

INNOVATIVE-INVESTMENT DEVELOPMENT OF AGRICULTURE IN THE CONDITIONS OF FORMATION OF THE EXPORT-ORIENTED ECONOMIC SECTOR: SYSTEM APPROACH

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Abstract

Creating a highly productive export-oriented agricultural sector of the economy and increasing the efficiency of agricultural production in agriculture is possible on the basis of stimulating innovation and investment. The purpose of this study is to assess the impact of investment resources on the activation of innovative processes on the example of the livestock industry and to develop recommendations for increasing the innovation and investment activity of agriculture in the context of the formation of an export-oriented economy. The author's paradigm of increasing innovation and investment activity in the agricultural sector of the economy is formed on the basis of the concept of NIS, diffusion of innovations, as well as theories of structural transformation of the economy. As a result of the analysis and evaluation of the innovation and investment development of agriculture, tendencies have been identified for increasing innovative activity and the imbalance between the existing innovative potential and the effectiveness of its use. Differentiation of regions by the level of provision with investments in fixed assets in agriculture was carried out, interregional differences were revealed. The developed author's methodology for assessing the level of innovation of the livestock industry in the Russian regions will allow us to formulate approaches to improving the structural investment policy. The practical significance of the results of the study is to develop a scheme for the development of organizational and economic support for increasing innovation activity in the context of the formation of an export-oriented agricultural sector of the economy.

Key words: *innovation and investment development, agriculture, export-oriented agrarian economy, organizational and economic support, state support*

INTRODUCTION

In solving the problems of creating a highly productive export-oriented agrarian sector of the Russian economy, the most important role belongs to the development of innovation and investment activity and its orientation towards the introduction of advanced scientific and technological achievements aimed at updating the technical, technological, organizational base of agricultural production and obtaining competitive high-tech products.

In the Address of the President of the Russian Federation to the Federal Assembly dated 03/01/2018, the main national development goals of Russia were formulated. Among them were named Russia's entry into the five

largest economies of the world, as well as the excess of world average economic growth rates. The head of state set a goal to increase the share of investment in fixed assets in GDP to 25% by 2024. It was emphasized that at present it does not exceed 21% in the structure of GDP. An increase of this indicator by only 4% by 2024 will lead to a significant change in the structure of expenditures in the country's economy [21]. An increase in the share of investments indicates a significant change in the structure of expenditures in the economy: an increase in the savings rate of the population, an increase in investment activity for modernization and technological renewal. The Message notes

that over the past five years, the index of physical volume of investments in fixed assets in the agro-industrial complex amounted to only 3.3%, which is insufficient for the country's economic growth. In accordance with the Decree of the President of the Russian Federation dated May 7, 2018 No. 204 «On National Goals and Strategic Tasks of the Development of the Russian Federation for the Period until 2024» [11], which the Ministry of Industry and Trade of Russia developed the Passport of the National project «International Cooperation and Export» [26]. One of the components of the Passport is the federal project «Export of agricultural products». In accordance with the latter, it is planned to increase the export of agricultural products by 2 times by 2024 compared to 2018. This is possible only by increasing the export of commodity stock with high added value, which, of course, should be based on an innovative approach to further strategic development of production.

The emphasis is on the fact that it is possible to intensify innovation and investment processes provided that production efficiency in the agricultural sector is increased, measures are taken to increase its stability, improve the pricing policy in the agro-industrial complex, develop competitive relations between agricultural producers in resolving issues of their lending, and also radically change state financial policy in the agro-industrial complex [14].

The formation of the author's paradigm of increasing innovation and investment activity in order to accelerate the formation of the export-oriented agricultural sector of the economy is described by the concept of National Innovation Systems of NIS and the diffusion of innovations.

The developers of the NIS concept include K. Freeman, B.-A. Lundvall and R. Nelson, who are supporters of the views of J. Schumpeter and F. Hayek. The main theoretical and methodological views are reduced to such postulates as knowledge as a factor of economic growth, the development of NIS is due to the diffusion of innovations; the institutional component of any economic

system determines and regulates the rate of diffusion of innovations, as well as the creation, implementation and commercialization of new knowledge in time and space, enhancing the spillover effects of their spread.

Freeman suggests to understand by «National Innovation system, NIS» the unification of public and private sector institutions into a single network, whose joint activity is focused on the development, modification, import and further dissemination of new technologies [20].

At the same time, Lundvall considers NIS, its elements and the links formed between them [19]. These elements and the relationships between them should be in active interaction in production processes, distribution processes, as well as when using knowledge that is useful for the economy. Nelson believes that knowledge can be recognized as useful only when it is possible to put them into practice in order to ensure the maximum degree of effectiveness. According to Nelson, NIS is a system of national institutions, on the level of joint interaction of which depends on the level of effectiveness of innovative companies. He defines the NIS as a system of national institutions collaborating together, and the degree of effectiveness of the activities of national companies in the field of innovation depends on the level of such interaction. Patel and Pavit suggested that the institutes included in the NIS structure are endowed with their own structural units that contribute to the activation of the innovation process, as well as the necessary competencies that allow to identify the main directions of technical knowledge, as well as determine their speed [27]. Metcalf defines NIS as “a set of different institutions that individually and in cooperation contribute to the development and transfer of technologies and provide a framework for the formation of public policies that affect innovation processes. NIS is a system of different interconnected institutions that produce, store and transmit knowledge, skills and human-created products used in the development of new technologies” [22].

