

Competitiveness of Russian Dairy Sector: Inter-Regional Comparison

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*Paper prepared for presentation at the XIth congress of the EAAE
(European Association of Agricultural Economists),
'The Future of Rural Europe in the Global Agri-Food System',
Copenhagen, Denmark, August 24-27, 2005*

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Abstract

In competitive market dairy production will shift to the regions with the best conditions. In the Soviet paradigm dairy production was evenly distributed throughout the country, what was caused by extremely low transportation prices and by differentiated by regions procurement prices. Thus, there was no specialized zones of dairy production. The start of economic liberalization in Russia was followed by the process of disintegration of the country's common economic space. Reforms entailed an increase in transportation costs and regional specialization based on comparative advantages of a certain commodity production. Specialized dairy producing zones started to emerge. This paper attempts to determine these zones in Russia in the nearest future. The analysis is based on an inter-regional comparison of comparative advantages in milk production. The research involves the study of raw milk production, dairy processing and consumption of dairy commodities in 51 regions of the European part of Russia. A system of indices to estimate specialization and comparative advantages in milk production is constructed.

Key words: Russia, dairy farming, competitiveness, comparative advantage, inter-regional comparison.

JEL Classification: D49, Q13.

1. Introduction

Generally speaking the Soviet agriculture was run by the State. The system was based on the state land monopoly. The state distributed the inputs for farms and set the production targets, and thus actually fixed the sectoral and spatial structure of industry. Inter-regional products transportation was determined by the state plans. The planning center not only fixed procurement prices, but fixed different prices in different regions in order to ensure the equal profitability of farms in different production areas (Wehrheim et al,2000). Thus the system of differentiated procurement prices was formed. The number of such price zones for milk in Russian Federation came up to 15. These measures were resulted in absence of regional specialization in dairy sector. The agro-food distribution system also belonged to the state, and free marketing was extremely limited. The internal laws of agricultural enterprises and wages levels were also regulated by the state. Apparently the problems of competitiveness and comparative advantages were not of any importance.

In the course of agrarian reforms the state was abandoning its distribution system and prices were liberalized. New market infrastructure is now emerging, market instruments begin to work. In view of these processes the question of competition and competitiveness become of current importance.

Conventional economic theory says that competition leads to effective allocation of resources. Applied to the dairy sector this means that milk production will be concentrated in one region or a group of regions that use resources in the most effective way. In other words, milk production will shift to the regions that have corresponding comparative advantages.

For the last years Russian agricultural sector has seen positive changes. More and more segments have become profitable and attractive for the investors. It has resulted in widening of investment in agri-food sector. Due to substantial natural and cultural diversity of the territory of Russian Federation, different regions have the necessary conditions for the development of different segments of agriculture. Comparative analysis of various regions is needed to define which one is more competitive in the concerned area of agriculture. And finding profitable sectors is the key to making the right investment choice.

Fetisova (2002) shows that large dairy processors have difficulties with raw milk supply of high quality. This explains the readiness of dairy giants to invest into establishing appropriate raw milk supply chain, which would meet their standard and stability requirements. Wimm-Bill-Dunn (the 4th Russian dairy company), for example, started investment campaign called "Milk Rivers of Russia". The company equips dairy farms in various regions with modern milking equipment and refrigerators,

provides seasonal loans to suppliers. Another large dairy processor Petmol invests in pastures expansion and improvement of fodder quality. Dairy processors are investing in those regions, which have competitive potential in milk production. By doing so, they help to improve the areas with favorable conditions for the development of dairy farming.

This paper examines the situation in the dairy sector of Russia's European regions with the aim to make an assessment of regional comparative advantages in production of milk and milk products and thus to define a group of regions which form zones of milk specialization in Russia.

The paper is organized as follows: the next section describes briefly the methodology used for the analysis. The subsequent section is devoted to inter-regional comparison of comparative advantages in milk production: the system of indices is built for that purpose. The regional specialization is examined. Finally, the conclusion presents the paper's main findings and the author's recommendations.

2. Methodology

The research is made for the regions of the European part of Russian Federation: Central, Northwestern, South and Volga areas.

We consider only production of cow milk as other milk is marginal in production and consumption in Russia.

The main prerequisite of the analysis is the assumption that all selected regions produce milk and then market their milk in Moscow and Moscow oblast. There are several reasons for taking Moscow and Moscow oblast as the central element of the analysis.

In respect of milk and milk products consumption, the Central area is in the lead. It's share in overall national consumption accounts for more than 35%. The leader in milk consumption is Moscow, followed by Moscow region. Together they represent nearly a half of total consumption of the Central area. Moscow and Moscow oblast consume more milk and milk products than the whole Northwestern district and a little less than the Volga district (source: GOSKOMSTAT, 2002).

