

## ANALYSIS OF THE FACTORS AFFECTING COST EFFICIENCY IN THE DAIRY INDUSTRY IN LATVIA

Irina Pilvere<sup>1</sup>, Dr.oec.; Aleksejs Nipers<sup>1</sup>, Dr.oec.; Agnese Krievina<sup>2</sup>, Dr.oec.

<sup>1</sup> Faculty of Economics and Social Development, Latvia University of Agriculture

<sup>2</sup>Latvian State Institute of Agrarian Economics

**Abstract.** The dairy industry is one of the most important industrial sectors for healthy development of Europe. There is not a single country being part of the EU that does not produce milk. In Latvia, the dairy industry is of great importance, as it ranked second behind grain in the percentage distribution of agricultural final products. Regardless of changes in the dairy industry since 2000, it is fragmented in Latvia. The year 2014 was quite difficult for the dairy industry in Latvia due to the embargo on dairy products imposed by Russia, low milk purchase prices and concerns regarding exceeding the milk quota. For these reasons, an urgent problem is efficiency increase possibilities in the dairy industry in order not to let it stagnate and dairy farms go bankrupt. The research aim is to analyse the dairy industry and the factors affecting farm cost efficiency in Latvia. To achieve the aim, the "cost parameter equation method" was employed to identify milk production efficiency for 113 farms based on the key cost items: labour, land, capital and intermediate consumption. The research found that milk production costs on farms in Latvia significantly differed. The reason was different labour consumption and different capital costs if measured per tonne of milk produced and sold. The farms were not interested in doing business efficiently from the perspective of land use, as direct area payments of the EU provided additional revenue.

**Key words:** milk production, costs, labour, efficiency

**JEL code:** Q10, Q12

### Introduction

Compared with other sectors of the economy, agriculture is known for its specific features. First of all, production processes in agriculture are complemented by a factor of influence of natural conditions, weather, the length of production processes and the associated length of current assets turnover (Lososova J., Zdenek R., 2014).

The dairy industry is one of the most important industrial sectors for healthy development of Europe. There are many reasons why the dairy sector is so important for the European Union (EU). There is not even one country that is part of the EU that does not produce milk (Prisenk J. et al., 2015). But the quota system has been limiting the EU milk production. Between 2004 and 2013, the EU milk production barely changed from 148.7 to 152.4 Mt (+2.5 %). During the same period, milk production in the United States increased from 77.5 to 91.3 Mt (+17.7 %), and the production in New Zealand rose from 15 to 18.9 Mt (+25.6 %) (Sobczynski T. et al., 2015). Nowadays, dairy farmers are facing new challenges and opportunities arising from the EU

Common Agricultural Policy (CAP) reform for the removal of milk quotas by 2015. This will allow expansion unlimited by quota for the first time since milk quotas were introduced in 1984 (Kelly E. et al., 2012). And it means that competition in milk production will increase and farms have to consider the ways how to achieve better performance results through raising their milk production efficiency. Several factors of productivity management that could affect company's profitability are considered: labour cost efficiency, labour cost competitiveness, capital intensity and capital productivity (Muminovic S., Aljinovic Barac Z., 2015).

According to S. Muminovic & Z. Aljinovic Barac (2015), productivity management components, labour cost competitiveness and capital productivity have positive impacts on a company's profitability. But "*higher milk productivity does not necessarily improve profitability*" (Machado Filho L. P. et al., 2014). Maximising production levels and profit are goals cherished by most smallholder dairy farms. It is thus important to understand the levels of performance that farmers achieve in the current

milk production systems, and what the viability of milk production and the farming system is in general (Somda J. et al., 2005). But no two farms are the same and CAP reforms will affect all producers differently. Everyone should look at where their business is now and where they want it to be in future before making decisions. ...there were four strategies for milk producers to examine. They could increase business turnover, they could improve efficiency, they could find alternative income sources or in some cases they may want to cease milk production (Long J., Buss J., 2004). There has to be also taken into consideration that the *"importance of dairy sector for local communities reflects in the creation of employment opportunities, primarily low-skilled workers, women and the young. This contributes to rural development and poverty reduction in national economies"* (Jandric M. et al., 2015).