Improving the efficiency of using the innovative potential of innovative systems in the agricultural sector is associated with the creation, implementation, distribution and commercialization of innovations, taking into account the needs of the regions and the specific features of agricultural production, the adaptation of foreign digital systems and the growth of integration interaction between educational, scientific, industrial and implementation units [12].

Aker J [1], Al-Hassan, R., Egyir, I, Abakah, J. [2] consider the development of the innovative potential of developing countries, in which agricultural growth rates, on the one hand, are ahead of the world due to favorable climatic conditions, on the other hand, they are slowing down due to undeveloped infrastructure, the complexity of investment policies, insufficiently developed mechanisms of state support at the regional level, and the low level of digitalization of agricultural production.

Allaire G., Boyer, R Barbier E., Reardon T. [7] are devoted to the study of global economic trends and their influence on increasing the efficiency of the innovative potential of the agro-industrial complex. Bush L., Bain C. [8]. In these works, the analysis of the main directions of network interaction and the transfer of knowledge and technologies is carried out. The contribution of innovation to improving the efficiency of production processes in agribusiness is presented in Autor D.H. [6], Dixie G. Jayaraman, N. [15], Gandhi R., Veetaraghavan R., Toyama K. [16]. Dasgupta S., Mamingi N. [10], Oliver, Y., Robertson, M., Wong, M. [24]. Consideration of adaptation options for advanced scientific and technological achievements in agriculture at the federal, regional and enterprise levels is reflected in the studies of Rios L.D., Srivastava L., Chaddad F., Reardon T. [17], Humphrey J., Schmitz H. [18].

The analysis of foreign and domestic literature allowed us to distinguish two trajectories of research on the innovative development of the agro-industrial complex. Foreign researchers are guided by a

technology leadership strategy and positive experience in the formation of cluster structures by developed countries, where the focus is mainly on the scientific and technological development of large companies, agricultural holdings, multinational corporations that are suppliers of high-tech products to the agribusiness of other countries.

Russian scientists are guided by the priority role of the state in the development of the scientific and intellectual potential of the agro-industrial complex, the application of a targeted program approach to the development of the high-tech agrarian sector of the economy and agriculture in the regions, the formation of a systemic innovation process with increased interest of agribusiness at all stages of the chain, provided with investment and infrastructural support at all levels of the hierarchy [23].

In domestic and foreign literature, there are various approaches to the essence of investment and innovation in agriculture.

The innovative development of various levels of the hierarchy of the national economy, including agriculture and agriculture, is reflected in the writings of Sandu I.S., Altukhov A.I., Ushacheva I.G., Nechaeva V.I., Tatarkina A.I., Lazovsky V. .V., Semenova E.I.

According to Altukhov, A.I. it is necessary to develop a methodology for the multifunctionality and multiplicativity of agricultural production, ensuring the level of profitability of the agricultural sector of the economy required by modern realities, and transforming it into a knowledge-based and high-tech sector [3]. The need for economic modernization in the transition to an innovative development model is justified in the works of Tatarkin A.I. The author characterizes modernization as a contradictory, protracted and high-cost process of changing the social structure, the dominant mode of production, to a more efficient and demanded [35].

In the context of the formation of an export-oriented agricultural sector of the economy, the transformation of the agricultural sector of

the economy into a high-tech and high-tech business is associated with the construction of the institute of an innovative system in the agricultural sector, generating scientific and technological achievements and ensuring their implementation, distribution and commercialization in the production process [33].

The basis of such systems, in our opinion, are innovation and technology centers, business incubators, technology parks, the functioning of which is aimed at accelerating the transfer of developments to production, the development of high-tech types of products [32].

According to Ushachev I.G. improving the efficiency of innovative processes in agriculture is impossible without institutional changes: the formation of vertically integrated cooperative associations and the creation of national cooperative structures; the revitalization of sectoral and functional unions in the development of agricultural production and the formation of territorial agro-industrial clusters [36].

Thus, the dominant role in creating a model of export-oriented agrarian economy belongs to building links between science, government and local self-government, agribusiness and innovative units within the framework of the implementation of innovative agricultural policy. These horizontal and vertical relationships are aimed at creating a favorable innovative environment for the development of regional innovative agricultural systems [28].

At the same time, economies that successfully form regional innovative agricultural systems are more intensively transforming into innovative ones. In their turn, the regions where the formation of innovative agricultural systems is constrained by administrative, bureaucratic, and infrastructure barriers are characterized by a slowdown in the rate of innovative development [13].

