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Development of Organic Production as a Condition for Sustainability of Russian Agriculture

Mariya KAGIROVA[1]* and Stanislava KONTSEVAYA[2]

[1] Russian State Agrarian University – Moscow Timiryazev Agricultural Academy, Moscow, Russia; kagirovamary@gmail.com

[2] Czech University of Life Sciences, Prague, Czech Republic; kontsevaya@pef.czu.cz

* Corresponding author: kagirovamary@gmail.com

Abstract: The paper is devoted to the prospects for the development of organic agriculture in the Russian Federation and its impact on the sustainability of the agricultural sector, the characteristics of which are also defined in the work. The aim of the study is to substantiate the necessity and accessibility of the development of organic production as a condition for the sustainability of agriculture in Russia. Based on the data of the official international and Russian statistical observation in the form of time series and cross-sectional data using statistical methods of grouping, correlation, modeling of the trend of the time series, analysis of time series, it has been established that at the present stage the agricultural sector of Russia in the direction of its development corresponds to the general global trends in the expansion of production and consumption of organic products and has the main prerequisites for the development of organic agriculture, varying by region. The paper substantiates the positive influence of organic production on the formation of sustainable agriculture through strengthening the position of it in the economy, meeting the effective demand of the population for high quality food products, preserving different types of producers and wise use of resources.

Keywords: organic agriculture; sustainability; international trade, resources; conditions for organic agriculture

JEL Classification: C10; C22; O13

1. Introduction

The sustainability of Russian agriculture is a prerequisite for the country's economic development. Agriculture provides food to the population, raw materials for the food and processing industries, services, shapes the environment, influences social and cultural systems and contributes to economic growth (Huylenbroeck et al., 2007). In addition, according to the input-output tables of most European countries and the United States, agriculture has the highest level of total input ratios compared to other industries (Linchpin, 2021), for example, in Russia in 2018 it was 489.4 rub per 1,000 rub. of agricultural output. So, it has the potential to become a driving force for the development of the country's economy as a whole (Romantseva, 2020; Benesova et al., 2017). The Ministry of Agriculture of Russia understands sustainable agriculture as the basis for the formation of agricultural policy in accordance with the definition of the Food and Agricultural Organization of the United Nations as a

production that has five main attributes: it saves resources, does not cause environmental degradation, is technically accessible, economically viable and socially acceptable (FAO, 1989).

This became especially evident during the crisis caused by the COVID 19 pandemic. Agriculture is often exposed to various natural and human-induced shocks and stresses, such as floods, droughts, temperature fluctuations, water shortages, resource scarcity, including those due to the economic crisis. Moreover, governmental decision in the field of supporting agriculture play significant role. Changing of quotes dairy industry can affect to firm competitiveness (Naglova et al., 2017). Therefore, agriculture has the ability to adapt to them in order to be viable in the future. This ability is referred to as agricultural sustainability and is defined by USAID as "the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth" (USAID, 2012). The pandemic crisis in the Russian Federation was expressed in the reduction of production of small and medium-sized enterprises in various types of economic activities. This happened due to the imposed restrictions on shopping, visiting restaurants and movement, migration between cities and regions. The decline in the number of jobs has led to an increase in unemployment and a decrease in the incomes of some groups of the population. The created conditions disrupted the formation of gross value added in most types of economic activity. The research conducted by the author (Kagirova, 2021) using methods of econometric modeling, in particular the method of piecewise linear functions, confirmed the stability of the agricultural sector during periods of economic crises, expressed in the preservation of the level and trend of growth in gross value added in agriculture with a decrease in the volume of gross domestic product.

Factors that ensure the sustainability of agriculture are: effective demand for products; multi-structure in agriculture; the location of enterprises of the agricultural sector on a large territory with different conditions and specialization of production (the possibility of locating production in farms of different categories, redistribution of resources); the implementation of measures of state support for agriculture (Lampridi et al., 2019). A special role in providing income to producers of the agricultural sector of Russia belongs to the export of agricultural products, which was also confirmed by the results of studying the consequences of the 2020-2021 crisis caused by the pandemic. The results of 2020 showed an increase in exports of food products and agricultural raw materials in general by 19.2% and grain by 27.7%, compared to the previous period. At the same time in the UK the grain export decreased by 27.2%, in China by 14.4% (According to the International Trade Statistics Database - TrendEconomy.com). Current trends in consumer preferences in advanced economies are based on the principles of healthy food, involving the consumption of organic products (Rizzo et al., 2020; Glibowski, 2020). To ensure the positive influence of the export factor on the sustainability of agriculture, it is necessary to orient production towards meeting consumer demand in the world market, including following the global trends in the use of organic products (Hou et al., 2022). Organic products are understood in accordance with the FAO definition as products produced following specific socio-economic and ecological rules, such as: types and quantity of external inputs used (often referred as chemical fertilizers and

