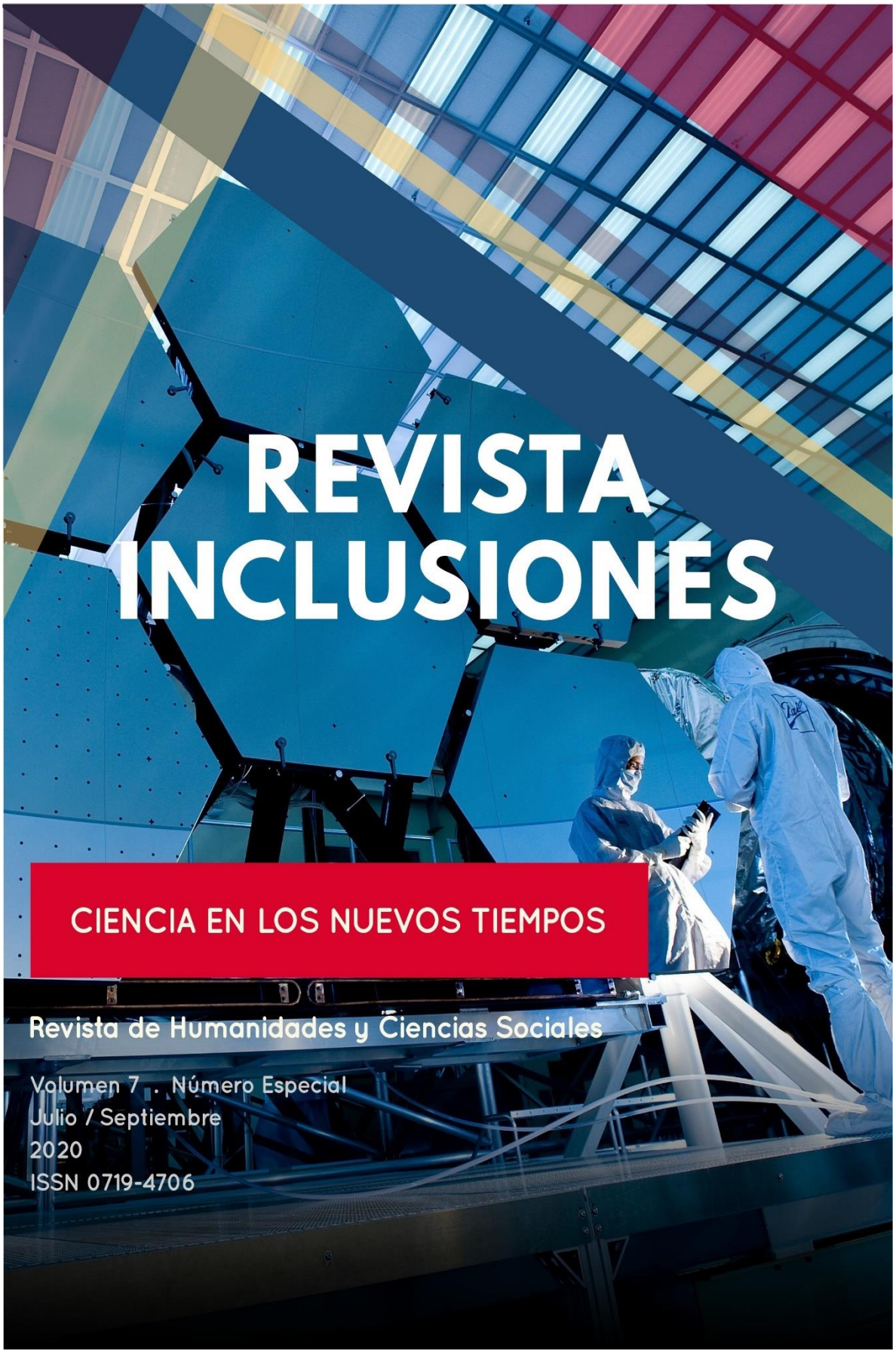

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IMPROVING THE TECHNOLOGY TRANSFER AND DIGITALIZATION OF THE AGRICULTURAL ECONOMY

