Formation and development of the biopreparations market

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Abstract. Within the framework of the study, the importance of organic agriculture is characterized, problems of its functioning are identified, trends in the development of the market for organic products are analyzed, and the features of the transition of agricultural producers to organic methods of management are investigated. Biological and organic biological products and fertilizers are considered as the most effective, economically profitable and environmentally friendly way of producing organic products in agriculture. The data on the development of the market for organic products and biological products in Russia and foreign countries are presented. The reasons are identified that prevent the accelerated growth of this market segment, consisting in the absence of clear requirements and a developed legal framework. At the same time, it is emphasized that the production of organic products can become one of the main sources of income for many Russian regions, subject to the formation of an appropriate legislative framework, investments, including from the state.

1. Introduction
The International Federation of Organic Agriculture Movement (IFOAM) defines organic agriculture as a production system based on ecological processes and avoiding the use of resources with adverse consequences, as well as focused on maintaining the health of soil, ecosystems and people. Organic farming combines traditional and innovative, science-based approaches to ensure a safe environment and improve the quality of life of all participants in the process.

Modern standards of organic farming are based on the principles formed at the beginning of the last century by European researchers, including Albert Howard, Evelyn Barbara Balfour, Rudolf Joseph Lorenz Steiner, and others. The main distinguishing feature of the European legislation of organic production from the Russian one is the presence of a developed social management system, including professional communities, communities of buyers, cooperatives, associations. Supervisory and regulatory functions are often assigned to professional organic farming organizations, which gives them certification and registration capabilities. The quality assurance system is legitimized by the
public. The set of corporate and cooperative standards is synthesized and embodied in national and international standards [6].

In the United States, organic production is as strong as in Europe. The legal foundations for organic production in the United States were laid back in 1990. However, in fact, the US National Organic Program began working in 2002. This program is focused on the development of a national certification system and the promotion of organic products. The US organic production system has some distinctive features, including hydroponic growing technologies and the ability to specify the proportion of organic raw materials in a product. Organic production in the United States and Europe is focused on solving socially significant problems, developing a sustainable rural economy and maintaining a balanced ecosystem. The policy for the development of sustainable, environmentally oriented organic farming is actively supported in Western countries by direct subsidies and in the form of compensation for certification costs.

Amid the 2020 COVID pandemic, sales of organic products have grown significantly. The most common quality marks for organic products on the international market are markings according to the EU Regulations and the US National Organic Program. Up to 95% of the world's products have at least one of these markings.

In Russia, only two regions have a state biologization program - Krasnodar Territory and Belgorod Region. In the Krasnodar Territory, a law has been adopted, according to which the absence of perennial plantings in the structure of sown areas of an agricultural enterprise may raise questions about the rationality of nature management. At the same time, the overwhelming part of the country's territory uses intensive tillage, which significantly reduces fertility [5].

The guidelines for ensuring sustainable development of agroecosystems presuppose the formation of a climate-neutral agricultural system, which provides for the reproduction of expanded soil fertility with the maximum use of organic matter resources, including waste from the livestock industry [8].

The experience of China is also noteworthy. The transition from agricultural production using toxic technologies to organic production of agricultural products should be consistent, based on the preliminary restoration of organic soil processes, which will allow in the future to work effectively as an organic agricultural enterprise [1].

China has three national guarantee systems. A distinctive feature of the National Quality System of China is the possibility of special labeling of products in a transitional stage that do not have the status of organic, the production of which is carried out using organic technologies. As part of the regulation of the organic market in China, a course has been taken to protect the domestic market. Imported organic products are required to comply with Chinese legislation. Products that are not certified under Chinese law cannot be labeled with appropriate marks on the packaging. National certification has become mandatory in the Chinese domestic market. Otherwise, the advertising information is considered to be false. Sales of organic products in the Chinese market are characterized by the highest growth rates, at around 1 billion euros annually. The dynamics of sales of organic products is shown in Figure 1.

