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SUBSTANTIATION OF FACTORS OF STRATEGIC DEVELOPMENT OF SCIENTIFIC AND INTELLECTUAL POTENTIAL OF AGRICULTURAL FOOD COMPLEX

Elena DERUNOVA, Sergey ANDRYUSHCHENKO

Institute of Agrarian Problems of the Russian Academy of Sciences, 94, Moskovskaya St., 410012, Saratov, Russia, Phone: +78452263179, Fax:+78452264768, Mobile:+79873093797, Emails: ea.derunova@yandex.ru, andrapk@yandex.ru

Corresponding author: ea.derunova@yandex.ru

Abstract

The strategic development of the scientific and intellectual potential of the agri-food complex is a driver for increasing the efficiency of agricultural production. The purpose of the article is to study the constraining and accelerating factors of strengthening the scientific and intellectual potential of the agri-food complex and to develop a methodology for assessing the level of its development. The study clarified the theoretical and methodological aspects of the development of the scientific and intellectual potential of the agri-food complex. The restraining and accelerating factors of the development of the scientific and intellectual potential of the agri-food complex are systematized. According to the results of the analysis, disparities in the efficiency of the functioning of scientific and intellectual potential and its structure were revealed. The assessment of the values of these indicators makes it possible to substantiate proposals aimed at increasing the number of people employed in the scientific field and at attracting additional public and private funding for research and development to the national average level. This will increase the economic, social, technological, and budgetary efficiency of managing the scientific and intellectual potential of the agri-food complex. In the agri-food sector, first of all, an increase in budget financing will be required, taking into account the achieved level of development based on the results of the assessment. As a result of substantiating the conditions and factors for the development of scientific and intellectual potential and the author's methodology for its assessment, strategic directions will be developed to increase the efficiency of the production potential of the country's agri-food complex, taking into account the possible effect of the implementation of national projects.

Key words**:** *scientific and intellectual potential, agri-food complex, factors of strategic development, assessment methodology, government regulation*

INTRODUCTION

In connection with the existing global problem of ensuring the food security of states, the availability of food in most developed countries, research is being carried out on the development of innovative activities in the agro-industrial complex and the growth of agricultural production [6]. Scientific and technological development of the agrarian economy of developed countries is guided by the intensive introduction of advanced scientific achievements into production processes. The economies of developed countries are increasingly relying on knowledge, innovation and new technologies, which are now considered to be the driving force of economic growth. Scientific and intellectual potential is closely related to the production potential of the agricultural economy. The level of the current development of the scientific and intellectual potential of the agri-food complex and the degree of its contribution to the economic growth of national economies depend on the combination of factors of strategic development that the state creates for its development and use.

The conceptual basis for the study of scientific and intellectual capital is the synthesis of the theory of the knowledge economy and innovative development. According to B. Milner, the knowledge economy is being transformed and become a part of the innovation system at the moment when ideas, knowledge and technologies reach the stage of commercialization and turn into a market product [17]. In this case, value

chains are formed from an idea to a final product, which is produced taking into account the needs of the population. An indicator of the dynamics of the rate of innovative development is an indirect spillover effect, expressed in an increase in demand for end products produced on an innovative basis. Government procurement and industry regulation are effective mechanisms to stimulate demand [2].

The evolution of management thought about the role of human and scientific and intellectual capital is reflected in the works of A. Smith, A. Marshall, T. Schultz, G. Becker. In recent years, the related concept of the "knowledge triangle", reflected in the documents of the Bologna Process, has been relevant, the mechanism of which is shown in the works of M. Unger and V. Polt. [33].

These authors demonstrated that the "knowledge triangle" unites other concepts that partially complement each other, such as the "third mission", where the need to modernize higher education as an initial element of human capital reproduction comes to the fore, "triple helix" (triple helix), where institutions such as the University, Business, Power strive for cooperation and, if necessary, partially take over each other's functions, which ultimately forms the innovative component of their interaction, an "entrepreneurial" university, which presupposes the entrepreneurial behavior of a higher educational institution, which in symbiosis with business should lead to the economic development of the region, as well as the "smart specialization" of the regions, developed by the expert group "Knowledge for Growth" of the Directorate for Technology and Innovation of the European Commission, interaction Actions taking into account the existing unique competencies of each region within a single innovation cluster.

L. Mindeli and L. Pipia proposed to highlight such areas of the knowledge economy as resources, knowledge asset creation, productivity, networking, and learning [18].

