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THE ROLE AND IMPORTANCE OF DIGITAL TECHNOLOGIES FOR INNOVATIVE AND SUSTAINABLE DEVELOPMENT OF THE AGRICULTURAL SYSTEM OF THE REPUBLIC OF UZBEKISTAN

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Abstract

This article focuses on the issue of innovative activities to ensure the sustainable development of the agro-industrial system of the Republic of Uzbekistan. As an author, the problem of clarifying the role and importance of the digital economy in the introduction of innovations is specially addressed. In the article, special attention is paid to the substantiation of promising directions that allow to increase the level of innovative activity of agricultural production with the help of scientific examples. The pros and cons of the industry are analyzed. Also, the process of changing agriculture in Uzbekistan through the introduction of modern digital technologies is highlighted. It discusses the benefits of data-driven decision-making, precision agriculture, smart irrigation systems, remote monitoring platforms and data analytics tools to improve agricultural productivity, resource efficiency and environmental sustainability in the country.

Keywords: *Agriculture, water management, remote, monitoring, efficiency, resources, ecology, innovation, technology, irrigation, farming, digital economy,·digital innovation,·sustainable development, smart agriculture*

Introduction. If we analyze the 100 goals of the development strategy of the Republic of Uzbekistan clearly and separately, the goal of the sustainable development strategy of the economic sector today is to ensure stable indicators of economic growth, competitiveness of agricultural production, socio-economic development based on the optimal use of innovative technologies. , solving production, technological, natural and environmental problems, scientific and technological potential, updating networks, equipment and technologies, expanding markets. In the current economic conditions, the implementation of the achievements of scientific and technical progress in some cases does not correspond sufficiently to the development of the innovative process and innovative activities. In most cases, the effectiveness of the innovation process is determined by the willingness of business entities to introduce and use knowledge-intensive technologies, one of which is digitization. The basis of the stable operation of networks and sub-sectors is the use of innovative technologies that provide structural changes in each direction of agriculture, increase production and cover material needs. The answer to the problems of instability lies in innovation activity, strengthening, optimization of its implementation and commercialization. In addition, the development of digitization will become the main vector for increasing production efficiency. Uzbekistan has a long history of agricultural production, and different crops are grown in different climatic zones of the country. However, traditional farming practices often face challenges such as water scarcity, inefficient resource allocation, and limited access to modern technology. By adopting modern digital solutions, Uzbekistan is transforming its agricultural landscape and water management systems to overcome these barriers and unlock the potential for sustainable growth and development.

Methodology. This article uses the following methods as a methodology: literature analysis, statistical analysis, data analysis, interviews and questionnaires. Scientific articles, reports and statistics in the field of innovative technologies and digital economy were studied. Through this, global and local experiences of introducing innovations in the field of agriculture were analyzed. Statistical data on agriculture of the Republic of Uzbekistan were collected and analyzed. Based on this information, the implementation of digital technologies and its results are shown. Successful examples of the introduction of digital technologies in agriculture in Uzbekistan and other countries are given. These examples show the effectiveness and advantages of innovative technologies. Practical experiences were collected with the help of interviews and questionnaires with agricultural specialists, farmers and entrepreneurs. This information helped to identify problems and opportunities in the introduction of innovative technologies. Data collected using modern digital technologies and platforms were analyzed. Through this, ways to increase resource efficiency and productivity in agriculture are shown. These methodologies ensure the scientific basis of the article and increase the realism of the presented ideas and results.

Discussion. In recent years, Uzbekistan has been adopting modern digital technologies and innovations in order to revolutionize the agricultural sector and improve water management practices. With a rich history of agrarian traditions, the country is now using innovative solutions to overcome challenges such as water scarcity, increasing productivity and ensuring food security for a growing population. Agriculture is an important component of the national economy of Uzbekistan, it employs 33.2% of the labor force and accounts for 28.7% of the gross domestic product. In addition, it is very important for Uzbekistan, where about 26% of the rural population works in agriculture, and 49% of citizens live in rural areas. The main agricultural crops are cotton, wheat, potatoes, fruits and vegetables. However, in recent years, the effects of climate change, water scarcity, increasing crop diseases and other agricultural problems have seriously threatened agricultural productivity and significantly reduced farmers' incomes. Therefore, the need to introduce digital technologies is really urgent. As a result of the penetration of the mobile communication network and the increase in the use of smartphones in Uzbekistan, the flow of information has increased and the costs of telecommunications have decreased. As a result, new ways of developing digital technologies are expanding.

In Uzbekistan, the number of mobile subscriptions

per 100 inhabitants increased from 101.2 in 2019 to 117 in 2022 and is forecast to reach 131.8 in 2025, and the Internet penetration rate increased from 60.5 percent in 2020 to 64 in 2022. increased by 5 percent. It is predicted to increase to 67.7 percent in 2025.

In Uzbekistan, the use of mobile phones in the provision of various services and the delivery of information in banking, energy and agro-technical fields is growing rapidly. Based on these data, it can be concluded that there is a great potential opportunity for digitalization of agriculture and the entire economy in Uzbekistan.

From vertical farming and smart irrigation systems to remote monitoring and data analysis, a wave of digital technologies is reshaping agricultural practices in Uzbekistan.

