Mechanism
of effective irrigation water use in the farms with small areas

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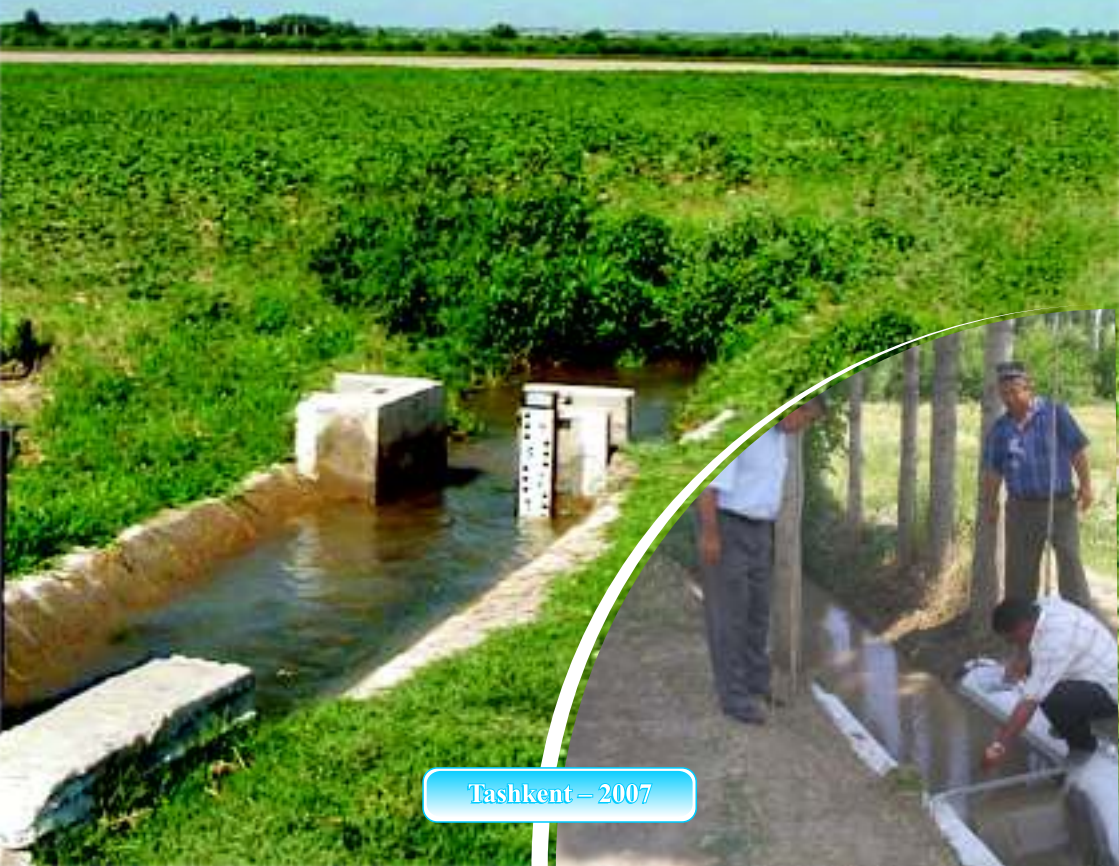

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This brochure was developed in SIC ICWC within the framework of the project "Integrated Water Resources Management in Fergana valley" (Director of the "IWRM – Fergana" project - prof. V.A. Dukhovny, Regional Manager of the project – V.I. Sokolov, Activity Leader " Introduction of advanced technologies on water and land productivity improvement "- Sh. Mukhamedjanov). The package of documents developed by oblast executors Sh. Alybaev, J. Kamilov, G. Manasov, U. Satymov and they also carried out work on the implementation of this approach in the real conditions of Sokolok canal.

The development of methods relating to the work with water users groups in lands with small areas and Sokolok Canal (Kyrgyzstan) is as an example of it. Working procedure with water users groups.

