

НЕОБХОДИМОСТЬ МОДЕРНИЗАЦИИ СЕЛЬСКОГО ХОЗЯЙСТВА В РЕСПУБЛИКЕ БЕЛАРУСЬ В УСЛОВИЯХ ЦИФРОВОЙ ЭКОНОМИКИ

THE NEED TO MODERNIZE AGRICULTURE IN THE REPUBLIC OF BELARUS IN THE CONDITIONS OF THE DIGITAL ECONOMY

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РЕФЕРАТ

СОЦИАЛЬНО-ЭКОНОМИЧЕСКОЕ РАЗВИТИЕ, МОДЕРНИЗАЦИЯ СЕЛЬСКОГО ХОЗЯЙСТВА, ЦИФРОВИЗАЦИЯ, АГРАРНАЯ ПОЛИТИКА, ПРОДУКЦИЯ СЕЛЬСКОГО ХОЗЯЙСТВА, СЕЛЬСКОЕ НАСЕЛЕНИЕ, НАПРАВЛЕНИЯ РАЗВИТИЯ

Модернизация сельского хозяйства с применением новейших цифровых технологий является на сегодняшний день одним из ключевых мировых трендов. Авторами выявлено, что в условиях устойчивого развития цифровая трансформация экономики выступает одним из ключевых элементов построения технологичного информационного общества на основе происходящих социально-экономических процессов.

Цель исследования состоит в выявлении необходимости модернизации сельского хозяйства в условиях цифровой экономики, обеспечивающей повышение качества отраслевого управления. Для достижения цели решались следующие задачи: анализ основных программных документов, утвержденных на среднесрочную и долгосрочную перспективу и связанные с развитием сельского хозяйства в условиях цифровизации экономики; оценка основных показателей сельскохозяйственной отрасли Республики Беларусь; выявление основных проблем развития сельского хозяйства. Проведенный анализ позволил разработать основные направления развития сельского хозяйства в условиях цифровизации, которые могут быть использованы для приня-

ABSTRACT

SOCIAL AND ECONOMIC DEVELOPMENT, MODERNIZATION OF AGRICULTURE, DIGITALIZATION, AGRICULTURAL POLICY, AGRICULTURAL PRODUCTS, RURAL POPULATION, DEVELOPMENT DIRECTIONS

Modernization of agriculture with the use of the latest digital technologies is one of the key global trends today. The authors found that in the context of sustainable development, the digital transformation of the economy is one of the key elements in building a technological information society based on ongoing social-and-economic processes.

The purpose of the study is to identify the need for the modernization of agriculture in the digital economy, which improves the quality of sectoral management. To achieve the goal, the following tasks were solved: analysis of the main policy documents approved for the medium and long term and related to the development of agriculture in the context of the digitalization of the economy; assessment of the main indicators of the agricultural sector of the Republic of Belarus; identification of the main problems of agricultural development. The analysis made it possible to develop the main directions for the development of agriculture in the context of digitalization, which can be used to make managerial decisions by republican and regional government bodies in the formation and implementation of regional and state programs for the development of the agro-industrial complex.

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тия управленческих решений республиканскими и региональными органами государственного управления при формировании и реализации региональной и государственной программ развития агропромышленного комплекса.

INTRODUCTION

Agriculture is the basis for the successful development of the state economy as a whole. In world practice, it is noted that the agricultural sector is focused on the widespread introduction of digital technologies for the development of precision farming, increasing crop yields, as well as reducing production costs and improving its quality, which is the main competitiveness priority for the efficient use of natural resources in certain climatic conditions. A new stage in the development of agriculture has begun, based on the widespread introduction of digital technologies.

The digital transformation of agriculture is largely based on the integrated implementation of a number of digital technologies within the interrelated concepts of precision farming and smart agriculture.

