Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 20, Issue 1, 2020
PRINT ISSN 2284-7995, E-ISSN 2285-3952

ASSESSMENT OF THE EFFICIENCY OF LITHUANIAN DAIRY FARMS OF DIFFERENT ECONOMIC SIZES

Deiva MIKELIONYTĖ, Ovidija EIČAITĖ

Lithuanian Institute of Agrarian Economics, LIAE, A. Vivulskio st. 4A-13, 03220 Vilnius, Lithuania, Phones: +37052614547, +37052622429, Emails: deiva.mikelionyte@laei.lt, ovidija.eicaite@laei.lt

Corresponding author: ovidija.eicaite@laei.lt

Abstract

This study aims at assessing the efficiency of Lithuanian dairy farms of different economic sizes, and at observing changes in this efficiency over a period of time. In order to achieve this aim, three groups of indicators, namely resource, input and result ones, were used for the analysis. On the basis of information available from the Farm Accountancy Data Network, these indicators were calculated for the years 2013, 2015 and 2017. The results of the analysis revealed that the least efficient dairy farms in terms of all three groups of indicators were the smallest ones (those of the economic size of EUR 2-<8 thousand of standard production). As the economic size of dairy farms increased, the efficiency of dairy farms also increased, and the most efficient dairy farms were the medium and larger ones (those of the economic size of EUR 25-<50 and 50-<100 thousand of standard production). However, the efficiency of the largest dairy farms (those of the economic size of EUR 100-<500 thousand of standard production) was already lower than that of the medium and larger ones and close to the efficiency of the smallest dairy farms.

Key words**:** *dairy farms, economic size, efficiency, resource indicators, input indicators, result indicators, Lithuania*

INTRODUCTION

Milk production is one of the most important sub-sectors within Lithuanian agriculture, and for many years, it has been ranked second, after cereals production. Nevertheless, the role of milk production in Lithuanian agriculture is declining: in 2013, the share of milk in the total agricultural production has comprised 19.2%, while in 2018, it has made up 16.2%. Milk production has decreased from 1,723.1 thousand tonnes in 2013 to 1,515.0 thousand tonnes in 2018, or by 12.1%, while over the same period, milk purchase for processing has slightly increased from 1,339.5 thousand tonnes to 1,363.0 thousand tonnes, or by 1.8% [9]. The vast majority of Lithuanian dairy farms are small-scale family dairy farms. Despite the fact, that the average herd size in Lithuania has increased from 4.8 cows per farm in 2013 to 6.6 cows per farm in 2017, it remains one of the smallest in the EU (only Romania has a smaller average herd size than Lithuania) [7]. In Lithuania, the largest share of freshly milked raw milk (about 80%) is sold for processing. The smaller dairy farms receive considerably lower prices for raw milk than the larger ones. Taking this into account, the smaller dairy farms either go out of business or become the larger ones. In many countries, the number of dairy farms has been decreasing, while the size of dairy farms has been increasing. The question arises whether only the larger dairy farms perform most efficiently. A number of studies have been carried out in different countries in order to analyse various aspects related to the situation and development of dairy farms of different economic sizes, such as efficiency [4; 6], competitiveness [10], value added [5], level of saved up surplus for investment self-financing [3], unit cost [8]. Such studies are lacking in Lithuania, therefore, in order to fill the gap, this study has been carried out. The present study has been aimed at assessing the efficiency of Lithuanian dairy farms of different economic sizes, and at observing changes in this efficiency over a period of time.

MATERIALS AND METHODS

First of all, in this study, the size structure of Lithuanian dairy farms over the period 2013–

2017 was examined. In order to achieve this, data from the State Enterprise Agricultural Information and Rural Business Centre was used [1].

Secondly, the efficiency of Lithuanian dairy farms of different economic sizes was assessed, using three groups of indicators, namely resource, input and result ones. All these indicators were calculated per livestock unit. Although the dominant source of income for dairy farms is milk production, the livestock unit rather than dairy cow was selected for the analysis since other cattle are also involved in the reproduction process. In order to maintain these cattle, resources are needed, and in addition, these cattle generate certain income on dairy farms.

