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A.T. Kokenova[1], A.B. Abylkasym[2],
A.R. Shalbaeva[3], N.S. Abdurazakov[4], N.M. Bekmanova[5]

[1]International Humanitarian and Technical University, city of Shymkent, Republic of Kazakhstan;
[2]International Humanitarian and Technical University, city of Shymkent, Republic of Kazakhstan;
[3]University Miras, city Shymkent, Republic of Kazakhstan;
[4]International Humanitarian and Technical University, city of Shymkent, Republic of Kazakhstan;
[5]International Humanitarian and Technical University, city of Shymkent, Republic of Kazakhstan;
Email: abilkasym77@bk.ru, akmira777@mail.ru

INNOVATION IN AGRICULTURE: DIGITIZATION AS A FACTOR OF NEW OPPORTUNITIES

Abstract. At present, each country in transition to a digital economy, depending on the level of economic development, level of education, preparedness of the regulatory framework, state and applied technologies for developing information systems, focus on a particular digital transformation strategy to achieve positive effects from it. The digital economy in agriculture can ensure the sustainability of agricultural development, the development of agrarian science, agrarian education, compliance with environmental standards.

The relevance of the topic of the article is due to the fact that the digital economy in agriculture is the present and the future of the agro-industrial complex of Kazakhstan. The formation of new approaches should be the goal of forming policy documents on the development of agriculture using the achievements of the digital economy to ensure the application of a paradigm for the growth of agricultural production.

The digital economy in agriculture will make it possible to develop a model of agricultural growth in the twenty-first century that reflects the characteristics of the Republic of Kazakhstan and is focused both on the domestic and foreign markets. This will increase the growth of production of the main product group, aimed both at export demand and import substitution and will ensure the demand for wheat, oilseeds, vegetable oil and other products produced by the Russian agro-industrial complex. This will achieve sustainable development as a steady increase in production.

Sustainable development is such an organization of agricultural production, in which new generations would have access to resources and could conduct agriculture on a scale that meets the needs of the population for food.

Keywords: digitalization, agriculture, production, development, efficiency, digitalization technology, the state.

Introduction

Industrialized countries continue to successfully modernize the economy. They are rapidly introducing innovative technologies based, inter alia, on automation, computerization, and digital platforms. Probably the day is not far off when artificial intelligence will control production.

Global spending on research and development today is about $ 2 trillion, with an average annual growth of 4%.

The world has already entered the era of digital globalization, defined by data streams that contain information, ideas and innovations. According to experts, by 2020, 25% of the global economy will switch to the introduction of digitalization technologies that enable the state, business and society to function efficiently.

Digital technologies in Kazakhstan are also considered as the main way to diversify the national economy, its reorientation from the raw material to the industrial-service model. For the accelerated

implementation of digitalization for the period until 2020, the state program «Digital Kazakhstan» was adopted, which, in particular, noted that «through the progressive development of the digital ecosystem, it is possible to improve the quality of life of the population and the competitiveness of the economy of Kazakhstan». Total expenses for the implementation of this program will amount to 384.2 billion tenge [1].

The world leaders in the implementation of digital technologies are IT companies, media, finance and insurance. In real production and logistics, the level of digitalization is much lower. Agriculture closes the list.

The widespread adoption of digital technology is a key trend in the global economy of the last decade. In agriculture, the industry standard is the use of geographic systems, integrated fleet management, precision farming. But as cross-industry analysis shows, the true digital revolution in global agriculture is yet to come.

The main constraining factor is the peculiarities of agricultural production.

But a number of modern trends suggest that in the coming years this situation will radically change. Industrial robots are the norm since the 90s of the 20th century. The development and production of robotic agricultural machinery is now at the forefront of innovation.

In general, 3 stages of development and implementation of digital technologies in agriculture can be distinguished:

- Pilot technologies: from the mid-2000s, the technologies of geolocation, monitoring the state of agricultural machinery, etc. began to be introduced.

- Market saturation: currently, the number of digital technologies and industry standards in agriculture has reached a critical mass. Almost all manufacturers of equipment, including companies from China and India, offer their own programs and solutions that optimize the use of their machines and equipment. There are several solutions related to precision farming. There are a variety of options for using geodata for crop forecasting, agricultural optimization, logistics management, etc. Additional pressure on the user is provided by the arrival of a new generation of agricultural technologies - the Internet of things and blockchain.

Integration is a key trend of the future: the leader in digitalization of agriculture will be companies that can offer common standards and solutions that combine existing developments in the field of digital agricultural technologies and remove the problem of choice and associated risks.

Methods

The methodological basis of the study is the general scientific methods of cognition - deduction and induction, analysis and synthesis, content - media analysis, sociography, a system and comparative historical method that allows us to identify the genesis, sequence and functioning of the stages of digitalization in the agricultural sector.

The theoretical source of the research was the scientific works of Russian and foreign scientists and specialists on the problems of introducing innovations and digitalization tools in the agricultural sector.

Results and discussion

In many countries, digitalization is currently a strategic development priority. According to the forecasts of leading world experts, by 2020, 25% of the global economy will be digital, and the introduction of digitalization technologies that allow the state, business and society to interact effectively will become an increasingly large-scale and dynamic process [2,3].

