

CONCEPTUAL ASPECTS OF THE GROWTH OF AGRICULTURE PRODUCTION BASED ON THE IMPROVEMENT OF SCIENTIFIC SUPPORT

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Abstract

The problems of ensuring food security and independence of the country in the current geopolitical situation and sanctions policy are of particular relevance. The purpose of this study is to develop conceptual aspects of the growth of production in the agro-industrial complex based on the improvement of scientific support. Theoretical and methodological approaches to improving the efficiency of institutional interaction between science, government, and business in the agro-industrial complex have been studied. An analysis was made of the share of domestic expenditures on research and development in the field of agricultural sciences in various countries. The main factors hindering innovation activity are systematized. An assessment of the volume and structure of financing of research work in the agro-industrial complex of Russia is given. The main directions of the concept of innovative development of agricultural products are formulated. The practical significance of the research results lies in the development of conceptual provisions for stimulating innovative production for the formation of an ecosystem of scientific support and commercialization of innovations in the agro-industrial complex.

Key words: innovations, institutional development, production, agro-industrial complex, efficiency, research costs, scientific support, trends, mechanisms

INTRODUCTION

Increasing the efficiency of agricultural production in the current geopolitical situation and sanctions policy is a driver for ensuring food security and state independence. The solution of these issues is inextricably linked with the development of the institutional structure of innovation activity, which provides the processes of generation, transfer, acceleration of innovations and science-intensive products into production processes to improve the quality of economic growth and solve the social problems of the rural population.

In accordance with the Strategy of Scientific and Technological Development of the Russian Federation [4], the problems of insufficient coordination of research institutions with sectors of the economy

hinder the scientific and technological development of Russia. The insufficient degree of congruence of development institutions - science, the state, agribusiness and society, as well as the imbalance in the distribution of resources, knowledge, information, competencies and technologies at all stages of the innovation process hinders the formation of a well-functioning system of scientific support and commercialization of innovations in the agro-industrial complex.

Issues of interaction between science, government and business are widely reflected in foreign and domestic literature.

For the effective organization of the management of innovative production in agriculture, it is important to develop directions for its balanced development at the federal and regional levels based on the concept of national and regional

agroinnovative systems [7, 12]. In particular, D. Spielman defines an innovation system as a set of stakeholders in the innovation process, the interaction of which largely depends on the quality of socio-economic institutions that determine the formation of a fundamentally new model of relations between various participants, organizational cultures and behavior patterns. Using the example of agriculture in countries and territories of Africa located south of the Sahara, the author studied the problems of interaction between participants in production, the exchange and use of knowledge and information; susceptibility of stakeholders to technological, institutional and organizational transformations; the influence of political factors on the strengthening of these interactions and the growth of the welfare of the population [22].

The functioning of innovative systems is based on the principles of self-organization, so the possibility of full control over them is significantly limited; in the research environment, approaches to adaptive innovation management are becoming more common [8]. Relations between the participants of the agro-innovation system are transformed in accordance with the needs of industries and regions, they reach a certain balance in the course of their functioning [10]. As a result of this process, a number of participants can be excluded from the system of interactions [2, 23, 26]. The principles of functioning of agro-innovative systems include both traditional actions (support for research, formation of links between science, government, business, innovation formations), as well as measures aimed at creating an innovative infrastructure, eliminating the gap between existing and demanded digital competencies, and improving the regulatory framework. A significant contribution to the development of theoretical and methodological approaches to the formation of an agricultural knowledge and innovation system (AKIS) was made by N. Röling [17].

In foreign economic literature, one of the most popular concepts that integrate science, education and innovation into a single whole in order to develop and justify a national

innovation policy is the “knowledge triangle” [24] (knowledge triangle).

