Free-Range Organic Beef Cattle Breeding as a Way for Sustainable Development of Russian Rural Territories

Zinaida KOZENKO¹, Sandzhi KOTEEV², Ivan NEDZIEV¹, Alexandra BOBICHEVA³ and Konstantin KOZENKO⁴,*

¹Volgogral State Agrarian University, Volgograd, Russia
²Federal Research Center of Agrarian Economy and Social Development of Rural Areas—All Russian Research Institute of Agricultural Economics, Moscow, Russia
³Volgograd Regional Station of Animal Disease Control, Volgograd, Russia
⁴All Russia Research Institute of Irrigated Agriculture, Volgograd, Russia
*Corresponding author

Keywords: Organic Agriculture, Organic Livestock, Organic Beef Cattle Breeding

Abstract. Paper reviews a potential for producing organic beef under environmentally friendly conditions. Environment of southern Russian regions allows to implement an innovative low-cost technology of cattle breeding conforming to world standards for organic agriculture. In this regard, paper reveals a development trend of organic productions markets, analyzes an institutional environment for organic food production, and considers a problem of unsustainability of Russian agriculture due to low hectare revenues and most risky weather conditions. As a way of solution for this problem there proposed a practically proven technology of free-range cattle breeding, allowing to improve the economic efficiency of agricultural lands by buildup of an extended production chain in transforming naturally and artificially grown forage grasses and grains in high-quality organic beef. High added value of this product and minimization of costs for its production under free-range conditions allows to receive a hectare revenue up to 3600 USD.

1. Introduction

A sustainable development of rural areas of Russia seems extremely difficult without the formation of new industries in rural areas, especially of livestock breeding due to its lesser dependence on a weather and market conditions, and also due to its possibility to receive highest revenue from each hectare of agricultural lands. Among of all animal husbandry forms beef cattle breeding under conditions of Russia builds up a most extended and sustainable production chain with increased added value.

It is related to peculiarities of development of organic products markets in Russia: while other countries are mostly characterized by a transition to organic farming from intensive conventional agriculture with high chemicalization, in our country the very crisis of post-Soviet transformation of agriculture deprived many agricultural enterprises and farmers of economical possibilities to fertilize and spray crops and use various growth stimulants for agricultural animals. These crisis conditions spontaneously formed a lot of unique opportunities for organic agricultural production and development of markets for its sales.

However, an economical scientific knowledge for this topic is difficult to characterize as satisfactory at the moment. Moreover, a problem of effective functioning of the market for organic cattle meat still has not yet received its proper institutional fixation. Due to that, an expediency of this paper is related to prospectives for buildup an environment-economic basis for sustainable development of rural areas by
implementing the low-cost technologies of organic cattle breeding, being more sustainable, profitable and environmentally friendly than a conventional agriculture.

In this regard, a scientific novelty of this paper lies in a development of theoretical foundations and practical recommendations on free-range husbandry of meat cattle breeds, what will allow to increase an economic efficiency of agricultural land and buildup a stable cash flows in rural areas. This, in turn, will allow an expanded reproduction of fixed assets of farms and agricultural enterprises and a relief for socio-economic issues of rural population.

2. Results and Discussion

Organic agriculture, including livestock, currently is one of the most promising areas for creating new production chains with high added value. Organic agriculture and its livestock sector became a global trend, taking roots in agriculture of more than 170 countries. 84 countries are already implemented a legal regulation for organic agriculture. A world area of agricultural land used for organic production currently stands at 43.1 million hectares, while in 1999 their area was only 11 million hectares [1].

In the United States, the area of certified organic land is more than 2 million hectares, in the EU countries, organic areas on 2018 year are 14.6 million hectares. Global area of organic arable land is about 12.1 million hectares, which in relative terms is 17 percent of the global area of organic land or 0.8 % of the total area of world arable land.

Among the land certified for IFOAM standards for the organic production, Argentina and Australia have the largest areas, each of these countries accounts for more than 20 million hectares, and a vast majority of these areas is used for pasture of sheep and cattle of meat breeds [2]. It is noteworthy that such livestock breeding has been a basis for agrarian economy of these countries for more than one century, however, it fits perfectly into the latest institutional trends. For the southern regions of Russia, including the current territory of the Volgograd Region, technologies that were mostly similar to Argentinean ones for loose livestock breeding on nutrient-rich steppe hay. Creation of collective farms and state farms in 1930s years entailed the formation of a new livestock paradigm, which has a number of systemic flaws. Among these, it was necessity to single out the focus on planned indicators without taking into account production costs, which could be effective in the command-administrative distribution system, but is fundamentally uncompetitive in modern market environment. An equally important problem was the priority of dairy cattle breeds, with beef production mainly based on residual principle from culling dairy herds. It was not allowing to fully reveal the economic potential of modern breeding achievements to improve beef cattle breeds with accelerated muscle gain.