An integrated approach to the development of the agricultural economy determines the content of the modern model of scientific and technological policy aimed at creating an export-oriented agricultural sector in the

context of the transition to Industry 4.0. The scientific substantiation of the need to intensify the integration interaction of the subjects of the innovation process in the agro-industrial complex is based on the theory of I. Schumpeter and M. Porter. In the era of the digital transformation of the economy and export orientation, the regional investment and innovation policy and the resources for its implementation must be balanced in all sectors of the innovation chain.

Investigation of investment processes is based on Keynesian and neoclassical theories of economic growth (the theory of the investment multiplier by J. M. Keynes, the theory of economic growth by R. Harrod-Domar, and the Solow theory). In recent decades, Paul Romer's theory of endogenous economic growth has been widely developed, according to which knowledge, innovation and investment in human capital are the most important factors in economic growth. The increase in economic growth is mainly due to the support of education, the provision of subsidies for research and development, as well as the creation of incentives for the introduction of innovations. Unlike previous theories that highlight technological innovation as the main source of economic growth, Romer's theory emphasizes the priority of knowledge in long-term economic development, and the development of new technologies is associated with economic decisions and market conditions.

The level of provision with investment resources is the most important condition for economic growth and increased competition in the agricultural sector, as it is an incentive to activate the process of innovative structural transformation. The most common theories of structural transformations are: the theory of dynamic development of E. Domar, the theory of structural changes of J. Schumpeter, the institutional theory of structural transformations of D. North, the theory of "three-phase development" X. Chenery, A. Straut. The first of them justifies the mandatory import of capital and softening the conditions for attracting it for economically underdeveloped countries against the

background of a deficit of both real savings and financial resources. The theory of X. Chenery, A. Strauta, called the “three-phase development theory” of the economies of underdeveloped countries, calls the cause of structural transformation the influence of a number of factors, among which capital accumulation is considered the most important. In this case, the “three-phase development” of the state is understood as the period of maximum use by the economy of investments to equalize the average propensity to save, as well as the investment rate; a period accompanied by a lack of investment resources, which requires an inflow of capital from outside; the period of economic growth due to import substitution and increasing exports, which determines the process of structural transformation of the economy [9].

As a result, the restructuring of the economy becomes a consequence of the redistribution of investment resources [4]. The growth of innovation development efficiency indicators necessitates the establishment of mutual relations at the regional level of innovation and investment processes, while it is necessary that the attraction of investments goes along the entire chain of innovations. An optimal strategy is characterized by the reflection of measures aimed at increasing the rating of the region, the application of institutional measures aimed at implementing an innovation policy, improving the distribution of productive forces in the territories, as well as taking other relevant measures [34]. The important role of the latest investment and innovation tools, models and mechanisms aimed at increasing the competitiveness of the agricultural sector, as well as increasing export potential, is noted by Russian scientists, while in order to solve the issues of increasing the activity of economic entities in the field of innovation, it is necessary to develop a focused agricultural innovation policy, which should identify tasks and mechanisms that take into account previously defined priorities [37]. Harmonization of politics at the federal and regional levels is the key to the

implementation of the task [31]. At the same time, the mechanism of state support for innovative reproduction in the countryside must be built in such a way that it directly stimulates the process of changing technological patterns. All of the above indicates the need to improve investment policy, its main directions in this case are measures to stimulate investment attraction in priority agricultural sub-sectors [25].

The purpose of this study is to assess the impact of investment resources on the activation of innovative processes on the example of animal husbandry and to develop recommendations for increasing the innovative activity of agriculture in the context of the formation of an export-oriented economy.

MATERIALS AND METHODS

The studies are based on the study and synthesis of statistical data on innovative activities in the agro-industrial complex and agriculture and scientific approaches to the activation of innovative and investment activities. When conducting research, empirical methods such as measurement, generalization, comparison, analysis were used.

The issues of developing methodological approaches to assessing the level of innovative development both in the economy as a whole and in agriculture are devoted to the works of various foreign and domestic researchers [29]. Systems for assessing the level of innovation activity are distinguished by their goals, factors, results, principles of formation and mechanism for the implementation of innovations. According to a rating compiled by the Organization for Economic Cooperation and Development (OECD), an innovative agricultural system consists of three groups of determinants: a knowledge system of the agricultural sector of the economy, research and development, education, society and consumers. On the basis of foreign assessment systems Agricultural Science and Technology Indicators ASTI for the Russian agricultural sector, it is possible to consider this type of

indicator as an investment in the creation of knowledge in relation to agriculture based on the criterion of the effectiveness of scientific research in agriculture. In the agricultural sector of the economy of foreign countries, there are institutes of innovative development, such as marketing research agencies, the development of their results and the spread of innovation on the basis of organizations that provide consulting services to ministries of agriculture, as well as "technological valleys" and innovation clusters at agricultural universities.

In world practice, the evaluation of the results of the development of innovations in the production processes of enterprises is reflected in statistical forms of accounting. In Russia, innovation statistics are mainly conducted in high-tech sectors of the economy. However, in recent years there has been a favorable trend in the collection and systematization of data on innovation and in the agricultural sector. On the basis of order No. 563 of August 30, 2017, the Federal State Statistics Service approved a new edition of the quarterly federal statistical monitoring form No. 4-innovation, "Information on the Organization's Innovation Activities," Since 2018, enterprises operating in agriculture are required to fill it out. This new edition was developed by Rosstat taking into account international recommendations in the field of statistical measurement of innovation. This form updates the information on technological innovations completed in the last 3 years in agriculture.

