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APPLICATION OF DIGITAL TECHNOLOGIES TO INCREASE THE ECONOMIC EFFICIENCY OF AGRIBUSINESS IN RUSSIA*

Yana Viktorovna Mochalova[1], Anna Nikolaevna Ermakova[2], Svetlana Vladimirovna Levushkina[2], Olga Borisovna Vavakina[3], Evgeniy Vitalyevich Savvateev[4], Anuarbek Talhauly Aimen[5], Darya Atashev[5], Oleg Vladimirovich Kabanov[6]**

[1]Belgorod State National Research University, Institute of Economics and Management, Belgorod, Russia
[2]Stavropol State Agrarian University, 12 Zootechnical Lane, Stavropol, 355035
[3]Plekhanov Russian University of Economics, 36 Stremyanny pereulok, 117997, Moscow, Rusia
[4]Moscow State University of Food Production, 11 Volokolamskoe sh., 125080 Moscow, Russia
[5]M.H. Dulaty Taraz Regional University, 30 Mynbulak st., Taraz, 080002, Kazakhstan
[6]National Research Ogarev Mordovia State University, 68 Bolshevitskaya Street, Saransk, 430005, Republic of Mordovia, Russia

Abstract

Currently, increasing economic efficiency in the field of agribusiness is impossible without the use of modern innovative means of communication and the use of new digital technologies, which determines the relevance of research on this problem. This paper identifies the problems of development of the agricultural sector at the present stage. The ways of increasing the efficiency of agribusiness based on the use of digital technologies are also proposed. The purpose of this study is to analyze the state of development of individual sectors of agriculture at the regional level before the use of digital technologies and after. We believe that the proposed recommendations can be useful for many industrial enterprises in the agricultural sector and can find their practical application.

Keywords: artificial intelligence, geography, industrial revolution 4.0, international relations, scientific diplomacy, soft power

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** Corresponding Author: kabanov.ovladmir56@mail.ru

1. Introduction

Existing agro-industrial systems can no longer fully ensure the efficiency of production and solve the food problem. Therefore, there is a need to introduce new mechanisms and methods of economic management. The use of digital technologies creates a springboard for further development of agriculture and increase of economic indicators.

In our opinion, digital technologies open up new opportunities and guidelines for both small farms and large agricultural holdings (Blokhina, 2018).

Of course, there are quite a lot of studies on this topic, but in our opinion, there is no single holistic approach to this study. It should be noted that certain issues of studying digitalization in agriculture were touched upon by such scientists as B. A. Voronin, O. G. Loretz, A. N. Lysenko, A. A. Lomakin and many other scientists.

However, in this paper we have attempted to study a holistic approach to the use of digital technologies in the field of agribusiness in order to increase economic efficiency.

In accordance with the purpose of the study, we have identified the main tasks, among which we can note the following:

1) explore options for the use of digital technologies in agribusiness in order to improve economic efficiency;

2) analyze the use of digital technologies on the example of Russia and evaluate the effectiveness of their application;

3) determine the prospects for further development of the digitalization of the economy in the field of agribusiness.

2. Precast production processes

We will analyze the state of development of certain sectors of agriculture at the regional level before the use of digital technologies and after. We will also assess the effectiveness of these technologies and the feasibility of their further implementation in order to increase economic efficiency (Izmailov et al., 2018).

In 2018, the volume of crop production in Russia reached the level of 3500.9 billion rubles. The use of digital technologies is expected to increase this figure to the level of 5500.9 billion rubles. During the reporting year, 120.7 million tons of grain were harvested, which is 15.2% more than in the previous year and 29.1% higher than the average annual level for 2011-2015. The provision of general conditions for the functioning of the agro-industrial complex by agricultural organizations amounted to 57 million tons, which is 6.3% more than in 2017 (Litvinova et al., 2020).

The increase in grain resources allowed to increase its use for feed. Consumption for these purposes in recent years has remained in the range of 40-45 million tons and is largely due to the pace of development of sub-sectors of animal husbandry and a decrease in feed conversion. The demand for grain for seeds remains stable, and its industrial processing is increasing at a low rate. Under these conditions, significant resources are saved for grain exports.

The gross harvest of sunflower in the reporting year increased by 18.6% compared to the previous year and amounted to 11 million tons. Rapeseed collected 1 million tons, or 1.3% less than in the previous year, the gross harvest of soybeans increased by 15.8% and reached 3.1 million tons. the vegetable oil Market operates in conditions of saturation of domestic demand and with a sufficiently high share of domestic vegetable oil in the volume of its resources exceeding the threshold value of the food security Doctrine.