It's necessary to point out that Moscow population has higher level of incomes. Thus in 2001 average per capita income in Moscow was four times higher than Russian Federation average. Hence Moscow is the most promising region for marketing of milk produce, there is a great demand still growing up. In Moscow in 2001 per capita dairy consumption makes only 245 kg, which makes up about 2/3 Moscovites used to consume in the Soviet time, therefore there is still room for consumption growth here in line with income growth (source: GOSKOMSTAT, own calculations).

Russia has been facing the process of concentration of dairy industry. Large companies increase their production volumes and begin to press their regional competitors even on small towns markets. According to the ACNielsen study of 24 major Russian cities in February – November, 2002, the processors in Moscow and St. Petersburg account for more than 60% of total dairy output in value terms. The largest producers of dairy products are located in Moscow and Moscow oblast. First of all, it's Wimm-Bill-Dann Foods (ltd) that owns three processing plants in Moscow and Moscow oblast. A large part of dairy produce is provided by the Ostankino Dairy plant and the Ochakovo Dairy Plant. World known big yogurt producers such as Campina, Ehrmann, Danone also have plants in Moscow oblast.

Due to the dairy market experts Moscow and Moscow oblast need 1 million tons of raw milk per year¹. Moscow dairy giants face the lack of raw milk supplies from Moscow area, that's why they are interested in receiving milk from other regions. Regional producers in their turn would willingly market their milk to Moscow processors rather than to local dairy plants because of more favorable terms.

Considering the above-mentioned, Moscow and Moscow oblast seem to be the right choice for the place where regions market the milk they produce.

¹ "Argumenty i Fauty", Moscow, internet-version, №13 27/03/2002

It should be mentioned that St. Petersburg and Leningrad oblast together represent another big center of dairy production and consumption. Their neighboring regions may not supply milk to Moscow. In order to avoid distortion in the analysis, St. Petersburg and Leningrad oblast are excluded from the considerations, assuming that all the rest regions deliver their milk to dairy processors of Moscow and Moscow oblast.

The next assumption of the analysis refers to the producers of milk. The structure of milk production by different types of farms in Russia is shown in Table 1. Agricultural organizations² account for about half of total milk production. Households and individual farmers produce the other half.

Table 1. The structure of milk production by different types of farms in Russia, 2001-2002.

Year	Agricultural organizations	Households	Individual farmers
2001	47,2%	50,9%	1,9%
2002	47,8%	50,2%	2,0%

Source: Russian Agricultural Sector, 2002. MAF.

Fetisova (2002) shows that household farms consume about 50% of their total milk. The next 30% of production is sold at local retail markets, and only the rest 20% is delivered to processors. This means that the households' share in the total volume of milk received by processors is less than 10%. Moreover, rural households do not have opportunity for marketing their milk far from home, so their only option is to sell milk to regional dairy processor.

Family farms market 60% of their production to processors. But their share in total production is very small (Table 1), so we may exclude them from the analysis without making fatal mistake.

Thus it makes sense to consider only agricultural organizations, as they prove to be the major suppliers of raw milk to dairy processors. In other words, we assume that all the milk marketed to the processors is produced by agricultural organizations. It is necessary to stress that big processors prefer to deal with large-scale producers, which could be capable of delivering large amounts of raw milk. In addition such processors have the necessary equipment and technology allowing them to offer milk of appropriate quality.

In accordance with these assumptions described above inter-regional comparison is made with the aim to assess comparative advantages in milk production in different regions. In order to carry out such analysis we construct a special system of indices, which allows estimating regional comparative advantages. The issues of competitiveness and the underlying factors that determine comparative advantages were studied by Porter (1986, 1998), Gurkov et al. (1997), Kurenkov and Popov (2001), Lifits (2001). The findings of those authors form the basis of the system presented in this paper.

The indices system consists of three levels:

1. Indices for assessment of comparative advantages in raw milk production
2. Indices for assessment of comparative advantages in the production of dairy products
3. Indices for integral estimate of regional competitiveness in dairy sector.

At each stage we construct special indices and compute their value for the sampled regions. After that for every index the regions are ranked in descending (or ascending) order according to the value of that index. Finally for every index we choose the first twenty regions with the best results.

The regions with the highest ranks in accordance with the indexes of the level are assumed with the best comparative advantages either in milk production or in production of milk products.

