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DIGITALIZATION AS A FACTOR OF INNOVATIVE DEVELOPMENT OF DAIRY INDUSTRY OF THE REPUBLIC OF KAZAKHSTAN

ЦИФРЛАНДЫРУ ҚАЗАҚСТАН РЕСПУБЛИКАСЫНЫҢ СҮТ САЛАСЫНЫҢ ИННОВАЦИЯЛЫҚ ДАМУ ФАКТОРЫ РЕТІНДЕ

ЦИФРОВИЗАЦИЯ КАК ФАКТОР ИННОВАЦИОННОГО РАЗВИТИЯ МОЛОЧНОЙ ОТРАСЛИ РЕСПУБЛИКИ КАЗАХСТАН

К.К. BAYGABULOVA*[1]*
C.E.Sc., Associated Professor
Y.A. AKHMEDYAROV [1]
PhD student
G.K. ALTYBAEVA[2]
Master of Economics
[1]*L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan*
[2]*Kostanay State University named after A. Baitursynov, Kostanay, Kazakhstan*
K.baygabulova@mail.ru
К.К. БАЙГАБУЛОВА[1]
э.ғ.к., қауымдастырылған профессор
Е.А. АХМЕДЬЯРОВ[1]
PhD докторанты
Г.К. АЛТЫБАЕВА[2]
экономика магистрі
[1]*Л.Н. Гумилев атындағы Еуразия ұлттық университеті, Нұр-Сұлтан, Қазақстан*
[2]*А. Байтұрсынов атындағы Қостанай мемлекеттік университеті*, *Қостанай, Қазақстан*
К.К. БАЙГАБУЛОВА[1]
к.э.н., ассоциированный профессор
Е.А. АХМЕДЬЯРОВ[1]
докторант PhD
Г.К. АЛТЫБАЕВА[2]
магистр экономики
[1]*Евразийский национальный университет им. Л.Н. Гумилева, Нур-Султан, Казахстан*
[2]*Костанайский государственный университет им. А. Байтурсынова, Костанай, Казахстан*

Abstract. Relevant issues of the development of dairy industry in Kazakhstan in terms of the implementation of the concept of digitalization have been considered. The experience of introducing digital technologies in agriculture of economically developed countries and the possibility of their use in the country has been studied. The authors noted the importance of the digital economy in the near future in the world and in the economy of foreign countries. The process of its implementation carried out by the United Nations Economic Commission for Europe, as well as the value of this experience for Kazakhstan in the context of integration, is considered. The study shows that the Republic of Kazakhstan has a sufficiently large potential for production and processing of milk by improving innovative development management of the industry. When considering these issues, the main provisions of the State program "Digital Kazakhstan" were taken into account, which determines the direction of promotion of digitalization in the republic. The problems of dairy products market are identified, in particular, the shortage of raw materials for dairy enterprises and high transaction costs in dairy supply chain from producer to consumer. The reasons for the low quality of raw milk - raw materials for milk processing enterprises have been identified. Measures for the application of digital information in dairy industry have been proposed: computer programs, GPS coordinate systems,

databases, digitization and mapping. The features of labor market functioning in rural areas, taking into account the introduction of digitalization are noted.

