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EU Programme on "Sustainable Management of Water Resources in Rural Areas in Uzbekistan"

Component 1: «National policy framework for water governance and integrated water resources management»

Economic mechanisms to incentivise water saving at on-farm level

PROJECT REPORT

Tashkent 2019

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CONTENT

Tables

Figures

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ABBREVIATIONS AND ACRONYMS

BAK	Big Andijan Canal
BFK	Big Fergana Canal
BISA	Basin irrigation systems authority
Co Ltd	Limited liability company
DID	District Irrigation Department
EF	Efficiency
F&L	Fuels and lubricants
GDP	Gross domestic product
GWT	Groundwater table
HES	Hydraulic engineering structures
IDS	Irrigation-drainage system
ISA	Irrigation systems authority
JSC	Joint stock company
MA	Ministry of Agriculture
MTP	Machinery and Tractor Park
MTR	Material and technical (maintenance) resources
MWR	Ministry of Water Resources
O&M	Operation and maintenance
ODMC	Operational department of the main (delivery) canal
PS	Pumping stations
PSA	Pumping stations authority
RCSE	Republican Commodity and Stock Exchange
RP	Regional product
RRW	Repair and restoration works
SFC	South Fergana Canal
SUE	State unitary enterprise
UE	Unitary enterprise
WCA	Water consumers association
WUE	Water use efficiency
ET	Evapotranspiration

INTRODUCTION

This report has been prepared in accordance with the tasks under the clause 7.5 – to support river basin organizations to conduct economic analysis of water use and implementation of the full cost recovery principles, in developing financial and economic incentives for water conservation and improving water productivity in rural areas under the Component 1: “National Framework Concept for Water Management and Integrated Water Resources Management” of the European Union Program on “Sustainable Water Resources Management in Rural Areas of the Republic of Uzbekistan”.

The report describes the current state of the organization of water use and a review of existing economic mechanisms for water conservation in Uzbekistan. The analysis of external factors stimulating / limiting water conservation is provided. It is proposed to introduce a two-part tariff to collect WCA service fees as one of the mechanisms that stimulate water conservation.

CURRENT STATE OF ORGANIZATION OF WATER USE

Water Consumer Associations (WCAs) have been established to organize water use. The WCA is responsible for providing the lower level of the irrigation system and organization of water use in proper working condition.

The modern structure of water resources management is organized according to the following top-down hierarchy:

Republican level - The Ministry of Water Resources oversees water management facilities of the republican subordination (major canals and reservoirs, including SFC, Andijan and Hisarak dams). Basin irrigation systems authorities (BISA) oversee water management facilities of regional subordination (canals and reservoirs of inter-district designation). District Irrigation Departments (DID) oversee water management facilities of district subordination and provide a direct supply of water to WCAs and other water users. BISA and DID carry out planning, distribution, accounting and control of water resources use.

The Department of water resources management and development of water saving technologies of the Ministry of Water Resources, departments of water resources, hydrometry and dispatching service of the BISA, and the main hydrotechnicians of the DID are directly involved in the planning and distribution of water resources. Also, the new structure of the Ministry of Agriculture foresees the establishment of departments in the Main Office and in the regional offices of agriculture, the tasks of which are to define and plan water consumption for agriculture, and recruiting chief specialists in the district agricultural departments, who will define and plan water consumption.

Planning and implementation of water use is carried out according to the following scheme.

Planning. In accordance with the “Regulation on the procedure for water use and water consumption in the Republic of Uzbekistan”, WCA should work out plans for water consumption for farmers and dehkans, self-governing communities of citizens and other water users before the next irrigation season (vegetation and non-vegetation) and based on their generalization, create water use plans for the association.

Planning of water use is advisable to carry out by the bottom-up approach, i.e. from the field to the head water intake. For an objective assessment of the water demand and the drawing up of a water use plan, the WCA should consider the following factors including normative-reference and operational information. Reference information includes:

- The contour (field) number, its area that is irrigated from each irrigation canal;
- Characteristics of each field - contour number, area, soil texture, number of the groundwater monitoring wells of the Hydrogeological-ameliorative Expedition within the zone of influence of the field;
- Available moisture for different soils, coefficient of soil moisture depletion by phenological phases;
- Irrigation efficiency for combination of soils with various water permeability characteristics and field slopes;
- Design, water conveyance capacity, efficiency and area of each section of the irrigation network;
- Path from district canal to main canal: district - group - farm - distribution - inter-district – main canal.

The operational information includes:

- Groundwater table;
- Date of the phenological phases of various agricultural crops;
- Thickness of the active root zone layer;
- Precipitation;
- Evapotranspiration (ET).

Figure 1.1 provides a recommended scheme for water planning and distribution.

Based on water use plans, WCAs, DIDs and BISA should work out a system water use plan. The water use plan should set the average decadal water consumption in the level of water consumers, WCAs and districts, as well as average decadal head supply rates for all water intakes into the WCA, in the farm, distribution, inter-district and main canal levels. The water use plan should also establish decadal water supply, i.e. irrigation areas under planned water discharges in the levels of water users, WCAs and districts, as well as on the areas at farm, distribution, inter-district and main canal levels. The water use and water consumption plan of the WCA and the water use plan of the entire system is a tool for managing water resources and the basis for operating irrigation systems (operation mode of the hydrotechnical structural units, pumping stations, canals, operation of the gates of canals at various levels, etc.).

In fact, at present, most WCAs do not have hydrotechnical specialists. Therefore, in practice, water use and water consumption plans for WCAs are not worked out.

Because of the lack of water use plans based on the distribution of agricultural crops, average irrigation rates and average efficiency of the on-farm irrigation system, DID determine the estimated water supply rates for WCA's outlets. At the same time, distribution of agricultural areas by hydromodule principles, cropping patterns on hydromodule zones, irrigation canal efficiency at various levels and irrigation efficiency are not taken into account for specific WCA outlets. As a result of it, unreliable (over- or underestimated) limits are set, organizational losses of irrigation water increase and the criteria for its fair and even distribution among all water consumers are violated.

The water requirements within the command zone of one branch of the irrigation canal is equalized, which is absolutely not allowed. As each water consumer has his own contractual obligations to deliver a certain amount of cotton and wheat to the state, each consumer should receive water amounts according to his needs.

Water use plans of WCAs as well as other water users are then generalized by DID. The system plans of the districts are summarized by the BISA.

Compiled and summarized plans for water use and water consumption are approved by:

- DID – for WCAs;
- by BISA in concordance with the relevant territorial bodies of the Ministry of Agriculture of the Republic of Uzbekistan – for districts;
- by the Ministry of Water Resources of the Republic of Uzbekistan – for the basin irrigation system, for large and especially important water management facilities.

Figure 1.1. Recommended scheme of water planning and distribution.

Limits of water intake. In accordance with Article 30 of the Law "On Water and Water Use", all water users and water consumers are subject to water withdrawal limits. The limits of water intake are established in the following order of priority:

1. Drinking, medical and municipal household uses;
2. Industry;
3. Agriculture;
4. Sanitary and environmental releases.

Water withdrawal limits are established by water sources (rivers, collector-drainage discharge, other surface waters), basin irrigation systems, main canals (systems), districts, sectors of industry, territories, water users and water consumers. Water withdrawal limits are set by:

The Ministry of Water Resources of the Republic of Uzbekistan - basin irrigation system authorities, administrations of channels (systems) of inter-regional and transboundary significance, individual enterprises and organizations that operate large and especially important water, energy and municipal facilities, by water sources, territories and sectors of economy;

Basin irrigation system authorities – districts, other water users and water consumers - from water objects of the regional (Republic of Karakalpakstan) or inter-regional significance by sources, territories and sectors of the economy;

District irrigation departments - WCAs, other water users and water consumers - from water objects of regional importance by sources, territories and sectors of the economy;

WCAs - farmer and dekhkan farms, citizens' self-government bodies and other water users located in their service area.

Water distribution. WCA releases water on the basis of farmers' requests. Not all WCAs receive written application requests from water users for water withdrawal. Basically, such application request is usually received by phone. WCAs do not register application requests. It is strongly recommended to keep a special register of water application requests. In the registration log, it is necessary to mark the date of the application receipt, date when the water user asks for water and the actual date of water supply. Registration of applications is necessary primarily to assess the WCA's activities in water resources management. According to the register of applications, the timeliness of the water supply can be estimated. The register of applications is also needed in case of litigation with water users, in order to prove the fact of timely delivery of water.

DID receive applications for water withdrawal from WCAs mostly in written form. But in some districts such applications are received by phone. Except for certain areas, the registration of applications is not conducted. After receiving of applications from WCAs, the heads of DID order the heads of the hydraulic sections via the dispatcher service to release water indicating the WCA's name, branches (canals) and the required water rate (in m3/sec). The water into the WCA inlets is provided only upon the order of the DID head, while individual WCA inlets operate in an alternating regime. Distribution channels (passing through territories of WCAs) operate in a constant mode, according to the system water use plan. In cases where more water is required into separate channels than at the limits established at the beginning of the season, the DID heads provide written requests to the head of the BISA for the allocation of additional water. Pumping stations operated by PSA operate in the same way in accordance with the system plan for water use agreed at the beginning of the season. If necessary, at the request of the DID, the BISA gives an order to PSA heads the dispatching service to change the operating mode of specific pumping stations.

The main channels of the Fergana Valley (SFC, BFK, BAK) also operate in a constant mode, in accordance

with the system plan for water use agreed at the beginning of the season. In cases where an operational correction of the water supply is required for individual branches of the main canal, the BISA head submits a written application request to the main canal authorities of the Fergana Valley (ODMC). The ODMC through the dispatching service instruct the heads of the ODMC on correcting water supply. Releases of water from the reservoirs of the republican subordination (Andjan and Khisarak dams) are also carried out in accordance with the system water use plan. Deviation is allowed only after permission of the Ministry of Water Resources. If necessary, the BISA head shall submit a written application request for the additional water to the MWR, the MWR shall, through the dispatching service, instruct the reservoir operation department heads to release additional water.

Prior to the transformation of the Ministry of Water Resources, the irrigation systems from the inter-district and inter-farm (inter-WCA) canals between the administrative districts and the WCA were operated by ISA. Now the operation of inter-farm (inter-WCA) canals and water distribution between WCAs will be carried out by the DID. It remains unclear who will operate the inter-district canals and distribute water between the administrative districts. At this time, the regulations on operational organizations (BISA, MCA, PSA, ODMC and DID) of the MWR have not been adopted. It is assumed that the distribution of water from inter-district channels will be carried out by the BISA.

Accounting and reporting for water use and water consumption. In the contracts for water use it is stipulated that the equipment of water intake points by regulation and water accounting means shall be realized by water users and water consumers by their ownership, i.e. water intake points for water users must be equipped by WCAs, for WCAs – by DID, and water intake points of the DID should be equipped by the ODMC. Unfortunately, there is no position of hydrometer in the “Classifier of the basic positions of employees and occupations of workers”. Hence, there is no hydrometer in the water management organization staff, and very often these functions are performed by people without special education.

In conditions of free water use, water users do not have an interest in measuring and recording water usage. There are practically no daily water reception / transfer logs between WCAs and water users, except for individual pilot WCAs. Another reason for this situation first of all is the lack of gauging stations at the water intake points to farmers. The second reason is insufficiency of specialists in WCA staff. Neither operative nor seasonal reports on the water use are compiled and the water use efficiency is not analyzed.

The gauge readings on all the canal branches of the water management organizations (ODMC, DID) are taken three times a day between 7-8, 12-13 and 18-19 hours. A log of water reception and transfer between ODMC and DID and between DID and WCA is filled out on a daily basis. The log indicates the water level at 7-8, 12-13 and 18-19 hours, and the water supply rate is calculated at this time by the flow characteristic curve Q = f (h). Based on these data, the average daily water supply rate and the volume per 24-hours are calculated. The transfer-receipt journal is signed by the representatives of the DID and WCA. At the end of each month, an act of water transfer-receipt is drawn up, indicating the amount of water supply and reception that is signed by the representative of the DID and the director of the WCA. Hydraulic station authorities pass on information on water supply by all irrigation branches daily by telephone to the control services of the DID.

The dispatching service maintains a journal (log) on water supply by irrigation branches from distribution channels. District dispatching services transmit information about water intake and supply to the dispatching services of BISA on a daily basis. At the end of the season, water balances are compiled for all channels, which indicate the water intake at the head, the amount of water supply to the inlets and water losses in the system. In addition to the daily water accounting in the head and branches of the channels, DID staff compiles a daily operational report on the water use. The report shows the water intakes at the head of the main, distribution and farm-level channels. This report is compiled for the level of WCAs and districts. In the report, the actual water discharge (in m^3/s), the possible area for

irrigation (ha), the actual irrigation area per day (ha) and the cumulative total area (ha) are provided in the report in the context of WCAs and districts. Daytime irrigation areas and cumulative irrigations are shown by grown crops. The number of irrigators and the water use coefficients (WUC) are also shown. The operational report is transmitted by telephone to the BISA and district authorities (khokimiyats). To assess the WUC, it is required to initially assessed the possibility of irrigation.

As stated above, at present water use plans are not compiled, and therefore it is not possible to objectively estimate the possible area for irrigation. In practice, the possible irrigation area is established based on the expert opinion and estimated by the WUC. At the same time, the WUC is needed to control the assessment of the irrigation water use efficiency by water users (farmers, WCAs, districts) for a day, a decade, a month, and for a crop growing season. However, as the above analysis has shown, the WUC at present is not estimated objectively.