At the final stage we construct the additional indices taking into account the nature of comparative advantages. Then we compare the regions ratings for the indices of the third level with the ratings for the first and the second level and make final conclusions regarding the group of regions

² For this study we use this term to determine the large-scale farms of different legal form which in the majority of cases inherited former *kolkhozes* and *sovkhozes*.

that have comparative advantages in milk production and regions with comparative advantages in production of dairy products.

Separately we examine specialization of the regions and study how the regional specialization in dairy sector correspond with the presence of regional comparative advantages in production of milk and dairy products.

3. Inter-regional comparison

3.1. Regional specialization

In order to define the specialization of the regions we construct Index of specialization (IS), which is calculated by Formula (1):

Formula (1).

$$IS_i = \left(\frac{X_{iR}}{\sum_{i=1}^k X_{iR}} \right) / \left(\frac{Y_{iR}}{\sum_{i=1}^k Y_{iR}} \right) * 100\% , \text{ where}$$

X_{iR} - total milk production of the i-th region;

Y_{iR} - total agricultural production of the i-th region;

k – the number of the considered regions (in our case $k=51$).

The above-mentioned index of specialization is a modification of production localization index³

Index IS_i shows by how many percentage points the region's share in total milk production in the European part of Russia exceeds the share of the same region in total agricultural production in the European part of Russia (for that purpose it is necessary to deduct 100% from the value of the index).

Let's write and interpret index IS_i otherwise (Formula 2):

Formula (2).

$$IS_i = \left(\frac{X_{iR}}{Y_{iR}} \right) / \left(\frac{\sum_{i=1}^k X_{iR}}{\sum_{i=1}^k Y_{iR}} \right) * 100\%$$

In this form the index shows in which extent a milk production share in a gross agricultural output of particular region exceeds a similar share for overall European Russia

³ The production localization index, formulated in compliance with the logic of examining a region's comparative advantages in the system of inter-regional ties pre-supposing a minor role of trade with foreign countries is a sum of two other indices: 1) the index of a region's commodity specialization in the country's foreign trade $RCA_i^E = (X_{ir} / X_{iR}) / (X_r / X_R) * 100\%$ and 2) the index of a region's specialization in the system of inter-regional ties $RCA_i^I = [(Q_{ir} - X_{ir}) / (Q_{iR} - X_{iR})] / [(Q_r - X_r) / (Q_R - X_R)] * 100\%$, where X – export, Q – output, r и R – an indicator's relevance to a regional economy or, respectively, to all Russia economy, i – a branch (Serova, Karlova ,2000)

Both interpretations give the same results. If the index value exceeds 100%, then we may say that the region specializes in milk production.

The results of sorting of the regions are presented in Table 2:

Table 2. Index of Specialization for milk production, average value 1999-2001.

Place	Region	IS	Place	Region	IS
1	Smolensk Oblast	163	15	Mordovia Republic	115
2	Kaliningrad Oblast	153	16	Karachay-Cherkessia Republic	115
3	Pskov Oblast	147	17	Ulyanovsk Oblast	114
4	Kirov Oblast	142	18	Kaluga Oblast область	113
5	Nizhny Novgorod Oblast	137	19	Karelia Republic	113
6	Ivanovo Oblast	137	20	Yaroslavl Oblast	112
7	Bashkortostan Republic	136	21	Saratov Oblast	111
8	Chuvashia Republic	134	22	Mari El Republic	110
9	Penza Oblast	130	23	Vladimir Oblast	110
10	Udmurtia Republic	129	24	Adygeya Republic	110
11	Tver Oblast	129	25	Ryazan Oblast	106
12	Vologda Oblast	123	26	Tatarstan Republic	104
13	North Ossetia-Alania Republic	121	27	Ingushetia Republic	104
14	Bryansk Oblast	120	28	Kostroma Oblast	101

Source: own calculations based on GOSKOMSTAT 2002.

The computed results show that 9 out of 17 regions of the Central district, 4 out of 8 regions of the Northwestern district, 4 out of 12 in the Southern district and 11 out of 15 in the Volga district have high level of dairy specialization. Thus, the majority of the regions in the Volga district (73%) specialize in milk production. The second place is taken by the Central district with 53% of the regions specializing in milk production. The figures for the Northwestern and the South districts are 50% and 33% correspondingly.

Index of Specialization does not say anything about regional comparative advantages in milk production. This index only reflects that in some regions milk share in the gross agricultural output is rather significant. In order to examine whether it is the result of comparative advantages we construct the system of indices ($ICA_7 - ICA_8$) to estimate the regional dairy sector competitiveness.

We may assume that the region has or has not comparative advantages in milk production depending on the volume of milk marketed outside the region. So at the first stages we construct indices indicating shipments of milk outside the regions.

