installation of control gates at each WC			1	2%	1	2%
Better water availability both for farms and homes			1	2%	1	2%

WUA benefits expected (WUA "Kerme-Too Akburasy")	Farm system						Total	
	Proprietary Farm		Private Cooperative		Season Tenancy		N=54	%
	N=26	%	N=27	%	N=1	%		
Timely water delivery	23	88%	16	59%			39	72%
Equitable water distribution	1	4%	6	22%			7	13%
Good maintenance	2	8%	4	15%			6	11%
Delivery in required volumes	3	12%	2	7%			5	9%
Stable and problem-free water supply	1	4%			1	100%	2	4%
A helluva lot of good things			2	7%			2	4%
Good and real service	1	4%	1	4%			2	4%
Installation of water gages at each farmer's point	1	4%	1	4%			2	4%
Using more clean than drainage water as is the case now	2	8%					2	4%
Maintain the current good situation	1	4%	1	4%			2	4%
Less disputes			1	4%			1	2%
No benefits expected	1	4%					1	2%
Access to clean river water	1	4%					1	2%
Construction of a new watercourse from distributory			1	4%			1	2%
Problem-free irrigation	1	4%					1	2%
Timely and adeqate delivery of river water			1	4%			1	2%
Get canals cleaned	1	4%					1	2%
Prompt resolution of disputes			1	4%			1	2%
Lower water charges			1	4%			1	2%

Tables to Chapter 7 "STABILITY OF WATER LEVEL"

How many of your farm neighbors received as much water as requested?	Location of respondent's fields within watercourse canal in WUA "Akbarabad"								Location of watercourse within distributory in WUA "Akbarabad"						Total	
	Head		Middle		Tail		Scattered		Head		Middle		Tail			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
All of them	1	7%	1	6%	1	5%			1	9%	1	5%	1	6%	3	6%
Most of them	12	86%	15	88%	13	68%	1	100%	10	91%	19	86%	12	67%	41	80%
Some of them	1	7%	1	6%	5	26%					2	9%	5	28%	7	14%
Total	**14**	**100**	**17**	**100**	**19**	**100**	**1**	**100%**	**11**	**100**	**22**	**100**	**18**	**100%**	**51**	**100**

How many of your farm neighbors received as much water as requested?	Location of respondent's fields within watercourse canal in WUA "Zarafshan"								Location of watercourse within distributory in WUA "Zarafshan"						Total	
	Head		Middle		Tail		Scattered		Head		Middle		Tail		N	%
	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
All of them	2	50%									1	17%	1	10%	2	9%
Most of them	1	25%	4	57%	4	44%	2	67%	5	71%	4	67%	2	20%	11	48%
Some of them	1	25%	1	14%	3	33%	1	33%	2	29%	1	17%	3	30%	6	26%
None of them			2	29%	2	22%							4	40%	4	17%
Total	**4**	**100%**	**7**	**100%**	**9**	**100%**	**3**	**100%**	**7**	**100%**	**6**	**100%**	**10**	**100**	**23**	**100%**

How many of your farm neighbors received as much water as requested?	Location of respondent's fields within watercourse canal in WUA "Kerme-Too"						Location of watercourse within distributory in WUA "Kerme-Too"						Total	
	Head		Middle		Tail		Head		Middle		Tail		N	%
	N	%	N	%	N	%	N	%	N	%	N	%		
All of them	3	38%	2	11%	2	25%	3	38%	2	15%	2	14%	7	20%
Most of them	4	50%	13	72%	4	50%	4	50%	10	77%	8	57%	22	63%
Some of them			3	17%	2	25%			1	8%	4	29%	5	14%
None of them	1	13%					1	13%					1	3%
Total	**8**	**100%**	**18**	**100%**	**8**	**100%**	**8**	**100%**	**13**	**100%**	**14**	**100%**	**35**	**100%**

