PRODUCTIVITY OF LATVIAN AND LITHUANIAN RURAL FARMS AND MAIN FACTORS INFLUENCING IT

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Abstract
The aim of the paper is the assessment of the changes in productivity expressed as the share of production costs in total output and its breakdown by major cost types of Latvian and Lithuanian farms over the period of the implementation of Rural Development Programme (RDP 2007 – 2013). The country's agricultural productivity is determined by comparison of the total agricultural output value (in producer prices) and total inputs which include intermediate consumption expenditure, depreciation, labor costs and other external costs. The information for the analysis was sourced from the standardized Farm Accountancy Data Network (FADN) data. The results show that productivity level is higher in Lithuanian farms, although the tendency is that the share of costs in production value is increasing in Lithuania, so the difference between two countries is reducing. The changes of productivity in both countries infer the relative growth in the productivity in crop farming both in Latvia and Lithuania respective to dairy farming, as well as the productivity of large farms respective to small and medium farms. The comparisons of major cost items reveal an especially high level of energy costs in Latvia, as well as a high and soaring level of depreciation in Lithuania, especially in dairy farms. In the future policy making, it is worthwhile to design the measures targeting the confinement of risks and negative trends identified in the study.
Key words: agriculture, productivity, farms, output, input.

Introduction

The objective of the study is the assessment of the changes in productivity expressed as the share of production costs in total output and its breakdown by major cost types of Latvian and Lithuanian farms over the period of the implementation of Rural Development Programme (RDP 2007 – 2013).

The topicality of the research is supported by previous findings suggesting generally higher intermediate consumption costs per production unit in Latvia if compared to the EU average and neighbouring countries. It would be appropriate to compare the data of two neighbouring countries – Latvia and Lithuania – to reveal the common and different tendencies of its development. Thus, the necessity arises to assess the changes over the programme period: what is the impact of the programme on production costs - have the costs grown or declined, and in which subsets? The analysis has been provided both for industry level and main farm grouping level by comparison of FADN data for Latvia and Lithuania.

To reach the research objective, the following tasks are set: (1) To assess the changes in the share of costs in total output in Latvian and Lithuanian agricultural farms over the period of the implementation of RDP; and (2) To analyze the structured data by main farming types (field crops and milk production) and by farm sizes (standard output groups).

Due to the format limitations, the paper includes a concise analysis of results only for main groups of specialization and overall analysis of different farm size groups.

Materials and Methods

The selection of the research methods and description of the general situation were based upon the previous national and international research on competitiveness and its assessment along with the research on dynamics of the share of the costs in production output.

The methods of economic analysis used in the present study comprise monographic and graphic methods, time series analysis with linear regression, comparative analysis along with the analysis and synthesis.

The information for the analysis was sourced mainly from weighted or standardized FADN data.

To get representative results, the sample survey data are extrapolated to similar farms by using weights. Every farm from FADN database has its weight, thus the results obtained represent all farms whose size exceeds the FADN threshold: standard output (SO) is greater or equals EUR 4,000 annually. In 2014, 24,000 or about 30% of total operating farms in Latvia were above this threshold (Central Statistical Bureau of Latvia, 2013) and 53,000 or 31% in Lithuania (Statistics Lithuania, 2013). The data on farms below the FADN size threshold are not available. Nevertheless, it should be noted that farms covered by FADN virtually represent the entire commercial sector of the agriculture: according to the structural surveys of CSB, farms above the FADN threshold provide 93.5% of total standard output (SO) in Latvia and 89% in Lithuania. Some 80% of agricultural land in Latvia is attributed to these farms (in Lithuania even 93%), and the share of them in agricultural labour input at

Full Time Employment (FTE) units are 56% in Latvia and 67% in Lithuania (2013). Thus, the analysis of this sample data provides a representative insight on commercial agricultural production.

