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Assessment of milk production competitiveness of the Slovak Republic within the EU-27 countries

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Abstract: Raw cow milk represents one of the most important commodity in the agricultural market. The Slovak agro-food foreign trade is characterized by a substantial increase in the commodity trade, monitoring of competitiveness is therefore very important. The aim of the article was to evaluate the current situation of breeding processes in the cattle production with focus to the raw cow milk production and dairy products; and to compare the competitiveness of the domestic supply with the EU-27 countries. To quantify the evaluation of competitiveness, mathematical and statistical methods were used. Indicators of the exposed comparative advantage (RCA); the competitiveness growth index (RCA 1); the net trade performance index (RCA 2); the indicator of relative import penetration (RMA); the indicator of relative export advantages (RXA); and the indicator of relative business advantages (RTA) were calculated. The research of the foreign trade competitiveness parameters of the aggregated group Milk (RCA, RCA 1, RCA 2, RMA, RXA; and RTA) showed that the Slovak Republic has a comparative advantage among the EU-27 countries in the commodity 0401 (milk and cream, not concentrated or containing added sugar or other sweeteners), in all other monitored commodities, a comparative disadvantage was determined. Based on the research, the ideas and recommendations for the agricultural policy and for the milk processors were formulated.

Keywords: comparative advantage, competitiveness indicators, European Union, milk products, raw milk

The raw cow milk (RCM) can be classified as one of the most important commodities of the agrarian market. The RCM and dairy products play an important role in the human nutrition and health, especially as a high-quality resource of proteins of the animal origin, and the calcium content indispensable for the bones creation. The milk products contain also a significant proportion of the essential microelements and vitamins, as well as minerals. The major part of the milk production is represented by the cow milk and the products made from the basic raw material. Other milk types such as the sheep, goats and milk of other species have specific properties as well as the use in human and animal consumption (Matić et al. 2014; Gavurová et al. 2014).

The major part of the raw cow milk is offered to the market by the economic subjects focused on breeding processes with a higher concentration of agricultural land, also oriented to cattle breeding. The Slovak agriculture is characterised by the differentiation in the achieved economic results in terms of the size of agricultural enterprises measured by the number of employees; the agricultural land area; the legal form of enterprises; and natural conditions (Chrastinová and Burianová 2012).

Cows' breeding can be considered as strategic, especially in relation to other categories of cattle and its connectivity to arable land and permanent grassland. Cattle breeding represents a crucial condition to maintain a balance between the plant production and breeding processes of agricultural business activities, its environmental impact is also significant (Siničáková 2012). Nevertheless, the number of cattle in the Slovak Republic (SR) reached 471 600 heads only at the end of 2012, out of which the number of dairy cows reached 150 800 animals. The number of cows shows a long-term declining trend. The same sharp decline was mentioned by Doubek et al. (2012) in the Czech Republic. Conversely, the number of suckler cows during the year increased significantly, their number rose and at the end of 2012 reached 50 700 animals. A significantly positive development

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was found in the dairy cattle production, which grew up to 349.6 kg (5.9%) to 6295.5 kg of milk per 1 dairy cow per year. This is due mainly to a better nutrition and feeding of cows, but also the improvement of the genetic potential of animals, their treatment and a range of other factors (Šajbidorová 2013; Makovický et al. 2015).

During the year 2012, the primary producers in the SR have sold 872 300 litres of the raw cow milk totally (representing 91.0% share). Processing of the raw cow milk is an activity followed by its distribution, processing and consequently the production of dairy products. In the dairy industry during the last decade, there are major changes in the ownership. The entry of the European dairy industry leaders into the processing plants in the SR contributed to restructuring the organizations of dairy processors to the front level of the European dairy industry, and hence more advantageous position in the national and international markets. The current significantly reduced processing enterprises are developing the traditional production of dairy products with some modification and innovation of the product lines. The conditions for establishment in the international markets of dairy products with a higher quality and competitive advantages were created (Matošková 2011; Mura et al. 2012; Horská and Nagyová 2013), as well as the concept of the development of milk production and dairy industry in the SR. The milk production in the neighbouring Czech Republic is in the spotlight of the policy makers who consider the recovery and boost of the cattle production as one of the political priorities in the upcoming period (Špička and Machek 2015).

Milk producers' organisations arose spontaneously from the farmers' initiatives in the late 1990s as a response to the need to secure the fair market conditions for dairy farmers. Their common traditional objectives (guaranteed deliveries, fair price and payment discipline) reflect the unconsolidated situation of the dairy industry (Ratinger and Bošková 2013).

