European Proceedings of
Social and Behavioural Sciences
EpSBS

www.europeanproceedings.com
e-ISSN: 2357-1330

DOI: 10.15405/epsbs.2022.02.21

LEASECON 2021
Conference on Land Economy and Rural Studies Essentials

INNOVATIVE DEVELOPMENT OF THE AGRO-INDUSTRIAL COMPLEX: TRENDS AND OPPORTUNITIES OF IMPROVEMENT

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Abstract

The modern stage of the development of the domestic agro-industrial complex is characterized by a stage of significant transformations, which consists in the transition to a model of innovative development, the task of which is to enhance innovation in the country and regions. At the same time, it is extremely important to consider the innovation component not as a single phenomenon, but as a dominant of the functioning of the agricultural sector. The vectors of the innovative development of agricultural production are identified and specified based on the analysis of the main indicators characterizing the innovative development of agricultural producers in the country such as the volume, the share of innovative products produced by the agricultural sector of Russia, the actual costs incurred by agricultural producers on technological innovations, as well as the shares of organizations implementing technological innovations. The authors analyze the features of scientific, technical and innovative activities in the agro-industrial complex of Tambov region, the innovative activity of which at the present stage of development is characterized by rapid growth. Moreover, they paper studies the key parameters of the project implemented in Tambov region on the creation and effective functioning of the structure of the cluster type of the innovative scientific and technological center “Michurinskaya Valley”, aimed at the creation and development of integral scientific and production system focused on stimulating the agricultural sector of economy through the transfer of innovations into the practical activities of agricultural producers.

Keywords: Agro-industrial complex, innovation, innovative development

https://doi.org/10.15405/epsbs.2022.02.21
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1. Introduction

Nowadays society is at the stage of formation of a post-industrial economy, which implies the increase in the technology and science intensity of all industries, including the agro-industrial complex. Intensive development aimed at the introduction of precision farming technologies, digitalization and robotization of technological processes and genetic engineering becomes a benchmark (Kornilova et al., 2018). Agriculture, as a part of domestic agro-industrial complex, a branch of the national economy that is of strategic importance for the provision of sustainable development of society has a multiplicative effect for the development of economy and, at the same time, has exceptional social significance. The main goal of the intensive development of the agricultural sector in the country is to supply the population with quality food (Bogachev, 2019).

In order to achieve this purpose, it is necessary to complete a number of tasks:

- to increase the productivity and competitiveness of the Russian agro-industrial complex;
- to ensure effective import substitution in the market of crop and livestock products, as well as to ensure the development of export potential, which in the future will allow taking stable positions in the global market (Blinova, 2016);
- to provide conditions for scientific and innovative activities in the agro-industrial sphere;
- to improve the quality of personnel training.

2. Problem Statement

At the present stage of development, the innovative development of the agro-industrial complex is characterized by a significant contradiction explained by the fact that the existing measures of state regulation, on the one hand, form the prerequisites for innovation and the inflow of private capital for the modernization of agricultural production, and on the other hand, the crisis situation of a large part of agricultural producers, insufficient financial support from outside present the most important factor that significantly limits the scale of innovations and the attractiveness of the agricultural sector for potential investors. The non-traditional mechanisms and instruments for investment in innovative activities used in world practice remain undeveloped. Thus, the problematic aspect of the paper is determined by the objective need to search for options for the development of innovative activities in the agro-industrial complex, which will create conditions for the effective functioning of agricultural enterprises based on the introduction of innovations and, as a result, the economic growth of the agricultural sector.

3. Research Questions

The subject of the paper is the socio-economic relations, which arise in the process of the implementation of innovative activities by agricultural producers.

4. Purpose of the Study

The purpose of the research is to develop practical recommendations for the improvement of innovation in the agro-industrial complex.

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5. Research Methods

During the solution of the problems posed in this the paper, the following general research methods were used: abstract-logical, monographic, economic-statistical, methods of deduction and generalization (induction), analysis and synthesis.

