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WAYS TO IMPROVE THE IMPLEMENTATION OF WATER-SAVING DIGITAL TECHNOLOGIES IN AGRICULTURE

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Annotation

the implementation of water-saving digital technologies in agriculture has become increasingly important as a result of the growing concern for environmental sustainability and the need to increase food production efficiency. This research work aims to identify the ways to improve the implementation of such technologies in agriculture, with a focus on water conservation. Opinions were expressed on the prospects for the use of digital technologies in water management in the Republic of Uzbekistan. The study explores the current state of digital technologies in agriculture, the benefits and challenges of their implementation, and the potential strategies to enhance their use for water-saving purposes. The research provides insights and recommendations for farmers, policymakers, and other stakeholders involved in agriculture.

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Introduction.

Water is a limited resource and can be rapidly depleted as a result of climate change, soil degradation and increased demand for water from other sectors of the economy. The rational use of water allows it to be used more efficiently and sustainably in order to meet the demand for water and ensure sustainable agriculture in the long term. Water is a key resource for agriculture, and the cost of using it can be a significant part of the total cost of agricultural production. Rational use of water can help reduce these costs and increase the economic efficiency of agricultural production. Excessive use of water can lead to soil degradation, water pollution and loss of biodiversity. Rational use of water helps to preserve biodiversity and improve the quality of soils and water resources. Climate change could reduce available water supplies and worsen conditions for agricultural production. Rational use of water can help agricultural enterprises adapt to these changes and maintain productivity in a resource-limited environment.

More than 90% of available water resources in our republic are used for irrigation. The main part of this amount (80–83%) falls on the growing season. During the new growing season, water is used for watering winter crops, watering before sowing and harvesting, washing saline lands on saline lands[1].

[1] Жўраев Ф.Ў., Каримов Ғ.Ҳ.. Бухоро вилояти шароитида интенсив боғларни тупроқ ичидан суғоришнинг сув тежамкор технологиясини жорий этиш бўйича тадқиқот натижалари. Эффективность применения инновационных

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The rational use of water in agriculture is essential for sustainable agricultural development, economic efficiency, environmental protection and adaptation to climate change.

Literature review.

From foreign scientists, Francois Sade in his scientific works addresses the issues of optimizing the use of water resources in agriculture with the help of digital technologies, such as geographic information systems (GIS), remote sensing and others[2].

Professor of Belgorod State University Vasily Martynov conducted research on the application of digital technologies for water management in agriculture, such as automated irrigation control systems and soil moisture monitoring[3].

Correct determination of water demand, rational use of water resources requires forecasting the development of all participants in the water management complex (for 15-20 years). Water supply planning is based on this indicator. Taking into account the relationship between the total volume of water and the volume of the product, it is first necessary to determine the volume of the product that is expected to be produced in the near and distant future[4].

Methodology.

We used a wide range of observational, data collection, grouping, plotting and analysis methods to explore the application of digital technologies for water management in agriculture. The experience of developed countries was also analyzed and recommendations for field research were formulated.

Results.

The digitalization of agriculture is the process of using modern digital technologies to increase production efficiency and improve agricultural management. This includes a wide range of technologies such as sensors, automated control systems, data analytics, cloud technologies, machine learning and other tools.

Starting this year, it is planned to reduce natural water losses by 10% as a result of the use of digital technologies in agriculture in our country. Also, to save at least 7 billion cubic meters of water and use it for irrigation of re-sowing on 300,000 hectares of land through the widespread introduction of digital technologies, the use of water-saving technologies, the timely implementation of the necessary irrigation and reclamation measures in the management of water resources[5].

Digitalization of agriculture has a number of advantages. It helps reduce production costs, improve product quality, improve resource management, and ensure more efficient use of land, water and other resources.

Examples of the use of digital technologies in agriculture include automated irrigation and fertilizer systems that optimize the use of water and fertilizers, as well as reduce the cost of these resources. Also, digital technologies are being used to monitor soil, plants and weather, which helps agricultural producers make more informed decisions.

технологий и техники в сельском и водном хозяйстве [Текст] / Т.Х. Жураев. - Бухара : “Sadriddin Salim Buxoriy” Durdona nashriyoti, 2020. - 572 с

[2] https://www.researchgate.net/profile/Francois-Sappey-Marinier

[3] Мартынов, В. Л., & Сазонова, И. Е. (2021). География внутреннего водного транспорта Сибири: Обь-Иртышский бассейн. *География и экология в школе XXI века*, (1), 19-35.

[4] Valiyev Kh.I., Muradov Sh.O., KhoIbayev B.M.. Perfect use and protection of water resources. Completed 2nd edition - T.: “Science and technology”, 2010, 168 pages.

