Preconditions and conditions of creating organic production in the Baikal region

Arnold Tulokhonov, Anna Mikheeva, Svetlana Ayusheeva, Tamir Boldanov, and Nadezhda Botoeva

1Baikal Institute of Nature Management Siberian branch of the Russian Academy of sciences, Sakhyanovoy str., 6, Ulan-Ude, 670047, Russia

E-mail: asmiheeva@binm.ru

Abstract. The economic growth associated with maximizing profits from the use of natural resources and the environment has exhausted itself. The ideology of organic farming implies an optimal combination of the interests of the rural population, consumers of environmentally friendly products and a healthy environment. In recent years, the idea of using a national Baikal brand in the food market has been widely demanded and relevant. Such a pioneer product is the production of bottled Baikal water that meets international quality standards. An obstacle to the wide access to the world market for this product is the legislative restrictions in most developed countries on the consumption of drinking water from open sources. However, the upcoming world water crisis will open up prospects for a wider use of Baikal water, primarily, in densely populated Asian countries. In recent years, breeding of native breeds of farm animals adapted to the local climate, which comply with the principles of organic farming, has been revived in the Baikal region. In addition, the proximity of the external export market determines the possible production of specific “halal” products that are targeted at Southeast Asian countries with a predominantly Muslim population. In Mongolia, practical steps have been taken to produce “religious-specific” organic products, including the national quality standard for “halal” products. The high quality of meat products based on pastoralism corresponds to the rules of kosher food. Strict laws of “kashrut” may correspond to beef and lamb, as well as high-quality fish products of endemic species of the Baikal basin. These factors give a particular specificity to the concept of organic products, which combine the quality of ecological products with the uniqueness of the Baikal brand, the national specificity of Buddhism culture and traditions of oriental culinary.

1. Introduction

The main tasks facing agricultural production in most countries of the world are the production of high-quality and wholesome food products, maintaining and improving the vitality of ecosystems and sustainable development of rural territories [1]. The fulfillment of these tasks becomes possible within the framework of the concept of organic agriculture, which implies the abandonment of chemical means of protection, stimulation of plant growth, the use of hormones and other biological active substances in both crop production and animal husbandry; non-use of gene and radioisotope technologies; minimizing the use of mineral fertilizers in crop production; loose animals in livestock, grazing in the summer and the use of feed obtained by “organic” technologies [2]. Ecological and economic aspects of the location of objects of economic activity, including agriculture in areas with environmental restrictions
are presented in [3]. The excess of the environmental benefits of organic agriculture in comparison with the traditional one and the analysis of production indicators of organic agriculture are reflected in [4,5].

Reducing greenhouse gas emissions and a positive impact on biodiversity are studied in [6,7,8]. A comparative analysis of the economic and energy efficiency of organic and traditional agriculture is presented in [9].

The Food and Agriculture Organization of the United Nations gives the following definition: organic agriculture is a holistic production management system that supports and promotes the health of the agro-ecosystem, including biological diversity, biological cycles and soil biological activity. This is a system that focuses on management practices, and not on the use of external agricultural resources, taking into account that specific regional conditions require their own systems adapted to their region. All this is accompanied by the application, where it is possible, of agronomic, biological and mechanical methods, as opposed to the use of synthetic materials to ensure functioning within the system [2].

According to IFOAM (The International Federation of Organic Agriculture Movements), organic agriculture is a production system that supports the health of soils, ecosystems and people. This system depends on ecological processes, biological diversity and natural cycles characteristic to local conditions. It does not use unfavorable resources. Organic agriculture combines tradition, innovation and science to improve the environment and develop equitable relationships and a decent standard of living [10].

