Prospects for the Development of Dairy Industry in the Region of the Territorial-Production Localization

I V Kovaleva¹, O Yu Voronkova²
¹Altai state agricultural University, Barnaul, Russia
²Altai state University, Barnaul, Russia

E-mail: irakovaleva20051@rambler.ru

Abstract. Operation of dairy industry in Altai region, historically, traditionally the main dairy products were butter and Altaic cheeses solid fraction. In recent decades, the industry is experiencing certain difficulties associated with reduced resource base due to sharp decline of livestock dairy herd and the low level of marketability of raw milk. However, the total consumption of dairy products in the Altai is 0.8 million tones, representing 16% of the total volume of milk consumed in the Siberian Federal District, and approximately 2.3% of the total volume of milk consumed in Russia.

The price environment of the dairy market is determined by fundamental and market factors. The current trends in the industry contribute to a systematic increase in prices. However, raw milk prices are subject to high volatility depending on the time of year. Processors face the problem of excess raw materials in the summer months (the season of "big milk") and lack – in the winter, which is reflected in the level of purchase prices.

1. Introduction

The operation of dairy industry in Altai, historically, traditionally the main dairy products were butter and Altaic cheeses solid fraction. In recent decades, the industry is experiencing certain difficulties associated with reduced resource base due to sharp decline of livestock dairy herd and the low level of marketability of raw milk. The main part in the Altai region is operating network of dairy enterprises: 68 enterprises for the production and processing of milk, including micro-enterprises (farms).

2. Research methods

The theoretical and methodological basis of the study amounted to works of domestic and foreign scientists on problems of agricultural production; development of land relations; research and recommendations of the Russian Academy of agricultural sciences of the Russian Federation, laws, presidential decrees and orders of the Government of the Russian Federation, normative-legal acts of the constituent entities of the Russian Federation, the EU regulation on the development of ecological agriculture, IFOAM standards. Methodological framework served as a systemic approach allowing ensuring comprehensiveness and focus. Also used were analytical, abstract-logical, settlement and constructive, economics and statistics, economic-mathematical, monographic research methods.
3. Analysis results
The available capacity of dairy enterprises capable of processing all raw milk produced in the province. The average annual power enterprises on January 1, 2018 year amounted to 2045.4 thousand tons per year, the average workload processing capacity was used at 44.2%. [19, 22].

Table 1. The Production and sale of raw milk in Altai [13].

| Indicators                              | 2009 year | 2010 year | 2012 year | 2014 year | 2018 year | 2018 to 2009 % |
|-----------------------------------------|-----------|-----------|-----------|-----------|-----------|----------------|
| Number of cows in farms of all types,  | 386,7     | 375,4     | 369,7     | 364,9     | 361,5     | 93             |
| thousands of goals                      |           |           |           |           |           |                |
| Dairy cow productivity, kg/goal         | 3941      | 3943      | 3762      | 4222      | 4527      | 114,8          |
| Implemented milk, thousand tons:       | 827,0     | 812,1     | 744,6     | 776,8     | 774,4     | 93,6           |
| 1. including agricultural enterprises  | 572,7     | 554,3     | 482,9     | 501,9     | 489,4     | 85,4           |
| 2. Individual household                | 228,8     | 230,6     | 229,4     | 240,0     | 242,3     | 105,9          |
| 3. Farms                               | 25,5      | 27,2      | 32,3      | 34,9      | 42,7      | 167,4          |
| Export milk, thsd.tons                 | 15,4      | 18,0      | 17,3      | 34,9      | 22,3      | 144,8          |
| Import of milk, thsd.tons              | 40,9      | 41,6      | 50,6      | 133,3     | 144,4     | More 3.5       |
| Purchased for processing, thousand tons| 852,5     | 835,7     | 777,9     | 875,2     | 896,5     | 105,2          |
| Localization ratio                     | 0.5       | 0.3       | 0.3       | 0.3       | 0.25      | 50             |

Reduction of livestock (for cows) to 64% in the agricultural organizations led to shortage of marketable milk and an increase in importation of milk to 144.4 thousand tons. Reduction of livestock in all categories of farms, despite is slight increase in the average dairy herd productivity by types of farms that have negatively affected the development of the market of raw milk. Statistics on 01.01.2018 suggest that dairy cows only increased productivity in agricultural organizations [16, 8]. In the Altai region to recycle 60% less milk goes.