Resource indicators helped to assess the degree of utilisation of resources needed to carry on and develop the activity on dairy farms of different economic sizes. These indicators included the following:

-Total utilised agricultural area.
-Total labour input.
-Total fixed assets.
-Renewal ratio of fixed assets.
-Total current assets and inventories.
-Balance subsidies and taxes on investments including on agricultural investments.
-Debt to assets ratio (although this indicator is commonly used to assess a farm activity risk, but it also shows the capacity of a farm to attract external capital for the development of this farm).

Input indicators helped to assess which categories of inputs were used most efficiently on dairy farms of different economic sizes and how these categories of inputs affected the total inputs. These indicators included the following:

-Total specific costs.
-Total farming overheads.
-Depreciation.
-Total external factors.
-Total inputs.

Result indicators included the following:

-Milk yield per dairy cow.
-Total output.
-Sum of balance current subsidies and taxes and total direct payments.
-Ratio of total output to total input.
-Ratio of sum of total output and balance current subsidies and taxes and total direct payments to total input.

All indicators were calculated for the years 2013, 2015 and 2017. In these years, the conditions for the development of dairy farming in Lithuania differed significantly. The year 2013 was exceptionally good for dairy farming due to a very high worldwide demand for dairy products which lead to higher milk purchase prices. In that year, milk purchase prices in Lithuania reached their all-time highest level. On the contrary, the year 2015 was unfavourable for the development of dairy farming. The collapse in worldwide demand for dairy products and increased raw milk supply had a negative impact on milk purchase prices. In 2015, as compared to 2013, the average purchase price for raw milk in Lithuania dropped by 32%. Finally, the 2017 year was average for the development of dairy farming, and the average purchase price for raw milk was higher by 37% than in 2015 but lower by 8% than in 2013 [9].

In order to assess the efficiency of Lithuanian dairy farms of different economic sizes, data from the European Union Farm Accountancy Data Network (FADN) was used [2]. For the year 2013, the FADN database provided data on dairy farms of four different economic sizes, while for the years 2015 and 2017, this database provided data on dairy farms of five different economic sizes.

RESULTS AND DISCUSSIONS

Size structure of Lithuanian dairy farms

Milk production in Lithuania is very fragmented: in 2017, there were 41,354 dairy farms which kept 272.1 thousand dairy cows. Between 2013 and 2017, the number of dairy farms and the number of dairy cows continuously decreased. Over this period, the number of dairy farms declined by more than one third (35.8%) and the number of dairy cows dropped by more than one tenth (12.3%) (Table 1).

Table 1. Dairy farms by number of dairy cows in 2013, 2015 and 2017 in Lithuania (at the end of the year)

Number of dairy cows per farm	Number of dairy farms				Number of dairy cows, thousand heads			
	2013	2015	2017	Change 2017, compared to 2013, %	2013	2015	2017	Change 2017, compared to 2013, %
1–2	45,014	35,558	26,416	–41.3	56.8	45.5	33.7	–40.7
3–9	14,250	13,183	10,298	–27.7	65.7	61.5	48.6	–26.0
10–19	2,642	2,443	2,216	–16.1	35.8	33.2	30.3	–15.4
20–29	1,003	1,017	949	–5.4	23.9	24.2	22.8	–4.6
30–49	781	764	719	–7.9	29.7	29.0	27.1	–8.8
50–99	457	509	487	6.6	31.0	34.9	33.0	6.5
>=100	244	256	269	10.2	67.5	72.3	76.6	13.5
Total	64,391	53,730	41,354	–35.8	310.4	300.6	272.1	–12.3
Average per farm, heads	–	–	–	–	**4.8**	**5.6**	**6.6**	**37.5**

Source: State Enterprise Agricultural Information and Rural Business Centre.

Table 2. Number of livestock units on Lithuanian dairy farms of different economic sizes in 2013, 2015 and 2017

Year	Economic size, thousand EUR of standard production				
	2-<8	**8-<25**	**25-<50**	**50-<100**	**100-<500**
2013	n. a.	9.4	27.7	55.4	130.6
2015	4.3	10.5	27.2	55.4	131.9
2017	4.1	10.5	27.7	52.3	134.1

Source: FADN data base.