The work will develop methodological approaches to assessing the diffusion of innovations at the regional level using the example of the livestock industry based on the calculation of production innovation criteria. Empirically, groups of regions will be identified that are described by different levels of investment in fixed assets in agriculture. The study puts forward a hypothesis about the impact of investment on accelerating innovation processes in agriculture.

RESULTS AND DISCUSSIONS

In the current conditions of the development of the agro-industrial complex, of particular interest are the problems of increasing innovative activity in the agricultural sector of the economy, assessing trends and prospects for improving the organizational and economic mechanism for managing innovative agricultural systems in Russian regions.

Current agricultural development trends put pressure and create new challenges for the agricultural sector in accordance with the requirements of the future. These trends are associated with an increase in food demand amid a global demographic upswing, a decrease in agricultural production in the face of adverse climatic and geographical factors. According to the analysis of world trends of continuous population growth, which suffers from hunger and lack of full access to food in recent years, the number of hungry people has reached 821 million. increasing this unfavorable trend by 17 million people. In addition, agriculture as a whole is inferior to other sectors of the economy due to the long turnover of capital and high risks, which necessitates its state support. Russian agriculture is characterized by a wide variety of technological modes, high spatial heterogeneity, asymmetry of economic and social status. The volume of state support for agriculture in Russia is inferior to the level of world leading countries, which will subsequently lead to a technological lag of the Russian agricultural sector from the indicators of developed countries by such criteria as the availability of agricultural machinery, elite seeds, mineral fertilizers and other types of effective innovations. The need for innovation in the agricultural sector of the Russian economy is also associated with increased competition as a result of globalization processes in the global economy, economic sanctions, the need to invest new funds, higher prices for advanced production technologies and equipment, a lack of competencies in managerial and production personnel in the context of structural

transformation of the economy. These challenges are both an incentive and a barrier to the formation of an export-oriented economy on an innovative basis. Actual problems of improving the efficiency of innovative processes based on the development of the scientific potential of the agricultural sector are related to the creation, implementation, distribution and commercialization of innovations, taking into account geographical and environmental factors affecting crop production and animal husbandry, adaptation of foreign digital technologies, increasing integration activity between education and science, agribusiness

and implementation structures, taking into account the needs of the regions in the implementation of targeted innovations.

The innovation and investment component is the most important determinant of the strategic development of the national economy at the macro, meso and micro levels and is considered in the work as an effective way to reduce the time lag during the transition to the next technological structure. Beginning in 1995, Russian agriculture has been characterized by fluctuations in production indicators both in crop production and in animal husbandry (Fig. 1).

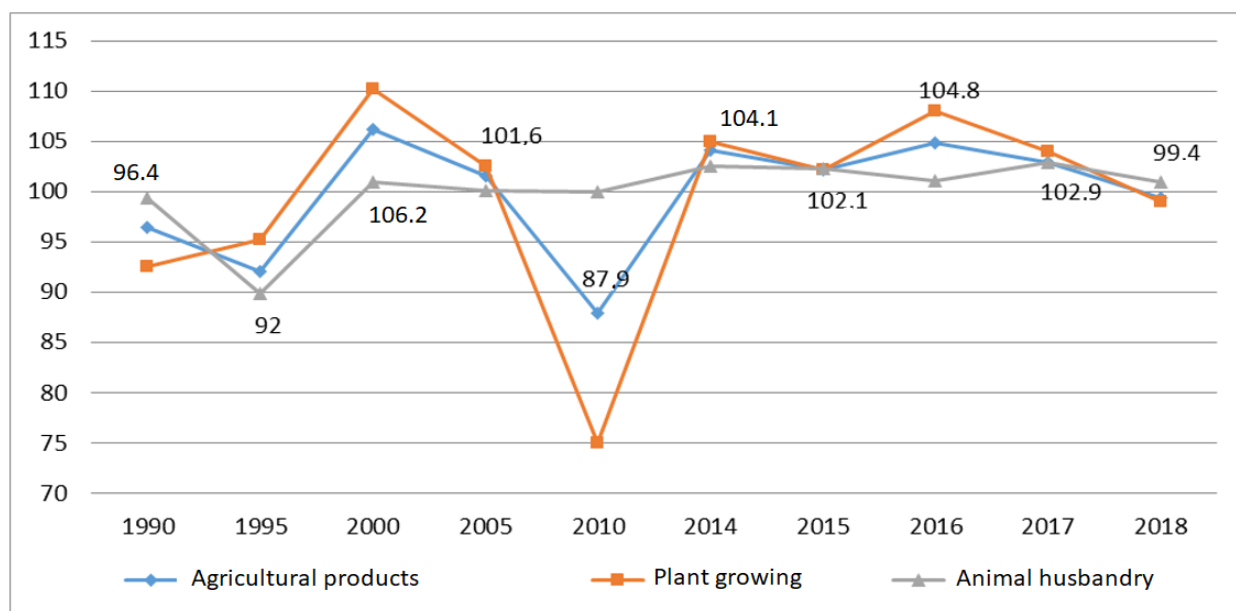


Fig. 1. Indices of agricultural production in the Russian Federation (in comparable prices, % of the previous year)
 Source: Own determination.