At the same time, the issues of digitalization in the agro-industrial sector, the introduction of innovative technologies in the production process and the effectiveness of their use have not been fully studied, which determined the relevance and choice of the research topic. Thus, the choice of the issues studied in the article is due to the fact that the modernization of agriculture using the latest digital technologies is one of the key global trends today. The task is to solve problems and increase the efficiency of the agricultural sector through digitalization to create competitive products.

The relevance of the research topic is confirmed by the fact that the aggravation of modern problems caused by the simultaneous impact of global crisis processes, disproportions between the sectors of the domestic economy and the upcoming digital transformation of most areas of activity, actualizes the search for effective solutions for the modernization of such a strategically important industry as agriculture. In recent years, the large-scale use of digital technologies has become

a sustainable direction for the development of agriculture around the world. At the same time, the elements of the modernization mechanism in the digital economy remain uncertain, its content is unidentified and contradictory, and only the set of factors that determine the objective need for modernization – ensuring the country's food security – remains constant.

In most recent studies in the field of agricultural modernization, attention was mainly focused on technical and technological modernization and updating the material base of production; and the problem of transition to the use of digital technologies remains isolated and fragmented which has determined the urgency of this problem.

Purpose and objectives of the study. The purpose of the research is to study the need to modernize agriculture in the digital economy, which improves the quality of sectoral management.

The goal set led to the solution of the following interrelated tasks:

- clarify and expand the conceptual aspects of the modernization of agriculture;
- substantiate the initial conditions and conceptual elements of the organizational model for the modernization of agriculture in the context of the transition to a digital economy;
- identify a set of effects from the digitalization of agriculture;
- to form directions for the development of agriculture in the digital economy.

A significant contribution to the research and development of the agro-industrial complex was made by such scientists as A. Altukhov, V. Belsky, G. Besplohotny, D. Buklagin, E. Kostyukova, A. Kiryakov, V. Maksimov, V. Nechaev, A. Petrikov, A. Serkov, E. Semenova, V. Osipova, V. Fedorenko, A. Fedorova and others.

The theoretical and methodological basis of the study is the research of domestic and foreign

scientists, statistical data of the National Statistical Committee of the Republic of Belarus, etc.

Belarus has taken track towards the introduction of information communication and advanced manufacturing technologies in all spheres of life. The target is to achieve the share of the digital economy in the country's GDP in the amount of at least 15 % in 2025. The digital transformation of the economy involves organization of digital information environment through the formation of a regulatory legal framework and the introduction of effective tools for managing the processes of digitalization of the economy.

The country plans to implement innovative projects in the field of digital development within the framework of state programs and sectoral plans. One of the main issues in the field of socio-economic development of the state is the digital transformation of agriculture. The undisputed driver of the agro-industrial complex of Belarus today is the processes in the field of digitalization.

Agriculture is a priority sector of the economy of the Republic of Belarus, ensuring food security and export potential. In the context of sustainable development, the digital transformation of the economy is one of the key elements in building a technological information society based on ongoing socio-economic processes [1]. The government policy of the Republic of Belarus is aimed at the introduction of information and advanced production technologies in all sectors of the national economy and spheres of life of society as a whole. Therefore, in the context of the accelerated transformation of the world economy, the emphasis is on studying the process of digitalization of all sectors that affect the development of economic progress and its opportunities to achieve the sustainable development goals in Belarus.

It should be noted that over the past year the Belarusian government has taken a significant number of measures at the national level aimed at supporting and innovative development of the country. Thus, in accordance with Decree of the President of the Republic of Belarus № 156 of May 7, 2020 "On priority areas of scientific, scientific-and-technical and innovative activities for 2021–2025", the first priority area of scientific, scientific-and-technical and innovative

activities for 2021–2025 digital information and communication and interdisciplinary technologies, production based on them, including the development of information and control systems, artificial intelligence and robotics [2].

To achieve this goal, the State Program "Digital Development of Belarus" is being implemented until 2025. One of the ongoing activities of the Program provides for the development and implementation of the digital platform of the Ministry of Industry and the implementation of the Industry 4.0 concept. The State Program provides for the level of "digital maturity" of the Republic of Belarus, both on an industry and regional scale, as well as applied technical solutions, global trends, which is the basis for further digital transformations.