In 2017, in Lithuania, the smallest dairy farms (those with less than 10 dairy cows) accounted for 88.8% of the total number of all dairy farms and dairy cows on these dairy farms represented 30.2% the total number of dairy cows. Between 2013 and 2017, the number of the smallest dairy farms and the number of dairy cows on these dairy farms fell the most. Over this period, only the number of dairy farms with 50 and more dairy cows rose and the number of dairy cows on these dairy farms showed an increase as well. In 2017, these dairy farms accounted for 1.8% of the total number of all dairy farms and dairy cows on these dairy farms represented 40.3% the total number of dairy cows. In Lithuania, the structural changes in dairy farming were strong with the number of dairy farms, especially the smallest ones, dropping significantly.

In order to compare the performance and activity of Lithuanian dairy farms of different economic sizes, the FADN, which provides data for specialised dairy farms from the EU countries, is useful. Table 2 presents the classification of dairy farms by economic size and the number of livestock units on Lithuanian dairy farms of different economic sizes in 2013, 2015 and 2017.

Efficiency of Lithuanian dairy farms of different economic sizes in terms of resource indicators

Table 3 presents the resource indicators per livestock unit on Lithuanian dairy farms of different economic sizes in 2013, 2015 and 2017.

The smallest dairy farms (those of the economic size of EUR 2-<8 thousand of standard production) needed to accumulate the most resources per livestock unit, therefore, these dairy farms were the least efficient in terms of resource utilisation. Compared to dairy farms which required the least resources per livestock unit, the smallest dairy farms needed around three times more labour input and ten times more total fixed assets. Differences in utilisation of other resources were smaller but also significant. However, with regard to renewal ratio of fixed assets, the smallest dairy farms showed having the potential: the renewal ratio of fixed assets for these dairy farms was the highest.

Table 3. Resource indicators per livestock unit on Lithuanian dairy farms of different economic sizes in 2013, 2015 and 2017

Resources	Unit	Economic size, thousand EUR of standard production				
		2-<8	8-<25	25-<50	50-<100	100-<500
2013						
Total utilised agricultural area	ha	n. a.	2.42	1.88	1.75	1.45
Total labour input	Number	n. a.	0.17	0.06	0.05	0.04
Total fixed assets	EUR	n. a.	4,386	3,055	3,162	3,527
Renewal ratio of fixed assets	–	n. a.	0.09	0.13	0.15	0.15
Total current assets and inventories	EUR	n. a.	1,615	1,209	1,245	1,274
Balance subsidies and taxes on investments including on agricultural investments	EUR	n. a.	56	94	37	34
Debt to assets ratio	%	n. a.	5.8	11.8	15.6	17.8
2015						
Total utilised agricultural area	ha	2.10	2.34	1.86	1.59	1.35
Total labour input	Number	0.30	0.16	0.06	0.04	0.03
Total fixed assets	EUR	6845	4,079	2,355	2,620	3,178
Renewal ratio of fixed assets	–	0.21	0.11	0.09	0,12	0.13
Total current assets and inventories	EUR	2,040	1,798	1,400	1,419	1,524
Balance subsidies and taxes on investments including on agricultural investments	EUR	760	280	61	109	150
Debt to assets ratio	%	4.5	10.1	9.8	20.2	18.4
2017						
Total utilised agricultural area	ha	2.99	2.36	1.84	1.54	1.40
Total labour input	Number	0.34	0.14	0.06	0.04	0.03
Total fixed assets	EUR	7,882	4,582	2,506	2,743	3,582
Renewal ratio of fixed assets	–	0.16	0.11	0.09	0.17	0.13
Total current assets and inventories	EUR	2,230	2,334	1,870	1,830	1,679
Balance subsidies and taxes on investments including on agricultural investments	EUR	837	925	170	158	196
Debt to assets ratio	%	2.3	8.9	13.5	15.2	19.3

Source: Own calculations.