The FADN standardized results from 2006 to 2014 are used for the analysis at industry level and grouped levels. Such period is chosen to explain one year before and one year after the Programme. Considering the significant share of the field crop farming and dairy farming in agriculture of both countries, these sectors are addressed particularly. Both sectors are sufficiently represented by FADN to enable the representative assessment. The exact number of farms varies by year as some farms undergo a change in specialization over time. There are about 33 – 35% of dairy farms and 27 – 35% of field crop farms in FADN sample of both countries. Other special fields do not have a sufficient number of farms to include them into the research.

The country's agricultural productivity is determined by comparison of the agricultural production value (producer prices) and total input costs which include intermediate consumption expenditure, depreciation, labor costs and other external costs (rent, interest and taxes linked to production).

To evaluate the intensity of involvement in various RDP 2007 – 2013 projects in particular farm size groups, the analysis is adjusted accordingly. There are six economic size groups in the Latvian FADN depending on their standard output. In Lithuania there are some differences in that division: the first group is divided into two parts (so 7 groups are in total), but the largest group begins from EUR 250,000 standard output per year instead of EUR 500,000 as in Latvia.

For the convenience, farms with SO of up to EUR 25,000 are considered 'small'. Farms with SO of more than EUR 25,000 and up to 100,000, constitute „medium" group. Finally, farms with the SO of EUR 100,000 and more are considered 'large'. The suggested breakdown is supported by the size and nature of farming operations, as well as the economic results.

Results and Discussion

The productivity of a company or entire sector is expressed by production in value terms divided to costs (Coelli *et al*., 2005). The value of the indices thus obtained itself is not explicable. However, the change rate of the indices over time indicates the growth of production in value terms that is not associated with the increase in costs, and as such, it directly shows the changes in the efficiency of production process over time. Moreover, productivity indices enable country comparisons to evaluate the relative national competitiveness of a country. Both of these comparisons are important in the assessment of a competitiveness level and its changes (Irz & Jansik, 2015). The interpretations of the competitiveness vary. Some authors point to a relative nature of the concept emphasizing the lack of the explanatory power of single indices alone considering the entire range of aspects associated with the competitiveness and its complex nature (Latruffe, 2010). Nonetheless, the industry level research predominantly focuses on the productivity. Paul Krugman considers productivity an important element of outcome competitiveness (Aiginger, 2006). UK Department for Environment, Food and Rural Affairs virtually infers competitiveness as economic efficiency or productivity (Irz & Jansik, 2015).

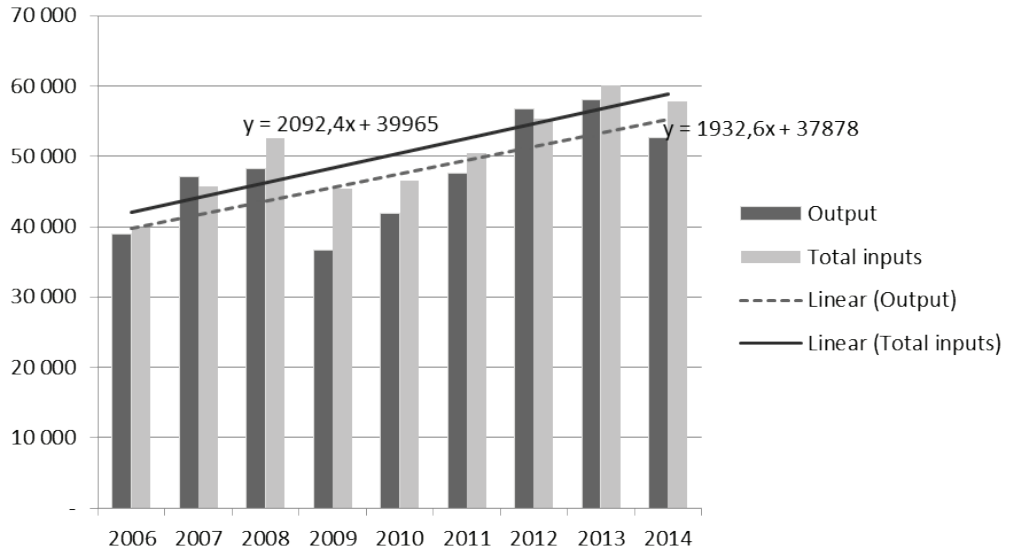
Interpreting the concept of productivity calculation, the researchers put forward similar views that the higher productivity can lead to economic growth. The productivity analysis in agriculture has been carried out using Data Envelope Analysis (DEA). DEA is a method of measuring the efficiency of the farm and allows to study separately the resources or products and their various relations of effectiveness assessments (Baležentis, Kriščiukaitienė, & Baležentis, 2009).