In Latvia, the dairy industry is of great importance, as it ranked second with 24.1 % in the percentage distribution of agricultural final products behind grain (27.6 %) in 2014, and it was the greatest increase in value compared with 2009 (+82 %). However, the year 2014 was quite difficult for the dairy industry in Latvia due to the embargo on dairy products imposed by Russia, low milk purchase prices and concerns regarding exceeding the milk quota (Ministry of Agriculture, 2015). Therefore, an urgent problem is efficiency increase possibilities in the dairy industry in order not to let it stagnate and dairy farms go bankrupt, as *"dairy farming in Latvia is still fragmented and totally 1944 farms stopped their dairy business in 2014"* (Ministry of Agriculture, 2015).

Accordingly, the **research object** is milk production in Latvia, while the **research subject** is farm cost indicators in milk production.

The research **aim** is to analyse the dairy industry and the factors affecting farm cost efficiency in Latvia. To achieve the aim, the following specific tasks were set: 1) to describe

the dairy industry in Latvia; 2) to analyse the key factors affecting farm costs in milk production.

### Research methods applied

The study analysed information and data from the Central Statistical Bureau (CSB) of Latvia and data of the Farm Accountancy Data Network (FADN) of Latvia. The EU FADN is an instrument for evaluating the income of agricultural holdings and the impacts of the CAP (European Commission, 2015). Analysis, synthesis and the logical construction method were employed to execute the research tasks. In addition, the *"cost parameter equation method"* (CPE) was employed because an account of accounting costs did not allow objectively identifying the most efficient farms, as unpaid labour costs as well as potential revenues from an alternative use of land were not included in calculations. CPE is based on cost price calculation, by inclusion and unification of labour price, as well as land price. It is done because not all farmers do include in production costs their own (and family) labour input and very often land price is not included, supposing land is for free. So, according to the CPE method, calculations include unpaid labour costs and making the labour costs equal across farms. Besides, it is assumed that land has an opportunity cost – the owner of land could rent it out. Accordingly, the use of land for the production of products involves costs in the form of forgone rents. Calculations of efficiency in milk production have to include the key cost items, measured per tonne of milk sold. In identifying efficiency, the key cost items represent the key factors of production: labour, land, capital as well as intermediate consumption<sup>1</sup>.

$$TCt = LCt + ZIt + CCt + ICt \quad [1]$$

where:

TCt – total cost per tonne of sold milk for a farm;

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<sup>1</sup> Intermediate consumption is the value of goods and services used in production (Krievina, 2012).

LCT – labour cost per tonne of sold milk for the farm;

ZIt – land opportunity cost per tonne of sold milk for the farm;

CCT – capital cost per tonne of sold milk for the farm;

ICt – intermediate consumption cost per tonne of sold milk for the farm (LLU, 2015).

The way all the factors of production are combined is determined by the knowledge of every producer. The present research analysed and summarised information on the distribution of various production costs in milk production in Latvia. The calculations were based on the 2013 data for 113 FADN dairy farms of various sizes, whose revenue from milk production accounted for more than 2/3 of their total revenue. A number of assumption were made for the calculations: 1) all the farms should pay equal wages per hour regardless of whether their employees are regarded as paid or unpaid labour (EUR 4.3 an hour); 2) every hectare of meadows and pastures as well as of grasses sown in arable land may be rented out by the owner. Consequently, if farmers farm their land and produce milk, there are foregone revenues (EUR 71.1 per hectare).

### **Novelty and topicality of the research**

The present research points to necessity to produce milk in Latvia as efficiently as possible and, in order to compare the factors affecting the

