

Measuring the performance of dairy farms using financial ratios: The case of the Baltic States and Poland

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Abstract

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This study aimed to assess the performance of dairy farms in the Baltic States and Poland, measured by financial ratios. The analysis was conducted using average data from the Farm Accountancy Data Network (FADN) database for the period 2012 – 2021. A total of sixteen financial ratios were selected, calculated, and evaluated, grouped into four dimensions: profitability, liquidity and independence, financial efficiency, and stability and solvency. According to the results, Polish dairy farms exhibited higher profitability and liquidity, whereas Lithuanian dairy farms demonstrated higher stability and solvency. A comparison of certain financial ratios with benchmarks reported in the literature revealed varied results. Concerning the profitability indicators of dairy farms in all countries, none of them reached the recommended values. In terms of liquidity and solvency, dairy farms in all countries were in a good position. The results for financial efficiency were varied. In order to obtain a comparison of the financial performance of dairy farms across the countries concerned, a four-dimensional composite index comprising sixteen financial ratios was calculated. Polish dairy farms ranked highest on the composite index of financial performance, closely followed by Lithuanian dairy farms. Latvian dairy farms ranked third, while Estonian dairy farms ranked the lowest.

Keywords: dairy farming; financial indicators; financial analysis; FADN; Baltic countries; Poland

Introduction

The primary dairy sector is one of the most significant sectors of agricultural production in Poland and the Baltic States – Lithuania, Latvia, and Estonia. Milk production constitutes a substantial portion of agricultural output in all these countries. For instance, in 2021, it accounted for 17.5% of the total agricultural production value in Poland, 13.8% in Lithuania, 20.0% in Latvia, and 25.3% in Estonia (EU-ROSTAT, 2023a). Milk production serves as a vital source of income for many farms and provides raw material for the dairy processing industry. In 2021, more than 90% of milk was delivered to dairies in Lithuania and Estonia, and over 80% in Latvia and Poland (EUROSTAT, 2023b).

The dairy sector in the Baltic States and Poland has been significantly impacted by their accession to the European

Union (EU) in 2004. This sector has had to adhere to the Common Agricultural Policy (CAP), which included direct payments and other support for farmers, milk quotas, market intervention such as public intervention and aid for private storage, export subsidies, import restraints, and other measures (Viira et al., 2015).

Over the past decade, the EU dairy sector has encountered significant challenges. Changes to the Common Agricultural Policy (CAP) concerning the dairy market, which were adopted and implemented after 2015, have had a considerable impact on the entire dairy sector. The abolition of milk quotas, the elimination of export subsidies, and the restriction of subsidies for private storage have intensified competition in the EU dairy market (Świtłyk et al., 2021). The EU dairy sector has undergone several structural changes, including a decrease in the number of dairy farms and an

increase in the average dairy farm size, as well as a decrease in the number of dairy cows and an increase in milk yields per cow (Popescu et al., 2019; Bórawski et al., 2020b; Jongeneel et al., 2023). For the Baltic States and Poland, in 2021, compared to 2015, the number of dairy cows has decreased by 5 – 25% (most notably in Lithuania), while milk yield per cow has increased by 13 – 26% (most notably in Estonia) (EUROSTAT, 2023c; 2023d). During the same period, the number of dairy farms in Poland decreased by 30.5% (from 265 thousand to 184.1 thousand), in Lithuania by 55.7% (from 54.0 thousand to 23.9 thousand), in Latvia by 47.9% (from 19.4 thousand to 10.1 thousand), and in Estonia by 57.1% (from 2.1 thousand to 0.9 thousand). Meanwhile, the average dairy farm size increased in Poland from 8.1 to 11.1 cows, in Lithuania from 5.6 to 9.4 cows, in Latvia from 8.4 to 13.0 cows, and in Estonia from 43.8 to 92.9 cows (IFCN, 2019; IFCN, 2023). Nevertheless, these changes have not fundamentally altered the existing farm structure in Poland, Lithuania, and Latvia, which is dominated by a large number of small-scale dairy farms. In contrast, Estonia is characterized by large-scale dairy farms (Náglová and Rudinskaya, 2021).

