Comparative analysis of agricultural development in the Russian border areas of North Asia

T B Bardakhanova and V D Munkueva

Baikal Institute of Nature Management, SB RAS, Ulan-Ude, 670047 Russia

E-mail: munvic@binm.ru

Abstract. The object of the research is the Russian border areas of North Asia, which include Tyumen Oblast, Omsk Oblast, Altai Krai, Tyva Republic, The Republic of Buryatia, Zabaikalsky Krai and Amurskaya Oblast. This research aims to conduct a comparative analysis of agricultural development in these territories over a long period from the early 1970s to the present. The authors have analysed the dynamics of the gross regional product of the considered regions and its structure, the share of agriculture in GRP of the regions, the volume of agricultural production (in US dollars), cultivated areas and a number of indicators of agricultural development efficiency. Conclusions are made about the low role of the considered regions in the formation of the RF GDP, as well as about the insignificant share of agricultural products in GRP of the regions and the decreased efficiency of agricultural land use in comparison with the average indicators for the Russian Federation.

1. Introduction

Agricultural land use is closely bound up with of the environmental and socio-economic problems facing society today. The relevance of studying agricultural land use efficiency is related to the increasing global population, land availability constraints and land degradation, as well as global changes in consumption patterns with increasing pressures on biodiversity and climate change [1].

Adequate economic analysis is needed to ensure agricultural sustainability, assess land use efficiency, identify gaps as well as potential opportunities and ways ahead. The main task is to assess the effectiveness of the processes related to agricultural land use, in terms of achieving the set goals. Among the state priorities for agricultural land use in Russia, as set out in the policy documents, are the conservation, reproduction and protection of agricultural land, improvement of soil fertility and ensuring an ecological balance [2]. It is especially interesting how these priorities are implemented at the regional level, in particular, in the Russian regions of North Asia, where many problems are transboundary (water, air pollution, ecosystem degradation, etc.) [3, 4].

Within the framework of the research program of the Baikal Institute of Nature Management SB RAS, the object of study is the Russian border areas of North Asia – Tyumen Oblast, Omsk Oblast, Altai Krai, Tyva Republic, The Republic of Buryatia, Zabaikalsky Krai and Amurskaya Oblast. The initial aim of this research was to conduct a comparative analysis of agriculture development in these territories over a long period of time.
2. Materials and methods
The present study is based on the scientific articles of foreign and domestic scientists devoted to the problems of agricultural land use, the relationship between agriculture and the environment, the directions of sustainable land use in the face of modern challenges.

The information base is statistical data on the agriculture development in the model areas of the Russian Federation from the early 1970s to the present [5-8].

3. Results and discussion
Analysis of the GRP dynamics of the model regions for the period 1995-2018 (Figure 1) shows that out of the studied model areas, only the Tyumen region’s share of the Russian GDP has reached – in different years – between 8% and 12%, as it is one of the commodity regions. In 2018, mining operations accounted for 63.7% of the regional domestic product.

The next region in terms of contribution to the Russian GDP is Omsk Oblast: from 1.4% in 1995 to 0.8% in 2018. In the structure of the GRP in Omsk Oblast, the main industry is manufacturing, which accounted for 36.4% of the GRP in 2018.

Since 2010, the contribution of other model regions to Russia’s GDP has been less than 1%.

![Figure 1. Dynamics of GRP of model regions as % of Russia’s Gross Domestic Product.](image)

A more detailed analysis of the GRP structure of the model areas shows that the share of agricultural products in GRP since 2005 has not exceeded 10%, except for Altai Krai, although the dynamics of the indicator here shows a decrease from 27% in 1990 to 13% in 2018 (Figure 2).

Altai Krai is a large agricultural region of Russia with the largest arable land areas (6.5 million hectares in 1975 and 5.15 million hectares in 2018). The main industries in the region are agriculture, manufacturing and trade.

The share of agriculture in GRP of Omsk Oblast decreased from 18.7% in 2000 to 8.9% in 2018. The region’s main agricultural sectors are: crop farming (grain and fodder crops, flax fibre), dairy and livestock farming, poultry farming, beekeeping, pig breeding, and fur farming. In Tyumen Oblast, the share of agriculture in GRP was mostly about 1%, but declined to 0.6% in 2018. The leading area of agriculture is dairy and meat animal husbandry; reindeer breeding, fur farming and poultry farming are also developed. Grain and fodder crops, as well as potatoes and vegetables are grown in the region.