In 2018, agriculture in Russia is characterized by an increase in the agricultural production index, an increase in the number of orders for equipment of domestic producers.

With its high scientific potential, agriculture is currently demonstrating growth in a stagnant economy and is the engine of economic growth, creating the necessary jobs and gross value added. However, in Russia there is an insufficiently stable trend of investment inflow into agriculture. In addition, the general deficit of domestic and foreign investment in agriculture is associated with a high degree of risks specific to this sector, as well as insufficient information from potential

investors on the state of the agricultural innovation climate. In Table 1, there are presented some proposed indicators for assessing the effectiveness of the functioning of the innovative potential of agriculture in dynamics.

Figure 1 shows that the innovative potential of agriculture remains low, and significant disparities are observed between the various sectors of the agro-industrial complex, despite the increase in costs of technological innovations.

The development of the innovative potential of agriculture needs the development of

effective mechanisms to stimulate innovative activity in the agricultural sector [5].

As a result of the analysis, we can identify trends in investment and innovation that are characteristic of agriculture. In the field of investment, there has been a slight increase in investment activity of Russian and foreign

investors, improvement of the structure and sources of investment, structural changes in investment policy due to inert state regulation of the agricultural sector of the economy, insufficiently developed regulatory framework for regulating investment processes.

Table 1. Dynamics of indicators for assessing the innovative potential of agricultural systems, RF, 2013–2018

Indicators	2013	2014	2015	2016	2017	2018
Amount of state support funds under the State program for agricultural development and regulation of markets for agricultural products, raw materials and food, million rubles.	260,960	262,122	254,982	295,928	257,529	...
Investments in fixed assets aimed at the development of agriculture, billion rubles.	516	510	505	511	434	...
Expenditures on technological innovations of agricultural enterprises, million rubles.	29,974	25,864	25,023	23,963	23,976	...
The share of costs for technological innovations in the total volume of goods shipped, works performed, and services provided by agricultural enterprises, %	0.57	0.55	0.53	0.54	0.55	...
Created varieties and hybrids of agricultural crops	298	293	287	266	295	238
Breeding forms of animals, birds, fish and insects	4	9	7	4	3	1
Developed new and improved technologies	301	295	273	247	224	210
Developed vaccines, diagnostics, and biopreparations	59	47	36	36	27	15
New names of food products have been developed	364	392	214	192	188	172
Received patents for inventions and selection achievements	755	751	649	710	730	745
Published books and monographs	589	571	566	585	610	630
Published articles, thousand units.	13.9	13.5	13.6	14.5	13.4	15.9
Including in peer-reviewed journals	5.7	5.9	6.0	7.5	7.9	8.5
In foreign publications	0.71	0.82	1.0	0.92	0.87	1.04

Source: Rosstat data.

The innovation sphere is characterized by a slow build-up of implementation activities based on advanced scientific and technological achievements, a concentration of new developments in the production sphere, and a poor supply of innovative personnel.

An important structural problem in the use of investments in agriculture is the imbalance in their distribution and concentration. It is necessary to improve the current investment policy at the level of the constituent entities of the Russian Federation, in particular, to stimulate the influx of investments into priority agricultural sub-sectors.

The agro-industrial complex of the Russian regions is characterized by spatial

heterogeneity and pronounced interregional asymmetry in terms of the level of provision with investments in fixed assets (Table 2).

In 2018, the Central Federal District of Russia accounted for 43.6% of the total investment in fixed assets aimed at the development of agriculture; the share of the Volga Federal District - 17.2% (Figure 2). By regions, the share of investments in fixed assets in agriculture in the total investment is also characterized by fluctuations [30].

The highest level of investment activity can be traced in the republics of Crimea and Sakha (Yakutia), the Kemerovo region, with more than 90% of organizations investing in fixed assets. The lowest values of investment activity are typical for regions such as the

Republic of Ingushetia - 29% of organizations invest in fixed assets; The Republic of Dagestan (37%), the Republic of Altai (48%). Analysis and assessment of the relationship between the level of security of investments in

fixed assets of agriculture and the diffusion of innovations were carried out on the basis of the sub-sectors of livestock and pig farming.