An integrated approach to measuring the knowledge economy, according to E. Vaisman, involves assessing the relationship between the level of innovative development and the formation of competitive advantages against the background of the development of the knowledge economy in certain regions [35].

The formation of knowledge clusters, the core of which is scientific and educational institutions, is one of the effective tools for the development of the knowledge economy. G.V. Petruk, Yu.V. Baldina, and Lebedinskaya Yu.S. prove that the most successful form of interaction in the knowledge cluster is a public-private partnership [21].

The innovative development of agriculture in foreign countries is most directly related to the farming sector, although research is not the basis of the EU strategy. The Common Agricultural Policy of the European Union includes measures to facilitate the transfer of information, innovation, technology, and knowledge from research and development to farmers. The study of the contribution of labor resources to improving the efficiency of agricultural production is reflected in the works of leading foreign researchers [22-26].

Foreign researchers note the need for wider use of targeted support measures: "knowledge transfer", "cooperation" and "investment in intangible assets" [14]. Increased farmers' access to knowledge can be achieved through the use of appropriate agricultural development programs aimed at integrating research centers [10]. Advisory services (PRO-AKIS) play an essential role in supporting farmers. CAP activities focus on climate change mitigation and adaptation; solving numerous environmental problems; economic development and training. The current concept of agricultural knowledge AKIS is based on the development of information and communication technologies (ICT) [15].

Rajalahti, R ., Willem, J ., Eija, P. highlighted the main purpose of the AKIS system - the transfer of knowledge to rural residents. The main links of the AKIS system are national agricultural research organizations; agricultural universities or agricultural colleges; advisory services, farmers; persons engaged in agricultural activities; non-governmental organizations (NGOs) and

entrepreneurs in rural areas [28]. Leeuwis, C. define an innovation system as "a network of organizations, businesses and individuals that manufactures new products; develops and implements new processes and new forms of organization in the economy ". Thus, within the framework of the Agrarian Innovation System (AIS), the knowledge creation process is complemented by activities for its implementation. AIS aims to create competitive agriculture and maintain the achieved positions in a changing economic and social environment. The main feature of AIS in comparison to AKIS, which unites classical systems of knowledge and innovation (universities and research institutions), lies in a wider range of participants, including both public and private organizations [16].

Thus, the agro-innovation system creates conditions for organizing the innovation process in relation to agro-ecological innovations.

In addition to AKIS and AIS, the National Agricultural Research System (NARS) is distinguished, the purpose of which is the creation and transfer of technologies. The World Bank defines NARS as a system that includes institutional units engaged in organizing, coordinating, or carrying out research aimed at developing agriculture and preserving its natural resource potential [36].

Foreign researchers note the imperfection of the conceptual apparatus for AKIS, AIS, PRO-AKIS and other research systems, including state ones [27]. It should be noted the specifics of the functioning of the AKIS system in different countries [13, 29]. Authors such as Dockès et al. [7] emphasize that a lack of understanding of the role and functions of various innovation systems hinders the effective organization of the innovation process of subsystems, and also hinders effective research and teaching. In particular, AKS/AKIS is often perceived as being overly regulated and not in the interests of consumers of knowledge and innovation. In addition, intense competition for financial resources between AKS/AKIS participants (researchers and institutions) hinders collaboration between researchers and innovators. Thus, all existing innovation systems can be perceived as competing. The development of innovative systems has led to the emergence of the new PRO-AKIS system associated with the development of a register of agricultural advisory services in the EU. Its purpose is to integrate AKIS and consulting services.

The political concept of innovation is itself controversial [31].

The most common two approaches to considering innovation: innovation and macroeconomic approach. According to the latter, innovation is viewed as a research and development process for commercial use. The first approach is considered more complex and focuses on interactions between the various actors in the [11].

Discussing innovation, Edler and Fagerberg [8] argue that innovation is an effective lever for solving important social and economic problems. In addition to generating new ideas, they should be promoted. Organization for Economic Co-operation and Development (OECD) [19, 20] notes that innovation can take different forms: the introduction of a new or significant improvement in a product, service, process, marketing or marketing method and an organizational method, both in the form of commercialization and in the form of the internal organization of the company and/or its relations with the outside world [12] assessed the measurement and definition of innovation in various sectors of the economy, using a systems approach to develop a framework for the statistical measurement of innovation. According to the Green Paper, European Commission. Green Paper on Innovation, Bulletin of the European Union [9], innovation flows within the system and business innovation can be grouped according to the following strategic areas (competencies): long-term analysis; the ability to identify and anticipate market trends; the ability to collect information and process technological and economic data; organizational capacity: risk awareness; internal and external cooperation; involving the entire company in the process of change and investing in human resources.