Solving these problems in the livestock industry of Russia will allow, on the one hand, to obtain significant savings on production costs, and on the other hand, to take advantageous positions in the emerging market of organic products.

This global market is subjected to steady growth and resistant to economical crises. It had increased in value terms by almost four times from 2000 to 2015 to $ 81.6 billion, and, according to a number of expert forecasts, in 2020 its turnover will be able to exceed $ 200 billion [3]. The number of certified global organic producers in the world exceeds 2.7 million. Meanwhile, the Russian organic market is currently significantly behind the world level for a number of institutional and technological reasons. According to Yu. V. Chutcheva, the volume of Russian organic market is about $ 200 million, but up to 90 percent of organic products are of import origins. Nevertheless, this market in Russia is characterized by high growth rates ahead of world indicators, increasing by 30-40 percent annually from its initially low basis. Moreover, a total potential of Russian production of organic agriculture in value terms is up to 12 billion $ annually, with up to 8 billion $ accounted for a possible capacity of export markets for organic products [4].
Since 2015 year in Russian institutional environment there were adopted some key regulatory acts for organic agriculture. First it were National Standards of the Russian Federation “GOST R 56508-2015:“Organic products. The rules of production, storage, transportation” and GOST R 57022-2016 "Organic production. The procedure for voluntary certification of organic production". Second, there was adopted the Federal Law on Organic Products dated August 3, 2018 No. 280-FZ, but its entry into force was postponed until January 1, 2020. At present, it's quite hard to call these regulations an effective legal measure. So, according to A. Frolova, there are just up to 70 agricultural producers in Russia who have certified their organic products by international standards, while 39 enterprises produce certified organic products in crop production sector, and only three are producing organic livestock. However, additional margin in organic production branch in comparison with conventional, chemicalized agriculture, comprises up to 80%, especially for agricultural producers controlling an entire production and processing chain [5].

With regard to Russian organic lands, it should be noted that, according to FiBL and the Ministry of Agriculture of the Russian Federation, 290 thousand hectares of land are certified, by the total area of which Russia has the fourteenth place in the world, however, it occupies only 0.2% in the volume of production of certified products. Average land area of certified Russian organic agriculture enterprise is approximately 3400 ha. Thus, this segment of domestic agricultural production is only at the very beginning of its development and will expand as the institutional environment improves, for example, subsidizing part of certification costs for farmers, as is done in the USA and the EU. From a formal point of view, only two percent of Russian agricultural lands are certified by international standards for organic farming. Difficulties of certification are related to institutional, technological and environmental factors.

In particular, significant degradation processes are inherent in soils with intensive crop production. A removing of nitrogen, phosphorus, potassium and other nutrients from the soil along with crop harvest is compensated by mineral fertilizing by only 25-30 percent, which forms a critical need for addition with organic fertilizers. But a volume of Russian organic fertilizer market is less than 2 percent of market of mineral fertilizers, and by last ones domestic agricultural producers are also not adequately provided with. At the same time, the global market of organic fertilizers is characterized by dynamic growth of up to 10 percent per year [6].

In this case, it is free-range beef cattle breeding could successfully solve this problem because it does not require any chemical fertilizers, and soil fertility on pastures increases steadily year-on-year due to manuring by cattle, if there is an adherence to the rules of rational grazing.

Thus, the free keeping of livestock in such conditions conforms even the most stringent requirements of the European Union for organic farming, where organic livestock production strictly demands a natural feeding, loose housing and a ban for antibiotics using [7].

Russian national standards for organic livestock production are basically unified with European rules. The main features of organic animal husbandry is, firstly, the keeping of animals close to natural conditions, secondly, it is necessary to feed the animals without a use of synthetic feed additives, and, thirdly, only natural mating [8].

Especial relevance for free-range organic beef cattle production is inherent to clause 7.11.2.2 of National Standard “Organic Production. Rules of production, storage, transportation”, where is stated that “a system of raising herbivores during their life should be based mainly on grazing in accordance with an availability of pastures at different times of year” [9].

