IMPACT OF GOVERNMENT SUPPORT MEASURES ON INCREASING THE DIGITALIZATION OF THE AGRO-INDUSTRIAL COMPLEX

IMPACTO DAS MEDIDAS DE APOIO GOVERNAMENTAL NO AUMENTO DA DIGITALIZAÇÃO DO COMPLEXO AGROINDUSTRIAL

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ABSTRACT

Objective: The authors conduct an in-depth assessment of state support measures aimed at enhancing the digitalization of the agro-industrial complex. The purpose of the article is to evaluate the impact of government initiatives on the adoption of digital technologies and their potential to improve efficiency in the agricultural sector.

Methods: The research employs a comprehensive approach, including the analysis of government policies, project implementation, and financial investments in digital agriculture. The study reviews specific digital projects, evaluates their outcomes, and examines regional strategies for promoting digitalization.

Results: The study shows that government support has played a key role in advancing digitalization in the agro-industrial complex. Initiatives, such as the Digital Agriculture project, have increased agricultural productivity, reduced production costs, and attracted investments. The integration of digital technologies has automated decision-

making processes, created new job opportunities, and boosted exports of agricultural products.

Conclusion: State support has driven the digital transformation of the agro-industrial complex. The results emphasize the importance of continued government efforts to promote digitalization, ensuring long-term benefits for agricultural productivity and economic growth. The research highlights the need for a coordinated approach among stakeholders and sustained investment in digital agriculture to achieve optimal outcomes in terms of sustainability and competitiveness.

Keywords: agro-industrial complex, digitalization, government support, project, program, cluster, subcluster.

RESUMO:

Objetivo: Os autores realizam uma avaliação aprofundada das medidas de apoio estatal destinadas a melhorar a digitalização do complexo agroindustrial. O objetivo do artigo é avaliar o impacto de iniciativas governamentais na adoção de tecnologias digitais e seu potencial para melhorar a eficiência no setor agrícola.

Métodos: A pesquisa emprega uma abordagem abrangente, incluindo a análise de políticas governamentais, implementação de projetos e investimentos financeiros em agricultura digital. O estudo analisa projetos digitais específicos, avalia seus resultados e examina estratégias regionais para promover a digitalização.

Resultados: O estudo mostra que o apoio governamental tem desempenhado um papel fundamental no avanço da digitalização no complexo agroindustrial. Iniciativas, como o projeto Agricultura Digital, aumentaram a produtividade agrícola, reduziram os custos de produção e atraíram investimentos. A integração das tecnologias digitais automatizou os processos de tomada de decisão, criou novas oportunidades de emprego e impulsionou as exportações de produtos agrícolas.

Conclusão: O apoio estatal tem impulsionado a transformação digital do complexo agroindustrial. Os resultados enfatizam a importância de esforços contínuos do governo para promover a digitalização, garantindo benefícios de longo prazo para a produtividade agrícola e o crescimento econômico. A pesquisa destaca a necessidade de uma abordagem coordenada entre as partes interessadas e investimento sustentado na agricultura digital para alcançar os melhores resultados em termos de sustentabilidade e competitividade.

Palavras-chave: complexo agroindustrial; digitalização; apoio governamental; projeto; programa; cluster; subcluster.

INTRODUCTION

The research topic is relevant since the Strategy for the Development of an Innovative Society in 2017-2030 is being implemented in the Russian Federation.

Based on it, the Ministry of Agriculture of the Russian Federation has developed a departmental project Digital Agriculture planned for implementation over five years

from 2019 to 2024. Major changes in the agricultural sector of the economy are expected from the use of digital technologies, including a reduction in production costs, an increase in the productivity of agricultural organizations by 100%, growing investment, automation of management decisions and production processes, creation of new jobs, and intensification of agricultural exports to the international market (Platonova, Sklyueva, 2019).