The Slovak agrarian market reacts sensitively to supply and demand for the milk and milk products commodities. The mentioned commodities are among the sources of the human basic daily food consumption and nutrition (Ubrežiová et al. 2009; Matošková and Gálik 2009). He transitional significant reduction in the production of the raw cow milk and the subsequent production of dairy products and liquid milk were solved by imports from abroad so as to supply meet demand (Horská and Nagyová 2013; Šimo and Rovný 2010). The inefficiency of milk production was alleviated by subsidizing the livestock units (LU); in 2006 and 2007, the production was profitable in the productive regions. In 2008, the production of milk proved a loss-making performance again (Chrastinová and Burianová 2012). The results of Michaličková et al. (2014) concerning the competitiveness of Slovak dairy farms (2007–2011) indicated that the Slovak farms were competitive in the milk production only in 2007 and 2008. The liquid milk market prices have shown a considerable variability and an upward trend over the past eighteen years in Slovakia (Weldesenbet 2013).

The agro-food foreign trade of the SR in 2012 was characterized by a significant intensification of the goods trade exchange. The year-on-value of the agro-food exports from the SR increased significantly by 29.3%, while the value of imports increased by 12.3% only. The exports of agro-food commodities reached in the observed year level of € 3 773 million, while the imports amounted to € 4 183 million. The negative trade balance achieved € –409.0 million, which represents a significant decrease in the negative trade balance up to –49.2% compared to 2011 (Matošková and Gálik 2013; Statistical Office of the Slovak Republic 2015). The Slovak foreign trade in 2012: Harmonized System (HS) of the Customs Tariff (CT) 0401–0406 (milk and milk products reached € 217 163 thousand, which can be evaluated as a decline in trade since 2006 (Statistical Office of the SR 2015).

Competitiveness is basically associated with the application of products in the domestic and foreign markets of organizations, integration groups, or countries to successful participation in the exchange of products of material or immaterial nature at different levels of trade. The essence of competitiveness is to obtain an advantage in the sales market. Competitive advantage is an opportunity of the economic subject to gain a greater market share, or other advantages as a market leader. The quantification of competitiveness could be provided by a range of methodological approaches of its evaluation and indicators (Pokrivčák 2008; Gálik 2010; Hambálková 2011; Matošková and Gálik 2013; and others).

MATERIALS AND METHODS

Raw cow milk is an essential source of the nutrition of calves and a raw material for the production of liquid milk and dairy products, which have a unique

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place in the human nutrition and dietetics. In the last period, the number of cattle and especially the number of dairy cows was significantly reduced in the SR. The demand for the liquid milk and dairy commodities in the domestic market is covered by imports mainly from the other EU countries.

The main objective of this paper is to identify the current situation of cattle breeding processes, especially the breeding cows focused to the production of the RCM and dairy products, and to assess the competitiveness of domestic supply to the EU-27 countries.

To meet the main objective, the following support objectives focused on problem areas were determined:

– Assessment of the current state of the raw cow milk and dairy production and their consumption in the domestic market.
– Foreign trade of the SR in selected commodities of HS 04 milk and assessment of competitiveness of the SR to the EU-27 countries.
– Suggestions and recommendations for paralysing the unfavourable situation in the supply of the domestic production of the RCM and dairy products.

To fulfil the main and supporting objectives of assessment of the current state of the milk production and its competitiveness in the EU market conditions, there were used following methodological approaches.

The research was focused on the identification of the dairy cows' number, the production parameter Sale of RCM, liquid milk and milk products consumption.

For the determination of changes between 2007 and 2013, the indicator index of changes was used in the following form: $[100 \times (x_{2013}/x_{2007}) - 100]$.

The multicriterial and econometric analysis focusing on dairy products in Slovenia was implemented by Pažek et al. (2014). In the assessment of the foreign trade, the individual commodities were divided into groups according to the aggregated HS 04, namely: 0401 milk and cream; 0402 milk and cream, concentrated; 0403 yogurt, sour milk, buttermilk; 0405 butter and other fats; and 0406 cheese and curd (full designation of individual commodities lists due to their range will be mentioned in the next part of this paper). Secondary source was the data of the Statistical Office of the SR, the underlying data were obtained from the Eurostat and other resources mentioned in the article. The research was conducted for the period 2007 to 2013. For obtaining the data, the methods of analysis and comparison were used to assess the current state of production and foreign trade of the SR in milk and milk products.

To assess the competitiveness of the aggregated groups of milk and milk products commodities, the indices and data of the agrarian foreign trade of the SR and the EU-27 were used. When examining the foreign trade commodity exchanges within the EU-27, the following selected indices and parameters were applied:

– ***Revealed Comparative Advantage*** (*RCA*)

$$RCA = \ln [(x_{ij}:m_{ij})/(X_j:M_j)] \quad (1)$$

x_{ij} = export value of the i-th product groups of analysed sector of the country j
m_{ij} = import value of the i-th product groups of analysed sector of the country j
X_{ij} = total export value of country j
M_{ij} = total import value into the country j

Interpretation if:
parameter $RCA > 0$: commodity has a comparative advantage;
parameter $RCA < 0$: commodity has a comparative disadvantage;
parameter $RCA = 0$: neither a competitive advantage nor disadvantage.