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Abstract

In the article, the authors analyze the main directions of agricultural development based on the use of digital technologies. Indicators of the development of digital agriculture in Russia are being presented. The influence of technology transfer on agricultural development is being considered. The scientific basis for the development of technology transfer in the digital transformation of agriculture and the digitalization of the agricultural economy is being disclosed. The practical aspects of the use of digital technologies and their transfer in agriculture are being analyzed. The conclusion is drawn on the need for the active development and improvement of the technology transfer mechanism in modern agriculture, as well as the creation of competitive agricultural production, which uses “highly intelligent” agriculture and smart technologies as its basis.

Keywords

Agriculture – Digital technologies – Technology transfer – Efficiency – Development economics

Para Citar este Artículo:

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Introduction

In modern conditions, the basis for the development of the macroeconomic system is the increase in the pace of economic development, labour productivity in various areas and sectors of the economy. As a rule, the higher the level of development of the economic system, the higher the level of interaction between the state and private business structures. Development of the digital economy in agriculture, as part of the economic system, in many respects ensures the effective interaction of various business entities, ensures the achievement of high results in production activities, contributes to the construction of highly efficient agriculture aimed at ensuring food security and economic stability of the macro system.

In modern conditions, “technology transfer” is a process of transferring knowledge and information that contributes to the effective development of subjects of economic systems within the framework of current legislation, taking into account possibilities and level of development of society. This definition, in our opinion, is the most accurate one characterizing the process of interaction of all participants in the technology transfer process at this stage of the development of economic science.

Methods

The conceptual basis for conducting the research is the fundamental principles and principles of economic theory, theory of economic development, as well as the theory of economic efficiency, on the basis of which the directions and conditions for the effective development of the agricultural sector will be substantiated.

Development of economic thought at the present stage is mediated by a number of features caused by the progressive pace of development of economic systems, the introduction of information and telecommunication technologies, which has a direct impact on the formation of the categories under consideration. The mechanism of forming information flows in the digital economy of the agricultural sector is a system of interconnected and interdependent economic regulators operating on a single methodological basis.

The fundamental basis of the study was the work of famous scientists of economic science, namely:

Beckmann J.[1],
Schumpeter J.[2],
Mansfield E.[3],
Gillis M.[4]

[1] J. Beckmann, Anleitung zur Technologie oder zur Kenntniss der Handwerke, Fabriken und Manufakturen. (Gottingen, 1870). Retrieved from: https://vikent.ru/author/233/?myuserform[myuserform.left-authors block.eventsblock.mylist][sort]=subject-desc

[2] J. Schumpeter, The Theory of Economic Developmentm (Cambridge: Harvard University Press, 1934).

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[4] M. Gillis; D.H. Perkins; M. Roemer y D.R. Snodgrass, Economics of development. No.Ed. (1992).

Sandu I.[5]
Kheyfets, Chernova[6];
Tokhayeva et al[7]. and other scientists.

Results

Modern agriculture is a high-tech industry that actively uses digital technology at its core.

Currently, the "digital economy" is the basis for building modern economic systems, as well as the way to accelerate the transfer of technology over time. In the works of many scientists Kelly K.[8] , Serbu R.[9] , Gatut B.[10] Pogodina et al[11]. the digital economy is becoming an important factor in the effective development of production and economic systems at various levels.

One of the important elements of agricultural development is the digitalization of technological processes. The main driver for the development of the digital economy of highly developed and developing countries in the global economy is the date of adoption at the state level of relevant programs and areas of economic development. At the same time, in our opinion, a digital economy should be understood as an economy implemented using digital technologies. The integral elements of this economy are the use of artificial intelligence, robotization of work processes, reduction of living labour costs in the production process, possibility of modeling and programming economic systems through the use of special computer programs, etc[12]. In fig. 1 shows the dynamics of the beginning of the process of digitalization of economic systems of each single state.