The model of “open innovations” is also aimed at the development of cooperative ties between enterprises, universities and state scientific organizations [3],

The concept of the innovation spiral is widely used to study the development trends of the innovation process at all its stages. Thus, Ana Simonovska, Emelj Tuna, Dragan Gjoshevski applied this theoretical approach to identify the features of interaction between stakeholders in the process of introducing innovations in agriculture in North Macedonia [21] Using the results of focus group discussions, an assessment of the innovative potential of agriculture is presented and such key factors are identified technological development as policy, legislation, knowledge, innovation infrastructure, Education system in North Macedonia does not yet play a significant role in technology transfer; underfunding of the innovation process is to some extent due to the lack of foreign direct investment in the agricultural sector.

An important role is given to government grants, international programs to support innovation processes, in particular, the EU IPARD program on innovation and knowledge transfer. The authors also note the need to develop programs to support innovation in small-scale agriculture

The study of the processes of interaction between representatives of the system of agricultural research, development and knowledge-intensive activities, as well as advisory services and farmers, made it possible to assess the extent of the diffusion of innovations and the process of knowledge transfer in the agricultural sector. The conclusion is made about the need for close interaction of all participants in the innovation process. At the enterprise level, interactions with farmers' associations are important to support their networking activities; with experts and consultants to develop business plans; funding partners. For the effective implementation of the innovation spiral, the authors consider it necessary to increase the efficiency of interaction between stakeholders

at the stages of development and implementation.

In the work of the team of authors, I.S. Sandu, V.I. Nechaeva and N.E. Ryzhenkova analyzes the mechanisms for introducing innovations in the leading economies of the world; the authors note a number of important specific features of agriculture, such as the duration of the innovation cycle, the perception of innovations and the readiness to implement them; the role of the state both in supporting commercialization and mass introduction of agricultural innovations [16].

Also, based on the analysis of the conceptual aspects of the innovative development of the agro-industrial complex, the following approaches to innovative development have been identified: a cluster approach based on integration; creation of production and research and production systems based on cooperation; creation of sectoral innovation systems [19].

According to S.N. Polbitsyn, the innovative agricultural system is a network structure of interactions that arise in the process of food supply for the population. The agro-innovation system is presented as an evolutionary combination of the food supply system, the agro-industrial complex and the innovation system. The presented interpretations of the integrated forms of interaction between science, business, government and society do not take into account the specifics and scale at the regional and sectoral levels [13].

Summarizing domestic and foreign developments in the field of the formation and functioning of innovation systems, as well as the successful implementation of intellectual potential, we can state that it is necessary to create favorable conditions for voluntary cooperation of all stakeholders that form national innovation systems, such as the state, universities, scientific institutions, venture capital enterprises, enterprises of the real sector of the economy, etc. with obligatory

consideration of the national specifics of the functioning of the economy.

The aim of the study is to develop conceptual aspects of production growth in the agro-industrial complex based on improving institutional interaction, as well as to study trends in the development of innovative processes based on improving scientific support.

MATERIALS AND METHODS

The methodological basis of the study was state legislative acts, government decrees and decisions, scientific works of domestic and foreign scientists - economists and agricultural specialists on the problem under study.

In the course of the study, monographic, abstract-logical, analytical, economic-statistical, expert research methods were used. Legal and regulatory acts, information from Rosstat, National Research University Higher School of Economics, the Ministry of Agriculture of the Russian Federation, the Deloitte Research Center, as well as regulatory documents and materials from scientific literature and periodicals were used as the information base for the study.

RESULTS AND DISCUSSIONS

The agro-industrial complex is a leading industry in Russia; in 2021, the volume of exports of agricultural products amounted to \$37.7 billion, which in physical terms is more than 70 million tons [9].

Figure 1 shows the structure of exports by types of agro-industrial products in 2021.

According to Figure 1, it can be concluded that there is a high share of exports of grain, oil and fat products, fish and seafood.

Along with a fairly high level of exports, it is necessary to note the insufficient use of natural resource potential on the basis of efficiency-yield and productivity indicators [25].