The scientists exploring the indicators of productivity (Tamosaitiene *et al*., 2010) defined the assessment of economic activity of farm and their resource efficiency by using the relative financial indicators.

The authors agree that there are factors such as technology, innovation, management, research and development which increase the productivity. A higher productivity associated with economic growth rates should be assessed based on the foreign direct investment (FDI) impact on the productivity, as well as determined whether there is a correlation between the volume of FDI and labour productivity of the country (Laskiene & Pekarskiene, 2011).

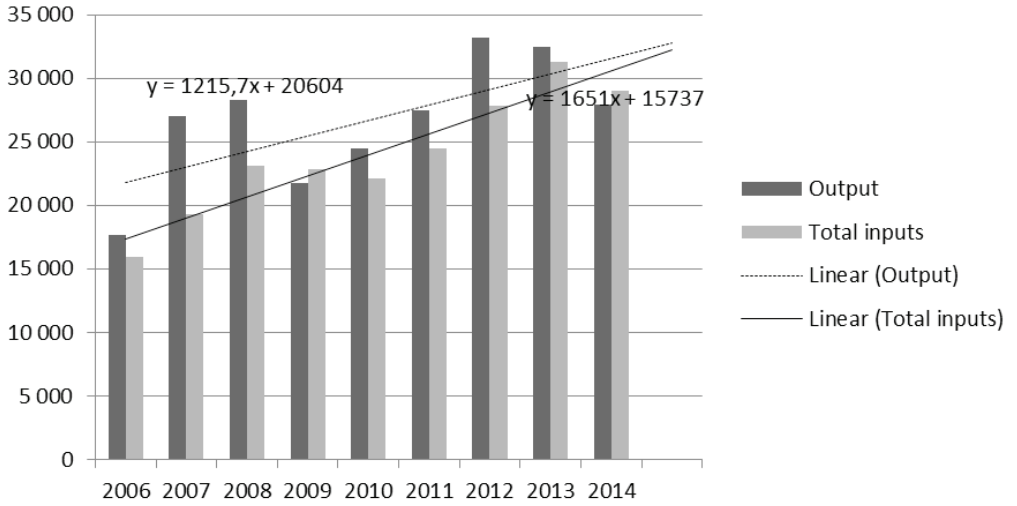
For agricultural farms in Lithuania and Latvia increasing the productivity remains an essential problem. Therefore, it is appropriate to identify the factors that determine agricultural productivity, provide its improvement opportunities, which will allow both countries to increase the competitiveness of the economy in the long term. One of the most important factors is to support agriculture. It should be noted that the rise in agricultural production since 2004 has been significant after Latvia's and Lithuania's accession to the EU. The support obtained from the EU and national budget stimulates agricultural production, while increasing the value added and income. Support funds are sufficient not only to maintain the farm incomes, but also to give more for investment purposes.

The size of both Latvian and Lithuanian average farm economy has grown from 2006 to 2014. The weighted average production in value terms (output) in a single Latvian FADN farm has increased from



Source: Calculations of authors based on FADN data

Figure 1. Trends of output value and total input for an average Latvian FADN farm (EUR, 2006 – 2014).



Source: Calculations of authors based on FADN data

Figure 2. Trends of output value and total input for an average Lithuanian FADN farm (EUR, 2006 – 2014).

