

## ANALYSIS OF THE FACTORS AFFECTING COST EFFICIENCY IN BEEF PRODUCTION IN LATVIA

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**Abstract.** The overall trends indicate that with increases in the world population and its incomes, the demand for meat rises. Growth is forecasted in the cattle industry in the countries with large grassland areas and suitable weather conditions. The European Union (EU) beef and veal sectors are significant: 10 % of the total value of the EU agricultural production and 13 % of the world beef and veal production. Meat cattle is one of the prospective agricultural industries in Latvia, as there are appropriate land areas, climatic conditions and experience accumulated by farms. However, meat production has to be efficient and as cheap as possible. The research aim is to analyse the beef industry and the factors affecting farm cost efficiency in Latvia. To achieve the aim, the "cost parameter equation method" was employed to identify beef production efficiency for 50 farms based on the key cost items: labour, land, capital and intermediate consumption. The research found that beef production costs significantly differed for the farms in Latvia. The reason was different labour consumption and different capital costs if measured per standard cattle unit. The farms with low labour consumption and minimum investments in fixed assets were the most efficient ones.

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

**JEL code:** Q10, Q12

### Introduction

From analysis of the Food and Agricultural Organisation of the United Nations data, it is clear that there has been a significant increase in global meat consumption over time driven in part by a growing world population and income increases in particular (Henchiona M. et al., 2014). Francesca Allievi, Markus Vinnari and Jyrki Luukkanenc (2015) point that "Income per capita is likely to continue to rise globally, and traditionally this has led to a shift towards the consumption of foods with higher content in animal protein, fats and sugars". It is agreed by A.Auzina (2004) who finds that "with household disposable incomes rising, the demand for meat and its products increases".

L.Kristensen, S.Støier, J.Würtz and L.Hinrichsen (2014) stress that "efficiency all the way from breeding and farming to processing and dispatch is crucial for success. Systems for optimal animal welfare will be even more important...".

Growth is forecasted in the cattle industry in the countries with large grassland areas and suitable weather conditions, for example, "the expanding New Zealand dairy cattle industry

*represents a huge opportunity to produce surplus calves for the beef industry both male and female. Surplus capacity in the dairy industry could be increasingly utilised to produce more efficient beef suckler cows" (Morris S. T., Kenyon P. R., 2014). "Brazilian beef production is estimated at 10,935 million tonnes of meat in 2023, representing an increase of almost 29 % relative to 2013, and 20% of the global market share" (Lobato J. F. P. et al., 2014). In Uruguay, there is a great potential to improve the productivity of grazing livestock systems, by improving grazing management, and at the same time reducing GHG emissions, and other environmental impacts, while conserving biodiversity (Picasso V. D. et al., 2014).*

Milan Zjalic, Antigoni Dimitriadou and Andrea Rosati (s. a.) from the European Association for Animal Production emphasise that the importance of the EU beef and veal sector goes beyond the economic figures, which alone are significant: 10 % of the total value of the EU agricultural production and 13 % of the world beef and veal production. The social and environmental role of the sector is equally important: sustaining rural populations and

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countryside. Today's EU Common Agricultural Policy (CAP) has evolved substantially since these early efforts and is striving to tackle new challenges in search of a fairer and greener more competitive agriculture. The main aims of the CAP are to improve agricultural productivity, so that consumers can benefit from a stable supply of affordable food, while making sure that EU farmers can make a reasonable living. Since the early 1980s, there has been a steady downward trend in the number of livestock on agricultural holdings across the EU. In 2014, looking at the EU Member States, Germany, Spain, France and the United Kingdom held the largest number of livestock and there have been considerable structural changes in EU livestock farming since the 1980s. Smallholders on mixed farms have gradually given way to larger-scale, specialised livestock holdings (Eurostat, 2015). In 2003, the reform of European CAP turned the focus from quantity to better quality production. The new aim included an increased attention to sustainable agriculture and citizens' concerns, in particular towards "animal welfare" (Serviere J., 2014). Hanne Marie Nielsen, Ab Groen, Jorn Pedersen and Peer (2004) point that *"also in a situation with non-profitable bull calf production, dairy farmers will stop producing beef from bull calves. In such situations the bull calves will typically be sold to specialised beef producers shortly after birth"*.

