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Effective Ways of Using Water with Information Systems

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A B S T R A C T

The article discusses complex ways of optimal use of water resources, depending on indicators of efficiency in agriculture. The main aspects of the structure of the information system of water use in agriculture are analyzed and systematic conclusions are drawn about the extent to which it is possible to achieve strategic goals.

A R T I C L E I N F O

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Introduction

Today, in the countries of the world, including in Uzbekistan, the issues of efficient and rational use of water resources are becoming an urgent problem. Global climate change, population growth and economic sectors, especially agricultural production, require an increase in demand for water resources from year to year, and as a result, the annual deficit of water resources increases. Solving these issues requires improving water resources management systems and mechanisms for the effective use of water resources, as well as consistent reforms to develop and modernize water facilities.

Literature review

From the analysis of scientific research of scientists, it can be concluded that the problem of improving the use of information systems in the efficient use of water in the management of irrigation systems is one of the main strategic directions of economic development, especially agriculture.

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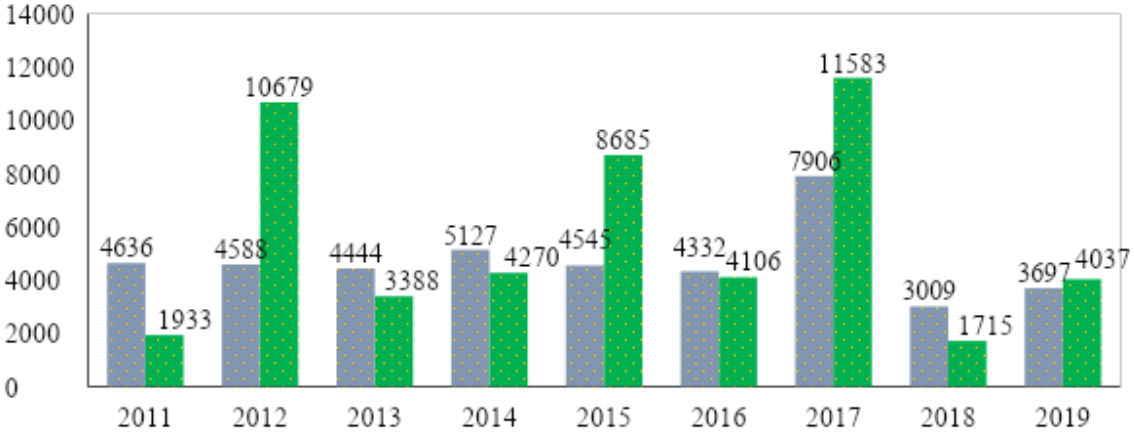
Scientific and practical issues of implementation in water resources management have been studied by foreign economists. Solutions to thematic problems were conducted by Richard Coeks, Philip Langarts on the topic "Improving the efficiency of water use in irrigation", Enda O'Connell on the topic "Adaptation of water systems to climate and socio-economic systems", Jaime Sainz-Santamaria, Adan L., Martinez -Kruz in the topic "Problems of investing in irrigation systems", Olufunke Kofi, Tilaksun Amede in the topic "Issues of organizing the directions of water resources management strategy"

Main part

The area of irrigated land in our republic is 4.3 million hectares, with an average of 90-91% of total water resources used in agriculture, and the rest - in other sectors of the economy. As a result of global climate change, the area of glaciers in Central Asia has decreased by 30 percent over the past 50-60 years. If the temperature rises by 20C, the volume of glaciers will decrease by 50%, and with an increase of 40C, by 78%. It is estimated that by 2050, water resources are expected to decrease by 5% in the Syrdarya basin, and by 15% in the Amu Darya basin. The total water shortage in Uzbekistan in the period up to 2015 amounted to more than 3 billion cubic meters, by 2030 this figure may reach 7 billion cubic meters, and by 2050 - 15 billion cubic meters (Fig. 1). Analyzes show that climate change will further exacerbate water scarcity in Uzbekistan, increase the duration and frequency of droughts, as in 2000, 2008, 2011, 2014 and 2018, and create serious difficulties in meeting the economy's water needs.