![Figure 1. Dynamics of sales of organic products in China.](image-url)
The EU and the US account for 80% of the global organic economy, despite the fact that more organic producers and agricultural land are concentrated outside the designated regions. According to EU and US regulations, organic certification acts as a kind of market maker and forms general trends in the development of the global organic production market. The global structure of organic sales is shown in Figure 2.

![Figure 2. Structure of sales of organic products by countries of the world (2018).](image)

The market for organic products is growing at a fairly active pace. From 2000 to 2016 alone, there was a 5-fold increase (from 18 to 90 billion dollars). Forecast calculations reflect an increase in the share of organic products in the global volume of agricultural products up to 20% by 2025. [4].

The volume of the Russian market at the present time remains rather modest and amounts to about 7 billion rubles, and the consumption of organic products per capita per year is about 50 rubles. At the same time, there is a steady upward trend. Since 2015 Russia is among the ten countries with the largest growth in the organic sector.

![Figure 3. Structure of organic products production in RF,%](image)

At the same time, the speed of development of this sector is limited by the lack of effective mechanisms for certification of organic products, legislation that protects the poorly informed Russian consumer. Another limiting factor in the development of the market is the low level of incomes of the Russian population [4].

Thus, the interest in organic products in Russia, as well as in the world as a whole, is steadily growing. At the same time, even in developed countries with high incomes, so far only a small part of consumers purchase exclusively natural products.

The Russian organic market is currently at an early stage of formation. The acceleration of its growth rates is hindered by the lack of clear requirements and a developed legal framework.
2. Materials and methods
The tasks set within the framework of the study were solved using methods of economic research, including abstract-logical, analytical, monographic, economic and statistical. To conduct the study, a systematic approach to assessing the presented characteristics was used, which makes it possible to reliably identify their effectiveness in time and space.

Research progress
In the course of this research, the following was carried out:
- generalization and systematization of foreign experience in the development of the market for organic agricultural products;
- identification of the main problems of the development of organic agriculture in the regions of Russia;
- study of the main directions of development of the organic sector of agriculture;
- systematization and clarification of various approaches to the definition of the concepts of "organic agriculture" and "biologization of agriculture";
- study of the effectiveness of the use of biological products in the production of organic products;
- research of the market of biological products and the establishment of major trends.

3. Results and discussion
The most effective, economically profitable and environmentally friendly way of producing organic crops is associated with replacing agrochemicals and pesticides with biological and organic biological products and fertilizers. The overuse of pesticides and herbicides in modern agriculture is a serious environmental hazard. Regular use of particularly persistent drugs in agricultural production leads to their accumulation in the soil, causing pollution of the agroecosystem and food. A significant problem is the migration ability along the profile of soils, in the air and water environment of chemicals used in agriculture. The indicators of migration of organochlorine pesticides from the soil reach significant values: to plants up to 30%; into water up to 15%, into air up to 30%. Herbicides and pesticides readily enter food. In addition, toxic effects are exerted not only by the drugs themselves, but also by the products of their transformation, which are characterized by an even higher level of stability and toxicity.

Russia is currently pursuing an active policy in relation to organic products and the formation of organic agriculture.

The rapid growth of the market for biological products for plant protection testifies to the steady desire of farmers to switch from chemical farming to environmentally friendly.

The biopreparations market in Russia has grown in the last few years by 30%, which exceeds the growth of all other agricultural sectors. The main reason for the growing demand for biological products is the problem of soil depletion faced by farmers. Another reason is a significant annual rise in the cost of chemical preparations, while simultaneously reducing the cost of biological products. The reduction in price is possible due to the presence of a significant scientific groundwork that allows domestic manufacturers to bring innovative drugs and technologies for their use to the market. It should be noted that the use of biological products is more effective. In practice, manufacturers have proven a significant reduction in the cost of crop production while maintaining or even increasing yields. This explains the growing trend of the transition of small and medium-sized agricultural producers from chemical production to combined and purely biological production of agricultural products.

