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СОВРЕМЕННОЕ СОСТОЯНИЕ ЦИФРОВИЗАЦИИ СЕЛЬСКОГО ХОЗЯЙСТВА: ПРОБЛЕМЫ И ПУТИ РЕШЕНИЯ

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АННОТАЦИЯ

Цель исследования – В статье проведен анализ особенностей внедрения и развития эффективных, цифровых технологий в сельском хозяйстве Республики Казахстан, где в качестве ключевой проблемы агропромышленного комплекса Казахстана выделена низкая производительность и высокие издержки. В связи с этим интерес представляет исследование особенностей внедрения и развития эффективных, цифровых технологий в сельском хозяйстве с целью определения проблем и перспективных направлений цифровизации в сельском хозяйстве Казахстана.

Методология – Автором были использованы методы научного познания: анализ, синтез, дедукция, индукция, абстрагирование и конкретизация, обобщение и группировка статистической информации, абстрактно-логический, функциональный и сравнительный анализы, междисциплинарный подход.

Информационную базу исследования составили законодательные и иные нормативные акты Республики Казахстан, статистические данные Агентства Республики Казахстан по статистике, аналитические материалы, материалы научной экономической литературы и периодической печати, материалы научно-практических конференций, данные электронных ресурсов.

Оригинальность/ценность – Заключается в том, что объектом исследования выступает сельское хозяйство, как одна из ключевых отраслей экономики Казахстана, обеспечивающая продовольственную и экономическую безопасность, а также трудовой потенциал страны. Эпоха цифровой глобализации определяется потоками данных, которые содержат информацию, идеи и инновации. Умные устройства становятся все меньше, быстрее, дешевле, мощнее и станут ключом к решению проблем. Сегодня интеллектуальные цифровые решения должны помочь сельскохозяйственной отрасли справиться с проблемами повышения производительности труда и устойчивого развития.

Выводы – Проведен анализ состояния казахстанского рынка сельскохозяйственных товаров на современном этапе и предложены альтернативные стратегии для повышения эффективности производства на основе цифровизации сельского хозяйства. Основные положения и выводы, приведенные в статье, могут быть использованы при выработке и реализации политики управления агропромышленным комплексом страны.

Ключевые слова – сельское хозяйство, цифровизация, животноводство, растениеводство, агропромышленный комплекс (АПК) аграрная экономика, агробизнес, сельхозпродукция, сельхозпроизводство, бизнес-процесс, управление.

**THE CURRENT STATE OF AGRICULTURE DIGITALIZATION:
PROBLEMS AND WAYS OF SOLUTION**

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ABSTRACT

Purpose – The article analyzes the features of the implementation and development of effective digital technologies in the agriculture of the Republic of Kazakhstan, where low productivity and high costs are highlighted as a key problem in the agricultural sector of Kazakhstan. In this regard, it is of interest to study the features of the introduction and development of effective digital technologies in agriculture in order to identify problems and promising directions of digitalization in agriculture in Kazakhstan.

Methodology – The author used the methods of scientific knowledge: analysis, synthesis, deduction, induction, abstraction and concretization, generalization and grouping of statistical information, abstract-logical, functional and comparative analyzes, an interdisciplinary approach.

The research information base was made up of legislative and other regulatory acts of the Republic of Kazakhstan, statistical data of the Agency of the Republic of Kazakhstan on statistics, analytical materials, materials of scientific economic literature and periodicals, materials of scientific and practical conferences, data of electronic resources.

Originality – The object of the study is agriculture, as one of the key sectors of the economy of Kazakhstan, providing food and economic security, as well as the labor potential of the country. The era of digital globalization is determined by data streams that contain information, ideas and innovations. Smart devices are becoming smaller, faster, cheaper, more powerful and will become the key to solving problems. Today, smart digital solutions must help the agricultural industry cope with the challenges of increasing labor productivity and sustainable development.

Findings – The analysis of the state of the Kazakhstan market of agricultural products at the present stage is carried out and alternative strategies are proposed to increase production efficiency based on digitalization of agriculture. The main provisions and conclusions presented in the article can be used in the development and implementation of the policy for managing the country's agro-industrial complex.