It is necessary to stress that official statistics does not provide information about the flows of goods. In other words we cannot know the directions in which goods produced in the region are shipped. It was said earlier that for the purpose of this research we assume that all the milk marketed outside the regions is supplied to the dairy processors in Moscow and Moscow oblast. That condition helps to simplify analysis and makes it possible to compare different regions.

At the next stages we distinguish two levels of regional milk production competitiveness. We mean competitiveness of the first level, when raw milk is marketed outside the region. We mean competitiveness of the second level, when milk is marketed outside the region in the form of dairy products.

3.2. Comparative advantages in raw milk production

For assessing the first level competitiveness the following indices are constructed and computed (Formulas 3,4):

Formula (3).

$$ICA_{ii} = X_{ir} - Z_i, \text{ where}$$

X_{ir} - raw milk production by agricultural organizations in the i–th region;

Z_i - production of dairy products in milk equivalent terms in the i–th region.

Z_i characterizes output of the main types of dairy products: whole milk products, butter, cheese, dry milk.

Other types of dairy products (condensed milk, evaporated milk, ice-cream, spreads) are not considered, because their share in total production of dairy products is very small and for some regions there is even no information on their production volume. We suppose that excluding these types of dairy products does not influence greatly the results of the analysis.

Index ICA_1 characterizes excess of fresh milk over volumes delivered to the regional processors. This milk potentially can be shipped outside of the region of production. Negativity of the index means deficit of milk deliveries for the local processing plants. We are aware that this conclusion is true only in a view of assumption that only agricultural organizations deliver raw milk for processing. In practice local dairy plants may buy raw milk from households and family farms. However, this phenomenon can not be statistically estimated in framework of our study.

Ranking the regions in accordance with ICA_1 value is presented in Table 3.

Moscow Oblast is an absolute leader. Its index value is twice higher than that one in Tatarstan Republic – the second region in the list.

Let us look at the top twenty regions. We find that the positions are almost equally shared among the regions of the Central and the Volga districts: 9 regions (out of 17) in the Central district and 8 (out of 15) in the Volga district. It is necessary to mark out Vologda Oblast in the Northwestern district which takes the seventh place in Table 3.

Table 3. Index of comparative advantage (ICA_1) for the top 20 regions, average 1999-2001, thousand tons.

Place	Region	ICA_1	Place	Region	ICA_1
1	Moscow Oblast	459,59	11	Vladimir Oblast	66,85
2	Tatarstan Republic	217,04	12	Perm Oblast	60,00
3	Krasnodar Krai	199,40	13	Oryol Oblast	56,82
4	Bashkortostan Republic	133,79	14	Ryazan Oblast	55,97
5	Orenburg Oblast	119,12	15	Yaroslavl Oblast	53,83
6	Nizhny Novgorod Oblast	107,09	16	Tver Oblast	50,56
7	Vologda Oblast	91,60	17	Udmurtia Republic	49,96
8	Kirov Oblast	83,97	18	Kostroma Oblast	48,18
9	Saratov Oblast	77,59	19	Kaluga Oblast	45,21
10	Kursk Oblast	72,52	20	Volgograd Oblast	44,63

Source: own calculations based on “Agricultural sector of Russia”, MAF 2002.

Index ICA_1 shows only absolute volumes of raw milk exported (imported) from the region. The regional scale of milk production was not involved into consideration up to now. The next index ICA_2 is devoted to do that. It is calculated by Formula (4):

$$ICA_{2i} = \frac{X_{ir} - Z_i}{X_{ir}} * 100\%$$

This index characterizes the share of milk in the total volume of milk produced by agricultural organizations and exported outside of the region. It allows us to distinguish the regions, which market large amounts of raw milk in relation to production volume.

The results of sorting the regions are the following (Table 4):

Table 4. Index of comparative advantage (ICA_2) for the top 20 regions, average 1999-2001, %.

Place	Region	ICA_2	Place	Region	ICA_2
1	Ingushetia Republic	100,00%	11	Oryol Oblast	31,37%
2	Kalmykia Republic	96,98%	12	Vladimir Oblast	28,15%
3	Dagestan Republic	73,95%	13	Vologda Oblast	26,90%
4	Moscow Oblast	54,51%	14	Tatarstan Republic	25,87%
5	Arkhangelsk Oblast	51,27%	15	Saratov Oblast	25,48%
6	North Ossetia-Alania Republic	44,82%	16	Vologda Oblast	25,40%
7	Kostroma Oblast	44,53%	17	Kaluga Oblast	25,04%
8	Kabardino-Balkaria Republic	36,41%	18	Yaroslavl Oblast	23,33%
9	Orenburg Oblast	33,69%	19	Nizhny Novgorod Oblast	23,18%
10	Kursk Oblast	33,51%	20	Ivanovo Oblast	22,79%

Source: own calculations based on "Agricultural sector of Russia", MAF 2002.