The agrarian policy of the Belarusian government is an integral part of the government's socio-economic policy aimed at the sustainable development of agriculture and rural areas. Improving the efficiency of agriculture is the main criterion for the development of the industry, defined by the "National Strategy for Sustainable Socio-Economic Development of the Republic of Belarus for the period up to 2030". For 2021–2030, the priority of the development strategy is the creation of a profitable agribusiness, the basis of which is large-scale production [3].

During the period of implementation of the State Program for the Development of Agricultural Business in the Republic of Belarus for 2016–2020, the food security of the country has been fully ensured. Gross agricultural output growth amounted to 12.2 % in 2015–2020 compared to 2015, including crop production (18.4 %), and livestock (6.9 %) (Figure 1).

For 2016–2020 the country's agricultural and food exports increased from \$4.2 billion to \$5.8 billion. The balance of foreign trade activity during this period has a positive value. The growth of foreign trade turnover over the past five years was largely ensured by increasing export deliveries (by 24.3 %), while the increase in import purchases was only 4.7 %. As of 01/01/2021, the geography of export deliveries has been expanded to 116 countries of the world. According to the results of the Program, the task for the production (growing) of poultry at the level of 3.4 million tons (109.7 %),

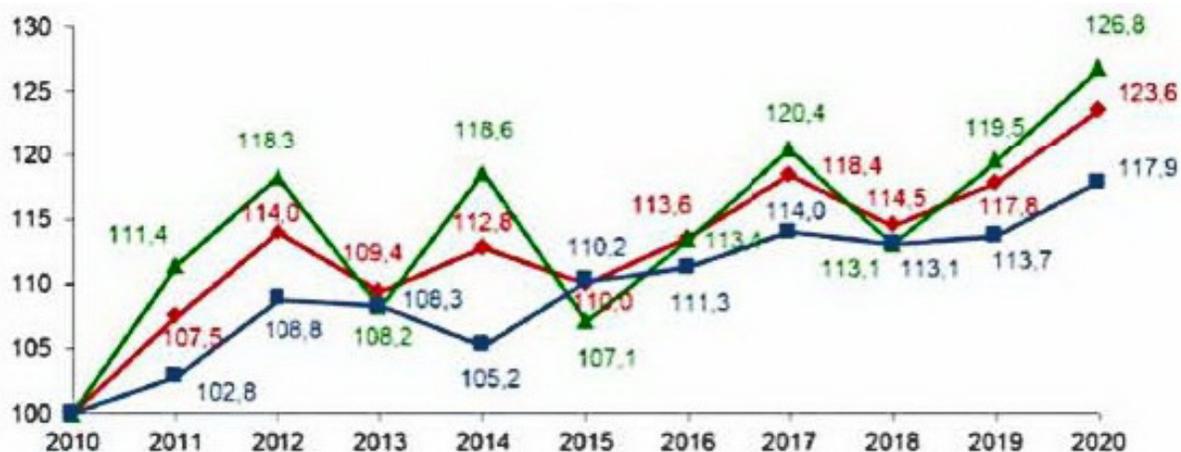


Figure 1 – Agricultural products in farms of all categories in the Republic of Belarus (in comparable prices; as a percentage of 2010)

Source: compiled by the author based on [4].

vegetables – 9.2 million tons (114.5 %), fruits and berries – 3.5 million tons (143.1 %). The volume of milk production for the task amounted to 90.4 %, cattle – 90.7 %, pigs – 93.9 %, grain – 80.3, rapeseed – 67.1, sugar beet – 94.6 %, flax fiber – 78.9 %, potatoes – 99.8 %.