There is potential to increase land use efficiency both by integrating the unutilised agricultural area into production and by exploiting the currently used area more efficiently. In 2012 in Latvia, permanent meadows and pastures and grasses sown in arable land occupied slightly more than 800 thou. ha or 49 % of the area declared for single area payments (Pilvere I., Nipers A., 2015), which created good preconditions for meat cattle farming. It is particularly important because in the autumn of 2014 milk purchase prices sharply fell in Latvia owing to Russia's embargo on dairy

products, which made farmers search for alternatives for milk production. Anna Jamieson (2013) points that meat cattle farming is one of the most prospective agricultural industries in Latvia. There are all the necessary preconditions for it here: an appropriate climate, vast and still unutilised areas useful for meat cattle farming, experience in farming and great opportunities to increase sales both in the domestic and in the foreign markets. The Ministry of Agriculture of the Republic of Latvia (2015) emphasises that the key objective of Latvia's meat cattle industry is to produce beef of high value and quality, to provide domestic consumers with beef produced in Latvia as well as to increase its competitiveness and exports.

Juris Plesums, Uldis Ositis, Astrida Runce, Ilma Ramane, Zinta Gaile and Santa Skuja (2008) believe that in farm management the allocation of resources – the practical exploitation of land and other resources needed in production – is important, as it is associated with the principle of use of the better alternative – how to use inputs, labour, finances and products in the most efficient way. The task of an owner/entrepreneur is to identify a combination of the resources which results in the highest profit at the current moment or in a short-term. Therefore, an essential aspect in raising farm efficiency is cost reduction, as revenues, to a great extent, depend on exogenous factors.

The **research object** is beef production in Latvia, while the **research subject** is farm cost indicators in beef production.

The research aim is to analyse the beef industry and the factors affecting farm cost efficiency in Latvia. To achieve the aim, the following specific research **tasks** were set: 1) to describe the meat cattle industry in Latvia; 2) to analyse the key factors affecting farm costs in beef 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. According to the CPE method, calculations include unpaid labour costs too, thus, 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 beef production include the key cost items, measured per standard cattle unit. 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 cattle unit 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 cattle unit for the farm;

ZIt – land opportunity cost per cattle unit for the farm;

CCt – capital cost per cattle unit for the farm;

ICt – intermediate consumption cost per cattle unit 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 beef production in Latvia. The calculations were based on the 2013 data for 50 FADN meat livestock farms of various sizes, whose revenue from beef sales 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 beef, there are foregone revenues (EUR 71.1 per hectare).

## Novelty and topicality of the research

The present research points to necessity to produce beef in Latvia as efficiently as possible, exploiting pastures and grasslands, in order that farms could choose the most appropriate agricultural industry, as the milk purchase price has decreased since the autumn of 2014 and the farmers have to choose an alternative for milk production.

## Research results and discussion

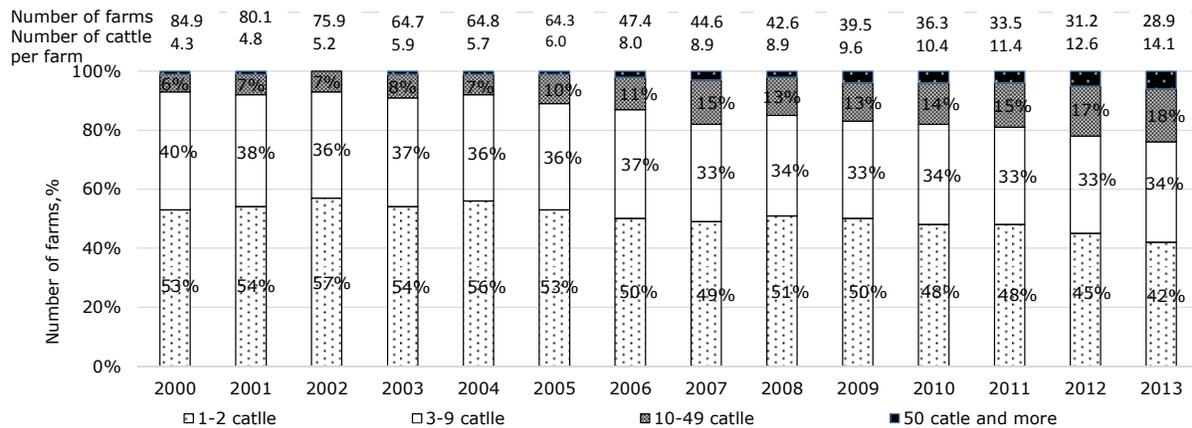
### 1. Characteristics of the cattle industry in Latvia