pesticides), natural resources conservation (biodiversity, soil and water), smallholders and family farmers' empowerment, and animal welfare (FAO, 2021). In Russian standards, organic products are recognized as products, produced in accordance with the rules of organic production, without the use of pesticides and other plant protection products, chemical fertilizers, growth and fattening stimulants, antibiotics, hormonal and veterinary drugs, genetically modified organisms, not processed using ionizing radiation and not containing residues of prohibited and harmful substances, as well as products of their processing (Interstate Standard, 2018).

Many works of scientists of different areas and from different countries are devoted to the study of the factors of development of organic production and the consequences for the economy. Thus, it has been established that an important condition for the development of organic agriculture is the interaction of producers in the implementation of the idea of a clean, resource-saving production from chemical influences (Sapbamrer & Thammachai, 2021), which forms the condition for the transition to new more profitable forms of interaction between participants in economic processes. Type of management plays a big role (Gogaev, et.el, 2019). Consumer interest in organic products is formed on the basis of the development in society of the idea of environmental protection (Prado & Moraes, 2020), as well as a sufficient level of income of the population, since production is mainly focused on the domestic market (Hanmann et al., 2020; Aertsens et al., 2009). The current level of development of society in Russia and the level of income, the existing natural conditions for the implementation of organic agriculture can form the basis for strengthening the position of the agrarian sector in the country's economy, as well as ensure the sustainability of agriculture.

Thus, the object of the presented study is the production of organic products in the Russian Federation.

The purpose of the study is to substantiate the necessity and availability of the development of organic production as a factor in the sustainability of agriculture in Russia. This involves solving the following tasks:

- to define the special characteristics of sustainable agriculture in Russia;
- to study the global trends in organic agriculture;
- to substantiate the necessity and possibilities for the development of organic agriculture in the Russian Federation.

Previous studies by the author have shown that the sustainability of agriculture in the Russian Federation is expressed in:

- uninterrupted supply of the population and industries with food products and raw materials, respectively;
- ensuring a high share of the gross value added of a type of economic activity in the formation of gross domestic product, subject to its sustainable growth
- ensuring the level of employment and income of the population of rural areas;
- preservation of natural resources and biodiversity, territorial integrity of the country;
- ensuring a high position of the country in the world food market.

Hypothesis: the development of organic production using the innovative technologies contributes to the formation of all these characteristics.

2. Methodology

To study the trends in organic agriculture, countries were selected with a duration of organic production in the agricultural sector for more than 10 years. Such indicators are considered as organic area (farmland); number of organic producers; sales of organic food; organic retail sales as the characteristic of consumer demand for organic products in the country.

To identify structural shifts in the production of organic products by countries, the Spearman rank correlation coefficient was applied:

$$r_s = 1 - \frac{6(\sum d^2)}{n(n^2-1)} \quad (1)$$

where d is the difference between two ranks (according to the share of the country in the total organic farmland) in 2019 and 2007 for each observation; n is number of observations (countries).

To analyze changes in the structure, data for 2007 (in most countries the production of organic products has already been formed) and 2019 (information on the production of products in most countries is available) were used.

To identify trends in the development of organic production in Russia and other countries, modeling of the trend of the time series was applied based on the Ordinary Least Squares (OLS) method, as well as the calculation of indicators of the time series – absolute growth and growth rate.

To identify the regional characteristics of agricultural production, the method of statistical grouping was used based on the interval series of distribution by the indicator of the area of fallow lands in the region. Three groups of regions were identified: the 1st group – regions with an area of fallow lands over 100 thousand hectares; the 2nd group – regions with an area of fallow lands from 10 to 100 thousand hectares; the 3rd group – regions with an area of fallow lands less than 10 thousand hectares per region (from the total number of constituent entities of the Russian Federation, regions in which there are no fallow lands, as well as the Tyumen region and Krasnoyarsk Territory, in which there is a high degree of air pollution, were excluded). For each group, indicators of factors for the development of organic production were calculated in the form of relative indicators and average values.