6. Findings

The key priorities for sustainable development of the agro-industrial complex as an essential element of ensuring food security in Russia for the medium and long term are the transition to the formation of a new technological base based on modern scientific achievements, the transformation of science and innovation into a leading factor of economic growth. At present, the innovations and innovative activities are the basis for the provision of competitive advantages and quality transformations. In addition, they contribute to the increase in the efficiency of production development and maintenance of market positions. This is confirmed by a number of expert assessments, according to which about one third of economic growth is provided by innovative technologies (Nikonova, 2016).

The main directions of the increase in innovation activity and the transition to innovative path of development are reflected in the Strategy for innovative development of the Russian Federation for the period up to 2020 (2011) and a number of active federal programs: “The State Program for the Development of Agriculture and Regulation of Agricultural Products, Raw Materials and Food Markets for 2013-2020”, “The concept of long-term socio-economic development of the Russian Federation until 2020”. At the same time, the analysis of the innovative activity of domestic agro-industrial complex showed that domestic farmers are significantly lag behind their foreign colleagues in the degree of innovation development, which is largely depend on the low level of development of the mechanism for introducing the results of intellectual activity into the production process.

However, the world experience of economically developed countries indicates that the effectiveness of innovation and the degree of involvement of producers in the innovation process largely determines the success of the engagement in the world agricultural market and the competitiveness of agricultural producers (Pershukevich et al., 2018).

In this regard, the development and implementation of innovative technologies for the cultivation, storage and processing of agricultural raw materials, new approaches to the organization of the production of functional and health-improving products for various categories of the population are of particular relevance. The main indicators characterizing the innovative development of the agro-industrial complex in Russia are presented in Table 1.

Table 1. Indicators characterizing the innovative development of agricultural organizations in Russia for 2016-2018

Indicators	Years			Relation of 2018 to 2016, %
	2016	2017	2018	
The volume of produced innovative goods, works and services, million rubles	22222,9	28446,0	33829,1	152,2

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The share of innovative products in the total volume of shipped goods and provided services %	1,4	1,8	1,9	0,5
Costs for technological innovation, RUB million	14963,3	15806,0	21960,5	146,8
Share of organizations implementing technological innovations,%	3,4	3,1	3,7	0,3

Source: compiled by the authors on the basis of data of Federal State Statistics Service

Despite the increase in the total volume of innovative products released by agricultural enterprises in 2018 by 50% or by 11,606.2 million rubles compared to the same indicator in 2016, the share of innovative products in the total volume of shipped products in agriculture is small - just under 2%. The share of the organizations implementing technological innovations in the agro-industrial complex is small - 3.7% in 2018. The analysis of the innovation activity of economic entities by agricultural sector according to data for 2018 showed that 4.2% of organizations are innovatively active in crop production, 3.9% in animal husbandry.

The level of technological innovation activity of agricultural organizations at the end of 2018 amounted to 3.4%, including 3.7% (3.9% in 2017) in the crop growing industry, 3.9% (2.9% in 2017) in animal husbandry (Antsiferova & Sutormina, 2019). At the same time, among organizations implementing such innovations, 23.2% of agricultural enterprises carried out product innovations, and 76% - process innovations (Emelyanova & Kharchikova, 2019).

The analysis of possible directions for the activation of innovative processes and generalization of methodological approaches to the innovative development of agricultural production allowed concretizing its main directions (Table 2).

Table 2. Main vectors of innovative development of agricultural production

Spheres of innovative development	Directions of innovative development
Plant and crop production	The creation of promising varieties of fruit and berry and vegetable crops, which are 1.5-2 times higher than existing analogues in terms of the content of biologically active substances and antioxidants in fruits with limited use of fungicides; the development of new types of structures for intensive plantings; development of resource-saving technologies for the cultivation of agricultural crops on a pesticide-free basis; introduction of intelligent robotic and automated engineering systems; the creation of an effective system for the intensification of land use.
Animal breeding	Breeding of highly productive breeds, types and crosses of animals and poultry; the introduction of improved technologies in animal husbandry; the formation of an effective feed base based on innovative technologies for the production and fodder conservation.
Processing production	The development and commercial exploitation of organic production of food raw materials, the creation of specialized food products for children and school meals, athletes of high levels of achievement, astronauts, workers in hazardous industries, as well as food products for the prevention of alimentary-dependent diseases, the creation and development of a modern safety control system and provision of guaranteed quality (safety, nutritional value, consumer properties) of food products
Sphere of economics, organization and	The implementation of development models for enterprises, cooperatives and integrated formations; the development of fundamentally new forms of

