

Geography of organic production for sustainable development of rural areas

Vitaly Aleschenko^{1*}, *Olga Aleschenko*², *Kirill Maksimovich*³, *Galina Gritsenko*³, and *Anatoliy Shastin*⁴

¹Novosibirsk State Agrarian University, 160, Dobrolyubov str., Novosibirsk, 630039, Russia

²Institute of Economics and Industrial Engineering of the Siberian Branch of the Russian Academy of Sciences, 17, Lavrentyeva prospect, Novosibirsk, 630090, Russia

³Siberian Federal Scientific Centre of Agro-BioTechnologies of the Russian Academy of Sciences, P.O. box 267, Krasnoobsk, 630501, Russia

⁴Radium Investments, LLC, 10, Mayakovsky Str., Omsk, 644010, Russia

Abstract. Climate change, new government policies, and changes in the geography of exports at the present stage require an integrated approach to assessing the prospects for the development of organic production in Siberia, which can act as a growth engine for rural areas. The calculation results show that the possibilities of organic production in Siberia are differentiated according to the natural and climatic principle. Tundra and forest-tundra are characterized by developed reindeer herding. The most productive zones are the southern taiga zone, forest-steppe and steppe. Western Siberia uses arable land as its main production asset: specialization is carried out in grain production and meat and dairy cattle breeding. Eastern Siberia has magnificent pastures and hayfields with developed sheep and dairy cattle breeding. Rural areas with suburban areas can specialize in the production of milk, poultry, pork, vegetables and potatoes; beekeeping has prospects.

1 Introduction

Siberia is the largest food producer in the Asian part of Russia. The macrozone consistently ranks 3rd in the production of potatoes, meat, milk and eggs, 4th in the production of grain (i.e., in fact, for all the main food products in our country) among all federal districts of the country, second only to the districts of the European part of Russia [1].

The priority direction for the development of rural areas in Siberia is the formation of zones of specialization and commercial production of organic products, raw materials and food, for the production of which the macroregion has favorable natural and climatic conditions and for which Siberia has a competitive advantage over other regions of the country. In crop production, the full list of agricultural specializations in Siberia includes 20 of the 47 crops taken into account by Rosstat [2-3], the key ones being wheat, rye, barley, oats, fiber flax, potatoes and buckwheat. In livestock farming, the regions of the Siberian Federal District have an all-Russian specialization in the production of milk, cattle meat, sheep and goat breeding, horse breeding, reindeer husbandry, and beekeeping [4-6].

* Corresponding author: 564435@mail.ru

The purpose of the study is to assess the prospects for the development of zones of economic specialization in rural areas of Siberia to produce organic products in modern conditions. The implementation of this goal involves posing and resolving issues about the spatial and sectoral distribution of economic activity and investment activity in the production and processing of organic agricultural raw materials in the regions of Siberia as a factor in the development of rural areas.

2 Materials and methods

To assess the promising zones of agricultural specialization of the regions of the Siberian Federal District to produce organic products, a database of indicators of municipalities of Rosstat [7] and data from the Federal Customs Service [8] were used. The data is for 2020, the base for comparison is 1990.

Strategic directions for the development of the agro-industrial complex of Siberia were ensured by such regulatory documents as State program for the development of agriculture and regulation of markets for agricultural products, raw materials and food; Strategy for the development of agro-industrial and fishery complexes of the Russian Federation for the period until 2030; Long-term strategy for the development of the grain complex of the Russian Federation until 2035; Passport of the federal project “Development of Agricultural Exports”; Spatial development strategy of the Russian Federation for the period until 2025.

3 Results and discussion

In terms of the volume of gross and marketable output, the value of fixed assets, and the number of employees in Siberia, the leading places belong to grain farming and cattle breeding, which determine the place of the regions of the Siberian Federal District in interregional specialization.

3.1 Crop production

Natural and climatic factors have different impacts on agricultural sectors. They determine the specialization and structure of production [9]. Thus, the Altai and Krasnoyarsk territories, Novosibirsk and Omsk regions are in more favorable natural and climatic conditions to produce grain crops with high quality characteristics. Therefore, they form the “grain wedge” of organic matter in Siberia. Grain production per capita in the Altai Territory is higher than the average level of the Siberian Federal District by 2.7 times, in the Omsk region by 2.1 times and in the Novosibirsk region by 1.1 times. In the structure of production in the Siberian Federal District, wheat occupies 64.0%, oats - 14.2%, barley - 12.5%, buckwheat - 3.9%, leguminous crops - 3.1%, rye - 1.2%.

In the structure of grain crop production, the highest share of wheat is in the Omsk region - 72.2%, the Novosibirsk region - 66.8%, the Republic of Tyva - 64.8%, the Krasnoyarsk Territory - 64.4% and the Tomsk region - 63.7%. In the structure of production, rye leads in the Tomsk region - 3.7%, Kemerovo region - 3.5%, Altai Territory - 1.4%. Krasnoyarsk Territory - 1.3%. In oat production, the leading positions belong to the Irkutsk region - 21.2%, the Kemerovo region - 19.7%, the Omsk region - 18.0%, and the Krasnoyarsk Territory - 17.1%. The Altai Republic has the largest share under barley - 87.8%, the Khakassia Republic - 31.9%, the Tyva Republic - 23.0% and the Tomsk region - 20.8%. The largest share of leguminous crops belongs to the Novosibirsk and Tomsk regions - 4.3%, the Kemerovo region - 3.9%, and the Altai Territory - 3.6%.

