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DIGITAL ECONOMY IN ACCORDANCE WITH THE PRINCIPLES OF ENVIRONMENTAL ENGINEERING

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Abstract

The article deals with the formation of digital technologies in the country, the use of information technologies in the activities of enterprises of the agro-industrial complex in the context of the application of the principles of environmental engineering. Digitalization is the most important factor in the intensification of agricultural production in any region. At the same time, digitalization is a basic factor in the development of environmentally friendly types of production, and informatization allows even non-profit enterprises to function effectively in the conditions of subsidized regions. However, in the modern agro-industrial complex of the Russian Federation, digitalization is most widely implemented in large agricultural enterprises of the regions. Thus, a special legislative framework is needed that would allow purposefully financing small enterprises in the first place, making them more competitive through digitalization. However, digitalization not only optimizes risks in regional agricultural enterprises, but also often creates new ones. In order to minimize the new risks associated with the digitalization of regional agricultural enterprises, it is necessary, along with innovations, to ensure the preservation of traditional methods and methods of work, as well as a high level of training and retraining of personnel.

Keywords: Digital economy, environmental engineering, agriculture, non-profit organizations, regional economy

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1. Introduction

The well-known advertising slogan of the Miratorg agro-industrial holding, which we can find on its website, and which reflects the main mission of this organization as a commercial agricultural structure - "We feed the people". This economic motto can be attributed to the majority of enterprises that belong to the commercial direction of agricultural production, and to a significant part of agricultural organizations, such as family estates, eco-villages, monastic farms, confessional agricultural enterprises that belong to the category of non-profit organizations - which, however, gives them the opportunity to engage in production activities without making a profit, primarily for self-sufficiency. According to the Food Security Doctrine of the Russian Federation, which was approved by the Decree of the President of the Russian Federation in January 2020, "food security is one of the main directions of ensuring national security..." (Decree of the President of the Russian Federation No. 20, 2020). At the same time, food security should be understood as providing the population of a particular state with all vital food and services by at least 80%, and ideally up to 90% at the expense of domestic production. In order to achieve all the security parameters defined by the Doctrine, first of all, it is extremely necessary to increase domestic production at an intensive pace, in the shortest possible time, over the next few years. It is also extremely necessary to create the necessary reserves and stocks of food for the purpose of their subsequent internal intervention, in case of need. At the same time, the most acceptable methods of increasing the efficiency of agricultural production, including non-commercial production at the regional level due to cost reduction, are the widespread use of informatization and the introduction of digital technologies, as well as innovative environmental engineering.

The departmental project "Digital Agriculture", approved by the Ministry of Agriculture (Departmental project "Digital agriculture": official publication, 2019), subsequently included in the national program "Digital Economy of the Russian Federation" (Decree of the Government of the Russian Federation No. 1632-R, 2017), approved by the Decree of the Government of the Russian Federation of June 28, 2017 No. 1632-R, clearly provides for: informatization of agricultural, including non-commercial, production, introduction and development of modern innovative technologies in the agro-industrial complex, digitalization of crop production and livestock of commercial and non-profit organizations.

Over the past five years, the Russian state has clearly realized the need for large-scale financial assistance and improvement of the legal framework for agricultural producers, primarily at the regional level, regardless of their commercial or non-commercial (eco-farming) mission. Only large-scale state measures have already made it possible in recent years and in the coming years will continue to completely eliminate the technological and technical backwardness of Russian agricultural enterprises, and encourage the transition of agricultural producers to the most advanced innovative technologies, primarily domestic production. In April 1993, it was first reviewed and approved by the Expert Council under the President of the Russian Federation, and then approved in 1994 by the Federal Digital Program "Informatization of Russia" (Federal target program "Informatization of Russia", 1994). In 2002, the Federal Digital Program " Electronic Russia (2002-2010) "was approved (Federal digital program "Electronic Russia (2002-2010)", 2002). Within the framework of this program, the activities were divided into three stages until 2010. Each of the stages provided for the corresponding amounts of state funding.