2. Materials and Methods

The organic agriculture market is growing every year. According to the data of Institute of Organic Agriculture, organic agriculture is being developed in 181 countries (Table 1). In 2017, the total land area used in organic agriculture was 69.8 million hectares. The largest areas are certified for organic agriculture in Australia (35.6 million hectares), Argentina (3.4 million hectares), China (3.0 million hectares). The total increase in organic land over 17 years has grown by more than 6 times. In 2017, the number of producers of organic products reached 2.9 million. The largest number of producers was registered in India - 835 thousand, Uganda (210 thousand), Mexico (210 thousand). The largest number of manufacturers work in this industry in Asia - 1.1 million. The market for organic products continues to grow, and in 2017, its volume reached 97 billion dollars. The leaders are the United States (45.2 billion dollars), Germany (11.3 billion dollars), France (8.9 billion dollars).

Table 1. Development of organic agriculture in the world. Source: compiled on the basis of [11].

| Indicators                                | 1999 | 2013 | 2014 | 2015 | 2016 | 2017 |
|-------------------------------------------|------|------|------|------|------|------|
| Organic farming area, million ha          | 11   | 43.1 | 43.7 | 50.9 | 57.8 | 69.8 |
| Number of countries with certified organic production | No data | 170 | 172 | 179 | 178 | 181 |
| Number of organic producers in the world, million | 0.2 | 2.0 | 2.3 | 2.4 | 2.7 | 2.9 |
| World organic production, billion dollars | 15.2 | 72   | 80   | 81.6 | 89.7 | 97   |

Organic farming has been developing in Russia for over 10 years. Currently, the organic market in Russia operates spontaneously. The production of organic products requires separate legislative regulation, since the technologies used in its production significantly differ from the technologies used in traditional agriculture. Of the 181 countries, only half have their own laws on organic farming.

In 2018, the Federal Law “On Organic Products and Amending Certain Legislative Acts of the Russian Federation” was signed [Russian standard about organic production], which is aimed at creating conditions for the sustainable development of organic agriculture in the Russian Federation in
order to provide the domestic market with domestic organic food products, effective since January 1, 2020.

According to article 2 of this law, organic agriculture is a set of types of economic activity that are defined by the Federal Law of December 29, 2006 N 264-FZ “On the Development of Agriculture” [13], the implementation of which uses ways, methods and technologies aimed at ensuring favorable environmental conditions, improving human health, maintaining and restoring soil fertility.

The new law prescribes the requirements that must be observed in the production of organic products, in particular, prohibitions on the use of agrochemicals, pesticides, antibiotics, growth stimulators and sagination of animals, a ban on the use of embryo transplantation, cloning and genetic engineering methods, genetically modified and transgenic organisms, a ban on the use of the hydroponic method of growing plants, a ban on the use of ionizing radiation, etc.

The volume of production of the Russian organic market is approximately 25-30 million euros. Russia occupies 0.2% of the global market for organic products. Organic agriculture occupies 290 thousand hectares (14th place in the world in the number of certified organic land) (European certificate). The number of organic producers in Russia is about 100 companies (135th in the world).

The reason for the serious lag in the Russian market for organic products was the lack of a regulatory framework and, as a result, a unified system of certification and standardization of products.

At the moment, only the “Organic Expert” organization is accredited by the Federal Accreditation Service, which provides organic certification services in Russia. This organization is engaged in certification of organic crop production; organic animal husbandry, poultry farming; organic beekeeping; organic aquaculture; processing enterprises; trade enterprises, including cafes and restaurants [12].

E. Schulze, N.V. Pakhomova et al. [13] summarized in their work the experience of switching to environmentally oriented farming models in some regions of Russia with the development of recommendations for modernizing state policy. In the absence of federal legislation, a number of regions (Ulyanovsk and Belgorod regions, Krasnodar Territory, the Republic of Tatarstan, etc.) adopted laws on organic farming at the regional level, focusing, as a rule, on European requirements, since the specifics of the new sector of the agricultural economy determine the need to comply with certain conditions that must comply with international standards. Agricultural landscapes, which produce agricultural and livestock products, should be as far away as possible from industrial centers that pollute airspace and adversely affect the aquatic environment. Another condition for the production of organic products is the creation of the most natural habitats for livestock, and primarily the use of natural pastures.

