

Theoretical foundations of the innovative development of agriculture in Uzbekistan

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Abstract: *The article reveals the theoretical foundations of the innovative development of agriculture based on intelligent technologies. According to the world ranking of the potential positive impact of global technologies, "smart" agriculture ranks 1st in the world, therefore, the article provides an overview of foreign experience in the implementation of smart agriculture, and also analyzes the problems that hinder its implementation in Uzbekistan.*

Key Words: *innovation, agriculture, innovative development, innovation process, innovative activities, "smart" agriculture.*

1. INTRODUCTION:

Today, many firms, enterprises, industries, including those operating in the agricultural sector, are faced with the problem of limited economic resources, which determines their rational use, and this is solved, first of all, by applying such methods and creating such products that can provide profitability of production. In other words, innovations are becoming a decisive factor in achieving an increase in production and sales, a decrease in production costs, an increase in capital-labor ratio and labor productivity. World practice has proven that as a result of the use of the innovative factor due to the capital-labor ratio, economic growth is ensured by 30%, due to an increase in labor productivity - by 40%, and the use of innovative technologies increases the growth rate by 30%.

In addition to increasing profitability and other production and financial performance indicators of enterprises, the results of the introduction of innovations are reflected in the high socio-economic development of the territories.

The assimilation and further widespread dissemination of innovations are becoming key factors in the growth of production and employment in agriculture. It is here that the most significant reserves for improving product quality, saving labor and material costs, increasing labor productivity, improving the organization of production and increasing its efficiency are hidden. All this, ultimately, predetermines the competitiveness of enterprises and their products in the domestic and world markets, improvement of the socio-economic situation in the country's agricultural sector.

It is known that the successful development of the innovation process requires not only the accelerated production of high-quality scientific products, but also its active practical development.

As a result of the implementation of comprehensive measures to accelerate the transition to an innovative way of agricultural development, aimed at structural transformation and diversification of the industry, as well as rational use of resources, Uzbekistan managed to maintain the growth trend of agricultural production.

In addition, in February 2017, by the Decree of the President of the Republic of Uzbekistan Shavkat Mirziyoyev, the Action Strategy for the Further Development of the Republic of Uzbekistan in 2017-2021 was approved, in which great attention is paid to the development of agriculture "3.3. Modernization and intensive development of agriculture: ... widespread introduction into agricultural production of intensive methods, primarily modern water and resource-saving agricultural technologies, the use of high-performance agricultural machinery; expansion of research work on the creation and introduction into production of new breeding varieties of agricultural crops resistant to diseases and pests, adapted to local soil, climatic and environmental conditions, and animal breeds with high productivity ..."¹.

The problems of the theory of innovations are becoming more and more urgent, arouse increased interest among many scientists, as evidenced by the constantly increasing volume of publications, both in foreign and domestic science. The problems of innovative development of agriculture are the most serious today and are relevant for further study.

2. LITERATURE REVIEW:

A significant contribution to the study of the content of innovations, the innovation process, potential, their connection with the development of scientific and technological progress, the efficiency of production, including

¹ Decree of the President of the Republic of Uzbekistan "On the Strategy for the Further Development of the Republic of Uzbekistan" dated July 02, 2017 No. UP-4947.

agricultural production, was made by P. Drucker, V. Ivanter, O. Inshakov, P. Quintas, J. Keynes, N. Kondratyev, M. Porter, G.Ya. Goldstein, R. A. Fathutdinov, A. Romyantseva, S.D. Ilyenkova, I. Sandu, B. Santo, B. Twiss, E. Toffler, J. Schumpeter and others.

General approaches to increasing the competitiveness of domestic agriculture and the role of innovation in solving this problem are disclosed by A. Abduganiev, S. S. Gulyamov, A. M. Kadirov, B. Salimov, T. Kh. Farmonov, R.Kh. Khusanov, K. Choriev and others.

Despite the multifaceted nature of the problem under study, in agrarian science, the potential for innovative development of agriculture in terms of integration processes, small agribusiness is insufficiently argued, there are no developments to rationalize the organizational structure and forms of interaction between agribusiness participants, to justify models and standard solutions for the formation of innovative sectors of agricultural production.