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The State program of the Russian Federation "Information Society (2011-2020)", developed in accordance with the Concept of long-term socio-economic Development of the country, was approved by the decree of the Government of the Russian Federation of October 20, 2020, under this Program, the amount of state funding exceeded 88.0 billion rubles.

2. Problem Statement

In the current conditions of economic development of the Russian Federation at the regional level, the formation of an "information society" is recognized as one of the leading factors. To create an "information society", it is necessary to:

1) reduction of the "digital inequality" of the subjects of the Russian Federation,
2) formation of a developed information and telecommunications infrastructure, including in the commercial and non-commercial agricultural sector (State program of the Russian Federation " Information Society (2011-2020)", 2010).

The Decree of the President of the Russian Federation "On National Goals and Strategic Objectives of the development of the Russian Federation for the period up to 2024" (Decree of the President of the Russian Federation N 474, 2020) sets out the main tasks of introducing digital technologies into the country's economy. The state program "Digital Economy of the Russian Federation" was approved by the minutes of the meeting of the Presidium of the Presidential Council for Strategic Development and National Projects No. 7 dated June 04, 2019. The program received the status of a national project for 2.4 trillion rubles, including 1.9 trillion rubles of budget funds (National program "Digital Economy of the Russian Federation", 2017).

3. Research Questions

Many researchers in modern conditions talk about a real "digital boom" in Russia. Indeed, informatization, within the framework of the program "Digital Agriculture" (Digital agriculture in Russia, 2018), is recognized as almost a panacea for all the troubles and problems of agricultural enterprises, both commercial (agricultural holdings, cooperatives) and non-commercial areas (personal subsidiary farms, ancestral estates, eco-villages), and is already widely used in organic farming and animal husbandry, primarily closed-type (greenhouse farms). Most Russian specialists believe that only universal informatization will be able to provide us with a twofold increase in output by 2024, including in the agro-industrial complex (Digital agriculture in Russia, 2018), for which it is primarily necessary to ensure universal digital literacy, including rural specialists. Computer technologies can be used in the production process, as well as in the processing, transportation, storage, reailization of products, in the management of production processes, in marketing and other scientific research, primarily at the regional and local level. At the same time, the introduction of IT technologies is extremely slow, even in large joint-stock companies, which is explained by their high cost and the import of most of the technologies and equipment. Therefore,

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without constant large-scale state financing of the total digitalization of production in Russia in the near future, it will be impossible to cope with this task (Slinkov et al., 2020).

4. Purpose of the Study

Despite the fact that many sectors of the economy at the regional level were very badly affected in 2020, agriculture as a whole showed steady growth - and one of the factors was the progressive digitalization. In this regard, the purpose of our research is primarily to find mechanisms to ensure further sustainable growth of informatization indicators of agricultural enterprises of commercial and non-commercial directions at the regional level. Back in the summer of 20202, the specialists of the Center for the Development of Financial Technologies of the Russian Agricultural Bank proposed a rating list of Russian regions in terms of the progress of informatization in agriculture (RIA News, 2020).

The main indicators for determining the gradation were the possibilities of introducing technologies of "precision farming" and "smart animal husbandry" (Kolesnikov et al., 2020). The regions of Russia were divided into 4 groups, while the first group included regions that have regional programs for informatization of agricultural enterprises, specialists of high competence and developed technological infrastructure. It is gratifying that along with the Voronezh and Tambov regions, the Belgorod region was also included in the top ten.