In Zabaikalsky Krai, the main industries are mining (15% in 2018) and transport (18.4% in 2018). The share of agriculture in GRP here decreased from 12.1% in 2000 to 5.2% in 2018. A specific feature of Zabaikalsky Krai is that the region specializes in fine-wool sheep breeding. Meat, dairy and beef cattle breeding, pig breeding, and poultry breeding are also developed.
Figure 2. Share of agricultural production in Gross Regional Product of Russian regions, %.

Mining, transport (14.7% each in 2016) and construction (14% in 2016) are the main contributors to the GRP of Amur Oblast. The share of agriculture in the same year was 6.2%. The leading areas of agriculture are: grain farming, meat and dairy cattle breeding. Soybeans are grown in the region, reindeer husbandry and fur farming are developed in the north, beekeeping in the southeastern and central parts, and fur trade in forest areas.

Figure 3. Dynamics of agricultural production, in million US dollars at the average annual exchange rate of the Central Bank of Russia.
The main components of Buryatia’s GRP in 2018 are trade (12.6%), transport (10.8%), and process manufacturing (9.9%). The share of agriculture is 4.6%. The Republic’s agriculture specializes in growing grain and fodder crops, potatoes and vegetables. Meat and dairy cattle, sheep, goat, pig and horse breeding are well developed.

In the GRP of Tyva Republic in 2018, the share of mining is 24.9%, agriculture – 5.4%. The republic’s agriculture is based on beef cattle, sheep, goat and horse breeding.

The analysis of the dynamics of agricultural production (in million US dollars) (Figure 3), shows that 3 regions are outsiders (The Republic of Buryatia, Zabaikalsky Krai and Tyva Republic). In other regions there is a general upward trend in production compared with the early 2000s, although the 2010-2013 volumes have not been achieved. Altai Krai accounts for the largest share of agriculture in GRP; agricultural production (in million US dollars) in this region almost doubled in 2018 compared with 2000.

Next, the results of comparing the quantitative parameters for agricultural land use in the studied areas with efficiency indicators are presented below. Figure 4 shows the dynamics of sown areas in the Russian Federation as a whole and in model areas for the period from 1970 to 2019.

Figure 4 indicates that the crop areas in these regions have decreased to a lesser extent than in the Russian Federation compared to 1970.

![Figure 4. Crop area in the Russian Federation and the model regions, k. ha.](image)

At the same time, as follows from the data presented in Table 1, the indicators of grain crop yield in the model areas of the Russian Federation both in 1990 and in 2019 were lower than the national average indicators. Although in most regions there is an increase in dynamics (the largest growth in Tyva Republic – 2.3 times, in Altai Krai and Tyumen Oblast – 1.7 and 1.3 times, respectively).

At the same time, all regions (except for Tyva Republic) use less water and apply significantly less mineral (except Tyumen Oblast) and organic fertilizers than the average for the Russian Federation.
Table 1. Specific indicators of agricultural development in the model regions of Russia.

|                      | Area per person, ha | Agricultural land area per person, ha | Cultivated area per person, ha | Gross harvest of grain crops per person, t | Grain yield, kg/ha |
|----------------------|---------------------|---------------------------------------|-------------------------------|--------------------------------------------|-------------------|
|                      | 1991    | 2019    | 1990 | 2019 | 1990 | 2019 | 1990 | 2019 | 1990 | 2019 |
| Russia               |         |         |      |      |      |      |      |      |      |      |
| Altai Krai           | 6.33    | 7.25    | 4.06 | 4.75 | 2.4  | 2.22 | 1.22 | 1.98 | 8.7  | 14.6 |
| Omsk Oblast          | 6.52    | 7.32    | 3.09 | 3.49 | 1.73 | 1.49 | 1.05 | 1.58 | 11.2 | 15.8 |
| Tyumen Oblast        | 46.15   | 38.97   | 1.19 | 1.13 | 0.52 | 0.28 | 0.48 | 0.39 | 16.9 | 22.4 |
| Tyva Republic        | 55.08   | 51.56   | 11.69| 11.72| 0.92 | 0.16 | 0.19 | 0.08 | 8.5  | 19.4 |
| The Republic of Buryatia | 33.36  | 35.63   | 2.52 | 3.19 | 0.73 | 0.12 | 0.43 | 0.09 | 14.9 | 14.1 |
| Zabaikalsky Krai     | 32.53   | 40.74   | 5.35 | 7.21 | 1.16 | 0.19 | 0.74 | 0.1  | 12.1 | 13.1 |
| Amurskaya Oblast     | 33.95   | 45.81   | 2.39 | 3.46 | 1.52 | 1.49 | 0.85 | 0.46 | 14.6 | 18.1 |

