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Time schedule of the conference

Preparation of the proceedings and organization: October 2015 – April 2016

Conference: 21-22 April 2016

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All reviewers were anonymous for the authors of the articles.

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The proceedings of the conference are published since 2000.

The scientific papers presented in the conference held on 21-22 April 2016 are published in 3 thematic volumes:

No 41 Rural Development and Entrepreneurship
Bioeconomy
Home Economics

No 42 Integrated and Sustainable Regional Development
Production and Co-operation in Agriculture

No 43 New Dimensions in the Development of Society
Marketing and Sustainable Consumption
Finance and Taxes

The proceedings contain scientific papers representing not only the science of economics in the diversity of its sub-branches, but also other social sciences (sociology, political science), thus confirming inter-disciplinary development of the contemporary social science.

This year for the first time the conference includes the section on a new emerging kind of economy-bioeconomy. The aim of bioeconomy is to use renewable biological resources in amore sustainable manner. Bioeconomy can also sustain a wide range of public goods, including biodiversity. It can increase competitiveness, enhance Europe's self-reliance and provide jobs and business opportunities.

The Conference Committee and Editorial Board are open to comments and recommendations concerning the preparation of future conference proceedings and organisation of the conference.

Acknowledgements

The Conference Committee and editorial Board are open to comments and recommendations for the development of future conference proceedings and organisation of international scientific conferences.

We would like to thank all the authors, reviewers, members of the Programme Committee and the Editorial Board as well as supporting staff for their contribution organising the conference.

On behalf of the conference organisers
Anita Auzina
Associate professor of Faculty of Economics and Social Development
Latvia University of Agriculture

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INTEGRATED AND SUSTAINABLE REGIONAL DEVELOPMENT

Proceedings of the 2016 International Conference "ECONOMIC SCIENCE FOR RURAL DEVELOPMENT" No 42
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HEAT INSULATION OF MULTI-APARTMENT HOUSES IN LATVIA: FUTURE PROBLEMS IN THE REGIONS

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Abstract. In 2009, the heat insulation of multi-apartment houses was initiated in Latvia using financial assistance of the European Regional Development Fund. In the future, problems will emerge with heat-uninsulated houses being partially uninhabited, as the population prefers living in heat-insulated houses and the population is likely to decrease not only in rural but also urban areas, while heating for heat-insulated houses is considerably cheaper and the lifetime of such houses after their heat-insulation (renovation) increases. Therefore, the research aim of the paper is to examine the socio-economic problems to be caused by heat-uninsulated multi-apartment houses in Latvia's regions in the future. The research found that heat-insulated houses had an implicit heating discount at the expense of heat-uninsulated houses, and the paper developed a methodology for calculating implicit discounts. In a long-term, it will contribute to their occupancy and consequently the degradation of heat-uninsulated houses. This might affect Latgale region the most, followed by Vidzeme region, while such a problem is the least specific to Pieriga region. Among cities, this problem will be the most specific to Daugavpils, followed by Rezekne; a relatively better situation might be expected in Jelgava and Jurmala.

Keywords: heat insulation of multi-apartment houses, implicit discount, Latvia

JEL code: O18

Introduction

Soviet period buildings are energy inefficient. For this reason, it is necessary to heat-insulate such buildings, which allows considerably reducing expense on heating. Latvia's policy documents, e.g. the National Development Plan of Latvia for 2014-2020, Guidelines for Energy Sector Development 2007-2016, the Energy Sector Long-term Strategy 2030 etc. have set an objective to increase the energy efficiency of buildings (Ministry of Economics, 2013).

The first energy efficiency programme was implemented in Latvia in the period 2009-2013. It was desirable to launch the heat insulation of buildings in Latvia earlier – during the years of fast economic growth – when energy prices reached high levels – or at least when the global financial crisis began, which most affected the construction industry that lacked construction orders. Approximately 1000 multi-apartment house renovation projects were implemented under the European Regional Development Fund's activity "Improvement of Heat Insulation of Multi-apartment Residential Buildings" (Investment and Development Agency…, 2013). On a national scale, it is not a lot, as there are approximately 25000 multi-apartment houses to be heat-insulated (Ministry of Economics, 2013).

The heat insulation of multi-apartment houses provides not only gains but will also cause certain problems in the future. Therefore, the research aim of the paper is to examine the socio-economic problems to be caused by heat-uninsulated multi-apartment houses in Latvia's regions in the future, and the subordinate specific tasks are as follows:

1) to describe the economic aspects of heat supply for heat-insulated and -uninsulated buildings;
2) to identify the problems to be caused by heat-uninsulated multi-apartment houses in the future;
3) to identify the regions the mentioned problems will manifest themselves the most.

The paper used the Central Statistical Bureau of Latvia, the Lursoft company and other information sources and employed the following research methods: analysis, synthesis, deduction, time series analysis, a case study and forecasting. Since this problem has not been researched in Latvia, the paper developed a methodology to calculate implicit discounts received by heat-insulated buildings.

Research results and discussion

1. Economic aspects of heat supply for heat-insulated and uninsulated buildings

Heat-insulated (renovated) buildings consume considerably less thermal energy, on average 35-50 %, in some cases 60 % (Public Utilities Commission, 2015) and even less (the author's estimates based on Jelgavas nekustama ipasuma parvalde LLC data). Consequently, the expense on heating seems to be lower by the mentioned percentage decreases. However, the problem is more complicated, as the price (tariff) of heating consists of various costs, the main of

which are fuel, electricity, maintenance and depreciation of equipment and wages (Fortum Jelgava, 2015); fuel and electricity are variable costs that depend on the consumption of thermal energy, whereas the other mentioned costs are fixed costs. Every building is located at a different distance from the place of thermal energy generation; accordingly, the length of heating networks and their related costs and other costs – electricity and thermal energy losses – (mostly fixed costs) are different. The energy efficiency of every building is also different – the less energy efficient a building is, the more it consumes fuel and electricity (mostly variable costs).