In these conditions, the priority tasks are to maintain competitiveness and expand foreign markets for domestic vegetable oil (Alisherovna, 2022). It should be noted that the average cost of grain crops in 2018 consisted of 7781.3 rubles / t. it is assumed that with the introduction of digital technologies, this figure will decrease to the level of 5569.2 rubles/t. According to official data, in

2018, the amount of investment in the development of agriculture amounted to approximately 3.9 billion rubles. This figure is not high enough in comparison with similar indicators of developed countries of the world. This indicates a low level of digitalization in agriculture (Bowen and Morris, 2019). In terms of completed work and shipped agricultural products, Russia ranks fourth among the leading countries.

We believe that this level of increase in this indicator can be achieved by digitalization of breeding technologies and seed stock. In our opinion, in order to achieve the level of development of the leading agribusiness countries, such as the United States, France, England and other countries, Russia needs IT specialists in the field of agriculture. Currently, there is an acute shortage of such specialists.

3. Main directions of agribusiness development

We believe that there is serious work to be done in the field of digitalization of the agribusiness economy and its further development (Llanes, 2020).

In our opinion, work in this direction should be carried out on the following main points:

1) creation of copplex satellite communication systems in agriculture, including the use of pilot-free technologies;

2) conduct qualitative selection of agricultural land using digital technologies of the future;

3) conduct satellite monitoring of the use of vehicles in agribusiness;

4) carry out satellite photography of agricultural land and analyze their quality of use;

5) Providing broadband Internet coverage (4G, 5G, Wi-fi) for agricultural land;

6) use of the blockchain system for the purpose of traceability of certain product categories and selection of material for sowing;

7) digitalization of the system of logistics and sales of agricultural products, acceleration of information exchange;

8) training of high-level specialists in the use of digital technologies in agriculture.

3.1. Factors influencing changes Total Correlation of Productivity Growth

In the following, as a case study, the factors influencing changes Total Correlation of Productivity Growth (TCPG) will be investigated with the approach of technology changes in the three areas of capital (KCH), labor changes (LC), chemical fertilizer (CFC) and changes in the level of agricultural land (LA) (Eq. 1).

$$TCPG_{it}=\alpha_0+[\alpha_1(KCH)+\alpha_2(LC)+\alpha_3(CFC)]_{it} \quad (1)$$

where, i represents the agricultural priods and t repsent the time.

Since there is a correlation between the disorder sentences, the obtained results will be distorted between the sections, so it is necessary to check the correlation between the sections. In this part, cross-sectional autocorrelation has been investigated using Sons and Freeze's cross-sectional autocorrelation tests (Liu et al., 2023). The cross-sectional correlation test results of the above model also show the absence of cross-sectional correlation in this model. The statistic related to the boys' test is 1.080 and the corresponding probability level is 0.28, which shows that the null hypothesis based on cross-sectional correlation in the model is rejected. On the other hand, the Freeze test showed that there is no cross-sectional correlation in the investigated model. Therefore, knowing the absence of cross-sectional correlation, other tests related to the model can be performed. After making sure that there is no cross-sectional correlation, the first test that is performed in the estimation of models based on panel data is Limer's F test, which is actually a choice test between pooled data and fixed effects. Table 1 shows the estimation results of Limer's

F test related to the above model. The results show that the estimation by the consolidated data method is more appropriate.

Table 1. F-Limer test results

Test	*statistics*	*probability*
F-Limer	0.667	0.88

Table 2 shows the results of the model estimation using the consolidated data method. In this Table, the negative effect of capital changes on the productivity variations of the total production factors is not statistically significant. On the other hand, changes in the labor force have had a positive and significant effect on changes in the total productivity of production factors, while changes in chemical fertilizers have a negative and significant effect on changes in the productivity of all production factors. Also, the results show that the cultivated area does not have a significant effect on the changes in the productivity of the total production factors, and also the time variable has a positive and significant effect on the productivity of the total production factors. This means that the productivity of the total factors has increased over time.

Table 2. The results of the model estimation by the consolidated data method

Variables	*Coefficient*	*standard deviation*	*t statistic*	*probability level*
Capital changes	-0.003	0.025	-1.35	0.17
Changes in the workforce	0.001	0.049	2.49	0.02
Fertilizer changes	-0.002	0.013	-2.01	0.04
Changes in cultivated area	-0.001	0.012	1.19	0.24
Time	0.041	0.017	2.405	0.02
F-Statistic (probability)				5.5 (0.0001)
Durbin Watson				1.988
The coefficient of determination				0.558

3.2. Development of the project "Digital Economy of the Future"

In this work, we also propose the development of a new innovative project "Digital economy of the future". This project is based on the complete digitalization of agriculture with new tools in this area to increase productivity and efficiency. The work on the development and implementation of this project is planned to be divided into several stages.