The dairy sector in the Baltic States and Poland is influenced not only by developments within the EU, but also by global factors. Following an exceptionally prosperous period, characterized by historic highs in milk prices at the end of 2013 and the beginning of 2014, the dairy sector experienced a crisis. This milk crisis, marked by a significant drop in milk prices between 2014 and 2016, was triggered by the import embargo imposed by the Russian Federation on EU agricultural products in 2014, as well as by volatility in the global dairy market and a sharp decline in demand for dairy products, particularly in China, at the end of 2014 (European Parliament, 2018; Rizojeva-Silava et al., 2021). In recent years, the dairy sector has been further affected by the global COVID-19 pandemic, which began in 2020 and extended into 2021. While the sector has shown relative stability in the face of the pandemic, there may be structural changes with long-term consequences (OECD/FAO, 2021).

The primary dairy sector in the Baltic States and Poland has attracted a great deal of scientific attention. Numerous studies have been conducted to analyse the underlying trends in this sector, which have been influenced by changes in the CAP and global developments. Some studies focus on the situation in individual countries (e.g., Świtlyk et al., 2021), while others employ comparative analysis to examine trends across multiple countries (e.g., Kołoszycz, 2020). Additionally, there are studies that utilize cluster analysis to group countries based on their similarities, as revealed by the obtained results (e.g., Poczta et al., 2020).

In most cases, studies are based on data from the Farm Accountancy Data Network (FADN) to investigate a wide range of aspects within the dairy sector. These include the economic viability of dairy farms (Kołoszycz, 2020; Parzonko et al., 2023; Wilczyński and Kołoszycz, 2021), the market position of milk producers assessed through the profitability of dairy farms (Średzińska et al., 2021), the economic sustainability of dairy farms (Reidla and Nurmet, 2017; Bórawski et al., 2020a; Wilczyński, 2020), and the economic and technical efficiency of dairy farms (Náglová and Rudinskaya, 2021; Świtlyk et al., 2021). Additionally, studies examine the economic results of dairy farms by considering various factors such as production characteristics, income and subsidies, costs and expenses, land, labour, capital inputs, and financial indicators (Skarżyńska, 2017; Poczta et al., 2020).

While research on dairy farms has increased in recent years, there are still gaps in the literature, particularly regarding the financial situation of these farms. The present study aims to address these gaps by assessing the performance of dairy farms in the Baltic States and Poland, using financial ratios as measures. The main contributions of this study include the selection, calculation, and evaluation of financial ratios for dairy farms, both for cross-country comparisons and for comparisons with benchmarks reported in the literature. Additionally, the study ranks the countries according to the financial performance of their dairy farms using a composite index.

Materials and Methods

This study utilized the FADN database as the primary source of data, focusing on farms specializing in milk production in the Baltic States and Poland. The study period spanned from 2012 to 2021, with average data for this period employed to offer insights into the financial situation of dairy farm businesses in the countries concerned.

The financial performance of dairy farms was assessed using financial ratios. Accounting and finance textbooks typically categorize financial ratios into four groups: profitability, liquidity, financial efficiency, and stability (as per European textbooks) or solvency (as per North American textbooks). These groups are generally considered to be of equal importance. Profitability ratios measure the ability of a business to generate a profit. Liquidity ratios measure the ability of a business to fulfil its commitments in the short-term. Financial efficiency ratios measure the intensity to which a business uses its assets to generate revenue. Stability and solvency ratios measure the ability of a business to survive over a long period (Kay et al., 1994; Zorn et al., 2018).