Table 2. Dynamics of investments in fixed assets aimed at the development of agriculture, by federal districts of Russia

	2016		2017		2018	
	million rubles	%	million rubles	%	million rubles	%
RF	363,685.3	100	374,722.4	100	423,194.4	100
Central District	169,094.8	46.4	163,084.0	43.5	184,504.1	43.6
Northwest Federal District	15,633.5	4.3	18,651.1	5.0	24,374.3	5.8
Southern Federal District	42,707.5	11.7	44,601.0	11.9	57,726.0	13.6
North Caucasian Federal District	21,000.3	5.8	21,675.8	5.8	19,416.7	4.6
Volga Federal District	67,495.8	18.5	66,577.8	17.8	72,639.6	17.2
Ural federal district	14,713.6	4.1	17,772.9	4.7	21,045.0	5.0
Siberian Federal District	25,020.6	6.8	29,412.2	7.8	31,563.9	7.5
Far Eastern Federal District	9,019.1	2.4	12,947.6	3.5	11,924.7	2.7

Source: Rosstat data.

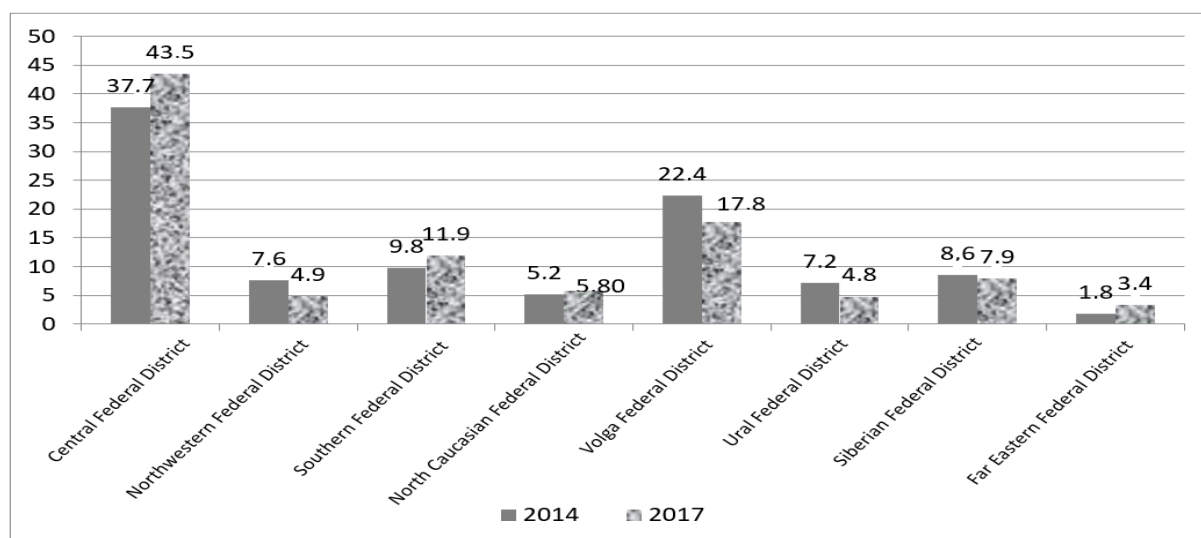


Fig. 2. Distribution of investments in fixed assets aimed at the development of agriculture in the federal districts, in % of the volume of investments in fixed assets for agriculture in the Russian Federation

Source: Own determination.

The rationale for the selection of these sub-sectors is explained by the fact that in recent years, due to the processes of modernization and technical re-equipment taking place in these sub-sectors, the processes of disseminating advanced scientific and technological achievements and innovations have been most actively implemented.

According to official statistics, in 2017, the commissioning of agricultural capacities for cattle amounted to 275.1 thousand cattle places (an increase compared to 2014 by 2.3 times); for pigs - 1,335.2 thousand cattle places (an increase of 1.7 times compared with 2014).

To carry out calculations in the study, an information array was used, including 71 regions of the Russian Federation. The regional typology criterion was determined by the indicator «Investments in fixed assets per 1,000 rubles. gross agricultural output». In order to increase the reliability of calculations and to exclude the incompatibility of information on individual indicators of the presented population, the Magadan Region and the Jewish Autonomous Region were excluded from the sample; Moscow, St. Petersburg, Sevastopol, as well as the Republic of Crimea. This indicator characterizes the capital intensity and allows us to characterize the sufficiency of investment resources for the implementation of innovative processes. The first group included regions with a capital intensity of up to 100 rubles. (42 regions); in the second - with an indicator of 100 to 200 rubles. (21 regions; in the third, with an indicator of over 200 rubles (8 regions). The average value for the groups is: the first group is 53.5 rubles (which is significantly lower than the average

Russian level of 91.1 rubles); the second group is 143.4 rubles; the third group - 402.3 rubles (a significant excess of the average Russian level). According to the results of the calculations, it can be seen that if we take the average Russian indicator as a threshold level (91.1 rubles per 1,000 rubles of gross output), the obtained typological groups of regions can be described as a group with a minimal insufficient level investments, the second group of regions as sufficient and the third group as ultra-high. An example of the leading regions from the third typological group are the Arkhangelsk (740.8 rubles) and Murmansk (4,657 rubles) regions. In addition, a special feature of the third group is investment in agriculture compared with the total investment (6.9%), while the average Russian value of this indicator is at around 3.6%.

To identify the degree of correlation between the level of capital intensity and innovative activity in animal husbandry, private indicators of innovative production of cattle, pigs and milk were used.