5. Research Methods

In our opinion, it is necessary to develop a more objective system for assessing the informatization of regions (Kolesnikov et al., 2020). First of all, we offer methods of enlarged integrated comparative analysis. The essence of this research method is to compare the digitalization indicators primarily for large agricultural holdings operating in several, often fundamentally different regions. However, it should be noted that such a system of assessment and criteria for digital transformation of regions is not sufficiently objective and does not fully take into account other areas of digitalization of the agro-industrial complex and the region as a whole (Kolesnikov et al., 2019). And here, the criteria for evaluating the effectiveness of the work of governors, taking into account the rating of "digital maturity" of federal and regional executive authorities, including taking into account the use of domestic IT solutions and platforms, approved in 2021 by Russian President Vladimir Putin, can be a reliable help in research (Akupiyan et al., 2018b). I must say that according to the "Global Innovation Index", presented in 2020, at the top of the rating of innovative development are still: the United States, Sweden and Switzerland, while Russia occupies only 47th place (TAdviser, 2021).

Analyzing the pace of development of digitalization of agriculture in the country, the author's team, led by E. V. Truflyak (Truflyak et al., 2019), notes the insufficiently high rates of digital transformation in the agro-industrial complex, as a result of which Russia is in the second ten in the world ranking with a significant lag behind the leading countries. And the elements of precision (smart) agriculture, the elements of the Internet of Things (IoT), are used to a certain extent by about 10.0% of agricultural enterprises, agricultural holdings and farmers (Akupiyan et al., 2018a).

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In the conclusion of the experts, it is noted that the elements of precision agriculture are most intensively used by the farms of the Krasnodar Territory (189 agricultural enterprises), the Voronezh Region (182 farms) and 144 agricultural enterprises of the Novgorod region, including the Belgorod region ranks 11th among the leaders. But when analyzing the application and use of elements of digital technologies in crop production, the Voronezh Region is the leader in terms of cultivated area - 1129.1 thousand. In the Krasnodar Territory, Omsk, Tyumen and Belgorod regions, the area where precision farming elements are used exceeds 900.0 thousand hectares. In our opinion, for a more objective assessment of this indicator, we can add a graph in which the share of such areas in the total structure of the arable wedge will be determined.

To date, the Belgorod Region (12 farms) occupies the 20th place in the rating of regions calculated according to the traditional methodology for the use of elements of "smart" animal husbandry by the number of agricultural producers. At the same time, using our integrated method, according to our calculations, the Belgorod region, where the largest agricultural holdings operate, using both total digitalization of production, and often being developers of intelligent agricultural systems (Pak & Kravchenko, 2020), and applying environmental standards, would move to the 10th place.

Along with the widespread use of digital technologies in agriculture in the Belgorod region, work is underway to develop, maintain and implement software, as well as consulting services in the field of informatization of agricultural production. The Limited Liability Company "Tsentrprogramsystem "(Belgorod) has implemented the following projects in recent years:

- AgroNTI project on the introduction of precision farming technologies within the framework of the National Technology Initiative program with the support of Aeronet");
- the software product "AG-DATA Integrator" is used for planning and monitoring the performance of field work and provides the formation and transfer of agricultural data between the on-board information systems of John Deere and the accounting production and management systems of agricultural organizations (FIMS, ERP) based on the 1C platform:Company»;
- digital system for managing the epizootic situation of African swine fever (ASF) using unmanned aerial vehicles (unmanned aircraft systems);
- the project "Dobropchel", supported by the Russian Ecological Society, is a communication platform for beekeepers and agricultural enterprises, horticultural farms and state authorities of the agro-industrial complex.

6. Findings

As a result, the agriculture of the Belgorod region, with its extensive digitalization and the use of environmental engineering in both commercial and non-commercial agricultural organizations (personal subsidiary farms, family estates, eco-farms), has a significant impact on the economy of the region and the country, occupying a leading position in the production of livestock products. In recent years, the region accounts for more than 18.0 percent of all-Russian pork production, about 12.0 percent of poultry meat and more than 3.0 percent of eggs. At the same time, the region's crop production, mainly grain enterprises,

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almost completely provide livestock (poultry, pig and dairy complexes) with high-quality feed (Kravchenko & Kitaev, 2020).