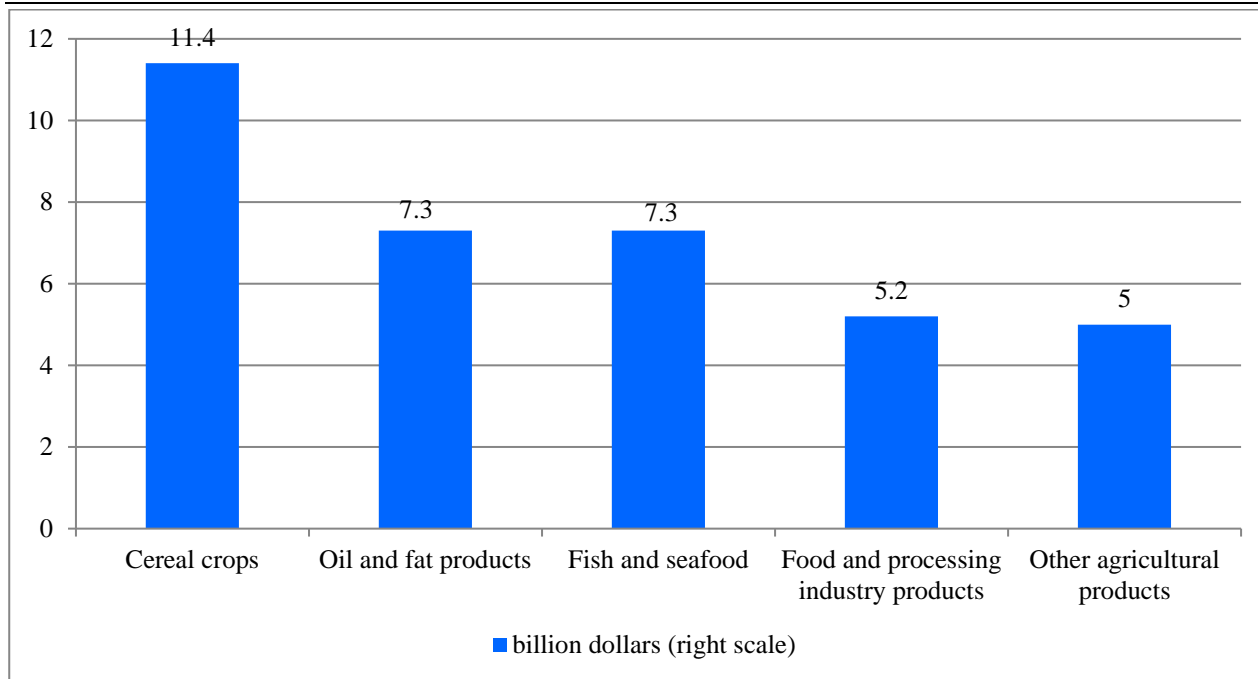


Fig. 1. Structure of exports by sectors of the agro-industrial complex in 2021
 Source: Own calculations based on the data [18].

In Fig.2. shows the proportion of domestic R&D spending in the field of agricultural sciences in various countries in 2021. According to the Higher School of Economics, India occupies the largest share -

16.7%, Argentina - 11.4%, South Africa - 9.1%, the Netherlands - 8.7%, China - 7.9%. This indicator in Russia in 2021 is 4.4%, which is almost 3 times higher than in 2016, when it was 1.5%.