To solve the problems, the acceleration of the scientific and technological development of the agri-food complex becomes relevant to study the factors of strategic development of scientific and intellectual potential, to improve the methods of its assessment and directions of state regulation.

MATERIALS AND METHODS

The study aims to identify the constraining and accelerating factors in the development of the scientific and intellectual potential of the agri-food complex and to develop a methodology for assessing the level of development of scientific and intellectual potential in the regional agri-food complex.

The author's methodological approach to the study of the factors of development of the scientific and intellectual potential of the agri-food complex is based on the analysis in the field of organizational, financial, legal, and information aspects of scientific and technological development; foreign and Russian approaches to financing innovative activities of the agri-food complex in Russia and abroad. The methodological basis of the study was the regulatory documents, studies of foreign and Russian scientists on the issue under study, monographic, analytical, and economic-statistical research methods.

Information materials are Rosstat data for 2013–2018. according to form No. 2K "Information on the number and level of professional education of workers of organizations of the agro-industrial complex."

International experience in assessing innovative development based on advanced scientific and technological achievements combines a pool of indicators and generally accepted indicators: the knowledge economy index and the knowledge economy index; global innovation index (Global Innovation Index); the Global Competitiveness Index; human development index, etc. These indices were proposed by the UN, UNESCO, the World Bank, the European Commission, etc.

These indicators are calculated for the economy as a whole. Directly to calculate the level of development of scientific and intellectual potential in the agri-food complex, it is necessary to take into account both industry and regional specifics, due to various factors.

In the course of this study, the main indicators were identified and substantiated, which makes it possible to assess these factors. Based on the author's indicators, a method is proposed for assessing the level of scientific and intellectual potential of the regional agri-food complex based on constructing and calculating integral indicators and directions for improving state policy on its regulation.

RESULTS AND DISCUSSIONS

Regions of Russia have significant differentiation in terms of the level of development of the scientific and intellectual potential of the agri-food complex. This is due to the state of natural, humanitarian material capital, the specifics of the policy pursued in the regions. For this reason, the conditions and factors for the formation and development of scientific and intellectual potential also differ significantly [30, 1, 5].

The work presents the factors of the development of the scientific and intellectual potential of the agri-food complex: political and legal, organizational and institutional, innovation and technological, structural, economic and financial, socio-psychological, informational and methodological, environmental. As a result, it was found that under the influence of the above factors, relations between the subjects of the innovation process are transformed [34].

Early studies summarized methodological approaches to assessing the effectiveness of the innovation process in the agri-food complex at the stages of production, promotion, and commercialization of knowledge [3, 4]. In continuation of the research, we will analyze and assess the structure and efficiency of science costs in the context of economic sectors. Government statistics distinguish four sectors in which research and development are carried out: government, business, higher education, and non-profit organizations. The gradation of expenditures on science by sector clearly

illustrates the specifics of the Russian structure of production (Table 1).

Table 1. Structure of internal current expenditures on research and development by types and sectors of economic activity of the agro-industrial complex in 2017 and 2019,%

	Internal operating costs - total		Including by type of economic activity			
			Agriculture		Food production	
	2017	2019	2017**	2019	2017	2019
Total, Russian Federation	100.0	100.0	100.0	100.0	100.0	…
Government sector	29.8	27.9	74.1	78.8	15.2	…
Business sector	60.4	60.6	3.5	3.6	35.6	…
Higher education sector	9.4	11.1	22.4	18.3	49.2	…
Nonprofit sector	0.4	0.4	0.1	1.3	0.0	…

Source: Own calculation.

According to Table 1, less than 30% of work is performed in the public sector, and in 2 years the share of this sector has decreased by 2%; and 60% of the costs are in the business sector. There is an inverse proportion in the structure of agricultural research. The public sector accounts for more than 70% of costs, while the entrepreneurial sector accounts for only 3.6%, which is almost 20 times lower than in the economy as a whole. This provision of low funding for agricultural science from the business sector indicates a lack of interaction between scientific organizations and agricultural production and actualizes the problem of the need to create effective forms and methods for integrating science and production. On a positive note, there has been a significant increase in the contribution of non-profit organizations to research and development for agricultural production.

Also, a favorable trend is an increase in research spending in the higher education sector in 2019 compared to 2017 by 1.7%. This may indicate the growth of state support for the development of talented personnel, the growth of key competencies in the sectors of the economy, the creation of regional centers of competencies.