Table 3. Indicators of investment, gross output and productivity of certain types of livestock products by groups of regions of Russia

	Groups of regions on the basis of «Investments in fixed assets per 1000 rubles. gross agricultural output», rubles		
	1st group, up to 100 rubles	2nd group, from 100 to 200 rubles	3rd group, over 200 rubles
The number of regions, units	42	21	8
Investments in fixed assets aimed at the development of agriculture, million rubles	181,526.4	227,408.6	62,473.8
Gross agricultural output, million rubles	3,390,197	1,586,369	155,287
Capital intensity of production, rubles	53.4	143.4	402.3
The share of investment in agriculture in the total investment,%	4.1	4.4	6.9
Milk yield in agricultural organizations per cow, kg	4,922	6,126	7,900
The threshold level of milk yield, kg	10,000	10,000	10,000
The innovation rate of milk production, share	0.49	0.61	0.79
The average daily gain of cattle in agricultural organizations	473	618	567
The threshold level of the average daily gain of cattle	800	800	800
The coefficient of innovative production of cattle meat, share	0.59	0.77	0.71
The average daily gain of pigs in agricultural organizations	437	502	533
The threshold level of the average daily gain of cattle	850	850	850
The coefficient of innovation in the production of pig meat, share	0.51	0.59	0.63

Source: Own determination.

These indicators were obtained by standardization as the ratio of animal productivity to its threshold level, which can be achieved with the efficient use of production resources in conjunction with

innovations being introduced into sub-sectors. The innovation coefficient is calculated as the ratio of actual productivity indicators to the threshold level (Table 3, Fig.3).

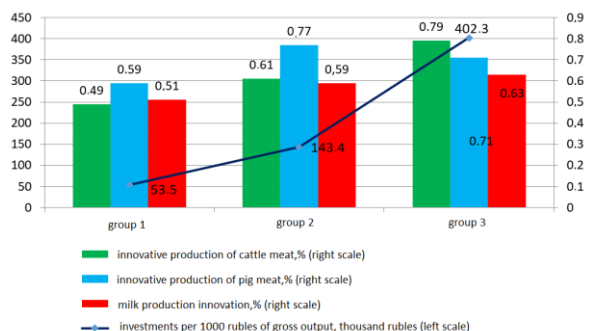


Fig. 3. The impact of agricultural capital intensity on the innovation of livestock production by groups of regions of the Russian Federation in 2018.

Source: Own determination.

Thus, the results of the study confirmed the hypothesis about the impact of investments on the innovative development of agriculture on the example of livestock industries.

The developed author's methodology for assessing the level of innovation of the livestock industry in the regions of Russia will allow us to formulate approaches to improving the structural investment policy.

In conditions of insufficient budgetary funds, the issue of determining the optimal level of investment necessary to intensify the processes of creation, implementation, distribution and commercialization of innovations and the effectiveness of the state innovation and investment policy, which will

be disclosed in further research by the authors, is relevant.

One of the most important areas for the development of innovation and investment processes and increasing the activity of medium-sized milk producers in regions with low agroclimatic potential is the possibility of buying machinery and equipment with a high level of innovativeness of production processes. The strengthening of the innovative vector of regional investment support predetermines the need to stimulate the acquisition by agricultural producers of such innovative resources as machinery and equipment with a high innovative component. It should also be noted such a direction of increasing innovation and investment activity as improving the systems of guarantee and collateral. So, in the Novosibirsk region, a guarantee fund provides guarantees of up to 70% of a loan under agricultural loan agreements to agricultural producers in the form of consumer cooperatives, small and medium enterprises, and peasant (farmer) farms.

The study proposes a scheme for the development of organizational and economic conditions for increasing innovative activity in agriculture (Fig. 4).