Meat cattle farming is a relatively small agricultural industry in Latvia, as its proportion in the total agricultural output in 2014 accounted for only 3.8 % (Ministry of Agriculture, 2015). To date, it developed as an auxiliary industry in milk

production (the meat of discarded dairy cows comprised almost half of the supply of beef in recent years); yet, meat cattle farming was purposefully developed as well. In 2014 in Latvia, the output of beef reached 17.9 thou. tonnes, and it has tended to decline since 2007 (-22 %). In the period since 2000, the output of beef has fluctuated from 16.0 thou. tonnes in 2002 and 16.7 thou. tonnes in 2013 to 22.8 and 22.3 thou.

tonnes (in 2007 and 2000, respectively) (CSB, 2015a).

Beef is produced in Latvia in considerably smaller quantities than pork, and the output of poultry meat too is greater than that of beef. A trend may be observed in Latvia for several years – calves are exported from the country, which are then raised in foreign countries, as the price offered by foreign dealers is higher than the domestic price on cattle raised in Latvia.



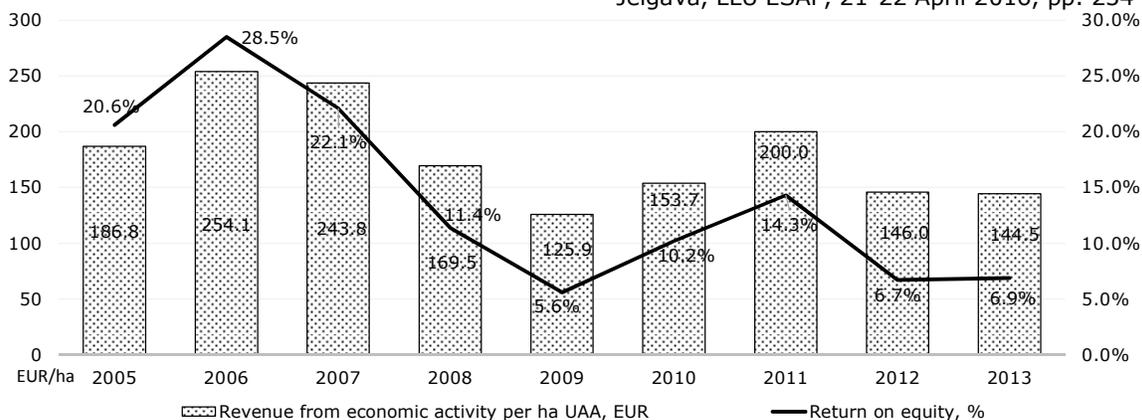
Source: authors' calculations based on CSB, 2015a, 2015b, ADC, 2015

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

The total number of cattle increased to 422.0 thou. in Latvia in 2014, which was caused by an increase in the number of cattle other than dairy cows (+17 % compared with 2007) (CSB, 2015a). An analysis of changes in the number of cattle of meat breeds, according to SJSC Agricultural Data Centre (ADC) statistics, reveals that there was a strong increase trend – in 2013 in Latvia, the number of cattle of meat breeds reached 27.8 thou. (it has more than doubled since 2007), and approximately 40 % were Charolais beef cattle (ADC, 2015). The increase in the number of meat cattle indicates stability

and growth in meat cattle farming (Ministry of Agriculture, 2015).

The average farm size and the proportion of farms with a herd of 10 and more cattle continue increasing (Figure 1). The average number of cattle per farm was 14.1, while the total number of cattle farms reached 28.9 thou. in 2013. Revenue indicators for grazing livestock farms were diverse, in particular the return on equity ratio – it was considerably lower for the group of small farms with a standard output of EUR 4-15 thou. (LVAEI, 2014).