The increase in prices in the processing and retail segment is currently a delayed effect of the increase in prices for raw milk in 2013-2014, caused by the attempt of agricultural producers to provide the necessary level of profitability for the modernization of production in the conditions of the continuing shortage of raw milk and the expansion of imports of dairy products. The import of food from other neighboring regions and countries to the Altai territory significantly affects the final price of consumption, since the expansion of commodity items of certain categories of dairy products (drinking milk with MD. 2.5%, etc.) exceeds demand, and the constant increase in energy prices (annual increase in energy tariffs by 2 times, according to the legislation of the Russian Federation) affects the consumer basket and consumer preferences [5, 9].

In the agro-industrial complex of the Altai territory dairy Brunch is one of the strategic priorities in the development of the region. Due to its own production, the region can fully meet the needs of the population in basic food products and export products to the regions of Russia and abroad. In the all-Russian volume of production of Altai cheese fat (including cheese) is 9.9%, animal oil - 4.6%, technical casein - 0.6% [2, 7]. The main producers of milk in the region are households and agricultural organizations. The share of each of them in the total volume of milk produced, since 2009, varies slightly, and in 2013 amounted to 0.54 and 0.41, respectively. The share of peasant (farm) farms is small and is 0.02. The level of marketable milk decreased by more than 10 p. p., which is explained by the high percentage of its use for on-farm (18-20%) and personal needs in households (60-70%) [11, 10].
The processing industry accounts for more than 50% of the gross value of dairy products in the presence of one third of the value of fixed assets [2]. The largest share in the production of raw milk in the SFO is Altai region – 28%. In our view, one of the strategic directions in solving ensures dairy industry raw milk is the clustering of localization. It is an intensely local properties of various types of agricultural raw materials, agricultural products processing industry and commerce organizations line with resource potential, competitive advantage and market demand on the local territory with boundaries resulting from the interregional competition [12].

Dairy cattle breeding is geographically unevenly located in all areas of the Altai territory, the largest share is in the Kulunda (32%), Priobskaya (21%), Biysk-Chumysh (20%) and Priaileyskaya (18%) zones, the localization coefficient varies in the amount of 40-70% (table 2). The territorial location of processing enterprises is basically identical to the zones of raw milk production, but significantly exceeds the raw materials resources. So, excess capacity is observed in the Biya-Chumyshskaya zone (53%) in the Kulunda area – more than 24% in Priaileyskaya – about 12%.

Characteristics of the local market, in our view, are the following: the purchasing power of the population; the level of competition on the local marketplace; manufacturers and buyers of the product; the Demand for commodity categories; logistics [3]. Spatial distribution of raw materials production and processing is localization development allocation priority strategic areas or locally located areas of agricultural products in terms of cost of manufacturing and processing products, commercial properties in line with demand for products on the local market in cross-border regions (export products). The formation and development of the local market of milk and dairy products should include: development of dairy industry in view of the rock factor; warehouse infrastructure that provides storage of dairy products, ripening cheeses of different fractions; processing capacity; development of integration processes among participants of the dairy market [1, 17, 18] (table 2).

Table 2. Localization and size of milk production in the zones of the region at an average 2014-2018,%[5, 16].

| Natural-economic zones Indicators | kulundinskay | Prialeyskay | Priobskay | Biysko-Chumyshskay | Priaileyskay | Priaileyskay | Altayskay |
|----------------------------------|-------------|-------------|-----------|--------------------|--------------|--------------|----------|
| Number of cows                   | 18,5        | 11,9        | 20,4      | 21,7               | 4,6          | 13,9         | 10       |
| Grassland area                   | 26          | 18          | 20        | 9                  | 11           | 11           | 5        |
| The size of the fixed assets in dairy cattle | 23        | 20          | 17        | 16                 | 10           | 11           | 3        |
| Milk production                  | 32          | 18          | 21        | 20                 | 2            | 4            | 3        |
| Workers employed in agricultural production | 21        | 14          | 16        | 14                 | 16           | 12           | 4        |
| Localization ratio               | 0.7         | 0.3         | 0.4       | 0.3                | 0.4          | 0.2          | 0.05     |

