

ANALYSIS OF THE STRUCTURAL EVOLUTION OF THE DOMESTIC DAIRY PRODUCTS SUPPLY IN ROMANIA

Rodica CHETROIU, Lidia IURCHEVICI, Diana Maria ILIE

Research Institute for Agriculture Economy and Rural Development, 61 Marasti Blvd, District 1, Bucharest, Romania, E-mails: rodica.chetroiu@iceadr.ro, lidia.iurchevici@iceadr.ro, necula.diana@iceadr.ro

Corresponding author: rodica.chetroiu@iceadr.ro

Abstract

The paper aimed to analyse the structural evolution of various dairy products in Romania, during the period 2014-2023, based on statistical data from the National Institute of Statistics. To study their trends, various statistical indicators were calculated, as well as characteristic regression equations. Thus, in the analysed interval, the highest growth was found for cow's milk cheeses, with +46.5%, followed by drinking milk, with +42.3%. Overall, the cheese category had a market supply of 102,078 tons in 2023, which means an increase of 37.1%, compared to the year 2014. The lowest increase was in butter, where the supply was 10,593 tons in 2014 and increased by 3.5% to 10,963 tons in 2023. The calculated statistical indicators highlighted the fact that, in all product categories, both in drinking milk and in dairy products, the dynamics were positive, with different growth rates.

Key words: evolution, dairy products, milk, Romania, trends

INTRODUCTION

Milk and dairy products have an important role in the people diets and the nutritional characteristics have determined an increase in production and consumption over the past years [6, 7].

Milk and dairy products have an importance place in food consumption per inhabitant [9]. Evaluating the supply of dairy products is part of the concerns regarding food safety aspects in the dairy supply chain.

The analysis of the near-term trends revealed that the increase in milk production is considered the most relevant in terms of the food safety.

Other factors which influence the food safety include the climate change and adapting of the farms, that consider animal welfare and environmental sustainability [10].

The safety characteristics of the dairy products affect the consumers health and the sustainability of the dairy supply chain. Sometimes, along the food supply chain could appear risks such as competition, quality of raw materials etc which have to be mitigated [12].

The increased consumers awareness regarding the food safety has determined the dairy

industry to improve it, including the image of the dairy products [2].

Previous studies have shown a trend in demand for dairy products in developed and developing countries, stemming from the positive evaluation of milk fat, as well as the increasing globalization of diets, which has influenced consumer decisions. Increased milk production, population growth and changing consumption habits are resulting in an increase in the volume of the dairy product market.

Also, producing companies are now more focused on the sustainability and environmental performance of the food supply chain [3].

The supply chain of dairy products, especially milk, alongside with farmers, includes intermediates like milk traders, processors, retailers, and consumers. The milk production should be increased to meet the consumer's demand and promoting milk production can be an important instrument for increasing farmers' income and meeting consumers' demand [4]. Research on the determinants shaping the supply and demand for milk and dairy products indicated that the demand may be influenced by the level of consumer education, or by product prices and consumer income, as well as the family spending etc. [1].

The most of economic agents rely on stable supply chain management, to support the flow from the raw material procurement, to the products delivery to consumers [11].

The sustainability of the milk and dairy production can be improved by optimizing the activities in the supply chain, taking into consideration not only the environment and the economic aspects, but also the social ones. More severe environmental constraints can result in higher economic costs and lower profit [5].

In this context, the paper aimed to study the structural dynamics of various dairy products supply in Romania based on official statistical data during the period 2014-2023.

MATERIALS AND METHODS

To analyse the structural evolution of various dairy products in Romania, the following

statistic indicators were used: minimum, maximum, average, annual average rate, standard deviation, coefficient of variation, as well as regression equations.

The period analysed in this study was 2014-2023.

The data, collected from National Institute of Statistics (NIS), have been processed, and interpreted, resulting the trend lines for each dairy product analysed.

