Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 23, Issue 1, 2023
PRINT ISSN 2284-7995, E-ISSN 2285-3952

DEVELOPMENTS IN THE LITHUANIAN DAIRY SECTOR IN 2004–2021 AND THE MAIN FACTORS AFFECTING THEM

Deiva MIKELIONYTĖ, Ovidija EIČAITĖ

Lithuanian Centre for Social Sciences Institute of Economics and Rural Development, A. Vivulskio st. 4A-13, 03220 Vilnius, Lithuania, Phones: +37052614547, +37052622429, Emails: deiva.mikelionyte@ekvi.lt, ovidija.eicaite@ekvi.lt

Corresponding author: ovidija.eicaite@ekvi.lt

Abstract

This study aimed at examining the developments in the Lithuanian dairy sector since the accession of the country into the EU and assessing the main factors affecting these developments. In order to achieve this aim, a descriptive method of statistical data analysis and document analysis was employed. The developments in milk production and dairy processing industry were presented by examining issues such as milk production, sales of raw milk for processing, quantities of milk sold directly, number of dairy cows, milk yield, self-sufficiency in milk, imports of raw milk, self-sufficiency in domestic raw milk, sales by the dairy processing industry, and exports of dairy products. The accession of Lithuania into the EU in 2004 initially had a positive effect on the primary dairy sector, with an increase in raw milk production, sales of raw milk for processing, and farm gate milk prices until 2007. However, in the period between 2008 and 2021, both raw milk production and sales of raw milk for processing showed a decreasing trend. The opposite trend was observed in the dairy processing industry. In 2021, as compared to 2004, sales of dairy products on both domestic and foreign markets increased significantly, by a factor of 2.5 and 3.0, respectively. The developments in milk production and dairy processing were affected by factors such as the levels of concentration among milk producers and processors, the cooperation between milk producers, and the shape of the Common Agricultural Policy.

Key words**:** *milk production, dairy processing industry, concentration of milk production, concentration of dairy processing, cooperation, Lithuania*

INTRODUCTION

In Lithuania, the dairy sector has long traditions. Favourable climatic conditions and fertile pastures lead to an orientation towards milk production. The primary dairy sector is one of the most important agricultural sectors in the country, as it has consistently been one of the largest contributors to the overall Lithuanian agricultural economy. For a long time, milk and grain crops have accounted for large shares of the value of gross agricultural production (in 2021, 16.1% and 33.9%, respectively). The dairy processing industry is one of the key sectors of the Lithuanian food industry. Over the years, dairy products have held the largest share of the value of total food industry production (in 2020, 25.4%). A wide range of dairy products are produced in Lithuania. Dairy products are a staple and fundamental in the Lithuanian diet. The dairy processing industry is fully capable of meeting domestic demand. About the half of the production produced is exported. Several Lithuanian dairy products are recognized at the EU level: cheese Liliputas and cottage cheese Lietuviškas varškės sūris are marked with the logo of a Protected Geographical Indication, while Žemaitiškas kastinys is marked with the logo of a Traditional Specialty Guaranteed.

Given the importance of the dairy sector in Lithuania, it is of great importance to determine the significance of changes taking place in this sector. Since the 1990s, the primary dairy sector and the dairy processing industry have undergone serious changes linked to political developments. The restoration of independence and the systemic transformation that followed, as well as the accession of the country into the European Union (EU) were the main events that affected the Lithuanian economy, including agriculture and dairy sector.

When Lithuania restored its independence in 1990, the transition from a centrally planned economy to a market economy began.

Privatization started both in agriculture and the food processing industry. In order to restore private ownership and management in the agricultural sector, major reforms were implemented. Land restitution and privatization enabled the development of family farms. At the same time, the restructuring of some collective farms led to the creation of agricultural holdings. All these changes had an impact on the primary dairy sector. The first decade of independence witnessed a marked contraction in milk production. Between 1990 and 2000, the total number of dairy farms fell from 848 to 494 thousand and total milk production dropped from 3,157 to 1,560 thousand tonnes. In this period, the primary dairy sector was characterised by small-scale farming, fragmentation of agricultural land, and a small number of dairy cows per farm [7; 9; 11]. Given these specificities, the scope for investment in modernisation and restructuring of dairy farms was limited. The systemic changes also caused a number of effects in the dairy processing industry. Strong competition in a market economy led to restructuring and concentration in this industry. Some companies went bankrupt, some merged with others. Between 1995 and 2000, the total number of dairy processing companies decreased from around 60 to 37. The largest dairy processing companies invested heavily in the modernisation of production equipment and technology. These companies succeeded in improving product quality and safety, as well as updating and expanding their product range. The dairy processing industry became one of the most concentrated and modern sectors of the Lithuanian food industry [8; 26].

The accession of Lithuania into the EU in 2004 led to significant changes at the level of both milk producers and dairy processors. Both sectors had to meet the EU quality requirements and implement the Common Agricultural Policy with direct payments, subsidies on investment, milk quotas, export subsidies, public intervention and aid for private storage, EU import licenses (sanitary certificates) and import tariffs, and other measures [22; 28]. The dairy sector has become largely dependent on the situation in the EU milk market, which is affected by policy changes and international consequences.

Over the last almost twenty years, the Lithuanian dairy sector has received attention in scientific literature. A number of studies have been carried out to analyse changes in the Lithuanian dairy sector since the country has joined the EU. The studies have described the phenomena occurring in this sector, as well as have identified causes and consequences of these phenomena. Some of previous studies have looked not only at the dairy sector in Lithuania but also at dairy sectors in other countries. These studies have mostly compared the performance of dairy sectors in the Baltic, Nordic, Eastern and Central Europe and all EU countries. The main focuses of previous studies include: a comparison of the performance of the Baltic countries and Finland in terms of milk production, processing, and foreign trade (1998–2008) [9]; the analysis of the economic effect according to the main dimensions of integration in the Baltic dairy processing sector (1996–2009) [19]; an overview of the dairy industry in Poland and Lithuania after the accession into the EU and the assessment of the economic situation of milk producers (2004–2012) [2]; the identification of market power in the raw milk markets in the Baltic countries and comparison of milk producers and the dairy industry in these countries (2004–2014) [23]; the assessment of the efficiency of Lithuanian dairy farms of different economic sizes [17]; the analysis of the dairy sector in the Baltic countries and trends in its historical development (2004–2018) [20]; the investigation of spatial raw milk price transmission in selected EU countries (2005–2020) [10]; the analysis of the Baltic dairy sector (2004–2019) and elaboration of prospects for its future development (2019–2025) [21]; the evaluation of the competitiveness of the EU dairy market in the periods before and after the abolition of milk quotas (2008–2018) [12]. As Lithuania approaches the 20th anniversary of its EU membership, it is important to assess the

changes that have taken place in the dairy sector during this period.

