

Peculiarities and development trends of the Russian agro-industrial complex under digitalization conditions

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Abstract— The article considers issues of the development and improving competitiveness of the agro-industrial complex of Russia, associated with changes in digital economy and the introduction of information-digital systems. Based on the methodological principle of the increasing role of the impact of changes in the digital economy on ensuring the competitiveness of the agro-industrial complex, an analysis of the scientific and technological potential of the Russian agro-industrial complex has been made. Also the approaches have been formulated to solve the identified problems, with a glance to peculiarities of the Russian context. The evaluation of digitalization processes impact on the reduction of cost and final prices for agricultural products, increasing profits and competitiveness of individual companies was made..

Keywords— *agro-industrial complex, competitiveness, digital economy, scientific and technological capacity, innovation development.*

I. INTRODUCTION

Contemporary challenges and threats in global food market, sanctions, an increase in the world's population, growing food demand, digitalization of the economy pose the challenge for the country's leadership to increase the competitiveness of the agro-industrial complex of Russia.

The instructions implementation of Government of the Russian Federation on increasing the competitiveness of the Russian agro-industrial complex is directly dependent on the innovative technologies..

Within the development of the digital economy paradigm in agriculture, socio-economic features should be taken into account and provide handling of labor release, their employment and other social issues. McKinsey Global Institute experts predicted that by 2036, up to 50% of workflows would be automated in the world economic system.

Balancing of employment in agriculture and the introduction of information and communication systems remains on the agenda of the state, business, scientific community and citizens.

In conjunction with the presence of significant amount of research in the field of ensuring the sustainable development of the system of the agro-industrial complex of Russia, it must be acknowledged that the absence of conceptual economic and legal solutions to the problem of managing the competitiveness of the Russian agro-industrial complex from

the standpoint of assessing the impact of the development and integration of information-digital systems.

II. METHODS

The study used the methods of economics and statistics analysis and regression analysis, a systematic approach, as well as other methods of scientific research, compilation and processing of information, due to specific tasks. The study is based on the methodological principle of the increasing role of changes influence in the digital economy on the competitiveness of the agro-industrial complex.

The study of the competitiveness of the agro-industrial complex of Russia should take into account the peculiarities of agricultural production, which consist in regulating natural-economic laws in comparison with other economic sectors. Thus, it is necessary to consider competitiveness using a synergistic approach that allows describing both the stages of stable development and unsustainable development zone. Consequently, government control with the financial support of agricultural sector plays a leading role.

III. RESEARCH RESULTS

The issues of competitiveness and efficiency of the agro-industrial complex, development at the federal and regional levels are the subject of ongoing research. Particular attention should be paid to research that allows to reveal the foundations of competitive relations in a strategic plan, and also contain methods and algorithms for obtaining competitive advantages with the methods of implementation in practice and justification of their effectiveness.

In the works of Russian scientists, various aspects of improving competitiveness of the agro-industrial complex of Russia and at different levels of its formation were considered [2, 3, 4].

The present stage of world economy development defines new conceptual solutions to the problem of ensuring the competitiveness of industries and economic entities based on the use of domestic, intangible assets [1, 5, 9].

The introduction of information-digital technologies in all national economy sectors is rapidly changing the concept of their qualitative state. In comparison with “new economics” branches , the Russian agro-industrial complex, which is the basis of national security in the food aspect, is not developing intensively enough [6].

In connection with the current volatile environment in the global food market and the sanctions regime against Russia, the state's attention to the agro-industrial complex has increased, both in the industry as a whole and in the introduction of information technologies, in particular.

One of the most fundamental risks in the food security field is technological risks mediated by the low level of technological development of the production base of Russia in comparison with developed countries.

This situation has also developed at the layer of development and implementation of information and communication systems and technologies.

According to experts, Russia is in the world rankings: in terms of the use of digital technologies in the context of economic effect, it is represented in 32nd place; on readiness for digitalization on the 41st place.