More than 15 countries of the world are implementing national digitalization programs: Denmark, Norway, Great Britain, Canada, Germany, Saudi Arabia, India, Russia, China, South Korea, Malaysia, Singapore, Australia, New Zealand and Kazakhstan.

China, in its Internet Plus program, integrates digital industries with traditional ones. Singapore forms the «Smart Economy», Canada creates an ICT hub in Toronto, which becomes the driver of ICT. And South Korea, in the Creative Economy program, focuses on the development of human capital, entrepreneurship and the dissemination of ICT achievements, while Denmark focuses on the digitalization of the public sector.

As we see, different countries have different priorities in the field of digital transformation. In our case, in the Digital Kazakhstan program, we expect the progressive development of the digital ecosystem to achieve sustainable economic growth.

The most striking example of a digital privatization approach is Singapore. So, in 2014, the state initiated the development of the Smart Nation concept and invited the business and expert community to cooperate to clarify and implement it.

The share of information technology in the gross domestic product of South Korea is 9%, in China and India - 4.7% [3,4].

Progress in the development of the digital economy of different countries and the level of integration of the global network into the lives of billions of people is reflected in the Digital Evolution Index 2017 rating. Having analyzed the current state and growth rates of the digital economy in each state, the study authors divided the countries into four groups:

Singapore, the United Kingdom, New Zealand, the United Arab Emirates, Estonia, Hong Kong, Japan and Israel are demonstrating high rates of digital development, maintaining it and continue to lead in the spread of innovation.

South Korea, Australia, as well as countries in Western Europe and Scandinavia have shown steady growth for a long time, but now they have noticeably slowed down the pace of development. Without innovation, these states run the risk of falling behind digitalization leaders.

Despite the relatively low overall level of digitalization, these states are at the peak of digital development and are showing steady growth rates, which attract investors. China, Kenya, Russia, India, Malaysia, the Philippines, Indonesia, Brazil, Colombia, Chile, Mexico have potential that can allow them to take a leading position.

Countries such as South Africa, Peru, Egypt, Greece, Pakistan face serious challenges associated with low digital development and slow growth.

Kazakhstan, however, does not start from scratch. In the 90s, the state program for accelerated industrial and innovative development was launched, the «Bolashak» international education program was initiated, and in 2005 the formation of an «electronic government" was launched».

The foundation for the digital transformation of the economy of Kazakhstan is the state program Information Kazakhstan 2020, approved in 2013. It contributed to the development of the transition to the information society, the improvement of public administration, the creation of «open and mobile government» institutions, the increase in the availability of information infrastructure not only for corporate structures, but also for citizens of the country. According to the results of three years of implementation of the State Program, 40% performance has already been achieved.

Also, the First President noted that the development of the digital industry will provide an impetus to all other industries. In this regard, the President set the task of developing new industries that are created using digital technologies [5].

Digitalization will cover primarily those industries in which there is great potential for economic growth: agribusiness, energy, the mining and oil and gas sectors, transport and logistics.

The projects «Intellectual deposit», «Digital mine» are already working. Investing in the development of local e-commerce.

According to forecasts, the cumulative effect of the implementation of digitalization projects will provide up to 30% of the country's GDP growth since 2025.

A good example, a breakthrough could be the digitalization of agriculture. According to estimates by the Food and Agriculture Organization of the United Nations and the Organization for Economic Co-operation and Development, the world population will reach 9.7 billion by 2050. To ensure food security for the inhabitants of the planet, it is necessary to increase agricultural production by 60–70% compared with the 2000s.

Here, such a competitive advantage of Kazakhstan, and indeed the entire EAEU, comes to the fore as huge reserves of fertile land. But it is possible to solve this global problem by introducing radical technological innovations. And the transition to the digital structure of the agricultural market will be an instrument for stable agricultural production.

According to Gartner, the overall economic effect of the introduction of the Internet of things in all sectors of the economy globally will be $ 1.9 trillion by 2020. Agriculture accounts for 4%, i.e. approximately $ 76 billion [6].

According to GoldmanSachs, the combined increase in crop productivity through the introduction of precision farming solutions can grow by 70% and bring $ 800 billion of additional products by 2050. The

market for precision farming solutions to manufacturers and developers will bring $ 240 billion in 2050. These are solutions for precision planting, precision irrigation, precision fertilizer, spraying, field monitoring, data analysis, small agricultural equipment, including autonomous ones [7].

The average level of penetration of precision farming technologies in the USA by the USDA is estimated at 30-50%, while in large farms the level of technology use is twice as high as in small ones. The penetration of precision farming technologies in active agricultural areas of the United States is 60-80%.

The most common: a computer with high-speed Internet access, soil sample analysis (98%); yield maps, yield monitors, GPS navigation systems (~ 80%); Differentiated application technologies (VR) and prescription maps are used by more than 60% of respondents; satellite images and analysis of the vegetative index of plants are used by no more than 30% of farmers, although new developments in the use of unmanned aerial vehicles (drones) can increase interest in the use of images for scouting, data analysis and management decisions.