The Imbalance of refining capacity and raw milk leads to is limited range of dairy products of low quality and the use of ingredients of vegetative character. Among dairy products the greatest role in the formation of production index plays whole milk products, cheese, and butter. For 12 months, 2016 compared to the same period last year, the production of dairy products increased by 2.2% (2.9% on milk products, butter at 5.3%, of cheese by 0.4%).
Increased release of dairy products contributes to the continued modernization of existing production facilities and introduction of the newest technologies. According to the results 2017 the Volume of investments in fixed capital, in view of the small business in the amount of 3.9 billion. 
[14].

On the basis of traditional biotechnologies in province 7 leading dairy enterprises produce more than 40 titles enriched dairy products and products based on whey. The Production of cheese in the province employing 39 Enterprises. In 2016, the volume of cheese and cheese products in the Altai region increased by 0.4% and amounted to 83.4 thousand tons. The hard cheese production growth occurred at 7.8%, cheese products at 30.7% while reducing the release of hard cheese at 22.2%. [15]The structure of the production of cheese and cheese products in Russia and the Altai region varies greatly. Almost half of the cheeses produced in Altai account for hard and semi-hard cheeses. On the existing technology base of dairy enterprises of the Altai region are processed approximately 97% of the whey. This secondary milk materials used as resource for increasing the Volume and expansion of assortment of the manufactured Products, as well as improving environmental performance.

The Milk production is concentrated in Kulunda, Prialeyskaya and Ob zones. At the same time, such allocation of raw materials complicates logistics operations and is not focused on segmentation of consumers on geographical basis, does not take into account consumer preferences and provision of basic food products.

Application of the method mapping allows to visualize the localization of key raw areas of the Altai territory: resources located North and West of the region (Kulunda and Ob natural economic zone), processing plants located in the North, the South and in the Central part of the Altai territory (Prialeyskaya, Ob, Biya-Chumyshskaya zone), which is reflected in the spatial remoteness of the production of raw milk from industrial processing and production of dairy products. Milk processing industry enterprises are concentrated in Kulunda and Biysk-Chumyshskaya zones (24 and 53% respectively).

The concentration of processing enterprises in the Biysk-Chumys, Kulunda and Prialeyskaya zones is explained by the concentration of markets for agricultural raw materials, since the main number of food consumers (more than 75%) is concentrated in the territory.

Segmentation of zonal branch markets by the method of mapping-zoning of segments allows to draw a conclusion about the level and directions of raw milk flows and localization of processing facilities and to develop recommendations for optimizing and rationalizing the functioning of the local dairy market of the Altai territory. The main flow of agricultural raw materials for processing enterprises, located in the Biya-Chumkayashs and Prialtaiiskaya areas, routed from Kulunda and Ob natural-economic zones. It is therefore necessary to concentrate efforts on the development of commodity markets Biya-Chumyshkayas, Pasalairskaya areas in connection with the concentration of raw potential and low degree of self-sufficiency of these zones.

Butter - cheese specialization of dairy products has an impact on the use of capacity: so the production of butter decreased from 62% (1991) to 50% (2016); cheese from 70% to 55% due to a reduction in the number of cows in agricultural organizations [2,4,6]. Primary processing of milk in farms practically is not carried out that is explained by prevalence of private farms of the population in channels of sale of raw milk. Partly produced cooling and primary purification of milk in large agricultural organizations and farms.
Table 3. Quality of milk sold in the farms of the Altai territory[14, 5].