One of the requirements of effective water use while irrigating crops is rated water supply to the field. The farms with irrigating areas of more than 10 ha, as it is widespread in Uzbekistan and partially in Tajikistan and Kyrgyzstan, are provided with rated water supply by means of organizing the water resources accounting and irrigation regime planning. Farms with small areas (up to 1 hectare) are widespread in Osh region. The water use planning is provided by the Water Users Associations only up to the subcommand canal connected with taps of water users. The water supply rating for each tap is not provided; water discharge for each tap is not fixed due to the lack of water-measuring devices and posts. The water distribution between the water users is made occasionally; each water user applies the irrigation water at their own discretion without any control and/or discipline, agreement or turn. As a result, the water planning organizations are deprived to control the time and volume of water used, water users are deprived to get the required volume of water timely, especially it impacts on the water users located downstream not only within the subcommand canal, but also within the bounds of taps.
In order to resolve the problem, within the framework of IWRM-Fergana Project a group of SIC ICWC experts has performed the work on adjusting the technique of effective irrigation water use based on the example of Sokolok Canal at "Japalak" WUA.

The analysis of water distribution from Sokolok Canal results:

- WUA hydrometers deliver water up to each tap only;
- Water allocation is done by the water users themselves within the bounds of tap;
- There are conflicts among the water users when water is distributed;
- Taps are not equipped with water-measuring devices;
- Water account and payment is made by WUA on the base of calculating the crop area - when 1 $м^3$ of water costs 0,04 som the price for 1 hectar is set as of 400 som that corresponds to the volume of water used in 1000$м^3$/hectare;
- Recording of the irrigated area is not almost made.

Technique of effective irrigation water use in the farms with small areas based on the water intake recording and payment for the actually used volume of water, made by each farmer, instead of existing payment per hectare

Step 1. It is necessary to organize mobilization and explanatory work with water users of each tap. During the explanatory work it is necessary to detect the problems of each water user relating to the irrigation water use, estimate how far the given method solves the problems. Each water user should understand the advantage and benefits of the method given.

- It is necessary to pay attention to the following questions during the work with farmers:

- how each water user gets water;
- through whom he/she gets water;
- whether he/she gets enough water;
- whether each water user gets the irrigation water permanently, i.e. whether the water supply stops sometimes during the water application;
- how far the water distribution between the water users is fair;
- what kind of costs the water users bear for the water used.

- The following advantages and benefits of the given method are necessary to explain to each farmer:

- guaranteed and permanent consumption of the required water achieved by means of the received water account on the tap bound;
- fair water distribution through the organized turn on the base of agreement between all members of tap;
- saving of financial assets by means of transition from hectare-based payment to the payment based on the used water volume.

- It is necessary to conduct a meeting with farmers of each tap together with director and WUA hydrometer and discuss the following questions:

- problems relating to the water distribution, terms of receiving, discharge, permanence and equity of water receiving by each farmer;
- organizing the water account on the tap bound;
- organizing the received water account by each water user;
- transition to the payment based on the used volume of water;
- election of tap's leader whose functions include water receiving on the tap bound, water account and distribution between members, who use the

water, and account of water received by each water user, collection of payment from each water user for the water used by him/her;

- drawing up the general agreement for the tap on receiving the irrigation water made by the leader on behalf of all water users and director of WUA on the base of acceptance-transfer reports;

Step 2. Installation of water-measuring device and organization of water account at the tap.

1. Installation of water-measuring device. WUA specialists install water-measuring device at the tap (Chipoletti or Thomson spillways or SANIIRI chute), preferably with blocked gate at the inlet. The payment for installation and spillway or materials for a chute is discussed by the water use members of tap with WUA administration.

2. Organization of water account at the tap. Water account at the tap is made by means of measuring of water discharge with the help of water-measuring device from the start of water supply into tap. First of all, at the moment of water-supply both WUA hydrometer and leader of tap should be available. Both representatives do measuring of level in the spillway and chute by using the water-measuring device, define the discharge as per table and then they write down the number of tap, type of water-measuring device, time of water-supply start, spillway's level and water discharge in their acceptance books. WUA hydrometer and the leader of tap sign in the books.