The water supply for water users (municipal services, agriculture, industry, energy, etc.) in Uzbekistan is free of charge, the costs being covered by the state budget. In accordance with the "Roadmap" developed for the cardinal reform of the water management system, it is envisaged to approve the procedure for reimbursing the costs of water management organizations for the delivery of industrial water for industrial and energy organizations and their use for the development of the water sector by the end of 2018. Free delivery of water does not stimulate water users for water conservation. As a result, the specific water intake from water sources several times exceeds the biological requirement of agricultural crops in water. In conditions of free water use, the efficiency of the government's economic mechanisms aimed at rational use of water resources is minimized. Neither the encouragement of water users for the introduction of drip irrigation systems, nor the imposition of penalties on water users for violating the order of water use do not give anticipated results.

Another reason for the inefficient water use at present is the low level of the WCA's performance on water management. Even reaching the high efficiency at the upper level of the irrigation system and delivering water from the source to the WCA inlet with minimal losses would anyway not bring the desired effects due to the water mismanagement at the WCA level with large organizational and technical losses, and lack of interest in water conservation. Therefore, the effectiveness of the potential (fixed assets, personnel, finance) and ongoing reforms to improve management at the top water management hierarchy, and the rational use of the potential of natural resources (land, water) mainly depend on the sustainable functioning of the WCA.

The following are the economic mechanisms applied in Uzbekistan aiming at the rational use of water resources.

ECONOMIC MECHANISMS FOR WATER SAVING

The following operational economic mechanisms that encourage water users for rational water resources use are in force in Uzbekistan:

1. Legal entities implemented a drip irrigation system in their fields are exempted from the unified land tax for a period of five years from the beginning of the month during which a drip irrigation system has been introduced, in the part of the land where drip irrigation is installed (Article 367 of the Tax Code).

2. Agricultural producers, who implemented a drip irrigation systems and other water-saving irrigation technologies, are granted the right to use the saved water resources for cultivating crops on the areas after grain crops.

3. The tax on water resources will help prevent irrational water use by consumers and forces them to conserve water. Table 2.1 shows the tax rates for the use of water resources in the Republic of Uzbekistan.

№	Tax payers	Tax rate for 1 m^3 (UZS)	
		Surface water sources	Underground water sources
1	Enterprises of all branches of economy (except for those specified in paragraphs 2 to 4), dekhkan farms (legal entities and individuals), as well as physical persons who use water resources in the course of carrying out entrepreneurial activities	98.2	124.8
2	Power plants	28.4	42.2
3	Municipal organization	53.9	69.7
4	Manufacturers of non-alcoholic beverages:		
	- by volume of water used for the production of soft drinks	15870.0	15870.0
	- for other purposes	98.2	124.8

Table 2.1. Tax rates for the use of water resources for 2018.

It is necessary to note that farms do not pay a tax for the use of water resources since this tax is included in the land tax.

4. In case the water users and water consumers violate the order of water intake, the following penalties are applied:

- for over-limit water intake by water consumers - 10% of the established minimum wage for each thousand m3 of excessively withdrawn water;

- for withdrawing water from unauthorized water intake sites as well as unauthorized withdrawal of water by water users and water consumers - 20% of the established minimum wage for each thousand m^3 of water taken.

In case of repeated violation of the water use and water consumption order within one year, the penalties specified in this paragraph shall be applied tenfold.

5. Violation of the water use and water consumption rules from artificial watercourses (open and subsurface canals, collector-drainage networks), water bodies (reservoirs, mudflows, ponds, etc.) and other artificial water bodies, that is unauthorized use of water, unauthorized production of hydraulic and other works affecting the condition of water and water bodies, violation of established water

withdrawal limits from water bodies, water use plans and water consumption - entails imposition of penalties on physical persons within two third to one, and on officials - within one to four minimum wages.

The repeated violation within a year after the application of the administrative penalty shall be sanctioned by a fine in the height of 2 to 6 times the minimum wage on physical persons and 6 to 14 times the minimum wage for officials (article 74 of the Administrative Liability Code).

The main principle of economic regulation of rational use, restoration and protection of water bodies is the chargeability of water use. The main principles of paid water use should be:

- establishment of such a price for water, which would stimulate the water user for the economical use of it;

- free market prices for agricultural products, allowing water users to be solvent when paying for water services;

- increasing the responsibility of water management organizations for supplying water to water users in established volumes and terms;

- provision of irrigation systems with perfect water metering facilities with measurement and control over the water supply

The policy of setting water prices is influenced by a huge number of issues in the field of irrigated agriculture, such as for example, O&M costs, restoration and modernization of irrigation systems, increased competition for available water between other sectors / water consumers, prices for inputs and agricultural products.

As indicated above, there is an order of free water use developed in Uzbekistan. Establishing the procedure for payment for the use of water resources is in the competence of the Cabinet of Ministers of the Republic of Uzbekistan (Article 6 of the Law “On Water and Water Use”).

In addition to the economic mechanisms listed above, Uzbekistan has many external factors outside the irrigation sector that have an impact on water conservation or limit the consumers’ desire for implementation of the water saving technologies that require additional costs.

An analysis of external factors outside the irrigation sector that have an impact on water conservation or limits the consumers’ desire for the implementation of the water-saving technologies is shown below.

EXTERNAL FACTORS STIMULATING / LIMITING IMPLEMENTATION OF WATER SAVINGS TECHNOLOGIES

3.1. Agricultural policy .

Important directions of state policy in agriculture are:

- Diversification of the agricultural sector, development of potato growing, viticulture, beekeeping, poultry and fish farming;
- State planning of the agricultural cropping pattern (structure) and cropped areas;
- State order for raw cotton and winter wheat at fixed purchase prices;
- State order for fruit and vegetable products at contract prices;
- Replacement of raw cotton and grain crops with other crops, primarily with forage and oilseed crops, on the agricultural areas with low soil fertility and yields of less than 1.5 tons per hectare over the last 3 years, for the implementation of fruit and vegetable and livestock projects.
- Expansion of the system of concessional lending to agricultural production;
- Establishment of a maintenance system for farmers and dehkans as well as supplies of the necessary material and technical resources (fuels and lubricants, mineral fertilizers, biological and chemical plant protection products, seeds) for their needs at government-regulated prices;

Despite the decisions not to place a government order for raw cotton and grain crops on the areas with low soil fertility, cotton growing areas and winter grains still occupy the major part of irrigated arable land - 77.74% in the Republic of Uzbekistan (Figure 3.1.1a), in the Shahrikhansay Basin - 80.3% (Figure 3.1.1b) and in the Aksu Basin - 65.38% (Figure 3.1.1c). Accordingly, the bulk of the farmers' expenses is directed for the production of raw cotton and winter wheat.

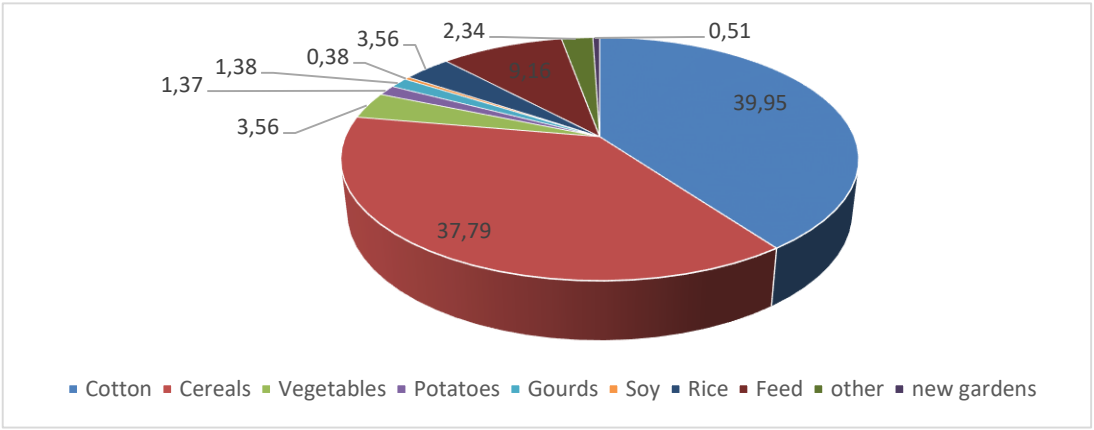


Figure 3.1.1a. Areas (in %) under agricultural crops in the country for 2018 (basis: Resolution of the President of the Republic of Uzbekistan, No. PP-3281 from September 15, 2017).

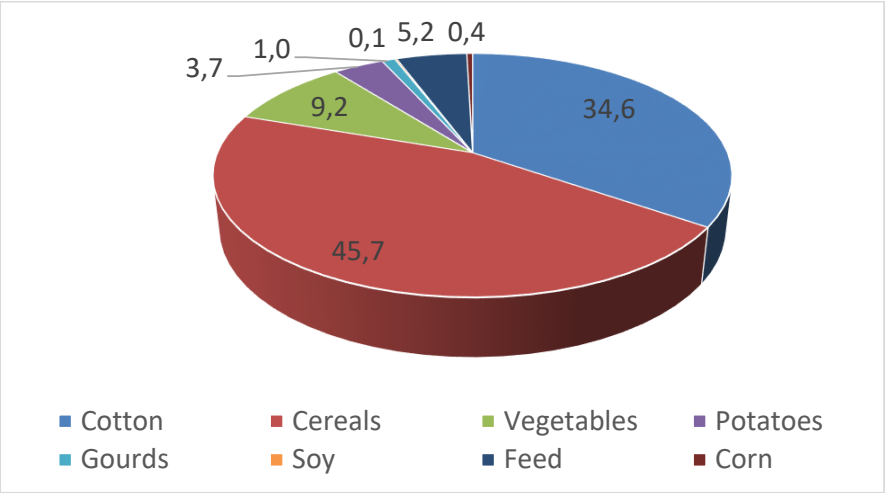


Figure 3.1.1b. Actual allocation of crops for 2017 in the Shahrihansay . asin,%.

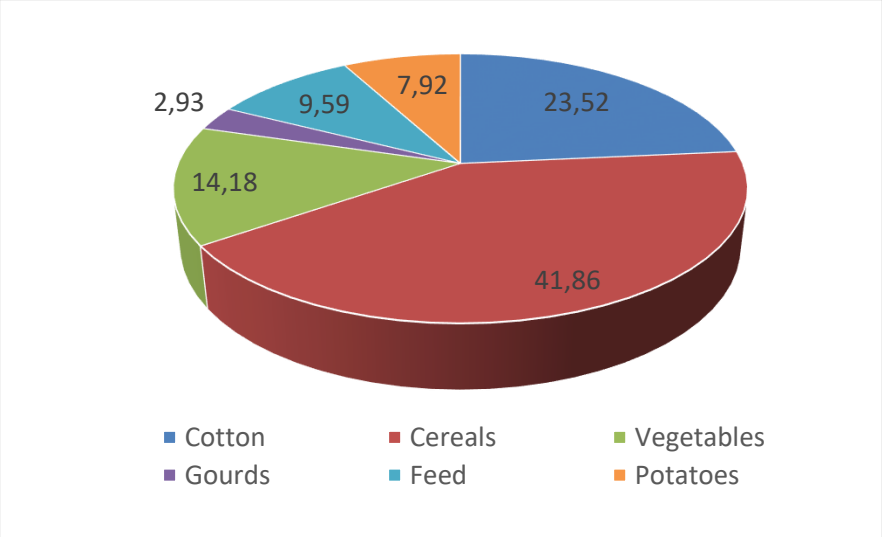


Figure 3.1.1c. Actual allocation of agricultural crops for 2017 in the Aksu . asin,%.

3.2. Legal basis for the use of water and land resources.

Land use in farms is regulated by the following Laws: “Land Code”, “Land Cadastre”, “on the Farm” and “Procedure for transferring land plots to farms for long-term lease”, approved by Resolution No. 476 of the Cabinet of Ministers of the Republic of Uzbekistan in October 30, 2003.

Farmers conclude agreements with regional hokimiyats to obtain land plots. To conduct farming, land plots are leased for a period of up to 50 years, but not less than for 30 years. In the following cases, the lease contract can be terminated:

- When a farm is liquidated, including bankruptcy case;
- When the land is used for other than its intended purpose, including growing crops, which were not under contractual agreements for state needs;
- If land is used irrationally, e.g., in cases if within three consecutive years the crop yields lower than the cadastral estimates for average yields is obtained due to the fault of the tenant

The right to lease a land plot can be given to farms as collateral for obtaining loans.

The farm, specializing in the production of livestock products, can be established under the condition that there are cattle with 30 conventional heads. The minimum size of irrigated land plot that can be provided to the farm is 0.45 ha per conventional head. The minimum size of land for farms specializing in the production of cotton and grain crops is at least 30 ha. The minimum size of farms that specialize in the production of horticultural products, viticulture and vegetable growing, is at least 5 ha.

The homestead plots for the dehkan farms are allocated for lifelong use with the right for inheritable transfer. The size of personal homestead land plots, including the area occupied by buildings and yards, is up to 0.35 ha.