One can consider two extreme options: 1) a building is located close to the thermal energy generation place and it is energy efficient (both part of its fixed costs and its variable costs are low); 2) a building is located far away from the thermal energy generation place and it is energy inefficient (costs are high). The heating enterprise, of course, calculates both fixed and variable costs and sets an average tariff. Accordingly, a building located close to the thermal energy generation place and being energy efficient implicitly cross-subsidises a building located far away from it and being energy inefficient. Nevertheless, the tariff on thermal energy is the same for all consumers, and the mentioned differences are not taken into account. After buildings are heat-insulated, the difference in energy efficiency significantly changes. In the result, the consumption of fuel, electricity etc. by such buildings will decrease (due to the decrease of their variable costs), whereas their fixed costs (maintenance and depreciation of equipment, wages etc.) that are incurred providing heating to heat-insulated buildings do not change.

If thermal energy production cost consisted of only variable costs, such a problem would not exist. But there are fixed costs, the proportion of which is high. The key component of variable costs is fuel, and in case of natural gas heating it accounts for more than 60 % of total cost, while in case of using biomass it is lower (Public Utilities Commission, 2015). So, variable costs comprise about half of total cost. Nevertheless, consumers pay their central heating enterprise for actually consumed thermal energy based on a single tariff. This factor results in: 1) revenue decrease for the heating enterprise, reducing its profit, if it is a private company (it cannot operate without profit and does not wish to work with a declining profit) or losses are suffered if it is a municipal enterprise (which often operates with no profit); this will lead to a situation that the company/enterprise has to raise its tariff or at least not to decrease it in case, for example, the fuel purchase price has fallen; 2) heat-uninsulated buildings will partially cover the fixed costs of heat-insulated buildings.

If, for example, the thermal energy consumption of a building decreases by 50 % after it has been heat-insulated, its total expense on heating also shrinks by 50 % – such a building, of course, consumes 50 % less fuel (and other variable costs) but it pays fixed costs also by 50% less, although these costs actually do not change; it means that the fixed costs of a heat-insulated building (50 %) will be paid by all the remaining heat-uninsulated buildings. The building gets an extra approximately 25 % implicit discount (at a ratio of variable to fixed costs of 50:50). Besides, the lower the proportion of variable costs in total cost for a heating enterprise, the greater discount heat-insulated buildings get.

A number of equations have to be considered and created to evaluate this factor.

A floor area that is centrally heated in a city (urban area) can be expressed as follows:

$$A = A_1 + A_2, m^2 \quad (1)$$

where A_1 – total floor area of heat-uninsulated buildings, m^2;

A_2 – total floor area of heat-insulated buildings, m^2.

The revenue of a heating enterprise:

$$TR = A \times t, EUR \quad (2)$$

where t – tariff (price) on thermal energy, EUR/MWh.

Since there are both heat-uninsulated and -insulated buildings:

$$TR = TR_1 + TR_2 = A_1 \times t + A_2 \times t \times k, EUR \quad (3)$$

where TR_1 – revenue from the supply of thermal energy to heat-uninsulated buildings, EUR;

TR_2 – revenue from the supply of thermal energy to heat-insulated buildings, EUR;

k – coefficient taking into account the thermal energy savings of heat-insulated buildings.

$$k = 1 - e \quad (4)$$

where e – thermal energy savings (50…70% or in terms of decimals it is 0.5…0.7; it is assumed to be, on average, 0.6);

k = 1-(0.5…0.7) = 0.3…0.5. It is assumed on average k = 0.4.

The more buildings are heat-insulated (A_2 increases), the more the revenue R_2 and the total revenue R of the enterprise decrease. The consumption of fuel (variable costs) by the enterprise also decreases but it only partially offsets the decrease in its revenue. For this reason, the enterprise will be forced to raise its tariff, thus, compensating for the loss of revenue from both heat-insulated and heat-uninsulated buildings, which is not fair but diversifying the tariff also causes problems to the enterprise.

Further, it is necessary to express the floor areas of heat-insulated and -uninsulated buildings as shares of the total floor area heated by the enterprise:

$$a_1 = 1 - a_2 \quad (5)$$

where a_1 – share of the floor area of heat-uninsulated buildings;

a_2 – share of the floor area of heat-insulated buildings.

The total profit, TP, of the enterprise is equal to its total revenue, TR, minus its total production cost, TC (Boyes W., Melvin M., 1991), i.e. TP=TR-TC. It is derived from the equation that TR=TP+TC. Since total cost, TC, is subdivided into total variable (TVC) and total fixed cost (TFC), TR=TP+TVC+TFC, EUR.

Since there are both heat-insulated and -uninsulated buildings, the enterprise's total revenue from heat-insulated buildings may be expressed as follows:

$$TR_2 = (TP + k \times (TVC + TFC)) \times a_2, EUR \quad (6)$$

although (if the tariff were reduced for heat-insulated buildings only by the decrease in total variable cost) it should be expressed as follows:

$$TR_2^{'} = (TP + k \times TVC + TFC) \times a_2, EUR \quad (7)$$

The difference

$$\Delta TR = TR_2^{'} - TR_2, EUR \quad (8)$$

$$\begin{aligned} \Delta TR &= (TP + k \times TVC + TFC) \times a_2 - \\ &(TP + k \times (TVC + TFC) \times a_2 = \\ &= TFC \times a_2 - k \times TFC \times a_2 = \\ &= TFC \times (a_2 - k \times a_2), EUR \end{aligned} \quad (9)$$

The difference represents the amount of total revenue of the enterprise that is not paid by heat-insulated buildings – it originates from the total fixed cost incurred by the buildings.