Regional authorities responsible for the development of the agro-industrial complex develop their own strategies for improving digital production while relying on the Digital Agriculture project. The main task of the Government of the Russian Federation is determined by the Central Information and Analytical System of Agriculture, which is a data bank combined with existing data sets of the Ministry of Agriculture of the Russian Federation, the Federal State Statistics Service, the Federal Customs Service, and the Federal Service for Hydrometeorology and Environmental Monitoring. All this allows us to assess the current state and prospects for the development of business entities and objects in the agricultural sector of the economy.

This fact gives relevance to the topic under study, which indicates the need to identify issues of state support for increasing the digitalization of the agro-industrial complex and introduce effective mechanisms to overcome them (Rybak et al., 2023).

The growth in the use of digital technologies and the widespread transition to a digital economy is one of the main directions of the Russian state policy, which contributes to socio-economic, scientific, and technological development.

When determining the effect of IT, it is necessary to consider the period of digital transformation and the application of innovations for the subsequent regulation of projects. In addition, the degree of digitalization can change over time. The rational use of IT must guarantee a systematic assessment of the current digitalization of any given organization and the effect that has been obtained from it.

For the purposes of digital transformation in the agricultural sector, it is necessary to study a whole range of issues related to the efficiency of using specific IT and the emergence of organizational and economic relationships that contribute to the rational implementation of innovative projects.

The experience in the digitalization of agriculture is studied in the following scientific works and materials (Digital Future Index 2021-2022, 2021; Pratt, n.d.; Status of Digital Agriculture in 18 countries of Europe and Central Asia, 2020; Klyukin, 2022). The essence, role, and principles of state regulation of digitalization in the agro-

industrial complex are addressed by A.A. Anokhina, M.K. Chistyakova (2018), N.A. Goncharova, R.N. Aulov (2019), Yu.A. Lemetti, A.V. Larionov, Yu.T. Farinyuk (2019), T.E. Platonova, O.N. Sklyueva (2019), etc.

METHODS

The research methodology employed in this study encompassed a multifaceted approach to comprehensively assess the state support for digitalization within the agro-industrial complex.

The study commenced with a meticulous analysis of government policies and initiatives aimed at promoting digitalization in the agro-industrial complex. This entailed an examination of legislative frameworks, regulatory provisions, and official documents outlining the objectives and strategies of the state.

To gauge the effectiveness of state-sponsored digital projects, we conducted a thorough evaluation. Specific digital initiatives, including Digital Agriculture, Smart Contracts, and Agroexport, were scrutinized for their impact on agricultural productivity, cost reduction, and overall sector growth.

The relevant data regarding the growth of digitalization in the agro-industrial complex, such as increased agricultural capacity, reduced greenhouse gas emissions, and job creation, were collected and analyzed to assess the overall impact of state support.

The research methodology aimed to provide a comprehensive and objective assessment of the role of state support in advancing digitalization within the agro-industrial complex, considering both policy frameworks and practical outcomes. The combination of these methods facilitated a holistic understanding of the subject matter, allowing for informed conclusions and recommendations.
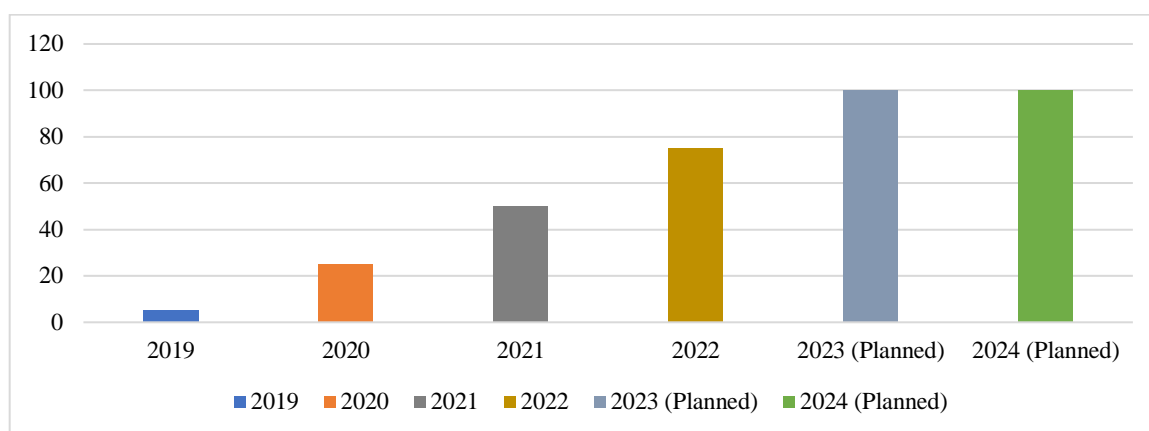
RESULTS AND DISCUSSION