Keywords – agriculture, digitalization, animal husbandry, crop production, agro-industrial complex (AIC) agricultural economy, agribusiness, agricultural products, agricultural production, business process, management.

INTRODUCTION

High-tech sector of agriculture of the Republic of Kazakhstan, which can contribute to solving a number of accumulated problems. In particular, to diversify the export structure, reduce dependence on imports in the resource sector and in the group of high value-added food products, as well as move from an export-raw to an innovative model of the economy through the use of technologies, the creation of high-tech industries, and stimulate the innovative activity of economic entities Agriculture.

The modernization of agriculture in Kazakhstan through the introduction of high technology is necessary for the formation of a self-sufficient, effective and sustainable sector of the national economy.

Modern agriculture seeks to increase productivity. At times, only advanced mechanized solutions can help achieve significant results in this area.

The era of globalization dictates its conditions to the modern market. According to experts, by 2020, more than 25% of the global economy will begin to introduce digitalization technologies. This will significantly improve the efficiency of not only business, but society as a whole. This process is facilitated by the new digital revolution, which is changing today's ways of production, the supply chain and value chain. The digitalization of agriculture occupies one of the leading positions in this matter, because the economic stability of the state largely depends on the degree of development of the agricultural sector in the country.

For Kazakhstan, the main condition for ensuring food security is the intensive development of agricultural and food industries, which will allow the agricultural sector to become a leading sector of the economy, which, ultimately, should contribute to the growth of the country's self-sufficiency in food. Given the importance of this issue, the agricultural sector is given one of the main directions in the strategic policy of our state.

Digitalization of all sectors of Kazakhstan, including agriculture, is the main vector of the country's development. In this regard, to implement the strategy for the long-term development of the agricultural sector, the Ministry of Agriculture of the Republic of Kazakhstan has developed a specialized program of strategic tasks called E-AIC, the main purpose of which is the introduction of the most effective and affordable tools for digitalizing agriculture to increase labor productivity.

Agriculture in the world is transformed from traditional to high-tech industry, which is able to create new markets for innovative solutions and developments.

Agriculture is one of the key sectors of the economy of Kazakhstan, providing food and economic security, as well as the labor potential of the country, especially in rural areas.

Digital technology in Kazakhstan is considered as the main way to diversify the national economy, its reorientation from raw materials to industrial-service model. The main technologies that are primarily introduced as part of the digitalization of agriculture in Kazakhstan are GPS navigation of agricultural machinery, parallel driving, weight automation, electronic field maps and, of course, unmanned aerial vehicles as the most spectacular and unusual technologies.

The issues of digitalization of agriculture remain rather unexplored. It should be noted that for the search query "digital technologies in agriculture" on the portal ELIBRARY.RU for 2015–2017, only five publications can be selected. These are the scientific works of such authors as Tasueva T.S., Rakhimova B.Kh., Dagaev Kh.Kh. [1], Voronin E.A., Semkin A.G. [2], I. Ilyinskaya [3], Osipov V.S., Bogoviz A.V. [4], Medennikov V., Muratova L., Salnikov S., Gorbachev M. [5].

Among the listed studies, the work of I. Ilyinskaya deserves special attention, which notes the advantages of computer technology that allows agricultural production on an environmentally friendly basis, focused on saving resources, obtaining programmed crops and protecting the environment from pollution; at the stage of GIS implementation in agriculture, the task was set to create an initial bank of a digital cartographic unified information system based on GIS technologies for geoinformation support of adaptive landscape farming systems [3].

In his publications Golubev A.V. He believes that the main socio-economic goals of the development of the agro-industrial complex are:

- achieving sustainable agricultural production growth;
- solution of the food problem of the state;
- providing people with non-food goods made from raw materials of the agricultural sector [6].

In his textbook "Agricultural Economics" Kovalenko N.Ya. describes the composition of the agro-industrial complex, which includes various areas, but despite their difference, they are closely interconnected, and for the productivity of the whole complex in general, the substantially effective functioning of all its elements, i.e. any industry [7].