According to the scientific literature, the authorship of the indicators of exposed relative comparative advantages is ascribed to Balassa (1989), who in different years (1965, 1977, 1979, and 1989) constructed the specific mathematical expressions in order to be able to precisely quantify these effects.

– ***Competitiveness Growth Index*** (*RCA* 1)

$$RCA\ 1 = [(X_{ij}:X_i)]/[(X_j:X)] \quad (2)$$

X_{ij} = exports of country "i" in the commodity group "j"
X_i = total agri-food exports of the country "i"
X_j = European exports in the commodity group "j"
X = total European agri-food exports

Interpretation, if:
RCA 1 > 1, country in the commodity (sector) has uncovered comparative advantages;
RCA 1 < 1, the country has a comparative disadvantage;
RCA 1 = 1, neutral competitiveness, no quantification of advantage or disadvantage.

– ***Net Trade Performance Index*** (*RCA* 2)

$$RCA\ 2 = \frac{(X_{ij} - M_{ij})}{(X_{ij} + M_{ij})} \quad (3)$$

X_{ij} = exports of country "i" in the commodity group "j"
M_{ij} = import of country "i" in the commodity group "j"

Index value varies within the range –1 do +1. Since –1 there is comparative disadvantage, up to +1 there is comparative advantage.

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Interpretation, if:
RCA 2 = –1, reduced exports (refers to comparative disadvantages);
RCA 2 = +1, reduced imports (refers to revealed comparative advantage).

If the value of exports equals the value of imports, then the RCA 2 index is zero.

– ***Relative Import Advantage Index*** (*RMA*)

$$RMA_{ij} = \frac{\left[M_{ij}/\sum M_{il}\right]}{\left[\sum\sum M_{kj}/M_{kl}\right]} \quad (4)$$

M_{ij} = imports of the observed commodity "*i*" from country "*j*"
ΣM_{il} = sum of the imports of commodity "*i*" from all EU countries except the country "*j*"
ΣM_{kj} = sum of all imports of commodities except the commodity "*i*" from country "*j*"
$\Sigma\Sigma M_{kl}$ = sum of all imports of commodities except the observed commodity "*i*" from all EU countries except the country "*j*"

– ***Relative Export Advantage Index*** (*RXA*)

$$RXA_{ij} = \frac{\left[X_{ij}/\sum X_{il}\right]}{\left[\sum X_{kj}/\sum\sum X_{kl}\right]} \quad (5)$$

X_{ij} = the monitored commodity exports from the country
ΣX_{il} = sum of observed commodities to all European countries except the particular country
ΣX_{kj} = sum of all exports of commodities except the observed commodity into the particular country
$\Sigma\Sigma X_{kl}$ = sum of all exports of commodities except the observed commodity in all European countries except the particular country

– ***Relative Trade Advantage Index*** (*RTA*): is much more complex than the indices RXA and RTA because it takes into account both export and import and expresses the difference between the RXA and RMA

$$RTA_{ij} = RXA_{i}j - RMA_{ij} \quad (6)$$

Based on mentioned indicators, the competitiveness is evaluated as follows:

Interpretation, if:
RXA > 1 and *RTA* > 0, so there is competitiveness,
RMA > 1 and *RTA* < 0, so there is no competitiveness.

Research results in synthetic conclusions with nominal suggestions and recommendations of the paralysis of the current state of the dairy industry in the SR.

From the technical reasons, in the Tables 6–9 in the column Commodities contain only the codes of the Harmonized System (HS) of the Customs Tariff (CT). The content of the individual codes is following:
– 0401: milk and cream, not concentrated nor containing added sugar or other sweeteners;
– 0402: milk and cream, concentrated or containing added sugar or other sweeteners;
– 0403: yogurt, sour milk, buttermilk, cream, kefir and other fermented or acidified milk and cream, also concentrated or containing added sugar or other sweeteners or flavoured or containing added fruits, nuts or cocoa;
– 0404: whey, concentrated or containing added sugar or other sweeteners; products consisting of natural milk constituents, or containing added sugar or other sweeteners, not specified or included elsewhere;
– 0405: butter and other fats and oils derived from milk; dairy spreads from milk fat with fat content ranging from 75 to 80%;
– 0406: cheese and curd.