It is especially important to note that if such projects are being actively implemented in the country, this indicates a favorable business climate and effective state support. New horizons are opening up as part of the modernization of agriculture: these projects help ensure food stability, reduce import dependence in the livestock and crop industries, in the processing segment, as well as increase the attractiveness of work in the countryside, attract personnel, young professionals, pay good wages, build housing, develop social infrastructure in agricultural towns and villages.

The government scientific and technical programs “Digital Technologies and Robotic Complexes” and “Intelligent Instrumentation” for 2021–2025 are also being carried out, according to which information technologies are being developed and implemented in the industry. For example, in the field of precision farming, monitoring of agro-industrial equipment,

engineering cooperation systems based on digital interaction and non-drawing technologies. In addition, under the State Program of Innovative Development of Belarus for 2021–2025, it is planned to implement a number of projects in the field of robotization and digitalization. The regional potential is the most important resource and functional basis for identifying promising projects of the digital economy [5].

In the economy of Belarus, innovative development is the most important vector and engine of modernization processes in agriculture. Agriculture closely interacts with other sectors of the economy and is a source of replenishment of the national income for solving the most important tasks of the country.

Thus, in 2021, the gross domestic product amounted to 173.2 billion rubles and grew by 2.3 % over the year. Agricultural production amounted to 25 billion rubles, or 95.8 % of the 2020 level. Agriculture is an important sector of the Belarusian economy, providing 6.8 % of the country's GDP, 19.8 % of exports, 11.7% of investments in fixed assets in 2020, and almost 10.5 % in 2021. At the same time, about 8 % of the total number of people employed in the country's economy work in this sector.

The allocation of agrarian policy as a relatively independent area in the general economic policy of the Republic of Belarus is due to the peculiarities of agricultural production, the specifics of the regulation of agrarian relations. In agricultural policy, much attention should be paid to achieving higher final results of production activities, both in agriculture and in all agribusiness, ensuring stable production growth rates, increasing its efficiency and social development of the village.

Based on the results of a study conducted by analyzing the key economic indicators and the current conditions for the use of digital innovations in Belarusian agricultural practice, it can be concluded that the lag behind regions and countries with a developed agro-industrial complex is due to the long-term lack of mutually beneficial conditions for investment and the low the level of provision with labor resources (potential) and the latest advanced technologies, as clearly evidenced by the statistical indicators of development (Table 1).

According to the data, over the past 5 years, there has been an outflow of the rural population in the whole country, and as of January 1, 2022, the number was 2,023,429 people. However, there is an upward trend in investments in investments in the agricultural sector, which led to an increase in 2017–2021 1.5 times. Investments in fixed capital amounted to 30.1 billion rubles in the country in 2021. To implement the large-scale tasks of digitalization, an important task is the training of human resources as a necessary condition for

supporting digital development processes.

The volume and dynamics of the share of the rural population in the Republic of Belarus for 2017–2021 are shown in Figure 2.

According to the data presented, there is a decrease in the proportion of the rural population in the country as a whole. This is due to the lack of employment in rural areas, the migration of the rural population to cities. First of all, for the development of agriculture in the Republic of Belarus, it is necessary to redistribute labor resources, increase the level of specialized education and attract highly qualified young scientists and specialists in this field to develop and implement innovative products and services.

At the same time, a number of key problems remain in the agro-industrial complex, the most important of which are the following:

- the level of profitability of agricultural production does not allow for expanded reproduction of food even with government's support (2020 – 6.1 %, and without it (1.4 %);
- lack of own financial resources necessary for the timely implementation of current activities and renewal of fixed assets on a qualitatively new basis;
- growth of accounts payable and debt on credits and loans of agricultural organizations;
- low level of wages of agricultural workers, which does not allow to use the proper motivational mechanism in the agrarian economy and ensure the retention of personnel, especially young specialists;

Table 1 – Key indicators of the agricultural industry in Belarus for 2017–2021

Index	2017	2018	2019	2020	2021
Population – total people	9,448,312	9,429,257	9,410,259	9,349,645	9,255,524
Including the rural population, people	2,164,033	2,137,548	2,106,354	2,069,325	2,023,429
Share of rural population, %	22.9	22.7	22.4	22.1	21.9
Investments in fixed assets – total, million rubles	21033.7	25004.4	28798.9	29633.4	30126.8
Including agriculture, million rubles	2178.5	2453.3	3030.4	3468.3	3120.3
Specific weight, %	10.4	9.8	10.5	11.7	10.4

Source: compiled by the author based on [6].

