



The Role and Significance of Digital Innovations in the Development of Agriculture

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Abstract: This article discusses the role and importance of digital innovations in the development of science, technology and agriculture, as well as their relationship. The work carried out within the framework of the decision "On approval of the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030" was carried out as a result of the introduction of experience and achievements in the digitalization of world agriculture. Higher values are provided in the fields. Also discussed are the advantages and disadvantages of the innovative development of the agricultural sector, as well as the priorities for the formation of an effective innovation system that contributes to its sustainable development.

Keywords: agro-industrial complex, Platform, wireless sensors, innovative technologies, scientific and technical development, intellectualization, GPS-navigation, integration, remote sensing, economic efficiency.

Introduction

The concept of digitalization of agriculture and effective management through it is considered a relatively new concept for modern society. In a general sense, it is common to understand this, that is, to conduct agricultural activities based on digital innovative technologies.

At the government level, the digitization of agriculture is defined as follows: Reduction of the human factor in the field, data obtained through the digitization of agricultural activities, enabling rapid information exchange between lower and upper management bodies, accuracy and transparency. A system based on digital innovative technologies that reflects information - Platform, and through this, practical and effective development of the factor of production by means of modern digital technologies. This system is based on the processing of large-scale digital data, the results of their analysis allow increasing the efficiency of production activities, improving technological solutions and equipment, developing storage systems, sell, deliver, that is, from the finished product to the final demand. ensures that it reaches consumers. Digitization of agriculture has many advantages. At the same time, it also faces a large number of risks. The opportunities it opens up exceed all possible risks. Today, the digital economy is penetrating all areas of society and all sectors of the economy. Agriculture is no exception. Agriculture is a set of branches, and the national economy performs a priority task in providing the country and its population with food.

Despite the fact that the agricultural sector of the economy includes many areas, the main ones are plant and animal husbandry. Cultivation is based on cultivating land and growing crops (grains, vegetables, fruits, etc.). The basis of animal husbandry is breeding of agricultural animals, it is customary to divide it into two types - meat and meat-dairy livestock. Agriculture plays a major role

in the country's economy. It not only supplies the state and the population with food, but also forms agricultural raw materials for the production industry, primarily light and food products. Currently, there are many problems in the field of agriculture around the world.

The main ones are:

- ✓ the problem of depletion of land resources;
- ✓ highly dependent on natural and climatic factors;
- ✓ seasonality of production;
- ✓ reduction in overproduction of food products, etc.

Considering the role of agriculture in the national economy, its development is one of the priority tasks of the state. The government of our country has always actively supported the agricultural sector of the economy. The modern stage of social development of informatization of agricultural sectors is characterized by high technological progress. Over the past 30 years, computers and information technologies have firmly entered the life of society, including production and non-production sectors of the economy. Agriculture was no exception. Today, the acceleration of informatization is the basis for ensuring the stability of future development. The basis of consistent economic growth is innovation. As mentioned above, agriculture, as one of the main branches of the national economy of many countries, faces many difficulties and problems. To solve them, we need to reduce the burden of the man-made environment on the agricultural economy; improvement of the technologies used; growth of human capital, it is necessary to increase their safety during the production of food products. Based on the experience of world agriculture, modern digital agriculture is the only solution that will increase the profitability of agricultural production and prevent the lack of potential workforce in this field.

Modern information technologies are taking a firm place in farming culture: from centimeter-accurate sowing of seeds and its planning, from irrigation automation and digital simulation of crops to calculation of feed for feeding farm animals. For example, the famous Italian company erisson, which actively uses the system of remote monitoring of vineyards in Italy, has managed to significantly reduce the amount of pesticides used by farmers with the help of wireless sensors. Thanks to the development and introduction of modern innovative information technologies, not only the productivity of agriculture will increase, but also financial and labor costs will decrease. As a result, product quality and profit increase. In order to eliminate the current and future threats to food security in the agricultural system, society needs a new type of agriculture based on the use of modern information technologies, principles of sustainable development and a zero-waste model.

"Smart" agriculture is modern technologies for decision-making, ecosystem modeling and design, agricultural automated systems based on integrated automation and robotics of production. Intellectualization of the agricultural sector allows, on the one hand, to reduce the amount of excessive use of external resources (agrochemicals, inorganic fertilizers, fuel, etc.), and on the other hand, to make maximum use of them. Production factors are local nature (organic fertilizers, biofuel, renewable energy sources, etc.). The use of modern technologies for the "intellectualization" of agriculture allows:

- ✓ preservation and restoration of beneficial properties of underground water and soil;
- ✓ ensuring ecologically clean and effective fight against pests;
- ✓ remote monitoring of compliance with certification requirements for organic agriculture.