The process of optimizing the size of the land plots in charge of farms is still ongoing (Figures 3.2.1 and 3.2.2). According to the State Committee of the Republic of Uzbekistan on Land Resources, Geodesy, Cartography and State Cadastre, the number of farms with different directions of agricultural production in the republic as of August 1, 2017 was as follows:

> cotton-grain farms – 50259 farms with an average size of irrigated land 49.65 ha;

> cereals growing farms – 7424 with an average size of irrigated land 6.49 ha;

> horticultural farms – 44003 with an average size of land 5.16 ha;

> horticultural-viticultural farms – 3396 with an average size of land 7.06 ha;

> viticultural farms 14101 with an average size of land 4.45 ha;

> vegetable-melon farms – 5609 with an average size of irrigated land 4.52 ha;

> vegetable-cereal farms – 9275 with an average size of irrigated land 10.81 ha;

> livestock farms – 7880 with an average size of land 19.76 ha;

> silkworm farms – 3217 with an average size of the land 4.36 ha;

> poultry farms – 863 with an average size of land 0.43 ha;

> fish-breeding farms – 2090 with an average size of land 2.80 ha;

> beekeeping farms – 189 with an average size of land 2.61 ha;

> poplar growing farms – 321 with an average size of irrigated land 0.91 ha and

> other 798 with an average size of irrigated land 15.15 ha

As a result of frequent land optimization and taking the land plots away from ill-performing farmers, farmers do not have confidence that in future they will not face the same procedure of being deprived of the land plots received for a 30-50 years lease.

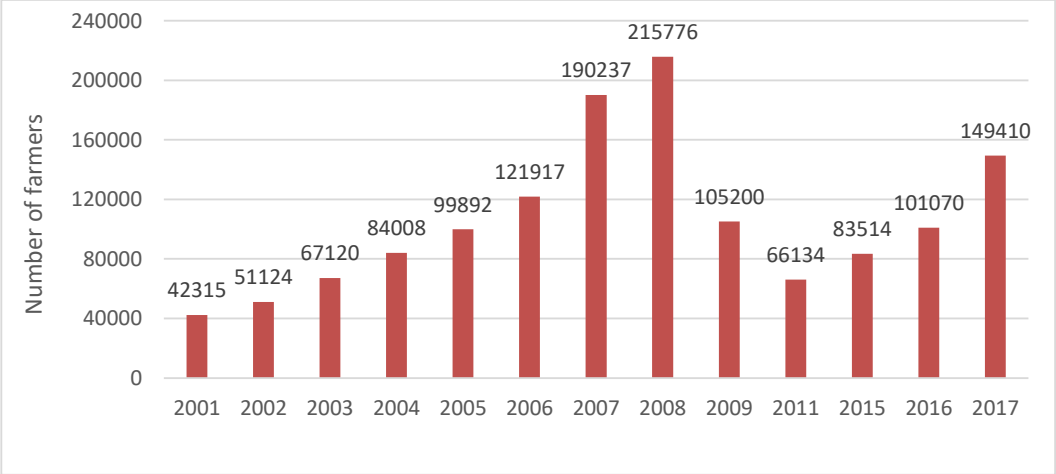


Figure 3.2.1. Dynamics of the number of farms in Uzbekistan.

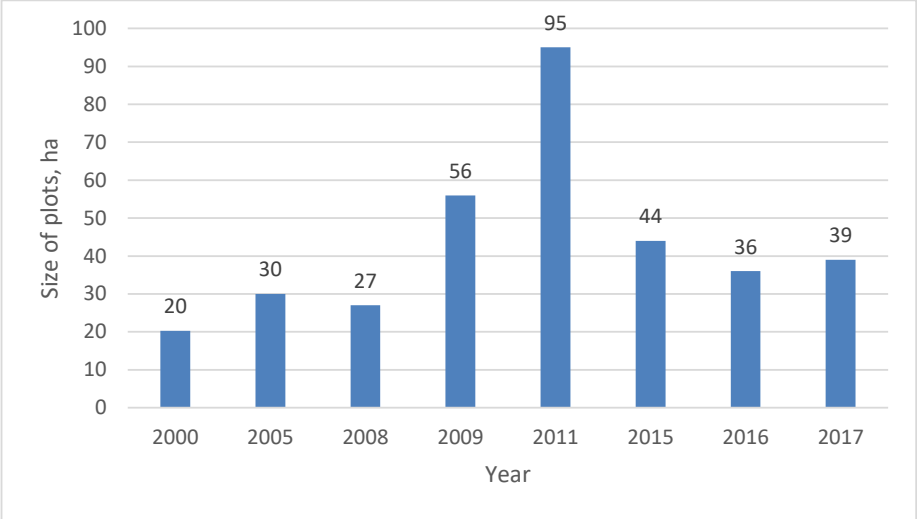


Figure 3.2.2 Dynamics of size of the land plots in Uzbekistan.

Water use is regulated by the following Laws: “On Water and Water Use”, “On Farms”, “On Dehkan Farms” and the Regulations on the Procedure for Water Use and Water Consumption in the Republic of Uzbekistan, approved by the Decree of the Cabinet of Ministers of the Republic of Uzbekistan, No. 82 from March 19, 2013.

Limits of water use for farms are set by WCAs.

In accordance with the amendment in Article 47 of the Law “On Water and Water Use”, “The limits of water consumption by farms and dehkan farms cannot be changed without their consent except for cases of low water years”.

In accordance with the Roadmap for the cardinal reform of the water management system, it is envisaged to look into the issue of creating water consumer associations according to the district zoning principle in place of the existing ones, with the subsequent strengthening of their material and technical base, staffing with skillful workers, introduction of incentive measures for workers involved in irrigation and drainage works, operation of pumps and providing water services to farmers.

Establishing one WCA per district is justified from the economic point of view. In cases when the size of a WCA is large, the specific costs of operation and maintenance of the irrigation system will be lower due to reduced administrative costs compared to small-size WCAs.

Establishing a WCA per district in the Navoi province its average size of the irrigated area will be 15.44 thousand ha, while in the Kashkadarya province the size will be 39.65 thousand ha. The number of farms on average in a WCA will range from 427 in the Republic of Karakalpakstan to 1563 in the Kashkadarya province. In addition to farms, numerous dehkan farms are also water users that own land outside of populated areas. The average number of citizens' communities is 23 in the Djizak province to 96 in the Navoi province (Table 3.2.1). Considering that there are more than 3 settlements (kishlaks) in the territory of one community of rural (makhalin) citizens (Khishlo), the number of water users in individual WCAs can reach 15,000. The share of horticultural and vegetable-growing farms in the Ferghana Valley is 51-60%. In these provinces' districts the horticultural and vegetable-growing farms are located compactly, and hence the number of water users will be even greater.

Establishing a single WCA in a district may create issues in coordinating the requirements of water users and managing water. There will be difficulties in holding general meetings. It will be difficult to observe one of the main principles of a WCA - the participation of all members in decision-making. Obviously, it is more difficult to manage large-size WCAs than small ones.

There is a world experience in functioning of large-size WCA. For example, the average size of WCAs in Italy (in Italy, Water Consumer Associations are called Consortiums, the Latin word "Consortium" means complicity, community - the organizational form of temporary association of independent enterprises and organizations with the aim of coordinating their entrepreneurial activities) is 72.57 thousand ha. The farmers who joined the Consortium entitled «Consorzio per la Bonifica della Capitanata» govern the water resources of the two rivers, Fortore and Ophont themselves, from the source head to the field boundaries. The boundaries of the Consortium cover the reclamation area of more than 441,000 ha. The total irrigated area is 147.7 thousand ha. The consortium was formed in 1933 as a result of the merger of 9 Consortiums, the discussion about which continued during 10 years. The Consortium is managed by the Board of Governors and consists of 90 farmers, selected by the owners of large and small-size fields, as well as land tenants and 18 local governmental representatives. The Consortium members are 85,000 farmers (owners of large and small fields, and land tenants). A clear and transparent system of elections to the Governing Council has been developed.

Provinces	Total area, thousand ha	Inc. irrigated areas	Number of farms	Number of dehkan farms	Number of rural districts	Number of rural communities and makhalla citizens	Average irrigated area of rural districts, th. ha	Average number of farms in the districts	Horticultural and vegetable growing farms, %	Average number of dehkan farms in the districts	Average number of rural communities and makhalla citizens in the districts	Total number of water users in the districts
Republic of Karakalpakstan	16656.1	509.5	5978	no data	14	393	36.39	427	15.5		28	455
Andijan province	430,3	273.6	14311	827	14	876	19.54	1022	54.9	59	63	1144
Bukhara province	4193,7	274.9	7589	154841	11	540	24.99	690	40.2	14076	49	14815
Jizzakh province	2117,9	300.4	12155	no data	12	272	25.03	1013	33.8		23	1036
Kashkadarya province	2856.8	515.4	20325	no data	13	729	39.65	1563	42.8		56	1620
Navoi province	10937,5	123.5	3758	10368	8	769	15.44	470	49.9	1296	96	1862
Namangan province	718,1	283.4	9369	no data	11	303	25.76	852	51.7		28	879
Samarkand province	1677,3	380.1	21816	no data	14	1089	27.15	1558	45.8		78	1636
Surkhandarya province	2009.9	325.6	9346	no data	13	717	25.05	719	48.7		55	774
Syrdarya province	427,6	287.2	6258	no data	8	220	35.90	782	19.8		28	810
Tashkent province	1525.4	399.4	15716	no data	14	1005	28.53	1123	48.5		72	1194
Fergana province	700,5	368.8	13987	no data	16	1028	23.05	874	60.9		64	938
Khorezm province	608,2	266.2	8802	no data	10	497	26.62	880	43.7		50	930

Table 3.2.1. Average number of water users in the provinces.

World experience shows that WCA is functioning and is sustainable when established by the personal initiatives of the farmers. Due to economic reforms in the agricultural sector, the establishment of the WCAs in Uzbekistan was carried out by the initiative of the state or donor projects. In these conditions, the success of the WCA functioning depends on the water users and responsible local authorities, who should correctly understand the roles and values of the WCA.

At present, not only numerous water users, but also even responsible local authorities take WCAs as divisions of state water management organizations, which results in substitution of the self-organization of water users by the administrative actions of local officials. Not all water users realized that they are the owners of irrigation and drainage infrastructure (IDS) of the former agricultural enterprises (in accordance with the Decree of the Cabinet of Ministers of the Republic of Uzbekistan No. 8 from January 5, 2002, which was issued to ensure the targeted use of the water facilities of former agricultural enterprises, which were transferred to newly organized farms). Also, not all water users have realized their responsibilities for joint management, operation and maintenance (O&M) of the IDS.

It is advisable that WCAs unilaterally unite after achieving a certain institutional development. Without such institutional development, the WCAs will find it difficult to achieve economic sustainability, even if all WCAs in the region would merge into a single WCA. In the perspective, after achieving a certain institutional development, the WCAs should unite around major channels.

3.3. System of maintenance of farms.

Provision of technical service to agricultural machinery and provision of mechanized services to the agricultural producers (such as plowing of land, sowing and harvesting of crops) is provided by the Machine and Tractor Parks (MTP) of the joint-stock company “Uzagroservice”. The fuel and lubricants (FL) are provided to the farmers by the regional Co Ltd. “Neftebaza” of the joint stock company “Uznefteprodukt” of the joint stock company “Uzbekneftegaz”. Services for chemical and biological plant protection in agriculture, prevention and control of plant diseases, agricultural pests, weeds and ensuring the supply of mineral fertilizers for agricultural activities are differentiated. These services are provided by the regional JSC “Agrokhimyokhimoya”, JSC “Uzagrokimyeohimoya” and its regional branches strictly in accordance with agrochemical soil cartograms, taking into account the availability of nutrients in the soils. The services for locust and mulberry fire (disease) control are provided by the provincial branches of the “Service for the control of locusts and mulberry fire” of JSC "Uzagrokimyokhimoya". Assessment of the sufficiency of nutrients in soils and the need for application of the mineral fertilizers is made by the regional branches of Ltd. “Agrochemical Station”. The main insurance company that provides insurance services to the agricultural enterprises, including farms in Uzbekistan, is Joint-Stock Company “Uzagrosugurta”. There are 14 branches and 189 city and district offices throughout Uzbekistan. Banking services are provided by the regional branches of the joint-stock commercial bank “Agrobank”. Services for maintaining the infrastructure of the IDS and the delivery of water are provided by WCAs.

Poor-quality services or services rendered to farms with delay by the above-mentioned organizations adversely affect the performance of agrotechnical measures at the optimal dates and in general on crop yields, and ultimately on farmers' incomes. For example, untimely provision of farms with mineral fertilizers delays dates of irrigation applications, and as a result, a slowdown of crop growth and development. If timely measures to combat pests are not taken it is possible to loose even the entire crop yield.

Provision with agricultural machinery. According to the technological map to care for the agricultural crops, developed by scientific-research institutes for market reforms and mechanization and electrification of agriculture (approved by the Decision of the Board of the Ministry of Agriculture and Water Management of the Republic of Uzbekistan No. 7/2 dated October 29, 2010), the Kurgantepa, Khuzhaobod, Bulokbashi, Marhamat and Fergana districts in the Shahrihansay river basin belong to the

cotton production Zone No1, the Asaka, Dzhallakuduk, Shahrihan, Kuvasai, Kuva, Altyarik, Kushtepa and Tashlak districts belong to the cotton production Zone No 2. All districts in the Aksu Basin belong to the cotton production zone № 1.