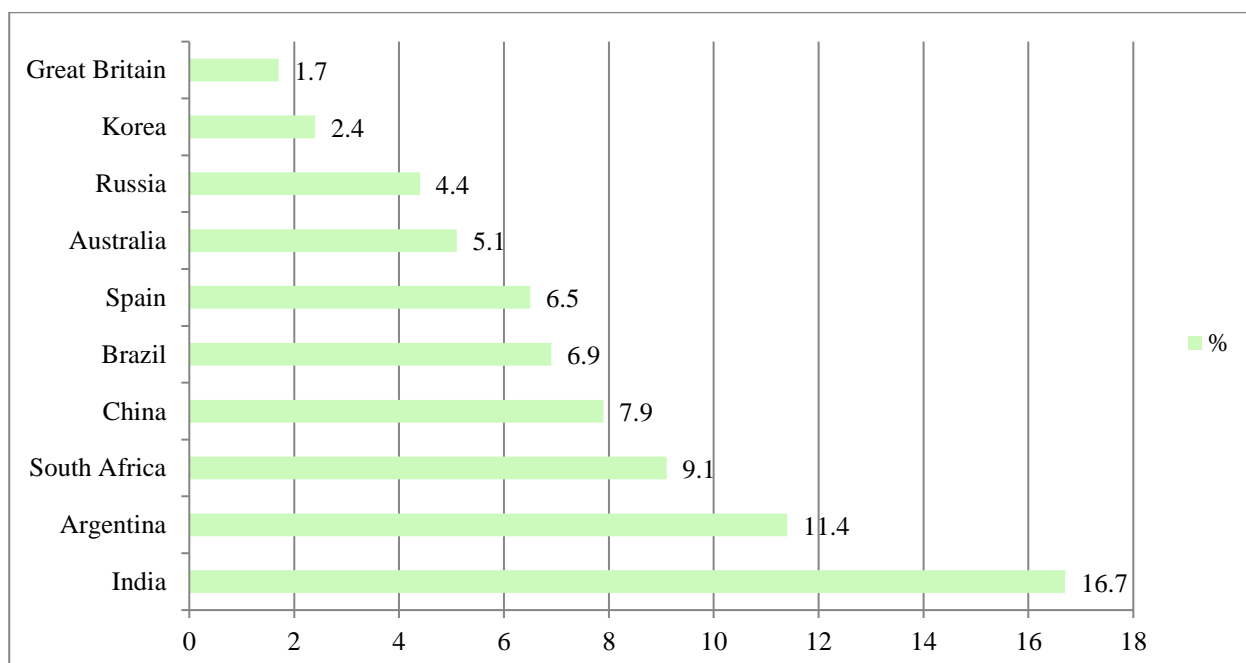


Fig. 2. Share of domestic spending on research and development in the field of agricultural sciences in the countries of the world in 2021, %
 Source: Own calculations based on the data [20].

The paper analyzes and evaluates the main factors hindering innovation activity in Russia and some European countries.

Significant cross-country differences in the ranking of these factors by business representatives should be noted. Thus, in Russia, the most significant factor is the lack of own funds, which was noted by 10.6%,

respectively. In Denmark, 32.4% of organizations identified a lack of credit or direct investment as the most important factor destabilizing innovation activity (Figure 3).