As a result, the agricultural sector, including production opportunities, will expand and the efficiency of using the resources of the agricultural sector will increase. In this regard, the strategy for the development of "Smart Agriculture" technologies in the Republic of Uzbekistan is based on the President of the Republic of Uzbekistan's "On Approval of the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030" 2019 Decree No. PF-5853 dated October 23 and "On the approval of the strategy of "Digital Uzbekistan - 2030" and measures for its effective implementation" Decree No. PF-6079 dated October 5, 2020, "On "On measures to implement tasks

in 2020 set in the strategy of agricultural development of the Republic of Uzbekistan for 2020-2030" dated January 28, 2020 PQ-4575 and "Digital economy and electronic government "On measures for wide implementation" was developed in order to ensure the implementation of decisions PQ-4699 of April 28, 2020, and in this regard, a number of systematic works are being carried out in the agricultural sector of our country.

Today, the acceleration of globalization, especially the problems related to the "Covid-19" epidemic, has a negative impact on the development indicators of the world economy, and has once again proven the need to develop the innovative economy in countries, including improving the efficiency of innovative management of enterprises. . On average, more than 50 percent of GDP in economically developed countries is created thanks to modern management based on innovations and technologies. In particular, according to the Global Innovation Index-2021, countries such as 87.9 percent of Switzerland, 78.0 percent of Sweden, and 76.0 percent of the United States have a leading share in the implementation of innovations in national economic sectors in the world.

Uzbekistan took 86th place among 132 countries in the Global Innovation Index-2021 rating. Before that, our country was ranked 93rd in 2020 and 122nd in 2015. It is determined that by 2030, our republic will be among the top 50 countries in the Global Innovation Index. The Global Innovation Index consists of 81 indicators and describes the innovative development of countries at different levels of economic development.

Table 1

Areas	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Republic of Uzbekistan	106,2	107,2	106,6	106,3	106,1	106,3	101,0	100,2	103,3	102,7	103,9
Republic of Karakalpakstan	94,9	119,3	103,5	106,6	109,8	108,3	103,1	100,6	107,0	102,3	104,2
Andijan	108,9	107,8	107,1	106,9	106,3	106,4	99,9	106,3	103,0	101,1	104,5
Bukhara	107,1	106,3	106,6	106,7	107,1	108,4	103,5	102,9	103,6	101,9	104,7
Jizzakh	106,2	106,9	107,0	106,3	106,7	106,3	103,5	99,7	106,4	102,7	104,2
Kashkadarya	104,9	107,1	107,4	106,0	106,1	106,5	103,3	96,5	101,4	103,7	101,3
Navoi	108,3	106,2	106,9	105,9	106,6	106,1	103,3	102,1	101,6	103,3	104,4
Namangan	107,5	107,2	107,9	108,0	106,3	107,4	103,3	102,2	102,7	104,0	107,0
Samarkand	108,0	106,6	107,0	106,8	107,1	108,4	100,4	94,1	103,1	102,5	103,1
Surkhandarya	108,8	108,0	106,9	106,6	106,3	104,7	104,5	97,2	103,5	105,3	104,2
Syrdarya	105,5	108,9	106,0	106,0	105,5	105,8	93,0	96,5	108,4	101,8	103,8
Tashkent	103,7	104,1	103,3	104,1	103,3	101,9	96,9	98,8	101,1	100,1	104,1
Ferghana	107,7	106,0	107,0	106,1	105,7	105,7	97,1	109,7	103,5	104,9	103,2
Khorezm	100,3	110,3	109,7	106,2	105,5	107,0	101,4	98,0	103,8	101,7	102,9

Table 1. Growth rates of agricultural products by region (in percentages compared to last year).