The initial data are presented in the form of time series, categorical data, and cross-sectional data. Sources of information: statistical office of the European Union Eurostat; International Trade Statistics Database - TrendEconomy.com; Research Institute of Organic Agriculture FiBL; The Food and Agriculture Organization of the United Nations (FAO); Federal State Statistical Services (Rosstat), National Organic Union of the Russian Federation.

3. Results

Analyzing the period from 1999 to 2019 it can be noted that sales of organic products in the world increased from 15.2 billion dollars in 1999 to 106 billion dollars in 2019, with an average annual growth of 4.6 billion dollars (significance F < 0.000, P-value for Intercept and Regression Coefficient < 0.000) (Figure 1).

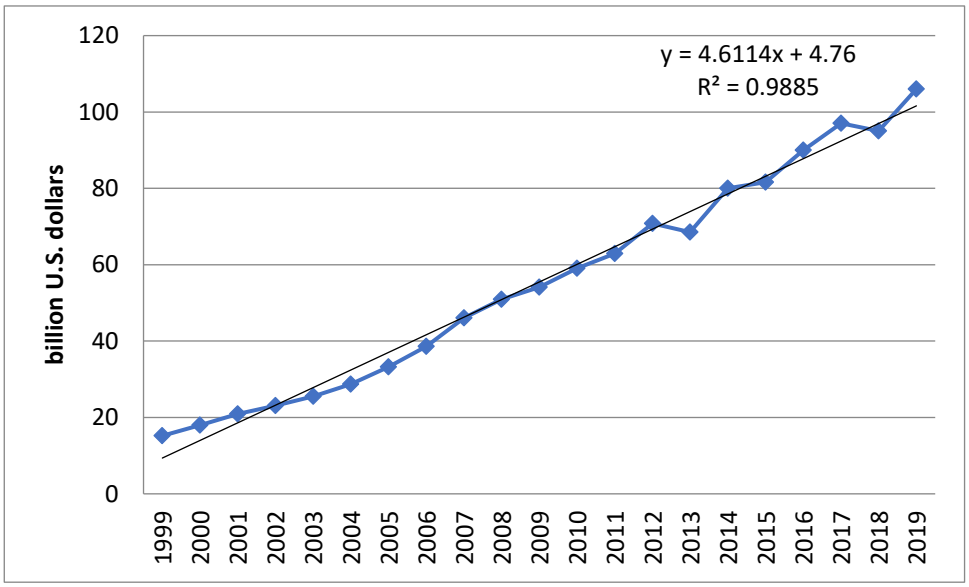

Figure 1. Worldwide sales of organic food from 1999 to 2019 (in billion U.S. dollars)

Thus, extrapolating the current trend, we can assume with a probability of 0.95 that the capacity of the organic food market will grow to $ 152 billion by 2030, provided other conditions remain unchanged. According to forecasts of the Institute for Research of Organic Agriculture (FiBL), by 2024 the market capacity will amount to more than $ 200 billion. Russian consumers are also forming a trend of growing interest in organic products, which is confirmed by Organic retail sales in Russia increased from € 30 million in 2007 to € 160 million in 2019 (i.e. €10.8 million average annual growth), similarly in Australia - an increase of 4.5 times, in Canada – 3.1 times, in China – 18.9 times. However, not all of these products are provided by domestic production. So, in Russia in the early 2000s, 100% of organic products sold on the market were imported, but currently more than 20% of the market is represented by domestic products. At the same time, Russia has significant opportunities for the development of organic production (natural conditions, low level of environmental pollution, development of transport infrastructure, availability of pastures).