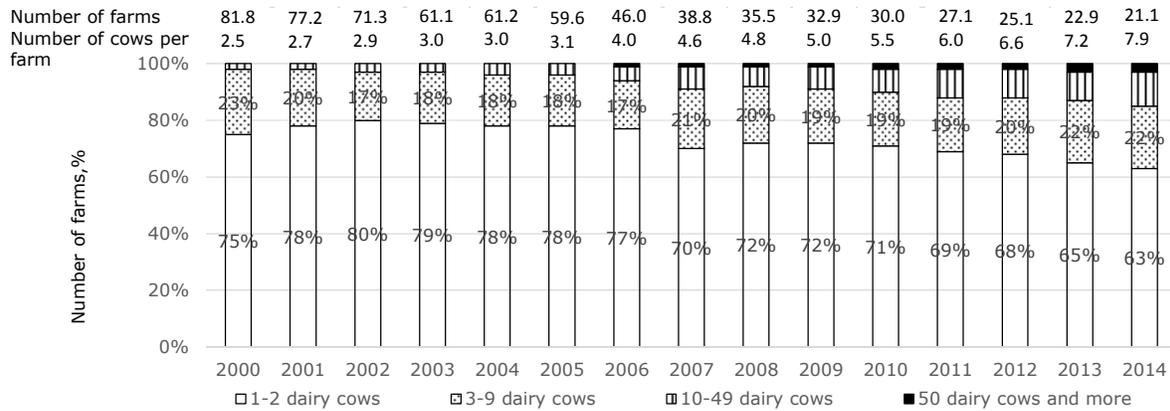
financial performance of various dairy farms, the CPE method was employed to compute not only total cost, capital and intermediate consumption costs but also labour costs, including unpaid labour and land opportunity costs.

## **Research results and discussion**

### **1. Characteristics of the dairy industry in Latvia**

The output of milk in Latvia rose to more than 900 000 tonnes in 2013 for the first time since 2000; it also continued to increase in 2014, reaching 972 000 tonnes, which was 16 % more than in 2007. A stable increase in milk output in Latvia has been reported since 2004, which was interrupted by a crisis in the milk market for three years, the beginning of which was observed already in 2008 (CSB, 2015a).

The average milk yield per cow increased in Latvia from year to year – it was 4 tonnes in 2000, while in 2014 it reached 5.8 tonnes (+45 %) (CSB, 2015b). Given the fact that cow productivity in other North European countries is higher and could reached, for example, on average, 8.7 tonnes in Finland in 2011 (European Commission, 2014), one can predict that the average milk yield in Latvia will continue increasing. At the same time, it has to be noted that according to the SJSC Agricultural Data Centre (ADC), some farms in Latvia have already reached high milk yields.



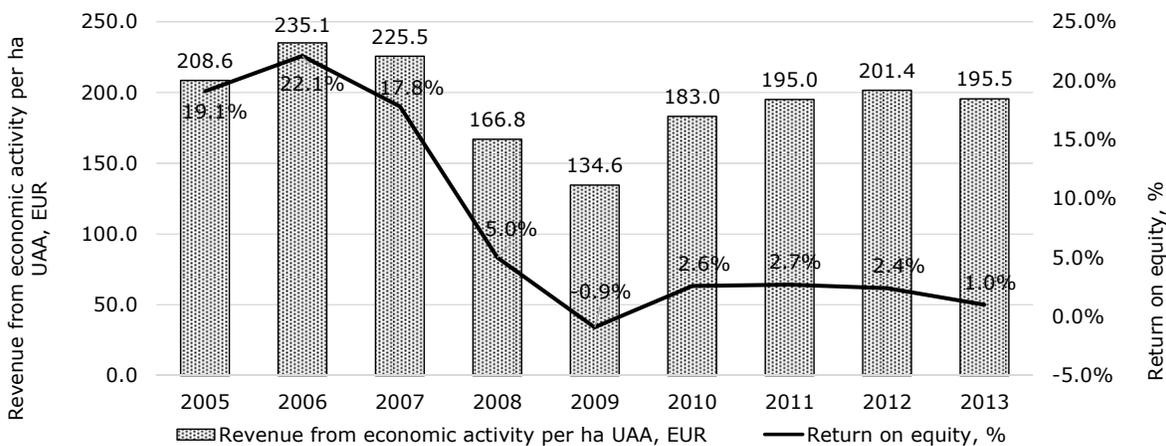
Source: authors' calculations based on CSB, 2015a, 2015b, ADC, 2015

Fig. 1. Characteristics and percentage distribution of dairy farms in Latvia in the period 2000-2014

Structural changes continue taking place in milk production in Latvia – mainly small farms (with a herd of less than 9 dairy cows) stop their business, whereas medium and large farms (with more than 10 cows) increase their milk output. In Latvia, small dairy livestock farms are still prevailing, as the average herd was 7.9 dairy cows in 2014, which was 3.2 times more than in 2000 (Figure 1).

