Digitalization as a way to enhance innovation in agriculture

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Abstract. This material examines the main trends in the development of crop and livestock production, which are subject to the increasing introduction of information technologies. These trends contribute to significant improvements in the efficiency and speed of the process. The work will consider in more detail the features of the flow of such innovations.

1. General information
The entire modern life of society is closely related to the extremely fast pace of development of the digital economy, as well as its integration into all spheres of existence. At the moment, none of the sectors of the economy operates in complete isolation from the digital economy.

The Russian Federation has adopted and is implementing the program "Digital Economy of the Russian Federation" for 2017-2030. Within the framework of the agro-industrial complex, the main opportunities for economic growth are being identified, which are based on the principles and theses of the digital economy, which is a global systemic program of technical generation. It should be noted that activities in this area are in dire need of the introduction of more innovative ways of working with electronic resources, since this is one of the necessary conditions for agribusiness management. Successful activities in this direction can become the key to successful and sustainable development of the regions of the Russian Federation, its rural municipalities and settlements. To implement the digitalization program, the Government is developing a certain set of measures and tools that will allow the creation and implementation of competitive domestic research competencies and technological groundwork by 2031, thanks to which the successful formation of information infrastructure and information security will be achieved on the basis of organizations subordinate to the Ministry of Agriculture of Russia. Thanks to such measures, it will be possible to create and subsequently develop a viable digital environment, reduce all technological risks in the food sector, and significantly simplify the task of ensuring the competitiveness of the Russian Federation. It will also act as a tool for ensuring the national security of the state [1].

It is worth noting that digitalization is a process that implies the accelerated pace of development of various advanced business areas, the creation of new working specialties, Internet trade in professional computer equipment, training in the basic principles of using intelligent systems in animal husbandry.

There are various factors that can be divided into indirect and direct impact, one way or another affecting the introduction and subsequent use of digital technologies in the agro-industrial complex. The most important among them are the following:
Globalization of trade;
Constant climate change;
Growth of urban population;
Population growth;
Changing the preferences of the end consumer.
High rates of technological development of agriculture;
Transition from a product model to a service model.

According to scientists and experts, a quarter of the world economy in 2022 will use digitalization technologies [2].

In connection with such global trends, the agricultural sector of Kazakhstan should also demonstrate a high rate of implementation of the achievements of digitalization, since this will significantly reduce costs, increase productivity, and also optimize the workflow. According to the current plans of the state, 20 digital and 4 thousand advanced farms will be created in the country over the next 5 years.

The main area to be innovated is the processes of the register of permits for the issuance of certificates for livestock and crop production, as well as the monitoring of the movement of goods.

At the moment, an effective system of interaction with the Russian side has been implemented, which implies the exchange of data between the Russian and Kazakh systems of veterinary monitoring according to the issued permits. Also, the process of automation underwent monitoring and the process of turnover of grain receipts. The process of automating the issuance of subsidies in the agro-industrial complex is at the final stages of development.

2. Main part

It is worth noting that digitalization was being introduced more actively in the field of animal husbandry: at one time a greater proportion of animals was concentrated in a private backyard, which presented certain risks of veterinary safety and great difficulty in organizing veterinary activities.

On average, across all sectors of the economy, Russia ranks 43rd in the world in terms of the level of development of IT technologies.

In the agro-industrial complex, the situation is even worse.

“In Russia, there are five IT specialists per 1000 people working in agriculture, in Europe this figure is five times more. Technologically advanced enterprises invest no less than 350-500 rubles per hectare in digital, while medium-sized enterprises invest no more than 10 rubles. "

The share of Russia's digital economy in GDP is only 2.8%, which is 4.4 times less than in the UK and 2 times less than in the United States.

In the countries of the European Union, as well as the USA and China, a digitalization program has already been launched and is developing successfully. It got its distribution not only in plant growing, but also in animal husbandry.

Already, farmers can, without leaving their computer, monitor the condition of plants or animals, synchronize and save data for further analysis.

In animals, for example, all stages of production can be monitored, from feed supply to indoor climate. There are also sensors that transmit data about the physiological state of the animal (it determines the acidity of the stomach, the temperature of the animal, its activity, the period of sexual activity, provides information necessary to adjust the diet).

For plants, this is an electronic map of fields, which allows you to adjust technological operations for the current agricultural year, calculate the required amount of seed material, monitor plant growth and development, track equipment, control the harvesting process, determine fuel consumption, effectively use working time, etc.

Base stations are installed on agricultural land, which receive information and send it to the "cloud". The reports are then sent to mobile devices to the farm specialists. It can be noted that this entire system is quite expensive and requires special precision during its adjustment. It also requires skilled workers to service it.
In Russia, an analysis was carried out of the current state of the introduction of precision farming with a division into "advanced" and "digital" farms, according to the results it became clear that there were 114 advanced farms, 10 digital farms, by 2022 there would be 2,000 advanced farms across the country.

A digital farm is a farm powered by new tools and technologies, almost without human intervention. The main task of digitalization is to simplify the activities of farmers from the beginning to the sale of products.

Due to new technologies, training and advanced training of workers in the agricultural sector will be carried out, for which, in 2020, an online training program has been launched with the involvement of private IT companies.

Students will be able to remotely choose a course, a teacher, which will significantly reduce the time and transport costs of farmers.