Аңдатпа. Цифрландыру тұжырымдамасын жүзеге асыру жағдайында Қазақстанда сүт саласын дамытудың өзекті мәселелері қаралған. Экономикалық дамыған мемлекеттердің ауыл шаруашылығында сандық технологияларды енгізу тәжірибесі және оларды республикада қолдану мүмкіндіктері зерделенген. Авторлар таяу болашақта әлемдегі және шет елдердің экономикасындағы сандық экономиканың маңыздылығын атап өткен. БҰҰ Еуропалық экономикалық комиссиясы жүзеге асыратын оны енгізу процесі, сондай-ақ интеграция жағдайында Қазақстан үшін осы тәжірибенің маңызы қарастырылған. Жүргізілген зерттеу Қазақстан Республикасының саланың инновациялық дамуын басқаруды жетілдіру есебінен сүт өндіру мен қайта өңдеудің айтарлықтай үлкен әлеуетіне ие екендігін көрсетеді. Осы мәселелерді қарастыру кезінде республикада цифрландыруды ілгерілету бағыттарын айқындайтын "Цифрлық Қазақстан" мемлекеттік бағдарламасының негізгі ережелері ескерілген. Сүт өнімдері нарығының проблемалары, көбінесе сүт өнеркәсібі кәсіпорындары үшін шикізат тапшылығы және сүт өнімдерін өндірушіден тұтынушыға дейін жеткізу тізбегіндегі жоғары транзакциялық шығындар анықталған. Сүт өңдейтін кәсіпорындар үшін шикі сүт - шикізатының төмен сапасының себептері анықталған. Сүт саласында сандық ақпаратты қолдану бойынша іс-шаралар: компьютерлік бағдарламалар, GPS координаталар жүйесі, деректер қоры, цифрлау және карталау ұсынылған. Цифрландыруды енгізуді ескере отырып, ауылдық жерлерде еңбек нарығының жұмыс істеу ерекшеліктері атап өтілген.

Аннотация. Рассмотрены актуальные вопросы развития молочной отрасли Казахстана в условиях реализации концепции цифровизации. Изучены опыт внедрения цифровых технологий в сельском хозяйстве экономически развитых государств и возможности их применения в республике. Авторами отмечена значимость цифровой экономики в ближайшей перспективе в мире и экономике зарубежных стран. Рассмотрены процесс ее внедрения, осуществляемый Европейской экономической комиссией ООН, а также значение данного опыта для Казахстана в условиях интеграции. Проведенное исследование показывает, что Республика Казахстан обладает достаточно большим потенциалом производства и переработки молока за счет совершенствования управления инновационным развитием отрасли. При рассмотрении данных вопросов были учтены основные положения государственной программы «Цифровой Казахстан», определяющей направления продвижения цифровизации в республике. Определены проблемы рынка молочной продукции, в частности дефицит сырья для предприятий молочной промышленности и высокие транзакционные издержки в цепочке поставок молочных продуктов от производителя до потребителя. Выявлены причины низкого качества сырого молока - сырья для молокоперерабатывающих предприятий. Предложены мероприятия по применению цифровой информации в молочной отрасли: компьютерные программы, системы координат GPS, баз данных, оцифровки и картирования. Отмечены особенности функционирования рынка труда в сельской местности, с учетом внедрения цифровизации.

Key words: agro-industrial complex, milk, dairy products, quality, digitalization of economy, information technology, labor productivity, food safety.

Түйінді сөздер: агроөнеркәсіптік кешен, сүт, сүт өнімдері, сапа, экономиканы цифрландыру, ақпараттық технологиялар, еңбек өнімділігі, азық-түлік қауіпсіздігі.

Ключевые слова: агропромышленный комплекс, молоко, молочная продукция, качество, цифровизация экономики, информационные технологии, производительность труда, пищевая безопасность.

Introduction. Recently, according to the Food and Agriculture Organization of the United Nations (FAO), every seventh inhabitant of the Earth suffers from hunger. The population on Earth will rise up to 8.5 billion by 2025, 83% of people will live in developing countries. Therefore, by that time, it will be necessary to increase the volume of food production by 70% compared with the present time.

Kazakhstan has a great potential for the development of agriculture and, consequently, perspective opportunities for food production, both for domestic consumption and for export.

Milk and dairy products are included in the daily meal of almost every person and are

related to the basic and everyday food products. The consumption volume of fresh dairy products will increase by 21.5%, butter by 21.2%, and cheese by 11.5% by the year 2027 in the global dairy products market. Such a forecast was estimated by the experts of the Organization for Economic Cooperation (OECD) and (FAO). The volume of milk and dairy products consumption in Kazakhstan in 2018 was at about 260.4 kilograms, which is 38% lower than the generally accepted norm necessary for a full-fledged human diet [1, 2].

The introduction of IT technologies in production in countries with developed agrarian sphere allowed them to reduce unplanned expenses by 80%, improve competitiveness and labor productivity, as well as ensure food safety and attract investment in the industry.