The quantity of milk sold for processing persistently increases in Latvia – it reached 804 400 tonnes in 2014 (+28 % compared with

2007). With farms becoming more market-oriented, the proportion of milk sold on the market in the total quantity of milk produced reached 83 % in 2014 (CSB, 2015c). In the EU-15, on average, approximately 96 % of the total milk produced is sold on the market (Krievina A., 2012). Until 1 April 2015, the quantity of milk for sale was limited in Latvia by its milk quota. Preparing for the opening of the milk market, the milk quota was almost fully fulfilled (99.14 %) in 2014/2015 (Ministry of Agriculture, 2015).



Source: authors' calculations based on LVAEI, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013 and 2014

Fig. 2. Financial indicators of dairy farms in Latvia in the period 2005-2013

Revenues of dairy farms from their economic activity, which is characterised by the difference between revenues from products produced (production subsidies included) and production costs per unit of agricultural area, have slightly

declined (Figure 2). In particular, the return on equity ratio (revenues have to include investment subsidies attributable to the reporting year, while expenses have to include unpaid labour cost) has worsened. The revenue indicators for dairy farms

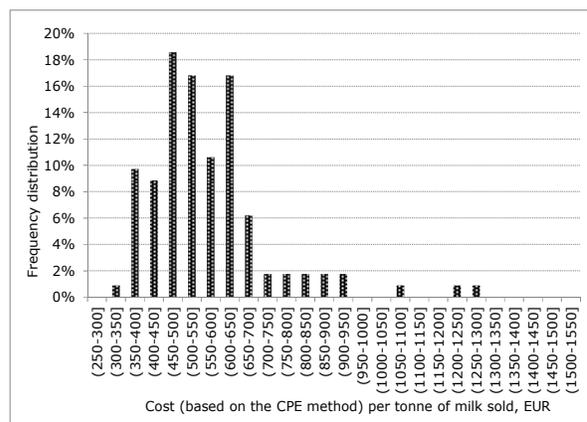
of various sizes differ. As regards the return on equity ratio, negative values were observed for small and medium farms (with a SO<sup>1</sup> less than EUR 25 000), while the best performance results were achieved by medium large and large farms (with a SO less than EUR 500 000).

Milk purchase prices have been mostly rising in Latvia since 2000, except for 2009 when the prices fell to a very low level owing to the milk market crisis. The year 2013 was very favourable for milk producers in Latvia, as the average milk purchase price was EUR 30.5 per 100 kg, which was the highest price level ever reached in this industry. However, with dairy products being included in the list of products subject to the embargo on exports to Russia, the milk purchase prices fell by almost a third, on average, in 2014, comparing the prices in the beginning of 2014 with those in the beginning of 2015. It has to be mentioned that among the three Baltic States, the sharpest milk purchase price decrease in 2014 was reported in Lithuania. In Latvia, the average milk purchase price was still below that in Estonia (by 13 %), and in 2014 it was below the average EU-15 level by about 30 % (CSB, 2015d). In Latvia, the prices of resources exploited in agricultural production tended to increase (there was a decrease during the milk market crisis), including a hike price on feed. The increase in prices on production resources considerably decreased the positive effect of high milk purchase prices; in 2014 as well the decrease in prices on goods and serviced used in production was relatively smaller than the average milk price fall. Therefore, farms have to analyse the situation in the dairy industry and seek possibilities for efficient farming through trying to reduce costs in order to offset milk purchase price decreases.