Regarding data collection and processing technologies, the use of data and software for mapping yield maps is the most common practice (80%), followed by the development of plans or guidelines for using VR technology for applying nutrients and fertilizers, as well as for sowing and planting (50-60%).

The USA is demonstrating stable growth in the agricultural machinery market; the country is a leader in the import of tractor equipment. The industrial nature of US agriculture and the combination of automation with the rapid implementation of the latest high-tech achievements in practice ensure the country's leadership in agricultural efficiency and AIoT market size.

The development of Agro IoT precision farming systems in the United States is being promoted by large farms with minimal state involvement.

The most developed region in terms of equipping agriculture with modern technology is Germany: the number of tractors per unit area is the largest in the world. Germany is the world leader in the export of tractors among the countries examined in the study. This is explained by the fact that at the level of national self-awareness, the country sets as its goal global industrial leadership (there are many German brands among world industrial leaders: Bosh, Siemence, BMW, Daimler, Volkswagen), is the «author» of the term "Industry 4.0" (as one of Germany's state-owned Hi-Tech strategy subprograms) and is the initiator of processes related to the digitalization of the industry.

At the same time, despite the fact that in Europe 70-80% of agricultural machinery is sold with integrated smart and navigation systems in Europe, the number of "connected" equipment is at the level of 25% -30%. The main barriers of the European market are the smaller share of large farms compared to the USA (the presence of a large number of «family» centuries-old successive businesses), for which the purchase of equipment with connected electronics is expensive, as well as the fact that most farms already have tractor equipment in use, which prevents its replacement with a more innovative [8].

In the USA and Germany, high Internet penetration in rural areas is at the level of 70-80%.

About 2.1 million new tractors are sold annually in the world. About 50% of all tractors are sold in China and India.

China is developing at the fastest pace in terms of agricultural mechanization. The agricultural machinery market has grown by an average of 13.3% over the past 5 years. China almost completely provides itself with machinery, the volume of imported machinery in monetary terms is 8 times less than exported, despite the fact that in 2004 China had the same volume of export and import of tractors.

As a country of catch-up development with the least mechanized agriculture, India shows the greatest demand for these products and is rapidly increasing the level of mechanization of agriculture. In the period 2006-2018. sales of new tractors increased by more than 3 times. In addition, according to J'son & Partners Consulting, India is one of the leading countries in the production of agricultural machinery. The main role in the engineering industry is played by 14 large companies, most of which work closely with well-known western partners. India is active in localizing the world's largest manufacturing enterprises. This is consistent with the national program Net Zero Export (Zero Import) - the state import substitution program, according to which by 2020 the country must learn how to produce everything independently and ensure zero volume of imports. Therefore, the country is able to quickly master the production of modern high-tech equipment.

• High penetration of precision farming technologies in Canada - 60-80% or more for some basic types. According to a survey of farmers, the overall attitude towards precision farming in Canada is generally positive:

- 84% of the surveyed farmers use one or another «precision farming» technology;
- 93% agreed that «precision farming» is beneficial to use;
- 75% plan to increase the use of «precision farming» technologies.

Canada became the No. 1 country in terms of production per employee (ratio: agricultural output / number of employees in the industry) and overtook the traditional permanent leader in this indicator - the United States in 2015. Leadership is due to the high penetration of automated systems and hitech agricultural practices, a large number of people employed in the agricultural sector, and strong government support for the industry (for example, farmers have free access to a variety of interactive maps based on satellite imagery).

An analysis of the activities of Kazakhstani farmers and state bodies on the issues of digitalization and automation of the agricultural sector for 2018 showed the following results:

Pavlodar region. Digitalization programs are already used in crop and livestock production. For example, a program has been connected for commodity producers that integrates information on the volumes of milk received into an electronic system of an information-analytical base. According to data, in the region 568.3 thousand hectares of 1.3 million hectares of land are digitized, which is 42.6% |6|.

North-Kazakhstan region. In 2019, nanotechnology will be applied in 50 farms of northern Kazakhstan.

Also, the basis of digitalization is an electronic field map. Today it is already 52%, the fields are digitized. In the future, it is planned to use satellite monitoring of fields and equipment [9]

In East Kazakhstan, within the framework of the Digital Kazakhstan program, the Information Technology Center of the Akim of the region has been opened. The objective of the Center is to develop the digitalization process in the region. In the cities of Ust-Kamenogorsk and Semey, electronic maps will be created that reflect information about the free land plots of settlements |8|.

Kostanay region. As part of the digitalization of the agro-industrial complex, the main emphasis will be placed on the introduction of precision farming elements, from which the greatest economic effect is expected. In the Kamystinsky PKF Kairat LLP, using modern high-performance equipment that allows the use of digital technologies, more than 30 million tenge, or 15% of production costs, were saved when sowing 15 thousand ha of grain. Last year, in the Troyana LLP of the Fedorovskiy district, during spring field work using satellite navigation, 4,000 hectares were sown with 4 units and 10 million tenge were saved due to the prevention of replanting, saving fuel, seeds and protective equipment. Due to the widespread use of «smart» technologies in the Zhanahay farm in the same area, annual savings amount to over 9 million tenge. Given the scale of sowing and harvesting in the whole region, the economic effect may exceed tens of billions of tenge [10].