In science, there is no one approach to the description of the agro-industrial complex. So, a group of researchers believe that the agro-industrial complex is a complex intersectoral production and economic structure, the composition of which is explained by the union of agriculture and the related industries (Volkova. N.A., Kovalenko N.Ya., Makarova. O.A.) [8].

Popov. ON. He intends to consider the agro-industrial complex as an association of sectors of the national economy, where agriculture plays a key role. The researcher's interest is focused on the representation of

the agro-industrial complex from the position of a holistic technological complex. This is manifested in the process of promoting a product from the first stage of production to its sale [9].

The most important components in the implementation of new tasks identified in the Address of the Head of State to the people of Kazakhstan in the conditions of the fourth industrial revolution are the development and improvement of digitalization of the agro-industrial complex [10].

Digital technology in Kazakhstan is seen as the main way to diversify the national economy. For the period from 1992 to 2017, the agricultural policy of Kazakhstan underwent a number of fundamental changes and resulted in several state programs:

1. The agricultural development program for 2000-2002;
2. The state program for the development of rural territories for 2004-2010;
3. The State Agricultural and Food Program for 2003-2005;
4. The agricultural development program for 2010-2014;
5. Agribusiness 2020 program for the development of the agro-industrial complex in the Republic of Kazakhstan for 2013-2020, approved by the Decree of the Government of the Republic of Kazakhstan dated February 18, 2013 No. 151 with separate sectoral master plans [11];
6. The state program for the development of the agro-industrial complex of the Republic of Kazakhstan for 2017 - 2021 [12].

In addition to the State Program for the Development of the Agro-Industrial Complex of the Republic of Kazakhstan for 2017-2021 (hereinafter referred to as the Program for the Development of the Agro-Industrial Complex of the Republic of Kazakhstan), support for export potential through increasing the competitiveness of agribusiness entities is provided for in the State Program for Infrastructure Development "Nurly Zhol" for 2015-2019. This program provides for the creation of an efficient transport and logistics infrastructure, ensuring the safety and quality of products through the development of laboratory facilities [13].

The Government of the country adopted the state program "Digital Kazakhstan", which allows accelerating the pace of development of the economy of the republic, the main tasks of which are the automation of state support measures, the implementation of precision agriculture projects and the automation of the creation of a system for the interaction of IT businesses with agribusiness [14].

Being one of the priority areas for the development of the economy of the republic, agriculture has enormous potential and large reserves, and the diverse climatic conditions of Kazakhstan make it possible to grow almost all crops of the temperate thermal zone and develop livestock farming. Almost one quarter of the entire territory of the country is characterized as steppe lands, half as semi-desert and desert territories, the remaining quarter of the territory is foothill. 80% of the country's territory is characterized as agricultural land, which is more than 200 million hectares. However, from this territory only 40% or 96 million ha are used in agricultural circulation.

METHODOLOGY AND RESULTS

Despite a rather low share of agricultural processing, Kazakhstan is one of the largest producers and exporters of certain types of products like cereals and flour. In the export of flour, the country occupies a leading position in the world market.

In Kazakhstan today, there are three main forms of management:

- agricultural enterprises (large farms) - are legal entities, while farms in the legal form are individual entrepreneurs and are not legal entities. Of the number of economic entities in the agricultural sector, 15% are represented by large enterprises and they process about 50% of all agricultural land. Large farms are mainly concentrated in the northern regions of the country where rainfed farming is practiced. Grain and oilseeds are mainly cultivated in these regions. Over the past 5-7 years, animal husbandry has been actively developing in the northern regions, in particular, with the support of the state, the species composition of farm animals is being transformed;

- farm / peasant farms (secondary farms). Medium and small farms are mainly concentrated in the southern regions, where grain, fodder and technical crops, melons and vegetables, and others are cultivated on irrigated lands. In the southern regions, farm sizes can vary from 3 to 500 ha and above.

- LPH (small farms) - were excluded as an economic and economic form (not legal entities), but despite this they remain important producers of agricultural products, especially livestock products.