Was water level in watercourse while irrigating stable and constant? (WUA "Akbarabad")	Location of respondent's fields within watercourse canal								Location of watercourse within distributory						Total	
	Head		Middle		Tail		Scattered		Head		Middle		Tail		N	%
	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Always	1	7%	1	6%					1	9%			1	6%	2	4%
Most of the time	8	57%	10	59%	9	47%	1	100%	5	45%	15	68%	8	44%	28	55%
Only some of the time	4	29%	6	35%	10	53%			5	45%	7	32%	8	44%	20	39%
Never	1	7%											1	6%	1	2%
Total	**14**	**100**	**17**	**100**	**19**	**100**	**1**	**100%**	**11**	**100**	**22**	**100**	**18**	**100**	**51**	**100**

Was water level in watercourse while irrigating stable and constant? (WUA "Zarafshan")	**Location of respondent's fields within watercourse canal**								**Location of watercourse within distributory**						**Total**	
	Head		Middle		Tail		Scattered		Head		Middle		Tail		N	%
	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Most of the time	13	76%	14	70%	11	58%	2	67%	16	76%	17	77%	7	44%	40	68%
Only some of the time	4	24%	6	30%	8	42%	1	33%	5	24%	5	23%	9	56%	19	32%
Total	**17**	**100**	**20**	**100**	**19**	**100**	**3**	**100%**	**21**	**100**	**22**	**100**	**16**	**100%**	**59**	**100**

Was water level in watercourse while irrigating stable and constant? WUA Kerme-Too Akburasi	**Location of respondent's fields within watercourse canal**						**Location of watercourse within distributory**						**Total**	
	Head		Middle		Tail		Head		Middle		Tail		N	%
	N	%	N	%	N	%	N	%	N	%	N	%		
Always	11	69%	7	28%	6	35%	7	70%	9	41%	9	35%	25	43%
Most of the time	5	31%	16	64%	6	35%	3	30%	12	55%	11	42%	26	45%
Only some of the time			2	8%	5	29%			1	5%	6	23%	7	12%
Total	**16**	**100%**	**25**	**100%**	**17**	**100%**	**10**	**100%**	**22**	**100%**	**26**	**100%**	**58**	**100%**

What are the reasons for the water level in your watercourse to be instable and inconstant? (by WUAs)	Akbarabad	Zarafshon	Kerme-Too Akburasy
	N=21	N=19	N=6
Upstream users steal water because of water shortage	10		
Water thefts by mahalla users	2		
Users from upstream and mahalla steal water	1		
Upstream private farmers block the canal	1		
Upstream users block canal for their own use	1		
Unfair water distribution		1	
Unfair water releases from the upstream country		1	
Upstream shrikats don't give us, tail-enders, water	1		
I am a tail-ender			3
Tail-most location at the distributory		1	
Water shortage	1	2	1
Little water in the upstream		1	
Little water in the distributary		3	2
Instable flow in the main canal	1		
Poor control over distribution and little water in the sai		1	
Water conveyance due to its shortage is complicated		1	
Poor performance by pump station		1	
Power failures and pump repairs when using drainage water	1	4	
Power use restrictions		1	
Depends on how warm is the weather		4	
Remoteness from the field turnout		1	
Once a SFC flow regulator shuts the gates water drops low	1		
Perhaps because sometimes canal is shut down	1		

What do people normally do to get more water in WUA "Akbarabad"	Location along distributory			Location along watercourse				Total	
	Head N=11	Middle N=22	Tail N=1	Head N=14	Middle N=17	Tail N=19	Scattered N=1	N	%
	%	%	%	%	%	%	%		
Apply to WMO for more	45%	59%	56%	50%	71%	42%	100%	28	55%
Steal	27%	18%	28%	14%	12%	42%		12	24%
Dyke and use drainage canal water	9%	14%	22%	21%	6%	21%		8	16%
Nothing	18%	14%	6%	14%	12%	11%		6	12%
Borrow turns from neighbors		5%		7%				1	2%
Dig wells		5%			6%			1	2%
Total	100%	100%	100%	100%	100%	100%	100%	51	100%