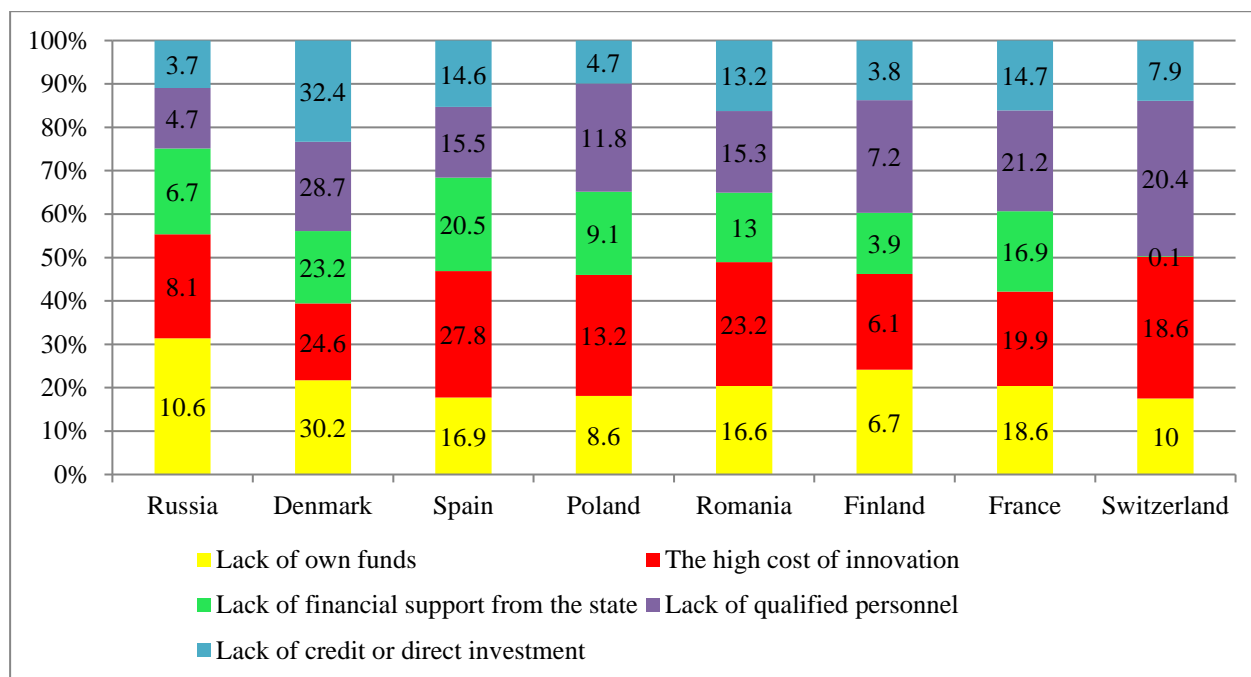


Fig. 3. The main factors hindering innovation activity by country (based on a sample statistical survey of organizations in 2018-2020), in % of the total number of organizations
 Source: Own calculations based on the data [29].

It is noteworthy that the high cost of innovation is more emphasized by entrepreneurs in Spain (27.8%) and Romania (23.2%). In addition, businesses in Switzerland and Denmark have significant problems with qualified personnel, which was noted by 20.4% and 28.7% of organizations, respectively. Quantitative assessments of factors in Russia are to a certain extent comparable to those in Finland. In 2021, Finland is recognized as the second most innovative country in Europe, behind only Sweden. Finland's strengths lie in the use of information technology and intellectual assets, and key indicators include lifelong learning, patent applications and international scientific publications [6, 14,15]. In Russia, various mechanisms are used to stimulate and support the acceleration of innovative development of the agro-industrial complex. One of the effective measures is the support of start-ups [5]. An indicator of the

priority of innovation activity in the economy is the volume of capital investment, and therefore it is important to monitor their dynamics. The volume of capital investments in agriculture, forestry, and fisheries in recent years from 2015-2021 increased by 130.1%, which to some extent compensated for the lack of foreign investment in the agricultural sector [27, 28]. An analysis of the volume of investment and financing of innovative activities in the agrarian sector of Russia showed that during the period under review there was an increase of about 200 billion rubles, which amounted to no more than 8%. The dominant role in the sources is the state budget. The reduction in funding was typical only in 2016 and 2021, in other periods there is a significant increase. The financing of research work in the agro-industrial complex of Russia is shown in Figure 4.