RESULTS AND DISCUSSION

The current state of production and consumption of RCM and dairy products in the markets of the SR

Traditional farming on agricultural land anticipated the inclusion of cattle breeding as a classical approach to agricultural management as a system. This was due to the principles of the relationship between the crop and livestock production, but also in relation to the classic crop rotation, forage production on arable land and their the following feeding and manure production, which return to the soil. Enrichment of the soil by organic fertilizers contributed to the increased soil fertility. By this brief description of farming systems, we wanted to highlight the significance of farming processes in an organization of production of the

Table 1. Development of the average number of cattle and cows in the SR according to the years (in thousands)

Category of animals/year	2007	2008	2009	2010	2011	2012	2013	Change index (%) 2013/2007
Cattle	507.8	501.8	488.4	472.5	467.1	463.4	471.1	–7.2
out of them: dairy cows	194.0	180.6	175.5	168.0	161.3	156.1	151.7	–21.8

Source: own processing of the data of the Statistical Office of the Slovak Republic (2015)

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Table 2. Production and sale of the RCM (in millions of litres)

Parameter/year	2007	2008	2009	2010	2011	2012	2013	Change index (%) 2013/2007
Production of RCM	1 091.7	1 074.7	1 057.2	957.3	917.9	928.3	959.4	–12.1
Index 2007 = 100	100.0	98.4	96.8	87.7	84.1	85.0	87.9	–
Sales of RCM	980.6	973.6	954.9	873.1	822.0	833.2	872.3	–11.0
Index 2007 = 100	100.0	99.3	97.4	89.0	83.8	85.0	88.9	–

Source: own processing of the data from the Ministry of Agriculture and Rural Development of the SR, and the Statistical Office of the SR (2015)

RCM, and consequently the milk products, not only in terms of human nutrition. The development of the average number of cattle and separately the number of cows in the SR is presented in the Table 1.

Number of cattle in the SR in 1993 reached 993.0 thousands, 386.0 thousands out of which were the cows. In 2013, a decline –521.9 thousands were recorded, out of which –234.3 thousand were cows (representing –60.7% index points). The long-term cattle population decline was recorded during the whole monitored period 2007–2013. Causality of the present status is affected by more macro- and microeconomic factors. The production and sale of the RCM are listed in the Table 2.

The total production of the RCM shows a decreasing trend, but the annual milk yield shows an increasing trend, which may be proved by the statistical data (in 1993 we achieved milk yield 2953 l per cow, but in 2013 it was 6295.5 litres per cow (113.2% index point increase). The increased milk yield was recorded as a result of several factors: the quality of the animal nutrition and feeding, a more powerful genetic potential of the animals, know-how, technology systems, but also the human factor starting from treatment to the top management. The RCM sale recorded for the observed period showed a slight decline (–12.1% index points). Sales and utilization of the RCM on the farms in the SR as % of the total production are shown in the Table 3.

As proved in the Table 3, the RCM has approximately a uniform level of milk fed at the farm (the calves on a milk diet mostly). For the observed period, the increase of direct sales on the farm and dairy sales through the milk machines was reported. A slight decrease in purchase relationships of the primary producers and business partners was noticed. Table 4 shows the production of liquid milk (in thousands of

Table 3. Distribution and utilization of the RCM on Slovak farms (in % of the total production)

Parameter/year	2007	2008	2009	2010	2011	2012	2013	Change index (%) 2013/2007
RCM fed on farm	4.15	4.24	4.36	4.99	4.92	4.69	4.46	7.4
Direct sale on the farm	0.92	0.97	1.02	1.41	2.69	2.58	2.42	163.0
Manipulation, losses	0.03	0.05	0.02	0.06	0.04	0.04	0.12	300.0
Contractual sales to customers	94.90	94.74	94.59	93.55	92.34	92.69	91.00	–4.1
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	–

Source: Gálik (2010), and own processing of the data from the Ministry of Agriculture and Rural Development of the SR

Table 4. Production of liquid milk and milk products in the processing industry of the SR in the observed period

Commodity/year	units	2007	2008	2009	2010	2011	2012	2013	Change index (%) 2013/2007
Liquid milk	1000 tons	238.3	252.3	242.0	262.7	276.7	297.4	318.3	33.6
Natural cheese	tons	11 746	11 012	38 391	35 163	29 903	31 819	33 235	182.9
Melted cheese	tons	3 269	3 493	11 695	10 315	11 256	11 663	11 499	251.7
Creams totally	tons	8 467	9 655	37 889	27 099	29 303	34 831	31 865	276.3
Sour-milk products	tons	12 347	11 662	51 086	50 869	48 684	54 427	62 237	404.0
Butter and milk fat products	tons	2 707	3 188	11 815	10 069	10 011	12 216	12 264	367.9
Milk powder	tons	2 475	3 273	11 659	7 339	4 306	3 763	4 382	77.1

Source: own processing of the data from the Statistical Office of the SR (2015)

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Table 5. Consumption of milk and milk products in the SR (in kg per capita per year)