What do people normally do to get more water in WUA "Zarafshan"	Location along distributory			Location along watercourse				Total	
	Head N=21	Middle N=23	Tail N=1	Head N=17	Middle N=20	Tail N=19	Scattered N=4	N	%
	%	%	%	%	%	%	%		
Apply to WMO for more	67%	52%	44%	47%	35%	84%	50%	33	55%
Steal	24%	22%	38%	35%	30%	16%	25%	16	27%
Nothing	14%	17%	13%	12%	35%			9	15%
Give bribes		9%			5%		25%	2	3%
Use tap water	5%				5%			1	2%
Jointly agree as on			6%	6%				1	2%
Total	100%	100%	100%	100%	100%	100%	100%	60	100%

What do people normally do to get more water in WUA "Kerme-Too Akburasi"	Location along distributory			Location along watercourse			Total	
	Head	Middle	Tail	Head	Middle	Tail	N	%
	N=9	N=22	N=26	N=15	N=25	N=17		
Steal	67%	59%	54%	47%	68%	53%	33	58%
Approach WMO or WUA	22%	19%	34%	40%	24%	24%	16	28%
Cleaning canals	22%	23%	8%	20%	20%	6%	9	16%
Nothing	11%	5%	19%	13%	8%	18%	7	12%
Dykeand use drainage canal water	11%	9%		7%	8%		3	5%
Give bribes	22%			7%	4%		2	4%
Employ water rotation	11%	9%			4%	6%	2	4%
Total	100%	100%	100%	100%	100%	100%	57	100%

Tables to Chapter 8 "WATER DISPUTES"

WUA "Akbarabad"		Location along			Location along watercourse				Farm system		Total	
		Head	Middle	Tail	Head	Middle	Tail	Scattered	Shirkat	Pty Farm	N	%
		N=11	N=21	N=18	N=14	N=16	N=19	N=1	N=22	N=28		
Are you aware of any water disputes at your watercourse during 2002?	Yes	9%	24%	56%	21%	31%	37%	100%	45%	21%	16	32%
	No	91%	76%	44%	79%	69%	63%		55%	79%	34	68%
	Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	50	100%

WUA "Zarafshan"		Location along distributory			Location along watercourse				Farm system		Total	
		Head	Middle	Tail	Head	Middle	Tail	Scattered	Kolkhoz	Cooperative		
		N=20	N=22	N=16	N=16	N=19	N=19	N=4	N=7	N=51	N	%
Are you aware of any water disputes at your watercourse during 2002?	Yes	40%	18%	56%	19%	37%	47%	50%	100%	27%	21	36%
	No	60%	82%	44%	81%	63%	53%	50%		73%	37	64%
	Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	58	100

WUA "Kerme-Too Akburasi"		Location along distributory			Location along watercourse			Farm system			Total	
		Head	Middle	Tail	Head	Middle	Tail	Sole Farm	Joint Farm	Tenancy	N	%
		N=9	N=20	N=24	N=14	N=23	N=16	N=24	N=29	N=1		
Are you aware of any water disputes at your watercourse during 2002?	Yes	22%	30%	38%	14%	43%	31%	42%	21%	100%	17	31%
	No	78%	70%	63%	86%	57%	69%	58%	79%		37	69%
	Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	54	100

Tables to Chapter 9 "REPAIRS AND MAINTENANCE STATUS"

WUA "Akbarabad"		Location along distributory canal						Location along watercourse canal								Total	
		Head		Middle		Tail		Head		Middle		Tail		Scattered		N	%
		N	%	N	%	N	%	N	%	N	%	N	%	N	%		
During the 2002 vegetation season did your watercourse need some repairs or maintenance that it didn't get?	Yes	2	14%	4	17%	4	22%			6	32%	3	16%	1	100	10	18%
	No	12	86%	20	83%	14	78%	17	100	13	68%	16	84%			46	82%
	Total	14	100	24	100	18	100	17	100	19	100	19	100	1	100	56	100

WUA "Zarafshan"		Location along distributory canal						Location watercourse canal								Total	
		Head		Middle		Tail		Head		Middle		Tail		Scattered		N	%
		N	%	N	%	N	%	N	%	N	%	N	%	N	%		
During the 2002 vegetation season did your watercourse need some repairs or maintenance that it didn't get?	Yes	2	10%	3	14%	7	47%	3	19%	4	21%	4	21%	1	33%	12	21%
	No	18	90%	19	86%	8	53%	13	81%	15	79%	15	79%	2	67%	45	79%
	Total	20	100	22	100	15	100	16	100	19	100	19	100	3	100	57	100