Globalization processes in the digital sector put competitiveness issues for all industries at the top of the list. These tasks cannot be solved without mastering new technologies.

According to global trends rating of digitalization presented by the group of companies "Rostelecom" agriculture ranks last in terms of a set of indicators by mention in the media: investments, scientific publications, patents. The first three leading industries are: industry and energy, telecommunications, healthcare. This fact is explained by government support and high management efficiency in these industries, as well as active position of interest in the introduction of innovations.

Global digitalization trends of industry players allow us to identify, evaluate and predict the scope of application of the most promising information technologies in the strategic planning of business entities.

The Federal Scientific and Technical Program for the Development of Agriculture until 2025 was developed in order to ensure continued growth of agricultural production and threat leveling. It is expected to reduce the level of import dependence and increase the share of high-tech agricultural producers in the industry by 30%.

The implementation of a set of measures will ensure the transition to highly productive and environmentally friendly agriculture, the introduction of systems of rational use of protection in crop production and animal industry, storage and efficient processing of agricultural products, the creation of safe and high-quality food.

It should be emphasized that the additional risks of the implementation of the Federal Scientific and Technical Program for the Development of Agriculture until 2026 due to the dependence on the means of financing in the amount of 36.7 billion rubles. at the expense of the State programs "Development of science and technology for 2013-2020" 3.3 billion rubles. until 2026 (FANO of Russia), "Development of agriculture and regulation of agricultural products, raw materials and foodstuffs for 2013-2020" 4.7 billion rubles.

(FANO (Federal Agency for Scientific Organisations Russia) and 9.5 billion rubles. (Ministry of Agriculture of Russia), "Development of education for 2013-2020" 7.4 billion rubles. until 2026 (Ministry of Education and Science of Russia), "Development of industry and increasing its competitiveness" 11.75 billion rubles. until 2026 (Ministry of Industry and Trade of Russia).

The main trends of the domestic agro-industrial complex are: robotic production, creation of autonomous vehicles, selection and genetics, informatization. Also, artificial intelligence and virtualization technology as well as production of customized goods should be attributed to "disruptive" technologies.

An important role belongs to the scientific community in solving the existing problems of ensuring the effective functioning of the agro-industrial complex, which should be provided with appropriate conditions for the formation and implementation of competitive research and development findings in the national economic system.

Building up the scientific and technological potential of the agro-industrial complex of Russia will make it possible to systematically reduce the dependence on imports of technology and resources.

Historically, the economics agrarian sector has low attractiveness for investors due to high risks associated with long production cycle, natural and technological risks, the inability to automate biological processes and the lack of progress in productivity, innovation and the widespread use of information and communication technologies.

By means of increasing efficiency of state regulation and improving the mechanism of interaction with the business community, as well as an increase in funding for the development of the agro-industrial complex of Russia, an innovative environment has been formed, which allows to adjust the mechanism for creating market relations.

Progressive farms appeared in Russian regions, changing the face of the village.

Over a period of 2010-2016 investment volume in fixed capital on agriculture in which intellectual property is included (costs for research, development and technological works; on software building and purchasing; making and purchasing the inventions, utility models and industrial designs; on exploration work) there has been a slight increase, and for the production of food products, including drinks and tobacco, a decrease of 17%.

By the number of registered patents, the Russian Federation ranks 18th.

Structural changes are observed in the investments structure on intellectual property objects over the period from 2013 to 2016: reduction in funding for intelligence work of the subsoil and an assessment of mineral reserves by 8% (in 2016 30.5%), research studies (development) - on 7% (in 2016, 16.3%); an increase of 17% - software, databases (in 2016, 45.8%).

The investments structure by intellectual property object is shown in Figure 1.