The actual availability of tractors for soil processing in the districts of the Shahrikhansay Basin is 23%, tractor-cultivators 41%, transport tractor vehicles 61%, trailers 21%, plows 63%, seeders 26%, cultivators 46%, combine harvesters 25% and cotton harvesters 0%.

The actual availability of tractors for soil processing in the districts of the Aksu Basin is 23.6%, tractor-cultivators 39.8%, transport tractor vehicles 51.2%, trailers 27.7%, plows 39.9%, seeders 29.5%, cultivators 50.5%, cotton harvesters 14.5%.

Availability of mineral fertilizers. The results of scientific research in Uzbekistan show that application of 0.1 ton of mineral fertilizer results in increase of a grain yield of up to 1.3 t ha-1, cotton 0.6-0.8 t ha^{-1}, potatoes 5-7.5 t ha^{-1}, vegetables 10 -12 t ha^{-1} and fruits 1.7-2 t ha^{-1}.

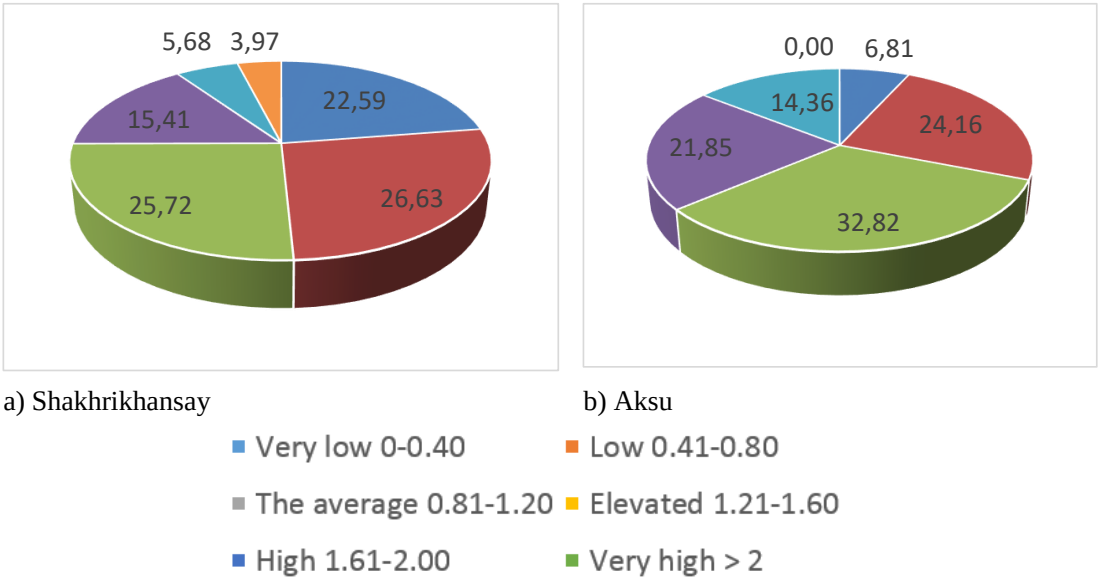
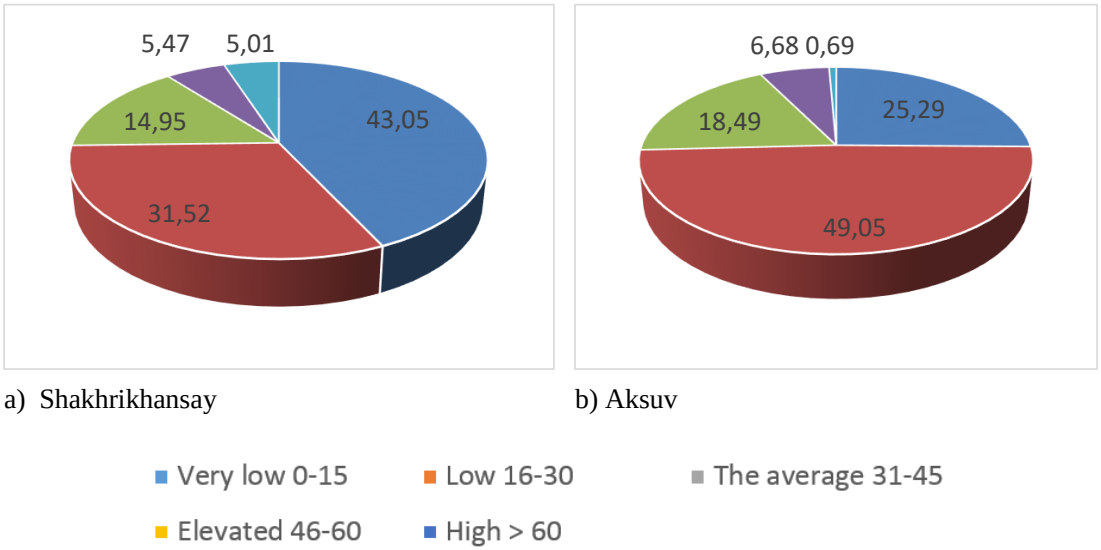


Figure 3.3.1. Distribution of land in the Shakhrikhansay (a) and Aksu (b) Basins by the degree of availability of soil humus, %.

In order to plan the application of mineral fertilizers, it is necessary to account for the availability of nutrients to the soil and the planned crop yields. Analyses of the data of Co Ltd “Agrochemical Station” of the Andijan and Fergana provinces show that in the Shakhrikhansay river basin some 22.59% of the arable land belongs to the category of very poor availability of soil humus and 26.63% to the category of poor availability (Figure 3.3.1a). According to the “Agrochemical Station” of the Kashkadarya province, 6.81% of the arable land in the Aksu Basin belongs to the category of very poor availability with soil humus and 24.16% to the category of poor availability (Figure 3.3.1b).

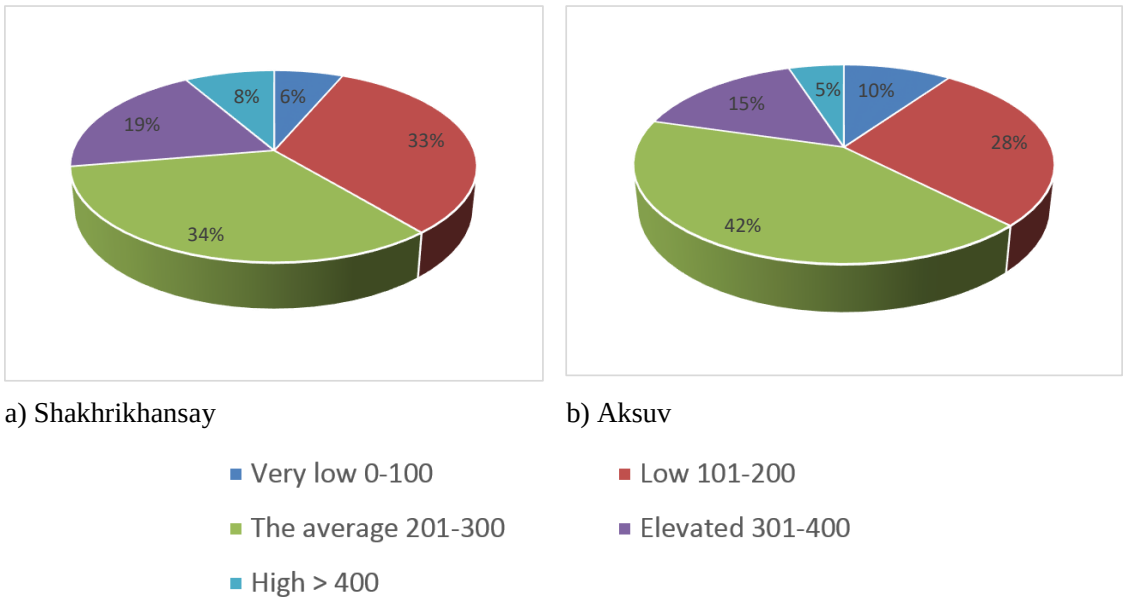
In the Shakhrikhansay river basin, some 43.05% of the arable land belongs to the category of very poor availability of soil phosphorus (0-15 mg kg^{-1}) and 31.52% to the category of poor availability (Figure 3.3.2a). In the Aksu Basin, 25.29% of the arable land belongs to the category of very poor availability of soil phosphorus and 49.05% to the category of poor availability (Figure 3.3.2b)



a) Shakhrikhansay b) Aksuv

Figure 3.3.2. Distribution of land in the Shahrikhansay (a) and Aksu (b) Basins by degree of availability of mobile phosphorus in soils, %.

In the Shakhrikhansay river basin, some 6,38 % of the arable land belongs to the category of very poor availability of soil potassium (0-100 mg kg^{-1}) and 32.54 % to the category of poor availability (101-200 mg kg^{-1}) (Figure 3.3.3a). In the Aksu Basin, 6.95% of the arable land belongs to the category of very poor availability of soil potassium and 19.74% to the category of poor availability (Figure 3.3.3b)



a) Shakhrikhansay b) Aksuv

Figure 3.3.3 Distribution of land in the Shahrikhansay (a) and Aksu (b) Basins by degree of availability of exchangeable potassium in soils, %.

An assessment of provision of the main crops cotton and winter wheat with mineral fertilizers while accounting for the present availability of soils with nutrients and planned yield, was carried out. In the Shahrihansay Basin, cotton is provided with nitrogen fertilizers in excess of norms, but application of phosphorus and potassium fertilizers is much less than required (Figure 3.3.4).

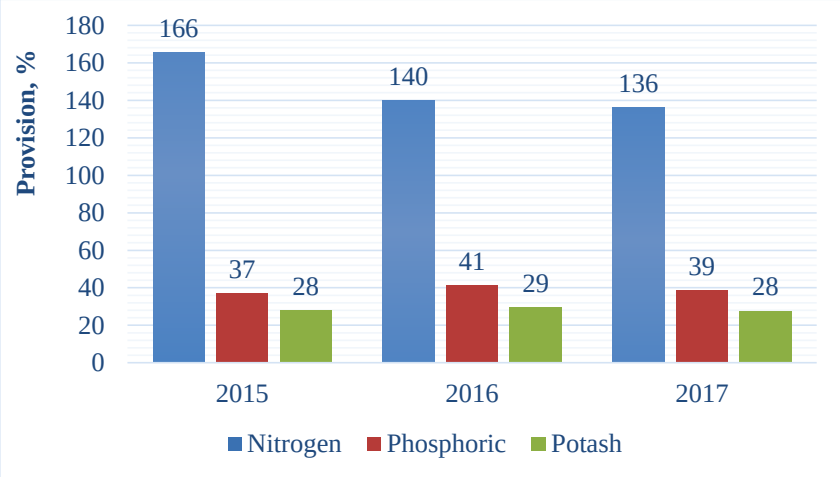


Figure 3.3.4. Provision of cotton with mineral fertilizers (in %) in the Shahrikhansay . asin.

Winter wheat is provided with nitrogen fertilizers in accordance with the norm, but the application of phosphorus and potassium fertilizers are also much less than required (Figure 3.3.5).

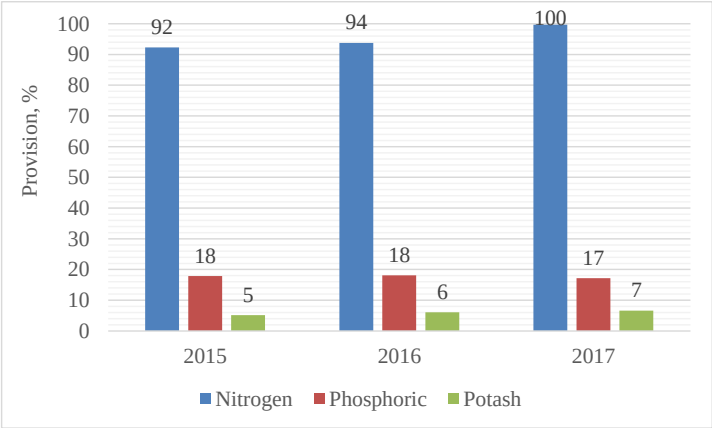


Figure 3.3.5 Provision of grain crops with mineral fertilizers (in %) in the Shahrikhansay . asin.

In the Aksu Basin, cotton is provided with nitrogen fertilizers in excess of norms, but application of phosphorus and potassium fertilizers is much less than required (Figure 3.3.6). Winter wheat is provided with nitrogen fertilizers in accordance with the norm, but the application of phosphorus and potassium fertilizers are also much less than required (Figure 3.3.7).

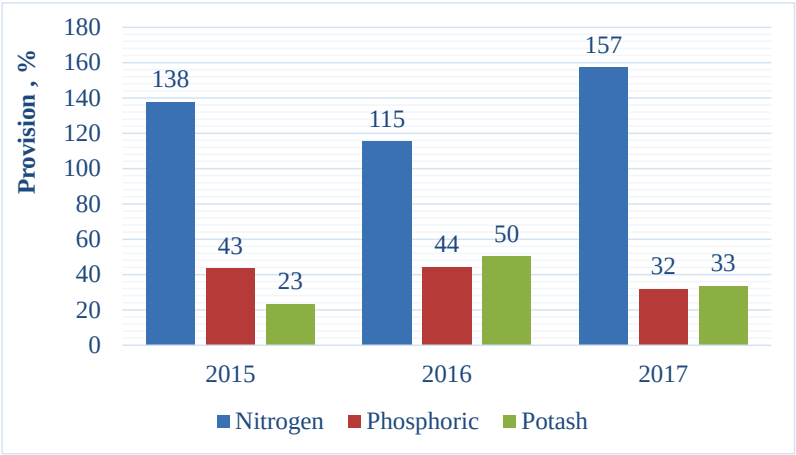


Figure 3.3.6 Provision of cotton with mineral fertilizers (in %) in the Aksuv . asin.