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production management	organization and motivation of labor, the improvement of the organization of the use of resources and their maintenance; scientific and industrial cooperation and integration.
Intelligent engineering technology	The development of the principles of individual approach to each object of influence (young trees and fruit trees) in the general chain of production and technological measures and procedures using robotic complexes, the creation of a system of interconnected automated lines and robotic complexes that ensure the implementation of the entire range of technological processes and operations in industrial crop production

Source: compiled by the author based on data (Reznichenko & Andreev, 2016; Sutormina, 2019)

The activation of innovation processes in the agricultural sector can be initiated by the creation of a favorable innovation, investment and institutional environment that allows business entities to form appropriate conditions for the generation of an innovative type of their development. It is also necessary to note that the effective flow of production and economic processes and the formation of innovative growth in agricultural production can be explained by the accumulation of necessary competitive advantages by business entities and the activation of innovation-oriented development from the perspective of the external environment through the implementation of agricultural and innovation policies (Lozinsky, 2016).

The analysis showed that a special feature of scientific, technical and innovative activities in the agro-industrial complex of Tambov region is the rapid growth of innovative activity, thus, by the end of 2018, the volume of innovative products produced by Tambov farmers increased by 7.4 times (Table 3).

Table 3. Main indicators characterizing the innovative activity of agricultural organizations of Tambov region in 2016-2018

Indicators	Years			Relation of 2018 to 2016, %
	2016	2017	2018	
The volume of produced innovative goods, works and services, million rubles	747,8	3926,0	5524,0	в 7,4 раза
The share of innovative products in the total volume of shipped goods and provided services %	1,3	9,5	10,4	9,1 п.п.
Costs for technological innovation, RUB million	1669,4	1090,0	1157,8	69,3
	1669,4	1090,0	1157,8	69,3
Share of organizations implementing technological innovations,%	18,1	12,3	19,0	0,9

Source: compiled by the authors based on the data of the report of Tambov region in figures, 2018 of Territorial body of the Federal State Statistics Service in the Tambov region

The volume of commercialized innovative production of agricultural producers of the region in 2018 amounted to 5,524.0 million rubles against 747.8 million rubles in 2016. The share of innovative products in the total volume of shipped goods and rendered services increased significantly - by 9.1 percentage points, from 1.3% in 2016 to 10.4% in 2018. The innovative production is focused on the

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domestic market. In the structure of exported innovative products in the region there are no innovative agricultural products at the end of 2018. At the same time, business entities of the regional agro-industrial complex experienced the decrease in innovation costs - more than 30%. The cost of technological innovation did not exceed 2.2-3% in the total volume of goods shipped by agricultural producers and performed work.

This is not comparable to the real needs of economy in renewing fixed assets and expanding the range of production of fundamentally new competitive products.

The main vector for the development of agriculture in the region is the organization of processing of new types of raw materials obtained using innovative biotechnologies, the production of environmentally friendly food products (the processing of pond fish, the conservation of plant materials by convective-vacuum-impulse exposure, the use of other innovative processing technologies). The development of agriculture in the region will be more focused on the automation of the process of transferring goods from a producer to final costumer using interactive technologies that provide not only the ability to position and promote goods, but also to create an electronic system of goods circulation. Under favorable external and internal conditions, the average annual index of agricultural production will be 106.7 %.

In the short and medium-term forecasting periods, the measures for the development of agriculture in the region will be aimed at the integrated development of the regional agro-industrial on the principle of intersectoral interaction (the development of subsectors of crop and livestock production with the orientation to existing and future capacities of food and processing industry). Moreover, these measures will be applied in order to exclude a territorial gap in the production chain “from the field to the consumer's table” and ensure the required volume of production of environmentally friendly raw materials and the creation of high-tech processing industries.