Commodity/year	2007	2008	2009	2010	2011	2012	2013	Change index (%) 2013/2007
Milk and milk products totally*	152.4	153.4	153.0	153.8	162.8	156.9	158.5	4.0
out of which: cow's liquid milk**	150.2	151.3	151.0	151.6	160.6	154.7	156.3	4.1
Cow's liquid milk	55.3	51.8	47.7	48.9	53.9	52.5	54.2	–2.0
Cheese and curd totally:	9.5	9.8	9.2	9.8	9.9	10.4	10.1	6.3
out of them: fresh	2.7	2.8	2.8	2.6	2.8	2.9	3.3	22.2
Hard and semi–hard	2.4	3.4	3.5	4.0	3.6	3.7	3.4	41.7
Dried and condensed milk	1.1	1.6	1.5	1.2	1.1	1.1	1.0	–9.1
Butter	2.0	2.1	2.2	2.8	2.6	2.9	2.9	45.0
Cream	3.0	3.0	4.4	2.4	2.8	2.5	2.4	–20.0
Sour milk products	12.3	13.7	13.8	13.7	13.8	13.7	13.8	12.2
out of them: yogurt	6.3	6.3	6.9	7.1	7.0	7.0	7.2	14.3

*milk and milk products totally in the value of milk, butter corrected in kg per capita per year; **out of which liquid cow's milk and other commodities in kg per capita per year

Source: own processing of the data from the Statistical Office of the SR (2015)

tons) and dairy products in the processing industry of the SR.

The production of liquid milk and milk products in the Slovak processing industry has shown a significant increase in all observed commodities. It is probably a consequence of the entry of the European dairy leaders and their purposeful product policy in the manufacture of dairy products. RCM and milk products consumption in the SR per capita per year is shown in the Table 5.

In the recent years, the consumption of liquid milk gradually decreased (while in 1993 consumption of milk and milk products was 192.3 kg per capita, in 2013 it was 158.5 kg only, which is lower by –17.6% of the index point). The liquid milk consumption decreased by 35.5 kg per capita, which is –38.3% of the index point.

As shown in the Table 5, the consumption of milk and milk products increased slightly during the monitored period. The highest increase among the monitored commodities was recorded in butter (45.0%), hard and semi-hard cheese (41.7%), fresh cheese and curd (22.2%), and sour-milk products (12.2% of the index point). The consumption of cream and dried condensed milk decreased (–20.0; and –9.1%, respectively).

The recommended food rations in the SR (according to http://portal.statistics.sk/) per capita per year in kg were set for the following foods: milk and milk products (220.0), including liquid milk (91.0), total cheese (6.9), other dairy products (16.0), total fat (22.0), including butter (2.8), cheese and curds (totally 10.1 kg). The comparison of the milk and milk products consumption in the SR and the recommended food doses showed a significant deficit of the overall consumption of dairy products and liquid milk. The consumption of curd and cheese, as well as butter, was in accordance with the recommended food rations.

Foreign trade of selected dairy commodities between the SR and the EU-27 countries

The market of domestic agro-food commodities in the SR was significantly reduced in the recent years, resulting in the attenuation of critical agricultural and breeding processes. The agrarian traditions of the business environment, which flow from the qualified human resources, adequate natural conditions, a high proportion of rural population, with high level of unemployment in a large part of the Slovakia's regions, as well as other factors, represent an opportunity to revitalize the agricultural business. The mentioned factors result in an increasing import of agro-food commodities to the Slovak market. The consumers appreciate a wide variety of food commodities, but they are also sensitive to the health safety of the products offered in the market. The Slovak foreign trade regarding exports of the selected commodities of milk products according to the tariff nomenclature is shown in the Table 6.

As shown in the Table 6, exports of the selected commodities HS 04 milk for the period 2007 to 2013 increased the most in the case of 0401 milk (41.8%)

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Table 6. Foreign trade of the SR regarding exports of the selected commodities of milk products according to the tariff nomenclature and time dynamics (in thousands Euro)

Commodity	2007	2008	2009	2010	2011	2012	2013	Change index (%) 2013/2007
0401	64 346	73 326	105 944	64 963	90 891	112 350	91 233	41.8
0402	32 369	57 726	39 951	16 125	10 106	8 635	9 058	–72.0
0403	20 545	21 007	17 940	16 146	15 010	19 175	22 878	11.4
0404	7 004	11 997	4 856	3 534	4 687	6 537	7 085	1.2
0405	6 015	12 463	8 922	5 207	5 172	6 957	1 060	–82.5
0406	99 000	82 222	95 830	68 814	111 713	83 352	85 849	–13.3

Source: own processing of the data from the Statistical Office of the SR (2015)

Table 7. Slovakia's foreign trade regarding the import of the selected commodities of dairy products according to the items of the tariff nomenclature and years (in thousands of Euro)