Rusagro Group, the largest vertically integrated agro-industrial holding in Russia, has its own division in the Belgorod region-Rusagro-Invest LLC, which has more than 300 thousand hectares of land, and the total land bank exceeds 665 thousand hectares. Rusagro Agroholding together with Cognitive Pilot, one of the leading developers of artificial intelligence systems for unmanned vehicles, has implemented an autonomous control system Cognitive Agro Pilot and tested an unmanned combine harvester in its fields in the Belgorod region. Such a system uses "computer vision", "sees" the field and cleans where it is not cleaned, in contrast to the technology of parallel driving, in which the navigation of agricultural machinery is carried out using a GPS or GLONASS signal.

Miratorg Agro-Industrial Holding LLC is one of the largest meat producers in Russia, whose production and technological structure includes a full cycle: the cultivation and production of feed, animal husbandry - (meat cattle breeding, pig breeding, poultry farming), meat processing, sales of finished products.

The plant-growing division of the Miratorg Agro-industrial complex in its structural divisions in the Belgorod and Kursk regions uses a system of precision agriculture, including GPS and GIS technologies, and LLC "Agroholding" Ivnyansky " has switched to a system of biological agriculture, which allows not only to obtain high yields of cultivated crops, but also to preserve and improve the condition of the soil, increase the content of humus, micro-and macroelements. The satellite monitoring program allows you to monitor the operation of agricultural machinery, keeps records of the area of cultivated fields, fuel consumption, etc. production and technological indicators. Using the elements of intelligent crop production, LLC "Agroholding" Ivnyansky " achieves the maximum yield of grain crops in recent years-more than 70.0 c / ha, which is one and a half times higher than the average for the Belgorod region.

The innovative center for genomic selection, created in the Miratorg Agricultural Complex, allows you to calculate the index of individual production and economic value of animals and grow them in the conditions of a specific region or a specific enterprise.

Agro-Belogorye Group of Companies together with the V. A. Trapeznikov Institute of Management Problems with the support of the scientific and educational center "Innovative Solutions in the Agro-industrial complex" develops and implements video surveillance technologies for animals based on machine vision and artificial intelligence on the basis of Belgorod Pig Complex LLC.

All of these empirical data suggest that: 1. digitalization is the most important factor in the intensification of agricultural production in any region; 2. digitalization acts as a basic factor in the development of environmentally friendly types of production; 3. informatization of production allows intensive development even for non-profit enterprises in the conditions of subsidized regions; 4. to date, in the agro-industrial complex of the Russian Federation, digitalization is most widely implemented in large agricultural enterprises of the regions of the Russian Federation, however, due to insufficient internal and external financing, it is not sufficiently developed within small farms; 5. a special legislative framework is needed that would allow targeted financing primarily of small enterprises, making them more competitive due to digitalization; 6. digitalization not only optimizes risks in regional agricultural farms, but often creates new ones: for example, difficult weather conditions can de-energize huge territories, thereby

paralyzing the work of many small and even large farms; 7. to optimize new risks associated with the digitalization of regional agricultural farms, it is necessary to provide for the preservation of traditional methods and methods of work, including, for example, keeping records in parallel on paper and electronic media; feeding the economy at the expense of several energy sources.

7. Conclusion

The digitalization of agriculture, the use of the Internet of Things technology, the development of domestic software will allow to automate the technological processes of agricultural production as much as possible and will solve the problem of food security in the country. Agricultural production, agriculture and the agro-industrial complex as a whole will switch to automated production technologies, there will be a reduction in the number of machine operators and workers in other professions, but there will be new types of employment and the need for new specialists who will manage and maintain modern machines and equipment (Slinkova et al., 2018).

At the same time, along with the existing problems of uneven economic development of various regions, insufficiently formulated and developed legislative framework, high costs of implementing digital technologies, there are issues of training IT specialists in agriculture and the cost of retraining personnel, as well as a deterrent is the low level of state support for rural producers, especially in the field of environmental engineering and organic agriculture (Kapinos et al., 2019).

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