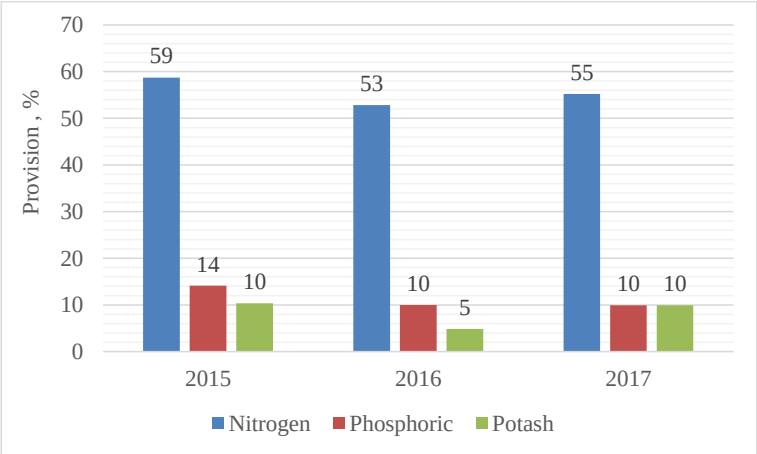


Figure 3.3.7 Provision of grain crops with mineral fertilizers (in %) in the Aksu . asin.

Protection of plants against pests and weeds. Protection of plants from harmful organisms plays an important role in increasing production and improving the quality of agricultural products. The development of biological methods of plant protection in our country is given great attention in connection with the consistent policy of protecting the environment and human health, caring for the protection, scientifically sound and rational use of land, water resources, flora and fauna. In the Shakhrikhansay and Aksu basins, the areas under biological treatment of crops several times exceeds the areas for chemical treatment. Biological methods of plant protection on the one hand do not adversely affect the environment and human health, and on the other hand they are much cheaper than chemical methods (Table 3.3.1 and 3.3.2).

	2015		2016		2017	
	Processed areas, ha	Costs, soum ha^{-1}	Processed areas, ha	Costs, soum ha^{-1}	Processed areas, ha	Costs, soum ha^{-1}
Bio-protection	1505700	2618	1407900	3029	1522400	3601
Fungicides	6383	40780	55282	25631	116373	42465
Insectoacaricide	57012	24840	83366	53313	121947	79044
Herbicides	45449	7378	55190	26931	66834	16744

Table 3.3.1 Areas for crop processing against pests and diseases in the Shahrihansay Basin.

	2015		2016		2017	
	Processed areas, ha	Costs, soum ha^{-1}	Processed areas, ha	Costs, soum ha^{-1}	Processed areas, ha	Costs, soum ha^{-1}
Bio-protection	181600	4000	149427	5000	158401	5000
Fungicides	6461	40000	17913	36800	12957	53200
Insectoacaricide	3996	14000	16458	12500	13200	16500
Herbicides	37928	24200	36977	28000	34624	35000

Table 3.3.2 Areas for crop processing against pests and diseases in the Aksu Basin.

3.4. Prices for agricultural products, material and technical resources and services.

Procurement prices for raw cotton and wheat. The annual dynamics of the purchasing prices of raw cotton declined from 19 to 8% in 2010 to 2016. Purchasing prices of raw cotton in 2017 rose sharply, the prices increased by 56% compared to those in 2016 (Figure 3.4.1).

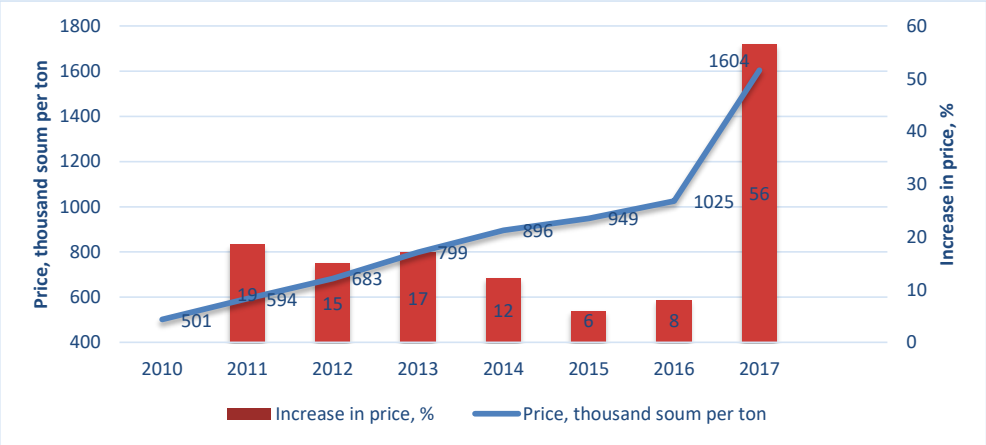


Figure 3.4.1. Dynamics of purchase prices of raw cotton (1-grade, class-3).

The annual dynamics of the purchasing prices of winter wheat declined from 18 to 9% in 2010 to 2017 (Figure 3.4.2).

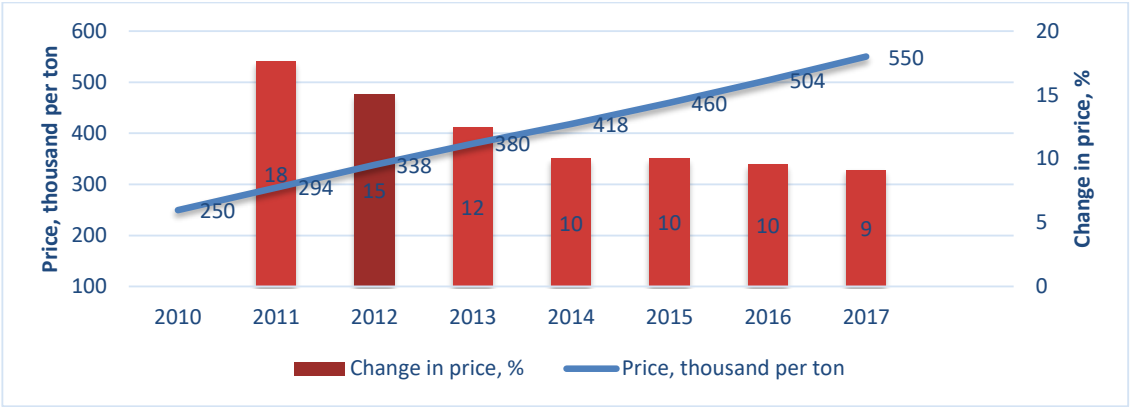


Figure 3.4.2. Dynamics of purchase prices of winter wheat (soft varieties, class-3).

Prices for MTP and services.

The increase in prices for material and technical resources and services outstrips the increase in purchasing prices for cotton and grain purchased for state needs. The analysis shows that during the period from 2012 to 2017, the electricity prices increase by 202%, diesel fuel by 193%, MTP services by 287%, nitrogen fertilizers by 187%, phosphate fertilizers by 235%, insecto-acarides by 651%, fungicides by 244%, herbicides by 304%, biological plant protection products by 363%, while purchase prices of raw cotton only by 235%, and cereals by163% (Figure 3.4.3).

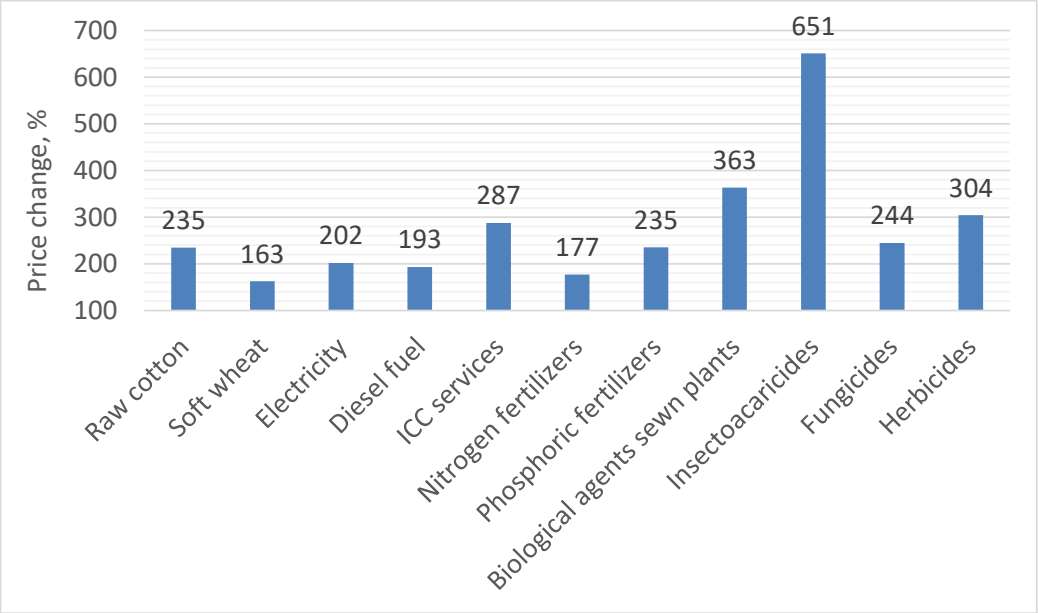


Figure 3.4.3. Dynamics of purchase prices of raw cotton, grain crops and factors of production for the period of 2012-2017.

The supply of MTR to farmers is carried out at declared prices. Comparison of exchange prices and declared prices shows that diesel fuel is supplied to farmers up to 48% cheaper (Table 3.4.1). However, the declared prices for mineral fertilizers are much higher than the exchange prices. For example, carbamide at Russiam Commodity-Resource Stock Exchange is 25% cheaper, superphosphate 164%, potassium chloride 45%, ammonium sulfate 58%, nitrogen-phosphorus fertilizers 61%, ammophos 41% (Table 3.4.1).

Because of the lack of available funds, farmers do not have the opportunity to purchase mineral fertilizers at lower prices on the stock exchange. Financing of farmers' expenses is mainly carried out through preferential crediting of costs for the production of cotton and grain crops, which are purchased through tranches for the needs of the state.

	2014			2015			2016			2017		
	Prices on the stock exchange	Declared prices	Difference, %	Prices on the stock exchange	Declared prices	Difference, %	Prices on the stock exchange	Declared prices	Difference, %	Prices on the stock exchange	Declared prices	Difference, %
Urea	493912	562165	13.8	530679	665685	25.4	574900	686000	19.3	664924	765000	15.1
Ammonium sulfate	295216	420000	42.3	333266	470000	41.0	371062	587927	58.4	386445	594368	53.8
Nitrogen - phosphoric fertilizer	687808	808000	17.5	716344	859780	20.0	703299	960000	36.5	674407	1090000	61.6
Potassium chloride	757308	901000	19.0	658993	957697	45.3	583919	806000	38.0	686054	988000	44.0
Superphosphate	356997	925000	159.1	479867	1267303	164.1	480966	829000	72.4	468378	1061000	126.5
Ammophos				1247723	1407427	12.8	1396508	1582000	13.3	1586094	2251000	41.9
PS- agro					1789289		1241808	1507000	21.4	1587711	2048000	29.0
Diesel fuel	4617985	2399650	-48.0	4123340	2673050	-35.2	4030306	2728675	-32.3	5239580	2885650	-44.9
ECO Diesel fuel	5600746	2478280	-55.8	5287209	2756320	-47.9	4175806	2813678	-32.6	5553705	2968920	-46.5

Table 3.4.1. Comparison of the declared and exchange prices of mineral fertilizers and diesel fuel.

3.5. Lending to farms.

Farms mainly enjoy preferential loans to agricultural enterprises for the production of cotton and grain crops, purchased for state needs.

Up to 2018, preferential lending to farms was carried out in accordance with the approved Decrees of the Ministry of Finance (No. 30 dated March 13, 2007) and "Regulations on the procedure of lending costs of agricultural enterprises for the production of raw cotton and grain crops purchased for state needs, by commercial banks" of the Central Bank of the Republic of Uzbekistan (No. 288 dated March 13, 2007).

Although the Regulations on the lending procedure provided for the allocation of a loan in the amount of 60% of the production cost of raw cotton and grain crops purchased for government needs, in fact, the funds for payments for agricultural products purchased for government needs were allocated by the Ministry of Finance in the total amount of 60% from the estimated costs for the production of raw cotton and grains.

The amount of loan was given in tranches for wheat for the period of 9 months from September to May, and for raw cotton for 8 months, from January to August. Such a financing mechanism required much time for WCA accountants to prepare necessary documents, time for transport, and hence led to unnecessary costs for paper works and transportation. As a result of untimely and incomplete payments for services, the WCA get into debts on taxes, on united social payments, which, with time, even increased due to the accrual of penalties.