3. MATERIALS AND METHOD:

The innovative development of agriculture is the basis for the growth of production and meeting the demand for agricultural products, contributes to an increase in the efficiency of the use of natural resources while preserving the environment, as well as improving the quality and standard of living of the rural population.

Innovation is the end result of innovation, which means activities aimed at using and commercializing the results of research and development to expand and update the range and improve the quality of products (goods, services), improve their manufacturing technology with subsequent implementation and effective implementation on the internal and overseas markets. Innovative activity involves a whole range of scientific, technological, organizational, financial and commercial activities, which together lead to innovation.

At present, in all countries of the world, the problem of increasing the competitiveness of the national economy has become aggravated, which can be solved through modernization, technical re-equipment of production, the rise of high-tech industries, transferring the economy of the region and the country as a whole to an innovative path of development.

The experience of industrialized countries shows how great is the role of innovation today. They help to change and improve not only goods and services, but also the organization management system, bringing it in line with the requirements of the modern environment. The intensity of innovation activity largely determines the level of economic development of the country. Currently, the most profitable enterprises are those that are focused on production and use of innovations in their activities.

The population of the planet in 2006 was 6.6 billion people. According to statistics, by 2050 the total population will exceed 9.5 billion. According to a report from the Food and Agriculture Organization of the United Nations, food production must increase by almost 70% by 2050 over 2006 to feed a rapidly growing population. Such an indicator can provide a constant increase in the level of agricultural productivity. At the same time, the implementation of “Smart” agriculture is of particular importance.

“Smart” agriculture, according to the world rating of the potential positive effect of global technologies, ranks 1st in the world, the digitalization of agriculture requires an active phase of investment in companies in the agro-industrial complex.

The active introduction of “smart technologies” in the field of agriculture has contributed to the creation of high-tech companies in this area. For example, if in 2010 there were about 20 high-tech companies working in the field of agriculture in the world, and the venture capital market was \$ 400 thousand, then in 2013 the growth of venture capital began. By 2016, more than 1.3 thousand new technology startups were invested, the volume of investments amounted to 3.2 billion dollars. The most active countries attracting investments in agricultural startups are the USA, China, India, Canada, Israel.

The global market for intelligent agricultural solutions was estimated at about \$ 13 billion (compared to 2015, the growth was 5%).

According to analysts' forecasts, the average annual growth rate in the coming years will be 11.2%, and by 2026 this market will be able to reach \$ 40 billion. It is argued that the transition to the concept of “smart agriculture” is proceeding slowly but surely. Most of the market (about 53%) is located in North America, which is largely due to the high interest of US farmers in “smart” innovations.

It should be noted that, in general, Europe is still lagging behind the United States in terms of the use of “smart” devices in the agro-industrial complex. Despite the fact that in the EU about 80% of agricultural machinery is already sold with navigation systems, no more than 30% are actually connected to the network. The reason for this is a much smaller share of large farms than in the United States. In Europe, small family farms prevail, which already have enough equipment and are in no hurry to change it to “smart”, and therefore more expensive.

In the post-Soviet space (Russia, Ukraine, Belarus, Kazakhstan), the main users of new technologies are large agro-industrial complexes, as a rule, with private capital. In addition to the financial component, the main obstacles to the use of “smart” devices in the agricultural sector of these countries are the insufficient development of infrastructure and coverage of 3G / 4G wireless communications, as well as the rather high energy intensity of existing technologies.

The United States of America is a leader in the use of smart technologies in agriculture. Such technologies are most actively implemented in animal husbandry, fishing, as well as in the sphere of grain growing. The main innovative solutions that can be attributed to the concept of “smart agriculture” in the United States are:

- a) unmanned aerial vehicles;
- b) “Bigdata” system;
- c) sensors and sensors;
- d) GPS;
- e) IoT platforms – software designed to connect Internet of things to the cloud (Internet storage of information) and thus provide remote access to them, etc.

These solutions have shown their effectiveness. So, according to experts, the results of the implementation of the GPS monitoring system in agriculture are:

- a) reduction of fuel costs up to 50%;
- b) reduction of vehicle mileage up to 30%;
- c) reducing the misuse of transport by two times;
- d) improving the organization of work of the driver’s staff, increasing the level of transport safety and meeting the deadlines for the work.