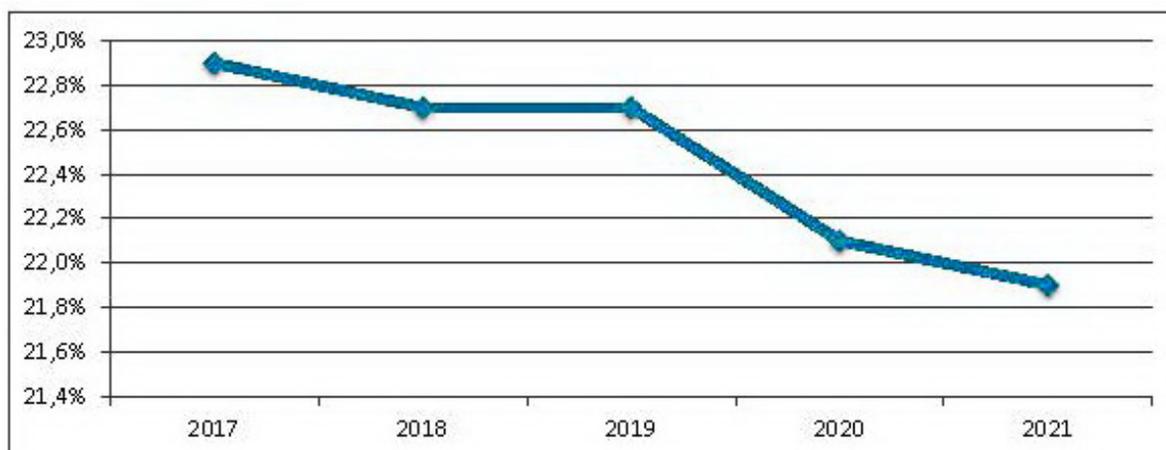


Figure 2 – The volume and dynamics of the share of the rural population of the Republic of Belarus for 2017–2021

Source: compiled by the author based on [6].

– slow rates of social development of rural areas and the reduction of the rural population caused by them, which is the reason for the deterioration of the socio-demographic situation;

– in the regions of the country there is a shortage of personnel in the most popular specialties (for example, veterinarian profile). The retention of young specialists is an urgent problem of the industry, without which further dynamic development of agriculture is impossible.

In the context of digital transformation, the problems of agricultural development have gained wide interest from representatives of various branches of economic science and public services. Therefore, the analysis of problems related to the implementation and role of innovations for the development of agriculture is a priority for Belarus at the current stage.

The digital transformation of the agricultural sector inevitably faces a labor factor: insufficient professional and scientific awareness of smart technologies and their capabilities, for example, makes it difficult to attract highly qualified specialists to the area under study, which is a necessary condition for the sustainable development of the state. Human capital is the main factor in the innovative modernization of the economy of the agro-industrial complex, which

implies the creation of favorable conditions for innovation and innovators.

Statistical indicators on employment in agriculture are presented in Table 2.

The study showed that the employment of the population in the agricultural area is low: there is a low percentage of highly qualified young professionals with higher specialized education under the age of 30. The total number of workers in the agricultural industry with higher education is 11.6 %, which indicates a low level of development of the study area.

First of all, for the development of agriculture in the Republic of Belarus, it is necessary to redistribute labor resources, increase the level of specialized education and attract highly qualified young scientists and specialists in this field to develop and implement innovative products and services. In the life of a modern high-tech society, specialized quality education occupies one of the most important places, since it is a key source of generation, improvement and development of human capital, and, consequently, a resource for the socio-economic development of the country.