Our research (Sekerin et al., 2019; Gaiduk et al., 2019) identifies problems that impede the increasing role of digitalization in the agro-industrial complex.

By 2024, the Efficient Hectare project will introduce intelligent agricultural planning in 85 constituent entities of the Russian Federation (100%) through the cultivation of highly profitable crops, considering the transport principle "to the place of processing or consumption".

The introduction of the Smart Contracts project has the following advantages: an active relationship with the banking system is ensured to automatically transfer funds from the owner's bank accounts in accordance with the agreement; the entire chronology of business relationships is stored in the cloud, and any event is recorded without the possibility of making any adjustments (Khalyapin et al., 2012a; 2012b, 2012c). The Smart Contract project is integrated with the Russian agro-industrial leasing company (AO Rosagroleasing) and information banking systems (Khoruzhy et al., 2023; Gaiduk et al., 2010). By 2024, a complete digital transition is planned, when contracts with subsidy recipients will be concluded only in the smart mode (Figure 1).

Source: Official website of the Ministry of Agriculture of the Russian Federation, n.d.
Figure 1. The share of concluded smart contracts, %

The Agroexport project "from the field to the port" is integrated with the information bases of the Federal Service for Hydrometeorology and Environmental Monitoring and Agrochemical Center. The Center will provide an accurate and detailed forecast of the yield of all types of agricultural crops and the timing of their harvesting, as well as model the export of agricultural raw materials in real-time. By 2024, it is planned to process 100% of agricultural products under this project on a paperless basis. For example, the Unified Federal Information System of Agricultural Lands was created in the Perm Territory, Sverdlovsk Region, and other constituent entities.
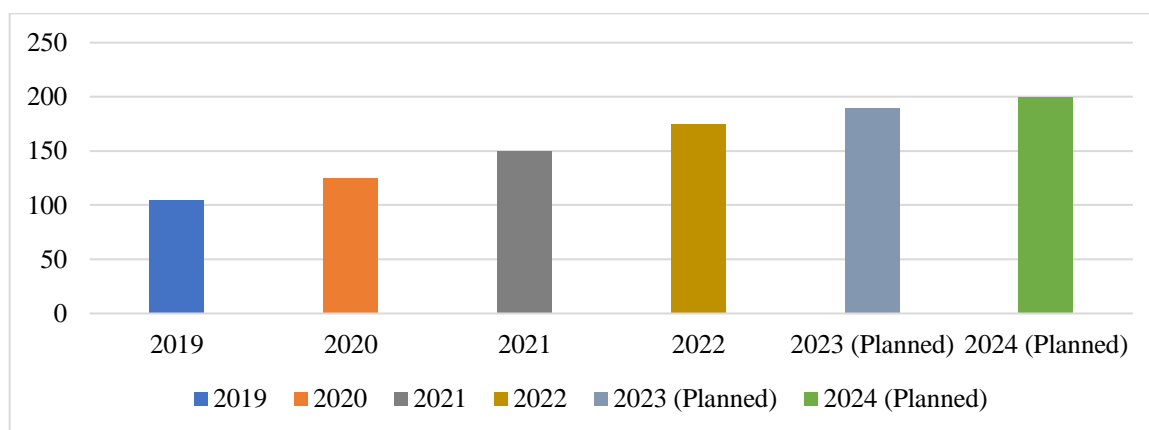
The Agricultural Solutions for Agribusiness project will provide an opportunity to present data on the industry attractiveness of a particular region for potential investors using digital technologies. It consists of the following components: Smart Agricultural Office, Smart Farm, Smart Field, Smart Processing, Smart Warehouse, Smart Greenhouse, and Smart Herd.

