Development of irrigation based on various business payment systems

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Abstract. As the result of the changes that took place in the Russian economy in the 90s, inter-farm reclamation systems remained in state ownership, and reclamation lands and intra-farm irrigation systems were transferred to private ownership. For fixed assets managed by budget organizations that pump water for irrigation, depreciation deductions are not provided by the current legislation, and state subsidies cover only a small part of the necessary restoration work. The study uses international practices in the field of paid water use in irrigated agriculture, the regulatory and methodological framework adopted on the territory of the Russian Federation, data received from regional state organizations for land reclamation and agriculture, materials, data from Russian Federal State Statistics Service and the Ministry of Agriculture of the Russian Federation, the work of Russian and foreign scientists and practitioners. The article explains the pricing of water supply for irrigation, creation of funds (financial resources) in the accounts of plumbing organizations to update their fixed assets, upgrading irrigation systems, having the physical deterioration of more than 70%.

1. Introduction

As the Russian and foreign experience shows, the organization of paid water use in irrigated agriculture (services for transporting water to irrigated massifs) is aimed at developing mechanisms for mutually beneficial relations between water management organizations and agricultural water users, which should ultimately strengthen the practice of taking care of the natural resource, through the realization of its social and economic value. The culture of water use, including in irrigated agriculture, is difficult to integrate into the system of public relations, as evidenced by the mass of examples of increasing water scarcity, their degradation as the result of uncoordinated use [1].

The most striking examples illustrating disagreement of the parties concerning use of water resources and establishment of level of payment are the countries of the Central Asian region and Northwest Africa. Paid water consumption for irrigation is often a necessary basis for ensuring survival of society and food security of the state. Payment size for water consumers of agro-industrial complex has to be defined on the terms of social and economic coherence, need of saving of water resources, increase in profitability of agricultural production [2].

The majority of inter economic irrigating systems of Russia have been constructed in the 60th-80th years of the XX century according to the state program of development of land reclamation. In some
regions of the country there is high physical deterioration of irrigation systems (from 70 to 90%) [3, 4, 5].

For example, in the North-Western Federal district of Russia the wear of irrigation systems reaches – 77.6%, in the Southern Federal District – 72.6%, in the North Caucasian Federal District – 94%. Such situation is explained by a number of economically caused factors, including because of current situation in the sphere of determination of the property rights to meliorative systems and the meliorative lands. As the result of transformations which have happened in economy of Russia in the 90th years intereconomic meliorative systems remained in state ownership, and the meliorative lands and intraeconomic irrigating systems have passed into a private property. On the majority of intraeconomic irrigating systems landowners carry out recovery work and depreciation charges on updating of fixed assets. On the fixed assets which are in management of budgetary organizations pumping water on irrigation, depreciation charges of the current legislation are not provided, and the state subsidies cover only a small part of necessary recovery work. In turn, according to expert data, the sums necessary for this purpose have to be 3-5% of cost of the operating business assets from which about 60% have to be distributed on a complete recovery and 40% – on capital repairs of meliorative systems [6, 7, 8].

The developed method of calculation of a payment for water supply fixed in standard and legal base of the Russian Federation not always give the expected effect of the application and demand more accurate differentiation on certain indicators.

2. Materials and methods
In the course of the research the international practicians in the sphere of paid water use in the irrigated agriculture, the standard and legal and methodical base accepted in the territory of the Russian Federation the data obtained from the regional state organizations for land reclamation and agricultural water supply, data of the Russian Federal State Statistics Service and Ministry of Agriculture of the Russian Federation, works of the Russian and foreign scientists and practicians were analysed.

3. Results and discussion
The carried-out analysis shows that in world practice there was no uniform approach to formation of a payment for use of water for crops irrigation. The main methods of calculation of a payment for water supply in irrigating systems are presented in Table 1.