In total, more than 15,000 organizations engaged in agricultural activities are registered in Kazakhstan (excluding forestry and fisheries). This is 3.5% of all organizations registered in Kazakhstan. In 2018, 1,278 new organizations in the field of agriculture were registered in Kazakhstan (excluding forestry and fisheries):

- mixed agriculture - 447 new organizations;
- livestock - 343;
- growing seasonal crops - 282;
- auxiliary activities - 158;
- cultivation of perennial crops - 48.

The largest number of agricultural organizations is in Turkestan (3,503). Almost 2 times less organizations are located in Almaty (1,821), which ranks second in terms of the number of such organizations (Figure 1) [15].

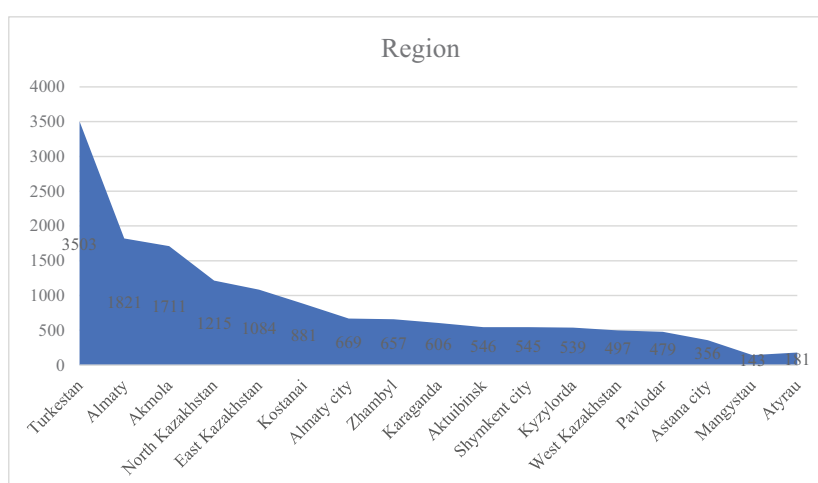


Figure 1 - The number of enterprises by region for 2018

Note – Compiled by the author based on the source [15]

To date, the share of agricultural producers using digital technologies in the agriculture of the Republic of Kazakhstan is insignificant, which limits the growth of productivity and cost reduction. In addition, agricultural land is either not used for its intended purpose or is used inefficiently, and this is difficult to control due to the large territory, low population density and the lack of the necessary infrastructure for monitoring the condition and use of land with analysis and forecasting in the short and long term.

There are 23 digital farms and 171 advanced farms in Kazakhstan (Figure 2) [15].

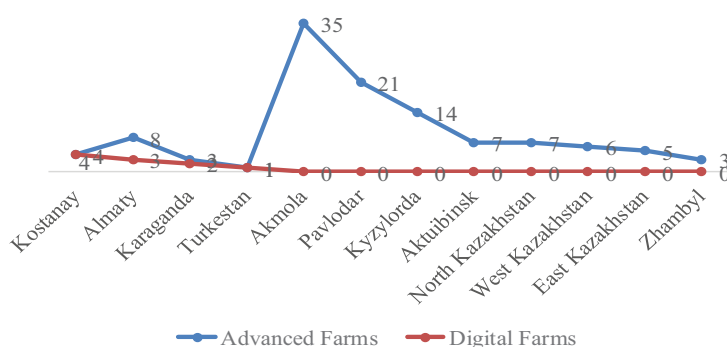


Figure 2 - Dynamics of indicators of digitalization of agriculture in the regional aspect of the Republic of Kazakhstan for 2018

Note – Compiled by the author based on the source [16]

In the process of digitalization, electronic field maps are created. To date, 24 million hectares of arable land have been digitized, almost 100% of the total sown area. Also, work has begun on digitizing pastures.

Farm productivity is enhanced by technologies such as:

- forecasting the optimal time for harvesting;
- “smart watering”;
- Intelligent mineral fertilizer application system;
- pest and weed control system.