In the Kostanay region, it is planned to complete the work on the "digitization" of the fields. They plan to tie the receipt of all subsidies, soft loans, insurance to these cards.

In the Akmola region, a number of tasks on the digitalization of agricultural production are being implemented. In the region, the process of transferring filing applications and paying subsidies in electronic form through the Minagro.kz web portal has begun.

Now agricultural producers do not need to submit applications themselves, everything is converted to digital format. In the region, work is underway on the formation of an electronic field map aimed at the development of precision farming.

Three basic enterprises for the introduction of precision farming technologies have been identified - AF «Homeland Tselinogradsky District» LLP, «Belagash»LLP of Zhaksynsky «District» and «Zhuravlevka-1» LLP of the Bulandinsky District) and three livestock enterprises producing products using smart farm technology (LLP «AF Rodina Tselinogradsky District», «Esil Agro» LLP, «Burabaysky District and Enbek» LLP «Akkolsky District».

In the near future, within the framework of the concluded memorandum between Akimat of Akmola region and JSC «Kazakh Agro Technical University named after S. Seifullin» on cooperation in the field of scientific and innovative development of the agro-industrial complex, it is planned to conduct advanced training courses and retraining of farm specialists in teaching digital literacy and precision farming

technology. In addition, a number of projects will be implemented to introduce digital technologies in crop production, an online monitoring and field work accounting system using digital technologies and GPS equipment.

The introduction of digital technologies will allow promptly making optimal decisions on field work, saving fuels and lubricants, increasing the efficiency of fertilizers and herbicides, which in general will contribute to the sustainable growth of agricultural production in the region [11].

West-Kazakhstan region. In April 2018, a meeting was held in the House of Agrarians in Uralsk on the preparations for the spring field work, chaired by the First Deputy Akim of the region.

As a result of the meeting, it was instructed to take comprehensive measures to ensure that agricultural enterprises lacked seeds, bring them to sowing conditions, to seed treatment, to complete repair of tractors, sowing and tillage equipment on time, to intensify work on the selection of allocated diesel fuel, as well as assisting agricultural producers in the introduction of precision farming elements and digital technologies in the agro-industrial complex, upon completion of digitization of fields in an electronic format. (newspaper «Ural»)

Turkestan region. The application of digital technologies in the agricultural sector is developing dynamically. In particular, in the region, modern technologies are being introduced in agriculture and animal husbandry.

As a result of applying advanced technologies, the productivity of intensive gardens planted on 2.8 thousand hectares in comparison with traditional gardens increased by 1.5-2 times. It is worth noting that 70 percent of greenhouses are automated in the region. Along with this, the area of land on which the drip irrigation method is applied increased by 16%, amounting to 59.1 thousand ha. In addition, in livestock breeding, automated livestock numbers are kept. This measure will allow you to control all animal movements and ongoing veterinary measures.

At the same time, new technologies are actively used in the region in the production and processing of livestock products. For example, the Burt-Milka dairy farm fully automated the entire production process, from milking to feeding and storing milk. As a result of automation of production, the annual productivity of one cow will be up to 7 thousand liters of milk, when in the traditional way the productivity is 3 thousand liters [12].

Roland Berger believes that the market for smart agriculture solutions in the world will reach € 4.5 billion by 2020, and according to Gartner's forecasts, the total economic effect of introducing IoT tools by 2020 will amount to $ 1.9 trillion, moreover Agriculture accounted for 4% of them, which in absolute terms will amount to more than $ 75 billion. Tractica concluded that the market for agricultural robots will reach $ 74.1 billion by 2024, and production will grow 19 times and reach 594 thousand. units of technology.

According to J`son & Partners Consulting, the efficiency of business processes in agriculture can be increased by 50-70% if robotic systems are used to control fuel consumption, water consumption, electricity, and harvesting. When optimizing the main work processes with the help of robotic systems, you can increase productivity by 1.5-2 times, reduce the cost of planting crops by up to 80%. In general, the global market for digital agriculture is estimated at 3 billion euros, and by 2020 it can grow to 4.5 billion euros.

Currently, the development of agriculture in our country is a priority. Improving the economic efficiency of agriculture to a level competitive from the standpoint of the world market is impossible without improving and developing the main creative force of the agrarian economy, it reflects the essence and inner core of rural residents. The development of agriculture is objectively determined by the need to create new effective infrastructure links in the digital economy and provide the population with food of appropriate quality in the required quantity. Modern information technologies help to increase the efficiency of agricultural production.

But, unfortunately, innovations in the agricultural sector in Kazakhstan are not sufficiently developed. And in order to achieve development effectiveness, it is necessary to create various programs to improve the skills of personnel that will advance agricultural production forward, attracting new specialists to enterprises.