We believe that digitalization will become an effective tool for increasing the volume of production and processing of milk, lifting the competitiveness of dairy products and realizing export potential.

Material and methods of research. Information base for the article was composed with the help of economical researches, published in periodicals and posted on various web-sites. The source of the review of the world trend of dairy products market development and their production was the publication of international organizations such as FAO, OECD and the European Bank for Reconstruction and Development (EBRD). The research used the official data of Statistics Committee of the Ministry of National Economy of the Republic of Kazakhstan.

To implement the tasks set in the study, as well as logical presentation of the material, a systematic approach was used in selecting data from various sources of official statistical information.

In conducting the study, the authors proceeded from the assumption of the possibility of milk production digitization and milk processes in order to fully realize Kazakhstan's potential (including export) in ensuring the market for dairy products and food security. Because global flows of all types of information support the growth by increasing productivity, and flows of data contribute to more efficient markets.

In the process of conducting the scientific research, dialectical methods of general scientific character and specific methods were used in the following economic research. The following methods were used in the process of research: monographic, economic and statistical, expert assessments, as well as abstract logical and comparative methods.

Results and their discussion. The next milestone in globalization is digital globalization, which is defined by data streams containing information, ideas and innovations. The next five years will be characterized by the information flow, data, search queries, video, etc., which will increase by dozens.

The term "digital economy" was recently introduced into scientific use and the concept of digital economy was formulated by Nicholas Negroponte. In the interpretation of a broad understanding of this term, this means the use of digital technologies in all sectors and fields of activity [3].

Digital globalization provides new opportunities for developing countries, small and medium-sized companies, as well as for a huge number of people. All of them have become new participants in world trade, joining the bases of electronic commerce.

Developed countries are successfully modernizing their economies, rapidly developing innovative technologies using artificial intelligence, automation and digital platforms. Global spending on scientific and technological development today is approximately 2.0 trillion dollars with an annual increase of an average of 4.0% [4].

At this point in time, developed countries are completing the process of industrialization and moving to a new stage of development, in which dominate the digital platforms and robots, which assisted in transferring a part of production and management functions to the artificial intelligence.

The issue of introducing digital technologies in the world, in particular in the agricultural sector of the economy, has been engaged for a long time. E-business standards have been developed and implemented by the United Nations Economic Commission for Europe, electronic notifications on food and feed safety issues, management and exchange of trade certificates, and electronic exchange of laboratory test results are already in place.

FAO pays considerable attention to the issue of e-agriculture and digital agriculture.

In Kazakhstan, the transition from extractive to industrial-service model of the economy will be possible thanks to digital technologies; in particular, this will be achieved through the use of machine learning and neural networks, digital platforms, 3D printing, robotics, biosensors and Big Data.

The introduction of digital technologies in agriculture will enable our country to improve food security and food quality, as well as to obtain a multiplicative effect in the economy as a whole [5].

Kazakhstan's participation in integration processes also dictates its own requirements. Thus, the following issues are on the agenda of the EEU: digital sectoral and cross-sectoral transformations; digital markets for goods, services, capital and labor; digital transformation of management processes; digital infrastructure and security.

Today, the possibilities for the modernization of the agro-industrial sector are enormous: agriculture in the world is turning from a traditional into a high-tech industry, capable of creating new markets for innovative solutions and developments to solve a large number of practical problems.

Digitalization in the agrarian sphere allows reducing risks, adapting to climate change, increasing crop yields. Reducing the cost of production, improving its quality and competitiveness based on the efficient use of resources and science-based approaches is the main task of digitization.

Evidence that Kazakhstan has a low level of implementation of advanced technologies in various sectors of the economy is that in 2017, our republic ranked 78th in the ranking of countries in terms of the development of innovations (Global Innovation Index).