"Mirab" and Leader of the tap sign in the recording book of water receiving every ten days.

Table 1

Date	Indications of depth gauge			Average	Discharge, l/sec	Time of supply, hour/sec	Runoff, м3	Runoff increasing м3	Notes
	8 h	14 h	20 h						
1									
2									
-.									
22	12	12	12	12	30,3	12/43200	1309		
23	12	12	12	12	30,3	6/21600	654	1963	
-.									
Average, l/s					30,3				
Sum ths. m^3							1963	1963	
Signature	WUA hydrometer					Leader of tap			

Step 3. Drawing up the contract with WUA

By mutual consent on the general meeting of farmers and WUA administration the leader of the tap, on behalf of water users, draws up the agreement with Water Users Association:
1. on the irrigation water supply according to the plan of water use;
2. on the account of water supplied in the point of tap along with drawing up the acceptance report by the leader of tap and transfer by the WUA hydrometer;
3. on the payment for the volume of water used by each water user on the base of *"Recording book of irrigation water used by the water users*» which is filled by the leader of the tap and represented to the WUA administration. Indication of the total volume used by all water users is registered, coordinated and signed by the WUA hydrometer.

Step 4. Distribution among the water users of water received in the head of tap.

The **Leader of the tap** distributes the water among the water users**.** First of all, on the general meeting the leader of the tap agrees with all water users on:
- consent of turn when irrigation is performed by the water users;
- Farmers accept the way of distribution and turn of water use which are fixed by the leader of the tap.

The technique of water distribution among the water users

1. The distribution is made on the base of structure of areas under crops and volume in the head of the tap.
2. On the base of acceptance report with WUA the leader gets information on the water discharge and measures it with WUA hydrometer. The measured discharge, date and time are written in the acceptance report.
3. The Leader of the tap calculates the area which can be covered by the water received in the head of the tap. For this purpose he defines the quantity of **simultaneously irrigated furrows** where the received water can be distributed to.
For example: The water discharge in the head of the tap is made $Q_{отв}$ = 30 l/s, the discharge into a furrow is $_{qб}$ = 0, 5 l/s, thus the quantity of simultaneously irrigated furrows will form:

$$\mathbf{Q_{отв}: q_б = 30\ l/s: 0,5\ l/s = 60\ irrigated\ furrows}$$

Knowing the number of furrows, the leader defines the turn of water users. Someone can have 10 furrows in the whole field, someone – 20, someone - more than 60 depending on the field area. It is possible to divide by 10 furrows and include 6 water users regardless the area. In this case the one who has only ten irrigation furrows copes with watering one time, the one who has 20 furrows performs the irrigation twice and the one who has 60 furrows irrigate 6 times. It is desirable for those who have a lager area to supply water for more quantity of furrows than for those who have smaller area. According to the quantity of furrows the leader estimates to whom and how much water he has distributed and then, based on the time of using, how much water was used by the water user and fix the volume of water to be paid by each water user.

For example: the water user has 20 irrigation furrows, the leader of the tap supplies the water based on the estimation as of q_6 = 0,5 l/s per furrow, so for 20 furrows it will form:

0,5 l/s * 20 = 10 l/s

4. The leader of the tap keeps records in the "*Recording book of irrigation water used by the water users"* on water supply to each water user (Table2). In the recording book the leader marks a surname of the water-user, date and time of water receiving, the quantity of furrows covered by one irrigation, rated water discharge into one furrow for this land, total volume of water discharge supplied to the field, final time for irrigation, total time of irrigation (i.e. duration of irrigation), total volume of water used, signature of water user and the leader of the tap.