Commodity	2007	2008	2009	2010	2011	2012	2013	Change index (%) 2013/2007
0401	39 335	43 013	48 398	30 851	49 981	56 741	44 930	14.2
0402	18 448	39 635	21 678	15 834	16 901	17 207	19 224	4.2
0403	28 778	30 455	39 678	37 719	38 447	39 274	37 151	29.1
0404	4 230	5 355	3 049	4 295	7 989	8 540	6 556	55.0
0405	13 454	17 779	15 912	33 421	29 858	35 722	35 631	164.8
0406	56 176	57 245	69 336	70 571	154 782	104 059	113 034	101.2

Source: own processing of the data from the Statistical Office of the SR (2015)

and 0403 sour-milk (11.4%), but the export significantly decreased in commodities 0405 butter and fats (–82.5%), and 0402 milk and cream, concentrated or sweetened (–72.0% of the index point). The Slovak foreign trade regarding the import of the selected commodities of dairy products according to the items of the tariff nomenclature is shown in the Table 7.

Import of the selected dairy products as shown in the Table 7 shows the annual increase of all monitored commodities. The highest increase was recorded in case of the commodities 0405 butter and fats (164.8%), 0406 cheese and curd (101.2%), 0404 whey (55.0% of the index point).

Indicators and indices of competitiveness of Slovak milk and dairy products and other EU-27 countries

Competitiveness of the SR foreign trade of the selected commodities of aggregated group milk products according to the RCA index with the EU-27 countries is shown in the Table 8.

As shown in the Table 8, the SR reached comparative advantage only in the commodity 0401 milk and cream without sweeteners, in the years 2009 and 2010. For other monitored commodities and years, a comparative disadvantage was found. Competitiveness of the SR foreign trade in the selected commodities of the aggregated group milk products according to the RCA 1 index to the EU-27 countries is shown in the Table 9.

Competitiveness of the Slovak foreign trade in milk evaluated by the RCA 1 index takes into account also the competitiveness growth index. The results of investigation show an uncovered advantage in the case of the commodity 0401: milk and cream without sweeteners, in all examined years. In commodities 0402: sweetened milk and cream; 0403: sour-milk; and 0406: cheese and curd, uncovered comparative advantages were found in certain years

Table 8. Comparison of competitive ability of the SR foreign trade in the selected commodities of aggregated group milk according to RCA index and the EU-27 countries

Commodity	2007	2008	2009	2010	2011	2012	2013
0401*	0.73	0.83	1.13	1.10	0.96	0.92	0.81
0402	0.80	0.67	0.96	0.38	–0.14	–0.44	–0.64
0403	–0.09	–0.07	–0.43	–0.48	–0.57	–0.47	–0.38
0404	0.74	1.10	0.82	0.16	–0.16	–0.02	0.18
0405	–0.55	–0.05	–0.22	–1.49	–1.38	–1.39	–3.41
0406	0.81	0.66	0.67	0.33	0.04	0.02	–0.17

Source: own processing of the Eurostat data (2015)

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Table 9. Competitiveness of the Slovak foreign trade in the selected commodities of the aggregated group milk products according to the RCA 1 and the RCA 2 index to the EU-27 countries

Commodity	RCA 1 index							RCA 2 index						
	2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011	2012	2013
0401	2.88	3.19	4.98	3.00	3.01	2.73	1.54	0.24	0.26	0.37	0.35	0.29	0.32	0.34
0402	1.38	1.78	1.32	0.69	0.30	0.19	0.13	0.27	0.18	0.29	0.00	–0.25	–0.33	–0.35
0403	1.59	1.42	1.23	1.15	0.99	1.03	0.75	–0.16	–0.18	–0.37	–0.40	–0.43	–0.34	–0.23
0404	0.77	0.84	0.55	0.48	0.43	0.41	0.25	0.24	0.38	0.22	–0.09	–0.26	–0.13	0.03
0405	0.41	0.70	0.57	0.38	0.25	0.26	0.02	–0.38	–0.17	–0.28	–0.73	–0.70	–0.67	–0.94
0406	1.29	0.96	1.08	0.85	1.15	0.67	0.43	0.27	0.17	0.16	–0.01	–0.16	–0.11	–0.13

Source: own processing of the Eurostat data (2015)

only. Slovakia has a comparative disadvantage in the case of the commodities 0404: whey, and 0405: butter fat. Competitiveness of Slovak foreign trade in the selected commodities of the aggregated group milk according to the RCA 2 index to the EU-27 countries is shown in the Table 9.