EUR 38,900 in 2006 to EUR 58,000 in 2013 (Figure 1). Since then, in 2014 it has declined to EUR 52,700; so the total growth since 2006 is by 35%. The annual fluctuations are mainly attributed to the market situation in the particular year (prices for grain, milk and other products). The growth in total input in value terms follows almost a proportional pattern, and the total growth of average farm costs from 2006 top 2014 is by 45% in Latvia. It is important that only in two years during this period (2007 and 2012) the total output in producer prices was slightly higher than total inputs. It was due to exceptionally high crop prices. In all other years, the farmers' income was ensured only with the help of subsidies (on average farm).

Similar tendencies we see in Lithuania (Figure 2) – in this country the average farm agricultural output increased even by 58%, but total input – even by 81.8% in 2014 compared with 2006. During the period 2006 – 2014 it can be noted that input was growing faster than output. Yet, there is one big difference from Latvia: only in two years – 2009 and 2014 – the farm costs were higher than the value of agricultural output. In all other years there was a positive output-input value balance in Lithuania farms.

During the period of 2006 – 2014, the highest value of agricultural output per farm was produced at EUR 33,199 in 2012. It was by more than 40% less than in average FADN farm in Latvia at the same year.

The most profitable year for farmers was the year 2007 when the average profits amounted to EUR 7,685 per farm. Whereas, in Latvia the maximum net profit was only EUR 1,462 per farm – more than 5 times less than in Lithuania.

If we compare input/ output ratio and its tendency in these countries, we can see that in Latvia this ratio is about 106% (input higher than output) and slightly increasing, but in Lithuania it is less, with a strong tendency to increase: from 75% in 2006 to 94% in 2014 (trend data). The average share of costs in the EU countries stands at the 88% of production output in value terms and it is stable; so the production in value terms substantially surpasses the costs. Hence, the dependency upon subsidies in Latvia is significantly more pronounced than in EU in general. In the last years the same tendency has also been observed in Lithuania.

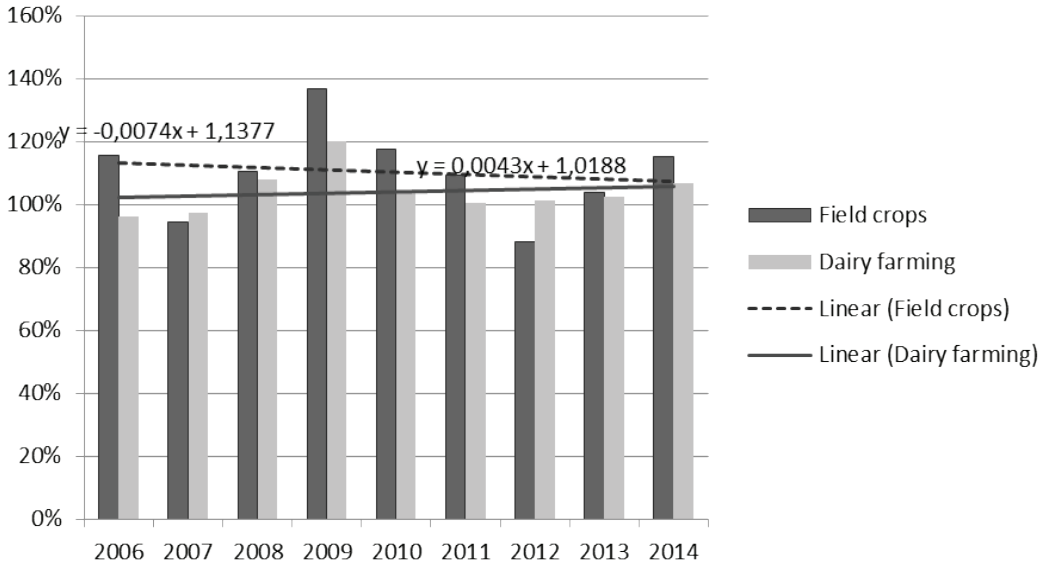
The main types of specialization in agriculture of both countries in question are field crop farming and dairy farming. Thus the substantial trends in farms within these industries are analysed separately. The dynamics of total costs in these industries is mapped in Figure 3 for Latvia and Figure 4 for Lithuania.