WUA "Kereme-Too Akburasi"		Location along distributory						Location along watercourse						Total	
		Head		Middle		Tail		Head		Middle		Tail		N	%
		N	%	N	%	N	%	N	%	N	%	N	%		
During the 2002 vegetation season did your watercourse need some repairs or maintenance that it didn't get?	Yes	1	14%	15	83%	13	59%	3	33%	16	73%	9	60%	28	61%
	No	6	86%	3	17%	9	41%	6	67%	6	27%	6	40%	18	39%
	Total	7	100	18	100	22	100	9	100	22	100	15	100	46	100

Tables to Chapter 11 "ATTITUDES TOWARDS THE IWRM CONCEPT"

		WUA of respondent					
		Akbarabad		Zarafshon		Kerme-Too Akburasy	
		N	%	N	%	N	%
Should WUAs have the authority to collect ISFs from their members to pay for at least part of the cost of irrigation services and maintenance?	Yes	51	89%	50	85%	47	94%
	No	6	11%	9	15%	3	6%
Total		57	100%	59	100%	50	100%
Should the size of an irrigation service fee be related to the amount and quality of service provided?	Yes	58	98%	59	98%	57	97%
	No	1	2%	1	2%	2	3%
Total		59	100%	60	100%	59	100%
Should kitchen gardeners also be members of WUAs?	Yes	58	100%	57	95%	52	95%
	No			3	5%	3	5%
Total		58	100%	60	100%	55	100%
Should the kitchen gardener have the same status and vote in a Water User Association as a farm operator?	Yes	56	95%	54	92%	55	100%
	No	3	5%	5	8%		
Total		59	100%	59	100%	55	100%
Should kitchen gardeners pay for water at the same rate as that of farms?	Yes	41	71%	24	41%	27	52%
	No, higher	7	12%	1	2%	2	4%
	No, lower	10	17%	34	58%	23	44%
Total		58	100%	59	100%	52	100%
Should women holding land titles in the service area of a WUA be equal members of the WUA as with men?	Yes	58	98%	60	100%	58	98%
	No	1	2%			1	2%
Total		59	100%	60	100%	59	100%
Should the proportion of women as WUA office bearers be required to be the same as the proportion of women members of WUA?	Yes	35	60%	52	90%	54	96%
	No	23	40%	6	10%	2	4%
Total		58	100%	58	100%	56	100%
Should the salaries, rewards, etc. of WUA staff be linked to their job performance?	Yes	58	100%	60	100%	58	100%
Total		58	100%	60	100%	58	100%

Should farmers share along with the state in the costs of the following tasks and, if so, to which extent?

		WUA of respondent						Gender of respondent				Total	
		Akbarabad		Zarafshan		Kerme-Too Akburasy		male		female		No	%
		No	%	No	%	No	%	No	%	No	%		
OM of watercourse canal	Fully	58	98%	43	72%	25	42%	122	72%	4	50%	126	71%
	Partially	1	2%	17	28%	31	53%	46	27%	3	38%	49	28%
	No					3	5%	2	1%	1	13%	3	2%
	Total	59	100%	60	100%	59	100%	170	100%	8	100%	178	100%
Rehabilitation of watercourse canal	Fully	56	95%	42	70%	17	29%	111	65%	4	50%	115	65%
	Partially	3	5%	18	30%	37	63%	55	32%	3	38%	58	33%
	No					5	8%	4	2%	1	13%	5	3%
	Total	59	100%	60	100%	59	100%	170	100%	8	100%	178	100%
OM of distributory canal	Fully	44	76%	5	8%	2	3%	48	28%	3	38%	51	29%
	Partially	14	24%	38	63%	49	83%	97	57%	4	50%	101	57%
	No			17	28%	8	14%	24	14%	1	13%	25	14%
	Total	58	100%	60	100%	59	100%	169	100%	8	100%	177	100%
Rehabilitation of distributory canal	Fully	41	71%	5	8%	2	3%	45	27%	3	38%	48	27%
	Partially	17	29%	32	53%	42	71%	87	51%	4	50%	91	51%
	No			23	38%	15	25%	37	22%	1	13%	38	21%
	Total	58	100%	60	100%	59	100%	169	100%	8	100%	177	100%
OM of main canal	Fully	34	59%	1	2%	1	2%	34	20%	2	25%	36	20%
	Partially	23	40%	7	12%	28	47%	57	34%	1	13%	58	33%
	No	1	2%	52	87%	30	51%	78	46%	5	63%	83	47%
	Total	58	100%	60	100%	59	100%	169	100%	8	100%	177	100%
Rehabilitation of main canal	Fully	32	55%	1	2%	1	2%	32	19%	2	25%	34	19%
	Partially	25	43%	7	12%	23	39%	54	32%	1	13%	55	31%
	No	1	2%	52	87%	35	59%	83	49%	5	63%	88	50%
	Total	58	100%	60	100%	59	100%	169	100%	8	100%	177	100%