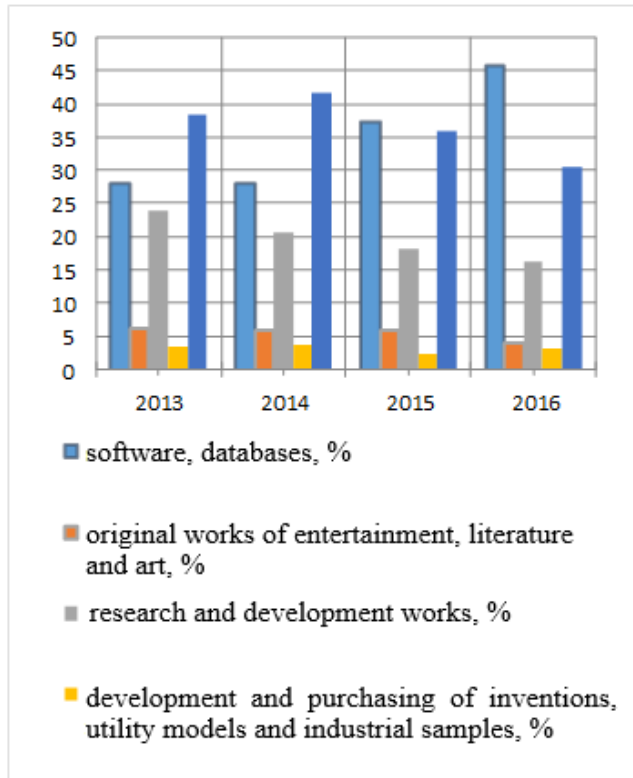


Fig. 1. Investing in intellectual property objects

The use of digital information systems in the agro-industrial complex of Russia was previously limited to the use of computers and software mainly for financial management, statistical reporting and tracking of commercial transactions.

In 2016, in investments structure into fixed capital on agriculture, attracted sources of financing account are 42%, 3.9% of which is budget. A large proportion of which - 2.3% at the expense of the federal budget. The share of funding for research and development from the sources involved 46.4%, 32.1% of which is budget; a large share of which is 31.1% due to the federal.

In 2016, the share of foreign property in the investments structure into fixed capital on agriculture was 2.8%, and 3.4% in the financing of research and development.

Factors analysis limiting the investment activities of organisations for the period from 2010 to 2016 showed structural changes. The highest indicators reached their values for 2016 due to lack of own funds - 61%, uncertainty of the economic situation in the country - 61%, a high percentage of commercial loans - 56% and investment risks - 50%. The growth over the study period is observed due to such factors as the unsatisfactory state of the technical base - 17% (4 times), an imperfect regulatory framework governing investment processes by 17% (3.7 times), the uncertainty of the economic situation in the country by 29% (1.9 times), a complex mechanism for obtaining loans for investment projects by 31% (3.2 times), investment risks by 27% (2 times), a high percentage of commercial loans - 25% (1.8 times), low profitability of investments in fixed assets by 9% (1.8 times), lack of ny product demand by 8%

The costs of technological innovations of organisations in food production for the period from 2010 to 2016 increased of which product innovations fourfold, process innovations twofold.

The dynamics of volumes growth of shipped innovative goods, works and services of food production organisations in the manufacturing industry is negative, which indicates the lag of agriculture from other industries.

The digital technologies use in agriculture for monitoring crops, livestock and various elements of the agricultural process occurs point-and-point at the level of individual farms.

The leader in the informatisation of dairy herds, in particular, is the Leningrad Region. In this region the informatisation covered 64.4% of the farms, this is almost all breeding (97%) and about half (40.5%) of commodity farms. The number of farms using computerised accounting increases from year to year [7].

An example of the organisation of effective informatisation is non-public joint-stock company "Slavyanskoye", of Verkhovsky district of the Oryol region. More than ten years ago, this farm began to engage in dairy breeding and now it is a competitive milk producer.

All systems at the dairy complex of non-public joint-stock company "Slavyanskoe" are computerised and automatically-controlled. Monitoring is carried out. Informatisation of dairy herd allows you to track not only its technological parameters, but also contributes to the adoption of economic decisions, as well as the implementation of financial indicators forecast (profit, profitability, costs, etc.).