The structure of grain production in Siberia was strongly influenced by prices. More favorable conditions for the production of organic grain and low production costs in the Altai and Krasnoyarsk territories, Novosibirsk and Omsk regions will contribute to the formation of large quantities of grain for delivery through interregional connections and for export (Azerbaijan, Kazakhstan, China, Mongolia and other countries). In turn, in the grain products subcomplex of the Siberian Federal District, negative trends have emerged in the location of wheat production - an increase in the share of wheat in the Tomsk, Irkutsk and Kemerovo regions, since there are no favorable natural and climatic conditions for obtaining high-quality food grain of organic wheat in these regions. This has a negative impact on the nutritional value of bread and baked goods.

In Siberia, there was a deterioration in the ratio in the production of grain fodder and leguminous crops. This contributed to a decrease in the content of digestible protein in one feed unit. The increase in demand for buckwheat from the population led to an increase in its sown area, mainly in the Altai Territory, which accounted for 87.1% of the regional level in 2019, i.e. 462.1 thousand hectares.

According to the executive authorities of the regions of the Siberian Federal District in the field of agriculture in the 2018–2019 agricultural year, the following structure of grain consumption by region of the Siberian Federal District developed: Altai Territory - 3.8 million tons (34.9%), Omsk Region - 1.6 million tons (14.6%), Novosibirsk region - 1.6 million tons (14.5%), Krasnoyarsk Territory - 1.3 million tons (12.3%), Kemerovo region - 1.1 million tons (10.0%), Irkutsk region - 0.9 million tons (8.0%), Tomsk region - 0.5 million tons (4.6%), Republic of Khakassia - 0.8% (88.7 thousand tons), Republic of Tyva – 0.1% (14.7 thousand tons), Altai Republic – 0.2% (21.2 thousand tons).

About 85% of winter rye and good prospects for organic production in the Altai and Krasnoyarsk regions, Novosibirsk region and Kemerovo regions. The main area for the production of organic cereal crops in Siberia is the Altai Territory. In 2020, the region produced 498.7 thousand tons of buckwheat, an increase against the 1986-1990 average. amounted to 722.9%. Buckwheat has a wide range. It is cultivated in many regions of Siberia. Barley, as one of the early-ripening grain crops, is produced in all regions of the Siberian Federal District, but the largest share in 2020 falls on the Omsk region (23.6%) and the Krasnoyarsk Territory (22.3%). Barley is the most valuable concentrated animal feed and is also used for food and technical purposes. Oats, unlike barley, are more demanding of heat and moisture conditions, but less demanding of soil fertility. It is in great demand in the feed and food industries. The largest share in oat production belongs to the Altai (24.8%) and Krasnoyarsk Territories (24.0%).

Millet is a valuable cereal crop and has the largest share in production for 2015-2019. belongs to the Altai Territory (76.3%), also to the Krasnoyarsk Territory (11.3%) and the Omsk Region (7.9%). Grain leguminous crops are especially valuable in terms of feed and food. In all regions of Siberia, they are sown for green fodder and silage and are valuable animal feed. The Omsk and Novosibirsk regions, as well as the Altai Territory, account for 82.8% of the production of grain legumes.

3.2 Livestock

Siberia is an area with a sharply continental and continental climate. Therefore, the growth in meat production and prospects for the development of organics in recent years is largely associated with the development of early maturing livestock sectors (pig and poultry farming) through the implementation of the priority national project “Development of the Agro-Industrial Complex,” which provided rural producers with access to credit resources. This made it possible to equip existing enterprises with modern equipment and acquire advanced Western technologies for growing pig and poultry products. In terms of their level of

development, pig farms and broiler poultry farms belong to the fifth technological structure, where the main production of pork and poultry meat in the region is carried out.

As a result, the production of pig and poultry meat in general in Siberia reached 472.0 and 482.4 thousand tons, respectively. In terms of efficiency, the leading place in the production of poultry meat is occupied by the Altai Territory, Tomsk, Omsk and Novosibirsk regions: their share in 2019 accounted for 338.4 thousand tons of manufactured products or 70.1% of the total. Pork production is successfully developing in the Altai, Krasnoyarsk territories, Omsk, Novosibirsk regions: their share in 2019 accounted for 70.9% of pig meat production in the amount of 334.8 thousand tons. Beef production ranks third - 22.5% of the total volume of meat production in the Siberian Federal District. In the Altai Republic, 14.9 thousand tons of beef meat and 5.2 thousand tons of deer meat are produced. Lamb meat production accounts for 2.1% of the total.