The message for creating a digital economy in Kazakhstan was the Address from the President of Kazakhstan "Third Modernization of Kazakhstan: Global Competitiveness" dated January 31, 2017. Thus "Digital Kazakhstan" state program for 2018-2022 was developed, approved by the Government of the Republic of Kazakhstan No. 827 of 12/12/2017. The goal of the adopted program is to accelerate the development of the republic's economy and improve the quality of life of the population through the use of digital technologies in the medium term, as well as creating conditions for the transition of Kazakhstan's economy to a fundamentally new development trajectory ensuring the creation of a digital economy of the future in the long term. The digitization of agriculture has been set as one of the tasks of this program [6].

Moreover, one of the reasons for introducing digitalization is the need to increase the volume of agricultural production voiced in the Address to the People of Kazakhstan "New development opportunities in the fourth industrial revolution" dated January 10, 2018, which instructed to increase labor productivity in the agricultural sector and the export of processed agricultural products is at least 2.5 times [7].

At this point in time, the Ministry of Agriculture of the RK is carrying out certain work and automated processes such as:

- veterinary and phyto-sanitary safety;
- grain receipts;
- system for collecting and managing loan applications;
- accounting of agricultural machinery;
- accounting of livestock, including breeding;
- water and land management.

The purpose of the digitalization of the agro-industrial complex is to increase the productivity and efficiency through the introduction of digital technologies and involvement of business in the development of IT solutions for agriculture.

Also, one of the goals of agricultural production digitization can be a reduction in losses. This problem is quite relevant, since in the world about a third of agro-food products are lost along the entire chain of distribution.

In Kazakhstan, there are about 150 milk processing plants with a total capacity of 2 million tons per year. The amount of raw materials that goes to them does not fully ensure the utilization of production capacity. The low quality of raw materials is further aggravated by the fact that there are informal channels for the sale of raw unprocessed milk (markets, residential courtyards and small workshops) that take in slightly less than half of the raw materials. All this leads to a year-round shortage of raw materials and a loss of value added by the country.

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

The introduction of digitalization of the economy of the country is associated with psychological and technological barriers. Nevertheless, it will be objectively necessary to reduce the links of intermediaries, which will increase the load on processing enterprises by 1.3 times and reduce the trade margin by 15-20% and will reduce retail prices for agricultural products.

EBRD and FAO calculated the structure of milk's final cost, for example, whole milk with a fat content of 3.2% was taken. The structure of the generated value added in tenge per 1 liter (at a retail price of 305 tenge) by the main participants is as follows: commodity

farmer - 28%; processor - 42%; dealers, retailers - 30%.

In Kazakhstan, only 10% of milk collected from personal subsidiary farms for processing, meets the conditions of the technical regulations of the Customs Union on microbiological and somatic indicators. At the same time, personal subsidiary farms occupy 70% of the total structure of raw milk production. Lack of proper sanitary conditions of livestock maintenance and systematic veterinary measures in personal subsidiary farms, as a rule, lead to a poor quality of produced products. To obtain high-quality raw materials, it is necessary to observe the conditions for proper keeping and care of livestock, as well as to comply with sanitary and hygienic requirements for milking and primary processing of milk, which is often not observed in farms and peasant farms, private farmsteads.

The basic condition for preserving the quality of milk is also violated - immediate cooling of fresh milk to 10°C, which allows it to remain fresh for more than 12 hours. The prevailing significant dispersion of dairy production in small-scale farms, in the absence of full-fledged livestock feeding, storage and cooling systems, adversely affects the quality of milk and its marketability. For example, the US dairy farm has a high level of marketability (98.2%). Of the total amount of milk produced, 38.5% is consumed fresh, 59.7% is processed [8].

With the help of the FAO and EBRD, Kazakhstan implements projects to introduce digital technologies for accurate mapping of raw areas of dairies and the application of technical regulation requirements for each milk supplier.

The use of digital technologies and satellite imagery make it possible to use the feed base more efficiently and effectively. Since the presence of full feed fully reveals the productive potential of dairy herds and is half the cost of produced milk.

In milk production in Israel, the meal of the dairy herd is made with a help of a computer program, which determines not only the balance of feed, nutritional value, but also calculates the economic efficiency of feeding [9].