MATERIALS AND METHODS

The aim of the present study is to examine the developments in the Lithuanian dairy sector since the accession of the country into the EU and to assess the main factors affecting these developments. This study employs a descriptive method of statistical data analysis and document analysis. In order to examine the developments in the Lithuanian dairy sector, data from various sources are used. These sources include data from the statistical office of the EU EUROSTAT [5], the Lithuanian Department of Statistics (Statistics Lithuania) [25], the EU Milk Market Observatory [3], the EU Farm Accountancy Data Network (FADN) [6], the State Enterprise Agricultural Information and Rural Business Centre [1], the State Food and Veterinary Service of the Republic of Lithuania [24], and the Nasdaq Baltic Stock Market [18]. In order to assess the main factors affecting the developments in the Lithuanian dairy sector, the literature on the subject is analysed.

In this study, the developments in the Lithuanian dairy sector since EU accession are presented by examining the following issues: milk production, sales of raw milk for processing, quantities of milk sold directly, number of dairy cows, milk yield, self-sufficiency in milk, imports of raw milk, self-sufficiency in domestic raw milk, sales by the dairy processing industry, and exports of dairy products. Later in this study, the effect of the main factors such as concentration in milk production and dairy processing, cooperation between milk producers, and EU agricultural and food policy on the developments in the Lithuanian dairy sector is defined.

This study covers the period from 2004 to 2021. The results are presented in the form of descriptive analysis and statistics.

RESULTS AND DISCUSSIONS

Developments in the Lithuanian dairy sector

Milk production. Between 2004 and 2007, both raw milk production and sales of raw milk for processing increased (Figure 1). Raw milk production in 2007 was the highest throughout the period analysed and reached 1,937 thousand tonnes. The global economic crisis in 2008–2009 had a significant impact on the Lithuanian dairy sector, with raw milk production starting to decline. Although demand for dairy products subsequently recovered and prices increased, raw milk production continued its downward trend. In 2021, compared to 2004, raw milk production decreased by one fifth (20.1%), from 1,849 to 1,477 thousand tonnes.

Raw milk production has been declining in line with the steady decrease in the number of dairy cows. In 2021, compared to 2004, the number of dairy cows in Lithuania fell by almost half (48.1%), from 433.9 to 225.2 thousand. During this period, there was only one year, 2007, when the number of dairy cows increased by 1.5% or 6 cows compared to the previous year. In all other years the number of dairy cows decreased (Figure 2). However, the average productivity of dairy cows increased by 53.9%, from 4,176 kg per cow in 2004 to 6,425 kg per cow in 2021. The average milk yield per cow was down between 0.5% and 1.8% compared to the previous year only in 2015–2016.

The increase in sales of raw milk for processing after EU accession was interrupted by the economic crisis of 2008–2009. Subsequently, these sales continued to grow, reaching 1,438 thousand tonnes in 2015. However, due to a significant drop in farm gate milk prices as a result of the Russian embargo on food imports from EU countries announced in August 2014 (until this date, Lithuanian dairy exports to Russia accounted for almost one third of total dairy exports) sales of raw milk for processing decreased in 2016. This downward trend continued until 2021. However, in the period of 2004–2021, sales of raw milk for processing in Lithuania increased by 16.9%, from 1,140 thousand tonnes in 2004 to 1,333 thousand tonnes in 2021. The composition of sold milk increased, from 4.12% to 4.24% for fat content and from 3.27% to 3.43% for protein content.

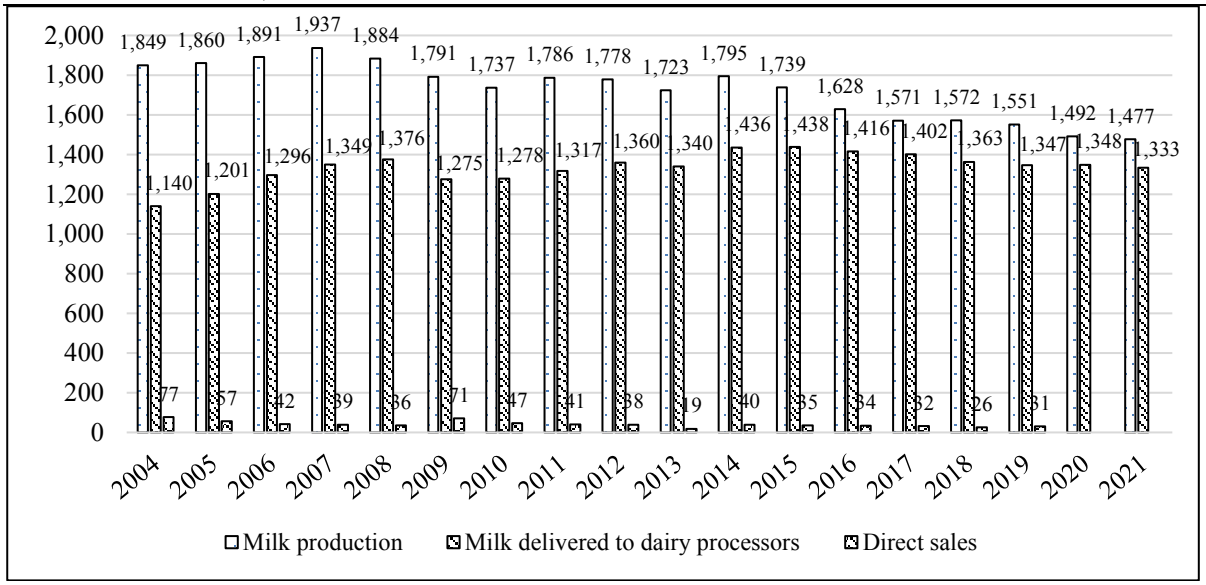

Fig. 1. Milk production, milk delivered to dairy processors, and direct sales in Lithuania in 2004–2021, thousand tonnes

Sources: Statistics Lithuania [25] and Agricultural Information and Rural Business Centre [1].