Imports of organic products in the world (across all exporting countries) in 2018 amounted to 3,230,675 metric tons. In 2019, imports increased by 0.36% to 3,242,382 metric tons. According to the Federal Center for the Development of Agricultural Products Exports of the Ministry of Agriculture of Russia, the world imports of organic matter in 2019 amounted to only 13% of the total consumption, nevertheless, this is a significant segment of $ 15 billion. The growth of the world market for organic products forms a new niche for the export of products produced in Russia. Exports play a significant role in the formation of the gross value added of agriculture in Russia (in 2019 – 12.3% of output). Growth in the export of organic products with a higher price in comparison with traditional products in Russia

will provide sufficient profitability for producers for sustainable development of the agricultural sector and rural areas.

To get the significant estimation of trade potential of organic products, it is necessary to evaluate current agricultural trade of Russia. European Union and EACU countries are the main trade partners of Russia in agricultural products. Figure 2 shows the number of agricultural products imported from Russia by countries over the past 20 years (based on the data form Un Comtrade database. The inflation effect was reduced using agricultural indexes from FaoStat for each year).

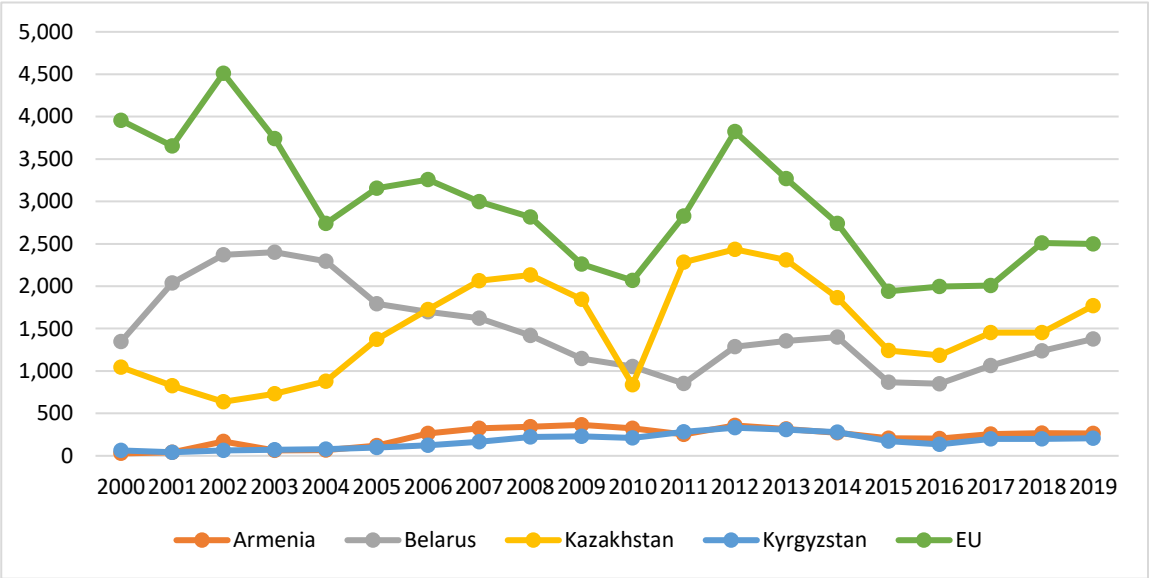

Figure 2. Import from Russia to EU and EACU from 2000 to 2019(in billion U.S. dollars)

The graph represents fluctuations with some shocks in international trade. The last leap is due to the introduction of an import ban in 2014. It affected all countries imports and exports, even which did not involve into ban. However, after decreasing, the amount of trade started to grow up. Thus, despite the several fluctuations, the import of agricultural products from Russia to EU and EACU is stable. Thereby import flow trade is quite permanent and these countries are potential consumers of organic production due to strong trade relationship and mutual agreement between firms. Last five years the main European trade partners for import from Russia were Germany, United Kingdom, Poland and Netherlands. Three types of agricultural products are mainly imported from Russia to European Union with covered 80% of all imports, they are fish, cereals, fats. The range of imported to EACU products is quite big.

The overview of organic production current state is based on the comparison of EAUE countries, Russia and selected European countries which are the main trade partners.

The European countries which are main trade partners have high level of organic land and for this reason could be high organic product competition during entering to organic market (Table 1).

The growing market for organic products, especially in developed European countries, requires the involvement in the production process of lands where mineral fertilizers and

chemical plant protection products have not been used for a long time. There is a limited number of such agricultural land in Europe.