In our opinion, the landscapes of Inner Asia, where the most productive pastures and arable lands of the Selenga River basin, the basins of the Big Lakes, Altai-Sayan Highlands, in which there is no influence of chemical and other industrial wastes, are most suitable for such requirements. Moreover, in the greater territory of the Baikal region, in connection with the protection of the unique ecosystem of Lake Baikal - a site of world natural heritage, the use of chemicals in agriculture is prohibited by law for many decades.

3. Discussion
Lake Baikal and the adjacent territory have a special status fixed at the world level as a UNESCO World Heritage Site (1996). At the federal level, the only federal law of regional action was adopted - Federal Law No. 94-FZ dated May 1, 1999 “On the Protection of Lake Baikal” [Russian standard about Protection of Lake Baikal] and a number of regulations to this law, which significantly limit economic and other activities that negatively affect the ecosystem of Lake Baikal [Russian standard about activities prohibited in the Central Ecological zone of the Baikal Natural Territory; Russian standard about Ecological zoning of the Baikal Natural Territory; Russian standard about statement of the borders of the Baikal Natural Territory; Russian standard about borders of water protection and fish conservation
zones of Lake Baikal]. As for agricultural production and processing industry, the following is prohibited in the Central Ecological Zone of the Baikal Natural Territory (CEZ BNT):

- construction of buildings and structures of enterprises of light, food, microbiological, flour and cereal, animal feed and medical industries, except for the construction of buildings and structures of enterprises for the production of bakery, confectionery and pasta, bottling of drinking water from Lake Baikal, processing of wild plants, vegetables, fruits and berries production of personal subsidiary and peasant farms, as well as the production of herbal medicines;
- economic activities for the acclimatization of biological objects unusual for the natural ecosystems of the Baikal natural territory;
- discharge of wastewater without purification to standard quality, as well as wastewater containing toxic and other substances for which maximum permissible concentrations of these substances in water bodies of fishery purpose have not been established.

Most of the territory of Buryatia (62.7%) is part of the Baikal natural territory, occupying 64.3% of the central ecological zone (57.27 thousand km$^2$), 74.5% of the buffer ecological zone (162.37 thousand km$^2$), and 1% of the zone of atmospheric influence (0.8 thousand km$^2$).

In 2014, a new version of the Federal Law “On the Protection of Lake Baikal” was adopted, which tightens the nature management regime on the territory of the Baikal natural territory:

- construction and reconstruction of economic facilities without a positive conclusion of the state environmental expertise of design documentation is prohibited;
- it is prohibited to transfer the lands of the forest fund occupied by protective forests to lands of other categories, with the exception of the transfer of such lands of the forest fund to the lands of specially protected territories and objects when creating specially protected natural territories in the CEZ;
- it is prohibited to place production and consumption waste of I - III hazard classes in the central ecological zone;
- the maximum permissible volume of discharges and emissions of harmful substances, the disposal of production and consumption waste is subject to mandatory annual review taking into account the environmental conditions of the BNT [16].
- The width of the fish protection zone is 500 m [Russian standard about borders of water protection and fish conservation zones of Lake Baikal]. According to the Water Code of the Russian Federation [Russian standard about water], the following is prohibited within a water protection zone:
  - the use of wastewater in order to regulate soil fertility;
  - placement of cemeteries, cattle cemeteries, production and consumption waste disposal facilities, chemical, explosive, toxic, and poisonous substances, radioactive waste disposal facilities;
  - implementation of aviation measures to combat pests;
  - movement and parking of vehicles (except for special vehicles), with the exception of their movement on roads and parking on roads in specially equipped places with a hard surface;
  - placement of gas stations, warehouses of fuels and lubricants, service stations used for technical inspection and repair of vehicles, the implementation of washing vehicles;
  - placement of specialized storages of pesticides and agrochemicals, the use of pesticides and agrochemicals;
  - discharge of sewage water, including drainage;
  - exploration and production of common minerals.

The possibilities of transition to alternative ecologically sustainable agriculture require consideration of the issues of existing restrictions in economic activity, economic efficiency of production and possible problems in the organization and activity of organic production.