In addition, the financial resources were used primarily for payments for labor and corresponding tax allocations, for seeds, taxes and services of the MTP Uzagromashservis" of the "Uzneftmachsulot" company, JSC "Qishloqhudjalokkimio", and the banks primarily paid for these services. The payment for services of these organizations was made by transferring funds to special accounts No 23210 (23220). In fact, the farmers were not able to dispose of their own means. Even if the farmer wanted to pay the WCA, he should have paid out of the available funds. Unfortunately, only a small number of farmers have available funds on their accounts.

Centralized credit schemes insufficiently account for the specifics of each farm, and households were not given the opportunity to independently channel incoming funds (in an advance form), based on priority and efficiency of their use. In such cases, the farmer is forced to direct the incoming funds for the "intended" purpose, even when there was no need for these types of services or logistical resources, since otherwise the funds could be returned back to the Fund.

The existing mechanism of payments does not allow farmers to make timely payments with suppliers of goods and services and receive the owing profits in due time. The payments mechanism for agricultural products purchased for state needs provides for artificial financial schemes with suppliers not for actually purchased and delivered products, but for their supplies within the limits stipulated in the averaged technological maps. Therefore, it often happens that the actual deliveries by terms and volumes do not coincide with those stipulated in the agreements. As a result, overdue debts of farmers to the servicing branches are formed in the end of each year, a significant part of which does not have sources for covering their unprofitable activities.

The "Uzdonmahsulot" enterprises make final payments with farmers for the produced grain within 60 days, while the cotton plants make their final payments with farmers for the 90% of the raw cotton by December, 31 of the current year and the last 10% of the raw cotton by August, 1 of the following year. This practice does not create an opportunity for the farmers to receive earnings in due time, and subsequently use these finances to cover expenses and for the development of production. At the same time, the received 10% of funds as payments for the previous year become substantially

depreciated as a result of inflation, as well as the growth of wholesale prices for material resources and services received by the farm.

Under the current economic conditions such as planning of cropping pattern by the state, fixed purchase prices for raw cotton and grain and state-regulated prices for production factors, the farmers are not interested in increasing labor productivity, improving soil fertility and conserve water. Absence of independence and financial conditions limit the ability of farmers to pay for WCA services in a timely and full amount.

For example, dehkan farms are provided with a land plot for a life-inherited possession. Owning 10% of irrigated land, the dehkan farms produce 63.6% of gross agricultural production, including 50.8% of plant production and 92.1% of livestock.

Finally, a number of documents have been adopted this year that improve the financial and economic situation of the farmers, increase profitability and stimulate farmers to increase labor productivity. In accordance with the Decree of the President of the Republic of Uzbekistan No. PP-3574 "On measures for the substantial improvement of the financing system for the production of raw cotton and grains" dated February 28, 2018, the final calculations for raw cotton and grains will fully be carried out until the end of the harvest year. It is also established that the cost of electricity consumed by pumping units of farms and WCAs will be covered by subsidies from the State budget.

Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 149 of 28 February 2018 "On Measures for the Broad Implementation of Market Mechanisms in Agriculture":

- guarantees the state prices for purchase of raw cotton and grain-spike crops by crop varieties and classes;

- guarantees fixed distribution of credit resources by regions, months and types of costs allocated to finance the costs of producing raw cotton and grain crops in 2018 for public procurement;

- since March 1, 2018, establishes unified retail prices for direct contracts, including agricultural producers and petrol stations, including consumption tax for diesel fuel in the height of 4,600 soums per liter; diesel fuel ECO - 4 700 soums per liter.

- establishes that for the period from March 1 to August 1, 2018, the cost of nitrogen and phosphate fertilizers sold to end users - the producers of agricultural products, should not exceed 1,1 thousand UZS per ton of ammonium nitrate; 1,13 thousand UZS per ton of carbamide; 2,8 thousand UZS per ton of ammophos; 1,95 thousand UZS per ton of superphosphate and 1,95 thousand UZS per ton of PS-agro;

- approved a new "Regulation on the procedure for lending costs for the cultivation and implementation of final mutual payments for the submitted raw cotton and grain-spike crops".

In accordance with the new "Regulations", the contracts for credit lines are operated by regional branches of commercial banks on the basis of applications of loan recipients, contracts and guaranteed volume of credit resources approved by a hokim of the respective district together with the heads of agricultural producing companies and the district council of farmers, dekhkan farms and landowners of Uzbekistan in the context of raw cotton and grain producers based on agrotechnical measures (maps), while taking into account the cost of seeds provided by a procurement organization by advancing up to 60% (forecast) value of the future yield.

Loans are provided for the payment of the following:

– wages, taxes and other obligatory payments;

– mineral fertilizers and chemical protection means;

– fuels and lubricants;

– seeds;

– mechanized services provided by business entities for agricultural machinery services, regardless of ownership;

– leasing payments for agricultural equipment supplied under leasing terms (financial leasing);

– services of Water Consumer Associations;

– supplied electricity;

– other costs and requirements related to the cultivation of raw cotton and grain spike crops.

Payments from loan accounts for the purposes indicated above are effected in a non-cash form (with the exception of wages) on the basis of payment orders of the borrowers.

At the same time, payments are made:

a) for monthly wages through bank cash desks or credited to plastic cards;

b) for special personal accounts No 23210 of the servicing and procurement organizations, and of the agricultural enterprises that supply raw cotton to cotton-textile organizations for the purposes indicated above;

c) for payment of taxes and other obligatory payments of the borrower.

In previous years, the accounts payable of farms constantly increased due to insufficient funds. On the contrary, currently the introduction of a new financing mechanism and payment for services on the basis of payment orders of farmers, there is an increase in the debts of suppliers' enterprises to farmers. Thus, according to the information of the Main Department of the State Financial Control of the Ministry of Finance (https://www.mf.uz/ of June 18, 2018), the debts of the territorial units of the JSC “Uzagrokimyeohimoya” to farmers increased from 336 billion soums as of March, 1 2018 to 587 billion soums as of May, 1. Over the same period, the debts of branches of JSC “Uzneftmahsulot” to farmers increased by 190 billion soums and amounted to 337 billion soums.

3.6. Taxation of farms.

With a view to simplifying taxation and the mechanism of paying taxes, the President of the Republic of Uzbekistan adopted the Decree “On introduction of a unified land tax for agricultural producers” dated October 10, 1998 and the Decree of the Cabinet of Ministers of the Republic of Uzbekistan No. 539”On the Procedure for Collecting a Single Land Tax from Agricultural Producers” dated December 26, 1998.

In accordance with this Decree and the Resolution, a single land tax was introduced for agricultural enterprises, including for farms starting from January 1, 1999.

The unified land tax replaced the following 9 previously applied taxes:

• profit tax;
• value-added tax;

• environmental tax;
• tax for the use of water resources;
• tax for the use of Earth interior;
• property tax;
• land tax;
• tax on the development of social infrastructure and in place of other local taxes and fees.

To encourage farmers to conserve water resources, it is advisable to collect a separate tax for the use of water.

The rates of the unified land tax are annually established by the Cabinet of Ministers of the Republic of Uzbekistan. Since 2006, the rates of a single land tax are calculated as a percentage of the normative value of agricultural land.

The resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 235 “On improving the system for determining the normative value of agricultural land” dated August 18, 2014, approved “Regulations on the procedure for determining the normative value of agricultural land”. The normative value of agricultural land of each agricultural commodity producer is determined for the purpose of calculating a single land tax and for other purposes stipulated by law.

In accordance with this resolution, the method of supplying irrigation water is taken into account when assessing the normative value of agricultural land. Downward coefficients are applied to the normative value for the farmers, who use pumps for irrigation of agricultural land.

In accordance with the Resolution of the President of the Republic of Uzbekistan No. PP-3454 “On a forecast of the main macroeconomic indicators and parameters of the State Budget of the Republic of Uzbekistan for 2018” dated December 29, 2017, the single land tax rate for 2018 is set at 0.95% of the normative value of agricultural land.

MECHANISM OF PAYMENT FOR IRRIGATION SERVICES

In accordance with the "Procedure for regulation of the water management relations in the territory of reorganized agricultural enterprises" approved by Resolution of the Cabinet of Ministers No. 8 "On Measures for the Reorganization of Agricultural Enterprises into Farms" dated January 5, 2002, the operation of water facilities and other assets of WCAs and the maintenance of the WCAs is carried out on the account of funds coming from farmers and dehkan farms, citizens and other members as payments for delivery of water resources, and for other water services rendered to the users in the amounts established by the general meeting of the WCA members and accounting for irrigated area, types of agricultural crops, water supply volumes, soil-climatic and other features. This means that the WCA can fulfill its mission on O&M of the IDS only after the water users payed for the services.

There are the following theoretical ways of collecting payment fees for WCA services:

1. By irrigated area

- generally fixed within the country (in cases when the specific costs for O&M are approximately equal in magnitude for different irrigation systems);

- differentiated depending on the cost of services for each irrigation system; from the cropping pattern that has different rates of water consumption; profitability from the production of specific crops.

2. By volume of water supply

- generally fixed within the country (in cases where the specific O&M costs are approximately equal in magnitude for different irrigation systems or there is no centralized tax collection and finance redistribution mechanism in the country);

- differentiated, that is, taking into account differences in the costs of O&M for each specific irrigation system; rising, i.e., depending on the volume of consumed water.

3. By the water supply timing (modification of the volume tariff)

- fixed;

- differentiated (for small, medium and deep wells, diesel or electric pumping stations, etc.).

4. Combined or two-rate tariff, for actually used irrigated area and for the volume of water consumption

The main way to collect fees for WCA services in Uzbekistan is fixed per hectare of agricultural land, i. e., collection of fees is carried out based on the irrigated area. Very rarely there is a differentiated tariff depending on the cost of services or the water supply methods. For example, a differentiated tariff is established in the "Urtabuz anori" WCA in the Fergana province depending on the specific costs of O&M. In the irrigation subsystems with concrete furrows, higher tariffs are set up compared to subsystems with an earthen irrigation network. In the "Mirsulaiman arigi" WCA of the Bukhara province, a differentiated tariff is established depending on the location of water consumers and the water supply methods. For water users located at the end of the irrigation system and those using pumps for lifting water, the tariffs are reduced. In the Fergana Valley, tariffs are set depending on the profitability from specific crops, i.e., the higher tariffs are set for gardens and vineyards.

To be fair, it should be noted that setting low tariffs for water consumers, who use pumps for water lifting is not entirely correct. As mentioned above, the decreasing coefficients are applied when determining

the normative value of the used land. Accordingly, with other conditions being equal, water users, who use pumps pay less land tax than those users with gravity irrigation.

It should also be noted that setting higher tariffs for orchards and vineyards is also not entirely correct. In the Fergana Valley, the horticulture farmers pay land tax 1.2 (the Kurgantepa district) to 4.4 (the Kushtepa district) times more compared to farmers growing row crops. Viticulture farmers pay land tax 1.1 (the Kurgantepa district) to 6 (the Marhamat district) times more compared to farmers growing row crops (Table 4.1).

Currently, water users are not interested in saving water because the WCA charges water services based on a per hectare method, i.e., this does not account for the volume of water received by a particular water user. Using a payment method per area for WCA services does not contribute to water conservation.

In conditions of free water use, the most effective method stimulating water saving and fair in terms of accounting for actual water consumption is the collection of fees per volume of water supply for WCA services. In conditions of paid water use, the fee will be paid for the amount of water received at the WCA border. This will serve as a mechanism that encourages water users to increase the efficiency of irrigation techniques, the efficiency of irrigation canals at the various levels of the system in the WCA: inter-farm canals, 2-order inter-farm canals, on-farm and in-farm canals, and also to reduce organizational losses.

In conditions of free water use, the fees will be paid for the amount of water received at the border of the farmer's fields. This will serve as a mechanism for encouraging water users to increase the efficiency of irrigation techniques and of the within-farm and inter-farm canals.

At present, the water inlets to farm borders are practically not equipped with water regulating and measuring facilities, and therefore it is not possible to organize collection of fees for WCA services based on volume of actually supplied water. In addition, during the low water years, such as those of 2000, 2001 and 2008, collection of fees for WCA services based on volumes of water supply may not work.

Since water conservation is vital, and it may not be possible to equipping water users with gauging stations, it is necessary to look for ways to estimate water supply in a volumetric way to provide reliable ways to pay for water services, even with a currently low level of water accounting. One of the ways of to do it is the application of a two-part tariff for irrigation services, both for irrigated area (per ha, constant tariff) and for the volume of water supply (per m3, variable tariff). This method can be applied through the construction of a gauging station and/or the introduction of mobile means of water accounting in a separate part of the irrigation system within WCAs. In cases of positive results from these practices, the farmers located in the neighboring irrigation subsystem will also be interested in paying for WCA services with a two-part tariff and will construct gauging stations themselves on their inlets. Thus, the entire irrigation system of the WCA will be covered by water-measuring facilities step by step

Table 4.1 The unified land tax in the Shahrikhansay Basin, thousand soum ha^{-1}.