The largest agricultural holdings are interested in Russian experience and have allocated experimental fields for bio-farming. The guidelines of these companies are associated with a total transition to the production of organic products. A number of companies are independently engaging small farmers in organic farming to jointly increase the volume of high-margin products.
Figure 4. Market size of biologics.

The market for biologics has more than tripled in five years due to increased demand. In Russia, using biological plant protection products, the components of which consist exclusively of natural organisms and the products of their symbiosis, about 4 million hectares are currently being processed, which is no more than 2%. In the USA and Europe this figure is 20-40 times higher. The transition of Western farmers to the use of biological products is explained by the need for an annual increase in the use of chemical plant protection products, which significantly increases the cost of agricultural production and reduces the overall profitability of agribusiness.

At the same time, a complete rejection of chemical fertilizers at the moment is impossible, since without them there may be no harvest at all. The increasing use of chemical plant protection products leads to soil degradation, loss of its ability to self-regenerate and, ultimately, withdrawal of farmland from crop rotation. In this regard, Western countries impose restrictions on the use of chemicals. In Russia, in a number of regions, the stimulation of the purchase of chemical plant protection products at the state expense is being carried out.

In Russia, the prerequisites for the transition to organic farming with the use of biological products are also being formed. The key reason is the availability of highly efficient production of innovative biological products that meet the needs of the domestic market. At the same time, manufacturers are ready for a multiple increase in production volumes for export. Another important reason is the protection of arable land, since medium and small agricultural enterprises are not able to allow the fields to withstand crop rotation. As a result, after 5-10 years of chemical treatment, the soil degrades and cannot be restored without additional costs.

Figure 5. Leading companies in the Russian production of biological plant protection products.
In fact, in Russia, producers are squeezing everything possible from agricultural land at minimal cost in order to then develop new territories.

The way out of this situation is seen in the introduction of scientifically grounded crop rotations at the state level, the systematic implementation of agroecological, phytosanitary soil monitoring, and updating of soil maps and cartograms. This approach will allow farmers to more correctly select plant protection products, and eliminate mistakes that lead to crop losses.

In a number of leading agro-regions of Russia, the implementation of internal programs for the greening of agriculture has been launched. These regions include the Belgorod Region, Moscow Region, Tomsk Region, Leningrad Region, Voronezh Region, Krasnodar Territory, Stavropol Territory, and the Republic of Bashkiria. The most significant results were shown by the Belgorod region, in which, over the seven years, during which the program of agricultural biologization is being implemented, record yields for the main grain and oilseeds have been achieved. Basic activities of the biologization program In the Belgorod region, the elimination of soil acidification, limitation of arable land on slope lands, the content of at least a tenth of the sown area in the crop rotation. The second stage of the program involves stimulating the use of biological products. According to the consulting agency Abercade, the total volume of the Russian market for microbiological protection products in monetary terms has more than tripled over the past five years and amounted to $30-35 million in 2018, with a turnover of plant protection chemicals of almost $2 billion a year.

This business is initially associated with science. Without a scientific basis, in principle, it could not have appeared. Russian scientific research is leading in the development of biological plant protection products, which is based on the developments of Soviet scientists. At present, the symbiosis of science, business and partly the state has made it possible to develop and register more than 60 biological products, while there are only 300 of them in the world. These are biopesticides, the most science-intensive bioherbicides, entamophages and others.

The demand for biological products is growing steadily. Demand growth began with small producers who have limited financial resources in the course of production activities. Their experience proved to be positive and attractive to medium-sized agricultural producers. In addition, the sales model for biological products presupposes support from proper seed preparation to harvest. Soil biotics is so complex in general and differs in different regions that the use of one or another drug under local conditions requires scientific support at the first stage. Leading manufacturers of biological products in Russia predict an increase in production volumes and areas processed by them in the near future in connection with the popularization of the biological method, as well as with the entry into force of the law "On organic products."