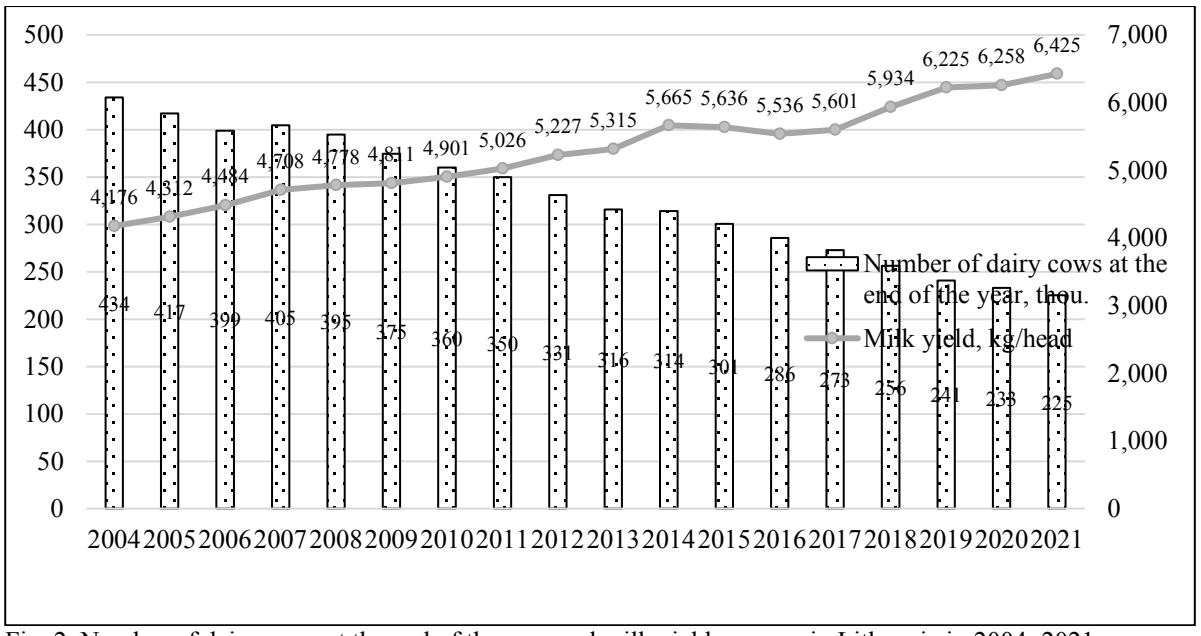

Fig. 2. Number of dairy cows at the end of the year and milk yield per cow in Lithuania in 2004–2021

Source: Statistics Lithuania [25].

The share of commercial milk steadily increased from 65.8% in 2004 to 91.3% in 2017, while milk consumption on farms was decreasing. In 2018–2019, the share of commercial milk dropped slightly to between 88.4% and 88.8% but increased again to between 90.3% and 90.4% in 2020–2021.

Milk sold directly accounted for a small share of total commercial milk over the analysis period. It was higher in the first years after EU accession: 77 thousand tonnes in 2004 (6.3% of total commercial milk), 57 thousand tonnes in 2005 (4.5% of total commercial milk), and 77 thousand tonnes in 2009, the year of crisis (6.3% of total commercial milk). In all other years, milk sold directly ranged from 19 to 47 thousand tonnes (between 1.4% and 3.5% of total commercial milk).

In Lithuania, milk production in 2004–2021 was higher than the amount needed to meet domestic demand. The percentage of self-sufficiency in milk ranged from 134% to 185% (Figure 3).

In 2021, the percentage of self-sufficiency in milk was the lowest in the whole period 2004–2021. This was due to a larger decrease

in milk production (-20.1%) than in domestic consumption (-12.0%).

Although Lithuania produced more raw milk than it needed to meet domestic demand throughout the period under analysis, the amount of Lithuanian raw milk sold for processing was not sufficient to fully utilise the capacity of the dairy processing industry. In 2004, the Lithuanian dairy processing industry used only about 70% of its production capacity.

There was no foreign trade in raw milk before Lithuania joined the EU in May 2004. However, since 2005, taking advantage of the benefits of the EU single market, raw milk has been imported into Lithuania. In 2005, 40.0 thousand tonnes of raw milk were imported, and imports have continued to grow steadily since then. In 2021, compared to 2005, imports of raw milk increased more than 12-fold to 483.5 thousand tonnes. The self-sufficiency in domestic raw milk decreased from 100% in 2004 to 72.5% in 2021 (Table 1). Around 70% of imports of raw milk came from Latvia and around 30% from Estonia, while imports from other countries were sporadic and very small.

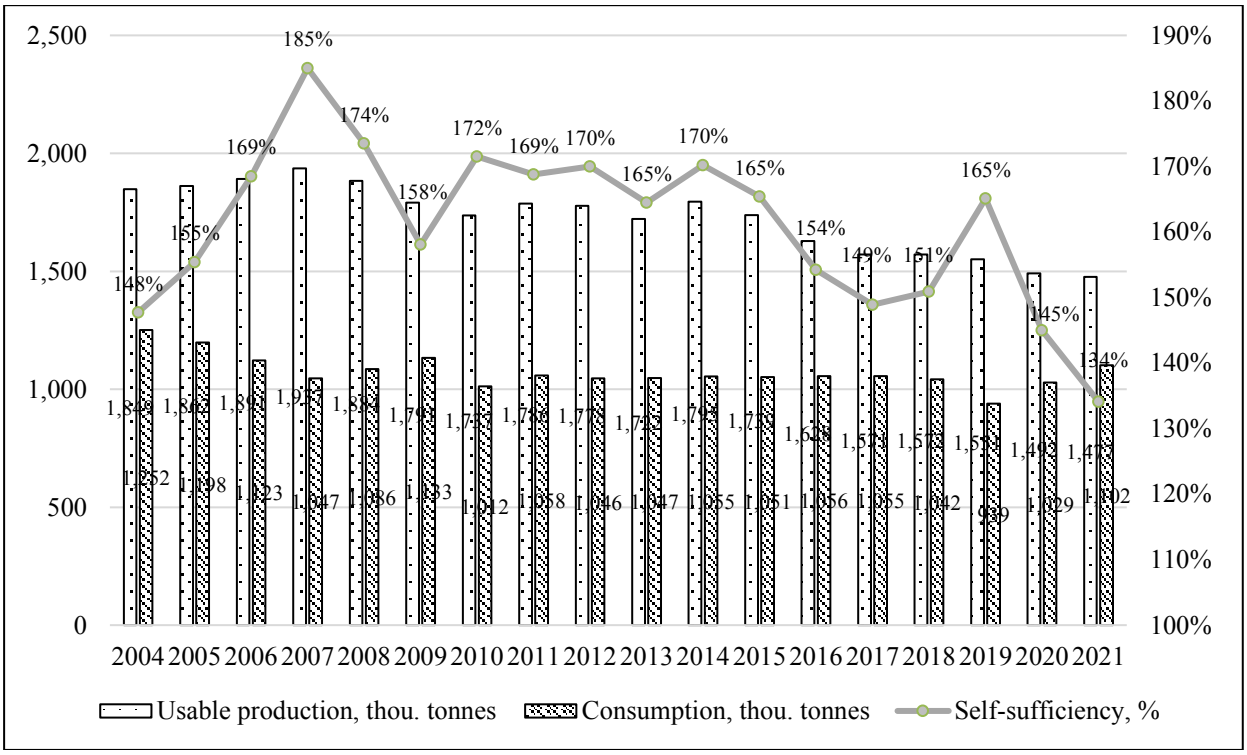

Fig. 3. Usable production, consumption, and self-sufficiency in milk in Lithuania in 2004–2021
Source: Statistics Lithuania [25].