№	Districts	Tax from 1 ha of arable land			Tax from 1 ha of garden			Tax from 1 ha of vineyard			Ratio of tax from garden with respect to arable land, times	Ratio of tax from vineyard with
		price per ha of land, thousand soum / ha	tax rate,%	tax, thousand soums / ha	price per ha of land, thousand soum / ha	tax rate,%	tax, thousand soums / ha	price per ha of land, thousand soum / ha	tax rate,%	tax, thousand soums / ha		
1	Asaka	39223.818	0.95	372.63	32692.254	0.95	310.58	28491.32	0.95	270.67	0.8	0.7
2	Buloboshi	8633.597	0.95	82.02	29504.249	0.95	280.29	42109.26	0.95	400.04	3.4	4.9
3	Jallakouduk	9404.128	0.95	89.34	19657.335	0.95	186.74	32421.99	0.95	308.01	2.1	3.4
4	Marhamat	8965.910	0.95	85.18	24198.471	0.95	229.89	54174.34	0.95	514.66	2.7	6.0
5	Huzhaobad	12051.552	0.95	114.49	18329.338	0.95	174.13	28987.17	0.95	275.38	1.5	2.4
6	Shahrihan	9247.976	0.95	87.86	30863.295	0.95	293.20	43833.90	0.95	416.42	3.3	4.7
7	Kurgantepa	13969.027	0.95	132.71	17417.916	0.95	165.47	14906.52	0.95	141.61	1.2	1.1
8	Kuvasay	9580.844	0.95	91.02	22407.405	0.95	212.87	16340.75	0.95	155.23	2.3	1.7
9	Kuva	5226.851	0.95	49.66	12535.449	0.95	119.08	20998.35	0.95	199.48	2.4	4.0
10	Oltiarik	3907.095	0.95	37.12	11812.127	0.95	112.21	15565.91	0.95	147.87	3.0	4.0
11	Kostepa	5828.370	0.95	55.37	25569.679	0.95	242.91	29373.95	0.95	279.05	4.4	5.0
12	Tashlak	5444.598	0.95	51.72	16091.078	0.95	152.86	17330.19	0.95	164.63	3.0	3.2
13	Fergana	7798.600	0.95	74.09	16213.151	0.95	154.02	16854.31	0.95	160.11	2.1	2.2
	On average			**101.78**			**202.64**			**264.09**	**2.0**	**2.6**

To analyze the efficiency of the introduction of a two-part tariff, the project provided water gauges at the inlets along the P-4-1 and P-4-1a irrigation canals of the pilot WCA named after Lutfilla Bakhromov in the Andijan province, the irrigation canal named after Nizamov of the pilot WCA “Kuva Urta Buz anori” of the Fergana province and the Navruz canal of the pilot WCA “Guldarasoy sohili” of the Kashkadarya province.

The advantage of the two-part tariff is that its part, based on volume of water used, can be based on the marginal costs and encourage to use less water, while its constant part can be used for compensation of any budget deficit and serve as a guarantee of a certain income irrespective of how much water is available and is actually supplied.

Methodology for determining the two-part tariff for WCA services.

Usually, the WCA's budget includes the following expenses: the expenses related to the payment of salaries to employees, social security contributions, to purchase materials for maintenance and operation of the IDS, equipment, interest and loan disbursements. After a complete shift to a fee-based water use system in future, the payments for the water supply will also be included in the WCA costs.

In turn, costs are divided into operating costs and maintenance costs. Operating costs include:

> Wage fund;
> Material encouragement fund;
> Deductions for social insurance;
> Office expenses;
> Costs of fuels and lubricants;
> Payment of debts for the past year

Maintenance costs include:

> Acquisition of equipment;
> Repair of vehicles and land reclamation equipment;
> Repair of hydraulic structures;
> Cleaning of canals and collector-drains;
> Construction of water-regulating and water-measuring constructions
> Depreciation charges

It is important to separate the costs attributed to a fixed and a variable tariff. Since the main task of the WCA is the maintenance and operation of the IDS infrastructure to keep it in working conditions, ideally the share of costs for maintenance of the IDS in the WCA budget should be the largest. Therefore, it is advisable to establish a fixed rate based on the maintenance costs. This serves as a guarantee of the receipt of a certain part of income regardless how much water is available and supplied. At variable rates, funds are collected for the actually delivered volume of water.

For example, the consortium «Consorzio per la Bonifica della Capitanata» in Italy has a two-part tariff, which includes a fixed contribution of € 15.50 per ha for maintenance of the Consortium's systems and variable charges for supplied water. Tariffs for water supply are differentiated as follows:

• € 0.12 for cubic meter of water consumed within the limit volume of 2050 m^3 ha^{-1};

• € 0.18 per cubic meter of water under water consumption from 2051 to 4000 m^3 ha^{-1};

• € 0.24 per cubic meter of water in case water consumption exceeds 4001 m^3 ha^{-1}

The farmers must pay a fixed contribution of € 15.50 per ha for the maintenance of the Consortium's systems even if they do not use land during the year.

However, despite the fact that the main task of the WCA is the maintenance of the IDS, reclamation equipment and other hydraulic structures in order to keep them in working conditions, at present the functioning of WCAs is limited to only the water supply. At the same time, the actual costs of maintenance of IDS by the WCAs of Uzbekistan do not exceed 15%. Therefore, to ensure at least some income inflow into the WCA's budget at present, the fixed rate will be established based on operating costs. In future, after institutional development and achievement of an economic sustainability, fixed rates will be established based on maintenance costs. Also, fixed costs will include costs for the reconstruction and modernization of the IDS.

At the beginning, the O&M plan for the forthcoming financial year will include a detailed cost estimation. The cost estimation items are grouped into operating costs and maintenance costs.

A general water consumption plan is then prepared, based on which WCAs prepare own water use plans. The water use plan is compiled on the basis of irrigation regimes of agricultural crops developed by the research institutes of cotton production in Uzbekistan. Preparing such water consumption plans should take into account the distribution of areas by hydromodule zoning and the efficiency of applied irrigation techniques depending on the soil water permeability and field slopes. When compiling the water consumption plan, the efficiency of the irrigation canals at various levels in the WCA must also be taken into account.

The fixed tariff is set by a division of operating costs by the irrigated area of the WCA. The variable tariff is set by dividing the maintenance costs by the volume of used water at the boundary of water consumers.

4.1. Implementation of a two-part tariff in the WCA named after Lutfilla Bakhromov.

General information about the WCA. The WCA named after Lutfilla Bakhromov was established in 2010 and is located in the Shahrikhansay Basin, in the Asaka district (Figure 4.1.1). The source of irrigation is the Sharikhansay river. The water from the Sharikhansay river is pumped up with the "Asaka Adir" pump station to the pressure pool. From the pressure pool, the water is distributed along the MK-1 and MK-2 irrigation canals. The water is supplied to the WCA border by the MK-1 canal. At the end part of the MK-1 canal, water is distributed along the P-4, P-4-1 and P-4-1a canals. Despite the fact that the P-4, P-4-1 and P-4-1a canals belong to the farms of the WCA, they are operated and maintained from the balance of the irrigation department of the Asaka district.

The area developed for irrigation is 581 ha. Due to the failure of the "Asaka Adir" pump station, these areas were practically not used until 2016. After the reconstruction of this pumping station in 2016, 200.2 ha were actually irrigated. The number of water users at the beginning of 2018 was 22, of which 18 farms, 2 settlements and 2 other water users.

The WCA is located on the sloppy areas (adir). The soils are automorphic with the groundwater table (GWT) deeper than 3 m, i.e., in these conditions drainage is not required.

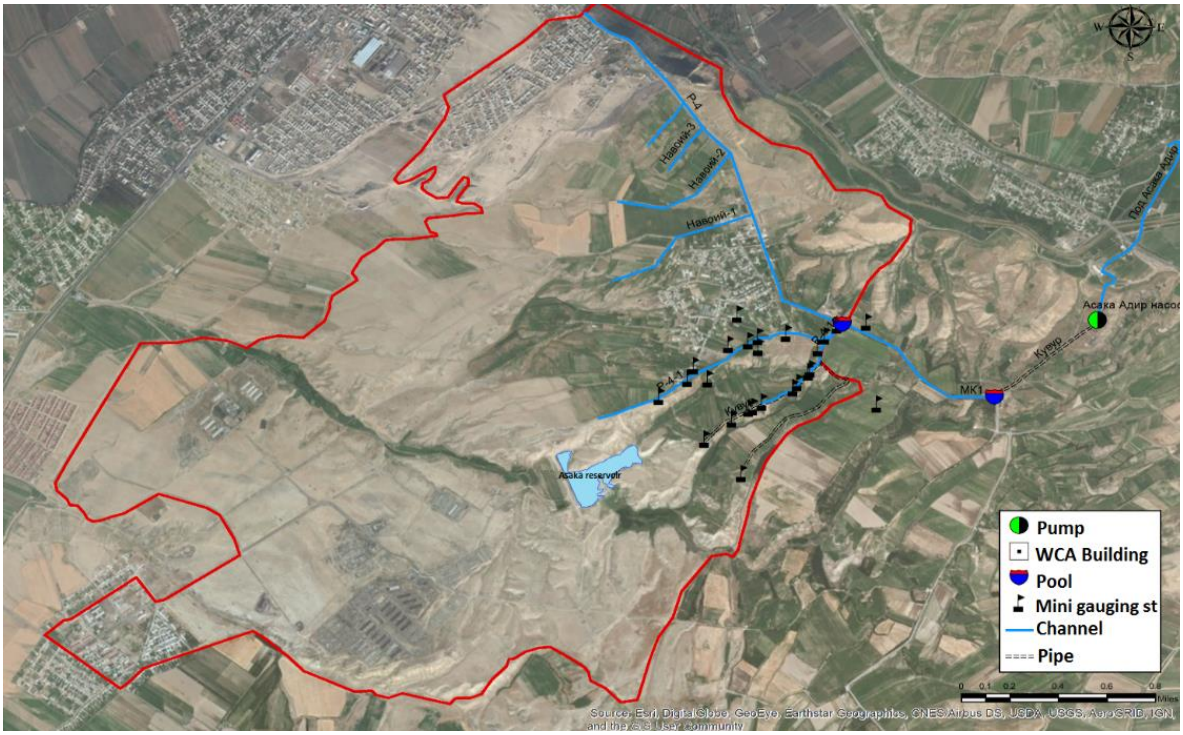


Figure 4.1.1 Location of the WCA named after Lutfilla Bakhromov.

Cost estimates for 2018. In accordance with the WCA budget approved at the general meeting, the operating costs are 31.36 thousand soums (Table 4.1.1)

Cost items	Amount, thousand soum
Wage fund	23,786
Including:	
Salary	23,786
Bonus	
Material aid	
Unified social payment (25%)	5,946
Office expenses	1,366
Including:	
Travel expenses	0
Office expenses	336
Expenses for electricity, gas, water	0
Fuel and lubricants and compensation	0
Communication service expenses	840
Other expenses	262
TOTAL:	**31,360**

Table 4.1.1 Operating costs of the Lutfilla Bakhromov WCA in 2018.

Maintenance costs amount to 5,125 thousand soums (Table 4.1.2)

Статьи затрат	Amount, thousand soum
Expenses for repair and cleaning of irrigation and drainage networks	1,660
Expenses for construction of water-regulating and water-measuring structures	0
Expenses for repair of water-regulating and water-measuring structures	1,462
Repair of land reclamation equipment	
Acquisition of fixed assets	0
Amortization charges	0
Other expenses	265
Reserve fund	1,737
TOTAL:	**5,125**

Table 4.1.2 Maintenance costs of the Lutfilla Bakhromov WCA in 2018.

Water consumption plan. The WCA is located on the alluvial cones of the Aravansay River, composed of proluvial and alluvial-proluvial deposits. The soils belong to light gray zone. These soils are newly irrigated light gray soils, medium loamy, not washed and slightly washed, the thickness of which in places are 0.5-1 m underlain by pebble. As mentioned above, the average GWT in the irrigated areas of the WCA is >3 m below ground surface. Accordingly, the irrigated areas of the WCA belong to the hydromodule zone No 1.

The water use plan for the WCA is compiled in accordance with the irrigation regime for agricultural crops of a hydromodule zone No 1 of the Andijan province (Appendix 1). Due to the lack of actual data on the efficiency of irrigation canals at various levels, the water use plan was developed with due expert consideration of the current technical condition of the irrigation network. In accordance with this plan, the water intake at the WCA inlet point is 2558.15 thousand m^3, water supply at the farmers' borders is 1779.27 thousand m3. The scheduled water abstraction from the P-4-1 canal is 220.38 thousand m^3 and from the P-4-1a canal 34.58 thousand m^3. Water use plan for the WCA is given in Appendix 1.

Calculation of tariffs for WCA services.

1. The fixed tariff for water users not included in the conducted experiment is defined as the ratio of total costs, i.e. for maintenance and operation costs per irrigated area:

36485000 soum / 200.2 ha = 182242 sum / ha

2. The fixed tariff for water users included in the experiment is defined as the ratio of operating costs per irrigated area:

31360000 sum / 200.2 = 156644 sum / ha

3. Variable tariff for water users included in the experiment is defined as the ratio of the maintenance cost to the amount of water supply at the border of farmers' fields:

5125000 soums / 1779000 m^3 = 2.88 soums / m^3

4.2. Implementation of a two-part tariff in the “Kuva Urta Buz Anori” WCA.

General information about the WCA. The “Kuva Urta Buz Anori” WCA was established in 2010 and is located in the Shahrikhansay Basin, in the Kuva district (Figure 4.2.1).