Since raw milk is a perishable raw material, when collected in conditions of territorial remoteness its quality is definitely reduced, and there is no possibility of its analysis upon acceptance, which affects its quality and cost in the process of acceptance and transportation. Using the GPS coordinate system makes it possible to measure time and track the path of the milk tanker to calculate depreciation and other necessary indicators.

Compliance with the technical regulations on microbiological and somatic indicators of raw milk is primarily possible using advanced methods for its production and primary processing. This requires the presence of milking and refrigeration equipment, disinfectants, analyzers of express milk quality control, stainless steel cans, etc.

The use of information and communication technologies provides information on the frequency of milk collection, on the suppliers who enter the raw materials zone and have a milking machine, indicators of bacterial contamination, milk yield and number of heads. The availability of such information makes it possible to evaluate suppliers, address and explanatory work with them to improve the quality of the raw materials received, as well as feedback on problem and pain issues.

To make the right management decisions, milk producers and processors must possess digital technologies, such as satellite imagery, high-tech sensors, mobile applications and GPS systems. The information received can be taken to decide which village should be procured and which should not be done. Thus, the supplier can summarize, digitize and map all data.

Mapping using data snapshots in Kazakhstan began in 2012 and continues to this day, as biomass has changed on specific pastures, when, due to good practices on what pastures, grass stands, despite the dry year, and where degradation occurred. This technology is open and all participants can use it for free.

The assistance of FAO and EBRD in Kazakhstan is to increase the competitiveness of the dairy industry through compliance with standards and regulations. These organizations are ready to support the creation of an automated dairy balance, a system for monitoring the quality of raw milk, and assessing the state of pastures [10].

One of the problems in agriculture is the aging of workers and the reluctance of young people to engage in agricultural production. There are many reasons for this, but the process of digitization, having an impact on the increase in labor productivity, will make it possible to free some workers from the production process [11]. At the same time, the implementation of the digitalization process is impossi-

ble without the presence of appropriate frames. Today in Kazakhstan there is a shortage of modern and practical knowledge in the dairy industry. It also requires a greater number of high level specialists. FAO and EBRD in 2018-2019 focus on building the capacity of local consultants in the dairy business. Moreover, IT-specialists are required with knowledge of the specifics and features of milk production and processing, computer programs and applications, workers with knowledge of the features of the new technology, with whom they will have to work, etc. Such specialists will need to be able to develop computer programs and implement them to manage systems precision farming, remote control equipment (unmanned tractors, combines), as well as use data from navigation systems, drones, etc. [12].

It should be noted that the cost of innovations related to digitalization is high enough and not all agricultural producers have the opportunity to purchase them, especially small farms and peasant farms. It cannot do without state participation as an interested subject of innovative development of the economy in terms of the spread of innovations, their replication and application.

Domestic scientists in joint research with the University of Michigan (USA) use mobile sensor systems to analyze the state of plants and animals. The data is then processed in the cloud server, specific events are analyzed and proposed, which can be used by all participants.

Information and communication links between the subjects of the dairy industry should be formed in a single information space of the cluster, in terms of cooperation, as well as horizontal and vertical integration. The basis of these relationships should be based on the principles: consistency, mutually beneficial exchange, adaptability, and information security.

In order to ensure the effective interaction of participants within a single information field, measures should be taken to: monitor the information support of organizations; unification of the process of entering information into a single automated system; instructing participants on the provision, use of information resources, updating information and increasing responsibility for its reliability; information security, etc.

Conclusion.

1. The results of the digitization of the economy, reflected in the system of indicators of economic entities, spheres and industries, require further study and refinement in order to conduct a comprehensive and complete analysis of their activities.

2. The digitization of the dairy industry in Kazakhstan will provide opportunities to increase competitiveness and increase the volume of dairy products.

3. The introduction of digital technologies will reduce the number of intermediaries in the dairy industry, which will lead to a decrease in retail prices for dairy products.

4. The realization of the dairy industry potential and ensuring food security of Kazakhstan will be possible by improving the innovative development management of the industry through the introduction of digital technologies.

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