The scale of the existing economic activity and the possibility of creating new industries are limited, first of all, by the need to preserve Lake Baikal itself - a unique natural phenomenon. Its
ecosystem is inextricably linked with the natural and economic complexes of the entire catchment area of the lake. Therefore, the organization of ecologically safe organic agricultural production in this territory fully complies with the requirements of a special nature management regime.

It should be noted that the introduction of a system of environmental restrictions in agricultural production in the Baikal region allowed us to consider these territories as pilot ones for the development of organic agriculture, since it is here where, in addition to generally accepted, special standards of natural quality environment and impact on natural complexes exist for quite a long time (since the 1980s).

The transition to alternative ecologically sustainable agriculture requires a separate consideration of the issues of economic efficiency of production.

Nowadays, literary sources do not have specific calculations for assessing the economic efficiency of organic production in Russia. Having considered the system of environmental regulation in agricultural production at BNT, we can note some elements of environmentally oriented production, in particular, a complete ban on the introduction of mineral fertilizers in the central ecological zone, a change in the technological base of production, and special requirements for the introduction of advanced ecologically safe technologies. These elements partially correspond to the basic principles of organic production. However, considering in aggregate the development of modern agricultural production in the Baikal region, legal and regulatory support, and state investment policy, it can be objectively stated that the creation of real conditions for organizing organic farming is still very far away. In 2018, in the Kabansky district, mineral fertilizers were applied for grain crops.

According to the Ministry of Natural Resources of the Republic of Buryatia, 71 settlements and more than 66.5 thousand inhabitants live within the borders of the Central Ecological Zone of the Baikal Natural Territory in the Republic of Buryatia.

As a model territory, we have chosen the Kabansky district of the Republic of Buryatia, on which the development of mechanisms and tools for organic agricultural production is possible. The Kabansky district is almost completely part of the CEZ BNT (88.9%). In 2016, 26,247 people or 45.7% of the population of the Kabansky district lived in the CEZ BNT (table 2).

Table 2. Characteristics of the municipality “Kabansky region” of the Republic of Buryatia. Source: compiled on the basis of [14, 15].

| Indicators                                      | 2012       | 2016       |
|------------------------------------------------|------------|------------|
| Area of the municipality, km²                  | 13537      |            |
| Population of the municipality, people         | 59274      | 57423      |
| Number of rural settlements                     | 19         |            |
| Number of localities of rural settlements       | 62         |            |
| Number of rural settlements included in the CEZ BNT | 17         |            |
| Area of rural settlements included in the CEZ BNT, km² | 12019.7    |            |
| Number of localities of rural settlements included in the CEZ BNT | 50         |            |
| Proportion of the area of rural settlements included in the CEZ BNT, % | 88.9       |            |
| Number of people living within the CEZ BNT, people | 27272      | 26247      |
| Proportion of the population living in the CEZ BNT, % | 46         | 45.7       |

As of July 1, 2018, the agricultural industry of the Kabansky district is represented by 10 agricultural organizations (FSUE “Baikalskoye”, LLC “Rubin”, LLC “BTPK”, SEC “Tvorogovsky”, SEC “Baikalo-Kudarinsky”, etc.), 8 agricultural consumer cooperatives (ACC “Kabansky”, ACC “Rubin”, ACC “Niva”, etc.), 17 organizations work in the food and processing industry. In total, 116 peasant farms and 13.6 thousand private subsidiary farms operate in the Kabansky district. Grain production, vegetable growing, and also dairy cattle breeding are traditionally developed in the Kabansky district (table 3).
Table 3. Key indicators of agriculture in the Kabansky district of the Republic of Buryatia. Source: [16].