[5] I. Sandu; N Ryzhenkova; V. Afonina y A. Doshchanova, “Digitalization as a tool for the innovative development of the agro-industrial complex”, Agro-industrial complex: economics, management num 8 (2018): 12-19.
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[8] K. Kelly, New Rules for the New Economy: 10 radical strategies for a connected world (New York: Viking, 1998).
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[12] N. I. Kuznetsov; N. V Ukolova; S. V Monakhov, y Yu. A. Shikhanova, “Development of the digital economy in modern agriculture of Russia: opportunities, drivers and trends Scientific Papers”, Series: Management, Economic Engineering and Rural Development. Vol: 1 num 1 (2018): 219-226.

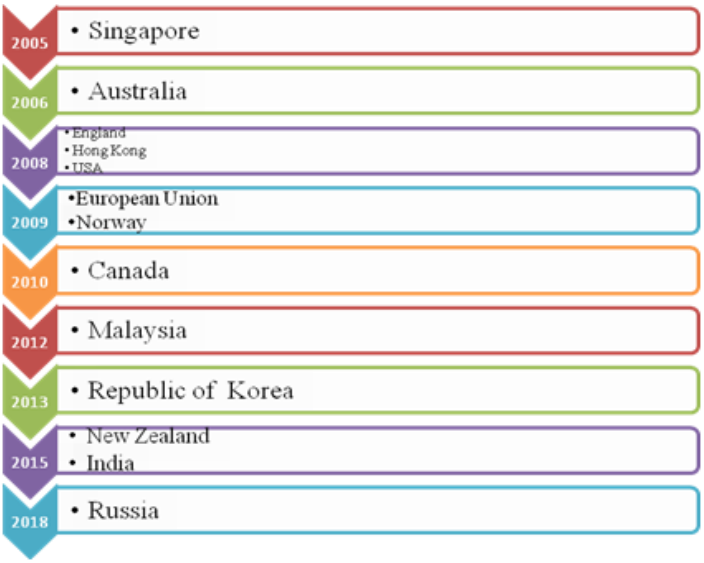


Figure 1
Range of the countries of the world, according to the years of adoption of the digital economy development strategy, compiled by the authors on the basis of data[13]

The leader in the adoption of the digital economy strategy is Singapore, which adopted the digital transformation of economic processes in 2005 as the basis for the development of the national economy. Only by 2018, the Russian Federation has activated the processes of digital transformation of economic processes. Under the current conditions, Russia began its immediate implementation in order to narrow the gap and catch up with highly developed countries in digitalization of the national economy by 2035. For this, a Strategy for the Development of the Information Society in the Russian Federation for 2017-2030[14] was developed in Russia.

Despite the fact that in Russia the digital economy strategy began to operate in 2018 which is later than in many other countries, it has every chance to catch up with countries which began to use the digital economy strategy much earlier than Russia. It is very likely as many leading countries have not fully implemented it by far. Therefore, it is worth considering the mechanism for the transfer of digital technology to agriculture. After all, the essence of the digital economy is not just the transition from analog data and their carriers to digital, but in: the transformation of production principles; in creating new industries and markets. All this also contributes to the creation of a new digital paradigm capable of integrating different countries into a single economic space. Building a highly efficient economic system in agriculture based on the development of the digital economy presupposes active development in two main areas: 1) digitalization of management processes and 2) digitalization of technological processes (Fig. 2).

[13] N. E. Tropynina y O. M. Kulikova, Digitalization of technological processes - the basis of innovative activity of industrial enterprises: In the collection: Institutes and mechanisms of innovative development: world experience and Russian practice Collection of scientific articles of the 8th International Scientific and Practical Conference (Kursk: Publishing House South-West State University, 2018).

