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FOREIGN EXPERIENCE OF WATER USE AND WATER USERS FUNDING

СУ ТҰТЫНУДЫ ЖӘНЕ СУ ҚОЛДАНУШЫЛАРДЫ ҚАРЖЫЛАНДЫРУДЫҢ ШЕТ ЕЛДІК ТӘЖІРИБЕСІ

ЗАРУБЕЖНЫЙ ОПЫТ ВОДОПОТРЕБЛЕНИЯ И ФИНАНСИРОВАНИЯ ВОДОПОЛЬЗОВАТЕЛЕЙ

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Abstract. The experience of economically developed countries (USA, Japan, France, China), the CIS countries (Uzbekistan, Kyrgyzstan, Turkmenistan, Tajikistan) has been explored that testifies about the importance of public support and participation of the State in organization and financing of capital and operating costs of water economy. Paid water use is used to return the costs associated with providing water to the consumer, as well as stimulating rational water resource use. The significance of measures taken to raise awareness of changes in tariffs management and regulation has been revealed. The analysis of current state of water resources has been carried out, which shows that Kazakhstan is limited in them in comparison with neighboring and other countries. A regional deficit in some river basins has been identified, which leads to losses in fishery and agriculture, degradation of lakes, rivers, wetlands. The article suggests ways of addressing problems, using the best practices of foreign countries: reduction of losses in highway and inter-economy canals and group waterways, as well as increasing the efficiency of water consumption in agriculture.

Аңдатпа. Экономикалық жағынан дамыған елдердің (АҚШ, Жапония, Франция, Қытай), ТМД елдерінің (Өзбекстан, Қырғызстан, Түркіменстан, Тәжікстан) тәжірибесі қарастырылып отыр, бұл мемлекеттік қолдаудың және мемлекет тарапынан капиталдың ұйымдастырылуына және қаржыландырылуына және су шаруашылығын пайдалану шығындарына мемлекеттің үлестік қатысуының маңыздылығы куәландырады. Ақылы суды пайдалану тұтынушыға су беру бойынша шығындарды өтеу үшін, сондай-ақ су ресурстарын ұтымды пайдалануды ынталандыру үшін пайдаланылады. Тарифтерді басқару мен реттеуді өзгерту туралы хабардарлықты арттыру мақсатында қабылданған шаралардың маңыздылығы көрсетілген. Су ресурстарының ағымдағы жағдайына талдау жүргізілген, бұл көршілес және басқа елдермен салыстырғанда Қазақстанда шектеулі екенін көрсетеді. Кейбір өзен бассейндерінде аймақтық тапшылық анықталған, бұл балық шаруашылығында және ауыл шаруашылығында жоғалуына, көлдердің, өзендердің, сулы-батпақты жерлердің деградациясына әкеледі. Мақалада шет елдердің озық тәжірибелерін қолдану арқылы проблемаларды шешу жолдары қарастырылған: негізгі және шаруашылықаралық арналарда және топтық су жолдарында шығындардың төмендеуі және ауыл шаруашылығында суды тұтыну тиімділігін арттыру.

Аннотация. Рассмотрен опыт экономически развитых (США, Япония, Франция, Китай), стран СНГ (Узбекистан, Кыргызстан, Туркменистан, Таджикистан), который свидетельствует о важности государственной поддержки и долевого участия государства в организации и финансировании капитальных и эксплуатационных затрат водного хозяйства. Платное водопользование применяется для возмещения затрат, связанных с обеспечением водой потребителя, а также стимулирования рационального использования водных ресурсов. Отражена значимость мер, принятых в целях повышения информированности об изменениях в области управления и регулирования тарифов. Проведен анализ современного состояния водных ресурсов, который показывает, что Казахстан ограничен в них по сравнению с сопредельными и другими странами. Выявлен региональный дефицит в отдельных речных бассейнах, за счет чего происходят потери в рыбной отрасли и сельском хозяйстве, деградация озер, рек, водно-болотных угодий. В статье предложены пути решения проблем, используя передовой опыт зарубежных стран: сокращение потерь в магистральных и межхозяйственных каналах и групповых водоводах, а также повышение эффективности водопотребления в сельском хозяйстве.

Key words: agriculture, water resources, water use, water consumption, water users, costs, irrigation water tariff, foreign experience.