RESULTS AND DISCUSSIONS

Table 1 presents the statistical indicators calculated for cow's milk collected by processing units, raw milk imported, drinking milk, drinking cream, acidified milk, butter, total cheeses, and cow's milk cheeses. The data calculated show that the highest annual growth rate was for raw milk imported, by 4.52%, and the lowest one was for butter, by 0.39%.

Table 1. Statistic indicators for dairy products

Specification	Minimum (tons)	Maximum (tons)	Average (tons)	Annual average rate %	Standard deviation (tons)	Coefficient of variation %
Cow's milk collected by processing units	915,952.00	1,204,546.00	1,072,484.30	2.13	88,444.54	0.08
Raw milk imported	77,396.00	146,572.00	121,509.50	4.52	20,684.05	0.17
Drinking milk	250,463.00	387,208.00	318,780.70	4.07	46,379.96	0.15
Drinking cream	58,646.00	69,833.00	66,466.70	1.36	2,892.93	0.04
Acidified milk	165,997.00	225,710.00	206,833.00	2.25	17,447.95	0.08
Butter	10,483.00	12,163.00	11,213.00	0.39	601.60	0.05
Total cheeses	74,654.00	102,078.00	92,543.90	3.54	8,553.55	0.09
Cow's milk cheeses	64,382.00	94,968.00	81,275.80	4.29	9,936.19	0.12

Source: Own calculations based on the data from NIS [8].

Cow's milk collected by processing units, following a generally upward trend, increased at an average annual rate of 2.13% (by 27.8

thousand tons/year), from 996.7 thousand tons in 2014 to 1204.5 thousand tons in 2023 (Figure 1).

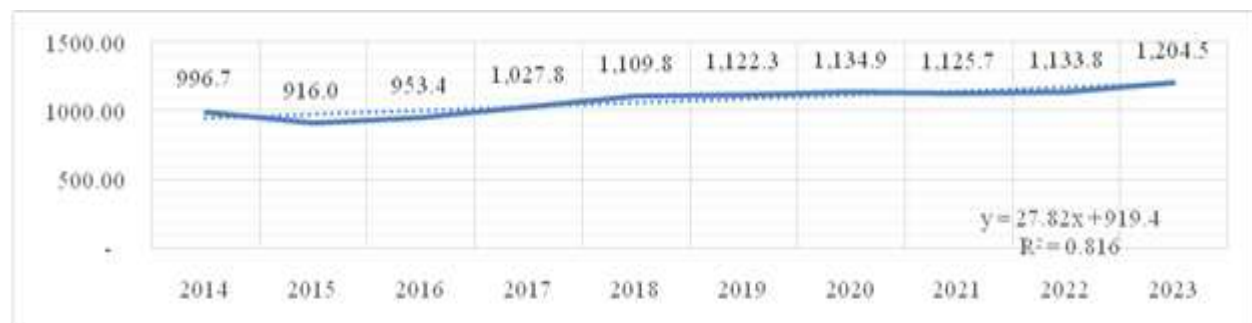


Fig. 1. Evolution of the quantities of cow's milk collected by processing units (thousand tons)

Source: Own design based on the data from NIS [8].

The quantity of the imported raw milk had a variable trend, increasing by 49.3%, the average annual rate being 4.52%, up to 115

thousand tons. Regression equation shows that imported raw milk increased every year by 4.49 thousand tons (Figure 2).

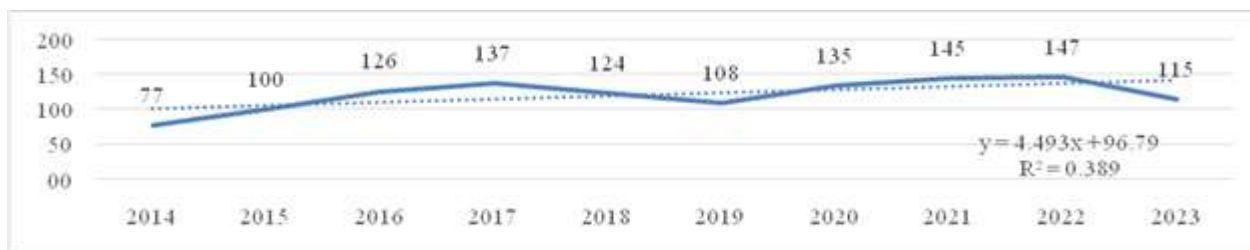


Fig. 2. The evolution of the quantities of imported raw milk (thousand tons)

Source: Own design based on the data from NIS [8].