<sup>1</sup> SO – standard output

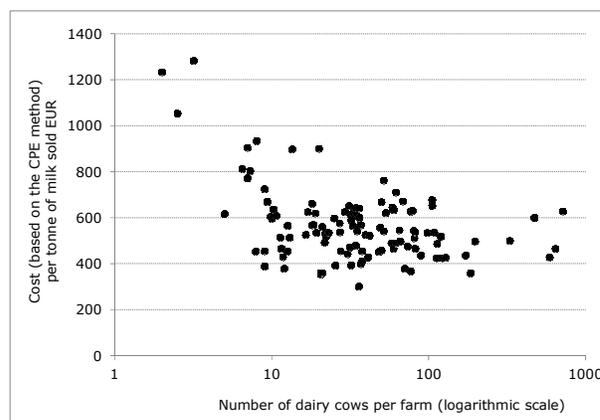
## 2. Analysis of the factors affecting the financial performance of dairy farms

An analysis of the financial performance of FADN farms shows that the range of milk production costs for farms in Latvia, based on the CPE method is very broad (Figure 3), as the average cost per tonne of milk sold reaches EUR 400-600, and it may vary from EUR 300 to 1300, i.e. more than fourfold. It means that if farms fully covered labour and land rent costs, they would suffer losses, as their total cost per tonne of milk sold exceeds the milk purchase price. So presently farmers do not value their own work in terms of money, and also their land is owned, which involves no rent costs.



Source: authors' calculations based on LVAEI, 2014

Fig. 3. Distribution of total milk production costs per tonne of sold milk in Latvia in 2013, EUR

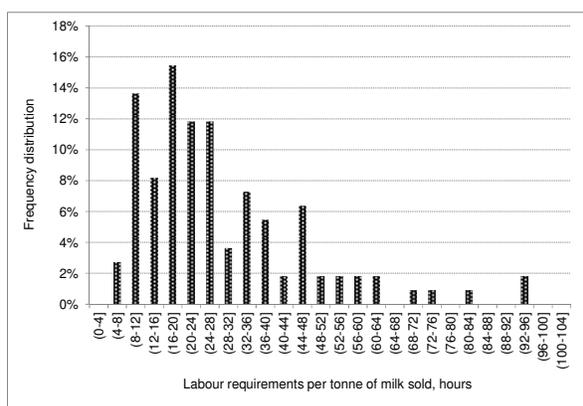


Source: authors' calculations based on LVAEI, 2014

Fig. 4. Total costs depending on the number of cows per farm in Latvia in 2013

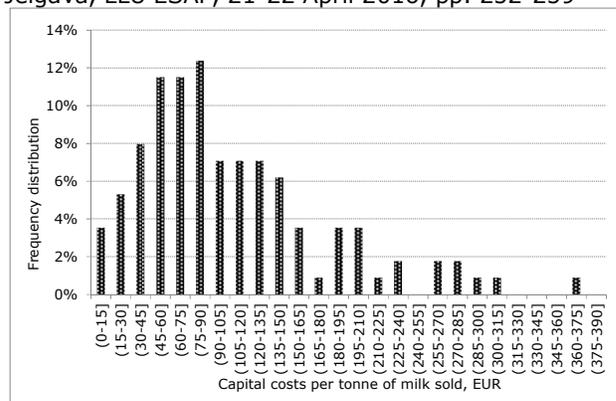
Besides, there is no strong correlation between the size of a farm and its cost per tonne of milk sold (Figure 4). An exception is very small farms and a small group of farms with 5-20 dairy cows whose production costs are much above the average. At the same time, there is a range of farms with 10-20 dairy cows, which, in terms of costs, are more efficient than some large farms. Further, the research presents the distribution of costs for the factors of production analysed and for intermediate consumption.

Distribution of unit labour requirements and capital costs. Unit labour requirements, measured per tonne of milk sold, considerably differ across the farms. More than 16% of the farms use less than 12 labour hours per tonne of milk sold. Approximately the same number of farms consumes more than 44 labour hours to produce a tonne of milk (Figure 5). Most of the farms (more than 60%) use 8-28 labour hours to produce a tonne of milk, which indicates possibilities for the farms to further increase their efficiency.