In this study, a set of sixteen financial ratios was developed based on a review of scientific literature (Nábrádi et al., 2009; Latruffe et al., 2016; Zorn et al., 2018; Žáková Kroupová and Trnková, 2020). Only indicators that could be calculated from FADN variables were selected for analysis. These indicators were grouped into four groups: profitability, liquidity and independence, financial efficiency, and stability and solvency. The first and third groups comprised four indicators each, the second group comprised five indicators, and the fourth group comprised three indicators. The next step involved compiling all relevant information from the FADN database, which served as the dataset. After extracting the data, the financial ratios were calculated. The method used to calculate each financial ratio is presented in Table 1.

After calculating the financial ratios, a comparative analysis of the financial performance of dairy farms across the countries concerned was conducted. Certain financial ratios were then compared with benchmarks (preferred ranges) reported in the literature.

In order to rank the Baltic States and Poland according to the financial performance of dairy farms, a composite index comprising sixteen financial ratios across four dimensions (profitability, liquidity and independence, financial efficiency, and stability and solvency) was constructed. As the rang-

es of financial ratios varied, it was necessary to normalize the values of all ratios. Data normalization was achieved using the min-max normalization technique, resulting in values ranging from 0 to 1. The min-max normalization process was conducted using the equations below:

$$x' = \frac{x - \min(x)}{\max(x) - \min(x)}, \quad (1)$$

$$x' = 1 - \frac{x - \min(x)}{\max(x) - \min(x)}. \quad (2)$$

where x is the original value and x' is the normalized value.

All ratios were normalized so that a zero value corresponds to the worst outcome and a unit value to the best outcome. Therefore, equation (1) was used to normalize ratios with a higher value indicating better performance, and equation (2) was used to normalize ratios with a lower value indicating better performance.

The sub-index for each dimension was constructed by taking the arithmetic average of the normalized ratios in that dimension, and the composite index was constructed by taking the arithmetic average of the sub-indexes. The calculated sub-indexes for each dimension and the composite index therefore ranged from 0 to 1. This approach assigned

Table 1. Calculation of financial ratios

Ratio	Calculation of ratio in FADN variables
Profitability	
Return on assets	(Farm net income + Interest paid – Cost for unpaid work) / Total assets
Return on equity	(Farm net income – Cost for unpaid work) / Net worth
Farm net income per annual work unit	Farm net income / Annual work unit
Operating profit margin	(Farm net income + Interest paid – Cost for unpaid work) / (Total output + (Total subsidies – excluding on investments))
Liquidity and Independence	
Current ratio	Total current assets / Short-term loans
Working capital ratio	(Total current assets – Short-term loans) / (Total output + (Total subsidies – excluding on investments))
Cash flow ratio	Cash flow (1) / (Total output + (Total subsidies – excluding on investments))
Dynamic gearing ratio	Total liabilities / Cash flow (1)
Share of subsidies in total output	(Total subsidies – excluding on investments) / Total output
Financial efficiency	
Asset turnover ratio	(Total output + (Total subsidies – excluding on investments)) / Total assets
Operating expense ratio	(Total Inputs – Depreciation) / (Total output + (Total subsidies – excluding on investments))
Depreciation expense ratio	Depreciation / (Total output + (Total subsidies – excluding on investments))
Net farm income from operations ratio	Farm net income / (Total output + (Total subsidies – excluding on investments))
Stability and Solvency	
Fixed assets to total assets ratio	Total fixed assets / Total assets
Equity to fixed assets ratio	Net worth / Total fixed assets
Debt to equity ratio	Total liabilities / Net worth

Source: Own construction based on Nábrádi et al. (2009), Latruffe et al. (2016), Zorn et al. (2018), and Žáková Kroupová and Trnková (2020).

an equal weight to each ratio when calculating the sub-index for a given dimension, and likewise an equal weight to the sub-index for each dimension when calculating the composite index. All sub-indexes and the composite index were calculated for each country and every year separately. Averages were then calculated for all sub-indexes and the composite index for 2012 – 2021.