[14] Decree of the President of the Russian Federation No. 203 "On the strategy for the development of the information society in the Russian Federation for 2017-2030". September 5, 2017.

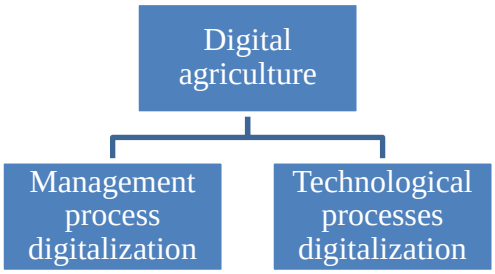


Figure 2
Main directions of digitalization in agriculture

The first area is characterized by the active use of modern digital technologies in the field of production process management, ensuring the effective interaction of various elements of the production process, as well as ensuring interaction between state authorities and producers. Modern digital technologies allow keeping records of all processes not directly in the organization, but remotely outside a specific farm or region. This contributes to cost savings in accounting and improving the quality of control. The digitalization of technological processes in agriculture allows you to effectively spend the available resources, which also directly affects the efficiency of business entities. Systems of "precision" farming, "parallel" driving of equipment, control of fuel consumption, use of GLONASS / GPS navigation systems provide a significant reduction in costs in production processes.

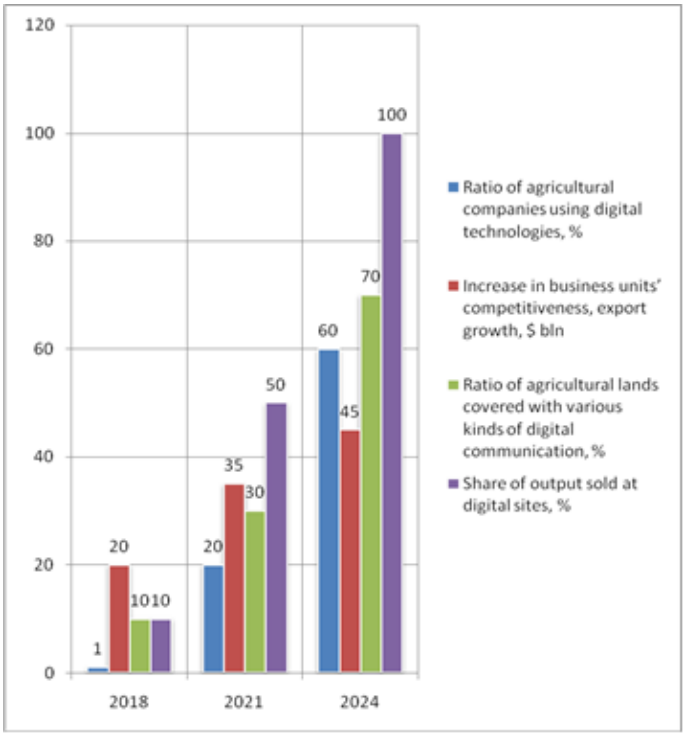


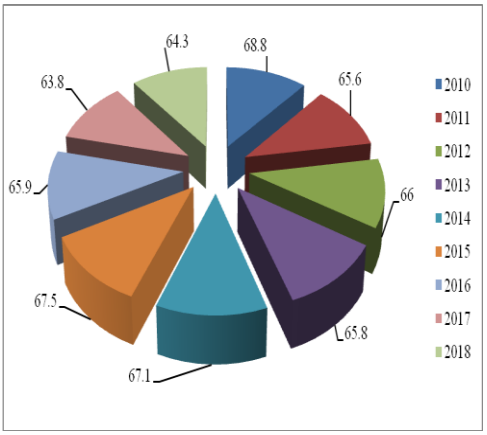
Figura 3
Target indicators for the development of the digital agriculture system in Russia, compiled by the authors based on data from the analytical center of the Ministry of Agriculture of the Russian Federation[15]

[15] Official data of the analytical center of the Ministry of Agriculture of the Russian Federation.