One can see from Table 4 that three regions from the Southern district have the highest index value: Ingushetia Republic, Kalmykia Republic and Dagestan Republic. This does not necessarily mean that the regions have comparative advantages in milk production. It is most likely an evidence of underdevelopment of local dairy processing.

Now we combine the results of ranking in accordance with ICA_1 and ICA_2 simultaneously.

The intersection of two sets gives the following results:

Central district – Moscow Oblast, Kostroma Oblast, Oryol Oblast, Vladimir Oblast, Kaluga Oblast, Yaroslavl Oblast and Kursk Oblast;

Northwestern district – Vologda Oblast;

Southern district – Volgograd Oblast:

Volga district – Orenburg Oblast, Saratov Oblast, Nizhny Novgorod Oblast and Tatarstan Republic.

At this stage we selected the regions that are very likely to have comparative advantages in raw milk production. In order to prove this assumption we should carry out additional analysis including extra factors. That will be done in paragraph 3.4.

3.3. Comparative advantages in the production of dairy products

Let's turn to the second level competitiveness. Here we examine what regions export not only raw milk but also dairy products. It was mentioned above that the region may have the necessary conditions for effective dairy processing and dairy products will be marketed outside the region instead of raw milk.

The first index in this group characterizes the export of milk and milk products outside the region (Formula 5):

Formula (5).

$$ICA_{3i} = X_{iR} - C_i, \text{ where}$$

X_{iR} - milk production by all types of agricultural producers (including households and individual farms) in the i -th region;

C_i - consumption of milk and milk products in milk equivalent terms in the i -th region.

The sorting of regions is presented below (Table 5):

Table 5. Index of comparative advantage (ICA_3) for the top 20 regions, average 1999-2001, thousand tons.

Place	Region	ICA_3	Place	Region	ICA_3
1	Bashkortostan Republic	396,8	11	Saratov Oblast	141,6
2	Krasnodar Krai	342,2	12	Orenburg Oblast	138,8
3	Belgorod Oblast	307,0	13	Oryol Oblast	133,9
4	Tatarstan Republic	246,5	14	Mordovia Republic	123,7
5	Kirov Oblast	238,9	15	Bryansk Oblast	120,9
6	Vologda Oblast	198,6	16	Ryazan Oblast	113,0
7	Voronezh Oblast	192,1	17	Nizhny Novgorod Oblast	111,4
8	Kursk Oblast	173,0	18	Pskov Oblast	107,6
9	Smolensk Oblast	173,0	19	Tver Oblast	107,0
10	Udmurtia Republic	160,5	20	Lipetsk Oblast	104,8

Source: own calculations based on GOSKOMSTAT 2002 and MAF 2002.

Some regions have opposite signs of ICA_1 and ICA_3 . Thus Moscow Oblast is the leader in volume of raw milk marketed outside the region, but takes the last place when considering dairy products marketed outside the region. It is not shown in the Table 5, for Moscow Oblast $ICA_3 = -524$ thousand tons (average for the 1999-2001 period). In other words, Moscow Oblast did not export dairy products but imported them in large quantities. There is a possible explanation to that fact. Raw milk produced in Moscow Oblast is shipped to dairy plants of Moscow (that is "outside the region" due to Russian administrative division). And high level of dairy consumption in Moscow Oblast causes large dairy imports from Moscow and other regions.

Just the opposite situation is in Voronezh Oblast, Smolensk Oblast and Pskov Oblast. They import raw milk export dairy products.

Like ICA_1 the index ICA_3 shows absolute volumes. It is necessary for the assessment of the potential of the regions on the assumption that they market their products in Moscow.

In order to take into account the scale of production when comparing different regions we construct and calculate a relative ratio ICA_4 similar to ICA_2 (Formula 6):

Formula (6).

$$ICA_{4i} = \frac{X_{iR} - C_i}{X_{iR}} * 100\%$$

This index characterizes the ratio between milk and milk products the region has exported (or imported) and the total volume of milk produced in the region.

After ranking the regions in accordance with ICA_4 , we get the following results (Table 6):

Table 6. Index of comparative advantage (ICA_4) for the top 20 regions, average 1999-2001, %.