At the initial stage of dairy breeding at non-public joint-stock company "Slavyanskoe", they milked 1 ton of milk per day. Now it is over 15 tons. Over ten years, productivity has increased tenfold.

According to scientists, due to the quality and operational implementation of information systems, production costs are reduced by 6-10%, and distribution costs by 7-20%. The effectiveness of information systems use at the company level reduces inventories by 3-4 times, working capital - by 7-10% [8].

Nationwide, it is necessary to take into account the varying level of onerous costs of processes digitalization for the business community: small, medium and large businesses.

"Internet of Things" (IoT) technology can serve as an indicator of scientific and technological progress. It consists of a combination of basic research in data analysis (Data Science) and applied research - the introduction of artificial intelligence (machine learning), and other innovative achievements, including the development of sensor networks and unmanned technology [10]. Significant role is given to digital modeling and cross-channel communications, influencing the economics digitalisation.

The use of scientific developments and innovations allows data collection, control and management of objects, including using control systems and network solutions.

In the agricultural sector, the market share as of January 2017 amounted to 6% of all projects implemented in the world in the field of the Internet of Things.

J'son and Partners Consulting company consultants believe that with market development the use of technologies of the Internet of Things will be widely used in various devices, technical and information systems [11].

In the Russian agro-industrial complex isolated projects are known that can be attributed to the Internet of Things and as long as they are experimental. Fulfillment of the objectives of the roadmap for the technologies introduction of the Internet of Things in the agro-industrial complex of Russia will make it possible to increase the economic efficiency of the activities of agricultural enterprises; expand the capacity of traditional domestic markets and product sales; create new niches for agricultural products; to bring domestic agricultural products to international markets; to ensure environmental management.

According to the "Roadmap" events, by 2019, the share of Russian enterprises using the Internet of Things in the agro-industrial complex will reach 30% against current 0.05%.

Due to the complex digitalization of the Russian agricultural sector and the introduction of IoT technologies, the following indicators will be achieved:

- the trade margin on foodstuffs at the wholesale and retail level has been significantly reduced without degrading product quality;

- significantly increased the amount of food consumption in Russia in natural terms;

- introduce elements of automated control of resource and reduce the influence of the human factor at all stages of agricultural production;

- labor productivity in agriculture will be multiply increased and the production cost of goods will be reduced by speeding up the process of product delivery to the final consumer and increasing the level of mechanisation and automation of private and individual farms.

After studying the Russian experience in introducing information technologies for agricultural producers, it was possible to identify key areas for the development and integration of information digital systems in the agro-industrial complex.

It is a bit early to talk about the digital maturity of the agricultural sector in Russia, but it can be argued that intelligent digital solutions should help the agricultural industry to cope with the problems of productivity improvement and steadfast development.

IV. CONCLUSIONS

In spite of the tasks assigned for the accelerated development and technologies application that increase productivity in the agricultural sector of Russia, an analysis of development level and integration of information digital systems in the agro-industrial complex allows us to conclude that there is a lack of systematisation and insufficient coordination in this area.

With the current economic situation in Russia, digitalisation can dramatically affect the reduction of cost and

final prices for agricultural products, increase profits and competitiveness of both specific enterprises and agricultural sector as a whole due to pass-through automation of processes.

To increase the agro-industrial complex of Russia competitiveness, an effective mechanism of state regulation of the agrarian sector should be formed, taking into account the creation of conditions for the development of scientific activity and the introduction of their results, attraction of investments, creation and implementation of information-digital systems in the production, processing and storage of agricultural products, raw materials and food.

The developed recommendations for competitiveness of the agro-industrial complex of Russia improving in the conditions of development and integration of information-digital systems will allow to form an effective mechanism of state regulation of the agricultural sector as the main function of ensuring the food security of the population.

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