Such a concept as “precision farming” is based on a deep and thorough analysis of soil composition. On traditional farms, one analysis per 75 ha is carried out. On smart farms, the soil for analysis is taken from each hectare. This method helps to more accurately determine the volume and composition of fertilizers, and also determines the most suitable methods of cultivating the land. A lot of work is performed by artificial intelligence in the form of computer programs, manual labor is minimal.

Computer systems can simultaneously process large amounts of data and constantly adapt the conditions for the favorable growth of agricultural products. As part of a pilot project on the introduction of precision farming, 9 Kazakhstan farms are already using new technologies and are showing excellent results.

In the future, by 2022, it is planned to introduce 2,000 advanced farms and 14 digital farms in Kazakhstan, that is, 1 digital farm in each region (Figure 3) [16].



Figure 3 - Forecast indicators of the development of advanced farms in the regional aspect by 2022 in Kazakhstan

Note – Compiled by the author based on the source [16]

For this, conditions are created that will contribute to the further process of digitalization of agriculture in the field of crop production in the Republic of Kazakhstan (Table 1) [16].

In general, the E-AIC program covers 224 investment programs for the development of various agricultural sectors. To simplify the assessment of the current level of digitalization of agricultural enterprises, a special scale was developed, thanks to which the path of any agricultural enterprise from the starting point to the digital farm has become as transparent as possible.

Table 1 - Stages of the process of introducing precision farming using digitalization in crop production

Implementation level	Plant growing											
	Electronic field maps	Soil analysis / electronic agrochemical cartograms	Fuel consumption sensors	GPS trackers	Process management software	Weather Stations / Weather Data	Weed Electronic Map	Yield sensors	Automatic motion control	Differentiated Seed / Fertilizer Application	Differentiated application of plant protection products	
	Level 1 "Digital Farm"	+	+	+	+	+	+	+	+	+	+	
	Level 2 "Advanced"	+	+	+	+	+	+					
	Level 3 "Basic"	+	+									
Note - Compiled on the basis of the source [16]												

With regard to livestock, the situation is as follows (Table 2) [16].

The stimulation of agricultural production will be carried out within the framework of the existing instruments for subsidizing interest rates and investment subsidies. The effect of the digitalization of the agricultural sector will be 30% of GDP growth, or about 1 trillion. tenge.

Table 2 - Stages of the process of introducing precision farming using digitalization in crop production

Implementation level	Livestock														
	Breeding livestock farms											Dairy Farm			
	The presence of an index rating of animals	Computer herd management	Pasture fence	Mobile machine lock, portable split	Automatic heated drinkers	Electronic scales, ultrasound apparatus, chips	Feeding robots (mixers)	Animal Activity Monitoring	Alternative energy sources	Drone, frantion with integrated monitor	Cow Index	Milking parlor with software	Manure removal robots	Automatic drinking bowls, room ventilation	Computer selection of bulls in the IAS for insemination
Level 1 "Digital Farm"	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Level 2 Advanced	+	+	+	+	+	+					+	+	+	+	
Level 3 "Basic"	+	+	+	+	+						+	+	+		

Note - Compiled on the basis of the source [16]

Despite the positive dynamics of gross agricultural output, the volume of production as a whole lag behind the growth rate of consumption and incomes of the population, and maintaining labor productivity and product competitiveness at a low level does not allow increasing output, which leads to a high share of imports in domestic consumption. With the entry of Kazakhstan into the World Trade Organization, the requirements for increasing competitiveness in foreign markets have intensified.

Gross agricultural output in the Republic of Kazakhstan in monetary terms shows growth over the past 5 years. However, growth dynamics are declining (Figure 4) [15]. A slowdown in agriculture, albeit slightly, provoked a decrease in growth in other sectors.

