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IWMI International Water Management Institute

Mechanism of effective water use in small farms which have small areas

Tashkent – 2007

Development of methods of work with water users groups at small area lands on example of canal Sokolok (Kyrgyzstan). Methodic of work with water users groups.

One of the requirements of effective water use during irrigation the agricultural crops is rated water supply to a field. In conditions when farms irrigated areas are more than 10 hectares, as it is widespread in Uzbekistan and partially in Tajikistan and Kyrgyzstan, rated water supply is reached by means of organization of water-account and planning of irrigation regimes. Farms with small areas (up to 1 hectare) are widespread in Osh region. Water use planning is provided by Water Users Associations only up to a canal border from which there are taps of water users. Water supply rationing is not provided on each tap; water discharge on each tap is not fixed due to absence of water-measuring devices and posts. Water distribution among water users has casual character, each water user uses irrigation water at own discretion without control and discipline, arrangements or sequence. As a result, planning organizations are deprived an opportunity to supervise time and volume of water use, water users are deprived an opportunity of reception duly and required volume of water, especially it affects water users located downstream, not only within the limits of the canal, but also within the limits of taps.
For the resolution of the problem a group of experts of SIC ICWC has done a work on adjusting the technique of effective water use on an example of canal Sokolok located at WUA "Japalak" within the frame of the project IWRM-FERGANA.
As a result of studying of water distribution on canal Sokolok it is found out that:

- WUA hydrometers deliver water only up to each tap;
- Water allocation inside the tap is done by water users themselves;
- there are conflicts among water users during water distribution;
- taps are not equipped by water-measuring devices;
- water-account and payment is made by WUA according to cropping area - 1 $м^3$ of water costs 0,04 som, 1 hectar costs 400 som that corresponds to volume of 10000 $м^3$/hectare;
- registration of the watered area practically is not conducted;

Technique of effective water use in farms with small areas based on the water intake registration by each farmer and organization of payment for water according to actually used volume, instead of existing payment by hectare.

Step 1. It is necessary to lead mobilization and explanatory work with water users of each tap. During explanatory work it is necessary to define problems of each water user connected to water use, to estimate how the given method solves the problems. Each water user should understand advantage and profitability of the given method.

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

- how each water user receives water;
- from who water is received;
- whether water is received in due time;
- whether enough water is received for irrigation;
- how much stably each water user receives water, i.e. whether there are stops of water supply during watering;
- how fair is water distribution among water users;
- what financial expenses are born by water users for the used water.

- It is necessary to explain benefits and advantages of the given method to each farmer:

- guaranteed and stable reception of required water through the water account of the received water on a border of a tap;
- fair water distribution through the organized sequence on the basis of the agreement between all members of tap;
- saving the financial assets through transition from payment by hectare to payment by volume of the used water.

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

- problems of water distribution, terms of reception, discharge, stability and validity of reception of water by each farmer;
- organizing the water account on border of tap;
- organizing the account of the received water by each water-user;
- transition to payment by volume of the used water;
- choose the leader of a tap whose functions will be reception of water on border of tap, its account, water distribution among all members of water use and account of the water received by each water user, gathering the payment for the used water from each water user;
- drawing up the general contract for a tap on reception of water on the basis of certificates of acceptance-transfer by the leader on behalf of all water users and director of WUA;

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

1. **Installation of the water-measuring device.** Water-measuring device is installed at a tap by WUA specialists (Chipoletti or Thomson spillways or SANIIRI tray), it is desirable that the device be with a partitioning off board at input of the tap. Payment for installation and a spillway or materials for a tray is discussed by members of water use of the tap with management of WUA.
2. **The organization of the water account in a tap.** Water account in tap is done by means of calculating water discharge on water-measuring device from the moment of the beginning of water supply in a tap. First of all, during the moment of water-supply there are should be WUA hydrometer and the leader of tap there. Both the representatives do gauging on the water-measuring device of a level in a spillway or a tray, then define under the table the discharge and both write down number of tap, a type of the water-measuring device, time of the beginning of water-supply, a level of a spillway, and water discharge in their acceptance-transfer books. In the books signatures of WUA hydrometer and the leader of tap are put.