At the first stage, it is planned to develop a platform for the organization of the project "Digital economy of the future". It is expected that this digital platform will interact very closely with other platforms through a single national system. This will enable the establishment of information exchange, the creation of a system of direct accounting and monitoring, and the elaboration of further steps for the implementation of work in the field of digitalization of agriculture.

The second stage involves the direct implementation and implementation of the developed solutions "Digital economy of the future" in agriculture. The result, which should increase the productivity of labor by about 2-3 times, as well as reducing the production costs of small and large agricultural enterprises. A policy for developing technical and substantive requirements should play a role in the full implementation of the second stage (Malina et al., 2022).

Finally, in the third stage, it is necessary to train specialists in the field of digital technologies and organize their effective work. To organize the recruitment and training process, it is recommended to develop a roadmap and training competencies. Within the framework of the project" Digital economy of the future" it is planned to cooperate with agricultural universities, which will be able to support the training of specialists. It is also possible to obtain knowledge with remote technologies and telecommunications, which will allow you to get not only knowledge, but also to exchange experience. It is convenient to present this project in the form of a model reflecting the efficiency of production, shown in Fig.1.

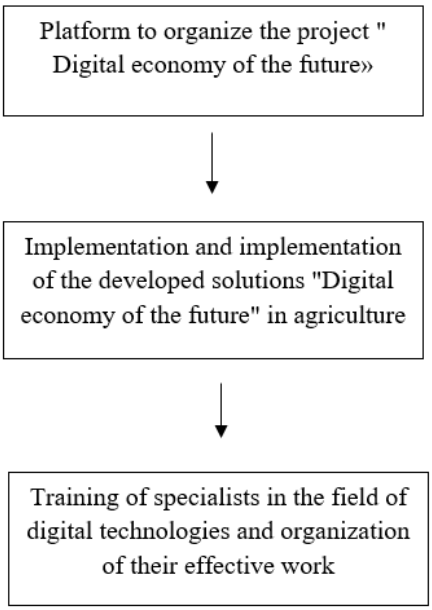

Fig. 1. Schematical structure of the project "Digital economy of the future"

Thus, the project "Digital economy of the future" is a project that requires detailed study of the issues of digitalization of agribusiness, and it reflects the mechanism of interaction between the state and agricultural enterprises in the field of solving the main issues of planning activities. Resource management with digital technologies will create an opportunity not only to optimally combine and combine production, but also to apply an individual approach to the field of agribusiness. It should be noted that the introduction of digital technologies requires certain basic conditions from the regions for their implementation. This includes the availability of appropriate infrastructure, financial conditions, level of education and support from regional authorities and management.

We believe that it will take some time to rebuild from the old agribusiness management mechanism to the new one. It is necessary to train specialists who are engaged in the development and application of digital technologies. We need people who cannot only understand computer programs, but also have the skills and knowledge based on a creative approach to decision-making. In fact, specialists-managers should manage all the links of this chain of production.

Foreign experience in the field of digital technologies has proved their effectiveness. Among the leading countries successfully applying digital technologies in agribusiness are England, Italy, America and many other developed countries. The use of digital technologies in agriculture is based on the use of the Internet.

We believe that the use of mobile applications allows farmers to quickly exchange information not only between Russian partners, but between also foreign ones. Be aware of information about prices on the market, helps to plan your purchases and deliveries of products, taking into account market fluctuations.

4. Conclusion

The purpose of this research was to analyze the effect of efficiency and technology changes on the productivity changes of the agricultural sector. For this purpose, data coverage analysis methods and indexes were used, then the effective factors on changes in the productivity of agricultural sector were estimated using the panel data method. In order to carry out further work on improving the effectiveness of digital technologies, the following main directions can be recommended:

1) creating universal digital technology models that bring together many small and large farmers;

2) carrying out further work on digitalization in the field of agriculture among the population;

3) development of an index that determines the level of development of agriculture at the level of a particular region in the context of its comparison with other regions.

In our opinion, the digital revolution in the field of agribusiness will not only lead to an increase in the scale of production, but also to improve its quality, environmental friendliness,as well as to enter major international markets with high performance.

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