Table 1. Raw milk purchases by the Lithuanian dairy processing industry, milk processed, and self-sufficiency in domestic raw milk in 2004, 2009, 2015, and 2021

	2004	2009	2015	2021	Change 2021, compared to 2004, %
Raw milk purchased in Lithuania	1,140.0	1,263.8	1,344.3	1,275.6	11.9
Imports of raw milk	0	167.6	334.6	483.5	–
Milk processed	1,140.0	1,431.4	1,678.9	1,759.1	54.3
Self-sufficiency in domestic raw milk, %	100.0	88.3	80.0	72.5	X

Source: Statistics Lithuania [25].

Dairy processing industry. In 2021, compared to 2005, sales by the Lithuanian dairy processing industry increased by a factor of 2.8 (Table 2). The value of dairy products sold

on the domestic market increased slightly less over the same period, by a factor of 2.5. Between 2004 and 2021, the market share of all domestic dairy products in Lithuania decreased from 92.6% to 71.5%.

Before joining the EU single market, Lithuanian dairy processing companies produced dairy products that met quality standards. More than half of these products produced were exported. This proportion has been maintained throughout the period 2004–2021. Exports of most dairy products have been increasing. In 2021, compared to 2004, exports of ice cream and milk and cream increased the most (6.5 and 4.4 times, respectively). Of all dairy products, only exports of butter and casein decreased (Table 3).

Table 2. Sales by the Lithuanian dairy processing industry in 2004, 2009, 2015, and 2021

	2004	2009	2015	2021	Change 2021, compared to 2004, times
Sales of dairy products, including other milk-based products, mill. EUR	426.1	622.8	754.3	1,173.0	2.8
on domestic market	*203.4*	*313.5*	*375.0*	*501.4*	*2.5*
on foreign markets	*222.7*	*309.3*	*379.3*	*671.6*	*3.0*
Share of the value of dairy products sold on foreign markets, %	52.3	49.7	50.3	57.3	X

Source: Statistics Lithuania [25].

Table 3. Lithuanian exports of dairy products in 2004 and 2021, thousand tonnes

Products	2004	2021	Change 2021, compared to 2004, %
Milk & cream, not concentrated (excluding raw milk)	25.5	112.0	439.2
Milk & cream, concentrated	19.3	55.2	286.0
Fermented or acidified milk & cream	5.1	7.4	145.1
Whey & products consisting of natural milk constituents	18.1	70.8	391.2
Butter & other fats & oils derived from milk, dairy spreads	6.7	6.1	91.0
Curd & cheese	52.3	58.0	110.9
Ice cream	3.5	22.7	648.6
Casein	0.7	0	0.0
Milk sugar	3.9	11.8	302.6

Source: Statistics Lithuania [25].

The geographical structure of Lithuanian dairy exports in value terms has evolved. EU countries accounted for around 70% of total dairy exports over the whole period analysed. In the year before EU accession, i.e. in 2003, only 42% of total dairy exports went to EU countries. At that time, one of the most important foreign markets for Lithuanian dairy products was the USA, which accounted for 25% of total dairy exports. However, Lithuanian dairy exports to the USA have subsequently declined sharply, accounting for only 1–6% of total dairy exports. Until 2014, Russia was an important and profitable export market for Lithuanian dairy products, accounting for 27–30% of total dairy exports. However, after the embargo imposed by Russia on food imports from the EU in 2014, only 0.1% of Lithuanian dairy exports went there.

Cheese and curd accounted for the largest share of both total dairy sales and total dairy exports. Although the share of these dairy products has gradually decreased, it remained the highest throughout the period analysed. In 2004, cheese and curd represented 48.1% of total dairy sales and 55.3% of total dairy exports, while in 2021 these dairy products represented 37.4% of total dairy sales and 32.1% of total dairy exports. This decrease was not due to a decrease in sales of cheese and curd (in 2021, compared to 2004, sales of

cheese and curd increased by a factor of 2.1, while exports increased by 68.2%) but to an increase in sales of other dairy products. Over the whole period analysed, sales of ice cream increased by a factor of 3.3 and exports by a factor of 10.2, sales of cream by a factor of 5.3 and exports by a factor of 4.6, and sales of whey and whey products by a factor of 7.0 and exports by a factor of 6.4. Sales of whey grew as their production increased.

Main factors affecting the developments in the Lithuanian dairy sector

Concentration in milk production and dairy processing. The Lithuanian dairy sector joined the EU with an oligopsony market structure. Milk production was dominated by a large number of small producers. A small number of large dairy farms were formed as a result of the transformation of Soviet farms and collective farms into agricultural holdings. Family farms were small, as they were mostly set up with 1–3 dairy cows when Lithuania regained its independence in 1990. In 2004, the number of large family farms was small. Farms with 1–5 dairy cows reared two third of all dairy cows (67.6%) and farms with 6–20 dairy cows reared slightly more than one fifth of all dairy cows (21.2%). Although the smallest farms with 1–20 dairy cows decreased by 86.9% between 2004 and 2021, while the remaining farms increased by 40.3%, the average dairy farm in 2021 was still relatively small, with 8.5 cows. Dairy farms with less than 100 cows accounted for 99.0% of all dairy farms (Table 4).

Changes in the number of dairy farm groups of different size have varied between periods. Over the whole period analysed, the number of farms with 1–20 cows has been decreasing, while the number of farms with more than 100 cows has been increasing.

Meanwhile, the number of farms with 21–100 cows increased by a factor of 3.1 in 2015, compared to 2004, but decreased by 19.6% in 2021, compared to 2015.

According to the Department of Statistics of Lithuania, between 2004 and 2021, there were between 27 and 69 dairy processing companies.

According to the State Food and Veterinary Service, the number of dairy processing companies with veterinary approval, excluding milk purchase spots, ranged from 31 to 39. However, already in 2004, the vast majority of all dairy products were produced and sold by five groups: Rokiškio sūris AB, Pieno žvaigždės AB, Žemaitijos pienas AB, Vilkyškių pieninė UAB (later AB), and Marijampolės pieno konservai UAB, each comprising 2–4 companies. In 2004, the degree of market concentration in terms of sales (RC5) of these five groups of dairy processing companies was 80.7%. Between 2008 and 2015, they retained 90–92% of total dairy sales.

This share fell to 83.6% in 2016, when Pienas LT ŽŪK, a new dairy processing company, was launched. As dairy production in Pienas LT gained momentum, between 2018 and 2021, the degree of market concentration in terms of sales (RC5) of the five groups of dairy processing companies mentioned above was 77–82%.