Table 2 shows the structure of internal current expenditure on research and development by sector in the context of basic and applied science, as well as development.

Table 2. Structure of internal current expenditures on research and development in the Russian Federation, including by sectors of agricultural science in the Russian Federation in 2017 and 2019, %

	Total, Russian Federation	Including agricultural sciences	of which by sector			
			government sector	business sector	higher education sector	nonprofit sector
Internal recurrent research and development costs	100.0	100.0	100.0	100.0	100.0	100.0
including:						
Fundamental research 2017	14.8	58.1	67.1	4.4	10.6	17.1
2019	17.1	60.7	67.8	42.6	37.9	14.9
Applied research 2017	18.1	31.1	24.0	40.0	77.5	62.4
2019	20.1	29.8	24.1	5.5	55.8	63.4
Development 2017	66.9	10.7	9.0	55.7	11.9	20.5
2019	62.8	9.5	8.1	51.9	6.3	21.6

Source: Own calculation.

As a result of the analysis of this table, it can be seen that the dynamics of spending on fundamental, applied research and development differs significantly across

sectors. For example, in the higher education sector, basic research accounted for only 10% of spending in 2017, while applied research accounted for over 70%. In the public sector, applied research accounted for 24% of spending in 2017, and fundamental research for 67%. The business sector is characterized by a high share of development costs, in 2017 almost 56%, but in 2019 the share of this sector decreased to 52%, reflecting the general trend of a reduction in the share of development costs. Agriculture is characterized by a fairly stable dynamics of the structure of costs by sector and by type of research, which creates favorable conditions for the development of scientific and intellectual potential.

Figure 1 shows the relative number of researchers by field of science in general and in the public sector.

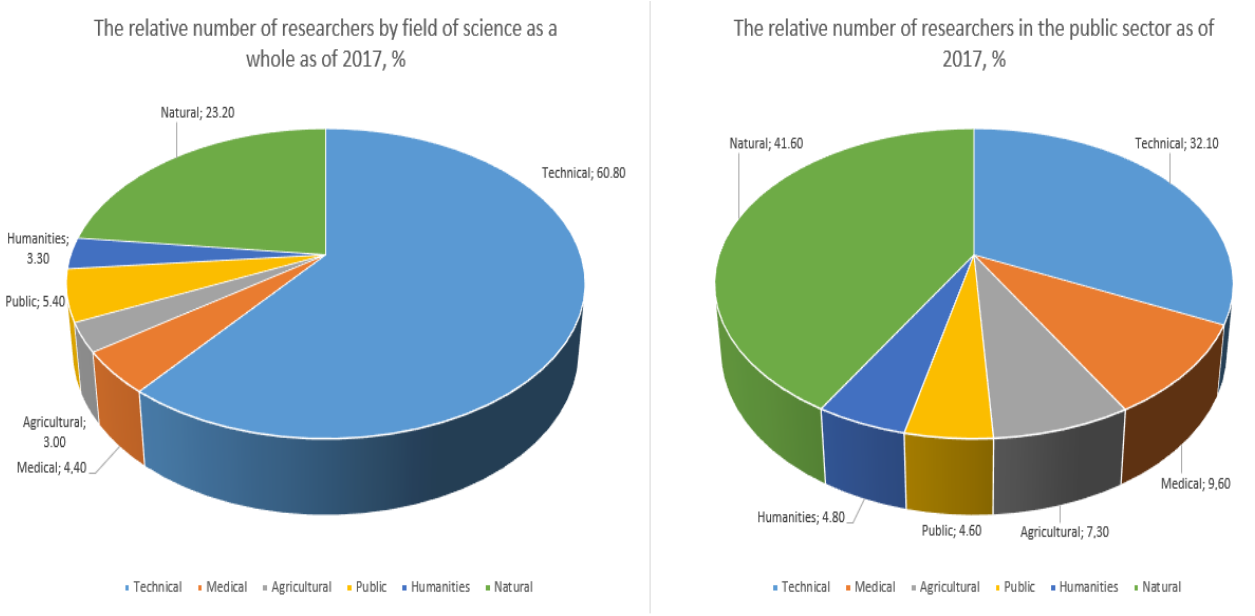

Fig. 1. Relative number of researchers by field of science in general (left) and in the public sector (right) as of 2017
Source: Own calculation.

An analysis of the results suggests that agricultural research is more intensive in the public sector.