Table 1. Organic production in 2019 (own calculation; World organic Agriculture report)

Country	Organic area [ha]	Organic share [%]	Organic producers [no.]
Armenia	594	0.04	29
Belarus	1,375	0.02	31
Kazakhstan	294,289	0.1	41
Kyrgyzstan	19,054	0.2	1,051
Russia	674,370	0.3	92
France	2,240,797	7.7	47,196
Germany	1,613,785	9.7	34,136
United Kingdom	459,275	2,6	3,584
Poland	507,637	3.5	18,655
Netherlands	68,068	3.7	1,867

Currently 72.3 million hectares of organic farming area is used worldwide. Analysis of the structure of the organic farming area by country in 2019 compared to 2007 did not reveal significant changes (Table 2).

Table 2. Calculation of Spearman's rank correlation coefficient based on the indicator of the structure of the organic farming area in 2007 and 2019

	2019		2007			
Country	Share of the country in total organic farmland, %	Rank	Share of the country in total organic farmland, %	Rank	d	d^2
Australia	49.431	1	38.082	1	0	0
Argentina	5.087	2	8.825	2	0	0
Spain	3.262	3	2.557	10	7	49
United States of America	3.222	4	5.515	3	1	1
India	3.185	5	3.273	6	1	1
France	3.104	6	1.770	12	6	36
China	3.069	7	4.933	4	3	9
Uruguay	2.969	8	2.957	8	0	0
Italy	2.761	9	3.654	5	4	16
Germany	2.235	10	2.749	9	1	1
Canada	1.830	11	1.767	13	2	4
Brazil	1.777	12	2.961	7	5	25
Russian Federation	0.934	13	0.107	50	37	1,369
Austria	0.928	14	1.652	14	0	0
Sweden	0.850	15	0.979	17	2	4
….	….	….	….	….	….	….
Zimbabwe	0.001	122	0.001	122	0	0
Total	**100**	**x**	**100**	**x**	**x**	**47,566**

Spearman's coefficient (0.86) indicates insignificant structural changes. The composition of the group of countries, the largest in terms of land occupied by organic production, has not changed practically, the leading positions in this indicator are occupied by Australia (38.1%), Argentina (8.8%) and the USA (5.5%). The role of China (4.93%) and Brazil (2.96%) increased in 2019. At the same time, the Russian Federation was in 50th place in 2007, and moved to 13th place with a share of 0.3% of the total area. That is, there has been a significant increase in the share of countries with large-scale agricultural land. In the Russian Federation, organic farmland increased from 9,861 hectares in 2000 to 674,370 hectares in 2019, with the most stable growth observed since 2011 (on average by 68.4 thousand hectares or 24.9 % annually). According to the National Organic Union of the Russian Federation (National Organic Union, 2021), the number of certified according to the interstate standard organic producers, represented by farms and large agricultural holdings, is also increasing annually, from 12 in 2004 to 92 in 2019. In 2020, a Federal Law on organic products was passed, regulating its production. By December 2021, the 105th organic certificate was registered in the unified state register of the Ministry of Agriculture of Russia. In 2020, 44 registered companies were directly engaged in production, mainly crop products. About 70% of them work for the domestic market and are small farms. Large crop companies mainly work for export. Sales of organic products in the Russian Federation, including imports, exceeded €190 million. Russian producers accounted for 20-25% of this volume (€ 35-45 million). Products worth € 20-30 million were exported. Trends in the increase in the number of producers of organic products and areas of agricultural land occupied by organic production coincide with global trends: in general, for all countries, the average annual increase in organic farmland in the period from 2000 to 2019 was 8.3%, the number of producers – 14.2%. In addition, for small forms of management, which at this stage of development of the agricultural sector cannot fully compete with large agricultural complexes, the production of organic products can be a point of growth of opportunities, allowing them not only to survive, but to fully compete with large companies due to the high quality of products. For the majority of rural areas of the Russian Federation, organic farming may be the only possible development model.

Further expansion of organic production in agriculture in Russia is possible due to the existing unused agricultural land for a long period of time. With a total area of farmland at the end of 2019 of 221,955 thousand hectares, the area of fallow lands amounted to 4,926.6 thousand hectares. The distribution of fallow lands varies across the territory of Russia (Table 3).