1. Log-book of reception of water through the water-measuring device with signatures of “mirab” and WUG leader every ten days.

Secondary canal Sokolok
the name of tap – №2
month – June

Table 1

date	Indications of depth-gauge			average	Discharge, l/sec	Time of supply, hour/s	Outflow, м3	Outflow total м3	notes
	8 h	14 h	20 h						
1									
2									
-.									
22	12	12	12	12	30,3	12/43 200	1309		
23	12	12	12	12	30,3	6/216 00	654	1963	
-.									
Average, l/s					30,3				
Sum ths. m^3							1963	1963	
Signature	WUA hydrometer					The head of tap			

Step 3. Drawing up the contract with WUA

According to the agreement, leader of tap on general meeting of farmers and WUA management on behalf of water users signs a contract with Water Users Association:

1. on delivery of water according to the plan of water use;
2. on the account of water supplied in a point of tap with drawing up the certificate of acceptance by the leader of tap and transfer by hydrometer of WUA;
3. on payment for volume of water used by each water user according to «*Log-book of water used by water users*» filled by the leader of tap and signed by WUA hydrometer and represented to WUA management with indication of the total volume used by all water users, registered and coordinated at tap.

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

Water distribution among water users is carried out by the **Leader of tap.** First of all, on general meeting, the leader of tap agrees with all water users on:

- sequence at carrying out a watering;
- appreciation by farmers the leader of tap as a person responsible for distribution and establishment of sequence of water use;

Mechanism of water distribution among water users.

1. Distribution is done proceeding from the structure of areas under crops and volume in a head of tap.
2. The leader under the certificate with WUA on acceptance-transfer receives water which is measured together with hydrometer of WUA in tap. In the certificate of acceptance-transfer the discharge measured, date and time is put.

3. Then the Leader of tap counts, according to **discharge** received in a **head of tap**, what **area** can be covered. For this purpose he defines, on what quantity of **simultaneously watered furrows** it is possible to distribute the **water**.
For example: Water discharge in a head of tap is $Q_{отв}$ = 30 l/s, discharge into a furrow is $q_б$ = 0,5 l/s, the quantity of simultaneously irrigated furrows thus will form:

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

Knowing a number of furrows, the leader defines sequence of water users. At someone it can be 10 furrows on the whole field, at someone – 20, at someone - more than 60 depending on the area of a field. It is possible to divide by 10 furrows and capture 6 water users regardless the area. In this case that who has only ten irrigation furrows waters at one time, that who has 20 - at two receptions and that who has 60 furrows at six receptions. It is desirable for those who have a greater area to submit water on a greater number of furrows, than to those who have smaller area. According to the quantity of furrows the leader defines, to whom and how much water he has given and further according to the time of use defines how much water is used by water user and writes down this volume of water for which water user should pay.
For example: the water user has 20 irrigation furrows, the leader of tap submits water at the rate $q_б$ = 0,5 l/s for a furrow, for 20 furrows it will form:

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

4. The leader of tap keeps records on water delivery to each water user in «*Log-book on water used by water users*» (table 2). In the book the leader marks a surname of the water-user, date and time of reception of water, quantity of furrows captured by one watering, water discharge in a furrow rated for the lands, total water discharge submitted to a field, time of termination the watering, total time of watering (i.e. duration of watering), total amount of water used, signature of water user and the leader of the tap.
The quantity of furrows is defined according to their amount in a field. The leader of tap together with the farmer looks through a field and marks quantity of field furrows. The quantity of furrows for initial and simultaneous watering is defined by the leader depending on the water discharge which is received from the canal and coordinates this quantity with the farmer. Depending on quantity of simultaneously watered furrows and total quantity of furrows, watering frequency rate is defined – *for example farmer has only 75 irrigation furrows, the leader and the farmer come to an agreement to water 25 furrows simultaneously, which means that farmer receives certain amount of water sufficient for 25 furrows.*