A key trend in the development of agriculture is the formation of effective human and social capital with the proper level of information support and transparency of information flows, a highly organized

institutional environment, with a minimum level of transaction costs, it is worth building a system of directions and measures for the development of the agro-industrial complex with the corresponding orientation of the digital economy.

The prospects for modernizing the industry are enormous. Agriculture in the world is transformed from traditional to high-tech industry, which is able to create new markets for innovative developments that did not exist before. The time has come when smart digital solutions should help the country's agriculture cope with the problems of increasing labor productivity and sustainable development.

The agricultural sector is the most vulnerable sector of the economy, largely dependent on the vagaries of nature. Moreover, the impact of climate change on food security in the world will only increase. The intensity, seasonality and amount of precipitation will become more and more unpredictable, which will significantly reduce the ability of the agricultural business to adapt to such changes.

To this we can add the likelihood of the enormous damage that the country's economy can cause drought or floods caused by climate change. Over the past 5 years alone, 30 billion tenge has been spent on eliminating the consequences of emergencies from the republican budget.

The digitalization of the agricultural sector will reduce these risks, adapt to climate change, increase crop yields and animal productivity, and plan field work in a timely manner.

Reducing the cost of growing products, increasing their quality and competitiveness through the efficient use of resources and scientifically sound approaches is the main task of digitalizing agriculture.

Providing the necessary information to rural producers will reduce transaction costs for the purchase and sale, simplify the supply chain of products from the field to the consumer, and reduce the shortage of skilled labor.

The experience of countries with developed agricultural sector indicates that the introduction of IT technologies in production allowed them to reduce unplanned costs by 20%.

Using available mobile or online applications and downloading data on a particular field (its coordinates, area, crop type, yield for several years), farmers receive accurate recommendations for further actions, taking into account the analysis of many factors.

The farmer will be able to combine this information with the data received from sensors installed on agricultural machines, drones. The farmer can also independently track the entire path of product promotion - from the field to the consumer, which guarantees its quality and meets the needs of customers.

So, agricultural machinery of the John Deere plant is already capable of transmitting information about the state of the crop. Field surveys performed by agricultural machinery manufactured by this company can reduce survey costs by up to 90%.

In Australia, a system for identifying and tracking farm animals and products obtained from them has been introduced, which makes it possible to quickly and effectively respond to various diseases when they occur and reduce the risk of infection [13].

In addition, digital technology enables farmers in different countries to be trained in best practices and to adhere to uniform production standards. For example, Nestle (Switzerland) trained 10,000 West African farmers in modern agricultural technology and product storage. As a result, the company received raw materials of guaranteed quality, and farmers - access to the global market and marketing of products at high prices [14].

The following data indicate an increase in interest in digitalization by business structures. If in 2010 in the world there were no more than 20 high-tech companies operating in the agricultural sector, while the venture investment market amounted to 400 thousand dollars, then already in 2013 the exponential growth of venture capital began [15].

Investments in the agricultural industry in 2015 reached a historic high of $ 4.6 billion. The most active countries that attract investment in agricultural startups are the USA, China, India, Canada, and Israel [16,17].

In the development of agricultural science in Kazakhstan, as in all advanced countries, there is a process of integration and close interaction in the areas: «science - education – production».

After that, the participants were shown the results of the introduction of new technologies on the fields of the research institute.

According to estimates, the accelerated introduction of agricultural innovation in agriculture will increase crop production by 2-2.5 times in the southern regions of Kazakhstan. And the introduction of

digitalization processes in the agricultural sector will help increase competitiveness and labor productivity, ensure food safety and attract investment in the industry.

In general, according to experts, the economic effect until 2025 will be at least 40 billion tenge.

The comprehensive digitalization of agricultural production, from his point of view, will allow farmers to reduce costs by 23%. Thus, the average cost savings in land use using GPS navigation technology is 11-14%, with differential fertilizer application - 8-12%, and thanks to parallel driving systems - 8-13%. With the inefficient use of agribusiness tools, up to 40% of the crop is lost [18].

More than 30% of pasture lands in Kazakhstan are subject to degradation, and today the urgent issue is the introduction of modern systems for a comprehensive assessment of the state of the country's forage base. The land hub, together with the US Department of Agriculture, is implementing a project to introduce methods for assessing the degradation of pasture lands using digital algorithmic analysis systems.

Agrohub specialists and international experts from the USA and Italy in 2017 carried out a pilot project to assess the condition of pastures in 5 regions of Kazakhstan. It is planned to introduce and adapt this system to assess all the rangelands of the country [19].

In December 2017, 35 employees of the Ministry of Agriculture of the Republic of Kazakhstan, who will use this assessment methodology in their practical work, were trained by the methodology of American scientists.

One of the challenges in agriculture is phytosanitary risks. So, for example, since 2011, a dangerous disease of fruit plantations - a bacterial burn, has spread rapidly. The area of infection since its registration has expanded 40 times. To solve this problem, specialists from Cornell University were involved, with whom it is planned to create a virus-free nursery using breeding material resistant to a bacterial burn.