| Year | % fat | Acidity, ° Turner following 16 | Reducing the sample over 18 | 1-2 class | 3 class | % |
|------|-------|-------------------------------|-----------------------------|-----------|---------|---|
| 1965 | 3.74  | 0.8                           | 99.2                        | -         | 98.7    | 1.3 | 98.1 |
| 1970 | 3.75  | 0.9                           | 99.0                        | 0.1       | 100     | -   | 98.6 |
| 1980 | 3.72  | 0.9                           | 99.0                        | 0.1       | 98.7    | 1.3 | 99.0 |
| 1995 | 3.68  | 0.1                           | 98.9                        | 0.1       | 98.9    | 1.1 | 98.2 |
| 2000 | 3.70  | 1.0                           | 98.9                        | -         | 98.7    | 1.3 | 98.8 |
| 2002 | 3.72  | 1.0                           | 98.9                        | 0.1       | 98.9    | 1.3 | 99.9 |
| 2005 | 3.73  | 1.6                           | 99.3                        | 0.1       | 98.9    | 1.3 | 99.9 |
| 2010 | 3.72  | 0.8                           | 99.1                        | 0.1       | 98.8    | 1.2 | 99.9 |
| 2012 | 3.71  | 0.9                           | 99.0                        | 0.1       | 98.7    | 1.3 | 99.9 |
| 2016 | 3.70  | 0.8                           | 99.1                        | 0.1       | 98.7    | 1.3 | 98.7 |

The main reasons for the return of milk are non-compliance with state Standards and Specifications. Transport logistics is an important element in the sales system, but due to the poor condition of the road network and the distance of more than 100 km from the processing zone, the problem of optimizing the collection and delivery of commercial milk is still relevant.

Table 4. Causes of low production capacity of dairy processing organizations in the region, %[6].

| Indicators                  | In an average 1989-1991 | 2002-2016 |
|-----------------------------|-------------------------|-----------|
| The lack of raw materials   | 70                      | 80        |
| Lack of staff               | 10                      | 12        |
| Equipment defects           | 5                       | 8         |
| Other reasons               | 15                      | -         |

Compared with 2012 year dry whey production has risen by more than 30%. For the Production of dry whey Altai, as well as other positions, holding first place in the Russian Federation and the SFO [4,5]. Dairy industry of the Altai region has export potential. The major share of dairy products exported to the Republic of Kazakhstan and other CIS countries. Traditionally, the main exports of dairy products of Altai account for the other regions of Russia. The main regions where exported dairy products of Altai were Tomsk oblast (hard cheese, sour cream, cream), Sakhalin Oblast (cheese and butter), the Republic of Buryatia (cheese and butter), Primorsky Krai (cheese and butter oil), Novosibirskaya oblast (all types of dairy products), Moscow (cheese and butter), Irkutsk oblast (butter, milk and cream in solid forms), Amurskaya oblast (cheese, butter, milk and cream in solid forms) [4].

At the same time foreign trade turnover increased dairy products from foreign countries (over 67% in 2016), at the same time, the percentage of CIS countries with 49% to 32% (2016). According to the experts of "NISIPP" to 2020, dairy market volume to grow by 21 percent to 40.4 billion rubles, however, growth of various product categories is assumed to be differentiated. Thus, the development of the dairy industry of the region is characterized by the most negative trends in development: raw milk shortages; reduction of livestock (for cows), with are substantial proportion of households in the Production of the raw milk; increased activity on the Russian market of the Republic Belarus; the decline in consumer demand for milk and dairy products. Due to the small volume of the domestic market of more than 70% of cheeses and powdered milk, about 40% of butter in the Altai region is exported to other regions of Russia. Therefore, without increasing and improving the effectiveness of Government support measures, this trend will continue in the medium term.
For the analysis of the product portfolio, the main commodity items of dairy products are analyzed: CMP and ice cream are traditional products, it accounts for more than 90% of the market share.

Table 5. Export of milk and dairy products from Russia, thousand tons [20, 14].

| Product name                                      | 2014 year | 2016 year | 2016 year/2014 year,% |
|--------------------------------------------------|-----------|-----------|------------------------|
| Whole milk products                              | 18,5      | 42,8      | 231,3                  |
| Condensed milk and cream                         | 31,5      | 24,6      | 78,1                   |
| Dairy products                                   | 70,6      | 69,4      | 98,3                   |
| Whey and products consisting of natural milk constituents | 4,1        | 3,8      | 92,7                   |
| Butter, milk fats and pastes                     | 5,2       | 4,5       | 86,5                   |
| Cheese and cottage cheese                        | 25,2      | 24,1      | 95,6                   |
| Cream                                            | 12,1      | 13,1      | 108,3                  |
| Cheese products                                  | 17,1      | 17,5      | 102,3                  |

During the analyzed period, exports of dairy products increased more than 2 times, slightly increased exports of cheese products and ice cream. For other commodity items, there is a decline, which may indicate an increase in imports of these commodity items.

