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Role and Development of Digital Agriculture in Uzbekistan

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Abstract. Digital technologies in agriculture are the automation of technological agricultural processes through digital modeling of all production cycles. The penetration of digital technologies into the field of agricultural work is increasing every year. The main reasons for this are the need to reduce production costs and increase the productivity of the agricultural sector.

Key words: agriculture, precision farming technologies, digital technologies, digital economy, digital agriculture.

In the modern world, digital technologies cover almost all spheres and sectors of the economy, including one of the most important and priority sectors of the national economy - agriculture. The transition to digital agriculture is one of the key priorities for the development of the Republic of Uzbekistan, since it is the level of digitalization that will determine the country's competitiveness in the new technological paradigm. Digitalization will not only accelerate the growth and development of agriculture, but also improve its quality. And most importantly, digitalization will reduce the number of hungry people in the world, whose number, according to 2022 data, amounted to more than 828 million people. [6]

The term digital - digital, comes from the word Digitus, which in Latin means "finger". Since people counted numbers simply on their fingers for a long period of time, thanks to this, the decimal number system became the main one. However, only whole numbers can be counted on the fingers, for this reason the term "digital" is used to denote a device operating in a discrete range of values. [5]

The digital transformation of agriculture is based on the use of advanced innovative technologies such as the Internet of Things (IoT), blockchain, artificial intelligence and machine learning, cloud and mobile technologies, and big data analytics. Today, the use of information technology in agriculture is not only the use of computers. Digital technologies make it possible to control the full cycle of crop or livestock production - "smart" devices measure and transmit the parameters of soil, plants, microclimate, etc. (Fig. 1). Farmers use mobile or online applications to determine the favorable time for planting or harvesting, calculate the fertilizer schedule, predict the harvest, and much more. All data from sensors, drones and other equipment is analyzed by special programs.

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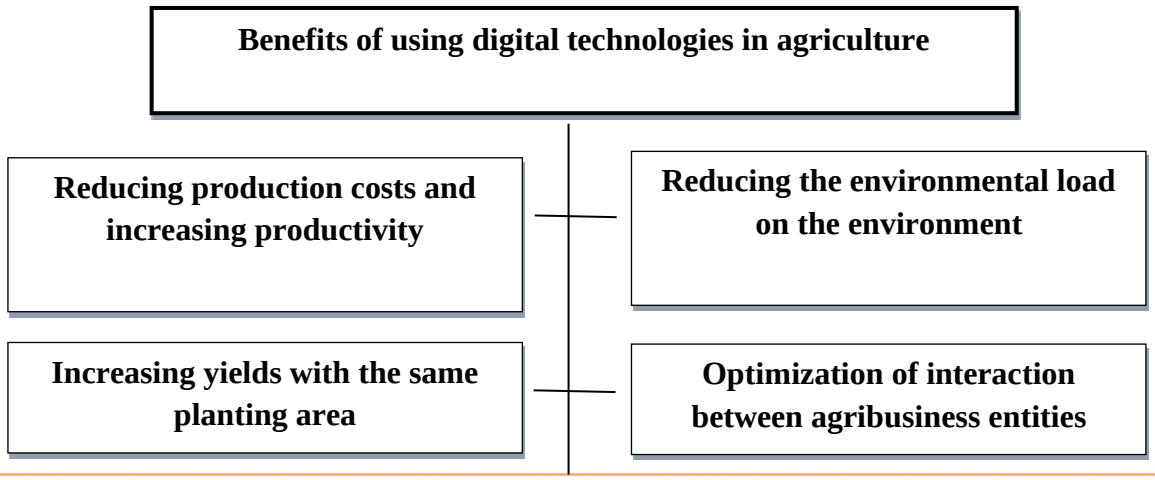
Figure 1. Data sources for monitoring the full cycle of crop production

The capabilities of Web and mobile applications are not limited to access to live market information and weather reports, they also help in obtaining information about logistics services, financial resources and products such as credit and insurance, making the interaction in the process of doing agribusiness transparent and easy.

The penetration of digital technologies into the field of agricultural work is increasing every year. The main reasons for this are the need to reduce production costs and increase productivity. This is most clearly manifested in precision farming technologies, the basis of which is digital information used to optimize the management of agricultural production. In the developed countries of the world, in particular, in the USA, soil sampling (98%) and the use of the Internet (94%) are most common, monitoring systems that form yield maps and the GPS world positioning system (80%) are also widely used. widespread use of satellite and aerial photographs.

According to experts, the advantages of precision farming technology are that:

- the use of chemical and natural fertilizers, water, fuel and other resources is carried out in optimal quantities and modes;
- quantitative and qualitative indicators of products increase;
- productivity increases with a constant planting area;
- the negative impact on the environment is reduced;
- the risks of crop loss are reduced (Fig. 2).