Results and Discussion

Some key characteristics of dairy farms in the Baltic States and Poland for 2012 – 2021 are outlined in Table 2. Significant differences were noted between countries in terms of both average economic and physical farm size (Coefficients of Variation (CV) 136.5% and 123.8%, respectively). The largest average economic and physical farm size was found in Estonia (EUR 389 thousand and 271 ha of utilized agricultural area (UAA)), while the smallest economic farm size was found in Lithuania (EUR 28 thousand) and the smallest physical farm size in Poland (24 ha of UAA). The total number of livestock units ranged from 18.2 units per farm in Lithuania to 159.3 units per farm in Estonia. The highest milk yield was also recorded in Estonia (9.241 kg per cow) and the lowest in Lithuania (5.725 kg per cow). Significant differences were noted between countries in terms of average labour input (CV 152.0%), with Poland reporting the lowest (0.1 annual work units (AWUs) per farm) and Estonia the highest (4.5 AWUs per farm). Polish dairy farms were family labour-based farms, where family labour input accounted for an average of 96.3% of total labour input per year between 2012 and 2021. A similar trend was observed in Lithuanian and Latvian dairy farms, where family labour input averaged 86.3% and 64.4% of total labour input per year, respectively. In contrast, family labour input in Estonian dairy farms accounted for only an average of 16.9% of total labour input per year.

The indicators, used to assess the financial performance of dairy farms in the Baltic States and Poland, are presented in Table 3. The results clearly show that the financial situation of dairy farms differed across these countries.

Estonian dairy farms had the highest return on assets (1.8%) and Polish dairy farms the highest return on equity (1.7%). Latvian dairy farms had the lowest return on assets and return on equity (1.3% and 1.1%, respectively). Net farm income per annual work unit varied considerably between countries, with the highest (Poland) and lowest (Estonia) values differing by a factor of 2.3. There were also large differences between countries in terms of the operating profit margin (CV 67.2%): Latvian dairy farms performed the poorest on average, retaining 2.3 eurocents of every euro of gross revenue as profit, while Polish dairy farms performed the best, retaining 8.4 eurocents of every euro of gross revenue as profit.

Estonian dairy farms had the lowest current liquidity ratio, while Polish dairy farms had the highest. More specifically, Polish dairy farms had an average of EUR 7.7 of current assets for every euro of current liabilities, while Estonian dairy farms had EUR 1.5. Overall, dairy farms in all countries were able to meet liabilities and pay current expenses. Polish and Lithuanian dairy farms seemed to have sufficient financial resources, with the cash flow of 46.1% and 44.2%, respectively. This means that the cash flow for dairy farms in these countries was almost half of turnover. However, the cash flow in Estonian dairy farms accounted for 13.6% of turnover. Working capital constituted the largest proportion of gross revenue in Lithuanian dairy farms (55.3%) and the smallest in Estonian dairy farms (13.3%). Significant differences were noted between countries in terms of the dynamic gearing ratio (CV 115.8%): on average, Estonian dairy farms needed more than 6 years to pay all their debts with the cash flow generated in one year, while Polish dairy farms needed slightly more than half a year to become debt free. The proportion of subsidies in total output varied from a low of 13.9% in Estonia to a high of 29.0% in Latvia.

Estonian dairy farms were the most efficient in using their assets to generate revenue (55.4%), while Polish dairy farms were the least efficient (21.1%). The highest proportion of gross revenue absorbed by operating expenses was found in Estonian dairy farms (84.7%) and the lowest in Polish dairy farms (50.8%). Estonian dairy farms had the lowest pro-

Table 2. List with some key characteristics of dairy farms in the Baltic States and Poland, 2012–2021 (annual average per farm)

Key characteristic	Estonia	Latvia	Lithuania	Poland	SD	CV, %
Economic size (thousand EUR)	389	46	28	48	174	136.5
Total Utilised Agricultural Area (ha)	271.1	53.2	32.9	23.6	117.9	123.8
Livestock units (LU)	159.3	29.2	18.2	28.6	58.8	67.2
Milk yield (kg/cow)	9.142	6.461	5.725	5.814	1.605	23.6
Paid labour input (AWU)	4.5	0.7	0.2	0.1	2.1	152.0