Should irrigation service staff who operate gates and maintain structures at the distributary canal level be brought under the supervision of the WUA or an inter-agency DC Council?	Akbarabad N=59	Zarafshan N=60	Kerme-Too Akburasy N-51
WUA	100%	90%	98%
DC Council	-	10%	2%

		WUA of respondent		
		Akbarabad N=58	Zarafshan N=57	Kerme-Too Akburasy N=39
Should government or non-government agencies also be represented in the Distributary Canal Council, in addition to the farmer WUA?	Yes	21%	14%	90%
	No	79%	86%	10%

In the Distributary Canal Council, how much representation and authority should the farmer WUA have versus government agencies?	***Majority control by WUA, minority control by govt agencies***	***Equal control between WUA and government agencies***	***Minority control by WUA, majority control by govt agencies***
	% of sample	% of sample	% of sample
Akbarabad	95%	2%	3%
Zarafshon	93%	3%	3%
Kerme-Too Akburasy	93%	4%	4%

In the Main Canal Water Committee, how much representation and authority should a farmer WUA Federation have versus government	***Majority control by FWUA, minority control by govt agencies***	***Equal control between FWUA and government agencies***	***Minority control by FWUA, majority control by govt agencies***
	% of sample	% of sample	% of sample
Akbarabad	97%	2%	2%
Zarafshon	92%	7%	2%
Kerme-Too Akburasy	95%	2%	4%

Water allocation along main canals should be based primarily on what criteria? (% of total responses N)	WUA of respondent		
	Akbarabad N=59	Zarafshan N=58	Kerme-Too Akburasy N=56
Equal water per area unit regardless of crop demand or soil	15%	28%	20%
Equal water per area unit adjusted for land/soil type	83%	21%	29%
Crop water requirement	2%	52%	52%

Penalties to be applied by the WUA (% of total sample)	WUA of respondent		
	Akbarabad N=58	Zarafshan N=60	Kerme-Too Akburasy N=59
Embarrassing warnings in public meetings of the WUA	2%	28%	34%
Fines (in cash payments to the WUA)	59%	60%	69%
Require to provide special labor for maintenance or repair	5%	5%	12%
Cancellation of one irrigation turn	33%	8%	15%
Cancellation of water supply for the season			5%
Confiscation of farmer crop	2%		10%
All punishments to be applied			2%

Who should oversee if WUAs are doing their business properly?	WUA of respondent		
	Akbarabad N=59	Zarafshan N=59	Kerme-Too Akburasy N=50
Audit unit appointed by WUA members	92%	93%	72%
Audit unit appointed by Government	3%	5%	2%
Audit unit appointed by WUA Federation and Government	5%	2%	26%