Түйінді сөздер: ауыл шаруашылығы, су ресурстары, суды пайдалану, суды тұтыну, суды тұтынушылар, шығындар, суармалы су тарифі, шетелдік тәжірибе.

Ключевые слова: сельское хозяйство, водные ресурсы, водопользование, водопотребление, водопотребители, затраты, финансирование, тариф на поливную воду, зарубежный опыт.

Introduction. In foreign countries, the government plays a major role in organizing, financing and regulating the water consumption system. Construction and subsequent operation of large irrigation facilities in almost all countries are paid by the state budget, and if they are insufficient by providing various soft loans. In countries with limited water resources, including the Republic of Kazakhstan, the state takes full responsibility for capital spending on irrigation systems. This is typical for most countries in Asia.

The current state of water resources shows that Kazakhstan is limited compared to neighboring and other countries. There is a regional deficit in some river basins, resulting in losses in the fishing industry and agriculture, degradation of lakes, rivers, wetlands. The expected trends in the growth of water consumption and the decline in water availability threaten the growth of the regional deficit, with which six of the eight water basins in Kazakhstan may face by 2030. Therefore, it is necessary to consider the best foreign experience of water consumption and water users financing in order to increase efficiency, use and management of water resources.

Material and methods of research. Only the volume of water actually supplied to the water consumer is taken into account when determining the amount of payment for a rendered service for supplying water. The coefficient of efficiency of the main distribution channels of irrigation systems is taken into account.

In the world practice two types of tariffs are applied to irrigation water: one-part and two-part. The tactics of applying tariffs are regulated by water suppliers and water users, which should be approved by the tariff regulation committee. The basic tariffs are applied when paying for water supply services used for vegetation and non-vegetation irrigation, within the limits calculated in accordance with the norms. Preferential tariffs in irrigated agriculture are used for washing and water recharge irrigation.

The procedure for one-part tariff calculations is recommended to be used in cases of provision of water supply services in the irrigation and watering zone, where the volume of water resources supplied to water users is less dependent on natural and climatic conditions. On average, the price for supplying 1m3 of water in water supply systems in developed countries ranges from 2 to 13 dollars / m3.

Results and discussion. In foreign countries, the main role in the organization, financing and regulation of the water consumption system is played by the state. The construction and subsequent operation of large irrigation facilities in virtually all countries are paid from the state budget, and if they are insufficient - with various soft loans.

In Japan, the state finances 90% or more of water management works, and up to 10% - through loans from interested private corporations [1]. In the USA, large water management systems, their protection and water resources are managed and funded by the government through the Federal Bureau of Reclamation, State Services, Environmental Services, and the Basin Interstate Organizations such as the Tennessee Association. The USA "Clean Water" Act of 1987 provides for the allocation of subsidies to landowners who apply the most advanced and effective methods of field irrigation.

In countries with limited water resources, capital expenditure on irrigation systems is usually fully assumed by the state. This is typical for most countries in Asia. In China, the construction of large and medium-sized reclamation (irrigation) facilities is financed by the state with the involvement of farmers (with the payment of regular wages). Absolute majority of capital expenditures are borne by the state budget. The exception is South Korea, where farmers pay 15-30% of capital costs for state irrigation systems [2].

Practically in all countries, paid water use is used to recover the costs associated with providing water to the consumer, as well as to stimulate more rational use of water resources. The highest fee in almost all countries is established for industrial and municipal water consumption (it fully covers the costs of the water management complex for servicing this sector).

Water users using water for irrigation are in a privileged position and cover only a part of the operating costs. In the USA, farmers who use water from state sources pay an average of only 20% of its real value. In Israel, with a cost of supplying 1 cubic meter of water to 0.65, and agriculture - 0.28 dollars.

When determining the amount of payment for a rendered service for supplying water, only the volume of water actually supplied to the water consumer is taken into account. The coefficient of efficiency of the main and distribution channels of irrigation systems is taken into account.

The procedure for single-rate tariff calculations is recommended to be used in cases of provision of water supply services in the irrigation and watering zone, where the volume of water resources supplied to water users is less dependent on natural and climatic conditions. On average, the price for supplying 1м^3 of water in water supply systems in developed countries ranges from 2 to 13 dollars/м^3.