V. Spitsyn suggested taking into account the effectiveness of interaction of its institutional elements when assessing the effectiveness of innovation processes [32]. His analysis showed serious disparities in the structure of research funding, the lag of Russian industry behind developed countries in funding science, and, as a result, low efficiency of interaction between research and educational centers and industry.

As a measure to expand the interaction between science and industry, it is proposed to stimulate the demand of industrial organizations for research work. The directions of improving statistics of scientific activity and innovations in the industry are also proposed. The statistical indicator of the cost of innovation should be detailed, it characterizes the industry demand for the development of Russian science. It is shown that in assessing current research, it is necessary to maximize the use of indicators of the volume of costs for innovations in the industry: the acquisition of machinery and equipment, as well as the costs of research and development.

In continuation of research to improve the efficiency of management of scientific and intellectual potential, a search was made for additional relevant indicators for assessing the scientific and intellectual potential of the agri-food complex, taking into account such aspects as resource provision, territorial and sectoral structure, organization of the use of the intellectual potential of the agri-food complex.

Due to serious limitations in Russian statistics of innovation and imperfection of methods for assessing the effectiveness of innovation processes in the agri-food complex, there are only limited statistical data in the context of regions and industries. Based on the existing private indicators, it is proposed to build an integral indicator for assessing the level of development of scientific and intellectual potential. Its construction is proposed to be presented as a set of specific weights of the following indicators: the proportion of organizations that carried out marketing innovations in the total number of organizations surveyed, the proportion of organizations that carried out organizational innovations in the total number of surveyed organizations, the proportion of organizations that carried out technological innovations in the total number of the surveyed organizations, internal expenditures on research and development as a percentage of GRP, internal expenditures on research and development per researcher, the share of people engaged in research and development in the average annual number of people employed in the regional economy. Table 3 shows the indicators for assessing the level of development of scientific and intellectual potential in the agri-food complex in 2018.

Table 3. Integral indicator for assessing the level of development of the scientific and intellectual potential of Russia and the Saratov region and its components in 2019

	Russian Federation	Saratov region	Saratov region in % to Russian Federation
Scientific and intellectual potential			
Share of organizations that carried out marketing innovations in the total number of surveyed organizations,%	0.53	0.42	79.25
Share of organizations implementing organizational innovations in the total number of surveyed organizations,%	0.94	0.68	72.34
Share of organizations implementing technological innovations in the total number of surveyed organizations,%	0.98	0.87	88.78
Internal costs for research and development as a percentage of GRP,%	0.08	0.10	125.0
Share of people employed in research and development in the average annual number of people employed in the regional economy,%	0.27	0.22	81.48
Scientific and intellectual potential index	0.56	0.46	

Source: Own calculation.

In the context of the selected private indicators of the development of the scientific and intellectual potential of the Saratov region, the following conclusions can be drawn. Relatively high values are typical for such indicators as “The proportion of organizations that carried out organizational innovations in the total number of surveyed organizations”, “The proportion of organizations that carried out technological innovations in the total number of surveyed organizations”, “The proportion of organizations that carried out marketing innovations in the total number of surveyed organizations”.

Low and below-average values of indicators are typical for such indicators as "The share of people employed in research and development in the average annual number of people employed in the regional economy", as well as "Internal expenditures on research and development as a percentage of GRP."

The assessment of the values of these indicators makes it possible to substantiate proposals aimed at increasing the number of people employed in the Saratov region in the scientific field and at attracting additional public and private funding for research and development to the average level in Russia.