Source: EU FADN (2023)

portion of gross revenue absorbed by depreciation (10.2%), while Lithuanian dairy farms had the highest (18.3%). There were large differences between countries in terms of the net farm income from operations ratio (CV 61.6%): Polish dairy farms had 35.4% of gross revenue remaining as net income after all expenses had been paid, while Estonian dairy farms had only 4.6%.

The fixed assets to total assets ratio had the lowest variability measure (CV 10.4%) among indicators. Machinery and buildings accounted for the largest proportion of total assets in Polish dairy farms (89.9%) and the smallest in Lithuanian dairy farms (72.1%). The equity to fixed assets ratio for Polish, Lithuanian, and Latvian dairy farms (close to or above 1.0) provide evidence that dairy farms in these countries were generally economically stable, being able to cover their fixed assets (machinery and buildings) with their own capital. Estonian dairy farms were found to have the equity to fixed assets ratio of less than 1.0, i.e. 0.732. The debt to equity ratio varied widely between countries (CV 90.5%), ranging from a low of 0.057 in Poland to a high of 0.768 in Estonia.

The literature on financial ratios in the United States of America provides a farm financial scorecard, which includes ranges along with the traffic light colours of green, yellow, and red, indicating high, medium, or low measures, respectively (Center for Farm Financial Management and Universi-

ty of Vermont, 2022). It is important to note that a green light does not guarantee success, just as a red light does not mean failure. Weaknesses in one area can be overcome by strengths in other areas (Northwest Farm Credit Service, n. d.).

Table 4 contains the financial scorecard for certain profitability, liquidity, financial efficiency, and solvency ratios, as well as a comparison of the financial ratios calculated for dairy farms in the Baltic States and Poland (Table 3) with benchmarks. Overall, the colour-coded analysis of strong (green light), normal (yellow light), and vulnerable (red light) in the financial scorecard helps to identify areas where farms are performing well and where there is room for improvement.

Profitability seemed to be a problem for dairy farms in all countries. None of the profitability ratios achieved the recommended values and were therefore considered vulnerable. However, while these indicators were uniformly low, they were positive. In terms of liquidity, dairy farms in all countries tended to be in a good position. The current ratio and working capital to gross revenue ratio were considered strong for Latvian, Lithuanian, and Polish dairy farms, and normal for Estonian dairy farms. This shows that dairy farms in all countries had few problems in paying back short-term obligations. The results for financial efficiency were varied. Dairy farms in all countries experienced difficulties with the depreciation expense ratio. Moreover, Estonian dairy farms

Table 3. Financial ratios of dairy farms in the Baltic States and Poland, 2012–2021 (annual average per farm)

Financial ratio	Estonia	Latvia	Lithuania	Poland	SD	CV, %
Profitability						
Return on assets	0.018	0.013	0.015	0.017	0.002	14.4
Return on equity	0.016	0.011	0.013	0.017	0.003	19.1
Farm net income per annual work unit	4578	5950	7180	10433	2502	35.6
Operating profit margin	0.028	0.023	0.033	0.084	0.028	67.2
Liquidity and Independence						
Current ratio	1.493	3.559	5.701	7.679	2.673	58.0
Working capital to gross revenue ratio	0.133	0.337	0.553	0.419	0.176	48.7
Cash flow ratio	0.136	0.270	0.442	0.461	0.154	47.0
Dynamic gearing ratio	6.784	1.953	0.758	0.563	2.912	115.8
Share of subsidies in total output	0.139	0.290	0.286	0.184	0.075	33.4
Financial efficiency						
Asset turnover ratio	0.554	0.551	0.417	0.211	0.162	37.3
Operating expense ratio	0.847	0.711	0.574	0.508	0.151	22.8
Depreciation expense ratio	0.102	0.110	0.183	0.129	0.036	27.7
Net farm income from operations ratio	0.046	0.183	0.284	0.354	0.134	61.6
Stability and Solvency						
Fixed assets to total assets ratio	0.773	0.733	0.721	0.899	0.081	10.4
Equity to fixed assets ratio	0.732	0.978	1.195	1.053	0.194	19.6
Debt to equity ratio	0.768	0.408	0.162	0.057	0.316	90.5