At the present stage, the effectiveness of the biological method, in the overwhelming majority of cases, is not inferior to the chemical method. This approach counteracts the emergence of pest resistance, and also significantly reduces pollution of the environment and agricultural products. Another significant argument is the cost of biological products, which is significantly lower than the cost of chemical remedies.

Currently, a trend of combined farming has formed on the market, which implies the gradual replacement of chemical plant protection products with biological ones, which allows enterprises polluted with chemistry to preserve the economy when switching to the biological method. Experts from leading manufacturers of biological products claim that in integrated protection systems, approximately the same yield is achieved as in chemical ones, while reducing costs by 15-20%, and with a full transition to the use of biological products, the production cost of some cereals and oilseeds can be halved.

Currently, Russia lags significantly behind in agriculture in terms of yield, level of technological equipment, staffing, level of innovation, seed base and selection.

The period of agricultural reforms in Russia is characterized by support for targeted modernization and selective priorities. Global trends are associated with the formation of new reserves with high performance indicators. New technological windows in these reserves may be closed in the near future. Organic agriculture and biologization, key elements of technological integration into the world.
market for Russia. These areas are included in the number of leading trends in forecasting the scientific and technological development of the agro-industrial complex of the Russian Federation for the period up to 2030.

Currently, organic agriculture has entered the era of Organic 3.0, which is focused on sustainable development, and the production and distribution of organic products is more environmentally friendly, safe for human health, socially fair, economically viable, and accessible for monitoring and control [3].

The emerging social and environmental externalities indicate that traditional agriculture is losing out to organic agriculture, since its contribution to solving global environmental problems is obvious. Ecological and organic products are in line with all current high-tech trends. If you combine precision farming, drones, and so on with organic farming, the effect will be colossal.

Organic agriculture is also fully compliant with the WTO green box, creating a potential niche for food and non-food exports, certification market services.

According to the Union of Organic Agriculture, in the future, organic farming may occupy about 10% of the Russian agro-industrial complex, and ecological (biologized) farming, in which certain methods of organic farming are used, about 80%.

Russia needs a technological forecasting system. At present, Russia has three national standards for organic products and one interstate standard of the CIS countries; laws on organic agriculture have been adopted in a number of regions. At the same time, there is a need to form a system for the development of the outlined directions, to develop a set of qualitative and quantitative indicators and indicators for assessing the state of the market, the dynamics of its development. This information is necessary for the development of state programs, investment planning, analysis and tracking of dynamics, development of a development strategy and roadmap. This systematization of data will contribute to the combination of science and practice, the formation of industry and government orders.

4. Conclusions

Currently, a steadily growing interest in organic products has formed in Russia and the world. At the same time, even in developed countries with a high level of income of the population, a small part of consumers purchases exclusively natural products on an ongoing basis.

In Russia, the organic market is at an early stage and does not have a clear development concept. Accelerated market growth requires clear requirements, legal framework and investments, including from the state, as well as state regulation. It is necessary to build a system of state regulation based on the fact that the market for organic products is the most important factor in the food and national security of the country, and not to consider it as another market segment.

The most effective, economically profitable and environmentally friendly way of producing organic crops is associated with replacing agrochemicals and pesticides with biological and organic biological products and fertilizers. Biological plant protection products are characterized by high rates of profitability. The payback indicator for chemical plant protection products fluctuates at the level of 2.5-5 times, while for microbiological products it is 30. This is due to several reasons: firstly, the cost of biological remedies is often much lower, and the effectiveness is higher, secondly, one type of drug can be used throughout the growing season, and thirdly, they have a prolonged effect.

Thus, the growth in the level of agricultural production in Russia expands the prospects for the use of microbiological preparations in crop production. The most popular are high-tech preparations of complex action, the release of which is carried out under the supervision of researchers with approbation in various agro-climatic zones. This approach provides predictable performance.

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