According to Latvian data, the share of total input in output of crop farms exceeds the overall average. This rate for crop farms in 2014 stood at 115% while the overall average was only 110%. Nevertheless, the linear trend suggests the decline in the share of the costs. However, the data per year varies significantly and the comparison with the respective crop and dairy prices leads to a conclusion that the product price fluctuations is the main factor behind the differences in shares of total input per year.

Nevertheless, there are other factors that influence the ratio of input and output. Moreover, farms in both specialization groups vary either by trends in changes of the ratio or the range of the changes. It is obvious that from 2012 to 2014 when the grain prices were markedly lower, the share of the costs in output grew by 28 percentage points from 88% to 115%. This points to the relatively high risks in crop farming where productivity is very dependent upon the situation in the global markets and yields (these can be volatile) as the productivity in industry in 2007 and 2012 when prices were high was higher than in other industries, in 2008 and 2013 (medium prices and average yields) it resembled the whole sector. For other years, in turn, when either prices or yields were lower (2006, 2010 and 2011) the share of the total input in output exceeded the agricultural average markedly.

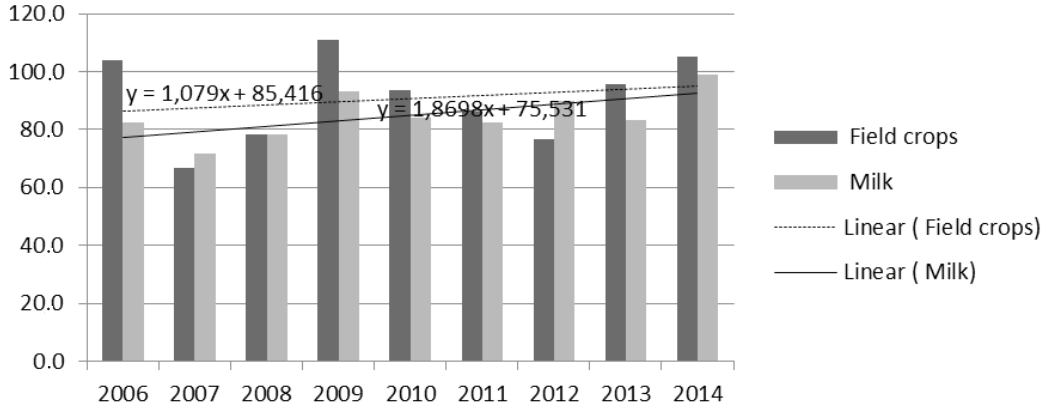
In dairy farming, the ratio of input is slightly lower than in crop farming and in agriculture in total (107%, 115% and 110%, respectively) with annual fluctuations significantly less pronounced. However, in comparison with crop farming in dairy farming ratio of input is growing as shown by general trend line. Only in 2006 and 2007 it was less than 100%. After that the ratio soared to a 120% maximum in 2009. From 2010 to 2013 the ratio was rather even – at 100% – 104% from the output.

Such a situation provided profits for farms considering the size of support payments that accounted for about a third of output. In 2014, in turn, the share of costs grew to 107% or 5 percentage points from output, reflecting the 5% decline in average milk price.



Source: Calculations of authors based on FADN data

Figure 3. Ratio of total input in output value at Latvian field crop and milk farms 2006 – 2014 (%).



Source: Calculations of authors based on FADN data

Figure 4. Ratio of total input in output value at Lithuanian field crop and milk farms 2006 – 2014 (%).

As of 2014, the ratio of costs increased by 5 percentage points to 107% of output, reflecting the 5% decline in average milk price. The results of 2014 were not fully affected by dairy crisis yet and milk price in the first half of the year was higher than in 2013.