4. Discussion

During the analyzed period, exports of dairy products increased more than 2 times, slightly increased exports of cheese products and ice cream. For other commodity items, there is a decline, which may indicate an increase in imports of these commodity items.

Discussion

Promising development of the dairy industry is possible in the context of the implementation of the concept of progressive systemic development. The main objectives are to increase the number and productivity of cows; increase the level of marketability of milk; production of quality dairy products. The logical scheme of development provides for a certain sequence, taking into account the main directions of the "Strategy of development of the food and processing industry of the Altai territory for the period up to 2025" [12].

1. Justification of the volume and structure of demand for dairy products for the main commodity items. The volume of demand for raw milk and dairy products for the forecast period is calculated taking into account the full provision of the region due to its own production, exports, production needs.

2. Determination of the volume of milk production taking into account the local location in the natural and economic zones of the Altai territory.

3. Optimization of raw material resources in terms of reproduction processes in dairy cattle breeding in the region, the level of development of forage and feed production in compliance with balanced feeding;

4. Development of waste-free technologies in the development of dairy products, involving an in-depth level of processing of both raw milk and secondary dairy resources.

5. Modernization of the material and technical base of dairy cattle breeding and processing industry, which involves not only improving the quality indicators of the industry, but also to introduce advanced technologies and innovative developments.

6. Production of import-substituting types of dairy products and cheese products based on the use of advanced technologies, in particular, the production of soft cheeses of different fractions in the Altai territory.

7. Optimization of logistics infrastructure, involving the development of a warehouse network for the main areas of cheese production long maturity; butter, as well as certain types of dairy products.

8. The need for investment resources for the development of the industry is justified.
On the basis of the calculations justified proposals for the development of the market of raw milk and dairy products in terms of localization of raw materials and processing capacity of the dairy industry in the region, taking into account the placement of pedigree cattle appropriate specialization.

Low level of logistics goods circulation in the Altai region manifests itself in poor ratio of warehouse and retail space, leading to the choice of the in addition elements of organizational-economic mechanism conditions of localization. The functionality of logistics complexes is to build capacity for long-term storage and follow-up of products oil-cheese; providing ISP services for the storage of milk products in compliance with the appropriate humidity and temperature regimes; selling service: preparation, labeling, packing and packaging; optimize the concept of B-to-C (business-to-consumer), substantially reducing logistics costs. The use of economic-mathematical modeling has streamlined production local raw milk given (Tabl.6).

Table 6. Zoning areas of the Altai region for the production of the main types of dairy products, project [21].

| Zoning | District | Specialization |
|--------|----------|----------------|
| A      | Soviet, Altai, Kosikhinsky, Soloshensky, Charyshsky, Smolensk, Petropavlovsk, Krasnogorsk, Krasnoshekovskij | Production of cheese solid, semi-solid (85%), butter (15%) |
| B      | Annunciation, Slavgorod, German, Rodinsky, Zavjalovskij, Romanovsky | Butter (35%), cheese semi hard, soft (30%), powdered milk (35%) |
| C      | Pervomaysky, Pavlovsky, Kalmansky, Barnaul, gnovol'taysk | SBEC (60%), processed cheese (30%), cheese products (10%) |
| D      | Shipunovsky, Rubtsovsky, Ugly, St. Michael | Butter (40%), cheese, semi-hard, soft (40%), ITC (20%) |

Heuristic method lets you describe the logistic zone: in the zone as the most preferred location for logistics complex is the Smolensky district. As the main criteria for selecting the location were made by close proximity to the commodity production zones, the presence of federal roads, the free movement of goods by Federal Highway M-51 in settlements specified areas concentration of tourist-and-recreational zone (Belokurikha, tourism cluster Turquoise Katun and Turquoise Katun -2), are major areas of coverage. Location of logistics complex in the zone, in our view, the most appropriate near with Blagoveshchenka (complex), locality is connected by rail with key settlements of the Kulundinskaya zones and roads Republican values with other settlements.