Much attention is paid to the storage system and product sales. Smart storages for vegetables and fruits allow you to monitor the condition of products during storage using specially set algorithms in real time (storage temperature, humidity level, carbon dioxide content), which helps to make the right decisions. For example, the developments of the American company CheckItNow check the temperature, humidity and illumination of the room themselves. If the conditions are violated, the system corrects the situation and notifies the warehouse owner about changes.

Electronic trading platforms for farmers are used to promptly communicate agricultural producers (farmers) with purchasing organizations that are also involved in the direct sale of products, which reduces the time for product delivery from the field to the counter.

For example, Global Precision has linked farmers and grain brokers through its BlockGrain.io platform. Using blockchain, this platform automates the entire grain supply chain. As the grain is harvested from each field, all information about the harvest is collected and displayed in real time in the program, and then sent to the suppliers’ warehouses, distributed among them depending on the required quality and price.

One of the main advantages of the Netherlands in agriculture is the implementation of knowledge and technology. The trinity (triangle) “producers – state – science” gave the country a great advantage in competition on the world stage.

According to experts, the main factors for the successful implementation of “smart technologies” in agriculture and increasing the efficiency and competitiveness of the industry are:

- a) effective interaction of the agri-food sector with scientific research institutions;
- b) establishing a vertical system (companies, cooperatives), which includes all processes, from growing agricultural products to delivering finished products to consumers;
- c) sustainable cyclic processing of resources in the food industry;
- d) active encouragement of exporters and assistance to the entry of Dutch companies into new foreign markets.

The most successful interaction of agricultural enterprises with scientific institutions in the field of food and nutrition is considered to be the creation of an agricultural research cluster “Food Valley”. The main goal of the cluster is the introduction of innovations in agriculture. The structure of “Food Valley” consists of a consortium of more than 60 companies, institutes, experimental farms. They are united by joint research, development and public-private partnerships.

Israel is a country, most of which is desert, one of the first countries in the world to start using drip irrigation, and is constantly improving this technology.

One of the most promising is the development of the Israeli agrotechnical company Roots – smart pipes laid in the soil. Plants receive the strictly necessary amount of moisture, and this is monitored by special sensors that collect data on the state of the soil on land plots.

The RZTO (Root Zone Temperature Optimization) system calculates and sets the optimum ground temperature for each site. Water pipes heat the root zone in winter and cool it during the summer, maintaining a relatively stable temperature. In addition, pipes running along the soil surface are used to condense moisture from the air and irrigate plants. After the introduction of the technology, the yield of various crops increased from 10 to 66%.

Only 15% of Japan’s territory is suitable for agriculture. To compensate for scarce natural resources, the country is betting on the development of automation and sensors used in many areas of agriculture, including animal husbandry.

One of Japan’s largest IT corporations Fujitsu has developed the GyuHo SaaS (“walking cow” from Japanese) or Connected Cow (“connected cow”) system, which allows you to count the steps taken during the day using a special “bracelet” worn on an animal, Data on the physical condition of the cows is 154avourab and transmitted to the farmer’s smartphone or computer. The information is updated every hour, thanks to which specialists can adjust the feeding, milking and sleep of the animals. The main task of a smart “bracelet” is to calculate the 154avourable period for

conception. As a result, according to the system developers, the success rate of artificial insemination rises from 44% to 90%. The system allows you to monitor the process remotely.

The system was actively implemented in Japan in 2013. About 40 thousand cows are connected to the system. According to Forbes, by 2017, Fujitsu technology was used on 64 farms in Japan, Korea, Poland, Romania and Turkey.

Since 2008, Korea has been implementing a Green Growth strategy aimed at preserving the environment by introducing green technologies, developing renewable energy sources, reducing harmful emissions into the atmosphere, recycling household waste, etc. The strategy provides for the development of industries that will be able to simultaneously solve the problems of ecology, energy and economic growth. To ensure the “green growth” strategy, an amount equal to 2% of GDP is allocated annually, which is twice as much as they recommend to countries to spend on environmental protection. By 2020, the Republic of Korea plans to reduce its greenhouse gas emissions by 30%. Currently, “green energy” in the country covers about 40-50% of the total energy production.

In Seoul in 2012, the Global Green Growth Institute (GGGI) was established, which, as an international non-governmental organization, assists developing countries in the implementation of green technologies. In February 2019, Uzbekistan became a member of this international organization.