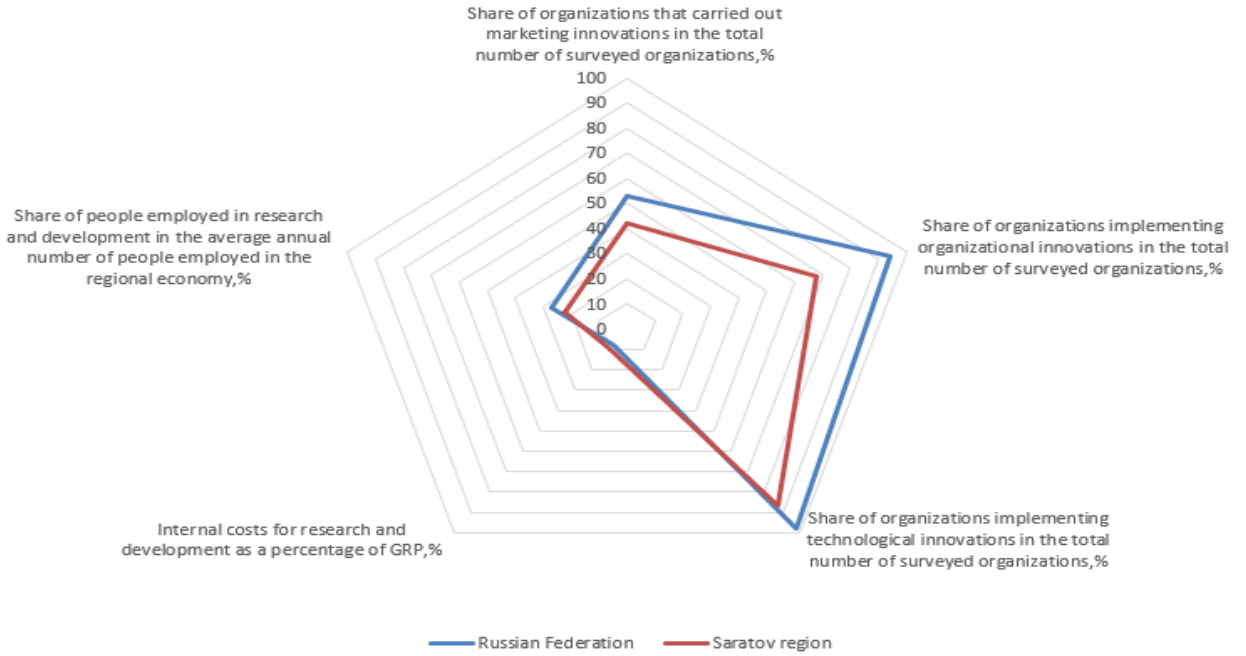

Fig. 2. The ratio of the integral indicator of the level of development of scientific and intellectual potential of Russia and the Saratov region in 2019
Source: Own calculation.

This will make it possible to make fuller use of the capabilities of existing scientific organizations. In the agri-food sector, first of all, an increase in budget financing within the framework of national projects will be required.

The weakness of the state agri-food policy in terms of the development of scientific and intellectual potential is evidenced by the pronounced differentiation of the constituent entities of the Russian Federation by the level of its development. The reasons for such interregional differentiation may be such factors as a low level of resource provision, insufficient funding for research and development, the imperfection of state policy in the allocation of budget funds for innovative activities, which does not take into account the level of development of the scientific and intellectual potential of the agri-food complex.

There are two strategies for innovative development. One of them is the acquisition of copyright for well-known technologies and types of products. This borrowing strategy is characterized by the high costs of acquiring innovative products and depends on the appearance of new products and technologies on the market.

The second strategy for the development of scientific and intellectual potential is an innovative breakthrough, focusing on one's own scientific and intellectual potential. The implementation of this strategy requires overcoming various financial and organizational and managerial barriers.

The strategic development of the scientific and intellectual potential of the agri-food complex causes the transformation of all components of the innovative agrosystem with further transformations of the external environment interacting with it. As a result, the strategy, goals, and priority directions for the development of innovative processes in the agri-food complex are changing.

CONCLUSIONS

The model for the development of the scientific and intellectual potential of the agri-food complex as a modern paradigm for the scientific and technological development of the agri-food system is based on the synthesis of the concepts of innovative development and the knowledge economy. The study clarified the theoretical and methodological provisions for the development of the scientific and intellectual potential of the agri-food complex. The restraining and

accelerating factors of the development of the scientific and intellectual potential of the agri-food complex, political and legal, organizational and institutional, innovative and technological, structural, economic and financial, socio-psychological, informational and methodological, environmental, are systematized. In the course of the study, the main indicators were identified and substantiated, which makes it possible to assess these factors.

Based on the private author's indicators, a methodology for assessing the level of scientific and intellectual potential of the regional agri-food complex and directions for improving state policy on its regulation is proposed. It is proposed to construct an integral indicator for assessing the level of development of scientific and intellectual potential as a set of specific weights of the following indicators: the proportion of organizations that carried out marketing innovations in the total number of organizations surveyed, the proportion of organizations that carried out organizational innovations in the total number of surveyed organizations, the proportion of organizations, carried out technological innovations, in the total number of surveyed organizations, internal expenditures on research and development as a percentage of GRP, internal expenditures on research and development per researcher, the share of people engaged in research and development in the average annual number of people employed in the regional economy.