The list of quarantine objects includes weed - creeping mustard. Large-scale localization and eradication of this dangerous weed is possible only with the use of the latest technologies for combating it, which the United States and Italy possess. In 2017, comprehensive studies were conducted with the participation of specialists from the Italian Agency for New Technologies and Sustainable Resources and the USDA. The possibility of using biological methods to combat mustard has been studied [20,21]

Obtaining timely information on the state of cultivated crops helps the farmer make the best decision.

Together with the University of Michigan, work is underway on the use of mobile sensory systems that can quickly and accurately analyze the state of plants, animals and the environment. Data obtained in this way is processed in a cloud server using algorithms developed by scientists of this university. Based on them, recommendations are received that the farmer receives through the mobile application. A pilot project to adapt this system began to be implemented in 2018 [22].

According to the Ministry of Agriculture, as part of the digitalization, at least 20 digital and 4000 advanced farms will be created throughout the country and one hundred percent automation of processes and public services will be provided.

The agency plans through automation to solve the difficulties encountered by the farmer at the initial stage of activity with the collection of information, obtaining advice, training. So, starting in 2020, it is planned to launch online training involving private IT companies, this will allow the farmer to undergo training with the choice of a teacher, courses and without coming to the training center and will reduce the time and transportation costs of farmers.

It is also noted that from 2020, the practice of online consultations on entrepreneurship, farming, agronomy, seed production, livestock farming will be launched. In 2019, it is planned to implement a pilot project to launch online lending for spring field work, in 2021 the process will be fully automated [19].

According to the Ministry of Agriculture of the Republic of Kazakhstan, 23.7 million hectares of land or 98.8% of the total sown area were digitized as part of the creation of electronic field maps, which are one of the elements of precision farming. By the end of the year, it is planned to complete the full digitization of arable land fields.

To analyze the application of precision farming in nine pilot farms in the North Kazakhstan, Akmola, Karaganda and Kostanai regions, the Kazakh Agro-Technical University carried out a revision of the capabilities of the equipment, differentiated fertilizer application, created electronic field maps, conducted an agrochemical analysis of the soil, and maps of the weediness of crops were compiled. Education of farmers in the use of new technologies takes place on the basis of precision farming landfills: «Kaskelen»

agricultural park, SPC grain farm named after A. Baraev, Zarechny LLP and Kazakh National Agrarian University.

By the end of the year, specific farms will be identified with which work will be carried out to develop them to the level of digital farms in the meat and dairy sectors. By the end of this year, it is planned to create electronic pasture maps.

As part of the introduction of precision farming, three truss levels are defined: a digital farm, an advanced farm, and a basic farm, for which a set of necessary elements is defined. Further work will be aimed at raising the level of the farmer through state support measures.

Today, agriculture is not one of the most innovative sectors, however, the agricultural sector is being transformed under the influence of bio- and nanotechnology, varieties and breeds are improved by genomics, producers are moving from a product to a service model, integrating production and marketing chains and adapting their products to customer specific requests.

Summary and Conclusion

The main objective of the digital transformation of agriculture is the integration of objective data flows of agricultural producers and government data into the digital agriculture platform to ensure global planning in the industry and provide accurate recommendations to market participants, including using artificial intelligence, to activate innovative processes using a modern innovative management apparatus. Key areas and initiatives (pilot projects) will enable the digital transformation of agriculture using digital platforms using data.

In its general form, «... the digital economy is the use of large amounts of data in economic life and ordinary household life by capitalizing this data, processing it online ...». The digital economy is an adaptive cyber-physical system of systems organized in such a way as to make the most rational use of the resources at its disposal at any given time to fully satisfy the needs of its participants. The core elements of the digital economy are constantly transforming integrated product and service systems (PSS). Without it, it is impossible to imagine innovative activity.

In the current conditions of economic development, it is necessary to use new technologies in order to reduce production costs, the need to comply with market needs, rapidly changing requirements of standards and many regulatory documents, which is practically impossible without the use of digital technologies, when information volumes grow squared faster than production volumes.

In the agricultural sector of Kazakhstan, the formation of digital agriculture is the mastery of the future. The strategic guidelines of the digital economy are reflected in geopolitics, industry development and agribusiness management. The use of elements of the digital economy is possible at all stages of the «field → counter» system. Conducting research on this issue, we can conclude that the creation of reference digital models of production processes in agriculture will improve the business efficiency of agricultural producers. But this requires universal open agricultural production management systems with hundreds of input conditions (parameters) and big data analysis with AI elements, which include the formation and algorithmization of control scenarios (equipment, devices, things, processes, finances) for the main cases - preparatory, production and marketing.

Each management decision platform should be built on an open platform for the management of crop production, livestock production, supply and marketing logistics, including traceability systems, the formation of a seed and genetic fund platform, fertilizer management and chemistry. The main platform being created is the knowledge platform, which reflects the presence of professionals in creating the necessary programs and providing farmers with new IT opportunities to increase added value.