Clustering is one of the most effective mechanisms for the innovative development of Tambov region. It is an effective form of integration and cooperative interaction for the consolidation of efforts, which allow effective use of the positive aspects of market mechanisms, the increase in the efficiency of business processes and the creation of conditions for entering new markets (Maidanevich & Anopchenko, 2017). Livestock, crop, dairy, and BIO clusters have been created and are successfully operating in the region. The Cluster Development Center, established in 2017 in accordance with Tambov Region State Program “Economic Development and Innovative Economy”, is the organization that ensures the cooperative interaction of cluster members with each other, educational and scientific institutions, non-profit and public organizations, government authorities and investors.

In 2019 large-scale work began on the creation of an innovative scientific and technological center “Michurinskaya Valley” in the region based on the successful experience of innovative development using the principles of clustering. Thus center will perform the functions of the coordination and provisions of scientific support for large projects in the field of agricultural production implemented in Russia and form the programs for scientific and technical development of the agro-industrial complex in the region.

The purpose of the creation and development of the innovative scientific and technological center “Michurinskaya Valley” is to organize the effective transfer of innovative technologies, complexes,

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equipment of scientific and innovative, domestic and foreign producers by placing a system of operating innovative industries on the territory of the center, which in real conditions of the Russian Federation allows producers to evaluate the technological and economic efficiency of innovations and purchase them using the services provided by the center.

The project for the creation and development of "Michurinskaya Valley" innovative scientific and technological center was quite seriously economically justified, including using such a strategic planning method as SWOT analysis (Table 4).

Table 4. SWOT-analysis of the innovative potential of the project to create the innovative scientific and technological center "Michurinskaya Valley"

Advantages	Disadvantages
1. Availability of scientific and educational groundwork in agricultural technologies, biotechnologies 2. Sufficiently strong scientific and technical culture, traditions, experience in research and development 3. Region territory availability of basic infrastructure for the formation of a regional innovation system: research organizations, the science city of Michurinsk, implementation of the technological platform "Technologies of the food and processing industry of the agro-industrial complex - healthy food products" 4. Law on innovation in force 5. Innovation council under the head of the administration of Tambov region.	1. Insufficient financial capabilities of the local large business capable of acting as a permanent customer of innovative projects 2. Insufficient infrastructure for the commercialization of innovative developments 3. The high cost of new technologies, as a result of which innovation is difficult for small and medium-sized enterprises 4. A large proportion of entrepreneurs who use traditional approaches to business and do not apply innovations in their activities
Opportunities	**Threats**
1. The opportunities for the development of a regional innovation system on the basis of the created infrastructure: the technological platform "Technologies of food and processing industry of the agro-industrial complex - healthy food", the agricultural science city, regional universities 2. Strengthening competition in Russian agricultural markets as an incentive for innovative activity 3. The oossibility of the implementation of projects within the FoodNet roadmap 4. The use of mechanisms to support federal agencies and development institutions	1. The reduction (insufficient size) of government measures to support innovative entrepreneurship. 2. The loss of the status of the science city of Michurinsky. 3. "Brain drain" - the outflow of the best specialists to other Russian and foreign scientific organizations with more favorable conditions for their activities 4. Low demand for new technologies by enterprises, due to the lack of a technological base for their application (technologies are ahead of their time)

According to our forecasts, the close proximity of the developed scientific structure to real agricultural production, the work with the use of a serious land fund and large agricultural producers will provide a large-scale transfer of the results of intellectual activity and new technological approaches to the production sector.

The forecast of economic indicators characterizing the development of the agro-industrial complex and innovations in Tambov region, as well as "Michurinskaya Valley" innovative scientific and technological center until 2034 is shown in Figure 1.