The practical implementation of the proposed approach consists in the possibility of using the author's system of indicators to assess the level of development of scientific and intellectual development potential. Improving the quality level and objectivity of the assessment will identify opportunities and threats in increasing the economic, social, technological, and budgetary efficiency of managing the knowledge economy in agriculture and the agri-food complex of Russian regions. An approach to the distribution of budgetary funds is proposed, taking into account the achieved level of development of the scientific and intellectual potential of the agri-food complex. The assessment of the values of these indicators makes it possible to substantiate proposals aimed at increasing the number of people employed in the Saratov region in the scientific field and at attracting additional public and private funding for research and development to the average level in Russia. This will make it possible to make fuller use of the capabilities of existing scientific organizations. In the agri-food sector, first of all, an increase in budget financing within the framework of national projects will be required.

As a result of substantiating the conditions and factors for the development of scientific and intellectual potential, strategic directions will be developed to increase the efficiency of the production potential of the country's agri-food complex, taking into account the possible effect of the implementation of national projects.

REFERENCES

[1]Andryushchenko, S.A., Vasilchenko, M.Ya., Derunova, E.A., Rubtsova, V.N., Sharikova, I.N., 2018, Modeling of Structural and Institutional Factors of Development in Regions Unfavorable for Agriculture. The Journal of Social Sciences Research, Vol. 3: 40-43.

[2]Derunova, E., 2020, Long-term trends of scientific-intellectual potential of agriculture food complex, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 20 (2), 199-209.

[3]Derunova, E., Kireeva, N., Pruschak, O., 2019, Inclusive development of the agri-food system as a driver for sustainable growth in the region’s economy, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 19(1),147-160.

[4]Derunova, E., Kireeva, N., Pruschak, O., 2020, The level and quality of inclusive growth agri-food system in modern conditions. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.20(3),193-206.

[5]Derunova, E.A., Firsova, A.A., Vavilina, A.V., Semenov, A.S, 2014, The study of the dynamics of innovative development of economy on the endogenous growth through multi-sector extension of the solow model. Biosciences Biotechnology Research Asia, Vol 11(3) : 1581–1589.

[6]Derunova, E.A., Ustinova, N.V., Derunov, V.A., Semenov, A.S., 2016, Modeling of diversification of market as a basis for sustainable economic growth.