| Indicators                  | 2000   | 2005   | 2010   | 2016   |
|-----------------------------|--------|--------|--------|--------|
| Sown area of crops, ha      | 30679  | 19748  | 14587  | 14036  |
| cereals                     | 18203  | 7090   | 5377   | 5103   |
| potatoes                    | 1951   | 1717   | 1507   | 1358   |
| vegetables                  | 291    | 383    | 145,9  | 138    |
| Gross crops, t              |        |        |        |        |
| cereals                     | 18365  | 7638   | 5320   | 3435.8 |
| potatoes                    | 17487  | 25551  | 19755  | 14412  |
| vegetables                  | 6055   | 8746   | 3605   | 3275.1 |
| Crop yield, kg / ha         |        |        |        |        |
| cereals                     | 15.2   | 10.8   | 18.7   | 12.3   |
| potatoes                    | 90     | 149    | 131.7  | 106.5  |
| vegetables                  | 211    | 195    | 255.2  | 251.7  |
| Pasture area, ha            | 20046  | 19026  | 19026  | 19104  |
| Livestock, conv. heads      |        |        |        |        |
| (end of year)               | 35.8   | 22.7   | 20.1   | 18.4   |
| cattle                      | 25.6   | 18.8   | 17.3   | 16.4   |
| pigs                        | 7.8    | 2.3    | 1.2    | 0.8    |
|                            | 2.4    | 1.6    | 1.6    | 1.2    |

Over the years under consideration, the area of sown crops in the Kabansky district decreased almost 2 times, including significantly reduced the area of cereals (3.6 times), vegetables (2.1 times), potatoes (1.4 times). During 2000-2016, cereal crop productivity varied at the level of 12.3-18.7 kg/ha. The yield of potatoes and vegetables did not change significantly. In the Kabansky district, cereals and legumes are traditionally grown by large agricultural enterprises (2016 –98%), potatoes and vegetables - on households (2016 –88.1% and 81.8%).

The number of farm animals also decreased significantly (1.9 times) for the period from 2000 to 2016. In 2016, 60.3% of the cattle population, 71.4% of the pig population, 91.5% of the sheep and goat population were in the households.

4. Results
Institutional factors (environmental restrictions, state support of rural producers), favorable climatic factors, high rural population (56.2% in 2017), relatively close proximity to sales markets (Kabansk, Kamensk, Selenginsk, Ulan-Ude), a significant number of tourists as potential buyers of environmentally friendly products who annually visit the Kabansky district (195 thousand people in 2016) create the prerequisites for organizing organic agriculture in Kabansky district. The ideology of organic production involves the optimal combination of the interests of the rural population, consumers of environmentally friendly products and a healthy environment. Such an approach involves the achievement of a trinity of goals and a combination of social, economic and environmental aspects of this problem, which are interdependent and inextricable [17].
Compliance with environmental restrictions contributes to the preservation of the natural environment and the reduction of negative anthropogenic impact, which meets the long-term public interests. But directly for the manufacturer - it leads to direct loss of products and lost profits, to an increase in the labor and material consumption of products, requires significant costs to replenish the resource base, the introduction of environmentally friendly technologies and equipment, etc.

Bardakhanova T.B. and Mikheeva A.S. conducted studies on the development of methodological approaches for assessing additional environmental costs, direct loss of products and lost profits associated with the system of environmental restrictions on BNT, including for agriculture [18].

The determination of additional environmental costs consists in assessing changes in production conditions that will occur as a result of environmental restrictions and identifying quantitative relationships between them and production costs.

The calculation of the additional costs of production in a particular industry ($\Delta C$) is proposed to be carried out as follows:

1. Factors affecting cost growth are determined ($i = 1,2,...,m$);
2. The coefficients of rise in price of products for each factor ($K_i$) are calculated:
   \[
   K_i = \frac{(C_i - C_0)}{C_0} + 1, \quad (1)
   \]
   where $C_0$ and $C_i$ – the cost of production per unit of production in situations “without environmental restrictions” and “establishing restrictions”.
3. The general coefficient of rise in price of industry products is determined taking into account production volumes for each of the factors:
   \[
   K_o = \frac{(V - \sum V_i + \sum V_i K_i)}{V}, \quad (2)
   \]
   where $V$ – total production in the industry; $V_i$ - the volume of production taking into account the $i$-th “more expensive” factor.
4. The total value of the increase in environmentally related costs is determined by the formula:
   \[
   \Delta C = C - \frac{C}{K_o}, \quad (3)
   \]
   where $C$ – the cost of marketable products of the industry.