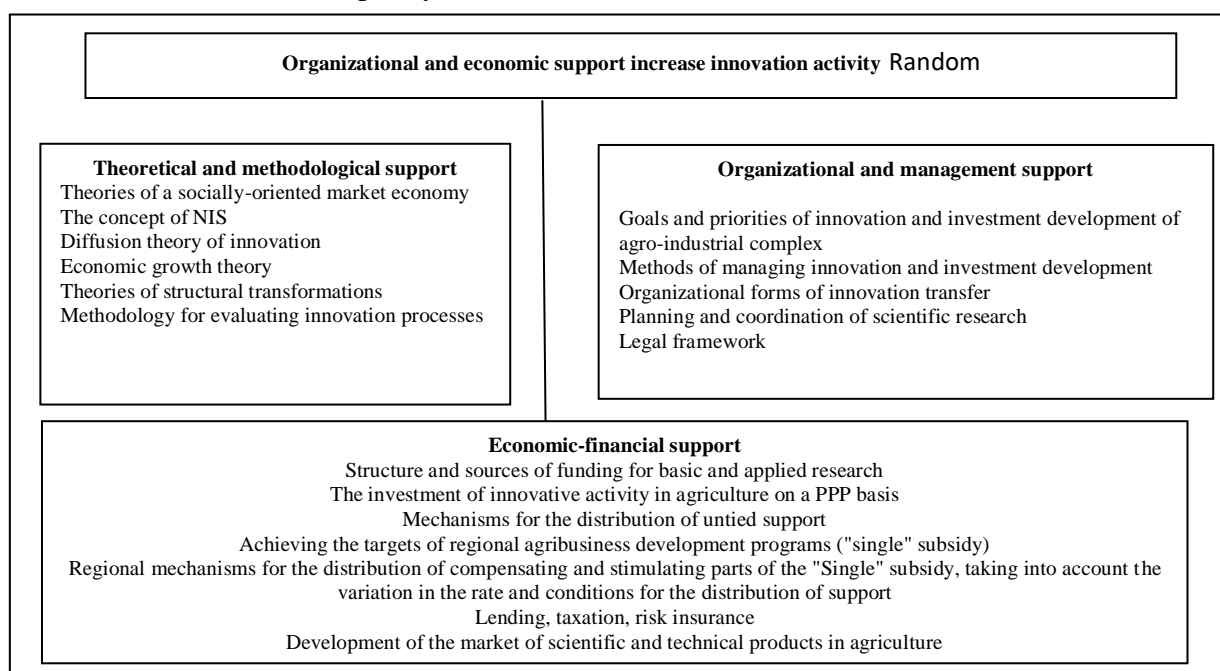


Fig. 4. The development scheme of organizational and economic support for increasing innovative susceptibility in agriculture in the context of the formation of an export-oriented agricultural sector of the economy

Source: Own determination.

The formation of a model of export-oriented agrarian economy by increasing the efficiency of agricultural production can be achieved with a comprehensive approach to solving legislative, regulatory, organizational and economic issues of the development of innovative processes. In fig. Figure 1 shows the development of organizational and economic support for increasing innovation activity in the context of the formation of an export-oriented agricultural sector of the economy, in which the theoretical, methodological, organizational and managerial, economic and financial blocks are highlighted.

The development of theoretical and methodological provisions of the organizational and economic mechanism is implemented through the adaptation and improvement of a number of theories as applied to ongoing innovative processes, as well as the construction of a methodology for evaluating innovative systems with the identification of principles, approaches, determinants, constraining and accelerating factors, the development of an algorithm and model for evaluating the effectiveness of individual innovations, industries, regions and justification of the optimal level of investment injections for the activation of innovative processes in accordance with industry requirements and conditions for the plurality of regional diffusion of innovation.

Improving the organizational and economic support of innovative processes consists in developing management methods for various forms of integration of scientific, educational, industrial, innovative structures, development of planning and coordination of fundamental and applied research, harmonization of federal and regional state policies in stimulating innovative activity.

Improving economic and financial support consists in researching the most optimal set of sources, forms and methods of targeted financing of agricultural enterprises, including by adjusting approaches to providing unrelated support and developing regional mechanisms for the distribution of compensating and stimulating parts of the

“Single” subsidy, taking into account varying rates and conditions distribution support.

CONCLUSIONS

It is proved that the growth of agricultural production and the creation of an export-oriented agrarian economy are inextricably linked with the intensification of investment activity. The development of theoretical and methodological provisions for investing in innovation is described by the concept of National Innovation Systems NIS and the diffusion of innovations. It is proved that increasing the efficiency of using the innovative potential of agricultural systems is associated with an increase in the degree of communicative interaction between the institutions of the innovation system: educational, scientific, industrial and innovative units. In the context of the formation of an export-oriented agricultural sector of the economy and the transition to high-tech agricultural production, it is advisable to build an institute of an innovation system in the agro-industrial complex, generating scientific and technological achievements and ensuring their creation, implementation, distribution and commercialization in the production process as innovative technological centers, business - incubators, technology parks.

It was substantiated by calculation that the actors forming institutional ties are more intensively transforming into innovation and vice versa - regions where the formation of innovative agricultural systems is constrained by administrative, bureaucratic, and infrastructure barriers, characterized by a slowdown in the rate of innovative development.

The paper assesses the impact of investment resources on the activation of innovative processes on the example of animal husbandry and develops recommendations to increase the innovation and investment activity of regional agricultural systems in the context of the formation of an export-oriented economy. The regions were differentiated by the level of provision with investments in

fixed assets in agriculture, interregional differences were revealed, and the hypothesis of the existence of a connection between investments and the ongoing diffusion of innovations was proved.

The formation of a model of export-oriented agrarian economy by increasing the efficiency of agricultural production can be achieved with a comprehensive approach to solving legislative, regulatory, organizational and economic issues of the development of innovative processes.

The improvement of innovation and investment policy is proposed on the basis of the introduction of the organizational and economic mechanism, in which the theoretical and methodological, organizational and managerial, economic and financial support are highlighted.

Thus, improving the innovation and investment activity of regional systems based on the proposed estimated and forecasting methodological tools and improving the organizational and economic mechanism to stimulate innovation activity will increase the efficiency of agricultural production in order to create an export-oriented agricultural sector of the economy.

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