Table 1 shows the indicators of the share of the state and the organization of water users in financing the lump sum and operating costs of the water sector.

Table - Share participation of the state and organization of water users in financing the capital and operating costs of the water sector

The state	Capital investments for development at the expense of, %		Operational costs at the expense of, %	
	The state	Water Users and Municipalities	The state	Water Users and Municipalities
Spain	70	30	50	50
France	50	50	0	100
Canada	75	25	50-70	30-50
Japan	100	0	0	100
USA	70	30	50	50

As can be seen from the data in Table 1, the share of states (or the republican budget) accounts for 50 to 100% of non-recurrent (capital) costs, and for water users 25-50%. Of the operating costs, the states either take 50-70% of the costs, or (as in France and Japan) all current costs are attributed to water users and municipalities (local budgets). According to the IBRD (International Bank for Reconstruction and Development) experience, their share in the form of long-term soft loans with preferential periods.

In Israel, at a prime cost of water consumption an average of 35-40% per 1 m^3 for the state enterprise "Mekhorot", there are differentiated tariffs for water: domestic and drinking and municipal needs -1 dollar/m^3, industry 60%/m^3, irrigation - 19%/m^3. Overflows in excess of the limits are penalized in a 10-fold tariff. The state pays to "Mekhorot" for each m^3 of water, submitted to agriculture 20% [3].

In the United States, water tariffs for municipal and industrial water users range from 40 to 2.500 dollars per 1000 m^3 of water. For agricultural water users the tariff is from 19 to 120 dollars per 1000 m^3. The state spends about 1 billion dollars on water

management support, of which the US Bureau of Land Reclamation subsidies are about 50 percent.

The United States has a great development of the corporatization of the right to water and the sale of the action to water along with an extremely sharp increase in their value. In 1980, the State of Colorado, one share, which gave the right to perpetual receipt of 1 acrofoot of water per year, cost 1 thousand dollars. In 1990, the cost increased to 15 thousand dollars, and in 2000, was sold already for 20 thousand dollars However, prices for water use differ in different states and even counties.

In Canada, from the federal and municipal budgets, water resources are subsidized 5.3 billion Canadian dollars, of which 2.2 billion dollars goes into operation and 3.1 billion dollars goes to development and reconstruction. The water supply for irrigation is paid on a per-hectare basis. Owners of irrigated land pay an average of 110 dollars per 1 ha of irrigation [see 3].

In Spain, the fee for municipal water supply is 0.75 dollars per m^3, rural communal - 0.25 dollars for industrial use of water, the tariff varies within the limits of up to 2 dollars per 1 m^3, irrigation - from 0.02 to 0,2 dollars per m^3. Irrigation and rural communal water supply is subsidized by the state through their participation in the maintenance of basin, river agencies and through municipalities.

The experience of China is interesting. Chinese economists believe that the payment for water use should not exceed 2-4% of gross income. In China, the industry pays 6-10 cents per 1 m^3, for the use of water for irrigation - 0.8-1.5 cents per m^3 for gravity irrigation and up to 2 cents per m^3 of water supplied by machine irrigation [see 2].

In Kyrgyzstan, the fee for supplying water to agricultural users is differentiated for vegetation and non-vegetation periods: for the growing season, 30 soms per 1000m^3, or 0.069 cents/m^3, for non-vegetation period 10 soms per 1000m^3, or 0.023 cents/$m3^3$ (data as of 01.01.1999). Kyrgyz farmers received about 25-40% of the total funding, while the rest was subsidized by the country's budget [4].

In Tajikistan, a payment for 1 m3 of water delivery to agricultural users is set at 0.6 dirams or 0.192 cents / m^3, and for industry - 1.2 dirams or 0.41 cents/m^3 (data as of January 1, 2004). When water is supplied by means of machine water, the tariff is set at 2.87 dirams (0.919 cents/m^3) as of 2008.

Turkmenistan has established a payment for water use for industrial enterprises and other water users in the amount of 28.8 manat per 1 $м^3$. With machine water lifting rate is applied 1.7 coefficient. Services for supplying water allocated for irrigated agriculture are free of charge within the planned limit. For a super-planned volume of water intake, a certain payment is established.

In Uzbekistan, the main source of financing of the water economy is the republican budget. Here an additional source of funding is the funds received by water management organizations from their submission of services to water users, WUAs (water users association).