The Smart Land Use program is an intelligent mechanism designed to simplify
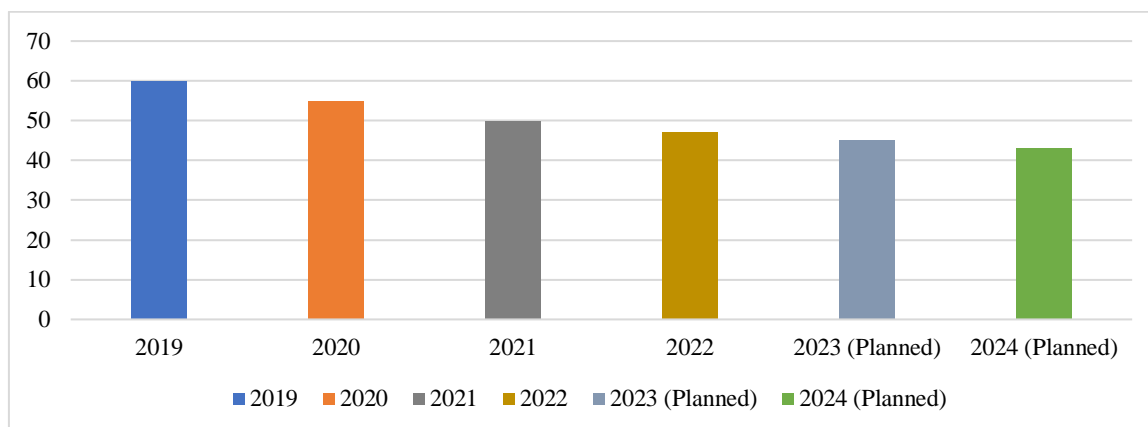
the generation, assessment, and updating of data on the state of land and soil resources of a specific territory at the date of the study. As part of this program, the SmartAgro digital platform (Agroanalytics) has been introduced which manages the crop production of any volume and automates most of the operations (for example, forecasting production processes, costs, machinery and equipment, crop rotation, and land management).

Such digital projects as Smart Herd, Smart Processing, Smart Warehouse, Smart Greenhouse, and Smart Agro Office will assist business entities in the field of management and control of activities, without which production will not achieve a certain goal. By 2024, the introduction of approaches to effective management will allow to double labor productivity in a timely manner (Figure 2) and reduce the share of costs in the cost of agricultural products from 60 to 43% (Figure 3).

Source: Official website of the Ministry of Agriculture of the Russian Federation, n.d.
Figure 2. Labor productivity growth rate at agricultural enterprises, %

Source: Official website of the Ministry of Agriculture of the Russian Federation, n.d.
Figure 3. Share of material costs in the unit cost of production, %

The Land of Knowledge program will ensure the formation of the first sectoral

Revista Jurídica

electronic educational system in Russia. In 2019-2021, about 55,000 specialists from agricultural enterprises obtained an academic degree and studied and mastered the elements of the digital economy on the open-access online platform of the Land of Knowledge Agricultural University using video lessons with practical tasks, purchasing useful materials, and tracking their progress.

Digital agriculture is not limited to the technological and technical improvement of production; it automates the document flow, which helps facilitate the processing of large arrays of information, providing access to tax transfers, receiving subsidies, and promoting the investment attractiveness of regions.

The Foodnet market (which focuses on the production and sale of nutrients, as well as relevant IT) has received a huge impetus for development due to the growing trends in digitalization in the agricultural sector of the economy.

By 2035, it is planned to develop smart services and products that will be able to take global leadership by introducing the best and latest scientific achievements in the field of food security. In the near future, digital technologies will penetrate the entire cycle of agricultural production, "from the field to processing and to the counter".