[5] Decree of the President of the Republic of Uzbekistan “On the state program for the implementation of the development strategy of the new Uzbekistan for 2022-2026 in the “A year of human care and quality education””. Decree of the President of the Republic of Uzbekistan, dated February 28, 2023 No. UP-27.

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However, the digitalization of agriculture also presents challenges and problems, such as the high costs of implementing technologies, the need for staff training, and the availability and reliability of communications and electricity in remote areas.

Nevertheless, the digitalization of agriculture is an important direction for the development of agriculture and can lead to a more efficient use of resources and improve the lives of the rural population.

In Uzbekistan, in 2022, due to the introduction of digital technologies at 6,610 facilities in the water management system, 155 million cubic meters were saved[6].

According to our data, at the global level, only about 20% of irrigated lands are equipped with modern water management systems, including digital technologies. However, countries with developed agriculture, such as the USA, Canada, Australia, New Zealand and EU countries, are actively implementing digital technologies in agriculture, including water conservation. Developing countries are also seeing an increase in the number of digitalization projects in agriculture and water conservation, but the level of use remains lower.

According to the Decree of the President of the Republic of Uzbekistan UP-4919 dated December 11, 2020 "On measures to accelerate the introduction of water-saving technologies in agriculture", mainly in the republic in 2021, water-saving technologies were introduced on a total of 201.2 thousand hectares (186.3 thousand with drip, 9.0 thousand with rain and 5.9 thousand with discrete irrigation)[7].

Many foreign countries are actively using water-saving digital technologies in agriculture. We have provided some examples below:

- using drones to estimate yields and control irrigation: in the US and Canada, drones are being used to collect data on yields and soil conditions, helping farms use water more efficiently and minimize wastage;
- irrigation automation: In Israel, Australia and other countries, automatic irrigation systems are widely used, which optimize water use and regulate irrigation depending on climatic conditions and plant needs;
- use of smart water management systems: in the Netherlands and Denmark, agricultural enterprises use smart water management systems that are based on water flow patterns and allow precise control of irrigation;
- Basin-level water management: basin-level water management projects exist in Australia and South Africa that bring together many agricultural businesses and communities to use and protect water resources more efficiently.
- Use of artificial intelligence and data analytics: in many countries, artificial intelligence and data analytics are used to analyze data on weather, soil, crops and other factors, which allows agricultural enterprises to make more accurate decisions in the field of water management.

Foreign experience shows that the use of digital technologies can help agriculture use water more efficiently, increase yields and protect the environment.

In the first quarter of 2023, a plan was approved to install 614 Smart Water devices and 525 Diver devices, but despite the lack of funds, 35 Smart Water devices and 209 Diver devices were installed at water facilities[8]. Late allocation of funds from the budget also leads to excessive waste in water use.

[6] Указ Президента Республики Узбекистан "О стратегии развития нового Узбекистана на 2022 — 2026 годы". Указ Президента Республики Узбекистан, от 28.01.2022 г. № УП-60.
[7] http://www.ach.gov.uz/uploads/0f201f4b-3b58-cd8d-3e4b-a5b3e6666368.pdf
[8] https://water.gov.uz/uz/page/1/76

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Subsidizing the digitalization of water use in agriculture is one way to support the development of agriculture and improve the efficiency of resource use in this industry. Digital technologies can help agricultural enterprises manage water resources more efficiently, improve the productivity and quality of agricultural products, and reduce the negative impact on the environment.

Subsidizing the digitalization of water use in agriculture can be provided in the form of grants or subsidies that allow agricultural enterprises to purchase the necessary equipment and software to automate and manage water use processes.

In addition, such subsidies can support the training and retraining of staff in the field of digital technologies, which will allow agricultural enterprises to use new technologies more efficiently.