The effect of economies of scale was most noticeable, when considering total labour input and total utilised agricultural area per livestock unit: these indicators were the highest on the largest dairy farms and the lowest on the smallest dairy farms. On the largest dairy farms (those of the economic size of EUR 100-<500 thousand of standard production), as compared to the smallest ones (those of the economic size of EUR 2-<8 thousand of standard production), the total labour input per livestock unit was lower from 9 times in 2015 to 10 times in 2017, while the utilised agricultural area per livestock unit was lower from 56% in 2015 to 2 times in 2017. It is to be noted, that in 2017, as compared to 2015, the disparities had increased. The larger the dairy farm, the more efficiently the labour input and utilised agricultural area per livestock unit were used.

The total fixed assets per livestock unit was used more efficiently on the medium dairy farms (those of the economic size of EUR 25-<50 thousand of standard production). These dairy farms had the least amount of total fixed assets per livestock unit. As the economic size of dairy farms increased or decreased, the needs for total fixed assets per livestock unit rose. The same situation was observed in 2013 and 2015 with regard to total current assets and inventories per livestock unit. However, this trend reversed in 2017, when the largest dairy farms (those of the economic size of EUR 100-<500 thousand of standard production) had the least amount of total current assets and inventories per livestock unit, and as the economic size of dairy farms

decreased, the needs for total current assets and inventories per livestock unit rose.

The renewal ratio of fixed assets helped to assess whether the technical condition of fixed assets was outdated and depreciated, and whether it served as an obstacle for dairy farms to develop their activity. The value of this indicator is to be assessed over a period of several years. In this study, the renewal ratio of fixed assets was calculated as averages of 2013, 2015 and 2017 values. The results showed that the smallest dairy farms (those of the economic size of EUR 2-<8 thousand of standard production) had the fastest renewal of fixed assets: the renewal ratio of fixed assets for these dairy farms was 0.19. The values of this indicator for dairy farms of other economic sizes were smaller: 0.10 for dairy farms of the economic size of EUR 8-<25 and 25-<50 thousand of standard production, 0.15 for dairy farms of the economic size of EUR 50-<100 thousand of standard production, and 0.14 for dairy farms of the economic size of EUR 100-<500 thousand of standard production. This could simply be explained by the fact that the smallest dairy farms received the highest investment support per livestock unit – an average of EUR 799 per the years 2015 and 2017, while the dairy farms of other economic sizes received lower investment support per livestock unit – an average of EUR 101–420 per the years 2013, 2015 and 2017. The larger and largest dairy farms (those of the economic size of EUR 50-<100 and 100-<500 thousand of standard production) were more capable to attract external capital. The values of debt to assets ratio for these dairy farms in all years were among the highest and reached 15–20%, while the values of debt to assets ratio for other dairy farms were 2–13%.

Efficiency of Lithuanian dairy farms of different economic sizes in terms of input indicators

Table 4 presents the input indicators per livestock unit on Lithuanian dairy farms of different economic sizes in 2013, 2015 and 2017.

In 2013 and 2015, the most efficient dairy farms in terms of total inputs per livestock unit were the medium ones (those of the economic size of EUR of 25-<50 thousand of standard production): the total inputs per livestock unit on these dairy farms were lower by 17.1% in 2013, and by 20.8% in 2015 than on dairy farms with the highest total inputs per livestock unit in the relevant year. In 2017, the situation slightly changed and the most efficient dairy farms in terms of total inputs per livestock unit became the larger ones (those of the economic size of EUR 50-<100 of standard production). The total inputs per livestock unit on these dairy farms were lower by 35.0% than on dairy farms with the highest total inputs in that year.

In 2015 and 2017, the least efficient dairy farms in terms of total inputs were the smallest ones (those of the economic size of EUR 2-<8 thousand of standard production). The total inputs per livestock unit on these dairy farms were higher by 26.2% in 2015, and by 53.9% in 2017 than on dairy farms with the lowest total inputs per livestock unit in the relevant year. The second least efficient dairy farms in terms of total inputs per livestock unit were the largest ones (those of the economic size of EUR 100-<500 thousand of standard production). The total inputs per livestock unit on these dairy farms were higher by 20.6% in 2013, by 23.4% in 2015, and by 29.6% in 2017 than on dairy farms with the lowest total inputs in the relevant year.