The work [18] gives the results of calculations of increased environmental costs, loss of products and lost profits in the agricultural sectors of the Republic of Buryatia, performed in accordance with the developed methodological approaches, which were adopted by the legislative bodies of the Republic of Buryatia and Russia.

To compensate for losses in agriculture associated with the limitation of the use of plant protection products and mineral fertilizers, it is necessary to introduce alternative technologies for cultivating crops, which include changing crop rotation, increasing the area of fallows, sowing crops that improve soil fertility. Based on technological maps of crop cultivation, specifics of fallow processing, and other regulatory data, the main indicators were calculated using four agricultural production technologies [17]:

- Technology I - using mineral fertilizers and plant protection products;
- Technology II - with limited use of mineral fertilizers, i.e. with an increase in the area of fallows, including the cultivation of green manure fallows (due to the lack of organic fertilizers);
- Technology III - without the use of mineral fertilizers, but with an increase in the area of fallows up to 50% of the arable land in processing, including the part that is green manure fallows with crop yields at the level of natural fertility;
- Technology IV - without the use of mineral fertilizers, with an increase in the area of fallows up to 50%, cultivated using traditional technology (currently existing in the Republic of Buryatia).

In the work, the coefficients of the rise in the cost of production of the products were determined depending on the production technology used in crop production and the proportion of feed of own production in the cost structure in animal husbandry.
For various reasons, the economic efficiency of organic production is 20-30% lower than in intensive agricultural production. The increase in the cost of plant growing is associated with a ban on the use of mineral fertilizers and chemical plant protection products. The increase in costs in animal husbandry is due to the use of feeds having a higher prime cost due to low productivity. The average coefficient of rise in cost of production in crop production is 1.4108, in livestock - 1.166 [17]. Table 4 presents an estimate of the increase in the cost of crop and livestock production in connection with environmental regulation.

Table 4. Estimation of additional costs in agriculture of the Kabansky district of the Republic of Buryatia due to environmental restrictions. Source: compiled on the basis of [16,19].

| Indicators                        | 2016 actual | taking into account the additional costs |
|-----------------------------------|-------------|-----------------------------------------|
| Cost of crop production, million rubles | 512.4       | 722.9                                   |
| Cost of livestock production, million rubles | 419.8       | 489.5                                   |

Additional environmental costs in crop and livestock production are estimated at increasing production costs by 41% and 16%, which leads to a decrease in the already low profitability of production in these sectors. So, in 2000, the profitability of crop production in the Kabansky district sold by agricultural organizations was 58.3%, in 2005 - 18.6%, in 2014 - 1.6%. In 2000, a similar indicator in animal husbandry was 20.3%, in 2005 it was negative (-18.5%), and in 2014 it was positive (2.9%) [19].

5. Conclusions

Features of environmental regulation in agriculture indicate that agricultural enterprises and farms of the Kaban district of the Republic of Buryatia are forced to limit the scope of economic activity and invest additional financial and material resources to meet environmental requirements. It was the system of severe environmental restrictions in agricultural production that made it possible to maintain the quality of natural complexes, to produce crop products without the use of mineral fertilizers, and to create certain conditions for the development of organic agriculture in the BNT. The economic efficiency of organic farms in the BNT due to the climatic and institutional factors cannot be high. However, the eco-economic efficiency of programs, events and investment projects will be significant due to positive changes in the natural environment, conservation of biodiversity, renewal of scarce resources, etc.

In our opinion, methodological approaches to determining the prevented environmental and economic damage during the development of organic agriculture should include long-term effects, such as preserving the health of the population, ensuring food security of the country, and improving the quality of natural components. This requires the implementation of new comprehensive scientific research, the implementation of government measures and the introduction of specific tools for the development of organic agriculture, as well as a long time period of observation. Thus, today the main economic tool that helps to reduce the additional environmental burden on rural producers in the CEZ BNT may be government support through increased investment in greening farming sector and agricultural enterprises.

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