When assessing the production of organic livestock products, indicators of gross livestock production and animal productivity are used. For example, in the Tomsk region, milk yield per cow in 2019 was 5476 kg, in the Krasnoyarsk Territory - 5814 kg, and in the Republic of Altai and Khakassia from 3831 to 4042 kg, which is 53-57% of the genetic potential. The largest average daily gain of pigs was 667 g in the Novosibirsk region, then in the Tomsk region - 622 g, in the Irkutsk region - 596 g, the smallest gain in 2019 was in the republics of Tyva and Khakassia - 191 g and 277 g. Average daily gain of cattle in regions of Siberia in agricultural organizations shows that the genetic potential of animals is used by only 46-55%, but in regions such as the Tomsk region, Krasnoyarsk Territory it is 51-60%, in the Altai Territory, Novosibirsk and Omsk regions from 44 to 57% .

In terms of egg production per capita, the main regions in 2019 are the Omsk region - 447 pieces, the Altai Territory - 427 pieces, then the Novosibirsk region - 423 pieces, in general in the Siberian Federal District - 362 pieces, but in the Republics of Altai, Tyva, Khakassia and Tomsk region, egg production ranges from 19 pcs. up to 172.

In 2019, the district as a whole produced 2524.2 thousand tons of feed (capacity utilization rate is 59.5%). Only the Altai Territory is engaged in the production of compound feed for horses and sheep, and, for example, only the Omsk Region for fur-bearing animals, rabbits and nutria. At an accelerated pace, the expansion of the feed industry for organic livestock farming must be ensured in the Altai, Krasnoyarsk territories, Irkutsk, Kemerovo and Omsk regions, that is, in the regions of the main production of livestock products.

Summarizing the above, as strategic directions for the development of organic livestock farming, the main emphasis should be on intensification and scientific and technological progress. The main directions of scientific and technological progress will be: widespread introduction of zoned breeds: black-and-white, Simmental, red steppe with a productivity of 6000-7000 kg of milk, beef cattle - Kazakh white-headed, Kalmyk, Hereford breeds capable of giving an average daily increase in live weight during fattening of 1200-1300 gram; development and implementation of automated systems for mechanization of production processes; ensuring the standard level of milk consumption for feeding calves and piglets; a significant increase in beef production due to intensive raising and fattening of livestock, an increase in the number of slaughter contingents based on an increase in the yield and safety of young animals; development of beef cattle breeding, the share of beef cattle breeding in the total volume of beef production should be at least 20-25%; Improving feeding and improving the quality of feed balanced in essential nutrients will ensure an increase in animal productivity by 70%.

4 Conclusion

Thus, to develop the production of organic grain in Siberia, it is necessary to create specialized zones for the cultivation of strong and durum wheat, cereal crops, considering the

demand from the cereal, baking and pasta industries. Geographically, the cultivation zones look like this: for strong wheat - the steppe and southern forest-steppe of the Altai Territory, the south of the Krasnoyarsk Territory, Novosibirsk and Omsk regions; for durum wheat - part of the steppe and southern forest-steppe regions of the Altai Territory and Omsk Region. In these areas, it is advisable to create a network of specialized farms with a modern material and technical base for post-harvest processing and temporary storage of food grain. It is necessary to bring flour and cereal factories closer to the places where production is concentrated and, on this basis, to form large zones to produce high-quality flour for various purposes and cereals.

The gross harvest of winter rye and wheat should be increased to meet the internal needs of Siberia and supplies through interregional exchange in the Tomsk and Kemerovo regions, as well as in the northern forest-steppe, foothill, taiga and subtaiga regions of the Omsk, Novosibirsk, Irkutsk regions, Altai and Krasnoyarsk territories. Buckwheat production for supplies to the domestic and foreign markets must be concentrated in the Altai Territory, and for the domestic market in other regions of the Krasnoyarsk Territory, Novosibirsk and Omsk regions. In the northern forest-steppe, taiga-subtaiga, foothill and mountain regions, the focus on the production of feed grains should be increased. The main increase in grain production can be achieved mainly through further intensification of agriculture, carried out on the basis of qualitative changes in land exploration, that is, rationalization of the structure of use of arable land and sown areas.

A promising direction for the development of the grain product complex in Siberia is the creation of territorial clusters for the production of environmentally friendly and organic grain products, which requires the training of qualified personnel and the introduction of appropriate technologies [10]. Also in Siberia, it is necessary to expand domestic production of feed grains and modernize the feed complex to increase the production of organic livestock products.

In livestock farming, organic production in Siberia is also zoned: the tundra and forest-tundra are characterized by developed reindeer husbandry, hunting (mainly fur farming) is developed in the northern and middle taiga zones, and farming is developed in river valleys. The most productive zones are the southern taiga zone, forest-steppe and steppe. Western Siberia uses arable land as its main production asset: specialization is carried out in grain production and meat and dairy cattle breeding. Eastern Siberia has magnificent pastures and hayfields with developed sheep and dairy cattle breeding. Suburban areas specialize in the production of milk, poultry, pork, vegetables and potatoes.

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