Source: Own calculations based on FADN (EU FADN, 2023)

struggled with the operating expense ratio and net farm income from operations ratio, and Polish dairy farms demonstrated weaknesses in the asset turnover ratio. Certain financial ratios for dairy farms in some countries fell well within the preferred ranges. More specifically, Estonian and Latvian dairy farms were financially efficient in using their assets to generate gross revenue, while Lithuanian and Polish dairy farms were financially efficient in terms of the operating expense ratio and net farm income from operations ratio. In terms of solvency, dairy farms in all countries relied mainly on equity rather than debt. The debt to equity ratio was considered strong for Latvian, Lithuanian, and Polish dairy farms and normal for Estonian dairy farms.

In order to obtain a comparison of the financial performance of dairy farms across the countries concerned, a composite index based on four dimensions and sixteen financial ratios was used. Table 5 presents the results from the sub-indexes and composite indexes for each country. Polish dairy farms scored highest in three dimensions (profitability, liquidity and independence, and financial efficiency), and ranked third in one dimension (stability and solvency). Consequently, they obtained the highest composite index of 0.72. Lithuanian dairy farms were not far behind with a composite index of 0.68. They scored highest in one dimension (stability and solvency) and ranked second in two dimensions (profitability and liquidity and independence) and third in one dimension (financial efficiency). Estonian dairy farms obtained the lowest composite index of 0.34,

scoring worst in three dimensions (liquidity and independence, financial efficiency, and stability and solvency) and ranking third in one dimension (profitability). Latvian dairy farms performed slightly better than Estonian dairy farms, obtaining a composite index of 0.53. They ranked second in one dimension (financial efficiency) and third in three dimensions (profitability, liquidity and independence, and stability and solvency).

During the period 2012 – 2021, the sub-index for profitability showed the largest variability among the four sub-indexes for dairy farms in all countries (CV ranged from 37.4% for Polish dairy farms to 80.7% for Latvian dairy farms). Regarding the variability of the composite index of financial performance, it was found to be low for Polish and Lithuanian dairy farms (CV 9.2% and 10.9%, respectively) and slightly higher for Latvian and Estonian dairy farms (CV 26.1% and 19.4%, respectively). The composite index of financial performance for dairy farms in all countries changed along the sine curve, increasing in some years and decreasing in others (Figure 1). Over the entire ten-year period, Polish dairy farms had the highest composite index for six years and Lithuanian dairy farms for four years. On this index, Latvian dairy farms usually ranked third (seven years) and Estonian dairy farms last (nine years).

The results of this study are worth comparing with those of other studies. Previous studies have employed various indicators to assess the performance of dairy farms across different countries, making direct comparisons challenging.

Table 4. Comparison of certain financial ratios of dairy farms in the Baltic States and Poland with benchmarks, 2012–2021