The raw milk procurement market in Lithuania can also be described as oligopsony. The five groups of dairy processing companies directly purchase around 60–65% of raw milk [29].

The high level of concentration in the dairy processing and the very low level of concentration in milk production led to unequal bargaining power between the parties when negotiating farm gate milk prices.

Dairy processors practically dictated farm gate milk prices for most milk producers. Particularly low prices were set for the smallest milk producers, who had the least bargaining power.

With the predominance of small milk producers receiving low prices for raw milk, the average farm gate milk price in 2004 was the lowest in the EU and stood at €12.05 per 100 kg, below the EU average, although it had already increased by 20.6% compared to 2003 (Figure 4).

Table 4. Dairy farms by number of cows in Lithuania in 2004, 2015, and 2021 (at the beginning of the year)

Number of cows per farm	Number of farms			Change 2021, compared to 2004, %	Number of cows			Change 2021, compared to 2004, %
	2004	2015	2021		2004	2015	2021	
1–5	184,768	50,987	21,331	-88.5	316,178	90,277	40,106	-87.3
6–20	9,622	6,680	4,116	-57.2	82,229	66,449	42,453	-48.4
21–30	373	934	734	96.8	9,194	23,244	18,262	98.6
31–50	205	775	610	197.6	7,833	30,215	23,798	203.8
51–100	113	464	403	256.6	7,632	32,311	28,014	267.1
>100	150	256	274	82.7	44,348	70,996	81,712	84.3
Total	195,231	60,096	27,468	-85.9	467,414	313,492	234,345	-49.9
Average per farm, heads	X	X	X	X	2.4	5.2	8.5	254.2

Source: Agricultural Information and Rural Business Centre [1].

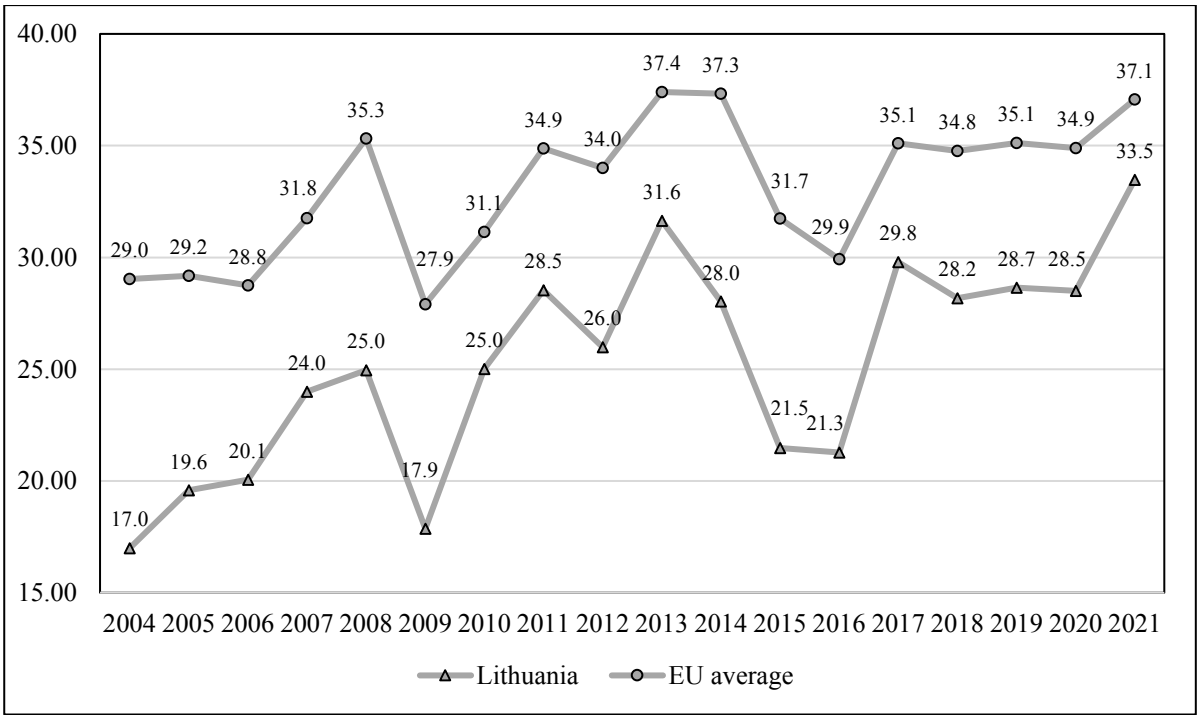

Fig. 4. Farm gate milk prices in Lithuania and the EU in 2004–2021, EUR per100 kg
Sources: EUROSTAT [5] and EU Milk Market Observatory [3].

Given the significant difference in farm gate milk prices between Lithuania and other EU countries, competition in the EU single market led to a rise in farm gate milk prices in Lithuania between 2004 and 2006, while in many other EU countries farm gate milk prices remained stable or even slightly decreased during that period. Thus, the difference between the Lithuanian farm gate milk price and the EU average fell from €12.05 per 100 kg in 2004 to €7.76 per 100 kg in 2007. However, this decreasing price difference did not help Lithuania to move up from last place among EU countries in terms of farm gate milk prices until 2020. In some years, Lithuania was only ahead of Romania, which joined the EU in 2007. Between 2007 and 2021, the trend in the Lithuanian farm gate milk price was similar to the EU average, with a correlation coefficient of 0.905. However, the Lithuanian farm gate milk price per 100 kg was €6–9 below the EU average, except in years when the demand for dairy products fell significantly, i.e. the years of the global economic crisis (2008–2009) and the years of the significant drop in world dairy prices (2014–2015). During these periods, the difference between the Lithuanian farm gate milk price per 100 kg and the EU average was more than €10. In this way, Lithuanian dairy

processors, with a significant bargaining advantage due to their high concentration in the dairy processing, were able to absorb their losses due to the fall in dairy product prices by lowering farm gate milk prices. Low prices for raw milk provided dairy processors a competitive advantage on dairy markets. The situation started to change in 2021: as the quantities of raw milk purchased for processing in Lithuania have decreased and scope for increasing import opportunities for raw milk has decreased, the difference between the Lithuanian farm gate milk price per 100 kg and the EU average narrowed to €3.58, and the Lithuanian farm gate milk price was higher than in nine EU countries, including Latvia and Estonia.

According to data published on the Nasdaq Baltic Stock Market, the four largest groups of dairy processing companies (Rokiškio sūris AB, Pieno žvaigždės AB, Žemaitijos pienas AB, Vilkyškių pieninė UAB (later AB) combined profitability of 1.9% to 7.3% over the whole period 2004–2021, with the exception of 2008, when a loss of 1.6% was incurred. Large milk producers, which received higher farm gate milk prices, were also profitable. The profitability of milk production of agricultural holdings, even without subsidies, averaged 20% over the period analysed and only turned negative in 2009, at -0.4%. This encouraged agricultural holdings to expand production of commercial milk. In 2021, compared to 2004, 2.5 times more raw milk was purchased from agricultural holdings.

