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DIGITALIZATION OF AIC: STATE AND PROSPECTS

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Abstract

The article discusses the issues of digitalization of the agro-industrial complex (AIC) in the context of digitalization of the economy. It is assumed that information and communication technologies will play an important role in various fields of activity, which, together with other components of digital technologies, become a key factor in the competitiveness of the analyzed industry. The general concept of digitalization and examples of its implementation are given. The advantages and disadvantages, the main risks of introducing digital technologies in AIC, the implementation process of which is progressing with difficulty, are described. It is necessary to take into account the negative aspects of these technologies, for which it is necessary to provide a reasonable approach between the desire to develop in an innovative way and the interests of end consumers. The purpose of the article is to study the possibilities of using various drivers of digital development of the domestic AIC. To achieve this goal, the legal documents governing the implementation of digitalization in Russia have been studied. The subject of the research is the tools and drivers of digitalization of the domestic AIC. The study was carried out using many methods, the priority of which are general economic methods of analysis and synthesis, the method of monographic review of various sources in order to understand the essence of the phenomenon under study. According to the results of the study, it was found that digitalization in AIC mainly affects the sectors of crop production, livestock and food production.

Keywords: Digitalization, agriculture, Internet of things, robotics

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1. Introduction

The Ministry of agriculture of the Russian Federation has developed the project "Digital agriculture", which assumes a 2-fold increase in the efficiency of agricultural production by 2024. The key criteria of this project are: scaling of complex agricultural solutions for agricultural enterprises; "Smart farm", "Smart field", "Smart herd", "Smart greenhouse", "Smart processing", "Smart warehouse", "Smart agrooffice". The purpose of these platforms is to provide a technological breakthrough in the field of agriculture. The implementation of this project requires the training of IT- agronomists and IT-zootechnics through the educational program "Land of Knowledge". Smart farming exists in many countries around the world. Today, the introduction of digital technologies in the agricultural sector in Russia is extremely slow (Gorlov et al., 2019).

Digitalization of agriculture is necessary to increase production, improve product quality and safety.

In general, the need to transition to a digital economy is enshrined in the Government's program "Digital Economy of the Russian Federation" (Tsvetkov et al., 2018).

2. Methods

The research is carried out using many methods, the priority of which are economic-statistical, abstract-logical, comparative analysis, general economic methods of analysis and synthesis, the method of monographic review of various sources in order to understand the essence of the studied phenomenon.

3. Results and discussion

As the calculations of the MGI Institute show, almost half of the work operations can be automated in the next 20 years (Marinchenko, 2018).

Digitalization tools include: the Internet of things, big data analysis systems, ERP systems, RFID tags, BPTS, BPLA, electronic and intelligent sensors, artificial intelligence elements, robotics, cloud services, and electronic commerce (Ermolenko & Bogdanova, 2019).

At the same time, it is necessary to take into account that in addition to the positive consequences, there are also negative consequences from the introduction of the digital economy:

- increased risks of cyber threats due to the problem of personal data protection;
- there is a need to use the personal data of specific individuals;
- the introduction of the digital economy will contribute to an increase in unemployment due to the reduction of necessary jobs and the risk of disappearance of some professions, including those in the agricultural sector (according to the forecast of RANEPA employees, the labor market will undergo significant dynamics by 2030, more than 45.5% of workers with outdated competencies will remain unemployed, including agricultural workers (Ivushkina, 2020);
- the gap in digital education and the level of well-being of the population;
- threat to the country's" digital sovereignty";
- constant monitoring of the activities of various entities;
- complication of business structures and interaction schemes between them;

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- the need to revise the administrative and tax codes (Bukhtiyarova, 2019).

As noted by Kolesova (2019) hypertrophied desire for digitalization will not bring benefits for the qualitative development of mankind and society as a whole, including agriculture.

However, it is necessary to take into account that the lag behind Western countries in implementing digitalization in agriculture will lead to the scientific and technological lag of the domestic agricultural sector from other developed economies (Ishaeva, 2019).

In addition, it is necessary to overcome objective factors that hinder the development of digitalization in our country: the reluctance of specialists to train and use the digital economy at the enterprise; the moral deterioration of computer equipment at agricultural enterprises; in many cases, the low speed and instability of the Internet (Brozgunova & Borzykh, 2019).