It is obvious that the lagging behind the regions and countries with developed agro-industrial sector is due to the long-term lack of conditions for investment and the low level of labor resources

Table 2 – The number of employees of agricultural organizations by level of education and age groups for 2014–2020

Index	2014	2016	2018	2019	2020
List number of employees, people, including those with education	338,600	314,855	292,245	280,273	272,924
higher, (specific weight) %:	9.2	10.0	11.0	11.2	11.6
secondary special and vocational	41.3	42.5	42.5	43.2	43.6
general average and general basic	49.5	47.5	46.5	45.6	44.8
List number of employees by age (specific weight), %:					
16–24 years old	7.4	7.1	6.2	5.8	5.9
25–39 years old	31.8	31.8	30.6	29.8	29.0
40–59 years old	56.2	56.4	56.7	56.7	56.4
over 60 years old	4.6	4.7	6.5	7.7	8.7

Source: compiled by the author based on [6].

and advanced technologies that has been formed at the current time, as it is shown by the statistical indicators of the development of this industry.

A comparative analysis of employees of agricultural organizations by level of education and age groups is shown in Figure 3.

Thus, it is necessary to conclude that various innovative transformations should be led by specialists who, in a complex, understand how to transform current resources into the latest digital services and how to successfully integrate them into the processes of the agricultural sector.

Analysis of the issues related to the introduction and role of innovations for the development of agriculture is a priority for Belarus at the current stage. Among the problems of the development of agriculture in Belarus in the context of the digitalization of the economy are:

- lack of specialized government programs and projects aimed at supporting the agro-industrial complex in the acquisition and implementation of bio- and nanotechnological products and services;
- lack of necessary management and regulation of the industry;
- lack of investment;
- lack of highly qualified personnel and young specialists;
- massive outflow of labor resources from rural areas to cities;
- reduction of arable land due to soil erosion;
- low material and technical base of subjects

of the agricultural sector;

- weak ties with scientific organizations [7].

It should be noted that the lag of the agricultural sector of Belarus in terms of the widespread use of digital technologies in agriculture from the world leaders is largely due to the presence of obvious socio-economic and institutional barriers.

Thus, in the industry as a whole, the share of specialists in the field of information and communication technologies is one of the lowest among all types of economic activity. An important problem in the development of digital technologies in agriculture is the sustainable digital division between urban and rural settlements.

In conditions of intense competition, one of the sources for the development of economic entities is the creation of vertically integrated structures. In Vitebsk region, the experience of creating integration structures in agriculture is successfully used. Support was provided by the government signing Decree № 70 of February 25, 2020 [8].

The digital transformation of agriculture makes it possible to achieve a number of economic and social effects: cost reduction, increased productivity, and rational environmental management, elimination of the digital division, food security, and efficient supply chains [9].

Thus, the most important goal of the agrarian policy of the Republic of Belarus is to ensure the dynamic development of all areas of the agro-industrial complex (resource supply, agriculture,