Meanwhile, for smaller milk producers, low farm gate milk prices did not only prevent them from expanding their farms, but often also from making a living. According to the FADN, the overall loss of specialised dairy farms with an average of 9.3–12.9 dairy cows, including costs for family work but excluding subsidies, averaged -37.1% between 2007 and 2020. Half of the years in this period were profitable if production subsidies were included, with an average profit on raw milk production of 2.6%. Nevertheless, even if subsidies were included, there were years when milk producers made a loss, e.g. -18.7% in 2009 or -11.0% in 2019. Smaller dairy farms that sold raw milk for processing were in an even worse financial situation. As a result, purchases of raw milk for processing from family farms in 2021 decreased by 0.4% compared to 2004. A large number of small milk producers withdrew from milk production throughout the period analysed, while there was a high degree of confrontation between the remaining small and medium-sized milk producers and the dairy processing companies. In order to solve this problem, in 2015, the Parliament of the Republic of Lithuania adopted the Law prohibiting unfair actions on the part of economic operators when buying and selling raw milk and marketing milk products [14]. This law established a classification of milk producers depending on the volume of raw milk of natural fat content sold per day (raw milk sellers are classified into ten groups I–X), and obliged purchasers of raw milk to offer the same price to all milk producers belonging to the same group. However, it did not solve the problem that raw milk of the same quality may be priced differently depending on the volume sold. For instance, in June 2017, the price of raw milk of basic indicators delivered to milk purchase points was 32.9% lower for milk producers belonging to Group I (selling up to 100 kg of raw milk per day) compared to milk producers belonging to Group VIII (selling between 4,000 and 10,000 kg of raw milk per day); milk producers belonging to Group I, from whom raw milk was collected directly from farms, were paid 34.7% less for raw milk than milk producers belonging to Group X (selling more than 20,000 kg of raw milk per day). In June 2020, these differences narrowed to only 29.0% and 30.5% respectively.

Cooperation between milk producers. One of the ways in which milk producers can increase their own bargaining power, when negotiating raw milk purchase prices, is through cooperation. Cooperatives were established in Lithuania before the country joined the EU. This process was not easy due to the strong hostility of dairy processing companies towards cooperating milk producers [30]. In 2004, 18 out of 54, or one-third, of all operators purchasing raw milk

were cooperatives, in 2016, 30 out of 59, or 50.8%, and in 2021, 27 out of 55, or 49.1%. Cooperatives in Lithuania purchased about 29% of raw milk for processing [29].

Between 2020 and 2021, in Lithuania, raw milk was purchased by seven large recognised agricultural cooperatives [16], three of which processed all or part of the raw milk purchased (vertical integration). One of these three cooperatives was Pienas LT. This cooperative was the only one that processed all raw milk purchased from its members and produced and successfully marketed high value-added dairy products on domestic and foreign markets. The success of the establishment and operation of Pienas LT was partly due to significant support from EU funds and strong political support from the Lithuanian government. The other two cooperatives processed only part of the raw milk purchased, produced traditional dairy products and, due to the small scale of production, faced difficulties in marketing them in the concentrated Lithuanian retail market. The remaining recognised cooperatives only resold purchased raw milk to dairy processors (horizontal integration). Most of the other cooperatives (non-recognized) were small and only purchase raw milk and resold it to dairy processors (horizontal integration). According to the survey conducted by the Competition Council of the Republic of Lithuania in 2015 during the market study of the dairy sector [13], one third of the 33 cooperatives in the survey indicated that they have no or little bargaining power when negotiating raw milk prices with dairy processors. However, more than one fifth of the cooperatives rated their bargaining power as good. Most of these cooperatives were large, purchasing the largest quantities of raw milk.

The low bargaining power of small purchasers of raw milk is reflected in the price paid to them by dairy processors. In December 2021 (this information began to be published from October 2021), milk purchasing companies (both cooperatives and purchasers with another legal form) delivering between 300 and 1,000 kg of milk per day, when milk was taken directly from suppliers, were paid a price that was 14–15% lower than the price paid to milk producers delivering the same volume of raw milk. And only milk purchasers delivering 4,000 kilograms or more of milk per day were paid a price that was 0.2–8.9% higher than the price paid to milk producers delivering the same amount.

Council Regulation (EC) No 1234/2007 of 22 October 2007 establishing a common organisation of agricultural markets and on specific provisions for certain agricultural products (Single CMO Regulation) [4] allows the setting up of milk producer organisations, which can collectively negotiate with dairy processing and other milk purchasing companies on the purchase price of raw milk and other contractual terms. In Lithuania, the rules for the administration of milk producer organisations and their associations were adopted in 2012, but so far milk producers have not made use of this instrument, and no recognised milk producer organisation has been set up.

EU agricultural and food policy. Since EU accession, the framework of EU agricultural and food policy has come into force for Lithuanian agriculture and food industry. For dairy farms, one of the biggest changes was the milk quota system, which was designed to limit the production of commercial milk. During the accession negotiations in the EU, Lithuania obtained a total milk quota of 1,647 thousand tonnes, including 1,256 thousand tonnes for deliveries to dairies and 390.5 thousand tonnes for direct sales at farm level. These proportions have subsequently changed, while the overall quota has been slightly increased, as in the EU as a whole. The negotiated quota amount did not limit the production of commercial milk. In different years, the implementation rate of quota for deliveries to dairies was 77–92% and quota for direct sales at farm level 19–61%. Lithuania has never had to pay a surplus levy. Individual milk producers who exceeded their individual quota or who wished to expand their production were able to obtain additional quota from the national milk quota reserve. Since 2007, the trade in milk quotas and the leasing of milk quotas in electronic auctions have been legalised. If in the first auction an

average of €0.09 was paid for one kilogram of milk quota [15], then in the second auction it was only €0.01–0.02 [27]. Later, the price of milk quotas in auctions was even lower.

Milk producers, like all farmers in the EU, started receiving EU subsidies in 2004. According to the results of the FADN, in the years between 2014 and 2021, production subsidies per specialised dairy farm averaged €7,264.4 per year. By contrast, before EU accession, in 1999–2003, these subsidies per dairy farm averaged only €1,922.6 per year. It can be concluded that after EU accession, dairy farms received 3.8 times higher production subsidies. In individual years, they accounted for between 21.1% and 39.3% of the total farm income from agricultural economic activity, including subsidies.