Since the enterprise is going to raise the tariff sooner or later, with the heat insulation of buildings gradually taking place in a city, a (any) new tariff, t_1, may be calculated as follows:

$$t_1 = t \times \left(\frac{\Delta TR}{(TR_2^{'} - \Delta TR + TR_1)} + 1\right), EUR/MWh \quad (10)$$

After the tariff has been raised, a part of the enterprise's revenue will be collected from heat-insulated buildings, while the remaining (second) part will come from heat-uninsulated buildings. Therefore, the second part of revenue is an implicit discount (ID) that is paid by heat-uninsulated buildings to heat-insulated ones, and it can be calculated as the difference minus the revenue the enterprise collects from heat-insulated buildings after the tariff was raised, i.e.:

$$ID = \Delta TR - \Delta TR_2, EUR \quad (11)$$

$$\Delta TR_2 = (t_1 - t) \times A_2 \times k, EUR \quad (12)$$

The same indicator can be calculated by multiplying a percentage increase in the tariff by revenue from heat-insulated buildings before the tariff was raised:

$$\Delta TR_2 = (t_1 - t)/100 \times TR \times a_2 \times k, EUR \quad (13)$$

ID for heat-insulated buildings, expressed as a percentage, can be calculated as follows:

$$ID = e \times \frac{TP + TFC}{TR}, \% \quad (14)$$

Let us examine an example with Fortum Jelgava, a company that supplies Jelgava city with thermal energy, and the process of heat insulation of buildings in this city. The company's turnover ranged from approximately EUR 18 to 24 mln (Lursoft, 2015) in the period 2012-2014 and its profit was about EUR 2 mln; it was assumed TR= EUR 20 mln. Since the company generates energy from woodchips, its TFC~TVC; it is assumed TFC=TVC. In this case TFC=(TP-TP)/2. According to calculations, TFC is approximately EUR 9 mln.

If 10% of buildings are heat-insulated in Jelgava, i.e. a_2 = 0.1, Fortum Jelgava, at the same tariff, will not gain ΔTR = EUR 0.66 mln (according to Equation 9). If 50 % of buildings are heat-insulated, then the company's revenue will decline by EUR 3.3 mln; if 90 %

– by EUR 5.94 mln (the author's estimates). As one can see, if half of all buildings are heat-insulated in Jelgava, Fortum Jelgava will operate with losses.

Further, let us assume that the company raises the tariff from time to time in order to have the same profit. If 10 % of buildings are heat-insulated, in order to regain EUR 0.66 mln, the company has to raise its tariff by about 3.5 %; at 50 %, to regain EUR 3.3 mln, the tariff has to be raised by about 23.6 %, and at 90 %, to get back EUR 5.94 mln, its tariff should be raised by approximately 64.6 % (the author's estimates).

Further, one can calculate the next most important indicator – the size of implicit discount paid by heat-uninsulated buildings to those being heat-insulated. If 10% of buildings are heat-insulated, according to Equation 11, it totals EUR 0.63 mln, at 50% – EUR 2.36 mln and at 90% – EUR 1.29 mln. The max value of EUR 2.48 is reached at 61% (the author's estimates).

The more buildings are heat-insulated in the city, the more the heating company has to raise its tariff and the relatively more heat-insulated buildings compensate for the decrease in the company's revenue. If 10 % of buildings are heat-insulated, after the tariff is raised, heat-uninsulated buildings will pay an implicit discount of EUR 0.63 mln or cover 95.7 % of the estimated loss of EUR 0.66 mln, while heat-insulated buildings (since they are small in number, only 10 %) will offset only 4.3 % of the revenue decrease for the company. At 50 %, heat-uninsulated buildings will pay an implicit discount of EUR 2.36 mln or cover 71.4 % (of the loss of EUR 3.3 mln), while heat-insulated buildings will compensate 28.6 % for the loss. At 90 %, it will be a discount of EUR 1.29 mln or 21.7 % (of the loss of EUR 5.94 mln), while heat-insulated buildings will compensate 78.3 % (the author's estimates).

The implicit discount to be paid by heat-uninsulated buildings if measured per m^2 of floor area, with the proportion of heat-insulated buildings increasing from 10 to 50 and 90 % and the proportion of heat-uninsulated buildings decreasing from 90 to 50 and 10 % (1.8 and 9 times, respectively), will increase from EUR 0.63 to 2.36 and 1.29 mln (3.7 and 2.0 times) (based on Fortum Jelgava data for 2012-2014). In total, it is 6.7 and 18 times, respectively, more, which is a very high relative increase (the author's estimates). In absolute figures, in this case, the discount is also large. Assuming that 90% of buildings are heat-insulated in Jelgava (they are mainly residential buildings), the remaining 10% of buildings will have to cross-subsidise the heat-insulated buildings at EUR 1.29 mln. Given the fact that expenses of the 10% of heat-uninsulated buildings on heating, compared with the initial situation when not a single building was heat-insulated in Jelgava, amount to about 10% of the total revenue of Fortum Jelgava or EUR 2 mln, an implicit cross-subsidy they would additionally pay to heat-uninsulated buildings is about 65% of their initial expenses or EUR 1.29 mln. It is a considerable additional financial burden for the 10% of heat-uninsulated buildings, compared with heat-insulated buildings. The author believes there is no reason to consider a case where all multi-apartment houses (100%) that need to be heat-insulated will be heat-insulated. The reason is that, firstly, banks will be reluctant to finance heat insulation activities in suburbs and other places having no prospects because of the declining population. Such a scenario would not come true only in one case – if the population does not significantly decrease in the future, which is unlikely. Secondly, giving guarantees for the heat insulation of multi-apartment houses by the government in all cases under the circumstances when the population is declining and will be declining would mean the waste of funds.