1. Dynamics of water supply of the Sirdarya and Amu Darya rivers, million m^3

Today, the rational use of water resources is an urgent problem for agriculture in many countries. In Uzbekistan, on the one hand, there is a shortage of water resources, on the other, we see the real state of water use technologies and irrigation systems in many sectors of agriculture, their efficiency is not used at the level of modern requirements in comparison with developed countries. Analyzing the state of affairs for 2019, the country has introduced economical irrigation methods for 37 thousand 767 hectares. Of these, 34 thousand 445 hectares were used drip irrigation, 1 thousand 122 hectares - sprinkler irrigation, 2 thousand 200 hectares - pulsar irrigation. In cotton growing alone, as a result of the introduction of drip irrigation on 12 thousand hectares of areas during the growing season, water

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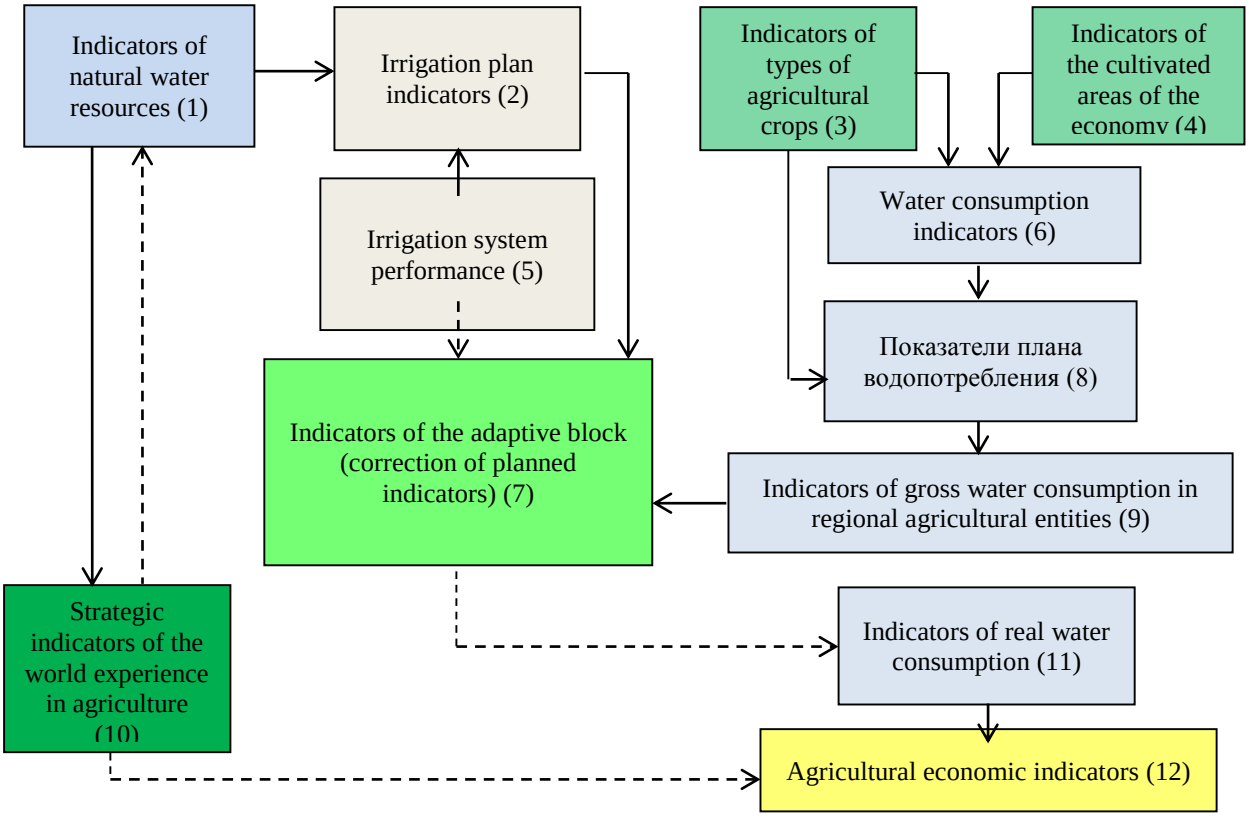
savings of 40.3 million m^3 were achieved. The saved water is directed for re-irrigation of more than 6 thousand areas. ha.

