9. Proposals on water resources allocation improvement among water users of farm canals

9.1. Effective water use problem

Living conditions provision of region population majority, as it was above mentioned, depends on effective water resources use, and this impact increases from upper to lower reaches of river basins. Recent low water years aggravated effective water use problem, which became more critical because of high population number increment.

Many politicians and public broad mass clearly understand that community well-being in the nearest future will depend on that how effectively and reasonably water management system will be constructed at all hierarchic levels.

Systems of former farm (presently in dominating number of cases inter-farm) canals are practically lowest level in complex hierarchy of regional water management, however, probably, the most sensitive to structural changes in water management system. Irrigation productivity on the fields under agricultural crops as well as opportunity of providing significant population part with food from their household plots or at the expense of these plots depend on that how effectively water will be used at farm level.

Traditional in region widespread use of gravity irrigation systems and surface irrigation methods cause increased specific costs for irrigation. Besides, above 80% of farm irrigation network is presented by earthen channels, i.e. have increased infiltration losses.

Water use efficiency improvement and water conservation in big, sufficient for all region, scales is complicated by following obstacles:

- water conservation measures by means of reconstructing and modernizing irrigation systems in present economical situation can't be covered by agricultural production profit;
- lack of single approaches to water consumption standardization at regional level[*];
- increased requirements for irrigation of water users from river basin upper reaches are not always grounded sufficiently;
- under chargeable water use introducing dependence of rayon water organizations' financial state rather on water supply volumes, than water allocation quality, to certain extent contradicts water conservation objectives;
- over-separation of former large farms into great number of small ones often causes increase of irrigation water organizational losses;
- water users from private farms, peasant farms, and shirkats, in particular in the countries, where chargeable water use hasn't been introduced yet, are not interested economically in water conservation, because bigger part of water conservation effect promotes decision of environmental and social tasks, which community faces in general.

Habitat deterioration caused by water quality decrease, ground water table rising and, in particular in reclamation-unfavorable zones, beside irrigation efficiency reduction provoke conditions for epidemic development, which can spread over vast areas.

Effective water use problem presently ceased to be the problem of only national sectors of water and agriculture management.

Efficiency increase of inter-farm and farm irrigation systems, perfection of irrigation technology and technique, improvement of fields leveling, partial or complex reconstruction of hydroreclamation systems providing rehabilitation of habitat can be solved only by means of the states at the expense of substantial increase of capital investments for these purposes, creation of favorable lending system of these measures.

Given important role of irrigated agriculture in regional economy of the countries, it is expediently to form state systems of support and development of water management and agriculture directed to efficiency increase of irrigated lands and irrigation water.

Before creating these goal-directed support systems it is required to highlight publicly GEF project started in 1999 under Subcomponent A-1 ("Participation in Water Conservation") and proceeded in 2001 under IWMI-SIC ICWC project "Adoption of best practices", important process of initiation by water users themselves of practical low-cost water conservation approaches.

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[*] Presently single principles are principles of irrigated area water allowance zoning. However, methodic approaches of crop water requirements calculation are different and often significantly.

Table 9 | Characteristics of water resources use efficiency by rayon water organization-"Water Conservation" competition participants

Oblast	Year	Irrigated area	Average weighted norm "net-field" of complex hectare	Established limit of specific water intakes per complex hectare	Actual specific water intake	Water Use Coefficients in irrigation systems corresponding to established limits	Actual Water Use Coefficients in irrigation systems	Difference between actual and established on limit WUC
		th.ha	th.m^3/ha	th.m^3/ha	th.m^3/ha	%	%	%
Kzyl-Orda	1999	68.72	13.6	26.4	24.6	51.7	55.5	3.8
	2000	132.02	15.5	25.6	20.6	60.7	75.4	14.8
South-Kazakhstan	1999	184.88	5.1	13.5	9.7	37.8	52.6	14.9
	2000	203.53	5.3	9.1	5.3	58.3	101.4	43.2
Jelalabad	1999	47.22	4.7	9.6	7.5	48.7	62.0	13.3
	2000	86.59	4.8	9.0	7.1	53.7	67.5	13.8
Osh	1999	91.50	4.8	10.9	8.4	44.5	57.9	13.4
	2000	83.02	3.9	11.1	9.1	35.5	43.3	7.8
Sugd	1999	39.85	7.3	19.0	14.0	38.6	52.3	13.7
	2000	69.95	7.3	20.9	15.1	34.8	48.1	13.3
Khatlon	1999	49.80	6.3	15.5	14.8	40.5	42.3	1.8
	2000	79.87	5.9	18.3	16.8	32.1	35.1	3.0
Fergana	1999	85.45	3.9	7.0	7.3	56.1	53.7	-2.4
	2000	79.14	4.0	6.3	6.4	62.9	62.5	-0.4
Kashkadarya	1999	111.48	5.0	6.1	6.1	81.7	81.1	-0.5
	2000	106.03	5.1	8.0	5.3	63.5	96.8	33.4
REGION	1999	678.90	5.9	12.6	10.6	47.2	56.0	8.9
	2000	840.15	6.8	13.3	10.3	50.9	66.3	15.4