2. Socio-economic problems caused by heat-uninsulated houses in the future

The heat insulation of buildings, including multi-apartment houses that comprise the largest share of floor area to be heated in any urban area is an efficient activity allowing reducing fuel cost and other variable costs. It is particularly important if natural gas is used, as the price of it might be high due to oil price hikes and this resource is imported from Russia as an unpredictable country. It also reduces pollution in the environment. Yet, at the same time, it worsens the financial situation of heat-uninsulated houses – they will be forced to implicitly cross-subsidise heat-insulated houses. The higher the proportion of multi-apartment houses is heat-insulated, the larger implicit cross-subsidy is paid by heat-uninsulated houses to heat-insulated ones. Besides, it has to be taken into account that the population in the country as a whole and its regions and cities, with a few exceptions, is declining and this process is likely to be continuing. The fastest population decrease takes place in rural areas, as residents move to cities, while part of them goes to developed EU Member States where the income level is much higher than in Latvia. In cities where multi-

apartment houses are mostly heat-insulated the population is also declining (see the next subchapter). Even though the population declines fast, residential floor area per household or resident, at the same time, increases. According to data, in 2005 the average number of rooms per household was 2.4, and that per household member was 0.9; in 2014, the indicators were 2.9 and 1.2, respectively. It means that with increase in income in Latvia, households and their members use a greater residential floor area. The average apartment size, too, increased in Latvia from 60.1 m^2 in 2007 to 65.8 m^2 in 2014 (CSB, 2015). Yet, such a trend, in the opinion of the author, will only partially solve the problems of population decline and unoccupied apartments.

This situation creates several problems:

1) because of the declining population, there will be unoccupied apartments in multi-apartment houses in the future
2) the segment of the market of multi-apartment houses (mostly the so called serial houses built in the Soviet period) will diversify – there will be heat-insulated houses that look better, their maintenance costs are lower and their market price is higher – and there will be heat-uninsulated houses with completely opposite characteristics;
3) prosperous residents will move to heat-insulated houses. Such houses will be fully occupied, of course, at the expense of heat-uninsulated houses in which poorer individuals are going to reside;
4) a different situation will be observed between the centre of a city and its suburbs – residents usually prefer living in the centre of a city. Consequently, the most problematic situation with heat-uninsulated houses will emerge in suburbs, particularly with those being very energy inefficient, as the energy efficiency of houses built in the Soviet period is quite diverse – it differs even two times.

In heat-uninsulated houses, especially in suburbs, the proportion of apartment owners who are not able to timely pay their home bills will increase. There will be apartments whose owners cannot be found (e.g. living abroad). The heating enterprise might not supply heating to such apartments. It is a partial solution, as thermal energy moves from apartments being heated, and in the result heating cost will increase for such apartments.

As a result, the amount of debts on heating, home management and other services will increase. Since the largest home expense involves heating, the heating enterprise, especially if it is not owned by the local government, might decide not to supply heating to heavily indebted houses, thus creating big problems not only to indebted apartment owners but also to those having no debts. The market price of apartments in such houses will significantly fall, and if their owners are not able to establish a local heating system for their houses, their market price will approach a zero value. It will be difficult for the owners of such houses to sell their apartments. If the apartment debts are larger than the apartment market price, it will not be possible to sell such apartments. Inability to solve this problem will result in larger expenditures of local governments on assistance to their problematic residents.

The problem with partially unoccupied houses in suburbs and other small urban areas in Latvia will not arise to the same extent, as there are differences across its regions and cities.

3. Regions where the socio-economic problems will manifest themselves the most in relation to heat-uninsulated multi-apartment houses

The key factor determining whether multi-apartment houses are fully or partially occupied, i.e. if they are not endangered in a long-term through their remaining lifetime is the population and its change. Yet, the population does not change (decrease) equally in all the regions and cities of Latvia. It requires examining relative population changes in the regions and cities over a long period (Table 1). This trend is unlikely to change in the future too even in a long-term, e.g. over the next 10 or 20 years, which will be crucial for the heat insulation of multi-apartment houses, i.e. if houses in suburbs and small residential places are not heat-insulated during about the next 10 years, it will not be prudent to heat-insulate them and it will be difficult or even impossible to get a loan for this purpose. The key reason is the lack of residents living in such houses, and banks are aware of it right now.

As regards houses in city centres, the period of their heat insulation will be defined, in the author's opinion, by the payback time and their lifetime. The lifetime of serial houses whose average age in Latvia is about 40 years, according to experts, could last for other 40 years in case they are properly maintained. The payback time of investment in the heat insulation of houses under the second heat insulation programme (its support intensity may reach 35 % of total cost) will be about 10-15 years (the author's estimate). The

support intensity for next such programmes is not known, which, given the great role of heat insulation of houses, will be likely implemented in Latvia. Perhaps this intensity will be reduced and financial resources will also get more expensive; consequently, the payback time can reach even 20 years (the author's estimate). So, if after about 20 years houses are not heat-insulated, from the financial perspective, there is no reason to do it, as investments will not pay back during their remaining lifetime.

As shown in Table 1, the population in Latvia decreased quite steadily, about 5-6 % in every five years. The only region where it increased, except for the last period, was Pieriga. Its specific is that mostly wealthy residents, which build private houses and do not live in multi-apartment houses needing to be heat-insulated, settle there. The next relatively favourable region is Riga where the population decrease slowed down at least in the last period. In contrast, the situation in the other regions is unfavourable, particularly in Latgale. A slightly better situation may be observed in Vidzeme, followed by Kurzeme and Zemgale. Even though the decrease in the period of 15 years was quite similar both in Riga and Zemgale, i.e. 16-17 %, the decline in Riga region (city) slowed down, whereas in Zemgale it accelerated.