As indicated in the Table 9, the net trade performance index (RCA 2) reached in the observed period 2007–2013 values lower than –1, indicating a reduction of the export of the observed commodities. Mentioned facts refer to comparative disadvantage of foreign trade in commodities 0403 (sour-milk), 0405 (butter, milk fat), but in the years 2011–2013 for almost all observed commodities except the 0401 (milk and cream without sweeteners). Competitiveness of Slovak foreign trade in the selected commodities of the aggregated group milk according to the RMA indicator compared to the EU-27 countries is shown in the Table 10.

The Relative Import Advantage Index (RMA) is in this article expressed as the import of the observed commodities from the country to the sum of the imports of the observed commodities in all EU-27 countries. Competitiveness of Slovak foreign trade

Table 10. Competitiveness of Slovak foreign trade in the selected commodities of the aggregated group milk products according to the RMA indicator compared to the EU-27 countries

Commodity	2007	2008	2009	2010	2011	2012	2013
0401	1.80	1.50	1.36	1.16	1.49	1.28	0.74
0402	1.15	1.80	0.93	1.01	0.84	0.70	0.54
0403	2.25	2.05	2.15	2.43	2.33	1.97	1.20
0404	0.64	0.47	0.34	0.70	0.90	0.65	0.31
0405	0.82	0.93	0.82	2.32	1.41	1.29	0.98
0406	0.84	0.72	0.67	0.86	1.69	0.88	0.63

Source: own processing of the Eurostat data (2015)

in the elected commodities of the aggregated group milk products to the EU-27 countries according to the RXA indicator is shown in the Table 11.

The Relative Export Advantage Index (RXA) is in our case expressed by the export of observed commodity from the SR to the sum of exports of the observed commodity from all the EU-27 countries except the SR, divided by the ratio of all exported commodities in addition to tracking commodities in the country, the sum of all exported commodities addition to tracking commodities from all EU-27 countries except the country. Competitiveness of the Slovak foreign trade in the selected commodities of the aggregated group of milk products compared to the EU-27 countries according to the RTA indicator is shown in the Table 11.

Based on the investigation of the cows' population number in the Slovak Republic during the reported period 2007–2013, a decrease by 42.3 thousands was recorded (–21.8%). During this period, the number of cows in the EU rose to 22.877 thousands (3.04% increase compared to 2007). The sale of the RCM to the processing companies in the Slovak Republic in 2013 has decreased by –11.0% despite the fact that the annual yield per cow in 2013 increased to 6 295.5 kg, (625.37 kg increase per cow and year compared to 2007). The sale of the RCM in the EU reached 130 800 thousand tons in 2007, and has increased to 140 000 thousand tons in 2013 (7.3% increase). The comparison shows the that total RCM production in the SR is, despite the increasing milk yield, affected by the permanent cattle population decrease, while in the EU the cattle population number is balanced together with the increased milk production per 1 cow (Šimo and Rovný 2010; Šajbidorová 2013).

Most of the RCM in the SR is used and distributed to the milk processing industry (91.0% of the total RCM production in 2013, which is –4.1% lower than in

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Table 11. Competitiveness of Slovak foreign trade in the selected commodities of the aggregated group milk products to the EU–27 countries according to the RXA and RTA indicator

Commodity	RXA indicator							RTA indicator*						
	2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011	2012	2013
0401	3.01	3.35	5.36	3.12	3.16	2.86	1.58	1.21	1.84	4.00	1.96	1.67	1.58	0.83
0402	1.40	1.82	1.33	0.69	0.30	0.19	0.13	0.25	0.02	0.40	–0.31	–0.53	–0.50	–0.40
0403	1.61	1.44	1.24	1.16	1.00	1.04	0.76	–0.63	–0.60	–0.91	–1.26	–1.32	–0.92	–0.44
0404	0.78	0.85	0.55	0.48	0.43	0.41	0.25	0.14	0.37	0.20	–0.22	–0.47	–0.24	–0.06
0405	0.41	0.70	0.57	0.38	0.25	0.26	0.02	–0.41	–0.22	–0.25	–1.93	–1.16	–1.02	–0.95
0406	1.31	0.96	1.09	0.85	1.17	0.66	0.42	0.47	0.23	0.41	–0.01	–0.51	–0.22	–0.21

*Based on mentioned indicators, the competitiveness was evaluated as follows:
if RXA > 1, and RTA > 0: there is competitiveness; if RMA > 1, and RTA < 0: there is no competitiveness.

Source: own processing of the Eurostat data (2015)

2007). Following the well-developed agrarian countries of the EU, the farmers in the SR with the government support began a more active development of the direct farmyard sale using the milk vending machines (in 2013 the share of direct sales reached 2.42% of the total production). The mentioned form of milk sales solves the problem of the RCM sale just marginally (Matošková and Gálik 2013). Farmers receive some financial resources, but the establishment and operation of milk vending machines is expensive and in many cases it does not reach the desired economic recovery. Direct yard sales would benefit from a more effective marketing communication (Horská and Nagyová 2013).