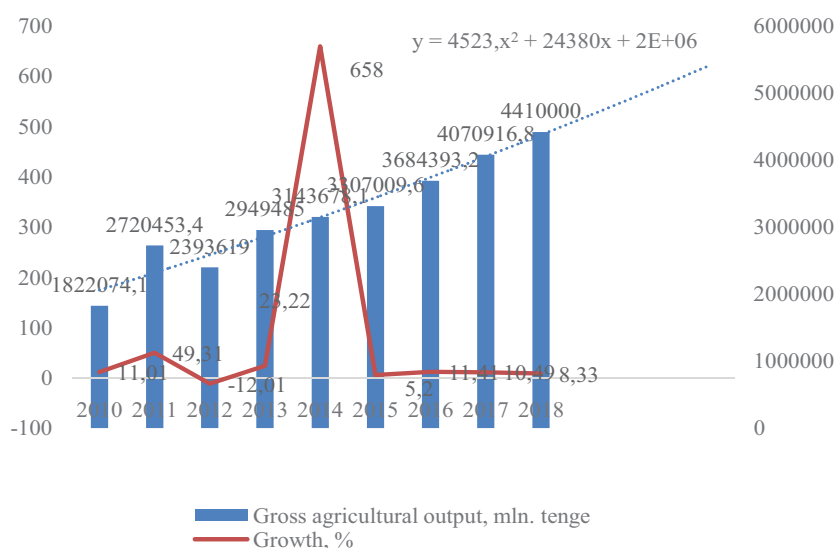


Figure 4 - Gross agricultural output in the Republic of Kazakhstan for the period from 2010-2018, in mln. tenge

Note - Compiled by the author on the basis of the source [15]

According to the Ministry of National Economy of the Republic of Kazakhstan for 2017-2018, investments in fixed assets of agriculture, forestry and fisheries indicate that the gross value added of agriculture at the end of 2018 amounted to 557.3 billion tenge - this is 6.7% more than a year earlier, and 4% more in physical volume (Table 3) [15].

Table 3 - Investments in fixed assets of agriculture, forestry and fisheries

(in billion tenge)

Index	2018	2017	Annual growth,%
Agriculture, forestry and fisheries	175,69	162,43	8,2
Crop and livestock, hunting and the provision of services in these areas	175,22	161,86	8,3
Growing seasonal crops	107,15	99,35	7,9
Livestock	47,28	43,75	8,1
Mixed farming	12,41	14,01	-11,5
Growing perennial crops	7,56	3,54	113,8
Auxiliary activities in the field of growing agricultural crops	0,83	0,98	-15,7
Nursery production	0,00	0,02	-90,1
Hunting and trapping, including the provision of services in these areas	-	0,22	-
Fisheries and Aquaculture	0,27	0,49	-43,9
Forestry and logging	0,20	0,08	151,7

Note - Compiled by the author on the basis of the source [15]

To improve the investment climate, at the end of 2017, the Ministry of Investment and Development of the Republic of Kazakhstan approved the National Investment Strategy for 2018-2022. [17]. At the end of 2018, the volume of capital investments in the agricultural sector reached 175.7 billion tenge, which is 8.2% more than a year earlier (and + 5.3% in comparable prices) (Figure 5) [18].