Table 1

Changes in the population in Latvia's regions and cities, %

	2005/2000	2010/2005	2015/2010	2015/2000
LATVIA	-5.54	-5.74	-6.34	-16.61
Riga region (Riga)	-7.06	-5.45	-4.82	-16.36
Pieriga region	1.78	2.59	-1.69	2.66
Vidzeme region	-6.42	-8.95	-8.79	-22.28
Kurzeme region	-6.34	-7.46	-8.80	-20.95
Zemgale region	-4.69	-6.41	-7.43	-17.43
Latgale region	-8.72	-10.78	-10.35	-26.99
Daugavpils	-7.19	-10.54	-9.93	-25.21
Jelgava	-0.09	-4.34	-6.14	-10.30
Jekabpils	-4.33	-5.50	-8.77	-17.53
Jurmala	-4.00	-3.18	-4.06	-10.83
Liepaja	-6.56	-5.79	-9.87	-20.66
Rezekne	-7.54	-8.23	-12.37	-25.65
Valmiera	-2.54	-4.44	-9.49	-15.71
Ventspils	-3.16	-6.30	-9.04	-17.47

Source: author's calculation based on CSB data

Among cities, the fastest decrease was observed in Rezekne, and the decrease even accelerated. The next fastest population decrease was reported in Daugavpils where it slightly slowed down in the last 5 years. The population decreased slower in Jelgava and Jurmala, even though the decrease accelerated in Jelgava, whereas in Jurmala it was quite steady.

On the whole, there will be not a single city and almost no region where the problem of insufficient occupation of heat-uninsulated multi-apartment houses will not arise in the future.

Conclusions and proposals

1) Heating cost for heat-insulated buildings decrease by at least 50%, and such buildings get an implicit discount of about 25 % that is paid by heat-uninsulated buildings.

2) The higher the proportion of heat-insulated buildings, the greater financial burden (both absolutely (up to a certain proportion) and relatively) is additionally put on heat-uninsulated buildings through an implicit discount.

3) The population will prefer living in heat-insulated houses, while heat-uninsulated multi-apartment houses (first of all, in suburbs) will be partially unoccupied in the future because of the population decrease, which negatively affects the maintenance and even existence of such houses, causing additional problems, expenditures and tax losses for local governments.

4) The problem of heat-uninsulated multi-apartment houses will be the most specific to Latgale region and its cities, whereas Pieriga region will have the least problem.

5) Institutions involved in the heat insulation of multi-apartment houses, in cooperation with local authorities, are advised to foster the heat insulation of those houses whose relative costs (per m^2 of floor area) are the lowest (houses with a large number of apartments and those being very energy inefficient).

6) Local authorities are advised to timely design an action plan for heat-uninsulated multi-apartment houses and their dwellers, as they will not be properly maintained and will start turning into slum houses because of the lack of residents.

7) It would be possible to diversify the heating tariff for heat-insulated and -uninsulated multi-apartment houses, but it is not advisable, as it will hinder the process of heat insulation of houses in the country.

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SPATIAL ANALYSIS OF AGRICULTURAL LAND PRICES BY REGIONS IN POLAND

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Abstract. The modern spatial structure of agriculture results from numerous important socio-economic changes which occurred throughout history. Therefore, it is difficult to determine precisely what are the causes of an increase or decrease in prices. The aim of this study is to analyse the spatial relationship among prices of agricultural land on the voivodeship level in years 2004-2014. The paper also presents the dynamics of change of average land price in this period.

Before the accession to the European Union, the price of farmland in Poland was moderately increasing. Poland's accession to the European Union in 2004 caused a significant increase in the price of farmland in Poland. It increased fivefold over the analysed period. In the fourth quarter of 2004 the average price of farmland was PLN 6,810 per hectare, while in the first quarter of 2015 it was PLN 36,203. The average prices of farmland were also significantly diversified regionally. Analysing the local spatial relationships (with the local Moran's statistic), it can be noticed that from 2009 the farmland prices in Kujawsko-Pomorskie and Wielkopolskie voivodeships were significantly higher than in neighbouring regions. In years 2005-2008 and 2011-2014 the only voivodeship characterised by statistically significant local Moran's statistic value was Podkarpackie. In its surrounding regions (Malopolskie, Swietokrzyskie and Lubelskie) farmland prices were similar. Analysing the farmland prices, it can be noticed that in Podkarpackie voivodeship they were the lowest in Poland.

Key words: agricultural land price, spatial correlation, Moran's statistic.

JEL code: Q14, C19

Introduction

Agricultural land is often considered by economists [*] (Physiocracy was an economic theory which appreciated the importance of agriculture and farmland for economic development (Gudowski, 2007, p. 146).) to be an important production resource for agricultural production. In this context, land is one of the three primary factors of production (apart from labour and capital goods). It is also the reason for numerous changes in agriculture and agricultural processes. The importance of farmland has been changing significantly throughout history, depending on the importance of agriculture for national economy. When a substantial proportion of people were employed in agriculture, agricultural production became a dominant part of domestic product. Then, the land was the most important factor of production. Being the land owner not only determined social status but it also gave political rights (Wilkin, 2014).

Farmland market condition depends on a range of economic, political and demographic factors. Supply and demand for farmland are determined by the pace of changes in the farmland market (Masniak, 2007). The price of farmland should be influenced by the location, economic and political factors (Van Dijk, 2003).

Before the accession to the European Union, the prices of farmland in Poland were moderately increasing. Typical market participants underestimated effects of the accession. The majority of Polish farmers were sceptical about the European Union. They were afraid of economic effects of the accession, particularly the bankruptcy of underfinanced farms or massive land repurchase by European farmers.

Poland's accession to the European Union in 2004 caused a significant rise in farmland prices in Poland. New laws and regulations and an increase in transfers for agriculture led to the changes of farmland prices and higher demand for farmland (Forys, Putek-Szelag, 2008). The price of farmland increased fivefold over the analysed period. In the fourth quarter of 2004 the average farmland price was PLN 6,810 per hectare as compared to PLN 36,203 in the first quarter of 2015. Therefore, having realised that the price of 1 hectare was significantly lower than in the "old" European Union countries, potential investors were right to predict fast profits. The dynamics of prices is presented in Figure 1 and Table 1. As one can notice, the biggest change in farmland prices, period by period, was recorded in 2007, 2012 and 2014. The lowest increase in farmland prices, whereas, was recorded in 2010. A huge rise in the prices can be explained by the interest of non-

[*] Physiocracy was an economic theory which appreciated the importance of agriculture and farmland for economic development (Gudowski, 2007, p. 146).