Attitudes towards water management at the watercourse canal level by WUAs

		Akbarabad		Zarafshon		Kerme-Too Akburasy		Total	
		N	%	N	%	N	%	N	%
Have main authority over OM for WC	Indiv.farmers	5	8%	50	83%	21	37%	76	43%
	WUG leaders	42	71%	3	5%			45	26%
	WUA staff	1	2%	2	3%	24	42%	27	15%
	WUA Council			5	8%	10	18%	15	9%
	WUG	6	10%					6	3%
	WUG staffl	4	7%					4	2%
Total		59	100%	60	100%	57	100%	176	100%
Operate gates to deliver water along WC	Indiv.farmers	3	5%	48	80%	12	21%	63	36%
	WUG leaders	41	69%	3	5%			44	25%
	WUA staff	1	2%	2	3%	35	61%	38	22%
	WUA Council			7	12%	7	12%	14	8%
	WUG staff	7	12%			2	4%	9	5%
	WUG	6	10%					6	3%
Total		59	100%	60	100%	57	100%	176	100%
Do WC maintenance & repair works	NA								
	Indiv.farmers	10	17%	50	83%	20	33%	80	44%
	WUA staff			2	3%	30	50%	32	18%
	WUG members	22	37%					22	12%
	WUG staff	19	32%					19	11%
	WUA Council			5	8%	7	12%	12	7%
	WUG	6	10%					6	3%
Total		60	100%	60	100%	60	100%	180	100%
Pay cost of O&M of WC	Indiv.farmers	9	15%	51	85%	16	28%	76	43%
	WUA Council			5	8%	17	30%	22	13%
	WUA staff			2	3%	21	37%	23	13%
	WUG members	23	39%					23	13%
	WUG staff	17	29%			1	2%	18	10%
	WUG	6	10%					6	3%
Total		59	100%	60	100%	57	100%	176	100%
Settle disputes in WC	NA								
	Indiv.farmers	4	7%	50	83%	10	17%	64	36%
	WUA staff	1	2%	2	3%	31	52%	34	19%
	WUG leaders	30	50%	2	3%			32	18%
	WUG staff	16	27%			1	2%	17	9%
	WUA Council			5	8%	11	18%	16	9%
	WUG	6	10%					6	3%
Total		60	100%	60	100%	60	100%	180	100%
Make sure farmers follow WUG rules	Indiv.farmers	5	8%	49	82%	11	19%	65	37%
	WUG leaders	26	44%	2	3%			28	16%
	WUA staff	1	2%	2	3%	22	39%	25	14%
	WUA Council			6	10%	17	30%	23	13%
	WUG staff	16	27%			3	5%	19	11%
	WUG members	4	7%					4	2%
	WUG	6	10%					6	3%
Total		59	100%	60	100%	57	100%	176	100%

Attitudes towards water management at the DC level by WUAs

		WUA of respondent						Total	
		Akbarabad		Zarafshon		Kerme-Too Akburasy		N	Col %
		N	Col %	N	Col %	N	Col %		
Have main authority over O&M for DC	WUA Council	9	15%	54	90%	19	33%	82	47%
	WUA staff	39	66%			31	54%	70	40%
	WUA	5	8%			1	2%	6	3%
	DWMO					3	5%	3	2%
	WUA members	4	7%					4	2%
	WUG leaders			2	3%			2	1%
Total		**59**	**100%**	**60**	**100%**	**57**	**100%**	**176**	**100%**
Operate gates to deliver water along DC	WUA staff	47	80%			42	74%	89	51%
	WUA Council	1	2%	53	88%	10	18%	64	36%
	WUA	6	10%			1	2%	7	4%
	WUA members	4	7%					4	2%
	DC Commt Council			4	7%			4	2%
Total		**59**	**100%**	**60**	**100%**	**57**	**100%**	**176**	**100%**
Do DC maintenance & repair works	WUA staff	41	69%			36	63%	77	44%
	WUA Council			53	88%	14	25%	67	38%
	WUA members	8	14%					8	5%
	WUA	5	8%			1	2%	6	3%
	DWMO					5	9%	5	3%
	DC Commt Council			4	7%			4	2%
Total		**59**	**100%**	**60**	**100%**	**57**	**100%**	**176**	**100%**
Pay cost of O&M of DC	WUA Council			53	88%	23	40%	76	43%
	WUA staff	35	59%			22	39%	57	32%
	WUA members	14	24%					14	8%
	DWMO					10	18%	10	6%
	WUA	5	8%					5	3%
	DC Commt Council			5	8%			5	3%
	Indiv.farmers	2	3%	1	2%	1	2%	4	2%
Total		**59**	**100%**	**60**	**100%**	**57**	**100%**	**176**	**100%**
Settle disputes in DC	WUA staff	47	81%			32	56%	79	45%
	WUA Council	2	3%	54	90%	21	37%	77	44%
	WUA	5	9%			1	2%	6	3%
	DC Commt Council			4	7%	2	4%	6	3%
	WUG	2	3%					2	1%
Total		**58**	**100%**	**60**	**100%**	**57**	**100%**	**175**	**100%**
Make sure WUGs follow DC Commt rules	WUA Council	1	2%	53	88%	25	44%	79	45%
	WUA staff	48	83%			27	47%	75	43%
	WUA	5	9%			2	4%	7	4%
	DC Commt Council			5	8%	1	2%	6	3%
Total		**58**	**100%**	**60**	**100%**	**57**	**100%**	**175**	**100%**