Rural producers will be trained in the basics of entrepreneurship, farming, agronomy, seed production, and animal husbandry.

Thus, in the context of prohibitive trade sanctions, a course has been taken towards modernization and import substitution, the introduction of progressive innovative technologies, along with which the importance of food security, safety, growth in livestock numbers, and the provision of the population with meat, milk and products based on them increases.

The effective development of agriculture in the digital economy determines the availability of modern technologies and the availability of information infrastructure.

In agriculture, special attention is paid to the construction of new and reconstruction of existing industrial complexes for the production of milk and beef meat.

Agriculture is a special branch of national economic production, the only one in which mankind produces almost infinitely renewable types of biological resources.

At the same time, agricultural production is carried out on significant spatial territories, has a certain time frame of seasonality and, gradually gravitates, strengthens the focus of improving production processes associated with industrial technologies.

At the same time, in the agricultural sphere of production, like no other, there is an urgent need for its improvement, one of the most important ways of which is the large-scale use of innovative management technologies, especially on the basis of functional synchronization of production processes [3].

As a result of the research, the following data were obtained, revealing the essence of innovative management technologies based on functional synchronization, presented in figure 1.

Figure 1 shows that the main branches of agricultural production - crop and livestock production are in a single integrative scheme, in which at least three levels are observed: the first (or upper) - the compatibility of industries; the second is cross-sectoral synchronization and agro-clustering of livestock and crop industries [4]; the third is intra-industry synchronization in crop and livestock production.
Synchronization as a term implies its use only under the condition of a really operating system that solves the corresponding specific organizational and production-economic tasks [5].

Its content turns out to be a plurality of actions aimed at effectively solving production problems related to the construction, ensuring high-quality functioning and dynamic development of production in the "non-stop" and "just in time" mode, when there is a clear idea of the presence of the following elements of synchronized production, clearly indicated in Figure 2.

![Diagram](https://example.com/diagram.png)

**Figure 2.** The main elements of synchronized production of agricultural products.

In the presented figure 2, the structural and functional elements of production are "extracts" from general and specific management functions, such as material flow management, flexible use of the labor potential of an agricultural enterprise and high-tech farming means, organization and effective use of innovative management methods in specialized production units, control the quality of the production process, complete mechanization of labor-intensive production processes, the formation of integrated control loops (synchronization) of the system [6]. The information-behavioral block of elements considers the issues of the general and personal culture of the organization (the enterprise itself and the processes of labor organization), as well as the motivational foundations of the functional synchronization of production. The block of development of agricultural activities includes such elements of innovative impact on labor processes as rationalization of material flows, the very organization of labor and production of agricultural products in general [7].

Thus, the presented indicators of the highly efficient use of innovative management technologies in agricultural production make it possible to assert the great positive significance of the method of functional synchronization of labor processes, objects of labor and labor itself, aimed at solving highly specialized professional problems of agricultural production with maximum economic efficiency.

The priority directions of modern agrarian policy are to ensure a stable growth in agricultural production, protection and rational use of soil and water resources, increasing the efficiency of organizational and economic potential, regional problems of managing the development of agribusiness and rural areas.

In this regard, there is a need to develop strategies for territorial development, identify growth poles that will help to increase the efficiency of using the economic potential of rural areas and economic transformations in the agricultural sector, including through the effective use of digital economy technologies.

The digital economy involves the use in agribusiness management of valuable data concerning all spheres of activity of an economic entity and relations regarding the production, distribution, exchange and sale of goods and services [8].

The share of information and communication services in the GDP in the EU countries currently exceeds 15%, and in the USA it reaches 25%. In Russia, this figure is approximately 3% of GDP. The share of people employed in the production of information products and services (excluding telecommunications) in our country does not exceed 1%, which is not comparable with developed countries (over 20%).
In agriculture in Russia, it is planned to use large databases and cloud computing, data processing software, programs for searching information on the phenotypes of purchased animals and plants, various sensors, high-speed measuring technologies, remote sensing, decision-making technologies, navigation and control devices, robotics for monitoring quality and movement of agricultural products, systems for collecting and processing information on field cultivation, early warning systems for plant diseases, cold logistics chain management systems.

3. Conclusion
At the current stages of development of society, relevant and operational information of online services is extremely effective and useful in the context of developing an effective action plan, as well as making the right management decision. This industry has received significant development and empowerment thanks to the development of information technology. Special changes have affected the industry of accounting and analysis of interrelated factors, management accounting and analysis of agribusiness, which made it possible to identify factors and causes of economic omissions and losses.

Departmental state information resources of the agricultural sector are quite large and one of the most essential components of the modern digital economy. All of them are formed by the Ministry of Agriculture of the Russian Federation on the basis of statistical information, as well as information from various other documents on the current state of agriculture. All this information is available to federal executive authorities, state authorities, constituent entities of the Russian Federation and various local governments, as well as interested legal entities and citizens [9].

For the further development of this area, appropriate technical and technological support is required, which implies the creation of all the necessary infrastructure, technical parks and centers. Attracting appropriate staffing is seen as an equally important component, since highly qualified specialists are one of the keys to success. It is also required to provide sufficient financial support for projects, especially those that are of national importance. Such activities should be achieved through funding from the federal and regional budgets and related programs.

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