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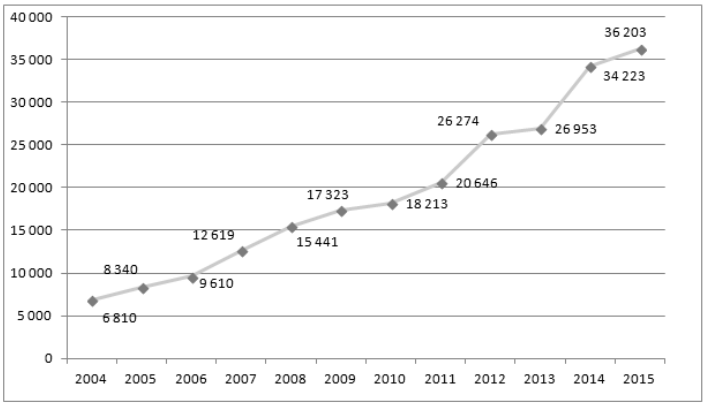
farmers in land investment. Low deposit interest rates make potential investors more interested in looking for different investments. People who want to buy farmland in order to re-sell or lease it (due to changes in regulations on selling agriculture land to foreigners, May 2016) at profiteering prices may also be interested in land purchase.

Table 1

Dynamics in farmland prices in the period 2004-2015

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fixed Base Index (Previous Year=100%)	122%	115%	131%	122%	112%	105%	113%	127%	103%	127%	106%
Fixed Base Index (Year 2004=100%)	122%	141%	185%	227%	254%	267%	303%	386%	396%	503%	532%

Source: author's calculations



Source: author's calculations based on the Central Statistical Office data

Fig. 1. **Average farmland prices (PLN/hectare) based on data provided by the Central Statistical Office of Poland (Polish: GUS) in the period 2004-2015**

The average farmland prices are significantly diversified by regions. Figure 2 shows average farmland prices in the first quarter of 2015. The highest price was recorded in Kujawsko-Pomorskie region, as opposed to the lowest price in Podkarpackie. The analysis of farmland prices shows that the lowest prices tend to be located in the South-East of Poland (Swietokrzyskie, Podkarpackie and Lubelskie) and in the North-West of Poland (Zachodnio-Pomorskie and Lubuskie).

The evaluation of farmland prices in specific regions does not seem to be evenly distributed. The data presented in Table 2 show that the highest (relatively) rise in prices was recorded in Lubuskie, Warminsko-Mazurskie, Opolskie and Dolnoslaskie regions. The lowest increase in farmland prices, whereas, was evidenced for Slaskie and Malopolskie regions. Based on the above-mentioned findings, it can be noticed that the highest rate was recorded in regions with the highest average farm size. In other words, farmland concentration may affect the price of land. The regions with relatively lowest rise in average farmland prices are characterised by fragmentation of farmlands*. However, this correlation does not seem to be strong. The correlation coefficient is in this case 0.71. To conclude, a clear tendency to regional diversification of intensity and changes in the market prices of farmland is visible.

Figure 3 illustrates farmland prices in 2004-2014. It can be noticed that the year 2004 is characterised by low diversification of farmland prices by regions. In the subsequent years increasing diversification of farmland prices is visible. Over the analysed period, the lowest prices were reported for Lubuskie (2000, 2007 and 2004), Podkarpackie (2005-2006, 2011-2014) and Swietokrzyskie (2009-2010) regions. The highest (average) price was reported in Slaskie (2004), Wielkopolskie (2005-2006, 2009-2013) and Kujawsko-Pomorskie (2007-2008 and 2014).

* Modern spatial structure of agriculture results from numerous important socio-economic changes which occurred throughout history, including the Partitions of Poland or the Centrally Planned Economy (Grabowski T., 2012).

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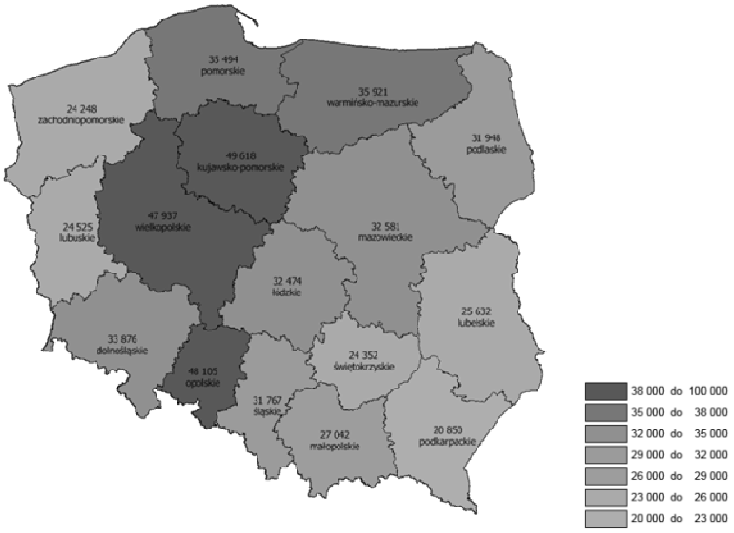

Source: Central Statistical Office of Poland

Fig. 2. **Average farmland prices (PLN/hectare) in the first quarter of 2015**

Table 2

Changes in farmland prices in 2004 - 2014 by regions

Region	Average farmland size in 2014	Rise in farmland prices over 10 years
Dolnoslaskie	16.22	619%
Kujawsko-pomorskie	15.30	578%
Lubelskie	7.54	469%
Lubuskie	20.92	634%
Lodzkie	7.61	463%
Malopolskie	3.95	347%
Mazowieckie	8.55	414%
Opolskie	18.22	655%
Podkarpackie	4.63	397%
Podlaskie	12.24	459%
Pomorskie	19.00	469%
Slaskie	7.37	356%
Swietokrzyskie	5.57	412%
Warminsko-mazurskie	22.92	605%
Wielkopolskie	13.51	503%
Zachodniopomorskie	30.29	512%