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

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

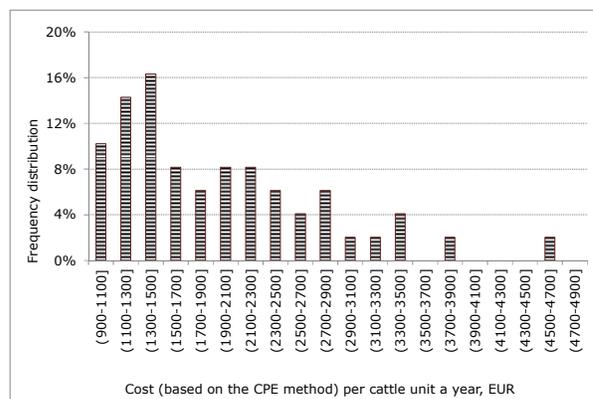
The available data on grazing livestock farms show that revenue from economic activity, which is characterised by the difference between revenues from products produced (production subsidies included) and production costs per unit of agricultural area, have been volatile and generally tended to decline. A similar trend was observed for profits (revenues have to include investment subsidies attributable to the reporting year, while expenses have to include unpaid labour cost) and return on equity ratios (Figure 2).

The purchase price of cattle has significantly risen in Latvia since 2000 (EUR 877 tonne<sup>-1</sup>) and reached EUR 1624 tonne<sup>-1</sup> in 2014, although it is still low compared with the other EU Member States, which may be explained by a lower specialisation level and the small quantity of beef produced in Latvia. The highest purchase price of beef was reported in 2012, EUR 2094 tonne<sup>-1</sup>. In recent years (2013 and 2014) the purchase price declined in this industry (CSB, 2015c). In Latvia, the prices of resources exploited in agricultural production tended to increase (there was a decrease during the economic crisis), including a hike price on feed (LVAEI, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014). The increase in prices on production resources considerably decreased the positive effect of high beef purchase prices. For this reason, farms have to analyse the situation in the meat cattle

industry and seek possibilities for efficient farming through reducing costs in order to offset beef purchase price decreases.

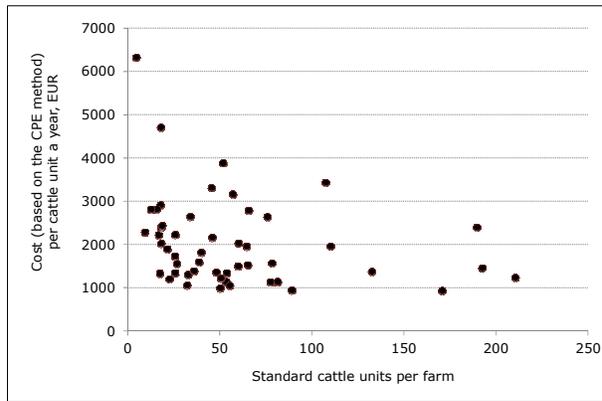
## 2. Analysis of the factors affecting the financial performance of meat cattle farms

An analysis of the financial performance of FADN farms shows that the range of beef production costs for farms in Latvia, based on the CPE method, is very broad (Figure 3).



Source: authors' calculations based on LVAEI, 2014

Fig. 3. Distribution of total beef production costs per cattle unit for farms in Latvia in 2013, EUR



Source: authors' calculations based on LVAEI, 2014

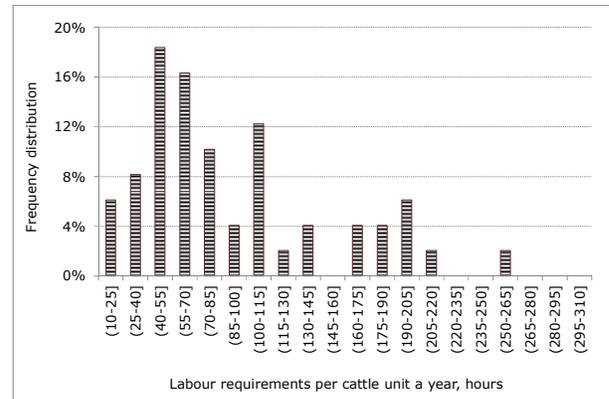
Fig. 4. Total costs depending on the number of cattle per farm in Latvia in 2013

As the average cost per standard cattle unit reaches EUR 1300-1700, and it may vary from EUR 1000 to 4700, i.e. more than four times. This means that if farms fully covered labour and land rent costs, they would incur losses, as their total cost per standard cattle unit exceeded the beef 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.