Another important legal rule lies in Appendix “G” of the indicated document, which indicates an admissibility of keeping up to 5 calves per 1 ha of pasture where they are fed, what is quite possible under conditions of their high-intensity feeding of corn grown in organic conditions.
Currently, cash crops cultivated by agricultural producers of southern Russia are providing them a fastest possible return of funds due to the short production cycle of a few months. In absence of cheap borrowed funds it allows farms to and to carry out the reproduction of their productive assets, even expanded under favorable conditions. However, without animal husbandry, this paradigm of agricultural business has a number of systemic, fatal flaws. So, purely crop production enterprises are most dependent on negative weather conditions, and do not have access to cheap organic fertilizers, which reduces the profitability of crop cultivation. In addition, there were formed a market conditions focused on a predominance of food wheat and oilseeds, mainly exported, so insufficiently diversified crop production remains vulnerable to fluctuations in a financial markets quotations of currencies, a price of exchange futures for relevant crops and a number of other macroeconomic and political risks.

In this regard, a development of scalable and replicable technological solutions for the production of organic agricultural products for rural areas is of special importance.

A. A. Polukhin and V. K. Devin noted that the main risks of the transition from intensive conventional production to organic one are related to duration of this process, as well to low technical endowment of small and medium agricultural producers [10].

However, the key advantage of the free-range cattle breeding is precisely a fact that it does not require significant investments and a well-developed technical base for a farmer. Effective cost optimization is achieved primarily due to absence of livestock buildings, replaced by a special method of arranging winter pastures for cattle. A field allocated for winter pastures is divided into areas where organic feed is stockpiled in a form of rolls of hay, which are prepared and left on a field in advance, as well as areas where the grass does not mows at all. At beginning of winter, with a low level of snow cover, cattle feeds on this unmowed grass without difficulty. Then, when feeding becomes difficult for cows and calves, livestock is being driven to prepared winter pasture sections with hay rolls, subsequently changing sectors by exhaustion of food stockpile. At beginning of spring, when the snow had already melted, but there is still no green grass, herds are driven to areas with remained vegetation where were no neither hay rolls nor cattle, and are fed there upon summer.

This technology almost eliminates costs for transportation and fully eliminates costs for cleaning of manure during the whole winter period. Also it qualitatively reduces costs of feed, for example, decreasing expenses on 1 kg of roughage to approximately 2 US cents.

The most important technological know-how here is a rational buildup of winter pastures as a main element of cost reduction during wintertime. Optimal areas for these pastures are fenced meadows with perennial grasses or natural hayfields, where a grass is mowed and baled by appropriate tractor-mounted equipment. Unlike a conventional technology, hay bales are left in place and not twisted with a thread, what allows to significantly reduce a cost of work on the preparation of feed and increases productivity of this operation, since the number and complexity of technological operations are sharply minimized. Loading, transportation, and laying of bales are not required. Cattle throughout the winter has free access to these feeds. Livestock watering in winter pastures is provided by installing automatic drinkers, provided by a well, a deep pump, and a hard coating around drinking bowl. Water enters through an overpressure valve and automatically shuts off the water supply as bowl fills. In addition, drinking bowls are equipped with heating unit to prevent freezing.

All this minimizes production and labor costs, making the technology available to almost any agricultural commodity producer on rural territories.

This technology of organic beef fattening is divided into three technological stages. The first one is a housing of cows with calves on a suction, the second is a separation and rearing of young animals, the third is a period of intensive fattening. A technological development of all these three stages is a main factor for increasing the production of organic meat under conditions of Russia.
A loose housing of cows with calves on a suction in open-air walking areas is the simplest, resource-saving technology, ensuring a minimum cost of keeping calves and a highest labor productivity of farm staff for young animals. However, for this method of keeping cows, seasonal organization of calving is necessary. Under conditions of southern Russia and Volgograd region it is most appropriate in April for climatic reasons.

With this technology, calves are raised on suction until they reach an age of 6-8 months. During a suction period, the calf consumes up to 1,500 kg of milk, mainly feeding it until three months of age. At the same time, early training of calves for roughage and concentrates is extremely important. As a rule, calves are beginning to eat grass and hay from 15-20 days of age. Food is placed in a special feeders, making it accessible to calves, but not to cows. In cases of high weight gain of young animals (more than 1000 g per day) and reaching a live weight of 200 kg by six months, their early weaning from cows is most appropriate. This allows cows to quickly restore their mass, increase their fatness, improve fertility and acquire the greatest resistance to winter conditions.