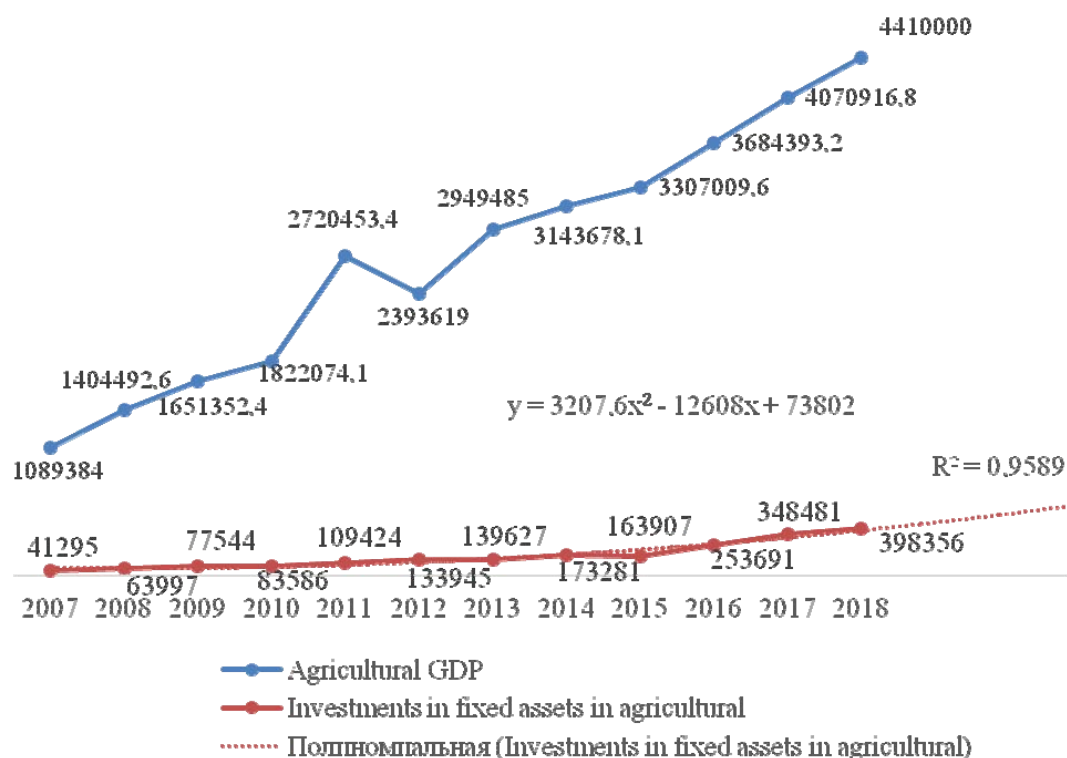


Figure 5 - Indicators of gross agricultural output and investment in fixed assets in dynamics, in mln. tenge

Note - Compiled by the author on the basis of the source: Review of national programs and strategies for supporting the export of agricultural goods in post-Soviet countries. Food and Agriculture Organization of the United Nations - Rome, 2018

More than half of all investments came from the three main granaries of the Republic of Kazakhstan:

- North Kazakhstan region of North Kazakhstan region (immediately 25.7%);
- Kostanay region (13.9%);
- Akmola region (11.2%) [19].

Note that it was these three regions that, according to the results of the last year, provided 72% of the total gross harvest of grain and leguminous crops and immediately more than 80% directly of wheat.

As noted by Kurmanbaev S.K., Alibaeva M.M. in their articles, it is necessary to identify effective ways to reduce agricultural risks, which are carried out on the basis of the development of scientifically sound recommendations and require knowledge of the structure and sources of financial support provided by equipment, crop protection products, financial guarantees of insurance coverage. The impact on risk by insurance means that other methods do not fully compensate for possible damage and losses from various risks [20].

Thus, on the basis of the study, the author made the following conclusions:

1 The serious problems that agricultural production is constantly confronted with, as well as its specific features, increase the backlog of agricultural enterprises in the application of modern management tools. Strategic planning has not yet entered into the practice of most agribusiness entities. However, without developing a scientifically based strategy for the development of the industry at all levels of management, it is

impossible to overcome the crisis and lay the foundation for the rapid development of the agricultural sector of the economy [21].

2 Today, smart digital solutions should help the agricultural industry cope with the challenges of increasing labor productivity and sustainable development. There is great potential for transformations in agriculture with the help of digital technologies, and in the context of a full-scale digitalization program, agriculture can reach a qualitatively new level of development and become a driver of the country's economy. The main directions of the implemented activities of the agricultural digitalization program are:

- increase productivity and labor productivity;
- maintaining food security of the country.

3 The main problems identified in terms of digitalization of agricultural business processes were:

- lack of a single source for obtaining comprehensive information about all scientific achievements, developments and innovations in the agricultural sector;
- unstructured information on world experience in the application of various technologies;
- the opacity and complexity of the processes of obtaining land, loans and subsidies, corruption;
- the problem of the lack of qualified personnel in the agricultural sector;
- irrational use of equipment, seeds, fertilizers and plant protection products;
- space monitoring, agrochemical analysis, provision of accurate weather data to agrarians is not developed;
- poor development of veterinary medicine and phytosanitary activity.