The quantity of furrows is defined according to the furrows available in the field. The leader of the tap together with the farmer surveys a field and marks the quantity of furrows in the field. The quantity of furrows for the first and simultaneous irrigation is defined by the leader himself depending on the water discharge which he will receive from the canal and co-ordinates this quantity with farmer. Depending on the quantity of simultaneously irrigated furrows and total quantity of furrows, the irrigation frequency rate is defined – *for example, a farmer has only 75 irrigation furrows, the leader and the farmer come to an agreement to irrigate 25 furrows simultaneously that means that farmer receives the certain amount of water which is sufficient for 25 furrows.*

Table 2

Recording book on water used by the water users

Names of the water user	Received water		Water supply					Ending of irrigation		Total irrigation time	Total amount of water	Signature of the water user	Signature of the leader of the tap
	Date	Time	Total quantity of irrigating furrows	What quantity of furrows for	Water discharge into a furrow	Total volume of water discharge	Irrigation frequency rate	Date	Time				
			pcs	pcs	l/s	l/s				hours	m^3		
1	2	3		4		5		6	7	8	9	10	11
Manasov	June, 22	8h 25 min	75	25	0,5	12,5	3	June, 23	2h25m	18	810		
Jumaev	June, 22	8h 25 min	30	15	0,5	7,5	2	June, 22	20h25m	12	324		
Babayev	June, 22	8h 25 min	60	20	0,5	10	3	June, 23	2h25m	18	648		
Total	June, 22	8h 25 min	165	60	0,5	30		June, 24	2h25m	18	1782		

Initially the farmer irrigates 25 furrows, then having finished the irrigation moves to the following 25 furrows and having finished the irrigation of the second group of furrows moves to irrigate the following 25 furrows. Therefore, it takes 6 hours to farmer for irrigation of 25 furrows and 18 hours for 75 furrows. So, the amount of water allocated to him will be used during 18 hours. Only after the ending of irrigation he informs the leader (in advance) and stops water receiving from the leader. The leader transfers this released amount of water to another farmer.

5. How to define what rate and time is necessary to supply water to the water users.

The irrigation rate for any crop is defined on the base of hydro module zoning where soil-meliorative conditions of the irrigated land are estimated. This information in details is available in the WUA administration. The leader of the tap should have irrigation rates for all crops cultivated on his land. He takes this information from hydro-technician or director of WUA before the irrigation season starts.

Duration of watering is defined according to tables given below

Table 3

Width of row-spacings	Discharge into a furrow	Length of furrows	Irrigation rates gross, m^3/hectare		
			600-700	800-900	1000-1200
meter	liter/s	meter	Duration of watering, in minutes		
0,6	1	80	56	72	96
0,6	1	90	63	81	108
0,6	1	100	70	90	120
0,6	1	150	105	135	180
0,6	1	200	140	180	240

Table 4

Width of row-spacings	Discharge into a furrow	Length of furrows	Irrigation rates gross, m^3/hectare		
			600-700	800-900	1000-1200
meter	liter/s	meter	Duration of watering, in minutes		
0,6	0,5	80	112	144	192
0,6	0,5	90	126	162	216
0,6	0,5	100	140	180	240
0,6	0,5	150	210	270	360
0,6	0,5	200	280	360	480

Table 5

Width of row-spacings	Discharge into a furrow	Length of furrows	Irrigation rates gross, m^3/hectare		
			800-900	800-900	1000-1200
meter	liter/s	meter	Duration of watering, in minutes		
0,6	0,25	80	3-4	4-5	6-6,5
0,6	0,25	90	4-4,5	5-5,5	7-7,5
0,6	0,25	100	4-5	6	8
0,6	0,25	150	7	9	12
0,6	0,25	200	9-9,5	12	16