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Increasing the sustainability of agriculture

Figure 2. Benefits of digital technologies in agriculture

In addition, the experts determined the amount of added value when using certain precision farming technologies:
1. High-tech application of fertilizers, with an investment of 65 billion dollars, gives an added value of 200 billion dollars.
2. The use of precision seeding systems, with an investment of 45 billion dollars, gives an added value of 145 billion dollars.
In Uzbekistan, the processes of introducing innovative and information and communication technologies into the agro-industrial complex have intensified with the adoption of the Decree of the President of the Republic of Uzbekistan "On approval of the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030", which identifies 9 strategic priorities for the development of agriculture, providing for the transition to digital agro-food system. [1]
Considering the importance of digitalization of agriculture, in order to implement the Decrees of the President of the Republic of Uzbekistan “On approval of the “Digital Uzbekistan - 2030” strategy and measures for its effective implementation” [2] and “On further improvement of the knowledge and innovation system, as well as the provision of modern services in agriculture economy” [3], the Ministry of Agriculture of Uzbekistan, together with the Food and Agriculture Organization of the United Nations (FAO), is implementing the project “Preparing the Foundations for the Digital Transformation of Agriculture in Uzbekistan”, aimed at solving problems related to the introduction of innovations and digital transformation of the entire agri-food sector . One of the challenges is to have a clear vision and roadmap in promoting innovation and digital agriculture, increasing cooperation and improving knowledge sharing between farmers, entrepreneurs, research and advisory services at the national and decentralized level.
It should be noted that at present digital technologies in agriculture of Uzbekistan are being developed in several main areas. Growth rates in various areas are significantly different, but at the same time, every year one can note the development of digital technologies in all these areas. For example, today, many advanced livestock farms of the republic already use various elements of a "smart farm", including robotic milking and feeding technologies, a veterinary control system, a breeding record program, herd management, energy-saving ventilation systems, automatic lighting and climate control. [4]
The most common digital technologies in crop production include:

1. Monitoring the state of crops, calculation of index indicators of plant mass. For these purposes, images taken by drones, as well as images from satellites, are used.
2. Estimated calculation of the future harvest. Using a tablet, you can collect the main yield indicators in a particular field. Then special software performs calculations and generates accurate data on the current state of affairs with the planted crop.
3. Monitoring and forecasting future harvests. Accumulation of information data on images from satellites, from special sensors that are installed on the technological devices of farmers. The situation with the grain harvest, humidity level, and other characteristics is assessed.
4. Detection of pathogenic manifestations, weed plants, insect pests. Continuous monitoring studies of soil changes, such as the level of nutritional qualities of the soil, the amount of organic elements, and so on.

It should be taken into account that the effective implementation of the digitalization of agriculture is primarily due to the creation of the necessary conditions for this and the solution of issues related to the lack of financial resources for the introduction of information and communication technologies in most agricultural producers and other problems.

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The main problem is the rather high cost of introducing digital technologies, and the vast majority of farms, as a rule, do not have enough funds. Many people are also afraid of complex modern computer technology, since in rural areas there is no training in the basics of computer programming and there are few specialists who can commission and further maintain precision farming technological equipment. The lack of digital skills among farm owners can be a major barrier to digital transformation. An important problem is the low level of connection of settlements to the Internet or the overpriced and low bandwidth of the Internet. In addition, there is very little practical implementation of innovative projects, which also stops farmers. And almost all innovative digital technologies are completely new, rapidly changing and improving. Such a rapid development of technologies implies a small amount of practical implementations. and, as a result, causes difficulties in evaluating their usefulness in various conditions of use.

In order to eliminate the problems that impede the more intensive promotion of "digital agriculture", it is necessary to intensify work in the republic to support start-ups that will be viable in the context of global digital competition; creation of business incubators, technology parks, research centers, research and production clusters and other projects that contribute to the introduction of innovative technologies; ubiquitous and accessible education of the rural population in digital literacy; expanding the coverage radius of fixed and mobile networks, ensuring coverage of the country's territory with the Internet from 5G and higher; increasing the investment attractiveness of agriculture, etc.

Summing up, we can state that digital technologies have become a necessary condition for the successful development of any industry, a source of their additional profitability. The main areas of digitalization of agriculture are related to reducing losses during cultivation, harvesting and storage, reducing the misuse of working equipment, improving product quality through regular and rapid monitoring in livestock and agriculture, as well as developing personalized marketing tools through automation and data management technologies. In turn, to ensure the above tasks through digitalization, it is necessary to timely and successfully implement the measures and activities provided for in the "Roadmap" for the implementation of the "Digital Uzbekistan-2030" Strategy, and aimed at developing four key areas:

e-government development;
development of the digital industry;
development of digital education;
development of digital infrastructure.

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