Attitudes towards water management at the MC level by WUAs

		Akbarabad		Zarafshon		Kerme-Too Akburasy		Total	
		N	Col %	N	Col %	N	Col %	N	Col %
Have authority over O&M for MC	FWUA Council	11	19%	37	63%	25	44%	73	42%
	FWUA staffl	35	59%			6	11%	41	23%
	DWMO			2	3%	22	39%	24	14%
	CWC Council	1	2%	19	32%			20	11%
	FWUA	5	8%					5	3%
	Govt agency	3	5%			2	4%	5	3%
	Government Canal Agency	3	5%					3	2%
Total		59	100%	59	100%	57	100%	175	100%
Operate gates to deliver water along MC	FWUA staff	46	78%			21	37%	67	38%
	FWUA Council	1	2%	38	64%	15	26%	54	31%
	CWC Council			18	31%			18	10%
	DWMO			2	3%	16	28%	18	10%
	FWUA	6	10%					6	3%
	Govt agency	3	5%			2	4%	5	3%
Total		59	100%	59	100%	57	100%	175	100%
Do MC maintenance & repair works	FWUA Council	7	12%	39	66%	16	28%	62	35%
	FWUA staff	38	64%			12	21%	50	29%
	DWMO			2	3%	23	40%	25	14%
	CWC Council	2	3%	17	29%	2	4%	21	12%
	FWUA	6	10%					6	3%
	Govt agency	2	3%			2	4%	4	2%
	Government Canal Agency	3	5%					3	2%
Total		59	100%	59	100%	57	100%	175	100%
Pay cost of O&M of MC	FWUA Council	10	17%	38	64%	25	44%	73	42%
	FWUA staff	36	61%			4	7%	40	23%
	DWMO			2	3%	24	42%	26	15%
	CWC Council	1	2%	18	31%			19	11%
	FWUA	6	10%					6	3%
	Govt agency	2	3%			2	4%	4	2%
	Government Canal Agency	3	5%					3	2%
Total		59	100%	59	100%	57	100%	175	100%
Settle disputes in MC	FWUA Council	3	5%	37	63%	22	39%	62	35%
	FWUA staff	42	71%			17	30%	59	34%
	CWC Council	1	2%	20	34%	3	5%	24	14%
	DWMO			1	2%	10	18%	11	6%
	FWUA	6	10%					6	3%
	Govt agency	3	5%			2	4%	5	3%
	CWC staff	1	2%			2	4%	3	2%
Total		59	100%	59	100%	57	100%	175	100%
Make sure WUAs & DC Comm. follow MC & Govt. regulations	FWUA Council	1	2%	39	66%	26	46%	66	38%
	FWUA staff	44	75%			13	23%	57	33%
	CWC Council	1	2%	18	31%			19	11%
	DWMO			1	2%	11	19%	12	7%
	FWUA	6	10%			1	2%	7	4%
	Govt agency	2	3%			2	4%	4	2%
	CWC staff	1	2%			3	5%	4	2%
	Government Canal Agency	3	5%					3	2%
Total		59	100%	59	100%	57	100%	175	100%