In Table 1, we consider the amount of financial investments in digital agriculture.

Table 1. Financing of the Digital Agriculture project, million rubles

Period	Sources of financing			Total
	Federal budget	Regional budget	Extrabudgetary sources	
2019	16,100.0	350.0	5,000.0	21,450.0
2020	26,000.0	500.0	7,000.0	33,500.0
2021	29,000.0	1,000.0	15,000.0	45,000.0
2022	35,000.0	2,150.0	22,000.0	59,150.0
2023 (planned)	23,000.0	2,000.0	35,000.0	60,000.0
2024 (planned)	22,900.0	2,000.0	56,000.0	80,900.0
2021 vs 2019, %	180.12	285.71	300.0	209.79
2024 vs 2021, %	78.97	200.0	373.33	179.78

Sources: Official website of the Ministry of Agriculture of the Russian Federation, n.d.; Russian statistical yearbook, 2022

According to the information presented in Table 1, this project received financial support in the amount of 45 billion rubles in 2021: 29 billion rubles from the federal budget, 1 billion rubles from regional budgets, and 15 billion rubles from extrabudgetary funds. By 2024, the structure of funding will be as follows: 22.9 billion rubles from the federal budget, 2 billion rubles from regional budgets, 56 billion rubles

from extrabudgetary funds, i.e., the total amount of state support will increase by 79.78% and reach 80.9 billion rubles.

At the beginning of 2018, the Krasnodar Territory adopted a strategy until 2030, according to which its territory was divided into several zones. Henceforth, their municipalities rely on integrated development. In terms of territorial proximity and economic similarity, eight municipalities were united into the Northern zone, including the Kushchevsky, Krylovsky, Pavlovsky, Starominsky, Leningradsky, Kanevsky, Shcherbinovsky, and Yeisk districts.

Under the Development Strategy initiated by the regional governor, the territories divided into zones should ensure an average annual economic growth of 102.9% by 2030, their accumulated investments should reach about 682 million rubles, and the average annual labor productivity index should amount to 102.8%. These ambitious goals can be realized by overcoming the insufficient development of engineering infrastructure, addressing the shortage of energy resources through improving the fuel and energy complex, including through the construction of wind and solar power plants, ensuring the development of investment sites, agro-industrial parks, and resorts, and solving a set of other social and environmental tasks.

The flagship project Cluster of Green Agro-Industrial Complex with Deep Smart Processing in the municipalities comprises three subclusters: agro-food (smart processing), green agriculture, and winemaking.

The first subcluster is planned to be implemented in the Starominsky, Kanevsky, Leningradsky, and Pavlovsky districts. The construction of a dairy complex for 3,000 heads in the Kanevsky district has almost been completed; the volume of allocated investments is 2.1 billion rubles, and 150 new jobs will be formed soon.

The green agriculture subcluster covers the entire territory of the free economic zone.

The winemaking subcluster is located in the Yeisk district, in which complexes are being built to process grapes.

Let us consider the dynamics of basic and planned indicators under this project (Table 2).

Table 2. Basic and planned indicators of the program Cluster of Green Agro-Industrial Complex with Deep Smart Processing in the Krasnodar Territory

Indicator	2019	2020	2021	2022	Changes, ±	
					2021 vs 2019	2022 vs 2021
Gross value added, in billion rubles	443.3	482.5	512.0	537.8	+ 68.70	+ 25.80
GVA growth rate in comparable prices (annual average for the period), %	101.7	102.6	103.0	103.3	+ 1.30	+ 0.30
Labor productivity, million rubles/person	1.15	1.29	1.39	1.47	+ 0.24	+ 0.08
Export of agricultural products, billion US dollars	2.3	2.52	2.73	3.04	+ 0.43	+ 0.31
Average monthly salary in the agro-industrial complex, rubles	30,252.0	32,845.0	34,710.0	36,215.0	+ 4,458.0	+ 1,505.0
Investments in the agro-industrial complex, million rubles	50,838.0	56,234.0	65,617.0	68,356.0	+ 14,779.0	+ 2,739.0
Average annual number of people employed in the agricultural sector, thousand people	378.0	371.0	368.0	367.0	− 10.0	− 1.00
Share of farmland that meets the standard of the green agro-industrial complex, %	–	–	5.0	7.5	–	+ 2.50