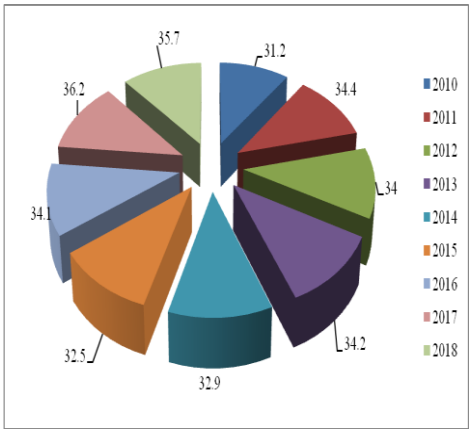
It should be noted that agriculture always affects the environment. The use of chemical plant protection products and mineral fertilizers has a negative impact on the environment, so the use of modern means of control not only saves resources, but also reduces the negative component of the impact.

Figure 3 shows the target indicators for the development of the digital agriculture system in the Russian Federation. The data indicate a significant increase in the share of agricultural enterprises using digital technologies. Their share in Russia should reach 60 percent by 2024. Another equally important indicator will be the fact that almost all manufactured products will be sold on electronic platforms, which may lead to lower transaction costs of agricultural business structures.

By now, quite a lot of technologies have been developed that use information, communication and digital technologies as their basis. However, not all of them are successfully used in agriculture, due to the fact that sometimes the business structures themselves are not ready to implement these technologies due to the lack of necessary funds, high borrowing, and simply because of the established mentality in carrying out production activities. In accordance with the Strategy for Innovative Development of the Russian Federation for the period until 2020, the main source of funding for research and development is the budget allocation[16]. Charts of target indicators for the implementation of the Innovation Development Strategy in Russia are shown in Figure 4.



a) internal costs of research and development (budget funds),%



b) the internal costs of research and development (extra-budgetary funds),%

Figure 4

Target indicators for the implementation of the Strategy for innovative development of the Russian Federation for the period until 2020, % compiled by the authors based on data[13]

Moreover, in the structure of domestic expenditures on research and development, the share of budget allocations varies in the range of 63.8-68.8%, the share of extra-budgetary funds, respectively, 31.2-36.2 percent.

Retrieved from: http://mcx.ru

[16] Decree of the Government of the Russian Federation No. 2227-r. On the Strategy for Innovative Development of the Russian Federation for the period until 2020. December 8, 2011.

For the efficient production and implementation of high-tech products in the agricultural sector of the economy, it is necessary to create a united information space, improve the quality and efficiency of managerial decisions based on the use of modern analytical research methods, stimulate government support for technology transfer market participants, optimally satisfy the transforming needs of users of information resources, increase reliability market development indicators a, reducing the time for an operational response to possible threats to the sustainable development of the market, further improving the regulatory, technical and organizational-methodological base for the application of effective information technologies in the market.

The main advantages of digital transformation in agriculture are:

- firstly, the restructuring of customer interactions, elimination of unnecessary links in the "producer – consumer" chain. Digital platforms allow agricultural producers to organize direct online interactions with suppliers, partners and customers;

- secondly, the reduction of the production cost, while maintaining high quality, and thus making a profit;

- thirdly, the improvement of integration processes between agricultural producers. This leads to the sharing of resources, the pooling of capital.

Discussion

The works of many scientists in agricultural economics are dedicated to the study of this problem. Eric Brousseau, Nicolas Curien[17] in their study note the importance of the development of the digital economy, use of information and communication technologies for economic growth and the development of traditional sectors of the world economy.

In the work by Gillis M ., Perkins D., Roemer M ., Snodgrass D[4.] the authors note the need for active development of the digitalization of economic processes in order to increase the efficiency of resource use.