Prospects for digitalization of the economy continue to be actively discussed by various researchers. The drivers of Russia's entry to a new level of digital development are:

- formation by the Government of a favorable environment for the development of digitalization, including agriculture;

- training of personnel with necessary competencies by agricultural and national economic universities (Dudin et al., 2017; Dudin & Lyasnikov, 2017);

- development of equipment for production;

- development of outsourcing or subcontracting relationships in the Russian Federation;

- integration of innovations by IT specialists into the digital environment (Volodin & Nagkina, 2018).

According to the Ministry of Agriculture of the Russian Federation, announced at the conference "Precision agriculture 2018", our country is on the 15th place in the world in terms of digitalization of agriculture (Russia has entered the Top 15 countries in terms of technology development in agriculture, 2020). In 2017, the volume of production of innovative goods in agriculture, according to Russtat (Official website of the Federal state statistics service, 2020), amounted to 0.7% of all produced innovative goods and services. The main share of innovations in agriculture is accounted for by animal husbandry (50.2%) and cultivation of annual crops (45.5%) (Altukhov et al., 2019a).

In agriculture, you can use drones to analyze the soil condition, sowing, to monitor the yield, and to forecast it. According to the data of the Institute of Agricultural Development in Central and Eastern Europe, named in honor of Leibniz, in countries with economies in transition, the introduction of technologies based on the Internet of things improves the efficiency of agricultural production by 20-30%. Currently, the level of digitalization in our country is insufficient. Digitalization of the economy leads to cost reduction, acceleration of the technological process, database of contractors, creation of optimal ways of logistics with the elimination of intermediaries. The introduction of digital technologies in agriculture will help create a multiplicative effect for the country's economy. Today, there are good databases for monitoring agricultural objects, and an information system for agricultural land has been formed (Soldatenko et al., 2019).

According to the analytical center of the Ministry of Agriculture of the Russian Federation, the introduction of this figure will allow controlling up to 70% of the main factors that affect productivity and the introduction of technologies, ensuring a reduction in the cost of grain from 6.5 to 5 rubles/kg.

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The Internet of things is used in agriculture for free grazing of cattle. A track chip is embedded in the cow's ear that allows you to control its movement from any point using special software (Popova, 2018). In some regions (for example, in the Volgograd region), veterinary accounting and reporting automation systems have been introduced to ensure that veterinary certificates are issued, and farm animals are being chipped. The agricultural enterprise “Donskoye” joint venture in the Volgograd region uses robotic milking technology, resulting in an increase in milk yield by 30-40%, and production efficiency by 20% (Gorlov et al., 2019). The use of robotic milking systems has shown that milk production on average increases by 15-25%, the incidence of mastitis in cows is reduced, and labor costs are reduced. Delaval and GEA Farm Technologies are the market leaders in milking robots. From 2006 to 2016, 376 units of robot milkers were introduced in agricultural enterprises of the Russian Federation (Svechnikova, 2019).

The main company implementing digital solutions in precision farming is the Canadian firm FarmersEdge. It created the FarmCommand application, which allows to calculate the frequency of application of tools, sampling and soil analysis, provide weather forecast for farms, provide local communication and data transmission, perform daily satellite surveys, analyze data, perform forecast modeling, access to an integrated management platform for an agricultural enterprise and the actual presence of specialists on the site.

In China, innovative technologies are being introduced in the management of the pig breeding complex, infrared sensors that allow tracking the movement and health of animals. In the UK, there is a project to use artificial intelligence to detect diseases of calves, which reduces the risks due to a lack of qualified personnel (Altukhov et al., 2019b).

Many studies have focused on the role of information technologies in the digitalization of the economy (Bogoviz et al., 2017; Nissen et al., 2018)

Among national software developers, Rightech and JSC «Component» can be singled out. Using their applications, you can automate monitoring of agricultural land, agricultural machinery, storage and processing of products. There is a development of Agrotronic (Rostselmash) for remote control of technological processes. To prevent the appearance of untreated, re-processed areas, measure the speed, direction of movement, processing area, use the navigation console "Azimut-1 "(LLC"Rateos"). LLC KSM-INTEX created systems of parallel driving of Atlas730 and COMMANDER for passing of a tractor with various aggregates and self-propelled agricultural cars along the edge of the previous pass. LLC "CTZ Agrosoyuz" has developed a similar system Agronavigator, with which it is possible to process wooden fields with a complex contour at night (Marinchenko, 2018).

About 200 business participants work in the field of digitalization of agriculture. 150 agricultural enterprises with crop area of about 2 million hectares of implementing a system of effective agriculture company "Agrosignal", more than 4,000 farms in 10 countries implemented a cloud-based service management crops a firm "Proagrotex" (Frumkin, 2018).