The quantity of drinking milk produced increased continuously until 2021 (with an average of 15.3 thousand tons/year), after which it began to decrease slightly, but overall,

it had a growth rate of 4.07% per year, reaching 359 thousand tons in 2023 (meaning +43.6% compared to the year 2014) (Figure 3).

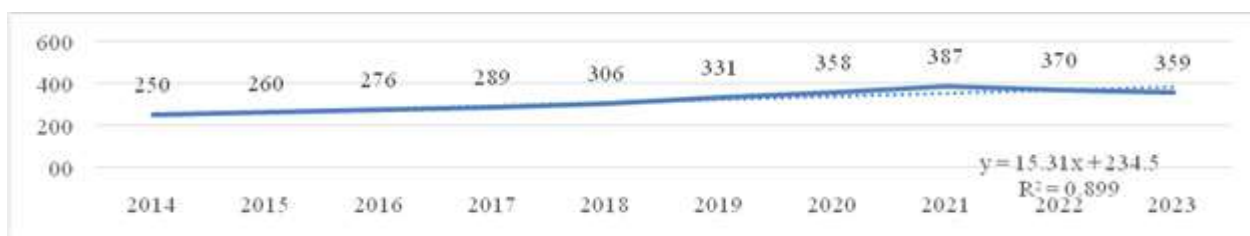


Fig.3. The evolution of drinking milk quantities (thousand tons)

Source: Own design, based on data from NIS [8].

Supply of drinking cream had increased by 12.9%, with a growth rate of 1.36% per year,

from 58.6 thousand tons, to 66.2 thousand tons, on variable trajectory (Figure 4).



Fig. 4. Evolution of the quantities of drinking cream (thousand tons)

Source: Own design based on the data from NIS [8].

Quantities of acidified milk have also increased by 22.2%, with a growth rate of 2.25% (an average of 3.93 thousand tons/year), from 166 thousand tons in 2014, to 202.8 thousand tons in 2023. This category includes the different assortments of yogurts, kefir, whipped milk (Figure 5). The quantity of butter had a very fluctuating course during the period 2014-2023, reaching maximum values of over 12 thousand tons in 2017 and 2020, and reaching 11 thousand tons at the end of the

analysed period (Figure 6). The supply of total cheeses increased by 36.7% during the analysed period, with an average annual rate of 3.54% per year (2.8 thousand tons per year), reaching 102.1 thousand tons in 2023 (Figure 7). The quantity of cottage cheese increased by 46% during the analysed period, with an average annual rate of 4.29% (3.4 thousand tons per year), reaching 94 thousand tons in 2023 (Figure 8).

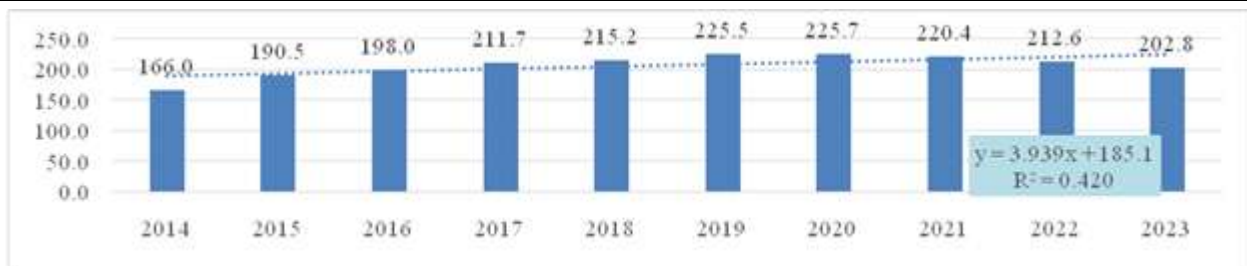


Fig. 5. Evolution of the quantities of acidified milk(thousand tons)
Source: Own design based on the data from NIS [8].