In the study by Udalov A.A. and Udalova Z.V[18]. they address the development of integration processes in the context of the digital transformation of the agricultural economy, using modern information technologies. They indicate that the information needs of agricultural commodity producers are greatly enhanced, concerning: firstly, the organization and management of agricultural production; secondly, agricultural market conditions; thirdly, production and processing technologies; fourthly, the means of mechanization and automation of labor. In addition, they substantiate the need to develop integration processes in the agricultural sector, in particular, agricultural holdings, based on digitalization and transformation. This, in their opinion, will allow expanding and deepening production and technological ties in the implementation of financial and economic activities of these associations.

[17] E. Brousseau, N. Curien, Internet economics, digital economics (Cambridge: Cambridge University Press, 2007).

[18] A. A. Udalov y Z. V. Udalova, "The development of integration processes in the conditions of digital transformation of the agricultural economy", Innovations in agriculture num 4 Vol: 29 (2018): 392-399.

With the development of the digital economy, in the opinion of Chekalin V.S, Kharina M.V.[19], the active development of three components is necessary: markets and industries; platforms and technologies; environment. In addition, they believe that the use of digital technologies should turn into widespread practice, which may require significant costs: organizational, financial and timely ones.

According to a group of scientists, such as Sandu I., Ryzhenkova N., Afonina V., Doshchanova A.[20] , farmers use elements of the digital economy in limited quantities due to lack of financial resources. In this regard, it is necessary to expand the scope of the digital economy through public investment, the formation of various cooperative associations.

In the study by Voronin B.A., Mitina A.N., Pichugina O.A.[21] the authors substantiate that the greatest potential in agriculture will be possessed by the technology of monitoring, machinery management, precision farming, a network of Internet-related facilities that can collect data and exchange information from built-in services. as they point out in their scientific work, all this is possible with the intensification of the introduction of information technology, the combined efforts of program developers, investors, specialists and authorities.

Conclusions

Summarizing the study, it is necessary to draw the following conclusions:

Digital agriculture is one of the promising areas of agricultural development. Digital technologies help reduce the dependence of agriculture on natural and climatic conditions, save material and monetary costs, save production resources, improve the quality of products, provide control at all stages of the product life cycle.

Digital transformation of agriculture will enhance the sustainability of agricultural business structures, as well as increase the efficiency of their activities and develop competitiveness; the further development of agriculture on a new technological basis and the formation of agricultural science; compliance with environmental standards. In order to transfer agriculture to a new technological level of development, active state support for agriculture is necessary, otherwise only large agricultural companies can provide a quick transition to a new level of development, in addition, machinery and equipment supplied to agricultural producers must possess the necessary digital technologies and are easy integrated into modern control systems. In the future, in our opinion, the basis of modern agriculture should be large associations. These business structures will be able to quickly move to new digital technologies, as well as to robotic processes. In addition, they will be able to stimulate scientific infrastructure, innovative activity of territories, level of investment development.

[19] V. S. Chekalin y M. V. Kharina, “Problems of the development of digital technologies and increasing export potential in agriculture”, Agro-industrial complex: economy, management num 10 (2018): 17-27.

[20] I. Sandu; N. Ryzhenkova; V. Afonina y A. Doshchanova, “Digitalization as a tool for the innovative development of the agro-industrial complex” Agro-industrial complex: economics, management num 8 (2018): 12-19.

[21] B. A. Voronin; A. N. Mitin y O. A. Pichugin, “Management of digitalization processes in agriculture of Russia”, Agrarian Bulletin of the Urals. Vol 183 num 4 (2019): 86-95.

The role and importance of digital technologies as the basis for the effective operation of agricultural business structures will only increase in the future. After all, various business entities will seek to maximize profits, and given the current price of manufactured products, the level of state support and other factors, they will be forced to reduce production costs and production costs, largely due to the introduction of new technologies using modern digital technologies.

Acknowledgments

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