Table 10 | Technological water conservation methods (not demanding additional capital costs for their implementation)

No.	Applied water conservation technology	Nature of technology	Water conservation effect, in comparison with usual irrigation technology	Are widely used on irrigation objects of oblsts:
1	Concentrated irrigation and water rotation	Plot canal discharge is directed in concentrated form to next irrigation plot. Water rotation is used under irrigation of large water use objects.	At the expense of concentrated water supply, by 10-20 % (of water supply) organizational losses are reduced, constituting under water supply «disperse» on majority of anabranches up to 30-35% of water supply to irrigated contour.	• Fergana, • Sogd • Osh, • Jalalabad.
2	Irrigation with alternating irrigated and dry row-spacing	Non-irrigated row-spacing is maintained by cultivation in loose state, hereunder providing favorable air-gas exchange in crop root-zone. Fertilizer application in non-irrigated row-spacing prevents its opportunity to be washed out root-zone limits, providing its effective use.	At the expense of reducing physical evaporation from soil surface total water consumption decreases. In comparison with water supply to each furrow irrigation water saving reaches 20-25 %. Irrigation missing row-spacing promotes balance of crop growth and development.	• Fergana, • Sogd • Osh, • Jalalabad.
3	Tier furrow irrigation with in-contour use of releases	Irrigation on short 60-100 m furrows is started with the first tier, on the next tier furrow heads are constructed. After irrigation current advance to output furrow of the second tier forming release is directed to output furrow and supplements discharge, diverted from «shokh»-aryk. In such order irrigation is carried out on next tiers.	Water conservation effect reveals in reduction by 15-20 % (of water supply) losses for surface release outside irrigated field, because surface release not used in given irrigated contour forms only on the last tier. Tier irrigation provides uniform moistening of irrigated plot.	• Fergana, • Sogd • Osh, • Jalalabad.
4	Alternate stream irrigation	Under alternate stream irrigation after irrigation stream advance front to furrow end the stream is double reduced in accordance with decreasing infiltration rate.	Water conservation effect reveals in reduction by 15-20 % (of water supply) losses for surface release outside irrigated field. Moistening uniformity increases along furrow length. Conditions are created for stable crop development.	• Fergana, • Sogd • Osh, • Jalalabad.

9.2. Ways of water use efficiency increase

Under present conditions first of all water users of low water available irrigation systems and highly populated irrigated zones with traditionally high farming culture are interested in effective water use and water conservation.

Impelling motivation of their involvement of effective water use are in the first turn those conditions, in which they carry out irrigated farming, and available traditions of careful treatment with lend and water. In these zones water use efficiency increase is possible on following scenario:

- on the first stage minimal government support is demanded to maintain and develop those forms of effective water use, which are initiated by water users themselves (irrigation with alternation of irrigated and non-irrigated row-spacing; application of mulch covers preventing excessive physical evaporation, use of multi-tier irrigation on short furrows; concentrated irrigation and water rotation use between irrigated plots; drought-resistant crop cultivation and so on).

- on the second stage it is necessary providing on parity basis (government allocates materials, equipment and carries out metrological provision, and farms present labor force) irrigation network water metering availability at level of farms and irrigated plots as well as farmers training on simplest approaches of water control and account, and water consumption standardization.

- on the third stage (under chargeable water use conditions) government initiated on parity basis (with partial reimbursement of water users costs) step by step complex reconstruction of irrigation systems.

- on the fourth stage water users, who are interested economically in costs reduction for irrigation network operation, under governmental support (favorable lending, equipment delivery by orders) initiate transition to more perfect irrigation types and technologies.

It is demanded and, first of all for new-developed zone farmers, to organize technical measures on training of effective water use and water conservation principles on the example of demonstration irrigation systems and irrigated plots.

With former large farms separating into small ones, on-farm irrigation network of former large farms transiting to inter-farm network necessity emerges to create intermediate level of self-governance – Water Users Association, as mediators presenting interests of the lowest water users in state water management bodies and carrying out, with the lowest water users' involvement, irrigation systems O&M from water inlets in WUA contour and up to farm plots.

Water management state bodies' functions in this case are concentrated on main canals O&M, water resources planning and management.

9.3. Proposals on water use efficiency increase system

Water use efficiency increase system should assume goal-directed activity of all users concerned about effective water use on four inter-related directions:

- legal basis perfection
- normative-technical base perfection
- creation of network of demonstration systems and plots for training on effective water use practical methods and legal water allocation issues;
- creation of zonal dissemination centers in irrigated agriculture practice.

Therefore development of national system grounds on increasing water use efficiency level with account for specific features of irrigated farming of natural-climatic zones and national laws about land and water (Table 11).