The specific costs accounted for the largest share of total inputs per livestock unit (on average 42–50%) but they did not influence the efficiency of dairy farms in terms of total inputs per livestock unit. These costs were the lowest on the smaller dairy farms (those of the economic size of EUR 8-<25 thousand of standard production) and the highest on the largest dairy farms (those of the economic size of EUR 100-<500 thousand of standard production). The most efficient dairy farms in terms of total inputs were those with the lowest depreciation, however, these costs did not influence the efficiency of dairy farms in terms of total inputs per livestock unit as well since the depreciation accounted only for 23–28% of total inputs. The most efficient dairy

farms in terms of total inputs per livestock unit had the low and average levels of all categories of inputs.

Table 4. Input indicators per livestock units on Lithuanian dairy farms in 2013, 2015 and 2017

Inputs	Unit	Economic size, thousand EUR of standard production				
		2-<8	8-<25	25-<50	50-<100	100-<500
2013						
Total specific costs	EUR	n. a.	663	692	717	857
Total farming overheads	EUR	n. a.	400	301	265	271
Depreciation	EUR	n. a.	367	315	324	346
Total external factors	EUR	n. a.	47	58	95	173
Total inputs	EUR	n. a.	1,477	1,366	1,401	1,647
2015						
Total specific costs	EUR	625	572	606	654	778
Total farming overheads	EUR	488	401	281	240	236
Depreciation	EUR	393	446	276	284	333
Total external factors	EUR	44	73	64	99	172
Total inputs	EUR	1,549	1,491	1,227	1,278	1,518
2017						
Total specific costs	EUR	680	589	698	680	878
Total farming overheads	EUR	586	417	309	237	323
Depreciation	EUR	750	622	323	314	355
Total external factors	EUR	63	78	87	120	195
Total inputs	EUR	2,079	1,706	1,417	1,351	1,751

Source: Own calculations.

Efficiency of Lithuanian dairy farms of different economic sizes in terms of result indicators

Table 5 presents the result indicators per livestock unit on Lithuanian dairy farms of different economic sizes in 2013, 2015 and 2017.

For the milk yield per dairy cow, the highest was observed on the largest dairy farms (those of the economic size of EUR 100-<500 thousand of standard production), while the lowest was observed on the smallest dairy farms (those of the economic size of EUR 2-<8 thousand of standard production). The difference in milk yield per cow between the largest and smallest dairy farms widened: in 2013, it stood at 28.9%, while in 2017, it reached 36.0%. The highest output per livestock unit was also observed on the largest dairy farms (those of the economic size of EUR 100-<500 thousand of standard production), while the lowest was observed on the smaller dairy farms (those of the economic size of EUR 8-<25 thousand of standard production). The smallest dairy farms (those of the economic size of EUR 2-<8 thousand of standard production) had a better output per livestock unit performance than the smaller ones (those of the economic size of EUR 8-<25 thousand of standard production). A possible explanation for this could be that the freshly milked raw milk at least in some of the smallest dairy farms was not sold for processing but processed on these dairy farms. Produced dairy products were sold directly to consumers and sales of these higher value added dairy products generated more income for the smallest dairy farms.

The ratio of total output to total input reflects the efficiency of dairy farms most accurately. This indicator was not the highest on the largest dairy farms having the best output per livestock unit performance. For the ratio of total output to total input, in 2013, the most efficient dairy farms (those having the lowest total input and the highest total output per livestock unit) were the medium ones (those of the economic size of EUR 25-<50 thousand of standard production), while in 2015 and 2017, the most efficient dairy farms were the larger ones (those of the economic size of EUR 50-<100 thousand of standard production). According to this indicator, the least efficient dairy farms were the smaller and smallest ones: those of the economic size of EUR 8-<25 thousand of standard

production in 2013 and 2015, and those of the economic size of EUR 2-<8 thousand of standard production in 2017. These dairy farms had the highest total input and the lowest total output per livestock unit and their activity without support was the least profitable in 2013 and had been loss making in 2015 and 2017.