In this table, we can see that the production of agricultural products in all regions of Uzbekistan is higher than 100% every year. If digitization is involved in the field, this indicator will increase, and new jobs such as IT-Agronomist will appear in the field. And our place in the rating will increase even more. Within the framework of the implementation of the activities planned in this strategy, in particular, it is planned to create a permanent online monitoring system of all products produced in the agro-industrial complex. Part of the cost of purchasing software and equipment for farmers has been mentioned. In this regard, subsidies are allocated by our state to farms that have introduced drip irrigation systems, and in this regard, it is known to everyone that water shortage areas are increasing the productivity of farms. known. Experts say that the introduction of digital technologies will increase the efficiency of agricultural production and attract young personnel to agribusiness. One of the goals of the agricultural digitization program is to create a unified information system. When this unified information system is created and put into operation, it will allow us to monitor all the processes in this system, such as what crops are planted on which plots of land determined by the

cadastral number of the enterprise, and how many hectares are not planted, as well as what kind of agrotechnical activities are being carried out in this system using space satellites. It allows landowners to determine the amount of mineral or organic fertilizers and chemical control agents, the amount of quality seeds, and to apply the required amount to the required point where there is a lack of fertilizer or chemical preparation. On the economic side, it reduces the costs of agricultural producers and increases the yield of crops.

In addition, the transition to digital agriculture, in accordance with the reforms being carried out in our country, is also important in the control of the decision and its execution, ensuring transparency and preventing greed. The introduction of digital technologies in agriculture will increase the profitability of the product, as well as attract young personnel interested in working with robotic equipment to the agricultural complex. As part of the digitization of agriculture, the Ministry of Agriculture wants to create a system for monitoring products produced in the agro-industrial complex. This allows you to monitor the movement of products from the field to the counter - low-quality products are not placed in stores.

Comprehensive digitization of agricultural products allows farmers to reduce costs by 23 percent. Thus, the average cost of land use using GPS-navigation technologies is 11-14%, with differentiated fertilization - 8-12%, and due to parallel plowing systems - 8-13%. "Up to 40% of the harvest is lost when agribusiness tools are not used efficiently."

Table 2

Indicators	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total - All categories	106,2	107,2	106,6	106,3	106,1	106,3	101,0	100,2	103,3	102,7	103,9
of farms	103,2	106,2	104,4	103,2	103,5	102,5	92,5	93,1	110,5	105,6	106,2
including: farms	107,7	107,7	107,7	107,6	107,4	108,2	104,5	102,3	99,2	100,5	101,5
dekhkan (personal subsidiary plots)	113,2	109,8	108,1	112,4	105,7	101,1	104,8	125,7	140,4	121,5	126,2
organizations engaged in agricultural activities	104,9	107,1	106,1	105,9	105,5	105,7	98,2	95,8	104,8	103,2	104,3
Crop production - All categories	102,9	106,0	104,2	102,8	103,3	102,3	92,2	90,5	110,2	106,2	105,5
of farms	107,9	108,4	108,9	109,4	108,2	110,2	104,6	99,8	97,6	96,4	99,5
including: farms	105,0	113,7	101,5	118,4	103,6	90,8	110,2	135,5	159,6	147,5	129,1
dekhkan (personal subsidiary plots)	108,0	107,4	107,3	106,7	106,9	107,0	104,1	105,7	101,6	102,1	103,5
organizations engaged in agricultural activities	110,2	110,6	108,3	108,4	105,7	106,2	96,7	137,5	113,8	99,4	113,5
Livestock products - All categories	107,5	107,3	107,1	106,6	106,9	107,0	104,5	104,0	100,2	102,7	102,4
of farms	119,3	107,2	112,6	108,7	107,1	108,5	101,7	118,9	123,5	91,5	121,0

Table 2. Growth rates of agricultural production (data for 2010-2021 are entered accurately)

Any program of modernization of agriculture should be aimed at solving this problem. Any ongoing reforms should improve the business of agricultural producers and at least not worsen the quality of products. When the entire process of production and sale of agricultural products is fundamentally rebuilt, it is actually called digital transformation. According to the analysis of experts, there are two factors that allow increasing the consumption of agricultural products in any country.

Firstly, the lack of modern mechanization and automation tools, extremely low labor productivity and high price per product unit for most of the country's agricultural producers. The transition from the model of sale of agricultural machinery and automation equipment to the model of payment for their functions according to actual volume or even consumption results, which is the basis of digital transformation, will solve the problem of equipment availability. As a result, labor productivity increases.

Secondly, digitization, due to the nature of interdependence, allows to connect a specific need with information of the end consumer and the capabilities of a specific agricultural producer, thus 80% of the retail price of the product eliminates many unnecessary middlemen, which is up to 1.5 percent. Together, these two factors increase the consumption of agricultural products in our country by 1.5 times, that is, the impact of the growth of consumption on retail compensates for the decline in prices, while the marginality of the business of agricultural producers increases and risks are reduced.

The main challenges of digitalization are the integration of all systems and business processes, new technologies significantly clarify the situation related to land and land use. This technology has another beneficial effect: it makes it possible to identify and adjust the number of bankrupt farms.