А.Т.Кокенова[1], А.Б.Әбілқасым[2], А.Р.Шалбаева[3], Н.С.Абдуразаков[4], Н.М.Бекманова[5]

[1]Халықаралық гуманитарлық-техникалық университеті, Шымкент қаласы, Қазақстан Республикасы;
[2]Халықаралық гуманитарлық-техникалық университеті, Шымкент қаласы, Қазақстан Республикасы;
[3]Мирас университеті, Шымкент қаласы, Қазақстан Республикасы;
[4]Халықаралық гуманитарлық-техникалық университеті, Шымкент қаласы, Қазақстан Республикасы;
[5]Халықаралық гуманитарлық-техникалық университеті, Шымкент қаласы, Қазақстан Республикасы;

АУЫЛШАРУАШЫЛЫҒЫНДАҒЫ ИННОВАЦИЯ:
ЦИФРОВИЗАЦИЯ ЖАҢА МҮМКІНДІКТЕРДІҢ ФАКТОРЫ РЕТІНДЕ

Аннотация. Қазіргі уақытта әр елдің экономикалық даму деңгейіне, білім деңгейіне, ақпараттық жүйелерді дамытуға арналған нормативтік базаға, мемлекеттік және қолданбалы технологияларға дайындыққа байланысты цифрлық экономикаға көшу кезіндегі елеулі оң нәтижеге жету үшін нақты цифрлық трансформация стратегиясына ерекше көңіл бөлінеді. Ауыл шаруашылығындағы сандық экономика ауыл шаруашылығы дамуының тұрақтылығын, аграрлық ғылымды дамытуды, аграрлық білім беруді, экологиялық стандарттарды сақтауды қамтамасыз ете алады.

Мақала тақырыбының өзектілігі ауыл шаруашылығындағы цифрлық экономика Қазақстанның агроөнеркәсіп кешенінің қазіргі және келешегі болып табылады. Жаңа тәсілдерді қалыптастыру ауыл шаруашылығы өндірісін дамыту парадигмасын қолдануды қамтамасыз ету үшін цифрлық экономиканың жетістіктерін қолдана отырып, ауыл шаруашылығын дамытуға арналған саяси құжаттарды қалыптастыру болып табылады.

Ауыл шаруашылығындағы цифрлық экономика XXI ғасырда ауыл шаруашылығының өсу моделін қалыптастыруға мүмкіндік береді, ол Қазақстан Республикасының ерекшеліктерін бейнелейді және ішкі және сыртқы нарықтарға бағдарланған. Бұл экспорттық сұраныс пен импортты алмастыруға бағытталған және негізгі ресейлік агроөнеркәсіп кешені өндіретін бидай, майлы дақылдар, өсімдік майы мен басқа да өнімдерге сұранысты қамтамасыз ететін негізгі өнім тобын өндіру көлемін арттырады. Бұл орнықты дамуды өндірістің тұрақты өсуі ретінде көрсетеді.

Тұрақты даму ауылшаруашылық өндірісінің осындай ұйымы болып табылады, онда жаңа ұрпақ ресурстарға қолжетімділікке ие болады және халықтың азық-түлікке деген сұранысына жауап беретін шкала бойынша ауыл шаруашылығын жүргізе алады.

Түйін сөздер: цифрлау, ауыл шаруашылығы, өндіріс, даму, тиімділік, цифрлау технологиясы, мемлекет.

А.Т.Кокенова[1], А.Б.Әбілқасым[2], А.Р.Шалбаева[3], Н.С.Абдуразаков[4], Н.М.Бекманова[5]

[1]Международный гуманитарно-технический университет, город Шымкент, Республика Казахстан;
[2]Международный гуманитарно-технический университет, город Шымкент, Республика Казахстан;
[3]Университет Мирас, город Шымкент, Республика Казахстан;
[4]Международный гуманитарно-технический университет, город Шымкент, Республика Казахстан;
[5]Международный гуманитарно-технический университет, город Шымкент, Республика Казахстан

ИННОВАЦИИ В СЕЛЬСКОМ ХОЗЯЙСТВЕ: ЦИФРОВИЗАЦИЯ КАК ФАКТОР НОВЫХ ВОЗМОЖНОСТЕЙ

Аннотация. В настоящее время каждая страна, находящаяся на переходном этапе к цифровой экономике, в зависимости от уровня экономического развития, уровня образования, готовности нормативно-правовой базы, государственных и прикладных технологий для разработки информационных систем, фокусируется на конкретной стратегии цифровой трансформации для достижения положительного эффекта. от него. Цифровая экономика в сельском хозяйстве может обеспечить устойчивость развития сельского хозяйства, развитие аграрной науки, аграрного образования, соблюдение экологических стандартов.

Актуальность темы статьи обусловлена тем, что цифровая экономика в сельском хозяйстве является настоящим и будущим агропромышленного комплекса Казахстана. Формирование новых подходов должно стать целью формирования программных документов по развитию сельского хозяйства с использованием достижений цифровой экономики для обеспечения применения парадигмы роста сельскохозяйственного производства.

Цифровая экономика в сельском хозяйстве позволит разработать модель сельскохозяйственного роста в XXI веке, которая отражает особенности Республики Казахстан и ориентирована как на внутренний, так и на внешний рынки. Это увеличит рост производства основной товарной группы, направленной как на экспортный спрос, так и на импортозамещение, и обеспечит спрос на пшеницу, масличные, растительное масло и другие продукты, производимые российским агропромышленным комплексом. Это обеспечит устойчивое развитие как устойчивый рост производства.