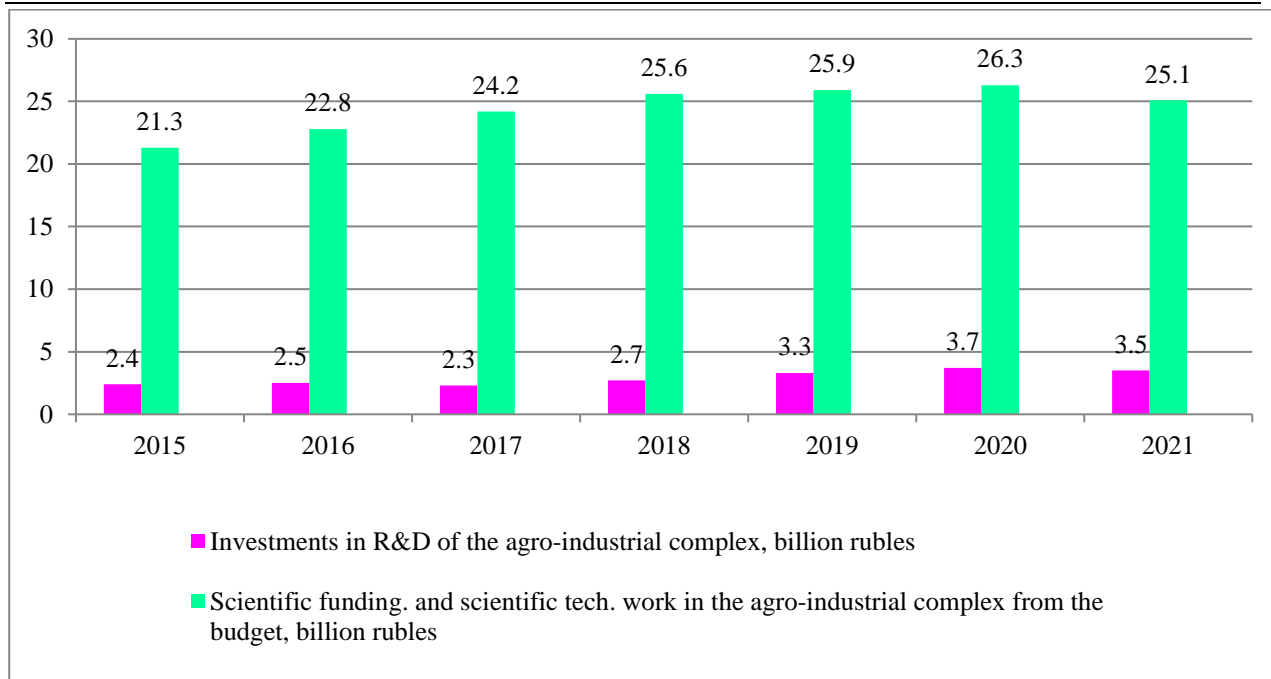


Fig. 4. Financing of research work in the agro-industrial complex of Russia, billion rubles
 Source: Own calculations based on the data [1].

In the author's early works, the concept of innovative development of the agro-industrial complex until 2035 was proposed, aimed at increasing the production of agricultural products, improving their quality to the level of international standards and competitiveness in the foreign market [11]. The main directions of innovative development until 2035 are formulated for the economy and land relations, for the field of biotechnology, for innovative processes in crop production, animal husbandry, mechanization and electrification, for the storage and processing of agricultural products.

The implementation of the main provisions of the concept is aimed at stimulating innovation activity, developing rural areas, increasing technological, social, economic and environmental efficiency and affects the following aspects:

- transition to a knowledge economy in the agro-food complex based on digital transformation, increasing the key competencies of specialists and adapting them to modern conditions;
- building a system of scientific support and commercialization of innovations in the real sector of the economy;
- ensuring the optimization of the level of land use on the basis of an adaptive landscape basis

- increasing the sustainability of agricultural production based on the principles of public-private partnership.

CONCLUSIONS

The paper explores theoretical and methodological approaches to improving the efficiency of institutional interaction between science, government, business in the agro-industrial complex. It is substantiated that as a result of this interaction, the processes of generation, transfer, acceleration of innovations and high-tech products into production processes are more effectively implemented. It was revealed that the functioning of network structures does not always take into account the specifics of agricultural production, taking into account regional and sectoral aspects. An analysis was made of the share of domestic expenditures on research and development in the field of agricultural sciences in various countries. Disproportions in financing in the main areas are revealed. The main factors hindering innovation activity in the EU countries are systematized. An assessment of the volume and structure of financing of research work in the agro-industrial complex of Russia is given. Conceptual provisions for regulating

the development of institutional interaction between science, the state, agribusiness and society have been developed in order to accelerate the introduction of innovations and scientific achievements into production. The practical significance of the research results lies in the development of conceptual provisions for stimulating innovative production based on the synergy of interaction between the state, universities, academic institutions, agribusiness, taking into account the needs for innovation in the context of industries and regions.

ACKNOWLEDGEMENTS

The reported study was funded by the Russian Science Foundation, project №23-28-01785 «Modeling the growth of food production, taking into account the improvement of scientific support for economic entities of the agro-industrial complex».

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