Place	Region	ICA_4	Place	Region	ICA_4
1	Belgorod Oblast	47,83%	11	Krasnodar Krai	27,34%
2	Vologda oblast	40,05%	12	Lipetsk Oblast	26,70%
3	Oryol Oblast	39,61%	13	Tambov Oblast	25,43%
4	Smolensk Oblast	39,60%	14	Voronezh Oblast	25,01%
5	Kursk Oblast	38,51%	15	Bashkortostan Republic	24,76%
6	Kirov Oblast	34,92%	16	Bryansk Oblast	24,64%
7	Pskov Oblast	33,68%	17	Ryazan Oblast	24,40%
8	Mordovia Republic	30,24%	18	Penza Oblast	22,28%
9	Udmurtia Republic	28,43%	19	Tver Oblast	22,14%
10	Kaluga Republic	27,40%	20	Chuvashia Oblast	21,90%

Source: own calculations based on GOSKOMSTAT 2002 and MAF 2002.

Comparing Table 5 and Table 6, we see that the order of the regions based on ICA_3 slightly differs from the order based on ICA_4 . But still several regions do not present in Table 6: Orenburg Oblast, Tatarstan Republic, Nizhny Novgorod Oblast, Saratov Oblast.

It seems to be useful to consider one more index for assessing the second level competitiveness (Formula 7):

Formula (7).

$$ICA_{5i} = \frac{X_{iR}}{N_i} - \frac{C_i}{N_i} = \frac{ICA_{3i}}{N_i}, \text{ where}$$

N_i - population of the i -th region.

This index is a modification of ICA_3 and it takes into account the population of regions.

Table 7 shows the results of sorting the regions.

Table 7. Index of comparative advantage (ICA_5) for the top 20 regions, average 1999-2001, kg per capita.

Place	Region	ICA_5	Place	Region	ICA_5
1	Belgorod Oblast	205,0	11	Ryazan Oblast	88,9
2	Smolensk Oblast	155,4	12	Bryansk Oblast	84,9
3	Vologda Oblast	151,7	13	Lipetsk Oblast	84,8
4	Kirov Oblast	151,7	14	Voronezh Oblast	78,8
5	Orlov Oblast	150,4	15	Kaluga Oblast	77,2
6	Pskov Oblast	136,4	16	Chuvashia Republic	76,9
7	Mordovia Republic	134,6	17	Kabardino-balkaria Republic	69,4
8	Kursk Oblast	133,2	18	Krasnodar Krai	68,5

Place	Region	ICA ₅	Place	Region	ICA ₅
9	Udmurtia Republic	98,9	19	Tver Oblast	68,0
10	Bashkortostan Republic	96,8	20	Penza Oblast	66,0

Source: own calculations based on GOSKOMSTAT 2002 and MAF 2002.

The list of the regions in Table 7 is the same as in Table 6, except for Tambov Oblast (it is not in the list of top 20 in Table 7, but it ranks 22 that is quite close) and for Kabardino-Balkaria Republic (it not in the list of Table 6, but it takes the 23d place in the rating). That kind of comparison proves our assumption concerning the competitive regions at this stage.

Thus joint analysis of indices value results (ICA_3 , ICA_4 , ICA_5) allows to distinguish the following regions:

Central district – Belgorod Oblast, Oryol Oblast, Smolensk Oblast, Kursk Oblast, Lipetsk Oblast, Voronezh Oblast, Bryansk Oblast, Ryazan Oblast, Tver Oblast;

Northwestern district – Vologda oblast, Pskov Oblast;

Volga district – Kirov Oblast, Mordovia Republic, Bashkortostan Republic, Udmurtia Republic.

At this stage we selected the regions that are very likely to have comparative advantages in production of milk products. In order to prove this assumption we should carry out additional analysis including extra factors. That will be done in the division 3.4.

3.4. Integral estimate of regional competitiveness in dairy sector

At this stage we take into account the nature of comparative advantages. Whereas in the previous two sections we examined what regions have milk that can potentially be marketed outside their territory (in Moscow – that was the assumption), in this section our goal is to study what regions have favorable conditions for development of milk production. We construct additional indices that help to get the fuller picture of competitive regions in Russian dairy sector.

The first index in this group is ICA_6 , calculated by Formula (8):

Formula (8).

$$ICA_{6i} = \left(\frac{X_{ir}}{n_{ir}} \right) / \left(\frac{\sum_{i=1}^k X_{ir}}{\sum_{i=1}^k n_{ir}} \right) * 100\%, \text{ where}$$

X_{ir} - raw milk production by in the i–th region;

n_{ir} - cow population in agricultural organizations of the i-th region;

k – the number of regions considered (in our case $k=51$).

This allows to define by how many percentage points milk yield per cow in the region is higher (lower) than average milk yield per cow in the European part of Russia (for that purpose we deduct 100% from the value of the index).

Actually, ICA_6 reflects cow productivity in the regions, but the index is relative, what makes it convenient for comparing different regions.