MISCELLANEOUS TABLES

		WUA of respondent		
		Akbarabad	Zarafshon	Kerme-Too Akburasy
Any additional laborforce hired apart from farm members?	Yes	11	6	3
	No	38	54	56

WUA of respondent Akbarabad

All taxes your family paid last year	Type of the farm						Total	
	State Cooperative		Proprietary Farm		Kitchen garden			
	Count	Col %	Count	Col %	Count	Col %	Count	Col %
$1-10	12	52%	15	45%	1	25%	28	47%
$10.5-20	5	22%	2	6%			7	12%
$20.5-50	2	9%	6	18%			8	13%
$55-100	4	17%	3	9%	1	25%	8	13%
$155-240			2	6%			2	3%
$440-600			3	9%			3	5%
960			1	3%			1	2%
NA			1	3%	2	50%	3	5%
Total	23	100%	33	100%	4	100%	60	100%

WUA of respondent Zarafshon

All taxes your family paid last year	Type of the farm				Total	
	State Cooperative		Private Cooperative			
	Count	Col %	Count	Col %	Count	Col %
$1-10	1	14%	23	43%	24	40%
$10.5-20			3	6%	3	5%
$20.5-50			5	9%	5	8%
$55-100	6	86%	20	38%	26	43%
$155-240			1	2%	1	2%
NA			1	2%	1	2%
Total	7	100%	53	100%	60	100%

WUA of respondent Kerme-Too Akburasy

All taxes your family paid last year	Type of the farm						Total	
	Proprietary Farm		Private Cooperative		Venture farming			
	Count	Col %	Count	Col %	Count	Col %	Count	Col %
$1-10	1	3%	2	7%			3	5%
$10.5-20			4	14%			4	7%
$20.5-50	12	40%	10	34%			22	37%
$55-100	16	53%	13	45%	1	100%	30	50%
NA	1	3%					1	2%
Total	30	100%	29	100%	1	100%	60	100%

WUA of respondent Akbarabad

Land tax or rental paid in 2002	Farm system						Total	
	State Cooperative		Proprietary Farm		Kitchen garden			
	Count	Col %	Count	Col %	Count	Col %	Count	Col %
$1-10	10	43%	10	30%	2	50%	22	37%
$11-19			4	12%			4	7%
$20-40			6	18%			6	10%
$50-100	2	9%	4	12%			6	10%
$120-510	1	4%	4	12%			5	8%
$4500			1	3%			1	2%
$14,335 - 25,500	2	9%					2	3%
NR	8	35%	4	12%	2	50%	14	23%
Total	23	100%	33	100%	4	100%	60	100%

WUA of respondent Zarafshon

Land tax or rental paid in 2002	Farm system				Total	
	State Cooperative		Private Cooperative			
	Count	Col %	Count	Col %	Count	Col %
$1-10	7	100%	47	89%	54	90%
$11-19			3	6%	3	5%
NR			3	6%	3	5%
Total	7	100%	53	100%	60	100%

WUA of respondent Kerme-Too Akburasy

Land tax or rental paid in 2002	Farm system						Total	
	Proprietary Farm		Private Cooperative		Season tenant			
	Count	Col %	Count	Col %	Count	%	Count	Col %
$1-10	2	7%	11	38%			13	22%
$11-19			1	3%			1	2%
$50-100	1	3%	1	3%			2	3%
$120-510			1	3%	1	100%	2	3%
NR	27	90%	15	52%			42	70%
Total	30	100%	29	100%	1	100%	60	100%

Any long-term debt owed by your farm	WUA of respondent						Total	
	Akbarabad		Zarafshon		Kerme-Too Akburasy		Count	Col %
	Count	Col %	Count	Col %	Count	Col %		
Yes	2	4%	30	54%	2	3%	34	21%
No	49	96%	26	46%	56	97%	131	79%
Total	51	100%	56	100%	58	100%	165	100%