Sources: Official website of the Ministry of Agriculture of the Russian Federation, n.d.; Russian statistical yearbook, 2022

In 2019-2021, the volume of investments in this project increased by 68.36 billion rubles. By 2022, its increase amounted to 2.74 billion rubles. The average monthly salary grew by 6,000 rubles. In addition, this project ensured growth in the size of exported products by 430 million rubles in 2019-2021. By 2022, this figure further increased by 310 million rubles. The share of agricultural land that meets the standard of green agro-industrial complex has reached 7.5%.

Let us consider the amount of government funding for this program (Table 3). It is supported by the federal budget, the regional budget, and extrabudgetary funds. In 2021, the budget of the Russian Federation allocated 2.99 billion rubles, its constituent entities provided 2.21 billion rubles, and extrabudgetary funds included 2.2 billion rubles.

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In Table 4, we consider the volume of investments in each area of the project.

The largest volume of investments is aimed at smart processing, where 2.01 billion rubles were allocated in 2021. However, this amount will be reduced by 10 million rubles by 2023. Five million rubles were invested in green agriculture in 2021 but this area will be provided with 258 million rubles by 2023. It is planned to allocate 785 million rubles to the winemaking subcluster in 2023, which is 63.8 million less compared to 2021 (848.8 million rubles).

Table 3. Sources of financing for the regional digital project, million rubles

Financing sources	2020	2021	2022	2023 (planned)	Changes, ±	
					2021 vs 2020	2023 (planned) vs 2021
Total	7,573.4	7,408.8	7,449.5	7,434.7	− 164.6	+ 25.9
Federal budget	3,400.0	2,994.9	3,108.5	3,108.5	− 405.1	+ 113.6
Regional budget of the Krasnodar Territory	1,911.7	2,213.2	2,092.7	2,077.9	+ 301.5	− 135.3
Extrabudgetary sources	2,261.7	2,200.7	2,248.3	2,248.3	− 61.0	+ 47.6

Sources: Official website of the Ministry of Agriculture of the Russian Federation*, n.d.;* Russian statistical yearbook*, 2022*

Table 4. Financial support for the program Cluster of Green Agro-Industrial Complex with Deep Smart Processing, million rubles

Directions for the regional project	2020	2021	2022	2023 (planned)	Changes, ±	
					2021 vs 2020	2023 (planned) vs 2021
Green agro-industrial complex	0.0	5.0	258.0	258.0	+ 5.0	+ 253.0
Smart processing	2,000.0	2,010.0	2,000.0	2,000.0	+ 10.0	− 10.0
Winemaking	750.2	848.8	802.9	785.0	+ 98.6	− 63.8

Sources: Official website of the Ministry of Agriculture of the Russian Federation*, n.d.;* Russian statistical yearbook*, 2022*

CONCLUSIONS AND RECOMMENDATIONS

Specialists working in the field of agriculture need access to innovations. In addition, it is necessary to ensure sustainability as manufacturers need the system to operate independently, without complex setup and maintenance.

The most expensive stage in the digitalization process is the collection of information. To ensure comprehensive management, it is required to have free access

to various information arrays provided by government agencies and private companies. However, it is still unclear how to motivate farmers to provide data on their performance.

An insurmountable obstacle to the digitalization of agriculture is slow scientific and technological progress, scarce resource potential, and lack of investment attractiveness of even large corporations associated with the high potential risk of agricultural activities. One possible solution to this problem is for the state to assume the role of investors. IT should be implemented simultaneously in all directions, which will bring long-term positive results in the social and economic spheres and ensure the influx of new additional investment sources.

Many Russian regions have had a positive experience in transiting to a smart agro-industrial complex, which requires considerable investment and coordination of government authorities, business entities, and the population.

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