5. Conclusion
The project will contribute to the development of the market of dairy production, reducing waste products, meeting the needs of the population in natural dairy products, intensification of warehousing and logistic services in the Altai region, creating additional jobs. Implementation of the proposed activities will increase livestock dairy herd at 83%, productivity in 2 times; milk production at 73%.

6. References
[1] Alakoz V V, Nikonov A V On the key problems of agricultural land use and regulation of land relations. land Management, cadastre and land monitoring 5 13-18
[2] Altukhov A I 2008 Food security - an important factor in the stability of Russia Economics of agriculture of Russia 12 13-16
[3] 2019 Development of the dairy industry to 2020 year: project results Soyuzmoloko: national dairy producers Union http://milknews.ru/analitika-rinka/moloka/molohnaya_otrasl.html
[4] Grzelak P 2013 Maciejczak M Comparison between the United States and Poland of consumers'
perceptions of organic products Studies in agr Economics Research inst. for agr. economics 115(1) 47-56

[5] Kovalev A 2016 Economics and Entrepreneurship 10(3) 2 04-206

[6] Kuznetsova I G, Surikov Y N, VotcheL M M, Aleynikova M Y, Voronkova O Y, & Shichiyakh R A 2019 The methodological aspect of human capital formation in the digital economy International Journal of Mechanical Engineering and Technology 10(2) 1020-1030

[7] Lipsky S A 2017 Transformation of the system of state management of the land Fund in post-Soviet Russia (theory, methodology, practice) Moscow State University of land management 316

[8] Lysenko E G 2008 Ecological and economic problems of agriculture Economics of agriculture of Russia 2 68-73

[9] Maergoiz I M 1986 Territorial structure of the economy Novosibirsk: Science 300

[10] Miloserdov V V World Food Crisis and Russia's Place in It Agricultural and food policy of Russia 1 13-17

[11] Nikitina Z V, Bannova N S 2005 Theoretical and organizational foundations of organic agriculture Great Lake 121

[12] Poltarykhin A L, Alekseev A E, Kudryavtsev V V, Makhanova T A, Voronkova O Yu, Aydinov H T 2018 Prospects for the Development of the Green Economy of Russian Federation European Research Studies Journal vol XXI 4 470-479

[13] 2019 Resources and the use of milk and dairy products http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/enterprise/economy

[14] Statistical Yearbook Altai Krai 2010-2015: Stat. collection Territorial body of the Federal service of State statistics for the administration of the edge http://akstat.gks.ru

[15] Sycheva I N, Permyakova E S, Voronkova O Yu & Kuzmina N N 2015 "Green box" and innovative development of the regional agricultural sector Biosciences Biotechnology Research Asia 12(1) 181-190 doi:10.13005/bbra/1649

[16] 2019 The Office of the Altai region in food processing, pharmaceutical industry and biotechnology http://www.ffprom22.ru/info/analitika

[17] Vedenin Yu A 1980 Processes of development of territorial recreational systems Socio-economic and geographical aspects of the study of territorial recreational systems M.: IG Academy of Sciences of the USSR 16-30

[18] Volodin V M 2000 Ecological bases of evaluation and use of soil fertility Moscow: TSINA 336

[19] Voronkova O Y, Akhmetshin E M, Sycheva I N, Shpakova R N, Pashkova E Y, & Poltarykhin A L 2018 Economic mechanism of regulating land relations in the agricultural sector of Russia European Research Studies Journal 21(4) 280-291

[20] Voronkova O Y, Ovchinnikov Y L, Sycheva I N, Kolomeytseva A A, Marchuk V I, & Osadchij E A 2018 Economic efficiency and resource potential of organic production in Russia International Journal of Mechanical Engineering and Technology 9(10) 900-909

[21] Zhuchenko A A 2012 Challenges of the XXI century of world and domestic food security Agro-Food policy of Russia 1 6-8

[22] Zituva E V, Voronkova O Y, Umirzakova D K, Rakovskiy V I, Qurbanov P A, & Kazakov A V 2019 A methodological approach to assessing the efficiency of the economic mechanism for formation and development of intersectoral linkages International Journal of Civil Engineering and Technology 10(2) 920-925