Economic and Social Changes: Facts, Trends, Forecast, No. 6, pp. 91-109.
[7]Dockès, A.C., Tisenkopfs, T., Bock, B., 2011, Collaborative Working Group Agricultural Knowledge and Innovation Systems; WP1: Reflection Paper on AKIS. Sub-Deliverable of the AKIS CWG—WP1; European Commission: Brussels, Belgium, April 2011.
[8]Edler, J., Fagerberg, J.,2017, Innovation policy: What, why, and how. Oxf. Rev. Econ. Policy, 33, 2–23.
[9]European Commission.,1996, Green Paper on Innovation, Bulletin of the European Union; European Commission: Luxembourg, Supplement 5/95.
[10]European Commission. Guidelines on Programming for Innovation and the Implementation of the EPI for Agricultural and Sustainability, 2014, EIP-AGRI Document; European Commission Directorate-General for Agriculture and Rural Development: Brussels, Belgium, 2014.
[11]EU-SCAR, 2013, Agricultural Knowledge and Innovation Systems Towards 2020—An Orientation Paper on Linking Innovation and Research; European Commission: Brussels, Belgium.
[12]Gault, F., 2018, Defining and measuring innovation in all sectors of the economy. Res. Policy, 47, 617–622.
[13]Knierim, A., Prager, K., Hutton, J., 2015, Agricultural Knowledge and Information Systems in Europe: Weak or Strong, Fragmented or Integrated? PRO AKIS, European Commission 7th Framework Programme Project; PROAKIS: Paris, France, 2015, http://proakis.webarchive.hutton.ac.uk/sites/www.proakis.eu/files/AKIS_characterisation_briefing_final.pdf, Accessed on 14 March 2018.
[14]Labarthe, P., Laurent, C., Andriew, T., Mora, A., Caggiano, M., 2014, Prospects for Farmers' Support: Advisory Services in European AKIS WP 2—Advisory Services within AKIS: International Debates". Deliverable 2.2 Systematic Reviews of Academic Literature for Evaluating the Effectiveness of Farm Advisory Services Preliminary Findings Based on a Case Study about Farm Advice and Occupational Health; PROAKIS: National Research for Agricultural Research (INRA), Research department "Sciences for Action and Development (SAD): Paris, France, 4 December 2014.
[15]Labarthe, P., Caggiano, M., Laurent, C., Faure, G., Cerf, M., 2013, Prospects for Farmers' Support: Advisory Services in European AKIS (PRO-AKIS): WP2—Advisory Services within AKIS: International Debates. Deliverable WP.2-1 Concepts and Theories Available to Describe the Functioning and Dynamics of Agricultural Advisory Services; PROAKIS: Paris, France.
[16]Leeuwis, C., 2012, Development and Support Role of Extension Services for Sustainable Intensification in Agriculture: Moving from Extension to Innovation Intermediation. In Proceedings of the Teagasc Best Practice in Extension Services 'Supporting Farmer Innovation, Dublin, Ireland, 1 November 2012.
[17]Milner, B. Z., Orlova, T. M., 2013, Organization of the creation of innovations: horizontal communication and management. M, 286 p.
[18]Mindeli, L.E., 2007, Conceptual Aspects of Knowledge Economy Formation. Problems of Forecasting, 3, 18-36.
[19]OECD, 2013, Agricultural Innovation Systems: A Framework for Analysing the Role of the Government; OECD Publishing, Paris, France.
[20]OECD, 1994, The Measurement of Scientific and Technical Activities: Standard Practice for Surveys of Research and Experimental Development—Frascati Manual 1993. The Measurement of Scientific and Technological Activities; OECD Publishing, Paris, France, 1994.
[21]Petruk, G.V., Baldina, Yu.V., Lebedinskaya, Yu.S., 2016, Public-private entrepreneurship as a tool for organizational and economic interaction in the knowledge cluster, ANI: Economics and Management, 4 (17), 307-309.
[22]Popescu Agatha, 2019, Trends in labour productivity in Romania's agriculture, Proceedings of 34th International-Business-Information-Management Association (IBIMA) Conference, Vision 2025: Education Excellence and Management of Innovations Through Sustainable Economic Competitive Advantage, pp. 9999-10016.
[23]Popescu, A., 2013, Considerations on the Rural Population as a Resource of Labor Force in Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 13(3), 229-236.
[24]Popescu, A., 2015, Research on labour productivity in Romania's agriculture, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 15, Issue 2: 271-280.
[25]Popescu, A., Condei, R., 2015, Research on Romania's employment in agriculture and its position in the European Union, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 15(2), 281-289.
[26]Popescu, A., Dinu, T. A., Stoian Elena, 2018, Demographic and economic changes characterizing the rural population in Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 18(2), 333-346.
[27]Prager, K., Creaney, R., Lorenzo-Arribas, A., 2017, Criteria for a system level evaluation of farm advisory services. Land Use Policy, 61, 86–98.
[28]Rajalahti, R., Willem, J., Eija, P., 2008, Agricultural Innovation Systems: From Diagnostics Toward Operational Practices; Agriculture and Rural Development Discussion Paper 38; Agriculture & Rural Development Department; World Bank: Washington, DC, USA.
[29]Rivera, W., Qamar, M., Mwandemere, H., 2005, Enchancing Coordination among AKIS/RD actors, An Analytical and Comparative Review of Country Studies on Agricultural Knowledge and Information Systems for Rural Development AKIS/RD, 2005. Research, Extension and Training Division Sustainable Development Department, FAO: Rome, Italy.
[30]Shabanov, V. L., Vasilchenko, M. Y., Derunova, E., A., Potapov, A. P., 2021. Formation of an Export-

Oriented Agricultural Economy and Regional Open Innovations. J. Open Innov. Technol. Mark. Complex. 7, No. 1: 32. https://doi.org/10.3390/joitmc7010032, Accessed on January 25, 2021.
[31]Smits, R.E., Kuhlmann, S., Shapira, P., 2010, The Theory and Practice of Innovation Policy—An International Research Handbook; Edgar Elgar: Chaltenham, UK, 496 p.
[32]Spitsyn, V.V., 2015, Product innovations efficiency in section DL manufacturing at foreign countries, Russia and Russian regions, Modern problems of science and education, 2(2), 23.
[33]Unger, M., Polt, V., 2017, Knowledge triangle» between the spheres of science, education and innovation: a conceptual discussion, Forsight, 11(2),10-26.
[34]Vasilchenko, M., Derunova, E., 2020, Factors of investment attractiveness of Russian agriculture in the context of innovative structural adjustment. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.20(2),511-522.
[35]Vaysman, E. D., 2009, Competitiveness and the knowledge economy: monograph, Abris-Print, 156 p.
[36]World Bank, 2012, Agricultural Innovation Systems: An Investment Sourcebook. Agricultural and Rural Development. World Bank, World Bank Publications: Washington, DC, Leg apparatus, USA, 2012, 680p.