One of the main technologies that has a significant impact on the agriculture of Uzbekistan is precision farming. Using satellite imagery, GPS tracking and sensor technology, farmers are now able to precisely monitor and manage their crops in real time. This allows for optimal allocation of resources, lower input costs and increased profitability. With sensor-equipped drones, farmers can now inspect their fields from the air in detail to identify areas that need attention, such as pest infestations or nutrient deficiencies. These insights enable farmers to make data-driven decisions that result in improved crop health and higher yields.

Another important aspect of the modernization of agriculture in Uzbekistan is the introduction of intelligent irrigation systems. Water scarcity is a significant problem in the region, and much of the agricultural land is dependent on irrigation. Smart irrigation systems use sensors and weather data to adjust irrigation schedules based on the specific needs of crops, resulting in efficient water use and reduced wastage. By implementing these technologies, farmers can save valuable water resources and provide optimal growing conditions for their crops.

In addition, remote monitoring solutions are playing an important role in changing agricultural practices in Uzbekistan. By deploying sensors across fields and using cloud-based platforms, farmers can remotely monitor critical parameters such as soil moisture, temperature and humidity. This real-time data allows farmers to make informed decisions about when to irrigate, fertilize or apply pesticides, leading to increased efficiency and productivity. Additionally, the integration of data analytics tools allows farmers to analyze trends over time, identify patterns, and optimize farming practices for better results.

Digital innovations in the field of water resources management are having a significant impact in Uzbekistan. The country is deploying technologies such as water quality sensors, automated water distribution systems and online monitoring platforms to improve the efficiency of water management practices. By monitoring water quality in real time, authorities can detect pollution incidents early and take prompt action to prevent adverse effects on agricultural production and public health. Automated water distribution systems ensure fair and efficient distribution of water resources, reduce wastage, and improve overall sustainability. Uzbekistan faces problems related to water scarcity and resource management in agriculture. Fortunately, there are several modern digital technologies and innovations that can be useful in these areas. Here are a few key examples: precision agriculture technologies: satellite imagery and remote sensing: collect data from satellites on soil moisture, crop health and field conditions to enable targeted application of water, fertilizers and pesticides. This reduces waste and optimizes the use of resources. Internet of Things (IoT) Sensors: Sensors placed in fields can continuously monitor factors such as soil moisture, temperature and nutrient levels. This real-time data helps farmers make informed decisions about irrigation, fertilization and pest control.

Geographic Information Systems (GIS): GIS creates maps with layers of data on soil types, water availability, and crop suitability. This allows better planning of land use and implementation of targeted activities. Water management technologies: Smart irrigation systems: These systems use sensors and automation to deliver water directly to plant roots, minimizing evaporation and water waste. Drip Irrigation: This method delivers water through a network of pipes directly to the root zone of plants, reducing water loss and increasing efficiency.

Decision Support Systems (DSS): These computer programs use information about weather, soil moisture, and crop water needs to suggest optimal irrigation schedules and help farmers conserve water.

Additional Innovations, Drones: Drones can be used to monitor crops from the air, identify areas of stress or disease, and apply precise amounts of pesticides or fertilizers. Blockchain technology: This technology can be used to track water usage and provide transparency in water distribution, especially important in water-scarce areas. Modern digital technologies and innovations that can be used in agriculture and water management in Uzbekistan include: Smart agriculture: using AgTech technologies to increase productivity, protect crops and address climate change. Water-saving technologies: drip irrigation, use of indoor and outdoor modern farming technologies and digital information and communication management systems.

Cultivation of indigenous and tropical crops indoors and in greenhouses using technologies developed in developed countries. Growing crops using artificial substrates, aeroponics and hydroponics in smart greenhouses with digital program control. Resource-saving technologies: accurate management of mineral fertilizers, use of navigation equipment to record agricultural activities. Robotics and drones for equipment, animal care and farmland monitoring. Training of specialists in the field of high technologies and introduction of foreign experience. Digital management of agriculture, information exchange and electronic document management. Monitoring of the condition of agricultural crops and land, advice for farmers. Creation of electronic data banks and platforms for agricultural management and monitoring at different levels.

Conclusion. In conclusion, modern digital technologies and innovations are changing agriculture and water management in Uzbekistan, paving the way for increased productivity, stability and resilience to changing challenges. By harnessing the power of sustainable and vertical farming, smart irrigation systems, remote monitoring and data analysis, modern agricultural techniques and foreign expertise, the country is showing its readiness to achieve food security, economic prosperity and environmental sustainability. As Uzbekistan continues its digital transformation, the future of agriculture and water management practices is bright. As we continue to invest in digital solutions and technology transfer, it

would be safe to say that Uzbekistan is ready to maximize its agricultural potential, ensure food security and protect its natural resources for future generations. We believe that the relevance of the topic will increase if we simultaneously pay attention to the issues of increasing the organic and medicinal level of products in further research. We present the unique results of innovations in Uzbekistan. The introduction of e-government in the field of information technology reduced the period of receiving public services by 50 percent. The introduction of drip irrigation in agriculture made it possible to increase the yield of cotton by 20%. The introduction of robotic production in industry has reduced labor costs by 30 percent. The introduction of distance education in the field of education increased the educational coverage by 20%. Uzbekistan intends to continue to introduce innovations in all aspects of life. This is one of the main directions of state policy. As a result of the implementation of the innovative development strategy of the Republic of Uzbekistan for 2019-2021, ensuring innovative and technological development in economic sectors and the social sphere, including agriculture, energy, construction, education, health care and great progress has been made in terms of promotion.

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