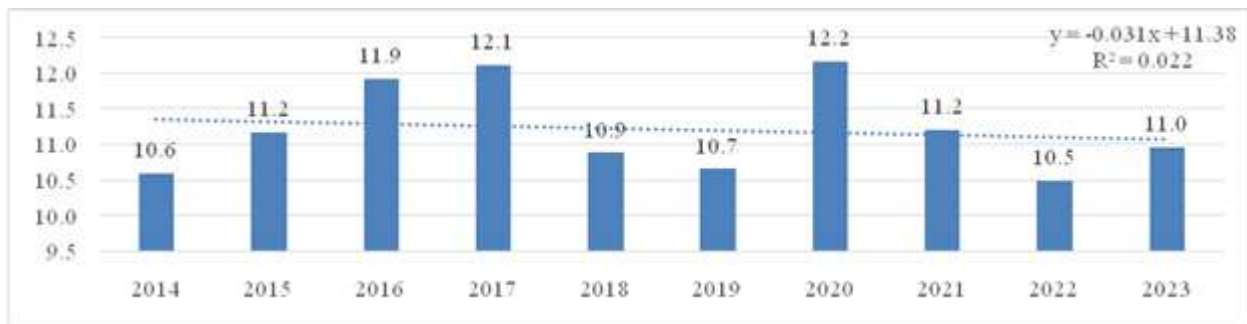


Fig. 6. Evolution of the quantities of butter(thousand tons)
Source: Own design based on the data from NIS [8].

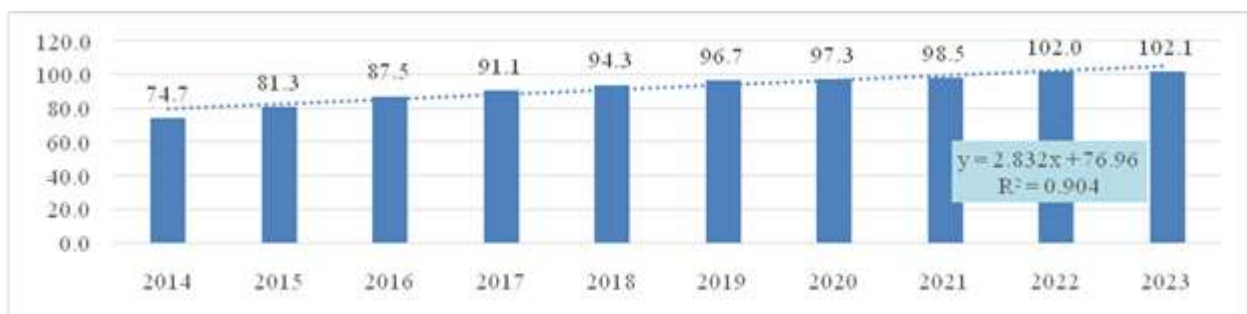


Fig. 7. Evolution of the quantities of total cheeses(thousand tons)
Source: Own design based on the data from NIS [8].