Results

Thus, based on the above, we propose to use the following scheme to create an information system aimed at setting goals for the efficient and optimal use of water in agriculture and identifying solutions, as well as solving issues in water resources management. We called this scheme the logical-functional structure of the information system for rational water use.

The above diagram explains the fundamental features of the structure of the information system for the use of water resources in agriculture.

Analysis of information and communication technologies (ICT) and the degree of use of these technologies in the departments of irrigation systems of the Jizzakh region shows that in the region all departments of irrigation systems are equipped with computer technology. While some have 1-2 personal computers, others have 7-8 computers. Most of the irrigation system departments use ICIT only to automate accounting reports. Insufficient development of software for the automation of technological processes directly related to the organization of water management of irrigation system departments is the main reason that impedes the use of computer technologies in the operation of irrigation networks.



2. The structure of the information system for the use of water resources in agriculture

Thus, based on the above, we propose to use the following scheme to create an information system aimed at setting the problem of efficient and optimal use of water in agriculture and determining

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options for its solution, as well as on issues of water resources management; we call this diagram a logical-functional structure of an information system for the effective use of water.

We explain the fundamental features of the functioning of the structural structure of the information system of water use in agriculture as follows: as the main component of this structure, we take “Indicators of natural water resources” (1-block). In this block, predictive and real annual indicators of the volume of potential water resources available in nature are formed. Along with the fact that these indicators are the main source for the "Indicators of the irrigation system plan" (block 2), on the basis of precisely these indicators in the block "Strategic indicators in world agricultural practice" (block 10) using indicators (data) on the potential distribution water resources of the world in agricultural production, data are formed for comparative analysis in the region under consideration.

Due to the fact that the indicators of block 2 are formed on the basis of the indicators of block 1, on the basis of the "Technical indicators of irrigation systems" (Block 5), the quality of the "economic resource" is taken, then, according to the capabilities of block 5, the indicators of Block 1 will become a "resource" in block 2, on this basis, indicators of its use are formed. The data generated in this way in block 2 are considered as data included in the "Adaptive block (change in planned indicators)" (block 7).

The indicators of the block "Indicators of the plan of water consumption" (block 8) are formed on the basis of the "Indicators of water consumption" (block 6), formed from the "Indicators of types of agricultural crops" (block 3) and "Indicators of agricultural sown areas" (block 4). At the same time, since the formation of indicators of block 3 is at the disposal of farms, they participate in the formation of indicators of block 8 as "multivariate" indicators.

The indicators of block 8 are the basis for the formation of "Indicators of gross water consumption of regional agricultural entities" (block 9) and are guides for the "Indicators of the adaptive block (change in planned indicators)" (block 7), that is, the formulation of adaptation questions is based on the data of this block ... In addition, the data of block 7 is formed on the basis of the data of block 2 and on the basis of indicators reflecting the characteristics of the "boundary" indicators, i.e. limited technical and technological capabilities of block 5.

The main task of the "Adaptive block (change of planned indicators)" (block 7) is the formation of "Real indicators of water consumption" (block 11) on the basis of algorithmic (target) calculations formed on the basis of the above scheme. By algorithmic calculation, we mean the planned indicators of water use, methods for determining the actual volume of water consumption; This algorithm is used in the software for the operation of the information system for the use of water resources. Along with this, this algorithm also includes performing benchmarking calculations for block 12 scores based on block 10 scores..

It is very important that on the basis of agricultural economic indicators in Block 12, or systemic conclusions about the degree of attainability of strategic goals in relation to the indicators of Block 10, sufficiently acceptable decisions are made precisely on the basis of the functioning of the water use information system (based on the principle of operation of this scheme). This shows the importance of this system, the relevance of its development.

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