Source: authors' calculations based on LVAEI, 2014

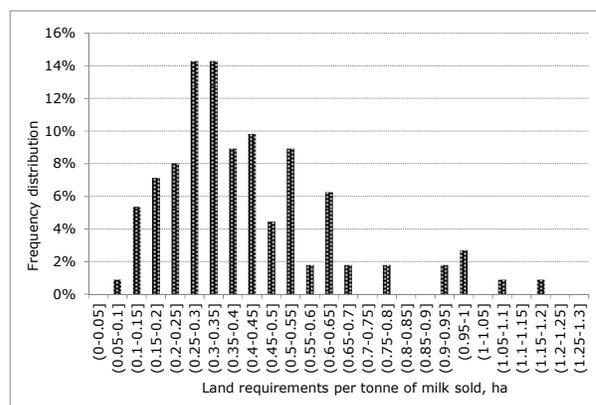
Fig. 5. Distribution of labour requirements per tonne of sold milk in Latvia in 2013, hours



Source: authors' calculations based on LVAEI, 2014

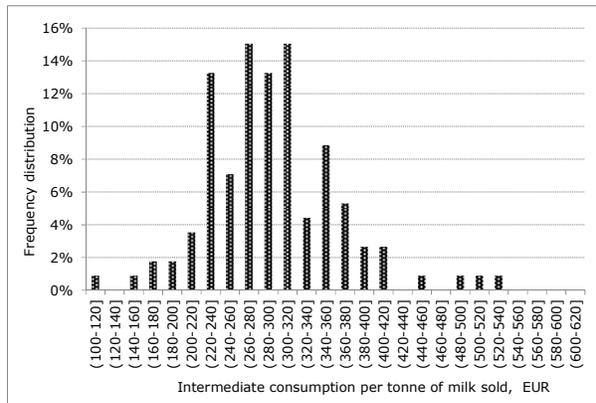
Fig. 6. Distribution of capital costs per tonne of sold milk in Latvia in 2013, EUR

Capital costs measured per tonne of milk sold are very diverse across the dairy farms; yet, the costs range within EUR 45-90 per tonne of milk sold for the majority of them (Figure 6). It has to be noted that no association was identified between the highest capital cost and the lowest unit labour requirement – namely, larger investments did not result in a more efficient use of labour. The farms with the greatest capital costs per tonne of milk sold did not represent mostly medium and large farms that made relatively large investments in their modernisation.



Source: authors' calculations based on LVAEI, 2014.

Fig. 7. Distribution of land requirements per tonne of sold milk in Latvia in 2013, ha



Source: authors' calculations based on LVAEI, 2014.

Fig. 8. Distribution of intermediate consumption costs per tonne of sold milk in Latvia in 2013, EUR

Distribution of unit land requirements and intermediate consumption costs. An analysis of the distribution of frequency of occurrence for land requirements leads to a conclusion that the farms most often needed land within a range of 0.25-0.35 ha in size to produce a tonne of milk, while almost a third exploited more than 0.4 ha for the production of a tonne of milk (Fig. 7).

The distribution of intermediate consumption costs (Fig. 8) takes a form that is close to a standard normal distribution with a maximum within EUR 260-320 per tonne of milk sold. Of the farms, 28 % spent less than EUR 260 on intermediate consumption per tonne of milk sold.

### Conclusions, proposals, recommendations

The dairy industry in Latvia is the second most important agricultural industry behind grain production if measuring its proportion in the percentage distribution of final agricultural products. The lifting of milk quotas in the EU in 2015 and Russia's embargo on dairy products in 2014 resulted in a decrease in milk prices in Latvia by almost a third, which makes producers

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By employing the "cost parameter equation method", it is possible to compare the production costs of milk produced on various farms, which significantly differed (more than fourfold) for the analysed 113 farms. The overall cost analysis reveals that farms in Latvia so far operate without paying full wages to their labour (their own contribution to their farm is not valued in terms of money), exploiting their owned land on which no rent has to be paid.

In Latvia, milk production costs significantly varied owing to the difference in labour consumption, as more than 60 % of the farms used 8-28 labour hours to produce a tonne of milk. Capital costs measured per tonne of milk sold were diverse across the dairy farms; yet, the costs ranged within EUR 45-90 per tonne of sold milk for the majority of them. The farms were not interested in efficient farming from the perspective of land use, as direct area payments of the EU provided additional revenue, and thus, more than a third of farms in Latvia exploited more than 0.4 ha of land to produce a tonne of milk. The distribution of intermediate consumption costs takes a form that is close to a standard normal distribution with a maximum within EUR 260-320 per tonne of milk sold.

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