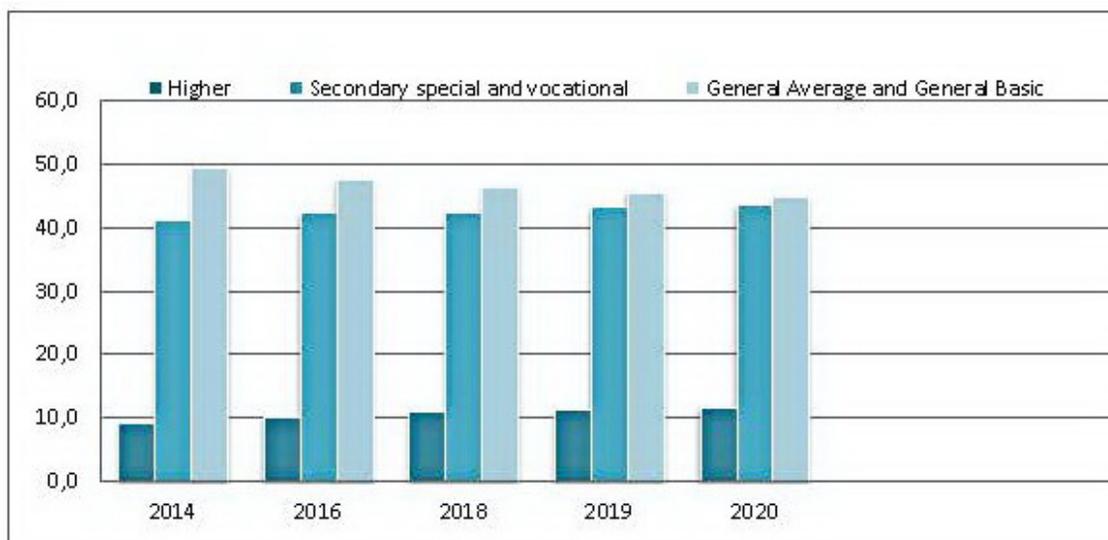


Figure 3 – Comparative analysis of employees of agricultural organizations by level of education and age groups for 2014–2020

Source: compiled by the author based on [6].

food and processing industry, trade) in the context of digitalization, increase its efficiency and competitiveness; ensure food security on this basis in the national security system of the country, a comprehensive solution to the socio-economic problems of rural development [10, p. 4].

The main directions for the development of agriculture in the context of digitalization are the following:

- digital technologies in the management of the agro-industrial complex;
- electronic maps of fields;
- unmanned agricultural machinery;
- "smart" farm;
- "smart" land use;
- "smart" greenhouse;
- "smart" field;
- "smart" garden;
- sharing of agricultural machinery [11, p. 108].

The creation of digital agriculture includes the following activities:

- collection, processing, storage and use of data;
- modeling, forecasting and planning of future crops;

- multifunctional suitability assessment;
- distribution of production capacities and resources;
- design of landscape systems.

The introduction of e-agriculture will help agricultural enterprises to successfully solve many problems [12, p. 15].

CONCLUSIONS

Thus, we can conclude that the modernization of agriculture in the context of the transition to a digital economy as an economic phenomenon is a complex and multidimensional concept that characterizes the process of selective adaptation of sectoral management to new economic and technological paradigms, revealing the multidimensional nature of continuous systemic transformations aimed at introducing progressive technologies that contribute to the deepening of the separation and growth of labor productivity, the expansion of the technical capabilities of agriculture, and the improvement of the environmental safety of biological resources.

In modern conditions, insufficient training of personnel can become the major obstacle to the introduction of innovations and ensuring the

competitiveness of the industry. Therefore, at present, the system of additional adult education in the Republic of Belarus should function effectively, which solves the problems of providing sectors of the economy with professional personnel of the required skill level, personnel support for innovative processes, and meeting the needs of employees in professional development.

The key distinguishing characteristic of the modernization of agriculture in the digital economy is the use of breakthrough technologies that reduce human participation in the production process and increase the efficiency of business processes, such as big data, artificial intelligence, new and portable energy sources, new production technologies, robotics, wireless communication, technologies for controlling the properties of biological objects, bio- and nanotechnologies.

Digitalization in the agricultural sector allows reducing risks, adapting to climate

change, and increasing crop yields. Reducing the cost of production, improving its quality and competitiveness based on the efficient use of resources and scientifically based approaches is the top priority task of digitalization.

Studying the trends in the development of agriculture in Western European countries, as well as the experience of the Belarusian agricultural organizations, allowed the Belarusian leadership to choose the right path, focused mainly on large-scale high-tech production.

The results of the analysis, the proposed directions for the development and modernization of agriculture can be of practical importance for making managerial decisions by country's and regional government bodies in the formation and implementation of regional and government programs for the development of the agro-industrial complex.

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