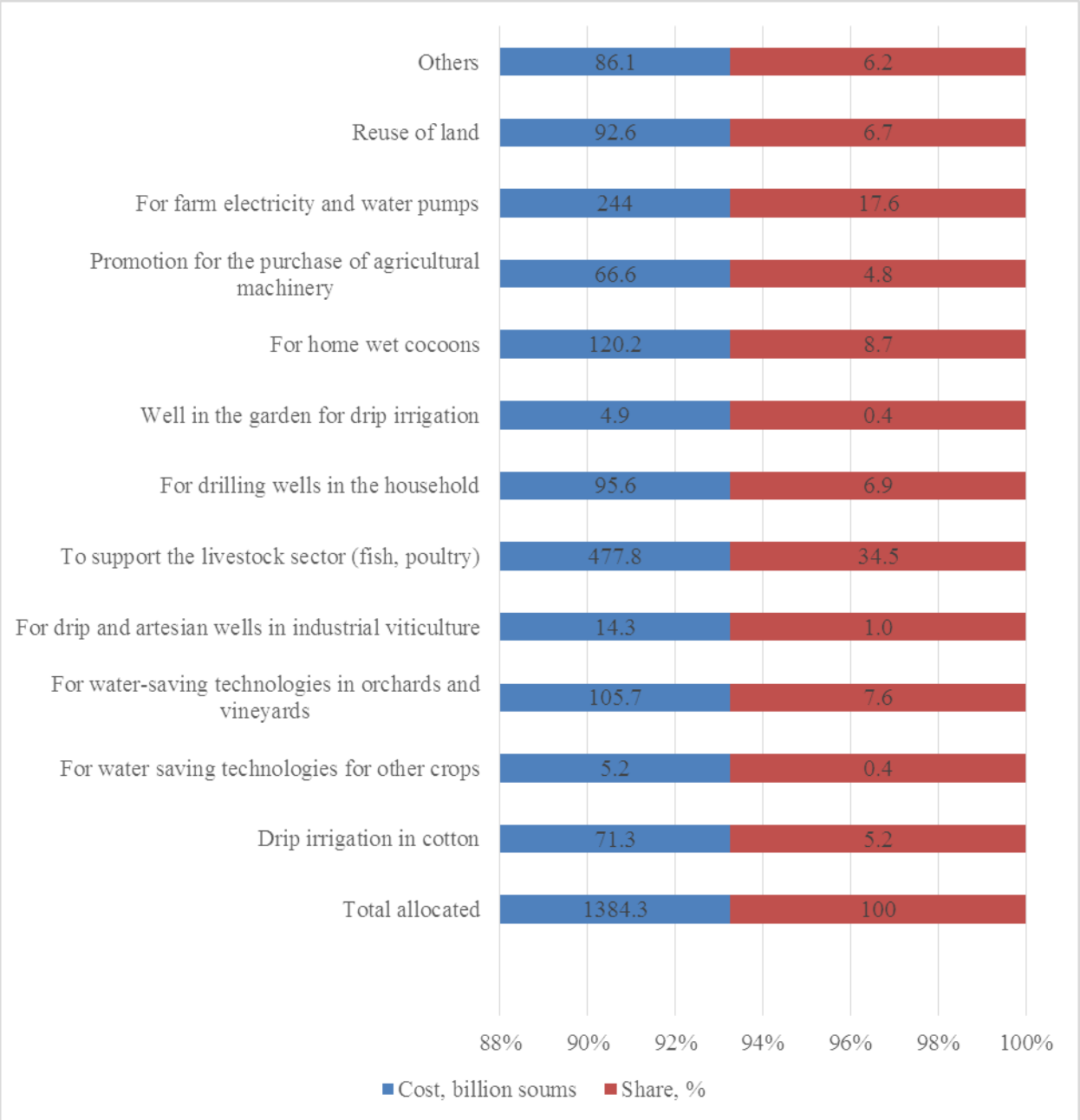

Diagram 1. Directions of subsidies allocated in the republic in 2022[9].

In the Republic of Uzbekistan, attention to drip irrigation of crops in agriculture is growing every day.

[9] Prepared by the author based on information from the Ministry of Agriculture of the Republic of Uzbekistan.

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For example, in 2022, 14.5 percent of the total amount of allocated subsidies or 200.7 billion soums was spent on water-saving technologies. These allocated funds do not meet our current needs.

Subsidizing the digitalization of water use in agriculture can be part of a more general strategy for the development of agriculture and the economy of the region as a whole. However, it must be taken into account that subsidies cannot be the only way to stimulate agricultural development, and other factors such as tax incentives, investment in infrastructure and marketing activities should be taken into account.

Conclusion and suggestions.

The implementation of water-saving digital technologies in agriculture is a crucial step towards sustainable water management and ensuring food security. Through the review of literature and analysis of case studies, it is evident that digital technologies such as drones, automated irrigation systems, intelligent water management systems, and data analytics can significantly improve water use efficiency and crop yields.

However, the adoption of these technologies in agriculture is often hindered by various factors such as high costs, lack of awareness, and technical know-how. Therefore, it is essential to address these challenges through various strategies such as government incentives, capacity building programs, and public-private partnerships.

Furthermore, the success of digital technologies in agriculture depends on their integration into the broader water management policies and practices. Therefore, there is a need for the development of coherent and coordinated policies that support the adoption and scaling up of digital technologies in agriculture.

In conclusion, the implementation of water-saving digital technologies in agriculture has enormous potential for improving water use efficiency, increasing crop yields, and promoting sustainable agriculture. However, the successful adoption and scaling up of these technologies require a holistic approach that addresses various challenges and promotes collaboration between different stakeholders.

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