Calves taken from cows are weighed and divided into groups. Young cows intended to replenish broodstock are kept separately, while rest of young animals are transferred to rearing, where they are kept in small groups of up to 50 animals. Under the proper conditions of keeping and high-quality breeding stock, a daily gain of weight on this stage could reach up to 1300 g. per day. It takes 130-150 days to grow young animals and requires maximum use of roughage and succulent feed in combination with organic feed concentrates. Oxen having reached a mass of 420-450 kg are transferred on intensive final fattening.

In this final third period of intensive fattening, more concentrates should be introduced into diet of animals due to a reduction of roughage. This allows to achieve sustainable weight growing, to increase bait and, for prospective slaughter, slaughter yield also significantly increases and meat quality improves. Animals that have reached the planned weight and the desired fatness should not be housed on farm too long, as this leads to a decrease in growth and food cost overruns.

The organization of such feedlots of intensive fattening is most optimal under condition of large farms where livestock concentrations reach up to 10,000 heads due to relatively high demands for grain and food concentrates. Under current market and production condition, oxen fattened up to 450 kg are mostly sold to slaughter after the second stage. It is mostly related to underdevelopment of organic food markets at the moment. However, prospectives for growth of organic meat market could allow to buildup this final stage as most effective form of organic beef production.

3. Conclusion

The systemic crisis of Russian agriculture, depriving many agricultural producers of a possibility for intensive conventional agriculture with high chemicalization, at the same time had created new possibilities for innovative development of organic farming, leaving vast areas of agricultural land without mineral fertilizers. Proposed technology of beef cattle breeding allows to use not only such fields for summer and winter pastures, but also graze cattle on various inconvenient lands represented by gullies and other sorts of rough terrain being not suitable for crop production. In addition, organic beef cattle breeding qualitatively increases a profitability of agricultural land, which is especially important for development of green rural economy and sustainable development. So, when selling grain from the harvest of 2018, agricultural enterprises of the Volgograd Region received approximately 250 $ from 1 ha of wheat, and from corn there was approximately 590 $ of revenue. This grain was exported, and added value of its processing had enriched foreign economies. But, if same amounts of grain under same production conditions were fed to beef cattle, there could be obtained 638 kg of meat from 1 ha of wheat, and 2058 kg from same area of corn crops. And after the sale of fattened to 420-450 kg bull-calves at a price of 2 USD per 1 kg, even in current market conditions being not very favorable for farmers, a hectare
revenue of wheat will be about 1120 $. Corn usage in cattle feeding allows to receive up to 3600 $ per hectare.

References
[1] T.E. Marinchenko, Organic Agriculture: Prospects for Russia [C] // Food. Ecology. Quality. Proceedings of the XIII International Scientific Conference. Krasnoyarsk, 2016, 262-266.
[2] H. Willer, J. Lernoud, “The World of Organic Agriculture Statistics and Emerging Trends 2019” [M], Bonn: Research Institute of Organic Agriculture (FiBL, Frick, and IFOAM—Organics International), 2019.
[3] A.S. Tarasov, The development of organic agriculture: quality control and strategic priorities [J]. Bulletin of the Don State Agrarian University, 2018, 4-2 (30), 91-98.
[4] Yu. V. Chutcheva, O.S. Nefedova, Organic agriculture - a new look at development of the agrarian economy of Russia [J]. Science Without Borders, 2016, 4 (4), 5-9.
[5] O.A. Frolova, O.V. Ivanova, L.V. Efimova, Study of prospects for development of organic livestock in the Russian Federation, taking into account the characteristics of the national economy [J]. Bulletin of the Kursk State Agricultural Academy, 2018, 7, 121-126.
[6] A.L. Garzanov, O.A. Dorofeev, What to do with organic waste from poultry and livestock [J]. Farm News, 2018, 2, 67-69.
[7] A.G. Paptsov, L. G., Akhmetshina, Organic farming in EU: development trends and regulatory experience [J]. Agri-Food Policy of Russia, 2014, 8 (32), 80-84.
[8] D.G. Galkin, Legal regulation of organic livestock production in Russia and EU [J]. Economics and Business: Theory and Practice, 2018, 11-1, 63-66.
[9] National standard of the Russian Federation GOST R 56508-2015 "Products of organic production, the rules of production, storage, transportation”. Moscow: Standardinform, 2015.
[10] A.A. Polukhin, V.K. Devin, Technological biologization and ecologization as a stage of transition to organic animal husbandry in context of technical modernization [J]. Economics of agricultural and processing enterprises, 2018, 12, 56-58.