Table 11 | Proposed composition of developments for grounding and disseminating effective water use approaches

Name of proper developments for grounding and disseminating of effective water use approaches	Results
1. DEVELOPMENT OF RECOMMENDATIONS ON WATER SYSTEMS MANAGEMENT AND OPERATION IN MARKET ECONOMY CONDITIONS I stage – Development of water systems management and operation concept in market economy conditions. II stage – Development of organizational and functional structures of water systems management and operation services at different levels of their management. III stage – Creation of normative documentation on experimental-production testing of management and operation forms on typical water systems. IV stage - Creation of demonstration irrigation systems and training on perfect methods of management and operation. IV stage - Irrigated agriculture introduction into practice.	Normative-technical documentation on water systems operation in market economy conditions. Demonstration irrigation systems. Experts trained for work by means of perfect management and operation methods.
2. DEVELOPMENT OF SET OF WATER CONSERVATION ORGANIZATIONAL-TECHNICAL MEASURES PROVIDING IMPLEMENTATION OF PERFECT CROP IRRIGATION TECHNOLOGIES FOR DIFFERENT NATURAL-CLIMATIC ZONES WITHIN ARAL SEA BASIN IN CONDITIONS OF MARKET RELATIONS DEVELOPMENT IN AGRICULTURE AND WATER MANAGEMENT I stage – Development of irrigated area zoning on expedient forms, irrigation technologies perfection for water conservation. II stage – Development of design-constructing documentation for creation of perfect irrigation devices and equipment with orientation on their production on base of local raw material and available production capacities. III stage – Creation of demonstration irrigation plots – basic systems for training for farmers on effective nature use approaches and grounds of irrigation efficiency increase. IV stage – Transition to broad dissemination of perfect irrigation technologies in irrigated agriculture practice.	Normative-technical documentation on broad dissemination mechanism for perfect irrigation technologies in irrigated agriculture practice. Farmers trained to effective nature use approaches and grounds of irrigation efficiency increase

9.4. Water allocation between agricultural and non-agricultural water users

Water allocation equitability problem between agricultural and non-agricultural water users (in rural zones this is mostly owners of homestead plots) can be solved by means of traditional council of parents, which exists in Central-Asian countries and being more available for communication has not less influence and authority amongst population, than local administration representatives.

According to water legislation homestead plots' owners are secondary water users, whose interests should be considered under planning and implementation of water distribution by primary water users, i.e. large farms or WUAs, in which contours homestead lands are located.

Task of parent (or council of parents) – basing on laws and equitability sense , water consumption norms established for homestead lands and under technical assistance as well as water expert advises – mirab of settlement – to make decision about potential conflict situations while standing for water rights from primary water user or allocating water inside settlement.

Under parent participation or (council of parents) works on settlement irrigation network operation are organized, i.e. on its timely cleaning up from sediments, control structures repair. These works are conducted by forces of and at the expense of settlement residents. Moreover water right of those residents, who refuse to participate in community works without serious reason, can be limited by solution of parent (or council of parents).

9.5. Possible ways of increasing equitable water resources distribution among private farms in conditions of market relations

When organizing irrigation in private farms, associations of private farms, it is necessary, first of all, to take into account designed flow capacity of irrigation network (if in operation years it reduced on some reasons, canal reconstruction should be taken) and designed framework of irrigated area organization.

Area adopted as irrigated land plot water allowance shouldn't be less than designed area of simultaneous irrigation from plot canal. Depending on zone it is 8-12 ha. This area can be charged to one farmer or association of several farmers. In this case average weighted water allowance, on which basis constant irrigation flow discharge is calculated in growing period on plot canal, is defined with account for cropping pattern of canal command area, and can't exceed average weighted water allowance for cropping pattern adopted under design of irrigation on given massif.

Regarding this under irrigation of more (than it is adopted in design cropping pattern) water-consumptive crops actual irrigated area with more water-consumptive crop should be reduced to those extent, to which its water consumption exceeds water consumption of designed cropping pattern.

For example, if on 12 ha of irrigated lands, in contours of irrigation field, designed for production of cotton-alfalfa crop rotation with growing period irrigation norm M=6000 th. m^3/ha it is planned to grow rice with irrigation norm M=18000 th. m^3/ha, actual irrigated area should be reduced triply, i.e. up to 4 ha. On the rest 8 ha rain-fed crops or green-manure crops can be cultivated.

In other case the farmer deciding to grow rice should "ransom" right for irrigation from farmers of the adjacent plot. Moreover he must pay for "re-transfer" of water rights basing on average profit obtained in given conditions under cultivation of designed cropping pattern crop per 1 th.m^3 of used water. Under forming conjuncture of prices for agricultural production farmer has to decide, what is beneficial to him in concrete situation:

- to produce crop with water consumption not exceeding water consumption of designed cropping pattern crop;
- to irrigate only part of land plot;
- to buy out right for additional water, having paid for re-transfer of rights average profit per 1 th.m^3 of used water, obtained in given conditions under designed crop production.

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