The comparison of these two industries leads to a conclusion that up to 2011, in general, the milk production in terms of costs was more efficient if compared to crop farming (lower ratio of input in output) albeit from this time on the trend has receded and the share of input in both industries has almost levelled. It should be noted that in FADN farm group from 2006 to 2014 the investment support for dairy farms was higher than in crop farms (6.1% and 5.1% from output, respectively). Aggregate support including all subsidies and state support for dairy farming is higher than for crop farming (36.6% and 32.2%, respectively). For all farms, irrespective of their specialization, the average ratios stand between these two industries: the share of total subsidies in output stands at 33.6%, including investment subsidies at 5.6%.

In Lithuania, the ratio of total input in output in the field crop farms was much lower than in Latvia, although, it exceeded the overall average too, except in 2007 and 2012. This rate for crop farms in 2014 made up 105% while the overall average was 104%. Nevertheless, the linear trend suggests the average at the same level in the share of the input. As in Latvia, there are high year-by-year fluctuations. The largest share of the input – 126% was in 2009, and the lowest – 69% in 2007.

In dairy farming, the ratio of input is lower than in crop farming and in agriculture in total (99%, 105% and 104% in 2014). Contrary to the crop farming, the ratio of input in dairy farms is growing, as shown by general trend line (Figure 4). At the same time, the value of total input is less than output value for all observed years, although the comparative advantage over Latvian farms is reduced. In 2007, this share was 70% in Lithuania and 97% in Latvia, but in 2014 – 99% in Lithuania and 107% in Latvia.

Taking into account the varying development trends, in particular, the farm size groups (including the rapidly falling number of small farms while these farms in aggregate still do employ the largest share of agricultural workforce), one of the research tasks is the study of the differences of productivity and its changes in farms depending upon their size.

The input and output ratio was compared in all economic size groups covered by FADN (in all 6 size groups according to the Latvian FADN classification and 7 groups in Lithuanian classification). The research revealed a more marked trend in input increase for small farms with SO less than EUR 50,000. While in 2006 in all farm groups with SI less than EUR 50,000 the costs did not exceed the output and for these the ratio against the output was markedly lower than in larger farms, in 2014 the share of costs is still the lowest for small farms at 104% from output and the 100% threshold is surpassed in all size groups.

In medium-small farm group (SI from EUR 25,000 to 50,000) the growth in input-output ratio is especially pronounced: from 100% in 2006 to 120% in 2014. At the same time, the second largest farm group (SI from EUR 100,000 to 500,000) has seen a relative decline in the ratio: from 112% in 2006 to 109% in 2014 (Table 5.2). These changes point to a relative disadvantage of production just for small farms (including medium ones with SI to EUR 50,000). This facilitates the concentration of production while at the same time draining workforce out of agriculture considering the concentration of labour in small farms (according to the CSB data on 2010 small farms with economic sizes of up to EUR 15,000 provide 73% of employment in agriculture).

Table 1

Ratio of main input items in output value in Lithuanian and Latvian farms by main types of specialization (%)

	Lithuania				Latvia			
	Field crops		Milk		Field crops		Milk	
Special field/ years	2006	2014	2006	2014	2006	2014	2006	2014
Total inputs:	**103.7**	**105.2**	**82.4**	**98.9**	**115.4**	**115.1**	**96.0**	**106.8**
Intermediate consumption:	***74.4***	***74.8***	***63.8***	***64.7***	***80.7***	***80.8***	***75.2***	***81.1***
Feedingstuffs	0.1	4.4	32.6	35.3	4.3	1.5	36.1	36.2
Fertilizers & crop protection purchased	31.7	33.7	4.4	3.9	26.4	30.7	2.6	3.7
Energy costs	13.8	12.7	9.6	9.5	17.8	14.1	12.6	13.7
Purchased seeds and seedlings	17.6	8.4	4.7	1.9	10.8	10.5	2.3	2.4
Maintenance of buildings and machinery	5.4	5.4	6.0	5.3	7.0	6.8	7.3	8.8
other costs	***29.3***	***34.1***	***18.6***	***34.1***	***34.7***	***34.3***	***20.7***	***25.7***
Depreciation	17.5	25.6	14.6	28.3	19.2	21.1	11.6	13.5
Wages paid	4.6	3.3	1.1	3.1	9.1	8.0	6.6	10.0
Rent and interest paid	7.3	5.2	2.9	2.7	6.4	5.2	2.5	2.2

Source: Calculations of authors based on FADN data.