Source: author's calculations based on data provided by the Agency for Restructuring and Modernisation of Agriculture and the Central Statistical Office of Poland

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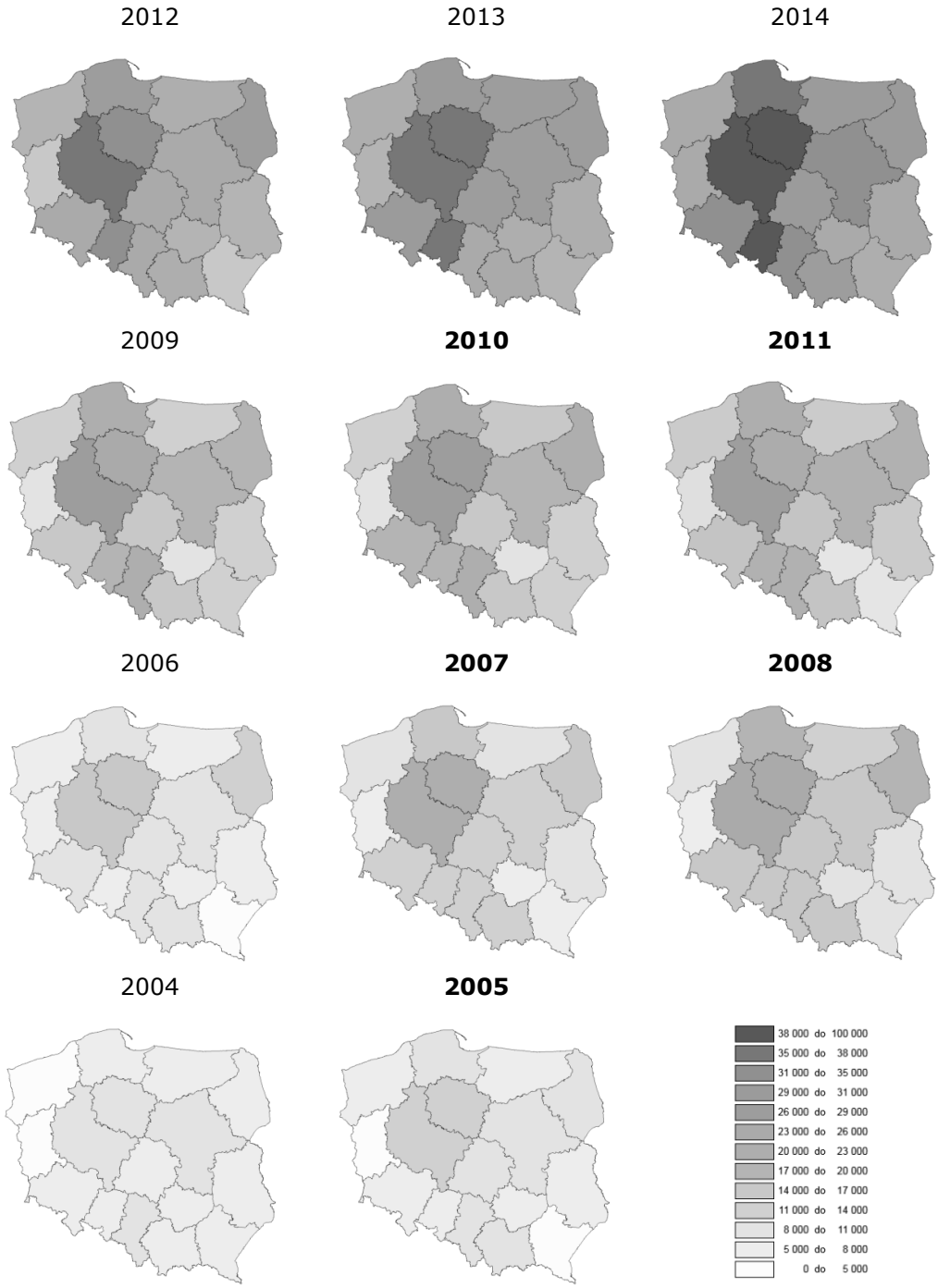

Source: author's calculations based on data provided by the Central Statistical Office of Poland

Fig. 3. **Average farmland price (PLN/hectare)**

Goal and research methods

The aim of this study is to analyse the spatial interrelationships between regions. For this purpose, the nearest neighbourhood method was adopted as the criterion. The structure of the relationship based on the common boundary criterion is presented in Figure 4. Based on this type of relationship between regions, weighted matrix W was calculated for spatial autocorrelation. The phenomenon of spatial autocorrelation is based on the values attributed to spatial objects. Spatial autocorrelation is a measure that looks at the relationship between close spatial units and describes the degree to which one object is similar to other nearby objects. Positive spatial autocorrelation occurs when similar values cluster together in a map. Research on spatial autocorrelation will be carried out using the Moran's and Gear's

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statistics. These measures are discussed briefly by Schabenberger and Gotway (2005).

Moran's indicator can be interpreted as correlation coefficient. The value of Moran's statistic generally falls into the interval [-1, 1] and can be classified as:

I = 0 - no autocorrelation;

I <0 - negative autocorrelation (objects are different);

I > 0 - positive autocorrelation (objects are similar to each other).

The Global Moran's statistic is described by the formula (1):

$$I = \frac{n}{W} \frac{^2\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^{n}(x_i - \bar{x})^2} \quad (1)$$

w_{ij} – weight of the connections between units i and j (first order matrix standardised according to rows);

xi xj – value of the variables in spatial units i and j (first order matrix standardised according to rows);

$\bar{x}$ - arithmetic mean value of the analysed variable for all spatial units.

Fig. 4. **Neighbourhood associations in the weight matrix according to the common boundary criterion**

To calculate spatial autocorrelation, the Moran scatter plot appears to be a useful tool. The vertical Y axis is based on the weighted average or spatial lag (in this particular case: average farmland price) of the corresponding observation on the horizontal X axis. The Moran scatter plot provides a visual representation of spatial associations; in this case it is the correlation between average farmland price and farmland location.