Subsidies on investments per specialized dairy farm did not differ significantly before and after EU accession. In the years between 2014 and 2021, these subsidies per dairy farm averaged €2,827.1 per year, compared to €2,860.4 in 1999–2003. However, excluding payments from the Sapard programme financed by EU funds, the national investment support per specialised dairy farm amounted to €2,675.2 per year in 1999–2003. Thus, between 2004 and 2021, investment support for dairy farms was on average only 5.7% higher than national investment support between 1999 and 2003.

Before EU accession, Lithuanian dairy processing companies were not subject to a regulated support system or market regulation measures. Support was mainly provided in the event of individual crisis situations. In 2002–2003, following a significant drop in dairy prices on foreign markets, farm gate milk prices in Lithuania decreased by 10–11% per year. Therefore, €3.19 million was allocated to dairy processing companies in 2002 and €16.22 million in 2003 to support farm gate milk prices. This support accounted for 1.1 percent of the income of dairy processing companies in 2002, and 4.7 percent in 2003.

Since joining the EU, Lithuanian dairy processing companies have been able to benefit from all measures of common organisation of the market in milk and milk products. Most of the support came from export refunds to third countries during the period of 2004–2011. The largest amounts of export refunds were received in 2006 and 2007, amounting to more than €20 million per year. This represented 4.1% of the income of dairy processing companies in 2006, and 3.2% in 2007. In the remaining years the amounts of export refunds were lower.

Lithuanian dairy processing companies also benefited from other measures of common organisation of the market in milk and milk products. Support under other measures amounted to less than 0.1% of the annual income of dairy processing companies. However, it helped to maintain the income in the situations of global decreasing demand and prices for dairy products. Almost every year, dairy processing companies took advantage of private storage of dairy products, and in the periods of 2009–2011 and 2015–2018, intervention purchases of dairy products. Dairy processing companies received support for supplying to children in educational establishments milk and certain dairy products. This support ranged from €0.02 million in 2005 to €5.57 million in 2013. Over the period of 2005–2021, it averaged €2.23 million per year, or 0.27% of the income of dairy processing companies.

Lithuanian dairy processing companies also benefited from investment support from EU funds. According to data published on the Nasdaq Baltic Stock Market, one of the five largest groups of dairy processing companies received on average €724.1 thousand of investment support per year between 2004 and 2020, while the other group received €1,026.3 thousand. This support was mainly used to modernise milk processing and marketing, as well as to increase added value.

CONCLUSIONS

Summarising the developments in the Lithuanian dairy sector in 2004–2020 and the factors affecting them, the following conclusions can be drawn.

The accession of Lithuania into the EU initially had a positive effect on milk production, with an increase in raw milk production, sales of raw milk for processing,

and farm gate milk prices until 2007, although the average farm gate milk price in the EU did not change significantly in 2004–2006. Between 2008 and 2021, milk production has been declining in line with the steady decrease in the number of dairy cows. Sales of raw milk for processing, which maintained a modest average annual growth rate of 0.8% until 2015, have been steadily decreasing since 2016 (except for 2020). It worth noting that at the same time demand for raw milk for processing has been growing. Dairy processing companies imported more and more raw milk. In 2021, compared to 2005, imports of raw milk increased more than 12 times. As a result of all this, milk production, which accounted for the largest share of the value of gross agricultural production in 2004 (23.8%), in 2021 was in third place with 16.1%.

The Lithuanian dairy processing industry was already well developed before EU accession. EU membership opened up new opportunities for exports of Lithuanian dairy products to other EU countries and third countries. Throughout the period of 2004–2021, dairy processing companies were producing dairy product that met quality standards. About half of the dairy production was sold on the domestic market while the other half was exported. In 2021, compared to 2004, sales of dairy products increased by a factor of 2.8, while exports increased by a factor of 3.0.

The different trends in milk production and dairy processing industry were mainly due to the oligopsony market structure that emerged before 2004. Many small-scale milk producers were involved in milk production. In 2004, the average dairy farm had only 2.4 dairy cows, while in 2021 this average was 8.5. In the meantime, the dairy processing industry was dominated by five groups of dairy processing companies. The degree of market concentration in terms of sales of these groups was 80.72% in 2004 and 77.1% in 2021. Dairy processors were better organised and had therefore a stronger bargaining power when negotiating farm gate milk prices. Small milk producers were paid low prices for raw milk, leaving them unable to expand their farms and make for a living. Between 2004 and 2020, the average farm gate milk price in Lithuania was either the lowest or the second lowest among all EU countries. Only in 2021, this price was higher than in nine other EU countries. Over the period of 2004–2021, 85.6% of milk producers in Lithuania left milk production. For dairy processors, low prices for raw milk provided a competitive advantage on dairy markets.

The bargaining power of milk producers has been partly improved by the cooperative movement which started before 2004. In 2021, of the 55 entities purchasing raw milk, almost half (27) were cooperatives. These cooperatives purchased about 29% of all raw milk sold for processing. Horizontal integration prevailed, which increased the bargaining power of milk producers only in cases where large cooperatives were set up. Between 2020 and 2021, there were four such cooperatives. Two other large cooperatives purchased raw milk and processed part of it, while another large cooperative processed all purchased raw milk. Of the remaining 20 cooperatives, most had no bargaining power when negotiating farm gate milk prices with dairy processors.

The EU agricultural and food policy and legal framework that came into force after EU accession had a positive impact on the Lithuanian dairy sector. The negotiated national milk production quota did not limit the production of commercial milk. The production subsidies received by dairy farms were 3.8 times higher than the national support received before EU accession. In individual years, these subsidies accounted for up to almost 40% of the total farm income from agricultural economic activity, including subsidies. Investment support for dairy farms was similar to what it was before EU accession. All support received allowed at least the larger milk producers to avoid losses year after year. Lithuanian dairy processing companies benefited from all measures of common organisation of the market in milk and milk products. Most of the support came from export refunds to third countries. In individual years, these refunds accounted for up to 4.1% of the total income received by dairy processing companies.