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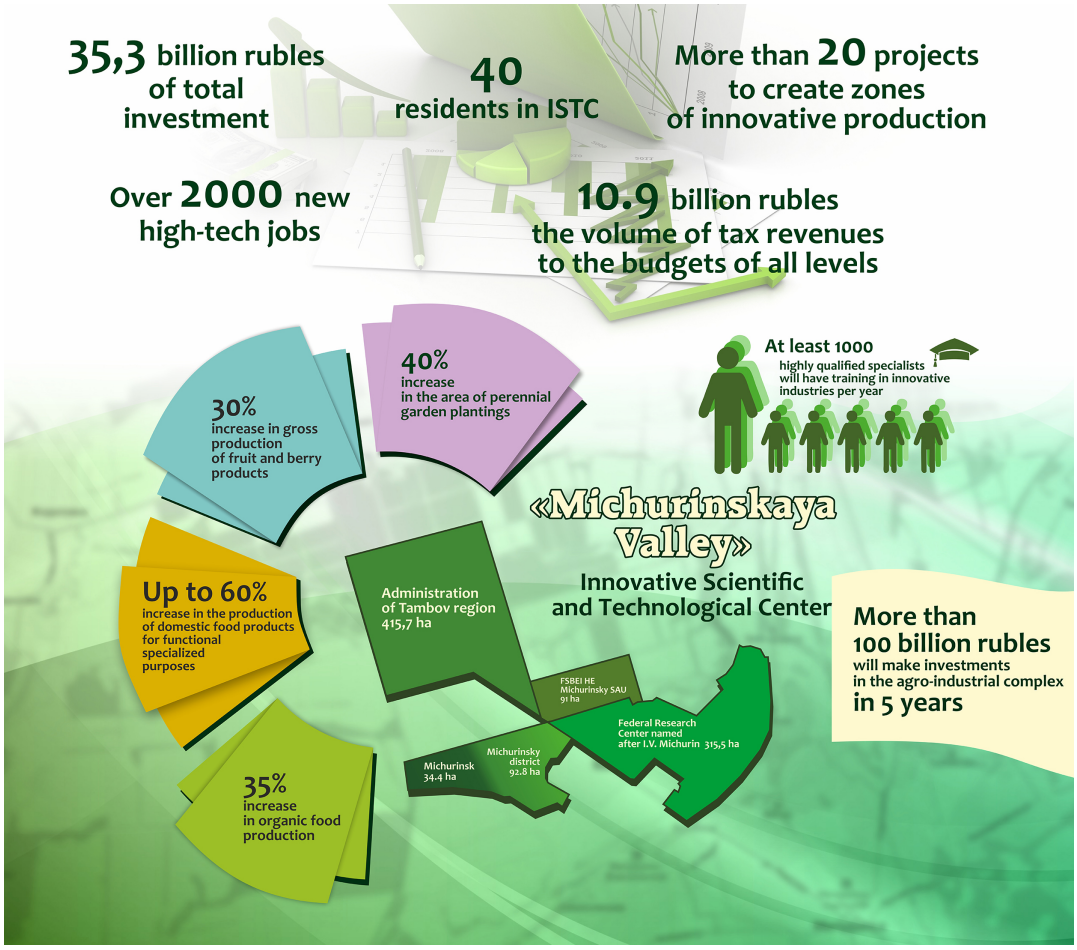

Figure 1. Forecast indicators of the development of "Michurinskaya Valley" innovative scientific and technological center

The creation of the innovative scientific and technological center "Michurinskaya Valley" will bring a positive effect for the development of the agro-industrial complex not only in Tambov region, but also for Russia with the following results:

- The saturation of the domestic market with a wide range of Russian high-quality agricultural products;

- The development of the export potential of the state agro-industrial complex (the transition from the export of raw materials to the export of food of high-tech industries with high added value) (Lozinsky, 2016);

- the growth of labor productivity in agriculture;

- the increase in the number of technologies for processing and storage of agricultural products, the use of which is possible not only on the territory of the innovative scientific and technological center;

- the expansion of the scientific and technical capabilities of the state agro-industrial complex on the basis of the scientific achievements of the innovative scientific and technological center.

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7. Conclusion

Thus, the main factors effective innovative functioning are the existing scientific and technical potential and the state policy implemented today in the agricultural sector. The authors believe that innovative scientific and technological centers as a set of structural components necessary for the dynamic development and functioning of enterprises of the agro-industrial complex in the field of the creation of fundamentally new scientific and technological solutions should become the core of the innovative system of the domestic agro-industrial complex.

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