The software complex "1C: ERP AIC" provides automation of some processes in the agricultural enterprises: planning in agriculture, production accounting in animal husbandry, registration papers and finished products on toque, including vehicles fuels and lubricants, optimizing the placement of crops, agro-ecological passport of the field, a history field, financial management, budgeting, cost management and costing, production management and sales, and other operations (Korolkova, 2020).

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For the crop industry, the main manufacturers of automated driving systems are John Deere (USA), Autonomous Tractor Corporation (USA), AGCO Corporation (USA), CNH Industrial (Netherlands). Autopiloting in the Russian Federation is created by the group of companies "Cognitive technologies", "Rostselmash", "Soyuz-agro" (Marinchenko, 2018).

In the United States, agricultural firms collaborate with organizations associated with digital technologies, such as Planetaryresources, which deals with space technologies. Through the use of GIS, a database is created with information about experiences in agricultural technologies around the world, taken over a 30-year period, which is used for intellectual connectivity. The company “Bayer” has developed a map application for selecting optimal pesticide dosages, as well as a technology that allows you to record information about the state of crops (Ermolenko & Bogdanova, 2019).

The main share of investments in information and communication technologies in agriculture is in crop production (51%) and the food production sector. Animal husbandry accounted for only 7% of the total investment in 2017 (Bubenok, 2019). According to Abebe and Cherinet (2019) farmers with stable access to electricity are better educated and use information and communication technologies in agriculture.

Examples of implementing B2B, b2C, and C2C digital platforms can be found in both developed and developing countries. For example, social media platforms and initiatives in Kenya (icow.co.ke). The integrated use of Airbnb or Uber applications will contribute to the revival of private seed exchanges, maintenance services, and harvesting (Bubenok, 2019).

The use of innovative digital solutions requires the settlement of legal issues related to the use of robotics, drones, the main parameters of the Internet of things, electronic document management, the creation of cryptographic algorithms for the security of data operations, the introduction of the institute of certification of agricultural land.

The state should provide various preferences for legal entities and individual entrepreneurs engaged in digitalization of agriculture. Confirmation of product conformity must be based on digital models (Buzina & Fedurina, 2019).

Digitalization should be provided through public-private partnership (initiative) on investment agreements, concession agreements, Agroleasing, agroclusters, and the creation of consortia (Lovchikova et al., 2019). It should be taken into account that without state support for digitalization in rural areas, it will only be implemented in large agricultural holdings, which will only exacerbate the disparity in the development of national agriculture (Frumkin, 2018).

4. Conclusions

The increase in the efficiency of any industry, including agriculture, is largely determined by the introduction of scientific and technological developments, one of which is the digitalization of the economy. In agriculture, it is aimed at increasing production volumes, improving the quality and safety of products. At the same time, it is necessary to take into account a number of negative aspects from the introduction of digitalization, first of all, the growth of unemployment. You can increase output as much as you like, but if it is not provided with effective demand, it is unlikely that such innovations will be useful to enterprises. The agro-industrial complex is characterized by a high level of low-skilled personnel, and an insufficient degree of modernization of the computer Park. It is also necessary to develop outsourcing and

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subcontracting relationships, train IT-agronomists and IT-zootechnicians. Innovative digital solutions should be provided through public-private partnerships with state preferences for those engaged in digitalization.

References

Abebe, A., & Cherinet, Y. M. (2019). Factors Affecting the Use of Information and Communication Technologies for Cereal Marketing in Ethiopia. *Journal of Agricultural & Food Information, 20*(1), 59-70.

Altukhov, A. I., Dudin, M. N., & Anishchenko, A. N. (2019a). Global digitalization as an organizational and economic basis for innovative development of the agro-industrial complex of the Russian Federation. *Problems of the Russian economy, 2*, 3-6.

Altukhov, A. I., Dudin, M. N., & Anishchenko, A. N. (2019b). Global digitalization as an organizational and economic basis for innovative development of the agro-industrial complex of the Russian Federation. *Problems of the Russian economy, 2*, 17-21.

Bogoviz, A. V., Sandu, I. S., Dudin, M. N., & Lyasnikov, N. V. (2017). Information technologies as a means of intensification of Russian agriculture. *Ekonomika Sel'skokhozyaĭstvennykh i Pererabatyvayushchikh Predpriyatiĭ*, *11,* 38-42.

Brozgunova, N. P., & Borzykh, A. A. (2019). Trends, features and problems of digitalization of the agricultural sector of the economy. *Science and education, 4*, 200.