Table 1 Continued

|                      | Meat production (slaughter weight) per person, kg | Mineral fertilizers applied, kg/ha of sown area | Organic fertilizers applied, t/ha of sown area | Fresh water used for irrigation, m³/ha of sown area |
|----------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|
|                      | 1990 | 2019 | 1990 | 2019 | 1990 | 2019 | 1990 | 2018 |
| Russia               | 68.2 | 74.05| 88.2 | 60.9 | 3.5 | 1.6  | 108.39|87.51 |
| Altai Krai           | 109.30|83.9 | 21.0 | 15.3 | 0.3 | 0.2  | 33.00 |7.05 |
| Omsk Oblast          | 109.67|81.53|28.0 | 7.1 | 0.7 | 0.9  | 15.74 |3.10 |
| Tyumen Oblast        | 43.62|36.25|85.5 | 77.6 | 0.7 | 0.9  | 13.69 |3.44 |
| Tyva Republic        | 77.10|37.92|25.1 | 0.1 | 0.1 | –    | 1927.27|854.08 |
| The Republic of Buryatia | 68.65|37.93|36.5 | 11.6 | 0.5 | 0.6  | 166.67|55.02 |
| Zabaikalsky Krai     | 68.77|46.70|30.3 | 2.7 | 0.3 | 0.1  | 68.67 |4.36 |
| Amurskaya Oblast     | 77.95|52.66|66.9 | 22.7 | 0.1 | 0.1  | 5.65  |0.31 |

4. Conclusion
The analysis of economic and a number of quantitative parameters of agricultural lands use and indicators of their efficiency allows us to draw the following conclusions:

- The Russian border areas of North Asia considered in this research, do not make a significant contribution to the GDP of the Russian Federation, except for Tyumen Oblast;
- The share of agricultural production in the GRP of the studied Russian regions has not exceeded 10% since 2005, except for Altai Krai, although the dynamics here shows a decrease from 27% to 13%;
- In terms of agricultural output (in million US dollars), most regions in recent years have tended to increase production as compared with the early 2000s, except for 3 regions (The Republic of Buryatia, Zabaikalsky Krai and Tyva Republic);
- Despite a twofold decrease in the share of agriculture in GRP of Altai Krai, the volume of agricultural production in this region (in million US dollars) has almost doubled in 2019 compared to 1995;
- There is a decrease in the efficiency of agricultural land use in comparison with the average for the Russian Federation, which requires additional research.
Acknowledgements
The present research was prepared within the framework of the State Research Program of the Baikal Institute of Nature Management SB RAS 0273-2021-0003 No. AAAA-A21-121011590039-6.

References
[1] Towards Sustainable Land Use: Aligning Biodiversity, Climate and Food Policies 2020 OECD (Paris: OECD Publishing) https://doi.org/10.1787/3809b6a1-en (accessed 23 July 2021)
[2] Decree of the Government of the Russian Federation of 14 July 2012 No. 717 “On the State Program for the Development of Agriculture and Regulation of Agricultural Products, Raw Materials and Food Markets” (as amended on 06.04.2021 No. 550) http://base.garant.ru/70210644
[3] Yugai A M, Kolesnikov A V, Tushkanov M P et al. 2009 Methodological provisions for the rational use of agricultural land, taking into account agroecological, economic and resource constraints in the regions of Russia (Moscow: NIPKTS Voskhod-A) p 204
[4] Gagarin A I, Zharnikov V B, Surkov N A, Lebedev Yu V and Lebedeva T A 2011 Critical technologies of rational nature management in the northern intensively developed territories of the Urals and Western Siberia Bulletin of the SSGA 3(16) pp 125-33
[5] The national economy of the RSFSR in 1985: Stat. Yearbook N30 CSO RSFSR 1986 (Moscow: Finance and statistics) p 398
[6] Agriculture of the USSR: Statistical collection. Goskomstat of the USSR 1988 (Moscow: Finance and statistics) p 535
[7] Appendix to the collection “Regions of Russia. Socio-economic indicators”. Socio-economic indicators for the constituent entities of the Russian Federation (accessed 23 July 2021) https://rosstat.gov.ru/folder/210/document/47652
[8] Agriculture in Russia https://rosstat.gov.ru/folder/210/document/13226 (accessed 23 July 2021)