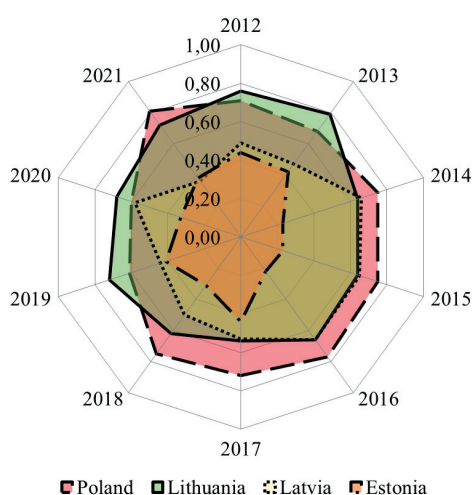
Financial ratio	Financial scorecard			Estonia	Latvia	Lithuania	Poland
	Green (Strong) **	Yellow (Normal) *	Red (Vulnerable) *				
Profitability							
Return on assets	>8%	4–8%	<4%	*	*	*	*
Return on equity	>10%	3–10%	<3%	*	*	*	*
Operating profit margin	>25%	15–25%	<15%	*	*	*	*
Liquidity							
Current ratio	>2.0	1.3–2.0	<1.3	**	**	**	**
Working capital to gross revenue ratio	>30%	10–30%	<10%	**	**	**	**
Financial efficiency							
Asset turnover ratio	>45%	30–45%	<30%	**	**	*	*
Operating expense ratio	<60%	60–80%	>80%	*	*	**	**
Depreciation expense ratio	<10%	5–10%	>10%	*	*	*	*
Net farm income from operations ratio	>20%	10–20%	<10%	*	*	**	**
Solvency							
Debt to equity ratio	<43%	43–150%	>150%	*	**	**	**

Source: Own elaboration based on information provided by the Center for Farm Financial Management and University of Vermont (2022) and Table 3

Table 5. Sub-indexes and composite index of financial performance for dairy farms in the Baltic States and Poland, 2012–2021 (annual average per farm)

Country	Mean	SD	CV, %	Rank
Sub-index for profitability				
Estonia	0.47	0.36	77.7	3
Latvia	0.44	0.36	80.7	4
Lithuania	0.50	0.29	58.3	2
Poland	0.75	0.28	37.4	1
Sub-index for liquidity and independence				
Estonia	0.20	0.00	0.0	4
Latvia	0.41	0.07	17.3	3
Lithuania	0.74	0.05	6.3	2
Poland	0.88	0.03	3.7	1
Sub-index for financial efficiency				
Estonia	0.48	0.02	3.2	4
Latvia	0.66	0.09	13.1	2
Lithuania	0.54	0.04	8.2	3
Poland	0.66	0.06	8.8	1
Sub-index for stability and solvency				
Estonia	0.22	0.03	12.6	4
Latvia	0.63	0.15	24.4	2
Lithuania	0.93	0.04	4.8	1
Poland	0.57	0.02	3.8	3
Composite index of financial performance				
Estonia	0.34	0.09	26.1	4
Latvia	0.53	0.10	19.4	3
Lithuania	0.68	0.07	10.9	2
Poland	0.72	0.07	9.2	1

Source: Own calculations based on FADN (EU FADN, 2023)


Fig. 1. Composite index of financial performance for dairy farms in the Baltic States and Poland in 2012–2021

Source: Own calculations based on FADN (EU FADN, 2023)

Nevertheless, some comparisons are meaningful for validating the results obtained.

Poczta et al. (2020) identified the economic situation of dairy farms in EU countries classified them into five groups based on their production potential. The study relied on FADN data for 2014 – 2016. Financial analysis was conducted using four groups of indicators, i.e. capacity to pay, financial assistance and debt sustainability, operational efficiency, and profitability. The study found that dairy farms in the third group, which included Slovakia, Hungary, Estonia, and the Czech Republic, had the lowest ratios of the capacity to pay. Concerning financial assistance and debt sustainability, dairy farms in the first group, which included Poland, Lithuania, and Latvia among others, had the lowest debt levels and high creditworthiness. In contrast, dairy farms in the third group, which included Estonia among others, had the highest debt levels and low creditworthiness. Regarding operational efficiency, dairy farms in the first and third groups, which included the Baltic States and Poland among others, performed neither the best nor the worst. When it came to profitability, dairy farms in these groups lagged behind those in the best performing group. When comparing operational efficiency and profitability between dairy farms in the first and third groups, the results were mixed: some indicators were better for dairy farms in the first group and others for dairy farms in the third group (Poczta et al., 2020). Dabkienė (2021) studied the economic performance of dairy farms in selected EU countries, including the Baltic States and Poland. The analysis was based on FADN data for 2015 – 2018. The study concluded that in terms of profit margin of dairy farms, Poland and Lithuania were the leading EU countries, while Estonia was in last position (Dabkienė, 2021). Średzińska et al. (2021) determined the income situation of dairy farms in 26 EU countries. The study used FADN data for 2013 – 2017. In this study, all countries were classified into four groups based on the income situation of their dairy farms: good, medium-good, medium-poor, and poor. The largest number of EU countries, including Poland and Lithuania, were classified into the third group, indicating a medium-poor income situation. EU countries such as Estonia, Latvia, and Slovenia exhibited low levels of income and fell into the last group, signifying a poor income situation (Średzińska et al., 2021). In conclusion, the results of the present study appear to be in line with those of the above mentioned studies.