Besides, there is no strong correlation between the size of a farm and its cost per standard cattle unit (Figure 4). An analysis of the most efficient farm in terms of the lowest production cost (based on the CPE method) shows that such a farm had 52 dairy cows and 80 standard cattle units, and its production cost equalled EUR 1122 per cattle unit. Further, the research presents the distribution of costs for the factors of production analysed and for intermediate consumption.

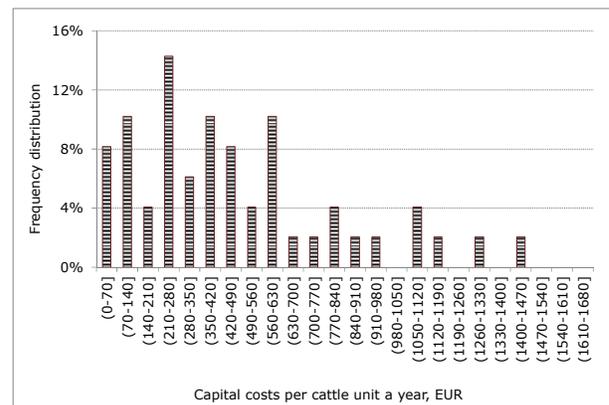
Distribution of unit labour requirements and capital costs. An analysis of unit labour requirements (Figure 5) shows that the average labour requirement per cattle unit ranged within 40-55 man-hours a year for most (18 %) of the FADN cattle farms. For 16 % of the farms, it reached 55-70 man-hours a year. However, the average labour requirement for 14 % was less than 40 and for 6 % less than 25 man-hours per cattle unit a year. At the same time, a relatively

high proportion of farms (36 %) consumed more than 100 man-hours per cattle unit a year. The significant differences may be explained by the different ways of work organisation on various farms. On the most efficient farms, the labour requirement per cattle unit a year was 12 man-hours and the total labour requirement a year was less than 1000 man-hours or approximately 2.5 man-hours a day.



Source: authors' calculations based on LVAEI, 2014

Fig. 5. Distribution of labour requirements per cattle unit in Latvia in 2013, hours



Source: authors' calculations based on LVAEI, 2014

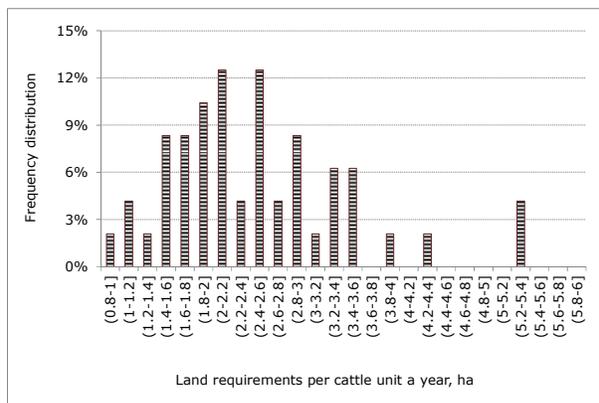
Fig. 6. Distribution of capital costs per cattle unit in Latvia in 2013, EUR

Even greater differences were observed in the distribution of capital costs per cattle unit a year for various meat cattle farms (Figure 6). A high proportion of the farms operated at minimum capital costs – for a third, capital costs were less than EUR 240 per cattle unit. It allows them to achieve a lower production cost and compete on