Table 6

Width of row-spacings	Discharge into a furrow	Length of furrows	Irrigation rates gross, m^3/hectare		
			600-700	800-900	1000-1200
meter	liter/s	meter	Duration of watering, in minutes		
0,6	0,1	40	5	6	8
0,6	0,1	50	6	8	10
0,6	0,1	60	7	9	12
0,6	0,1	70	8	11	14
0,6	0,1	80	9	12	16
0,6	0,1	90	11	14	18
0,6	0,1	100	12	15	20
0,6	0,1	150	18	23	30
0,6	0,1	200	23	30	40

The duration in the table shows how much time is necessary to supply the water into furrow in order to supply the required irrigation rate. If irrigation water is supplied simultaneously to 25 furrows than the duration for all 25 furrows will be the same. To use this table it is necessary to know the furrow width which is actually always known and, in the majority of cases, especially for the Osh area, it makes 0, 6 m. It is necessary to know the furrow length that is known for each field too. The water discharge into a furrow is unknown. The water discharge into furrow can be accepted proceeding from the recommended values for various soils. Table 6 shows the values received by the IWRM-Fergana Project for various combinations of soils and slopes.

The approach, described above, was used in on Sokolok Canal of «Japalak» WUA.

As a result of using this approach the agreement between all water users has been achieved within the tap bound and the conflicts on water use have resolved in 2006. After the ending of irrigation each water user applied to the head urgently and stopped the water supply to his field. The basic role in such discipline played the transition to the payment based on the volume of water used and its account by each water user, instead of former one when the payment was done as per hectare of the irrigated area. As a result both saving of water and payment for the used water have been achieved.

Big water losses and low efficiency on the small areas in the Osh area of Kyrgyzstan is a result of unorganized and uncontrolled water supply and use by the water users. Reduction of losses and fair water distribution to each water user are provided by methods allowing involving the water user to save the water supplied to him/her and only in those terms when there is a need in it. By studying this situation it is found out that the water users paying for the irrigated area are equalized irrespective of the fact that someone uses more water and someone is less.

In this case the payment for one hectare of area makes 400 soms ($10) at the cost for 1000 m^3 is 40 soms ($1). It turns out that each water user paid for 10000 m^3/hectare. The experiences made by the project on the demonstration sites have shown that the irrigation rate, for example for winter wheat, does not exceed 4000 m^3/hectare which is 2,5 times less than the water for which the water users pay when a payment is made for 1 hectare of the irrigated area.

Comparative analysis of payment for water and water use on tap 2 of canal Sokolok

Farmers first, middle, last name	Total area, Hectares	by cultures						Actual payment for water (in soms)		Saving of money	Calculated volume of the used water		Saving of water
		corn	Winter wheat	vegetables	sunflower	Grass	potato	2005	2006		2005	2006	
Mazhitov A	0,5	0,35	-	0,15	-			200	83	117	5000	2075	2925
Mazhitov T	0,45	0,15	-	0,3				180	75	105	4500	1875	2625
Karabaev A	0,15	0,15	-	-				60	25	35	1500	625	875
Abdykerimova G	0,35	-	0,35	-				140	95	45	3500	2375	1125
Azimov M	0,15	0,15						60	25	35	1500	625	875
Azimova M	0,13			0,13				52	22	30	1300	550	750
Temirov T	0,15	0,15						60	25	35	1500	625	875
Turgunbaev I	0,26	0,26						104	43	61	2600	1075	1525
Turgunbaeva A	0,49		0,49					196	81	115	4900	2025	2875
Turgunbaeva A	0,45	0,45						180	75	105	4500	1875	2625
Turgunbaeva Sh	0,45	0,45						180	75	105	4500	1875	2625
Turgunbaev A	0,38	0,38						152	63	89	3800	1575	2225
Turgunbaev N	0,19	0,19						76	31	45	1900	775	1125
Kochkorov T	0,13	0,13						52	22	30	1300	550	750
Kochkorov A	0,38						0,38	156	65	91	3900	1625	2275
Tynybekov S	0,13	0,13						52	22	30	1300	550	750
Mamazaitov N	0,13	0,13						52	22	30	1300	550	750
Mamazaitov Ch	0,13						0,13	52	22	30	1300	550	750
Raimov M	0,26	0,26						104	43	61	2600	1075	1525
Matmusaev A	0,26		0,26					104	43	61	2600	1075	1525
Atazakov A	0,13			0,13				52	22	30	1300	550	750