In most cases the received payment doesn't cover completely expenses of the water supply organization. In Australia, reimbursement of costs of the water supply organization due to payment received from farmers is carried out at 60-100% (depending on the region), in Argentina – at 12%, in Bangladesh fluctuates in limits – from 12 to 100%, in Pakistan – 20-25%, in Slovakia – 25-30%. In the majority of developing countries the incomplete collecting of a payment for water use is observed that respectively forms deficiency of means at the water supply organizations which are partly compensated by the state subsidies. Differentiation of payments is carried out, mainly, depending on water security of the region, cost intensity of water supply, level of the state subsidies, quality of waters (natural, sewage or drainage) that defines presence at the water supply organization of additional expenses on a fence and water purification.
Table 1. Methods of calculation of a payment for water supply in the irrigating systems applied in world practice.

| No. | Method of calculation of a payment | Description of a method |
|-----|-----------------------------------|--------------------------|
| 1   | Zone method or territorial method (in the Russian terminology – hectare method) | 1) a rate per unit area (for example, ha, acre) of the agricultural economy, regardless of the intended use of water within the holding;  
2) a rate per unit of irrigated area, hectare. |
| 2   | The differentiated method | the payment is established depending on a species, the irrigated lands which are grown up on of crops and from the area occupied under them, proceeding from the norms of watering established in the region on separate agricultural cultures. |
| 3   | The volume method | 1) the fixed rate of payment for unit of volume of the received water;  
2) the variable rate or “the ascending block of tariffs” which is that unit of volume of the received water, the water user pays for various rates which, most often, depend on the acquired quotas (or limits), at the same time, the most part of a quota is taken up, the water unit of volume is more expensive. |
| 4   | The time / season-based method | calculation of a tariff for time, for example in days or for an irrigation season. |
| 5   | The equity method | calculation of payment is made in shares from income gained from the realization which is grown up as a result of irrigation, production and taking into account profitability of production of agrarian economy, on average it is considered that she can be brought to 10%. |

In the Russian practice at implementation of water supply on irrigation the system of calculation of payments carried to types of the tariffs having one-rate (volume and pogektarny) is more widespread. The formula of the tariffs having one-rate can be expressed in the following form:

\[ T_{\text{IRR}} = \frac{E_{\text{SER}}}{R_{\text{IRR}}} \]  

where \( T_{\text{IRR}} \) is one-rate tariff of formation of a payment for water supply for irrigating systems, rubles/hectare (m³); \( E_{\text{SER}} \) is expenses which are needed to do by the water supply organization when rendering service in transportation of water to intraeconomic irrigating systems, rubles; \( R_{\text{IRR}} \) is quantity of the rated resource stated by economy – the water consumer for ensuring irrigation of crops, hectare (in case of tariffing on the irrigated areas) or m³ (in case of tariffing of volumes of water consumption).

Considering that in Russia the main water supply organizations have the status of state institutions, costs of service have to include revenues: the state subsidies and a payment from individuals and legal entities (water consumers):

\[ E_{\text{SER}} = \left( E_{\text{GEN}} - S_{\text{FB}} + E^{\text{PR}} \right) \times (1 + \omega_{\text{VAT}}) \]

where \( E_{\text{SER}} \) is expenses included in structure of a payment for rendering service in water supply, rubles; \( E_{\text{GEN}} \) is general expenses necessary for ensuring services in water supply to irrigating systems, include straight lines, the distributed general running and overhead costs of rubles; \( S_{\text{FB}} \) state funds from the federal budget of Russia (subsidy), rubles; \( E^{\text{PR}} \) is expenses of property of the water supply
organizations which isn't used for rendering public services (performance of work) and for general economy needs; \( \omega_{\text{VAT}} \) is deductions of Value Added Tax, \%. 