Moreover, we can rewrite the index (Formula 9):

Formula (9).

$$ICA_{6i} = \left(\frac{X_{ir}}{\sum_{i=1}^k X_{ir}} \right) / \left(\frac{n_{ir}}{\sum_{i=1}^k n_{ir}} \right) * 100\%$$

In this form it reflects how changes in the region's share in total milk production influence its place in the rating. We can also see what happens to the region's rating if the number of cows increases or decreases.

We sort the regions as we did for the previous indices and consider the top 20. The intersection of this group of regions with the group selected at the first stage gives the following results:

Moscow oblast, Vladimir Oblast, Yaroslavl Oblast, Vologda Oblast, Nizhny Novgorod Oblast, Saratov Oblast and Tatarstan Republic.

The intersection with the group selected at the second level allows to select the following regions: Belgorod Oblast, Vologda Oblast, Kirov Oblast, Udmurtia Republic and Krasnodar Krai.

The next index is constructed to take into account the size of agricultural farms (Formula 10):

Formula (10).

$$ICA_{7i} = \left(\frac{X_{ir}}{S_{ir}} \right) / \left(\frac{\sum_{i=1}^k X_{ir}}{\sum_{i=1}^k S_{ir}} \right) * 100\%, \text{ where}$$

X_{ir} - milk production by agricultural organizations in the i -th region;

S_{ir} - the area under agricultural crops in the i -th region.

We take the area under agricultural crops as an approximate value for the size of agricultural producers.

After sorting the regions and making intersections we get the following:

The first level competitiveness – Moscow oblast, Vladimir Oblast, Yaroslavl Oblast, Kaluga Oblast, Vologda Oblast, Nizhny Novgorod Oblast and Tatarstan Republic.

The second level competitiveness – Belgorod Oblast, Ryazan Oblast, Tver oblast, Vologda Oblast, Kirov Oblast, Udmurtia Republic and Krasnodar Krai.

At this stage a fuller picture is emerging concerning the competitive regions in the dairy sector. Nevertheless the analysis is not complete without considering the cost of producing milk since one of the main factors, affecting regional competitiveness is the price at which regions can offer their milk to Moscow dairy plants. Assuming the equal quality of raw milk from different regions Moscow processors would prefer lower price milk.

Suppose that all the regions have equal margins for milk. By “margin” we mean the difference between the price at which milk sold to processors and the cost of its production. In this case we may say that the less the milk production cost in the region the more competitive it is.

That's why we consider the next step – the study of milk production costs – to be a very important part of the analysis.

Data on production costs in dairy sector of different regions show large dispersion. The milk production cost varies in Russia from 159 rubles per 100 kg of milk to 831 rubles (source:

GOSKOMSTAT, 2002). There are many reasons for such differentiation: different labor expenses, feed expenses, capital expenses, different cow productivity and technologies used.

Simple comparison of production cost in different regions does not allow us to distinguish those competitive at Moscow market. Transportation costs increase the price of milk and if there is a long distance between the particular region and Moscow, this region may become uncompetitive despite low milk production costs. To take into account the distance from Moscow we make the following assumptions:

Milk is transported in ten-tone tank trucks;

Transportation costs depend only on the volume of fuel used;

Fuel price is equal within the European part of Russia.

After that the difference in transportation costs will reflect only the difference in distance from Moscow. The study of motor freight shipments tariffs shows that the average shipment rate for ten-tone tank trucks is 10 rubles per km.

The ICA_8 indicates the milk costs taking into account transportation costs (Formula 11):

Formula (11).

$$ICA_{8i} = C_{ir} + TrC_{ir}, \text{ where}$$

C_{ir} – milk production costs in the i-th region;

TrC_{ir} – transportation costs from the i-th region to Moscow.

Table 8 shows the results of calculations and ranking the regions.

Table 8. Milk cost including transportation costs, average 1999-2001, rub per 100 kg.

Place	Region	ICA_8	Place	Region	ICA_8
1	Oryol Oblast	274	11	Bryansk Oblast	340
2	Kaliningrad Oblast	288	12	Kirov Oblast	346
3	Mordovia Republic	295	13	Tver Oblast	348
4	Ryazan Oblast	296	14	Ivanovo Oblast	355
5	Vladimir Oblast	305	15	Vologda Oblast	356
6	Kaluga Oblast	307	16	Pskov Oblast	359
7	Yaroslavl Oblast	326	17	Saratov oblast	362
8	Nizhny Novgorod Oblast	327	18	Smolensk Oblast	363
9	Chuvashia Republic	331	19	Mari El Republic	364
10	Moscow Oblast	338	20	Tula Oblast	370

Source: own calculations based on GOSKOMSTAT 2002 and freight companies tariffs.