This is a very small figure compared to the gross income from agriculture. On the downside, there are many challenges that most businesses face. The main difficulty with modern technologies is the problem of integration. Systems should be integrated with all business processes in the enterprise. In countries with developed agriculture, satellite tracking systems have been introduced to monitor equipment and perform agricultural work. Some farmers often think that it is enough to buy an expensive system and everything will work immediately, but without checking how it works directly in the field, there will be no results. Until the farmer goes out into the field and "tills" the land, the satellite data is of little help to him. The farmer only sees many problems, but does not understand what they are related to.

Another problem is the search for ready-made options. Today, there is no ready-made comprehensive solution on the world market that provides automation and transparency of all agricultural and business processes in it. But in this regard, this process is slowly being formed over the years. Thus, there is a task to interconnect existing solutions, create a platform that ensures data exchange, and register some business processes from scratch.

On the basis of reliable and robust satellite navigation and GPS technology in agriculture and forestry, to its fully digital technologies, that is, agricultural robots, drones and multicopters and their software. According to Johannes Seidl Schulz, a leading expert in the Remote Sensing department at Geo Konzept, a German company that offers mortar development, installation and service services, "Collect facts about technological operations that take place in the field. work is a very difficult task. You need to know which of the drivers and mechanics was in the field and controlled this or that tractor, as well as which attachments were used. Usually, this information is filled in manually. Although there are software solutions and tools that allow us to determine these parameters. "Later, the question arises of how to process the information received from the technology.

All this depends on the IT landscape formed in the enterprise. Thus, it is possible to integrate with other platforms, because we provide it with the necessary information and documents. In a word, we want to achieve full transparency of information in the system," Seidl Schulz explains. "We receive information from three sources: GoGis and Minis programs used in the scanning process of drones created by Komania, GPS processing programs from Topcon and sensors installed on the tractor," Seidl Schulz continues. In Germany, there are prestigious organizations such as Next Farming, TeweStar, Harvio, which produce a number of software that provide practical support to the

activities of such agricultural enterprises, and Germany is at a high level in terms of digitization. If we focus on the German experience in the digitization of agriculture, high-tech agricultural machinery, agricultural applications, robotics or drones - digitization is an integral part of German agriculture today. It is the result of a representative study commissioned by the German Farmers' Association (DBV) and the Landwirtschaftliche Rentenbank (LR) and the Digital Association Bitkom, for which 500 Farmers with 30 hectares and more in the West and 100 hectares in the East have arable land in 2020. The survey was conducted in February and March of this year. More than 8 out of 10 farms in Germany (82 percent) use digital technologies or applications. Another 10 percent are planning or discussing it. It can be seen that even in a country like Germany, which has developed agriculture in the world, the current growth has been achieved through digitization of agriculture. The work being carried out in this regard in our country will bear fruit in the near future.

In conclusion, as mentioned above, the development of agriculture is directly related to the development of science and technology. As a result of scientific and technical progress, innovative, resource-saving technologies, high-performance machines, equipment, agricultural machinery and other mechanisms are being created for agriculture. There are many problems that prevent the development of an innovative type of development in agriculture. At the same time, the main economic factors that hinder the innovative activity of agricultural enterprises are the low innovative potential, the lack of own funds to expand this type of activity, the high cost of innovation, economic risk and payback periods. is the distance. It is also obvious that the agrarian reform requires its logical continuation. Inadequate financing of fundamental and applied agricultural science, creation of scientific and technical developments, private and state investments and their integration into agribusiness, innovative infrastructure in agriculture, underdevelopment of mechanisms for the development and stimulation of innovative activities are the reasons for the development of agricultural production. is preventing it. Recognizing the effectiveness and high importance of innovations for agriculture, it should be noted that the transition to the controlled development of innovative activities is a new organizational, aimed at providing scientific and technical, management and organizational conditions for the development of agriculture. requires the creation of an economic mechanism.

The development of this mechanism allows solving one of the main problems of agriculture by harmonizing agricultural science and production - increasing the scientific and technical potential of the sector, in particular: - by forming a system of introduction of new knowledge. Bringing innovations to real production; - growth of investment activity and increase of investments. As a result of human intellectual development, scientific and technical development should be carried out on the basis of a unified state innovation policy aimed at further improvement of scientific research, management and professional specialized work. It is necessary to provide motivation and incentives for the initiative and consistency of all participants in the implementation of the innovation process.

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