CONCLUSION

In order to further develop the country's agricultural sector, it is planned to implement a number of measures aimed at automating the traceability of agricultural products with the inclusion of all authorized organizations involved in the process, which will allow quantitative and qualitative accounting and trace the entire life cycle of the production and origin of agricultural products.

1 The implementation of the traceability system will have a direct impact on attracting investments in the industry and expanding both the product line of export products and the geography of deliveries of agricultural products and processed products.

2 The implementation of full monitoring under the traceability system will also improve the quality standards of agricultural products, which multiplier affects the attractiveness and competitiveness of Kazakhstani products in foreign markets.

3 For the implementation of "precision farming", a pilot project will be carried out in a number of farms using elements of "precision farming", including the use of weather stations. Based on the results of the pilot project, the economic efficiency of the widespread use of "precision farming" will be determined.

The development and implementation of precision farming elements in all regions of the Republic of Kazakhstan are supposed to simplify activities, increase productivity and labor productivity in the sector. The manufacturer will be able to make a decision based on an array of real-time data on the status of crops, moisture, nutrients, nitrogen, potassium, phosphorus, pests, and the likelihood of precipitation. At the same time, the introduction of precision farming elements will be carried out in conjunction with the acquisition of new agricultural equipment, the implementation of agricultural technologies, and as farmers are ready.

4 Also, measures are envisaged to automate monitoring of natural resources, including the circulation of fish and fish products, the protection, reproduction and use of the wildlife, monitoring of specially protected natural areas, accounting for the use and protection of the water fund, water use and supervision of water facilities. This event will reduce, and subsequently eradicate, poaching and shadow trafficking in fish products, illegal logging, collection and timely processing of information on the activities of organizations and enterprises engaged in entrepreneurial activities related to natural resources. Monitoring of water resources is especially important due to the special importance of water resources and water supply for all sectors of the economy of Kazakhstan.

5 Along with the creation of new and development of existing state information systems in the agricultural sector of Kazakhstan, a prerequisite and condition is the creation and implementation of automated systems in the agricultural enterprises themselves. The experience of all the leading agricultural countries of the

world is an indisputable example of such an approach. Many IT solutions for all the numerous processes in agricultural production and processing directly and mainly affect the efficiency of doing business, increasing labor productivity, profitability and ultimately the competitiveness of agricultural enterprises, from small-scale farming to large agricultural enterprises.

In this connection, the Ministry of Agriculture will build a transparent and calculated principle for the IT community and agro-formations on the large-scale implementation of popular and effective automated systems for agribusiness, as well as mechanisms to stimulate the application of best practices of automated systems in agricultural production.

Improving the competitiveness of domestic agricultural products and their processed products is closely related to the need to promote and position domestic products both in the domestic market and export markets.

As part of addressing these challenges, the platform for e-commerce between farmers, distribution centers, retail chains, markets and stabilization food funds will be implemented to develop sales of agricultural products.

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РЕЗЮМЕ

Целью данной статьи является анализ особенностей внедрения и развития эффективных, цифровых технологий в сельском хозяйстве Республики Казахстан, где в качестве ключевой проблемы агропромышленного комплекса Казахстана выделена низкая производительность и высокие издержки. В связи с этим интерес представляет исследование особенностей внедрения и развития эффективных, цифровых технологий в сельском хозяйстве с целью определения проблем и перспективных направлений цифровизации в сельском хозяйстве Казахстана.

ТҮЙІН

Мақалада Қазақстан Республикасының ауыл шаруашылығында тиімді, цифрлық технологияларды енгізу және дамыту ерекшеліктеріне талдау жүргізілді, онда Қазақстанның агроөнеркәсіптік кешенінің негізгі проблемалары ретінде төмен өнімділік пен жоғары шығындар бөлінген. Осыған байланысты Қазақстанның ауыл шаруашылығында цифрландырудың проблемалары мен перспективалы бағыттарын анықтау мақсатында ауыл шаруашылығында тиімді, цифрлық технологияларды енгізу және дамыту ерекшеліктерін зерттеу қызығушылық тудырады.

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