Farmers first, middle, last name	Total area, Hectares	by cultures						Actual payment for water (in soms)		Saving of money	Calculated volume of the used water		Saving of water
Kochkonov B	0,26		0,26					104	43	61	2600	1075	1525
Joldoshev D	0,13		0,13					52	22	30	1300	550	750
Apazov K	0,26	0,26						104	43	61	2600	1075	1525
Mamatalieva R.	0,39	0,39						156	65	91	3900	1625	2275
Alimbekov M	2	1,5			0,5			800	332	468	20000	8300	11700
Mamashev Sh	2	2						800	332	468	20000	8300	11700
Moldobaev M	0,6	0,6						240	100	140	6000	2500	3500
Ergeshov K	0,2	0,2						80	33	47	2000	825	1175
Naymanov U	0,2	0,2						80	33	47	2000	825	1175
Chotuev A	0,2	0,2						80	33	47	2000	825	1175
Zhunusov A	0,4	0,4						160	66	94	4000	1650	2350
Bekiev E	0,2	0,2						80	33	47	2000	825	1175
Emilov A	2	0,7	0,7	0,6				800	332	468	20000	8300	11700
Moldoaliev M	0,2	0,2						60	25	35	1500	625	875
Kalyev Kenzhe	0,1	0,1						40	17	23	1000	425	575
Kalyev Kydy	0,17	0,17						68	28	40	1700	700	1000
Kalyev E	0,28	0,28						112	46	66	2800	1150	1650
Kalyev T	0,14	0,14						56	23	33	1400	575	825
Kalyev E	0,38	0,38						152	63	89	3800	1575	2225
Kalyev S	0,34	0,34						136	56	80	3400	1400	2000
Myrzakarimov A.	0,25	0,25						100	41	59	2500	1025	1475
Abdykalykov Zh	1,73	0,63	0,5	0,3		0,3		692	287	405	17300	7175	10125
Abdykalykov M	0,1	0,1						40	17	23	1000	425	575
Baltabaev N	0,39	0,39						156	65	91	3900	1625	2275

Farmers first, middle, last name	Total area, Hectares	by cultures						Actual payment for water (in soms)		Saving of money	Calculated volume of the used water		Saving of water
Baltabaev O	0,49				0,49			196	81	115	4900	2025	2875
Baltabaev A	0,2	0,1			0,1			80	33	47	2000	825	1175
Baltabaev T	0,15				0,15			60	25	35	1500	625	875
Tokoev I	0,45		0,45					180	75	105	4500	1875	2625
Sarymsakov Zh.	0,13	0,13						52	22	30	1300	550	750
Sarymsakov S	0,13	0,13						52	22	30	1300	550	750
Sarymsakov A	0,13	0,13						52	22	30	1300	550	750
Sarymsakov M	0,25	0,25						100	42	58	2500	1050	1450
Sarymsakov A	0,15	0,15						60	25	35	1500	625	875
Sarymsakov K	0,15	0,15						60	25	35	1500	625	875
Sarymsakov M	0,1		0,1					40	17	23	1000	425	575
Sarymsakov K	0,09		0,09					36	15	21	900	375	525
Sarymsakov E	0,3		0,3					120	50	70	3000	1250	1750
Sarymsakov O	0,68		0,68					272	113	159	6800	2825	3975
Sarymsakov Zh	0,19		0,19					76	32	44	1900	800	1100
Sarymsakov B	0,19		0,19					76	32	44	1900	800	1100
Karybekov K	1		1					400	166	234	10000	4150	5850
Total	23,36	14	5,69	1,61	1,24	0,3	0,52	9324	3911	5413	233100	97775	135325

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