Table 5. Result indicators per livestock unit on Lithuanian dairy farms in 2013, 2015 and 2017

Results	Unit	Economic size, thousand EUR of standard production				
		2-<8	8-<25	25-<50	50-<100	100-<500
2013						
Milk yield per dairy cow	kg/year	n. a.	4,785	5,390	5,393	6,170
Total output	EUR	n. a.	1,599	1,721	1,716	2,056
Total output/Total input	–	n. a.	1.08	1.26	1.22	1.25
Balance current subsidies and taxes + Total direct payments	EUR	n. a.	872	703	630	512
(Total output + Balance current subsidies and taxes + Total direct payments)/Total input	–	n. a.	1.67	1.77	1.67	1.56
2015						
Milk yield per dairy cow	kg/year	4,560	4,914	5,197	5,433	5,969
Total output	EUR	1,429	1,232	1,279	1,339	1,563
Total output/Total input	–	0.92	0.83	1.04	1.05	1.03
Balance current subsidies and taxes + Total direct payments	EUR	965	1,079	915	759	638
(Total output + Balance current subsidies and taxes + Total direct payments)/Total input	–	1.55	1.55	1.79	1.64	1.45
2017						
Milk yield per dairy cow	kg/year	4,613	5,300	5,412	5,604	6,272
Total output	EUR	1,530	1,410	1,570	1,698	1,965
Total output/Total input	–	0.74	0.83	1.11	1.26	1.12
Balance current subsidies and taxes + Total direct payments	EUR	1,252	1,166	936	755	632
(Total output + Balance current subsidies and taxes + Total direct payments)/Total input	–	1.34	1.51	1.77	1.81	1.48

Source: Own calculations.

Lithuanian dairy farms of different economic sizes received uneven levels of support for their activity. The support for the activity in this case was considered as the sum of balance current subsidies and taxes and direct payments as both these components affected income equally. The smaller dairy farms (those of the economic size of EUR 8-<25 thousand of standard production) received the highest support per livestock unit. As the economic size of dairy farms increased, the support per livestock unit decreased. The largest dairy farms (those of the economic size of EUR 100-<500 thousand of standard production) received the lowest support per livestock unit, and this support was by 41–50% smaller than support received by the smaller and smallest dairy farms. The higher support for the smaller and smallest dairy farms (those of the economic size of EUR 2-<8 and 8-<25 of standard production) made their activity from loss making to profitable. For the ratio of sum of total output and all the support to total input, the most efficient dairy farms were the medium and larger ones: those of the economic size of EUR 25-<50 thousand of standard production in 2013 and 2015, and those of the economic size of EUR 50-<100 thousand of standard production in 2017. According to this indicator, the largest dairy farms (those of the economic size of EUR 100-<500 thousand of standard production) were the least efficient in 2013 and 2015, while they were the second least efficient in 2017 (in that year, the least efficient dairy farms were the smallest ones (those of the

economic size of EUR 2-<8 thousand of standard production)). Nevertheless, the activity of Lithuanian dairy farms of all economic sizes with support was profitable.

CONCLUSIONS

In order to comprehensively assess the efficiency of Lithuanian dairy farms of different economic sizes, three groups of indicators, namely resource, input and result ones, were used for the analysis. On the basis of information available from the Farm Accountancy Data Network, these indicators were calculated for the years 2013, 2015 and 2017 to observe changes in the efficiency of Lithuanian dairy farms of different economic sizes over a period of time.

The most efficient dairy farms in terms of resource indicators were the larger and largest ones (those of the economic size of EUR 50-<100 and 100-<500 thousand of standard production). The needs for all resources on these dairy farms were among the lowest. The smallest dairy farms (those of the economic size of EUR 2-<8 thousand of standard production) receiving the highest investment support per livestock unit had the fastest renewal of fixed assets. The larger and largest dairy farms (those of the economic size of EUR 50-<100 and 100-<500 thousand of standard production) receiving much less investment support per livestock unit renewed fixed assets at only a slightly slower pace since they were more capable to attract external capital.