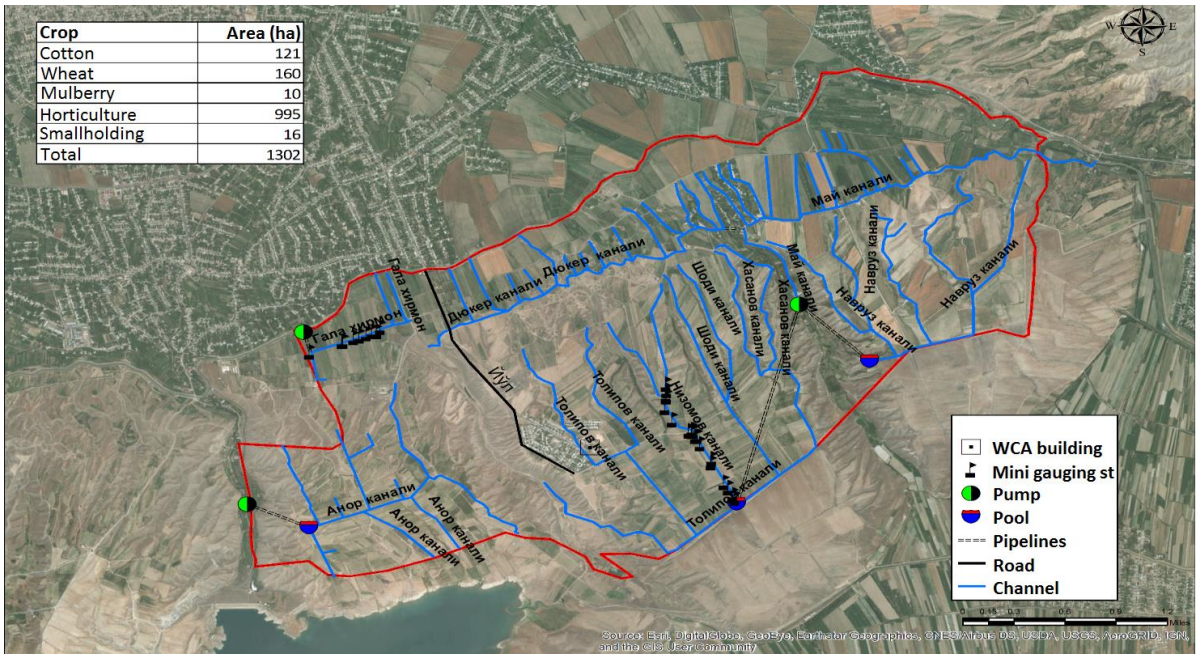


Figure 4.2.1 Location of the “Kuva Urta Buz Anori” WCA.

The source of irrigation is the South Fergana Canal and the Karkidon water reservoir. The water from the South Fergana Canal is withdrawn by the Galahirmon canal with help of pumping stations and the May channel. The water from the Karkidon reservoir is withdrawn by the Anor canal using a pumping station of PSA.

The total length of the irrigation network in the WCA is 65.9 km, of which 41.4 km are concrete flumes. Information on the WCA irrigation network is given in Table 4.2.1

Name of irrigation canals	Service area, ha	Length, m	Including flumes	Source
Galla Hirmon	95,2	3000		SFC pump station
A.Tolipov	130,3	8260	7960	May (PS Navruz)
A. Nizomov	111,2	6180	4880	Tolipov
N. Hasanov	67,8	4000	4000	Tolipov
Shodi	114,3	5300	5100	Tolipov
Anor	220,6	12060	12060	Karkidon reservoir
May	215,4	11800		SFC
Navruz	214,8	8400	7400	May
Dukur	123,6	6900		May
Total	**1328,8**	**65900**	**41400**	

Table 4.2.1 Information on the irrigation network of the “Kuva Urta Buz Anori” WCA.

The irrigated area of the WCA is 1302 ha. The number of water users at the beginning of 2018 was 313, including 311 farms, 1 settlement and 1 other water user. Farms mainly specialize in horticulture. The size of land plots of horticultural farmers ranges from 0.5 to 5 ha. The area of the gardens is 995 ha.

The WCA is located on the slopes (adir). The soils are automorphic, with the groundwater table (GWT) deeper than 3 m, i.e., the drainage is not required.

The WCA has own office maintained from own balance, a pumping station on the Gala Hirmon canal, a car "Gaz-3110", tractors T-130, MT-80 and T-28, one excavator UMZ and two trailers PTI

Cost estimates for 2018. In accordance with the WCA budget approved at the general meeting, the operating costs are 122375.0 thousand soum (Table 4.2.2)

Cost items	Amount, thousand soums
Wage fund	92620
Including:	
Salary	78664
Bonus	
Material aid	13956
Unified social payment (25%)	23155
Office expenses	4600
Including:	
Travel expenses	
Office expenses	1000
Expenses for electricity, gas, water	2600
Fuel and lubricants and compensation	
Communication service expenses	1000
Other expenses	2000
TOTAL	**122375**

Table 4.2.2. Operating costs of the "Kuva Urta Buz Anori" WCA for 2018.

The maintenance cost is 59365 thousand soum (Table 4.2.3)

Cost items	Amount, thousand soum
Expenses for repair and cleaning of irrigation and drainage networks	62167
Expenses for construction of water-regulating and water-measuring structures	0
Expenses for repair of water-regulating and water-measuring structures	
Repair of land reclamation equipment	
Acquisition of fixed assets	
Amortization charges	3222
Other expenses	
Reserve fund	
TOTAL	**65389**

Table 4.2.3. Maintenance costs of the "Kuva Urta Buz Anori" WCA for 2018.

Water consumption plan. The WCA is located on the alluvial cones of the Kuvasay River, composed of proluvial deposits. The soils belong to light gray zone, newly irrigated light gray soils, slight, sometimes medium loamy, in places slightly saline, with thickness of 0.5-1 m underlain by pebble. the average GWT in the irrigated areas of the WCA is >3 m below ground surface. Accordingly, the irrigated areas of the WCA belong to the hydromodule zone No 1.

The water use plan for the WCA is compiled in accordance with the irrigation regime for agricultural crops of a hydromodule zone No 1 of the Fergana province (Appendix 2). Due to the lack of actual data on the efficiency of irrigation canals at various levels, the water use plan was developed with due expert consideration of the current technical condition of the irrigation network. In accordance with this plan, the water intake at the WCA inlet point is 13899.79 thousand m^3, water supply at the farmers' borders is 8085.02 thousand m^3. The scheduled water abstraction from the canal n.a. Nizamov is 643.30 thousand m^3. Water use plan for the "Kuva Urta Buz Anori" WCA is given in Appendix 2.

Calculation of tariffs for WCA services. A two-part tariff is set for the experimental canal n. a. Nizamov. The fixed tariff is set at 150000 soum ha-1, variable at 8.09 soum m-3. For the rest of the WCA territory, a differentiated per-hectare tariff is established, depending on the specific maintenance costs (Table 4.2.4).

	Served area, ha	Tariff, thousand soums / ha	Amount of fee collection, thousand soums
For farmers, receiving water from a flume network	587	200	117400
For farmers, receiving water from the farm pump	94	180	16920
For farmers, receiving water from from gravity earthen canals	219	106	23214
For cotton-grain producing farmers	281	30	8430
For household plots	16	50	800
For farmers, receiving water from canal n.a. Nizomov, fixed tariff, thousand soum ha-1	105	150	15796
For farmers, receiving water from canal n.a. Nizomov, variable tariff, thousand soum ha^{-3}	643.3 thousand. m^3	8.09	5204
TOTAL			**187764**

Table 4.2.4. Tariffs for the services of the "Kuva Urta Buz Anori" WCA.

4.3. Implementation of a two-part tariff in the "Guldarasoy sokhili" WCA.

General information about the WCA. The WCA was established in 2010 and is located in the Aksu Basin, in the Yakkabog district.

The source of irrigation is the Khisor canal. The water from the Khizor canal is withdrawn into the farm-level canals Navruz, Khaqiqat, Kairagach, Qorabayir, Gishzavod, P-1 and Chubron. The total length of the irrigation network is 41.6 km. Collector-drainage discharge is diverted by the collector X-1. The Guldarasoy and Aminsoy canals receive water and transport it further. The total length of the collector-drainage network (KDS) is 28.7 km.

The territory of the WCA is 14539 ha, the irrigated area is 2908 ha. The number of water users at the beginning of 2018 was 287, including 34 grain producing farms, 53 cotton-growing farms, 17 livestock-breeding farms, 119 horticulture farms, 119 grape-growing farms, 51 viticulture farms and 4 silkworm farms. Besides, there are other water users: 6 Co Ltd and 3 populated areas.

Cost estimates for 2018. In accordance with the WCA budget approved at the general meeting, the

operating costs are 39,602 thousand soum (Table 4.3.1)

Cost items	Amount, thousand soum
Wage fund	29,982
Including:	
Salary	29,982
Bonus	
Material aid	
Unified social payment (25%)	7,496
Office expenses	336
Including:	
Travel expenses	0
Office expenses	336
Expenses for electricity, gas, water	0
Fuel and lubricants and compensation	0
Communication service expenses	0
Other expenses	1788
TOTAL	**39,602**

Table 4.3.1. Operating costs of the "Guldarasoy sokhili" WCA for 2018.

The maintenance costs are 6,633 thousand soum (Table 4.3.2).

Cost items	Amount, thousand soum
Expenses for repair and cleaning of irrigation and drainage networks	2080
Expenses for construction of water-regulating and water-measuring structures	
Expenses for repair of water-regulating and water-measuring structures	3527
Repair of land reclamation equipment	
Acquisition of fixed assets	
Amortization charges	1026
Other expenses	
Reserve fund	
TOTAL	**6633**

Table 4.3.2 Maintenance costs of the "Guldarasoy sokhili" WCA for 2018.

Water consumption plan. The WCA is located on the piedmont sloping plains, associated with alluvial cones, upper river terraces and the Kitab-Shahrisabz depression. Soils are old-irrigated and newly irrigated typical sierozems, medium- and heavy-loamy. The average GWT in the WCA is below 3 m. Accordingly, the irrigated areas of the WCA belong to the hydromodule zone No III.

The water use plan for the WCA is compiled in accordance with the irrigation regime for agricultural crops of the hydromodule zone No III of the Kashkadarya province (Appendix 3). Due to the lack of actual data on the efficiency of canals at various levels, the water use plan was developed with due expert consideration of the current technical condition of the irrigation network. In accordance with this plan,

the water intake at the WCA inlet point is 11,124.27 thousand m^3, water supply at the farmers' borders is 6827.6 thousand m^3. The scheduled water abstraction to the farms included in the experiment is 1342.1 thousand m^3. The water use plan for the "Guldarasoy sokhili" WCA is given in Appendix 3.

Calculation of tariffs for WCA services.

1. The fixed tariff for water users not included in the conducted experiment is defined as the ratio of total costs, i.e. for maintenance and operation costs per irrigated area:

46235000 sum / 1495.3 ha = 30920 sum / ha

2. The fixed tariff for water users included in the experiment is defined as the ratio of operating costs per irrigated area:

39602000 sum / 1495.3 = 26484 sum / ha

3. Variable tariff for water users included in the experiment is defined as the ratio of the maintenance cost to the amount of water supply at the border of farmers' fields:

6633000 sum / 6827600 m^3 = 0.97 soums / m^3

CONCLUSIONS

1. Taking away the agricultural land from farmers before the expiry of the lease period (30-50 years) does not stimulate them to contribute to increase in soil fertility.

2. For example, a land plot is granted to dehkan farms for a life-inherited possession. Owning 10% of the irrigated land, the dehkan farms produce 63.6% of gross agricultural production, including 50.8% of plant production and 92.1% livestock.

3. WCAs are a key element of the water resources management and rational organization of water use. However, WCAs cannot fully play their role in water resources management, rational organization of water use and improvement of living conditions in the rural area if they are not provided with the support and encouragement from the authorities at all levels.

4. In conditions of free water use, the effectiveness of the government's economic mechanisms aimed at the rational use of water resources is minimized. Not every farmer will want to bear large expenses for the introduction of water-saving technologies to save on freely available water. Under the current economic conditions - planning of crops by the state, fixed purchase prices for raw cotton and grains and state-regulated prices for production factors, the farmers are not interested in increasing labor productivity, soil fertility and water conservation.

5. In order to stimulate water saving with economic ways, it is necessary to adopt a set of measures that allows develop mechanisms to increase the motivation of farmers to increase labor productivity and rational use of water and land resources:

– Introduction of paid water use;

– Abolition of state orders for production of cotton and wheat. Abolition of the state planning of the cropped areas. Depending on the soil and climatic conditions, demand and prices for agricultural products, farmers must plan cropping pattern themselves to produce profitable crops and crops that increase soil fertility - alfalfa, legumes, etc.;

– Establishment of free market prices for agricultural products that allow water users to be solvent when paying for water services;

– Increase of responsibility of water management organizations for water supply to water users in established volumes and timing;

– Provision of irrigation systems with perfect water metering facilities with measurements and control over the supplied water.

6. For an objective evaluation of the results of the experiment on application of a two-part tariff for WCA services, it is necessary to conduct such an experiment a minimum 2-3 years as this year water scarcity is expected. Water availability in the Shahrikhansay basin is expected to be 80-85% of the average volume, in the Aksu basin - 70-75%. Under these conditions, water users participating in the experiment can receive much less water than required for crop production due to the lack of water.

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For notes