India focuses on enhancing the education of farmers: Agri Value Added Services are being introduced – mobile applications that provide farmers with information about weather, product prices, better technologies for growing crops, etc. Agricultural innovation and research centers have been established in each region.

Russian Federation. According to the Ministry of Agriculture of the Russian Federation, Russia ranks 15th in the world in terms of digitalization, in the country, 10% of arable land is processed using digital technologies.

Some of the leading enterprises in digital transformation are such large agricultural enterprises as the Rusagro agricultural holding, which processes almost 1% of all agricultural land in the country. The digitalization of the company began with the introduction of a resource management system – 1.5 thousand employees go out into the field with tasks generated in SAP ERP.

The Agrotterra company, in cooperation with the Israeli SMART Fertilizer, has successfully carried out an industrial experiment to install sensors on fields with a total area of one thousand hectares in the Tula and Kursk regions. This technology for a year of application increased the yield of soybeans by 11.5%, wheat – by 6.5%.

Among Russian companies that provide agricultural producers with a single IoT platform with specialized software, one can single out Rightech and kSense, which allow automating such aspects of agricultural activities as: Monitoring of vehicles and agricultural machinery, Storage and processing of agricultural products, Precision farming, Livestock management.

At present, the draft Concept for the Scientific and Technological Development of Digital Agriculture, Digital Agriculture, developed by the Ministry of Agriculture of Russia and the Russian Academy of Sciences is being discussed.

4. DISCUSSION AND ANALYSIS:

The current level of digitalization of domestic agriculture causes concern: the lack of scientific and practical knowledge on innovative modern agricultural technologies and methodology, the lack of a global forecast for prices for agricultural products, the lack of an adequate amount of information technology and equipment, as well as the underdevelopment of the logistics, storage and delivery system lead to high production costs.

Main problems:

- Lack of financial resources for the implementation of information and communication technologies in most agricultural producers. Only a small number of agricultural producers, mainly agricultural clusters, have the opportunity to purchase new equipment, use information, computer and telecommunication equipment and platforms. Along with highly profitable farms with access to efficient technologies, there are a large number of farms operating with outdated technologies.

- Lack of qualified personnel. An increasing number of farmers in the republic recognize the need for digital skills, however, the level of use of personal computers and the information and telecommunications network “Internet” is low, there is a serious gap in digital skills between individual groups of agricultural producers. The number of IT specialists working in agriculture is not significant, and several times less than in countries with a traditionally developed agricultural sector.

The current system of training, retraining and advanced training of personnel in the field of information technology and communications does not take into account the rapid pace of development of IT technologies.

- Insufficient development of infrastructure in rural areas for the introduction of digital technologies and platform solutions.

Currently, the telecommunications infrastructure is underdeveloped, remote settlements of the country remain organizations, electronic payments are developing and the regulatory framework in the field of electronic commerce is being improved.

At the end of 2017, under Uzbekozikovkatholding, a specialized company, LLC “Unmanned Technologies”, was created to operate unmanned systems that will be used to measure crops, monitor their development, which will allow timely updating of planning and cartographic materials and eliminating shortcomings in ongoing agricultural activities.

5. CONCLUSION:

In order to further improve the public administration system, create conditions for the introduction and development of the digital economy, improve the investment environment, as well as implement the Action Strategy in five priority areas of development of the Republic of Uzbekistan in 2017-2021, the Resolution of the President of the Republic of Uzbekistan dated July 3, 2018 No. PP-3832 "On measures for the development of the digital economy in the Republic of Uzbekistan", which identified the main tasks for the further development of the digital economy in the Republic of Uzbekistan, instructed to develop and implement in 2018-2020 the Program for the development of blockchain technologies.

At the same time, as noted in the decree of the President of the Republic of Uzbekistan dated November 21, 2018 No. PP-4022 "On measures to further modernize the digital infrastructure in order to develop the digital economy", the analysis of the actual state of affairs indicates the fragmentation of the implemented software products, which is due to the lack of a unified information technology platform that provides integration into a centralized data system.

The use of digital technologies in the agro-industrial complex makes it possible to increase the profitability of agricultural production through targeted cost optimization and more efficient allocation of funds.

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