Use of information technology data in efficient water resource management

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Abstract: The article analyzes the efficiency of water usage based on information systems and develops integrated computer software. One of the main reasons for the insufficiently effective management of water resources is the lack of proper solutions based on information systems. Therefore, it is necessary to pay special attention to the use of information systems in water use.

Keywords: water resources, information system, digital technology, efficiency, agriculture

Considering the limitations on land and water resources alongside the region's growing population, ensuring a stable food supply for both local consumption and export hinges on the efficient use of agricultural resources and policies. To conserve water, leveraging agricultural clusters with digital technologies has emerged as a key strategic direction. Implementing a management system based on digital technologies to save water resources. The management system includes the use (development) of software for quick decision-making analysis, as well as considering agricultural clusters based on modern digital technologies as one of the directions. This approach necessitates innovative solutions like enhancing the structural mechanisms for irrigation system management and integrating automated information systems with a modeling subsystem to optimize water resource utilization.

Purpose of Investigation

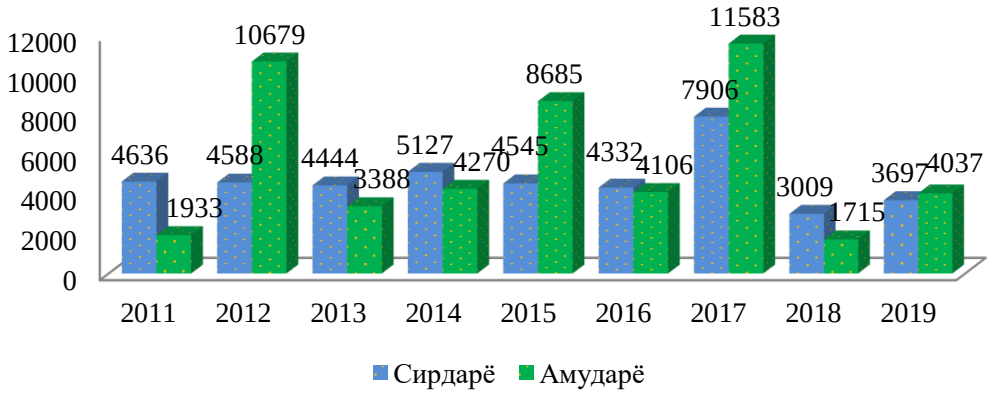
➤ Analyzing the efficiency of water use based on modern information systems.

➤ Developing integrated computer software aimed at efficient water use.

➤ Developing an optimal variant for annual water consumption for different crops with economic efficiency.

In the efficient use of water, the operation of IT should be considered as a process in which the entire set of data (information) representing water resources from an economic point of view should be directed to the expression of efficiency, that is, the entire process, including the creation and use of water resources, should be focused on solving the issue of efficiency. In our republic, the area of irrigated land amounts to 4.3 million hectares, with an average of 90-91% of all water resources being used in

agriculture, and the remaining part in other sectors of the economy. Due to global climate change, the area of glaciers in Central Asia has decreased by 30% over the last 50-60 years. If the temperature increases by 2°C, the volume of glaciers will decrease by 50%, and if it increases by 4°C, the volume will decrease by 78%. According to calculations, by 2050, the water resource in the Syrdarya basin is expected to decrease by 5% and in the Amudarya basin by up to 15%. In Uzbekistan, the total water deficit was more than 3 billion cubic meters until 2015, and by 2030, it may reach 7 billion cubic meters, and by 2050, it may reach 15 billion cubic meters (Figure 1).



(Figure 1) Dynamics of water flow of the Syrdarya and Amudarya rivers.

As of 2023, water-saving irrigation methods have been implemented across Uzbekistan on a significantly larger scale. Drip irrigation is now utilized on 558.2 thousand hectares, sprinkler irrigation on 88.3 thousand hectares, and discrete irrigation on 59.2 thousand hectares. Additionally, laser leveling has been applied to 649,000 hectares, substantially contributing to water conservation. For instance, in cotton farming, the adoption of modern irrigation techniques has resulted in notable water savings, with millions of cubic meters of water redirected to support the irrigation of secondary crops.

Thus, based on the above, we propose using the following scheme to address the issues of efficient and optimal water use in agriculture and identifying its solution options, along with solving water resource management issues.

Efficient use of water resources is currently a critical issue for agriculture in many countries. In Uzbekistan, we face challenges from both water scarcity and the real-world effectiveness of water use technologies and irrigation systems in various agricultural sectors.

Conclusion

In conclusion, efficient water management in agriculture is essential due to limited resources and a growing population. Implementing innovative approaches and digital technologies, such as automated information systems and improved irrigation techniques, can significantly enhance water use efficiency and conservation. This not

only supports a stable food supply but also improves sustainability and economic potential.

An economic-mathematical model was developed to choose the optimal option for efficient use of water, and a database was formed on this basis.On the basis of statistical data, a logical-functional structure of the data used in the process of water use was developed. It was argued that the IT structure of water resources use should consist of two interacting systems.

The adoption of these advanced methods has demonstrated substantial water savings and efficiency improvements, showcasing the potential for broader application in agriculture. By optimizing resource use and integrating digital solutions, the agricultural sector can achieve greater productivity and sustainability, ensuring long-term success and competitiveness.

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