The recommended RCM and dairy products consumption in the SR is 220 kg per capita per year. In 1993, the consumption of 186.7 kg per capita per year was recorded. Since that period, the consumption was decreasing annually until 2009, when it reached 147.5 kg (Šimo and Rovný 2010) and gradually increased to 156.3 kg in 2012 (Šajbidorová 2013). Based on the above, we can state that in present condition in the SR, we are unable to reach the recommended level of consumption of the RCM and dairy products.

Competitiveness of the aggregated group of milk and dairy products examined with the support of parameters and indices for the assessment of the competitiveness of the observed commodities, monitored during the reporting period, shows that the foreign trade commodity exchange within the EU-27 is competitive in the commodity 0401 only (milk, cream without sweeteners). All the other monitored commodities show no competitiveness. Consistent results of the examined parameters were indicated by Gálik 2010; and Matošková and Gálik 2013; in their long-term examination of the mentioned topic.

In the monitored issue, we are currently witnessing a certain paralysis. In order to maintain competitiveness in cattle farming in the future, it will be necessary to focus more attention not only to the farmers, with the aim to achieve a better reproduction and production parameters, but also to the processors of raw cow's milk, as well as to creation of effective incentive systems of state administration and reform of the EU Common Agricultural Policy.

Quantification of the examined indicators shows that the foreign trade with the aggregated group of commodities Milk for the years 2007–2013 is competitive only in commodity 0401 (milk and cream without sweeteners). All the other monitored commodities and years showed no competitiveness at all.

CONCLUSIONS

The production of RCM as the basic raw material for the production of liquid milk and milk products depends on the number of cows. The research for the reporting period 2007–2013 in the Slovak Republic proved a significant long-term reduction of the number of cattle and especially the number of cows. During the period 1993–2013, the number of cows decreased by –60.7%, and during the observed period by –21.8% of index points. A positive finding was the increase of milk yield per cow over the observed period by 113.2% (up to 6295.5 litres in 2013). The reduced numbers of cows affected the production of RCM, thereby reducing the sales based on the purchase and sales relationships and its following processing. The direct sales of farms were increased thanks to the use of milk vending machines or dispensers.

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Foreign trade, annually increasing in the past few years, was balancing the demand for dairy commodities in the domestic market. Imports of the liquid milk and milk products were realized mainly from the EU-27 countries. The highest percentage of exports to the EU-27 countries in 2013 represents the export of RCM to Hungary (34.4%), Italy (20.9%), and the Czech Republic (8.0%). Most of the butter was exported to the Czech Republic and Hungary, cheese and curd to the Czech Republic, Belgium and Hungary, and fermented products to Spain and to the Czech Republic. Imports of milk and milk products to Slovakia in 2013 were realized mainly from the EU-27 countries, namely the Czech Republic (milk and sour-milk products), cheese and curd from Poland, the Czech Republic, butter from Poland and Germany. The foreign trade balance was considerably weakened especially since 2009, when more commodities of the aggregated group of milk were exported (+59.5% comparing to the previous year), but the value of imports increased significantly by 229.9%. An unfavourable development was reflected in a negative balance of the foreign trade of the aggregated group milk (–72 570 000 Euro).

The results of the indices and foreign trade competitiveness indicators research of the aggregated group milk (RCA, RCA 1, RCA 2, RMA, RXA, and RTA) shows, that the Slovak Republic has a comparative advantage to the EU-27 countries in the commodity 0401 (milk and cream, concentrated or containing added sugar or other sweeteners), but for other monitored commodities have a comparative disadvantage.

Based on the study and research on the subject, suggestions and recommendations may be formulated for the public administration, milk processors and primary producers of the RCM. The influence of the public administration through the Ministry of Agriculture and Rural Development of the Slovak Republic (despite the influence of external factors, particularly the EU Common Agriculture Policy, but also the impact of the legislation, financial and economic instruments), must revitalize the cattle breeding, especially breeding of the cows with the marketable milk production through the system of national subsidies and other economic instruments, to finish the overall decline of one of the crucial sector of the agricultural system.

Primary producers of the RCM, despite their rich tradition of livestock breeding (particularly the cattle and cows breeding), can survive only due to the rational management decisions of "land management system". Farmers, soil, plants, and livestock, as well as other natural factors and machine-technological systems, create a synergistic effect on the long-term successful agricultural business, if they operate with one another to ensure the effective spending of human labour and other mutually interacting factors. Unfortunately, in the current conditions of the agricultural market, there is a dominant effect of the issues of economic and legislative nature. These result in a long-term decline of the significant part of cattle breeders by the reduction of the number of cows, followed by the entire vertical, which ends at the market of milk and milk products. This is a key problem of the increase of imports of milk and milk products to the SR, particularly by the EU-27 countries.

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