REFERENCES

[1]Agricultural Information and Rural Business Centre, 2022, https://www.vic.lt, Accessed on August 28, 2022.
[2]Augustynska-Grzymek, I., Czulowska, M., Skarzynska, A., Zekalo, M., Stalgiene, A., 2015, The view of dairy sector and the economic situation of milk producers in Poland and in Lithuania after accession to the EU, In Challenges of Europe: International Conference Proceedings (p. 307), Sveuciliste u Splitu.
[3]European Commission, 2022, Agriculture and rural development, EU Milk Market Observatory, https://agriculture.ec.europa.eu/data-and-analysis/markets/overviews/market-observatories/milk_en, Accessed on September 18, 2022.
[4]European Union, 2007, Council Regulation (EC) No 1234/2007 of 22 October 2007, establishing a common organisation of agricultural markets and on specific provisions for certain agricultural products (Single CMO Regulation). Official Journal of the European Commission, 299, 1-249.
[5]Eurostat, European Statistics, 2022, http://ec.europa.eu/eurostat, Accessed on August 22, 2022.
[6]FADN survey results 2004–2019, Vilnius, Lietuvos agrarinės ekonomikos institutas (Lithuanian Institute of Agrarian Economics), 2004–2019.
[7]Hartmann, M., 2001, The Dairy Sector in the Central European Candidate (CEC) Countries–The Status of Restructuring and Future Challenges, German Journal of Agricultural Economics, 50(670-2016-45577), 342-353.
[8]Jansik C., Irz X., Kuosmanen N., 2014, Competitiveness of Northern European dairy chains, Publication 116, MTT Economic Research, Agrifood Research Finland, Helsinki, Finland, 160 p.
[9]Jansik, C., 2009, A comparison of dairy supply chains in Finland and in the Baltic Countries, In IAMA Symposium.
[10]Jurkėnaitė, N., Mikelionytė, D., 2021, Raw milk price transmission in the selected EU countries, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.21(3)2021, 477-482.
[11]Kėdaitienė, A., Hockmann, H., 2002, Milk and milk processing industry in Lithuania: an analysis of horizontal and vertical integration (No. 44), Discussion paper.
[12]Kotyza, P., Náglová, Z., Slaboch, J., Hálová, P., Czech, K., Wielechowski, M., & Cherevyk, D., 2022, Dairy processing industry in the European Union: Country-group clustering in pre and post-milk quota abolishment periods, Journal of Central European Agriculture, 23(3), 679-691.
[13]Lietuvos Respublikos Konkurencijos taryba, 2015, Pieno ir pieno produktų sektoriaus rinkos tyrimo išvados, Patvirtinta Lietuvos Respublikos Konkurencijos tarybos 2015 m. gruodžio 30 d. nutarimu Nr. 1S-38/2015, (Competition Council of Lithuania 2015, Conclusions of the market research of the milk and milk products sector, Approved by the Competition Council of the Republic of Lithuania in 2015. December 30 by resolution no. 1S-38/2015, https://kt.gov.lt/uploads/documents/files/2015-12-30_1S-138.pdf, Accessed on September 28, 2022.
[14]Lietuvos Respublikos Seimas, 2015, Lietuvos Respublikos ūkio subjektų, perkančių–parduodančių žalią pieną ir prekiaujančių pieno gaminiais, nesąžiningų veiksmų draudimo įstatymas, 2015 m. birželio 25 d. Nr. XII-1907 Law on Prohibition of Unfair Actions of Economic Entities of the Republic of Lithuania, Buying and Selling Raw Milk and Trading in Dairy Products, 2015, June 25, No. XII-1907, Vilnius, https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/11893812200c11e585eaba374ef4b409/asr, Accessed on September 22, 2022.
[15]Lietuvos Respublikos Žemės ūkio ministerija, 2007-11-15, Baigėsi pirmasis elektroninis pieno gamybos kvotų aukcionas, (Ministry of Agriculture of the Republic of Lithuania, 2007-11-15, The first electronic auction of milk production quotas has ended), https://zum.lrv.lt/lt/naujienos/baigesi-pirmasis-elektroninis-pieno-gamybos-kvotu-aukcionas. Accessed on September 22, 2022.
[16]Lietuvos Respublikos Žemės ūkio ministerija, 2022, Pripažinti žemės ūkio kooperatyvai, (Ministry of Agriculture of the Republic of Lithuania, Recognized agricultural cooperatives), https://zum.lrv.lt/lt/kooperacija-zemes-ukyje/pripazinti-zemes-ukio-kooperatyvai, Accessed on September 22, 2022.
[17]Mikelionytė, D., Eičaitė, O., 2020, Assessment of the efficiency of Lithuanian Dairy Farms of different economic sizes, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 20(1), 365-373.
[18]Nasdaq Baltic stock market, 2022, Reports of the largest Lithuanian dairy processing enterprises, https://www.nasdaqbaltic.com/market/?pg=reports&list%5B%5D=BAMT&list%5B%5D=BAIT, Accessed on September 12, 2022.
[19]Ozolinš, J., 2011, Economic effect of dairy processing integration in the Baltic states, Economics and rural development, 7, 31-36.
[20]Rizojeva-Silava, A., Zeverte-Rivza, S., 2020, Trends in dairy sector in Baltic countries, In Engineering for Rural Development, Proceedings of the International Scientific Conference (Latvia), Latvia University of Life Sciences and Technologies.
[21]Rizojeva-Silava, A., Zeverte-Rivza, S., Rivza, P., 2021, Analysis and outlook of dairy sector in Baltic States, In Engineering for Rural Development, Proceedings of the International Scientific Conference (Latvia), Latvia University of Life Sciences and Technologies.
[22]Skarżyńska, A., Abramczuk, Ł., Augustyńska-Grzymek, I., Żekalo, M., Stalgienė, A., 2013, The conditions of the development of dairy farms in Poland and Lithuania, Transformations in business & economics, 12, 91-107.

[23]Stalgienė, A., Jedik, A., Viira, A. H., Krievina, A., 2017, Market power in Lithuanian, Latvian and Estonian dairy sectors: the case of raw milk market, Transformations in business & economics, 16, 89-105.
[24]State Food and Veterinary Service of the Republic of Lithuania, 2022, Register of food business operators dealing with food of animal origin, http://vetlt1.vet.lt/vepras/, Accessed on September 4, 2022.
[25]Statistics Lithuania, 2022, https://www.stat.gov.lt/#, Accessed on September 8, 2022.
[26]Steponavičienė, G., Lomovska, A., Demskis, D., 2004, Factors and Impacts in the Information Society– A Prospective Analysis in the Candidate Countries: Report on Lithuania, Foresight on Information Society Technologies in Europe (FISTE) Technical Report EUR, 21281.
[27]Tauragės kurjeris, 2008-11-20, Pieno kvotos nepopuliarios (Milk quotas are unpopular), https://kurjeris.lt/aktualijos/kaimas/pieno-kvotos-nepopuliarios/. Accessed on September 8, 2022.
[28]Viira, A. H., Omel, R., Värnik, R., Luik, H., Maasing, B., Põldaru, R., 2015, Competitiveness of the Estonian dairy sector, 1994–2014, Journal of Agricultural Science, 26(2), 84-105.
[29]Vitunskienė, V., 2019, Žalio pieno vidaus rinkos struktūra ir koncentracija Lietuvoje: Structure and Concentration of Domestic Market of Raw Milk in Lithuania, Management theory and studies for rural business and infrastructure development, 41(4), 576-588.
[30]Žemės ūkio kooperatinė bendrovė "Pieno gėlė", Bendra informacija (istorija), http://www.pienogele.lt/bendra-informacija/, Accessed on September 8, 2022.