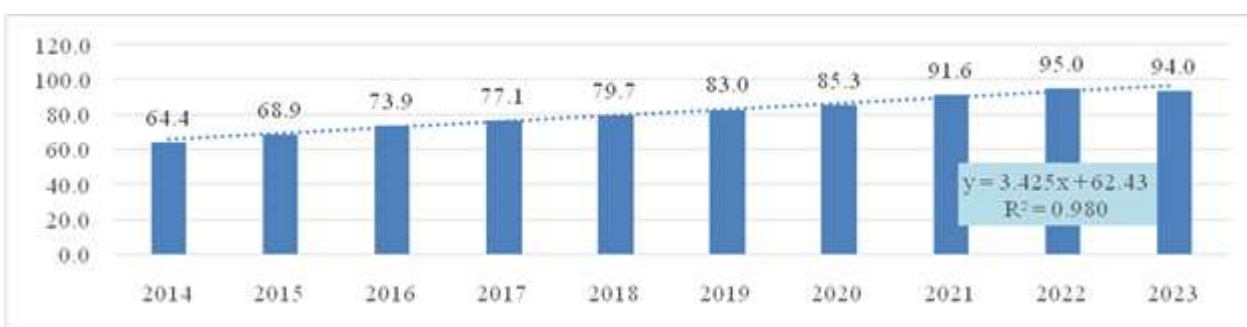


Fig. 8. Evolution of the quantities of cow's milk cheeses(thousand tons)
Source: Own design based on the data from NIS [8].

Comparing the trends of milk and dairy product supply on the market with that of the resident population in Romania between 2014-2023, it is observed that they are different, with that of the population being in decline, decreasing by over 106 thousand people per

year, according to the regression equation (Figure 9).

This situation is also reflected by the annual increase in the consumption of milk products by 1.66 kg/capita/year, over the last decade, according to data in Figure 10.

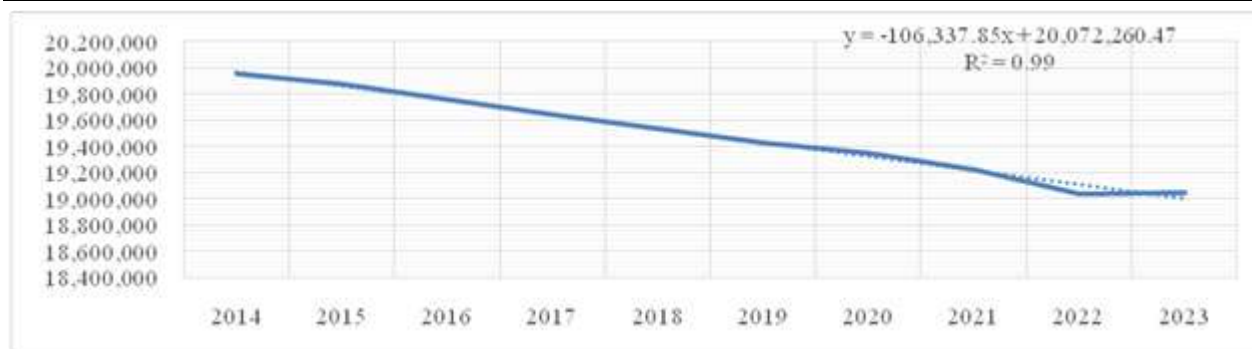


Fig. 9. The evolution of the resident population in Romania, number of persons
Source: Own design, based on data from NIS [8].

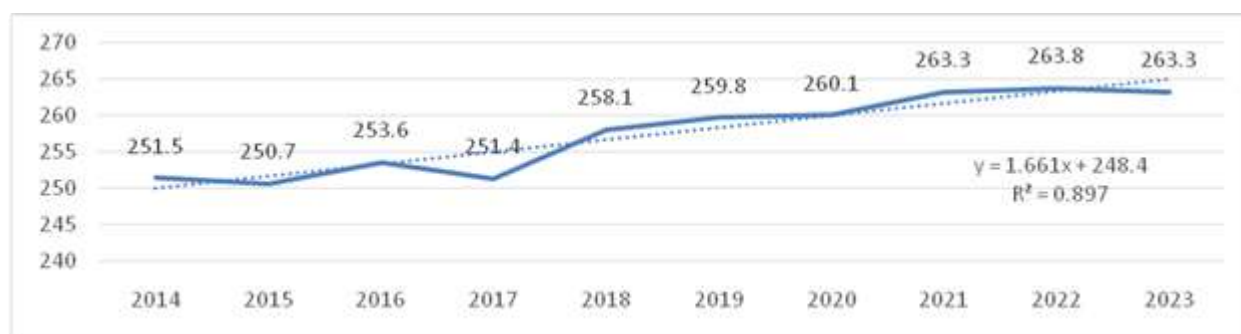


Fig. 10. The evolution of the milk products consumption in milk equivalent 3.5% fat (excluding butter)
Source: Own design, based on data from NIS [8].