Conclusions

This study was dealing with assessing the financial situation of dairy farms in the Baltic States and Poland for 2012 – 2021. The financial performance of dairy farms was mea-

sured through financial ratios grouped into four dimensions: profitability, liquidity and independence, financial efficiency, and stability and solvency. A total of sixteen financial indicators were selected for analysis. In order to obtain a comparison of the financial performance of dairy farms across the countries concerned, a four-dimensional composite index comprising the selected financial indicators was constructed.

The financial ratios revealed that among all countries, Polish dairy farms had the highest number of indicators with the best values (nine out of sixteen), while Latvian dairy farms had none. Estonian dairy farms had the highest number of indicators with the worst values (nine out of sixteen), followed by Latvian dairy farms with five indicators showing with the worst values. The results also indicated that Polish dairy farms exhibited higher profitability and higher liquidity, while Lithuanian dairy farms showed higher stability and solvency.

A comparison of certain financial ratios with benchmarks reported in the literature revealed mixed results. When examining return on asset, return on equity, and operating profit margin, dairy farms in all countries fell below the preferred ranges. However, while these indicators were low, they were positive. In terms of liquidity, dairy farms in all countries were in a good position. Latvian, Lithuanian, and Polish dairy farms exhibited strong liquidity indicators, while Estonian dairy farms demonstrated normal ones. Regarding financial efficiency, the results were varied. The general trend was that dairy farms in all countries had the depreciation rate that exceeded the preferred range, indicating vulnerability. Moreover, Polish dairy farms showed weaknesses in the asset turnover ratio, and Estonian dairy farms struggled with the operating expense ratio and net farm income from operations ratio. In terms of solvency, dairy farms in all countries demonstrated good performance with debt to equity ratios below 1.5. In order to increase profitability, they relied more on equity than on debt.

Polish dairy farms ranked highest in the composite index of financial performance and were thus the best performers among all the countries concerned, at least on the basis of the sixteen financial ratios selected. Lithuanian and Latvian dairy farms ranked second and third, respectively, while Estonian dairy farms ranked lowest.

The present study has several limitations which open avenue for future research. Firstly, it relies on average data for 2012 – 2021. The analysis could be extended to a different time scale. Comparing financial indicators from different periods would allow trends to be observed, which would help to assess whether the financial performance of dairy farms is improving or deteriorating over time. Secondly, while the present study provides insights into the financial situa-

tion of the average dairy farm, future research could consider measuring the financial performance of dairy farms by their size. Thirdly, this study focusses on four countries (the Baltic States and Poland). Future research could broaden its scope to include more EU Member States, particularly those that joined the EU in the same year as the Baltic States and Poland. Additionally, countries like Bulgaria and Romania, which joined the EU shortly afterward, and Croatia, which joined the EU in 2013, could be included. The financial performance of dairy farms in these countries could then be compared with that of dairy farms of the largest milk producers in the EU, such as Germany, France, and the Netherlands, as well as with the EU average.

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