The best efficiency of dairy farms in terms of input indicators was related to the low and average levels of all categories of inputs. In 2013 and 2015, the medium dairy farms (those of the economic size of EUR 25-<50 thousand of standard production), and in 2017, the larger dairy farms (those of the economic size of EUR 50-<100 thousand of standard production) had such levels of all categories of inputs.

Assessing the result indicators, it could be noted that, as the economic size of dairy farms increased, the milk yield and total output increased as well. However, in order to achieve higher milk yield and total output, dairy farms of larger economic sizes needed higher input. For the ratio of total output to total input, the most efficient dairy farms were the medium and larger ones (those of the economic size of EUR 25-<50 and 50-<100 thousand of standard production), while the least efficient dairy farms were the smallest ones (those of the economic size of EUR 2-<8 thousand of standard production). Although as the economic size of dairy farms increased, the all support per livestock unit decreased, according to the ratio of sum of total output and all the support to total input, the most efficient dairy farms were the medium and larger ones (those of the economic size of EUR 25-<50 and 50-<100 thousand of standard production), while the least efficient dairy farms were the smallest and largest ones.

The least efficient dairy farms in terms of all three groups of indicators were the smallest ones (those of the economic size of EUR 2-<8 thousand of standard production). As the economic size of dairy farms increased, the efficiency of dairy farms also increased, and the most efficient dairy farms were the medium and larger ones (those of the economic size of EUR 25-<50 and 50-<100 thousand of standard production). However, the efficiency of the largest dairy farms (those of the economic size of EUR 100-<500 thousand of standard production) was already lower than that of the medium and larger ones and close to the efficiency of the smallest dairy farms. In 2013, the medium dairy farms (those of the economic size of EUR 25-<50 thousand standard production) were more efficient than the larger ones (those of the economic size of EUR 50-<100 thousand of standard production), while in 2017, slightly more indicators showed that the larger dairy farms were more efficient than the medium ones.

REFERENCES

[1]Agricultural Information and Rural Business Centre, https://www.vic.lt, Accessed on January 10, 2020.
[2]Farm Accountancy Data Network, Public Database, https://ec.europa.eu/agriculture/rica/database/database_en.cfm, Accessed on December 18, 2019.

[3]Kołoszycz, E., 2017, Volatility of milk prices and the formation of the surplus on the self-financing of investments in dairy farms, Problems of Agricultural Economics, 2(351), 77-93.
[4]Kovács, K., Szucs, I., 2016, Measuring of the Hungarian dairy farms efficiency, Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu, 18(5).
[5]Krieviņa, A., 2009, Effect of concentration and specialisation on value added in dairy sector, Economic Science for Rural Development.
[6]Krisztián, K., Ratnesh, P., 2017, Hungarian Dairy And Beef Production Sector Technical Efficiency Comparsion Using Dea, APSTRACT: Applied Studies in Agribusiness and Commerce, 11(1033-2018-2962), 131-140.
[7]Lietuvos žemės ir maisto ūkis 2017 = Agriculture and food sector in Lithuania 2017, Autorių kolektyvas: R. Melnikienė – vadovė … [et. al.], Vilnius, Lietuvos agrarinės ekonomikos institutas, 2018, 178 p., iliustr., lent., reziumė (angl.), (online), https://www.laei.lt/?mt=leidiniai&straipsnis=1333&metai=2018, Accessed on December 18, 2019.
[8]Sinisalo, A., 2015, Production costs of Finnish dairy farms in the 2000s, Economic Science for Rural Development, 26.
[9]Statistics Lithuania, https://www.stat.gov.lt/#, Accessed on January 8, 2020.
[10]Ziętara, W., Adamski, M., 2018, Competitiveness of the Polish dairy farms at the background of farms from selected European Union countries, Problems of Agricultural Economics, 1(354).