The analysis of the results of grouping shows that fallow lands are concentrated mainly in regions with a fairly developed agricultural production, while the use of mineral fertilizers in these regions is on average lower than in the regions of the 2nd group by 17.3% and by 48.9% than in the regions of the 3rd group. The analysis of atmospheric pollution requires special attention in substantiating the possibility of producing organic products. So, in the first group of regions, the level of pollution is the lowest (on average 92.3 thousand tons in 2019). It is also worth noting that in the regions of groups I and II and as a whole in the sample, there is a tendency towards a reduction in emissions of harmful substances into the

atmosphere from 2005 to 2019 on average annually by 1.6 thousand tons, 4.2 thousand tons and 0.7 thousand tons, respectively. That is, the development of organic agriculture in these regions is possible. And the fulfillment of the condition of minimizing pollution for the production of organic products will contribute to the conservation of natural resources and biodiversity, and therefore, fulfill one of the tasks of sustainable agriculture.

Table 3. Characteristics of groups of regions of Russia by area of fallow lands according to 2019

Indicator	groups of regions by area of fallow lands, thousand hectares			Average
	I over 100	II from 10 to 100	III less than 10	
Number of regions	13	24	27	64
The area of fallow lands, thousand hectares:				
total	3,793.7	1,043.1	89.8	4,926.6
per 1 region	291.8	43.5	3.3	77.0
Share of Gross Value Added of agriculture in Gross Regional Product, %	8.2	7.1	9.4	8.3
Application of mineral fertilizers per 1 sown area, kg	38.2	46.2	74.7	55.8
Emissions of pollutants into the air, thousand tons	92.3	156.6	189.1	157.7
The share of peasant farms and subsidiary farms in the value of gross agricultural output, %	47.9	46.6	51.8	49.0

The regions of the first group are located on the territory of the Far Eastern Federal District and the Siberian Federal District. The inclusion of fallow lands in these districts in the production use will eliminate the violation of the country's territorial integrity due to purchases and leases by representatives of other countries (in particular, China), solving one of the specified tasks of sustainable agriculture.

Another important factor that determines the segment's predisposition to the transition to organic production is the share of competitive farms and small organizations that have sufficient flexibility in changing the production process. The agricultural sector of Russia is a system of complex structure, the elements of which are large and medium-sized agricultural organizations, including agricultural holdings, peasant farms and subsidiary farms; each of the elements has its own characteristics of the organization of the production process and the objectives of the activity. At the same time, peasant farms and subsidiary farms represent a small business that aims to provide the domestic market, organizes the production process on small areas of farmland, with a low volume of use of genetically modified products, chemicals. Subsidiary farms mainly have non-commercial production aimed at meeting the needs of a particular household, based on the principles of healthy nutrition. It is these categories of producers that are promising for the development of organic production. The preservation of various forms of organization of production and the development of small businesses makes it possible to ensure the sustainability of agriculture in times of crisis, which are difficult for large agricultural organizations bound by the terms of long-term contracts, including logistics. As can be seen from Table 3, in the Russian regions there is a

high proportion of small businesses in the total volume of agricultural production. The introduction of land into the production process by peasant farms will allow preserving multistructural agriculture and ensuring the stability of the agricultural sector during periods of crisis through effective redistribution of resources, their conservation, and increased employment in the agricultural sector.

In the world market, the most competitive are organic wheat, green peas, soybeans and buckwheat; also they are in great demand. High growth potential due to the large share of peasant farms in production has organic vegetable growing in open ground for the domestic market. In animal husbandry, the most promising direction for the production of organic products is dairy farming. Farms in this sector of the agro-industrial complex are the most competitive and mobile enough to meet the growing demand for organic products. High investment activity in the milk processing segment may also lead to an increase in demand for organic milk. At the same time, the growth of competition among processors will increase the profitability of producers of organic raw materials, and ensure the stable development of the agricultural sector. An increase in the production of organic milk will naturally lead to an increase in the demand for organic green feed.

The study (Sapbamrer & Thammachai, 2021) noted that one of the factors for the development of organic agriculture is the availability of neighboring farms for the producer, also with organic production, to ensure that production is clean from the effects of chemicals. This approach will contribute to the development of cooperation of peasant farms, including with large agricultural organizations. This will ensure the expansion of the use of expensive digital technologies in the production process, preserving land fertility, increasing productivity and labor productivity, which is consistent with the objectives of sustainable agriculture (Arkhipova et al., 2021).