In Lithuania the tendencies in the farm size groups are quite similar to those in Latvia. There is a sharp increase of input-output ratio in farms of less than EUR 50,000 of SO, and the only farm group with reduced input-output ratio is the largest farm group with SO of EUR 250,000 and more: from 103% in 2006 to 91% in 2014.

In the evaluation of the strengths and weaknesses of Latvian farms as well as to reveal the opportunities for improving the productivity, analysis of cost structure is crucial. Hence the main constituents of total input are selected and their dynamics over the period covered are studied, and comparisons of Latvia and Lithuania are provided to assess the changes over the implementation of LAP 2007 – 2013.

The shares of all the most important input constituent parts of the production costs are provided in Table 1.

The calculations show that the changes in Latvian cost structure over the years covered are not intrinsic: relative costs of fertilizers and energy are still high. It has already been mentioned in previous research (Veveris, 2009) that these stand markedly above the EU average. Moreover, the share of fertilizers and plant protection grows with more pronounced increase of these items in Lithuania. Energy costs, in turn, are markedly higher in Latvia for both specialization groups in question.

Generally, the intermediate costs in Latvia over the period covered have grown in dairy farming while in Lithuania the changes both in dairy and grain farming are insignificant.

As for other costs not included in the intermediate consumption, a very marked growth in depreciation has occurred in Lithuania. This constituent has increased in Latvia, too, albeit less markedly. This brings evidence of large investment in Lithuanian agriculture in recent years. It has to be mentioned that the share of labour costs in Latvia is essentially higher than in Lithuania. Interest and land lease payments, in turn, are relatively small in both countries with a declining share in output.

The cost structure in dairy farms, of course, is different if compared to crop farming with feed costs dominating. This constituent along with energy costs previously has been mentioned as the weaker cost item in Latvia.

Conclusions

1. During the time period from 2006 to 2014, the ratio of output and input has been volatile. While changes by year have been closely adhered to prices of basic products, the basic trend line still shows a relatively high share of input in the output – exceeding 100%. It means that at an average commercial farm subsidies play an important role to support income both in Latvia and Lithuania.
2. On the average, in all farm groups by specialization and size the share of both total

input and intermediate consumption has increased. However, marked differences do exist: in crop farms at the beginning of the period it stood above the average while in dairy farms it was below the average. Nevertheless, a trend for this ratio seen towards the 2014 was that of levelling out in both types of farms.

3. The share of input in the output on Latvian farms in comparison with Lithuania is higher albeit virtually stable according to the trend line, while in Lithuania the share grows.
4. The changes of productivity in both countries infer the relative growth in the productivity in crop farming both in Latvia and Lithuania respective to dairy farming, as well as the productivity of large farms respective to small and medium farms.
5. A marked surge in the share of input in the output from 2006 to 2014 has occurred in the farms of the smallest sizes (with SO to EUR 50,000). It means the production in small farms (including medium ones) has become relatively disadvantageous. This facilitates the concentration of production, while at the same time, draining workforce out of agriculture considering the concentration of labour in small farms.
6. During the period observed, the indices of competitiveness for small and medium farms have deteriorated while in large farms they have improved. Thus the necessity exists in the future to increase the share of the support for improvement of the competitiveness of small and medium farms, especially considering the role of these farms in shaping the rural socio-economic environment including the employment.
7. The results obtained prove the necessity of a special input support to improve the energetic efficiency in Latvian and Lithuanian farms using the measures for the reduction of costs for feed, fertilizers and other direct costs. These measures would provide for the decline in the dependency of farmers on subsidies and allow for the increase in farming income.

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