Now we should take the regions selected at the previous stages and see whether they are cost competitive.

Finally we may say that the following regions have comparative advantages in production of milk and milk products:

Moscow Oblast

Vladimir Oblast

Yaroslavl Oblast

Vologda Oblast

have comparative advantages in raw milk production (high values of ICA_1 , ICA_2 , ICA_6 , ICA_7 , ICA_8);

Belgorod Oblast
Vologda Oblast
Kirov Oblast

have comparative advantages in production of dairy products (high values of ICA_3 , ICA_4 , ICA_5 , ICA_6 , ICA_7 , ICA_8).

5. Conclusions

During the transition of Russian agricultural and food sector from a centrally planned system to a market-oriented one Russia has seen great changes. Markets were liberalized relatively fast; at least those for commodities and services as well as the labor market. This meant the planning system was largely dismantled, state procurement abolished, and, in principle, production and consumption decisions were to be guided by the market. Also government intervention via subsidies or other instruments was greatly reduced.

Thanks to that, regional specialization based on comparative advantages of a certain commodity production started to form.

There have been positive changes in Russian dairy market. There was an increase in milk and milk products consumption after dramatical fall since the beginning of the reforms. Demand for dairy products is income-elastic that's why increase in real disposal income is the main factor for growing demand for dairy products.

In the situation of rapidly growing demand for their products dairy giants face the serious lack of raw milk for processing. Agricultural organizations are not capable of supplying the necessary quantities of milk. Households though produce almost half of all milk in Russia are not considered by large dairy plants as reliable partners. First, milk supplied by households rarely corresponds to the standards established by the processing company. Second, there are no guarantees that milk will be supplied on a regular basis. And at last making a large number of contracts (that is inevitable because of household farms small size) increases transaction costs. Thus agricultural organizations are the main or most important producers whose milk is marketed to dairy processors.

Being interested in developing their sources of raw materials dairy processors are looking for suppliers from outside Moscow region. The need in stable deliveries of milk stimulates dairy processors to set up long-term relations with milk producers. Many large dairy companies are now working toward establishing close contacts with their suppliers by providing credits on a preferential basis, financing purchases of agricultural machinery and leasing this machinery to producers. Thus Wimm-Bill-Dunn company in the framework of "Milk Rivers" program purchased combine harvesters for milk producers. The company thinks that poor condition of agricultural machinery leads to reduction in feed crops production, which is the main reason for decrease in milk production. In that way dairy processors become the main investors of milk producers.

Being a rational agent any company is interested in effectiveness of its investment and stable profit. That's why the presence of comparative advantages in milk production is one of the main factors influencing the direction of company's investment. At the same time, making investment in dairy farming of the regions with favorable conditions, companies help the development of effective specialization in milk production.

The main goal of the study was to determine Russia's zones of milk specialization. Conducted analysis allowed to define the regions that have large potential for dairy production development and are likely to form zones of milk specialization. The first group has comparative advantages in raw milk production: **Vologda Oblast, Yaroslavl Oblast, Vladimir Oblast and Moscow Oblast**. The second group includes **Belgorod Oblast, Vologda Oblast, Kirov Oblast**, which are characterized by comparative advantages in production of dairy products.

The study proved a trend toward specialization on milk production according to the presence of comparative advantages. This is typical for Vologda Oblast, Yaroslavl Oblast, Vladimir Oblast and Kirov Oblast. At the same time there is a number of regions specializing in milk production while there are no competitive advantages. That is true about Smolensk Oblast, Ivanovo Oblast, Pskov Oblast. In regions like these ones it is necessary to carry out policy of agricultural producers'

reorientation toward more effective segments and if there are no such segments to reduce the number of people employed in agricultural sector of the region.

Moscow Oblast holds an interesting position. The analysis showed the presence of competitive advantages in raw milk production but the index of specialization value turned out to be quite low. In this case it is advisable to develop local milk production since there are all the necessary conditions for such production in the region and the potential is not exhausted yet.

Vologda Oblast deserves special attention. This is the only region characterized by high values of all the indices constructed. Vologda Oblast is the oldest region of dairy farming in Russia. Dairy production traditionally takes a key role in agri-food sector of the region. Dairy industry accounts for 70% of commodity output of Vologda Oblast. Our study allows asserting that this region has the largest competitive potential in the European part of Russia.

Thus, the regions of specialization in milk production are being formed in Russia. These regions have great competitive potential in dairy sector due to the presence of comparative advantages in production of milk and milk commodities. In future these regions are likely to define the national milk price.

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