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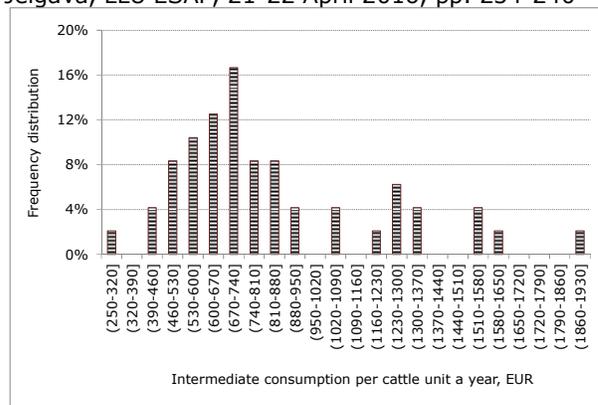
the market under falling beef prices. For about a fifth of the farms, capital costs exceeded EUR 640 per cattle unit, which decreased their production efficiency.

Distribution of unit land requirements and intermediate consumption costs. Like unit labour requirements and capital costs, unit land (meadows and pastures) requirements for various farms were diverse. This may be explained by the effects of several factors. There are differences in land quality – the higher quality and more productive land, the smaller land area is necessary to provide a cattle unit with green forage. According to the calculation methodology, a larger land area means less efficient farming. However, in practice, a larger land area is beneficial if it is owned by the farm and has no financial liabilities, as a larger land area provides larger direct area payments. Most farms in Latvia exploited a land area being greater than minimally needed – more than 60 % of the farms used more than 2 ha of land per cattle unit.



Source: authors' calculations based on LVAEI, 2014.

Fig. 7. Distribution of land requirements per cattle unit in Latvia in 2013, ha



Source: authors' calculations based on LVAEI, 2014.

Fig. 8. Distribution of intermediate consumption costs per cattle unit in Latvia in 2013, EUR

The most efficient farm had no grasses sown in arable land, and its entire land of 170 ha consisted of meadows and pastures. Of the total area, 150 ha were owned by the farm. The land was exploited quite extensively, as it was an organic farm.

The distribution of intermediate consumption costs was more compact (Figure 8) than that of the analysed factors of production (labour, capital and land), as the largest share of intermediate consumption involved purchased feed, the prices of which were similar for various farms. The farms with very high intermediate consumption mostly made emergency purchases, which might be associated with their basic activity – raising cattle. For part of the farms (18%), intermediate consumption costs per cattle unit a year ranged within EUR 450-500. However, for 40 % it ranged within EUR 350-500. Intermediate consumption costs per cattle unit a year exceeded EUR 850 for more than a fifth of the farms. The most efficient farm had a very low intermediate consumption cost. It was related to very low expenses on feed concentrate (it was used relatively little in production) as well as to very low maintenance costs of farm buildings and low operational cost of machinery and equipment, which allowed the farm to reach the lowest total cost level.

## Conclusions, proposals, recommendations

1) Beef production in Latvia is a relatively small industry, as its proportion in the total agricultural output in 2014 accounted for only 3.8 %. However, there are all the necessary preconditions for it: an appropriate climate, vast and still unutilised areas useful for meat cattle farming, experience in farming and great opportunities to increase sales both in the domestic and in the foreign markets. Beef production is an alternative for milk production due to Russia's embargo on dairy products imposed in 2014 and the decrease in milk purchase prices.

2) By employing the "cost parameter equation method", it is possible to compare beef production costs per standard cattle unit for various farms, which significantly differed (more than four times) for the analysed 50 farms. The overall cost analysis revealed that farms in Latvia so far did not value the contribution of their own work to their farm in

terms of money, exploiting their owned land on which no rent has to be paid.

3) In Latvia, cattle farming costs significantly varied owing to the difference in labour consumption, as a third of the farms used 40-70 man-hours, while another third needed more than 100 man-hours per animal. Even greater differences were observed in capital costs among the farms, as a third operated at minimum capital costs, which allowed them to produce competitive products. The most efficient farms were those owning their land and exploiting meadows and pastures for raising cattle.

## Acknowledgment

This research paper is prepared with the support of the Ministry of Agriculture and refers to research carried out within the project No 2013/86 "Competitive and Efficient Production of Milk and Meat ", subproject "Development of Efficient Farming Models ".

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