Studies (Hanmann et al., 2020; Aertsens et al., 2009) have shown that Income is positively related to organic purchases. Therefore, the possibility of developing organic agriculture in Russia for consumption on the domestic market is largely determined by trends in household income. On average, the price difference for organic dairy products compared to conventional products is: milk – 220%, cottage cheese and butter – 380%, fermented baked milk – 550%, sour cream – 745%. Meat products are represented mainly by beef and lamb. The cost of lamb meat is 80-100% higher than the usual one, beef is 200-600%. Real disposable money incomes of the population have been showing a steady upward trend since 2000. So, from 2000 to 2020, the income of the population increased 2.44 times while maintaining the share of spending on food in the range of 29.6-31.2%, ensuring the effective demand of the population for organic products. Research conducted by the National Organic Union of the Russian Federation (National Organic Union of the Russian Federation, 2021) showed that "a huge advantage of the organic market is the loyalty of consumers to products, despite any crises. Despite all the problems, a person who adheres to proper nutrition tries not to return to ordinary foods. According to the specialists of the Union, during the crisis period of 2013-2015, the main part of clients remained, despite the problems, both legal and economic, and since 2016, with the growth of household incomes, the number of clients began to grow again." Thus, the production and sale of organic

products is a sustainable source of income for farmers. Higher selling prices of organic products provide a higher level of income for producers and a basis for modernization of production at their own expense and for obtaining credit funds.

One of the tasks of the current stage of development of the agrarian complex of Russia is to ensure the biological safety of production, preservation of soil fertility, purity of water resources, which is indicated in the State Program for the Development of Agriculture and Regulation of Markets for Agricultural Products, Raw Materials and Food (State Program). Conservation agriculture is one of the manifestations of organic production. The availability of information for the population about the content of resource-saving production and the characteristics of organic products ensures an increase in demand for these products in the domestic and world markets (Prado & Moraes, 2020). There is no massive advertising of organic products in Russia. The main source of information is the data presented on the packaging of the product itself and in the certificate, which complicates the formation of mass interest among the population in this type of product. However, according to a social survey, 58% of Russians are ready to overpay for ecological products. Producers can receive information about organic farming, as well as timely expert advice through the National Organic Union (Korshunov, 2019).

4. Discussion

The hypothesis put forward about the positive impact of the development of organic production on the sustainability of agriculture in Russia was confirmed. The study found that:

- growth in the size of organic farmland and the number of producers, and consequently the production volumes in Russia coincides with global trends, corresponds to the growth in demand in the world market for this type of agricultural products from the population and processors, i.e. increases the export potential of the country's agricultural sector and strengthens the country's position in the world market;
- organic agriculture ensures the inclusion of previously unused agricultural land in the production process, which ensures the integrity and sustainability of the country's rural areas, the inclusion of farms and small agricultural organizations in the production process, the development of producers' cooperation, thereby forming sustainable domestic production;
- the production of more expensive products, secured by effective demand, increases the profitability of the activities of produces of different categories, the possibility of their technical modernization and the stability of the agricultural sector.

The study found that the Russian Federation has conditions for the development of organic production: the presence of fallow areas; active participation in the formation of agricultural output of peasant farms and other forms of small business, capable of switching over to new production technologies in a short time; growth of incomes of the population, development of processing industries, which form effective demand; government regulation and support of organic production; the presence of our own powerful research and

production base for the development of organic agriculture and the biologization of agriculture (specialized research institutes, domestic production of biological products based on a bacterial bank, the Center for agricultural consulting and retraining of agro-industrial complex personnel) (Korshunov, 2019).

At the same time, there are a number of restrictions in the development of organic production: insufficient information support for consumers and producers; unlimited overpricing of organic products in retail chains; insufficient level of actual profitability of manufacturers for the use of innovative technologies without additional public and private investments.

One of the conditions limiting the scope of research and forecasting the development of organic production in Russia is the lack of data from official statistical observation in the context of the constituent entities of the Russian Federation on the amount of produced and consumed organic products, production costs by type of product. The direction of further research can be the identification of clusters of regions according to the level and potential of development of organic agriculture in order to formulate agricultural policy for sustainable agriculture.

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Conflict of interest: none

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