Устойчивое развитие - это такая организация сельскохозяйственного производства, в которой новые поколения будут иметь доступ к ресурсам и смогут вести сельское хозяйство в таких масштабах, которые удовлетворяют потребности населения в продовольствии.

Ключевые слова: цифровизация, сельское хозяйство, производство, развитие, эффективность, технология цифровизации, государство.

Information about authors:

Kokenova A.T. - International Humanitarian and Technical University, city of Shymkent, Republic of Kazakhstan, https://orcid.org/0000-0002-8805-5924

Abylkasym A.B. - International Humanitarian and Technical University, city of Shymkent, Republic of Kazakhstan, abilkasym77@bk.ru, https://orcid.org/0000-0002-7773-1712

Shalbaeva A.R. - University Miras, city Shymkent, Republic of Kazakhstan, https://orcid.org/0000-0002-5496-8354

Abdurazakov N.S. - International Humanitarian and Technical University, city of Shymkent, Republic of Kazakhstan, https://orcid.org/0000-0002-7586-6381

Bekmanova N.M. - International Humanitarian and Technical University, city of Shymkent, Republic of Kazakhstan, https://orcid.org/0000-0001-9661-6819

REFERENCES

[1]https://strategy2050.kz/ru/news/51207/

[2]Kozubenko I.S. (2018) Analitika dannyh kak instrument gosudarstvennogo upravlenija APK [Jelektronnyj resurs]. URL: https://www.sas.com/ru_ru/events/17/sfr-2017.html#materials/ (data obrashhenija: 16.08.2018)

[3] M. Ayazhanova, Sh. Muldokanova (2019). Development management system in agriculture // News of the National academy of sciences of the Republic of Kazakhstan. Series of agricultural sciences. ISSN 2224-526X. 2019. Vol. 4, N 52. P. 24-30. https://doi.org/10.32014/2019. 2224-526X.1

[4] G.Nurmanbekova, R. Duiskenova (2019). Realization of regional innovation policy // News of the National academy of sciences of the Republic of Kazakhstan. Series of agricultural sciences. ISSN 2224-526X. 2019. Vol. 5, N 53. P. 24-30. https://doi.org/10.32014/2019. 2224-526X.1

[5]IT v sel'skom hozjajstve i agroprome (2017) [Jelektronnyj resurs]. URL: https://www.osp.ru/netcat_files/userfiles/Akron_2017/1.3_Agro_IT_v_selskom_hozyaystve_i_agroprome._Investitsii_i_trendy_FRII.pdf (data obrashhenija: 16.08.2018)

[6]Klimova N.V. (2013) Osobennosti regulirujushhego vozdejstvija gosudarstva na agrobiznes v zarubezhnyh stranah [Jelektronnyj resurs] // Politematicheskij setevoj jelektronnyj zhurnal Kubanskogo agrarnogo universiteta. 2013. № 90. URL: http://ej.kubagro.ru/2013/06/pdf/45.pdf (data obrashhenija: 16.08.2018)

[7]Cifrovoj jekonomiki i obshhestva indeks (DESI), EC.Europa.EU/Digital-Single-Market/EN/Desi

[8]Portal Nacional'noj tehnologicheskoj iniciativy http://nti.one/. Stranica Rabochej gruppy «TechNet» (Peredovye proizvodstvennye tehnologii) NTI. http://fea.ru/compound/national-technology-initiative/

[9]https://informburo.kz/novosti/dlya-cifrovizacii-apk-kazahstana-msh-ispolzuet-opyt-pyati-stran.html

[10]https://kapital.kz/gosudarstvo/68144/ekonomicheskij-effekt-ot-cifrovizacii-apk-sostavit-40-mlrd-tenge.html

[11]http://kazakh-zerno.kz/novosti/agrarnye-novosti-kazakhstana/243961-kazakhstan-tsifrovizatsiya-apk-prodolzhaetsya

[12]Cifrovoj jekonomiki i obshhestva indeks (DESI), EC.Europa.EU/Digital-Single-Market/EN/Desi

[14]Klimova N.V. (2013) Osobennosti regulirujushhego vozdejstvija gosudarstva na agrobiznes v zarubezhnyh stranah [Jelektronnyj resurs] // Politematicheskij setevoj jelektronnyj zhurnal Kubanskogo agrarnogo universiteta. 2013. № 90. URL: http://ej.kubagro.ru/2013/06/pdf/45.pdf (data obrashhenija: 16.08.2018)

[15]https://strategy2050.kz/ru/news/51207/

[16]http://www.itk.kz/index.php/ru/48-uncategorised/2105-gartner

[17]http://www.iksmedia.ru/news/5417075-Selskoe-xozyajstvo-vstalo-na-put.html

[18]www.dknews.kz

[19]https://24.kz/ru/

[20]https://region-press.kz/

[21]https://www.ng.kz/

[22]https://www.zakon.kz/