Log-book on water used by water users

Table 2

First name, middle, last name of the water user	received water		Water delivery					finished having watered		Total watering time	Total amount of water	The signature of the water user	The signature of the leader of tap
	Date	time	total watered furrows	quantity of furrows	water discharge into a furrow	Total water discharge	Watering frequency rate	Date	time				
			item	item	l/s	l/s				hours	m^3		
1	2	3		4		5		6	7	8	9	10	11
Manasov	June, 22nd	8h 25 minutes	75	25	0,5	12,5	3	June, 23rd	2h25m	18	810		
Jumaev	June, 22nd	8h 25 minutes	30	15	0,5	7,5	2	June, 22nd	20h25m	12	324		
Babayev	June, 22nd	8h 25 minutes	60	20	0,5	10	3	June, 23rd	2h25m	18	648		
total	June, 22nd	8h 25 minutes	165	60	0,5	30		June, 24th	2h25m	18	1782		

The farmer initially waters 25 furrows, then having finished watering moves to the following 25 furrows and having finished watering the second group of furrows moves to water the following 25 furrows. Means, if for watering the first 25 furrows 6 hours is required than for watering all the 75 furrows 18 hours is required. So, the amount allocated to him will be used during 18 hours. Only after the termination of watering he informs the leader (in advance) and stops reception of water from the leader. The leader transfers this released amount of water to another farmer.

5. How to define what rate i.e. what time is necessary to submit water to water users.
The watering rate for any crop is defined according to hydro module division into districts where soil-meliorative conditions of the irrigated grounds are considered. This information in details available at WUA management. The leader of tap should have irrigation rates for all crops cultivated on his lands. He takes this information before irrigation season from hydro technician or director of WUA.

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

Duration resulted in the table shows, what time is necessary to submit water in furrow in order to ensure required watering rate. If irrigation water is supplied simultaneously to 25 furrows than duration for all 25 furrows will be identical. To use this table it is necessary to know furrow width that is practically always known, in the majority of cases, especially for the Osh area, it is 0,6 m. It is necessary to know furrow length that is known too by each field. Discharge into a furrow is unknown. Discharge into furrow can be accepted proceeding from recommended values for various soils. In table 6 values received by project IWRM-Fergana for various combinations of soils and biases are resulted.

The approach described above was used in WUA «Japalak» on canal Sokolok. Offered technique has been tested and introduced for group of water users linked to one tap of canal Sokolok.

As a result of using the approach the agreement between all water users inside a tap and conflicts resolution on water use have been reached in 2006. After the termination of watering each water user was urgently addressing to the head and stopping water delivery on his field. The basic role in such discipline played the transition to payment for volume of water used and its account by each water user, instead of former when payment was done for hectare of the irrigated area. Saving of water has been reached as a result of paying for water.

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 water users. Reduction of losses and fair water distribution to each water user are provided by methods allowing interesting the water user to use water carefully and only in terms when there is a need in that. By studying the situation it is established that water users paying for the watered area are equalized regardless of the fact that someone uses more water and someone - less.

At payment by hectare of the watered area payment for 1 hectare is 400 soms ($10), at cost 1000 m^3 – 40 som ($1). It turns out that each water user paid for 10000 m^3/hectare. Experience of the project from demonstration sites has shown that irrigation rate, for example of winter wheat, does not exceed 4000 m^3/hectare which is in 2,5 times less than that water for which water users pay at payment for 1 hectare of the watered area.

Below in the table are data received as a result of use of the offered approach on canal Sokolok in WUA “Japalak”. As it can been seen from the table saving of water and money resources has formed more than 50 %.

Stability of the given method and interest in it of water users are possible only at the account of water use by each water user.

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

Table 7

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
Kochkonov B	0,26		0,26					104	43	61	2600	1075	1525
Joldoshev D	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
		corn	Winter wheat	vegetables	sunflower	Grass	potato	2005	2006		2005	2006	
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
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

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	
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

The brochure was prepared at SIC ICWC within the frame of the project «Integrated Water Resources Management in Fergana Valley» by the head of activity «Introduction of the advanced technologies on water and land productivity improvement» Sh. Sh. Muhamedzhanov. Materials of official information sources were used in the brochure.

The brochure is intended for experts-hydro technicians.

On any questions you can address:

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