Bubenok, E. (2019). Artificial intelligence in the digital platform as a driver of innovative development of breakthrough technologies for the development of domestic agriculture. *Vestnik MIRBIS, 1*(17), 90-95. https://journal-mirbis.ru/

Bukhtiyarova, T. I. (2019). Digital economy: features and trends of development. *Business and society, 1*(21), 22.

Buzina, T. S., & Fedurina, N. I. (2019). State regulation of the use of digital technologies in the region. *Digital technologies and systems in agriculture: Content of the International scientific and practical conference*, 36-47.

Dudin, M. N., & Lyasnikov, N. V. (2017). Professional competence of personnel as a factor of ensuring competitiveness. *Professional competence of personnel as a factor of ensuring competitiveness, Economics of agriculture of Russia, 7*, 39-46.

Dudin, M. N., Lyasnikov, N. V., Makarov, O. N., Maslennikova, O. A., & Grebennikov, V. V. (2017). The fostering of motivation for innovative activity in future agriculture specialists as a pedagogical issue. *Espacios*, *38*(40), 10-10.

Ermolenko, O. D., & Bogdanova, R. M. (2019). *The problem of forming an effective organizational and economic mechanism in the grape growing industry in the conditions of digitalization*, *Digital transformation of the economy and the development of clusters.* St. Petersburg.

Frumkin, B. T. (2018). Digitalization of agriculture: potential and problems. *Lomonosov readings-2018*, Section of economic Sciences, *Digital economy: people, technologies, institutions,* 249-253.

Gorlov, I. F., Fedotov, G. V., Mosolova, N., & Kaydulina, A. A. (2019). Agrocifra 4.0: New solutions in milk production. *Agrarian-food innovation, 2*(6), 20-27.

Ishaeva, A. A. (2019). Digital transformation: Economics, entrepreneurship, technology, innovation, logistics, business processes. *Vestnik of AGTU*, *Ser.: Economy, 3,* 56-63.

Ivushkina, A. (2020). *Cyberavral: robots can take the Russians half jobs.* https://iz.ru/918814/anna-ivushkina/kiberavral-roboty-mogut-otobrat-u-rossiian-polovinu-rabochikh-mest

Kolesova, I. S. (2019). Digital and technological singularity: prospects and consequences for humanity. *Theory and practice of agricultural management*: *Materials of the Russian scientific and practical conference, devoted. 80th birthday of A. L. Pustuev.* 64-68.

Korolkova, E. M. (2020). The use of ERP systems in agriculture. *Digitalization of agro-industrial complex*, *coll. of scientific articles the I of the International scientific and practical conference for new information technologies, II, (CD-ROM),* 172-174.

Lovchikova, E. I., Solodovnik, A. I., & Alpatov, A. V. (2019). Development of digitalization of the agro-industrial complex on the basis of public-private partnership: problems and prospects. *Bulletin of agrarian science, 6*(81), 104-112.

Marinchenko, T. E. (2018). Digital transformation of crop production. *Innovations in agriculture, 4*(29), 330-338.

Nissen, V., Lezina, T., & Saltan, A. (2018). The Role of IT-Management in the Digital Trans-formation of Russian Companies. *Foresight and STI Governance, 12*(3), 53-61.

Official website of the Federal state statistics service. (2020). http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/accounts/

Popova, O. V. (2018). Problems of legal regulation of digitalization in the agro-industrial complex. *Agrarian and land law, 9*(165), 96-102.

Russia has entered the Top 15 countries in terms of technology development in agriculture. (2020). http://prodpost.ru/49719-Rossiya-voshla-v-top-15-stran-po-urovnyu-razvitiya-tehnologiiy-v-sel-skom-hozyaiystve.html

Soldatenko, A. V., Razin, A. F., Shatilov, M. V., Ivanova, M. I., Rossinskaya, O. V., Razin, O. A., & Surikhina, T. N. (2019). Digital economy in agriculture as a driver of industry growth. *Vegetables of Russia, 3*(47), 3-6.

Svechnikova, T. M. (2019). Efficiency of using robotic milking systems in the organization of milk production. *Russian economic online magazine, 2*, 72.

Tsvetkov, V. A., Shutkov, A. A., Dudin, M. N., & Lyasnikov, N. V. (2018). Digital Economy and Digital Technologies as a Vector of Strategic Development of the National Agrarian Sector. *Moscow University Bulletin. Series*, *6*, 45-64.

Volodin, V. M., & Nagkina, N. A. (2018). Formation of innovative infrastructure for digitalization of production at industrial and agricultural enterprises. *Izvestiya of higher educational institutions, The Volga region, Economics, 2*(8), 3-12.