CONCLUSIONS

The analyses in the paper indicated that, in the last decade, the supply of dairy products on the market in Romania followed positive trends, with the highest annual growth rate being for imported raw milk, followed by cow's milk cheeses and drinking milk. The lowest growth rate was for butter supply. In contradiction with these developments, that of the resident population was negative, the population decreasing by over 106 thousand persons per year. This comparative situation is also reflected by the growth curve of milk and equivalent milk product consumption in the last 10 years. The laws of demand and supply are those that govern market economies and determine the functional characteristics of the markets for different products.

ACKNOWLEDGEMENTS

The work is part of the ADER Project 22.1.2–” Technical-economic models for reducing the vulnerability of livestock farm income to climate change”, financed by the Ministry of Agriculture and Rural Development.

REFERENCES

- [1]Aslam M., LI Z., Naeem S., Nasir S., 2024, Navigating digital frontier: Factors influencing supply and demand of fresh milk in Pakistan. Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 24(1), 75-86. Accessed on February 3, 2025.
- [2]Ding, H., Fu, Y., Zheng, L., Yan, Z., 2019, Determinants of the competitive advantage of dairy supply chains: Evidence from the Chinese dairy industry. International Journal of Production Economics, 209, 360-373. Accessed on February 4, 2025.
- [3]Ferreira, F. U., Robra, S., Ribeiro, P. C. C., Gomes, C. F. S., Almeida Neto, J. A. D., Rodrigues, L. B., 2020, Towards a contribution to sustainable management of a dairy supply chain. Production, 30, e20190019. Accessed on February 4, 2025.
- [4]Hossain, S., Jahan, M., Khatun, F., 2022, Current status of dairy products in Bangladesh: A review on supply and utilization. International Journal of Business and Management Social Researches, 11, 609-18. Accessed on February 4, 2025.
- [5]Kirilova, E., Vaklieva-Bancheva, N., Vladova, R., Petrova, T., Ivanov, B., Nikolova, D., Dzhelil, Y., 2022, An approach for a sustainable decision-making in product portfolio design of dairy supply chain in terms of environmental, economic and social criteria. Clean Technologies and Environmental Policy, 24(1), 213-227. Accessed on February 4, 2025.
- [6]Medelete, D.M., Panzaru, R.L., Grecu, M.C., 2024, Consumption of milk and dairy products in Romania

(2017-2019) . Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 24(1) 599-606.

[7]Montgomery, H., Haughey, S. A., Elliott, C. T., 2020, Recent food safety and fraud issues within the dairy supply chain (2015–2019). *Global Food Security*, 26, 100447. Accessed on February 4, 2025.

[8] National Institute of Statistics NIS, Tempo online, <http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table>, Accessed on February 2, 2025.

[9]Popescu, A., Chirciu, I., Soare, E., Stoicea, P., Iorga, A. 2022, Trends in average annual food consumption per inhabitant in Romania. *Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development"*, Vol. 22(3), 561-580.

[10]Research Institute for Agriculture Economy and Rural Development, 2025, ADER 22.1.2. Project - Technical-economic models for reducing the vulnerability of livestock farm income to climate change. Accessed on February 4, 2025.

[11]van Asselt, E. D., Van der Fels-Klerx, H. J., Marvin, H. J. P., Van Bokhorst-van de Veen, H., Groot, M. N., 2017, Overview of food safety hazards in the European dairy supply chain. *Comprehensive Reviews in Food Science and Food Safety*, 16(1), 59-75. Accessed on February 4, 2025.

[12]Zubair, M., Mufti, N. A., 2015, Identification and assessment of supply chain risks associated with dairy products sector. *Journal of Basic & Applied Sciences*, 11, 167-175. Accessed on February 4, 2025.