In the world practice two types of tariffs are applied to irrigation water: single-rate and double-rate tariffs.

Single-rate tariff. One-rate tariff includes all costs that are payable by water users, and accruals in accordance with current legislation. The one-rate tariff is recommended to be used in cases of provision of water supply services in the irrigation and watering zone, where the volume of water resources supplied to water users is less dependent on natural and climatic conditions. Two-part tariff is acceptable for southern regions, with a stable arid climate**.**

The double-rate tariff. The double-rate tariff includes two rates: the first rate - per hectare - is formed due to conditionally fixed costs, the size of which does not depend on the volume of water supply, the second rate - per cubic meter payment - is formed at the expense of conditionally variable costs, the size of which depends on the actual volume of water actually delivered to the point of the establishment. This tariff can be applied to arrays, where the equipment for accounting water is weak.

In countries such as the United States, France, Mexico, a two-part payment system for water in irrigated agriculture is used, consisting of constant and variable rates.

The tactics of applying tariffs are regulated by the water supplier and water users, which the tariff regulation committee should approve. *The basic tariffs are applied when paying for water supply services used for vegetation and non-vegetation irrigation, within the limits calculated in accordance with the norms. Preferential tariffs in irrigated agriculture are used for washing and charge watering.*

Penalty tariffs are applied for excessive water intake and for unauthorized water abstraction (disrupting the watering schedule). Penalty tariffs are in 3-5 times higher than the basic tariff.

Regarding the regulation of irrigation water tariffs, in all countries of the world, farmers pay only a part of the costs of operation and maintenance of the inter-farm part of the water management systems and irrigation systems with the help of water charges, and the remaining part of the expenses of the water management organizations is financed from the state. The size of the payment for water depends on the profitability of production on irrigated land. Table 2 provides information on the share of operating costs (operation, maintenance, permanent repair and depreciation) of irrigation systems in the gross income of farms (gross income / cost of a crop from 1 hectare or from the entire irrigated area of the farm).

Table 2- Information on the share of payment for water delivery in the gross income of farms

Countries	Share of operating costs in gross household income
Nepal	5%
Pakistan	6%
Indonesia	8%
Thailand	9%
Republic of Korea	26%
Cathay	4%
Kazakhstan	0,5-1,5%

In developing countries, based on a survey conducted by the World Bank in conjunction with the Asian Development Bank, the share of irrigation fees is 5% of income in Nepal, 6% in Pakistan, 8% in Indonesia, 9% in Thailand, and 26 % in the Republic of Korea. Chinese economists believe that the payment for water should not exceed 2-4% of gross income (that is, the share of the amount of payment to the water supplier in gross income from irrigated land). In Kazakhstan, the share of household payments for water supply is within 1.5% (0.5-1% on conventional crop systems, in rice systems -1.5%).

It should be noted that examples of foreign experience show the importance of state support and the participation of the state in the organization and financing of capital and operating costs of water management. Examples also show the importance of awareness-raising measures as a supplement to changes in management, regulation and tariffs.

World experience allows us to draw the following main conclusions about the mechanisms for reducing water deficits:

■water saving in agriculture is the key to saving water in most water-deficit countries;

■ the use of recycled water supply, efficient water treatment systems, reduction of losses in infrastructure facilities in industry and the municipal sector is a prerequisite for reducing future water consumption;

■ increasing the forest cover of the catchment areas of water bodies for increasing, stabilizing and purifying water flow, strengthening river banks through forest reclamation in order to save and maintain water balance in terrestrial ecosystems, regulate and improve its surface runoff (from the experience of Turkey and other countries);

■ the quality of water resources is an integral part of the deficit problem and should be considered in terms of monitoring the use of water resources and the conservation of ecosystems.