In turn the general cumulative expenses of the water supply organizations are determined by a formula: 

\[
E_{\text{GEN}} = E_{\text{ALL}} + E_{\text{PT}} + E_{\text{OP}},
\]

where \( E_{\text{ALL}} \) is all expenses rendering service in water supply, rubles; \( E_{\text{PT}} \) expenses on payment of taxes the property of establishment is recognized as a subject to the taxation, rubles; \( E_{\text{OP}} \) is expenses on payment of other obligatory payments, rubles.

The size of the general expenses which will be incurred by the water supply organization in the course of rendering services in water supply will include in the structure the expenses incurred by the organization directly on rendering service in water supply to irrigating systems, general economy expenses of the organization which need to be born for ensuring its functioning and overhead expenses:

\[
E_{\text{ALL}} = (\sum_{i=1}^{n} E_{\text{CO}_i} + \sum_{j=1}^{m} E_{\text{NE}_j} + \sum_{k=1}^{n} E_{\text{OV}_k}) \times C_{D} \times C_{I},
\]

where \( n \) is quantity of the indicators which are a part of the factor cost which is directly connected with rendering service in water supply; \( E_{\text{CO}_i} \) is expense \( i \) of the component, which indicator is directly connected with ensuring rendering service in water supply to irrigating systems, rubles; \( m \) is the quantity of the indicators estimated during the determining of costs of general economy needs of the water supply organization; \( E_{\text{NE}_j} \) is expenses \( j \) of a component, an indicator of general economy needs, rubles; \( E_{\text{OV}_k} \) is expenses \( k \) of a component, which indicator is a part of overhead costs of the water supply organization, rubles (in case of distribution and accounting of overhead costs between a factor cost and general economy they can be considered at calculation as a part of the corresponding groups without allocation in separate); \( k \) is the quantity of expenses types as a part of the overhead costs accompanying rendering services in water supply; \( C_{D} \) is coefficient-deflator considering the change in price for the beginning of settlement year; \( C_{I} \) is coefficient considering inflation in settlement year for the period from the beginning of year prior to the beginning of an irrigation season:

\[
C_{I} = 1 + \frac{i}{100},
\]

where \( i \) is the rate of inflation, \%.

Following the main directions of Strategy of innovative development of the Russian Federation until 2020 approved by the order of the Government of the country of December 8, 2011 No. 2227-r (further – Strategy), on accounts of the budgetary water supply organizations it has to be accumulated the funds (for example, planned accrual) allowing to involve the innovative potential of a meliorative complex of agrarian and industrial complex. A fund of accumulation has to be distributed by founders of the state water supply organizations on innovative updating and modernization of fixed assets.

The sum of planned accrual has to be defined by the size of the total book value of the assets which are in operational management of the state water supply organizations:

\[
P_{a} = 0.1 \times C_{C} \times A_{T},
\]

where \( P_{a} \) is planned accumulation, rubles; \( C_{C} \) is coefficient of comparative economic efficiency of capital investments, for agriculture – 0.15; \( A_{T} \) is total book value of the assets which are in operational management of the organization, rubles.

4. Conclusion

The question of a payment calculation for water supply on irrigating systems remains one of discussed as in the Russian, and international practice of water use. Researches, accumulation of information in this direction of development of agro-industrial complex (savings of water resources and supply on irrigation) demonstrate that in the foreign states and Russia there was no practician of private investment investments in irrigating (drying) systems yet. There are no standardly verified tools of accumulation of funds of water users for updating of fixed assets of the water supply organizations. The efficiency of use of a number of irrigating systems, their safety needs to be checked. The research shows that decisions lie in the plane of public-private partnership and use of «the best available technologies» in the field of melioration and water
use. Experience of application of quotas for water resources and works of the market of regulation of their (purchase and sale) deserves attention. The question of formation of a payment for water supply on irrigation of lands demands the international discussion, work of “a year-round electronic round table”. The question of formation of a payment is directly connected also with a question of a condition of water resources, there is a need of creation of dynamic models of use of water resources in the territories belonging to several states. These water models will allow to understand: how many water is available and how many it is possible to use for needs of agriculture.

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