World experience in the field of tariff formation suggests the following basic principles:

♦ return on costs - the main principle of tariff regulation for all groups of end-users. In agriculture, the main task is usually to cover operating costs, while full coverage of expenses can be difficult. In many countries, water tariffs in agriculture cover only operational costs, which do not reflect the real cost and water deficit as a resource. Of the 23 countries of the Organization for Economic Cooperation and Development (OECD), only six (including the UK, Sweden and New Zealand) managed to achieve full coverage of costs by water tariffs in agriculture. With regard to industrial and domestic consumers, the possibility of achieving full cost recovery is more realistic;

♦ efficiency of water consumption and rational use of water resources is another important task of tariff policy in all sectors. In agriculture, tariffs should be associated with the effective use of water resources (irrigation equipment, drainage systems, etc.), as well as using drainage and wastewater treatment systems (for example, lower tariffs for the use of drainage systems). For industrial consumers, part of the tariff incentive should be the reduction of the degree of pollution of

water bodies (for example, the use of recycled water, sewage treatment in accordance with standards). Progressive tariffs have had a significant impact on the situation in the municipal sector of cities experiencing severe water shortages, for example, in the capital of Namibia, Windhoek;

♦ reflection of the value of water resources and the alternative possibility of water consumption. This principle ensures that end-users receive a signal that water resources have economic value and stimulate optimal distribution by sectors and consumers (for example, crops with different value-added water). The application of this principle can be achieved through the introduction of a fee for the use of water resources, uniform for all consumers (for example, payment for the use of water in Singapore, the fee for water abstraction in Germany);

♦ accessibility to ensure effective use of water resources without worsening the situation of economically vulnerable members of society;

♦ in the field of water resources management and regulation there are a number of circumstances that should determine the choice of the structure of water management. First, it is important to take into account the country's initial position in terms of the availability of water management experts, infrastructure and service coverage, as well as the overall state of the infrastructure (for example, investment lagging or sufficient financing of capital expenditures). Secondly, an important criterion is the ability of the management system to rationally use water resources at the national and regional levels, as well as to ensure and coordinate investment programs for a long period. Thirdly, the potential of the system in terms of qualitative changes in the level of customer service also has critical value [see 3].

The current state of water resources shows that Kazakhstan is limited compared to many neighboring and other countries. There is a regional deficit in some river basins, resulting in losses in the fishing industry and agriculture, degradation of lakes, rivers, wetlands.

The expected trends in the growth of water consumption and the decline in water availability threaten the growth of the regional deficit, with which six of the eight water basins in Kazakhstan may face by 2030. If efficiency of water use and management is not improved, by 2040 the water shortage will increase, which will negatively affect the provision of water to the population, GDP growth and the state of the environment [5,6].

Thus, in order to improve and solve the problems of this issue, using the best practices of foreign countries, the Republic of Kazakhstan recommends the following activities:

1. Reduction of losses in the main and inter-farm canals and group conduits, for which it is necessary to carry out works on infrastructure rehabilitation, including the following activities:

- development of a unified methodology for a multifactorial survey; multifactor survey of water management facilities;
- implementation of an automated water resources management system, including automation of water level accounting in the canals and control over its quality; restoration and modernization of infrastructure;
- development and approval of specific standards for infrastructure maintenance;
- ensuring an adequate level of infrastructure operation.

2. Increasing the efficiency of water consumption in agriculture is achieved through the following measures:

- revision of the composition of crops grown on irrigated land;
- a survey of the state of irrigation infrastructure and farmland, irrigation methods and agricultural practices; use of return water for irrigation;
- installation of measuring devices at all stages of water intake and automation of water outlets (necessary investments 12 billion tenge for installation of 200 thousand measuring instruments);
- introduction of water-saving methods of soil cultivation and water-saving crop restructuring, water-saving irrigation technologies (drip, sprinkling and discrete);
- restoration and reconstruction of infrastructure in order to reduce losses, including through channels lining;
- improvement of the quality and efficiency of collector-drainage systems, return and reuse of drainage water;
- revision of tariffs in agriculture to increase the incentive to save water and additional financing for water saving measures in agriculture;
- changing the principle of subsidies to encourage the use of best available technologies and cost-effective practices;
- launch of targeted support and educational programs for farmers to inform about available solutions and skills development.

Conclusions. In addition to the above recommendations, the results of the

implementation of the state policy in the water sector show that the country has established the basics of the development of the water sector in the conditions of market relations with the division of managerial and economic functions. The basin principle of water resources management was introduced.

The Water Code of the Republic of Kazakhstan, the Laws “On Subsoil and Subsoil Use”, “On Agricultural Cooperation”, as well as the relevant by-laws were adopted with the aim of creating a legislative basis for the development of the water sector, rational and integrated study and use of subsoil resources, including groundwater resources [7,8,9].

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