The global Moran's statistic describes only a certain pattern observed in the whole area. Other measures can be used to investigate the changes in the individual spatial units. This indicator is determined separately for each region. In other words, based on local statistics, it can be judged whether the tested area is adjacent to the areas of low or high values. Such analysis allows us to detect clusters of areas of high (or low) value in terms of the tested variable. It also identifies unusual areas (values of which significantly differ from their neighbours) by means of local Moran's statistic*. This characteristic can show how the value of one region is formed in comparison with neighbouring regions, as compared to a random distribution of values in the tested area. The measure is described by the formula:

$$I_i = \frac{(x_i - \bar{x})^2 \sum_{i=1}^{n} w_{ij}(x_j - \bar{x})}{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}} \quad (2)$$

Description as previously.

Research results

Global Moran's statistic was calculated in order to determine the impact of neighbouring regions on the farmland prices in a specific region in 2004-2014. As presented in Figure 5, the Moran scatter plot allows the division of objects on spatial regimes: High-High, Low-Low, Low-High, High-Low. Local Moran's statistic values are presented in Figure 6. The following clusters of regions can be found: regions characterised by low (statistically significant) local Moran's statistic value and surrounded by regions with a low value of local Moran's statistic (Low-Low; areas filled with grid pattern); as well as regions characterised by high (statistically significant) local Moran's statistic value and surrounded by regions with a high value of local Moran's statistic (High-High; areas filled with diagonal lines). Random farmland prices in specific regions are represented by values near 0 (in white).

In 2004, spatial correlations between the prices of farmland in specific regions did not occur. There were no statistically significant values of local Moran's statistic. In 2005, there were ussually two regions Podkarpackie and Kujawsko-Pomorskie, characterised by statistically significant Moran's statistic value. Podkarpackie region is surrounded by the regions with similar farmland prices (Malopolskie, Swietokrzyskie

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* For more details see: Anselin, (1995).

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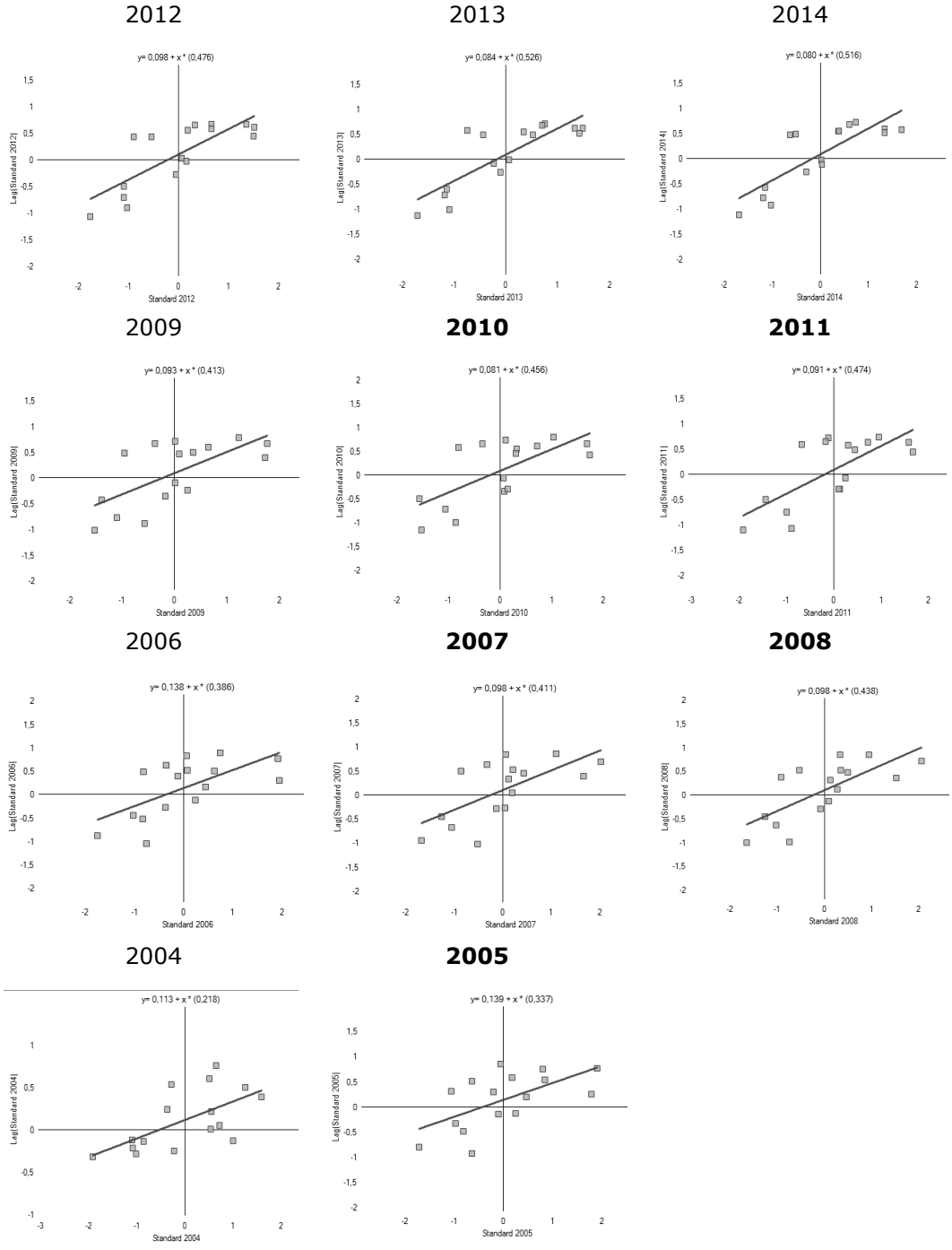
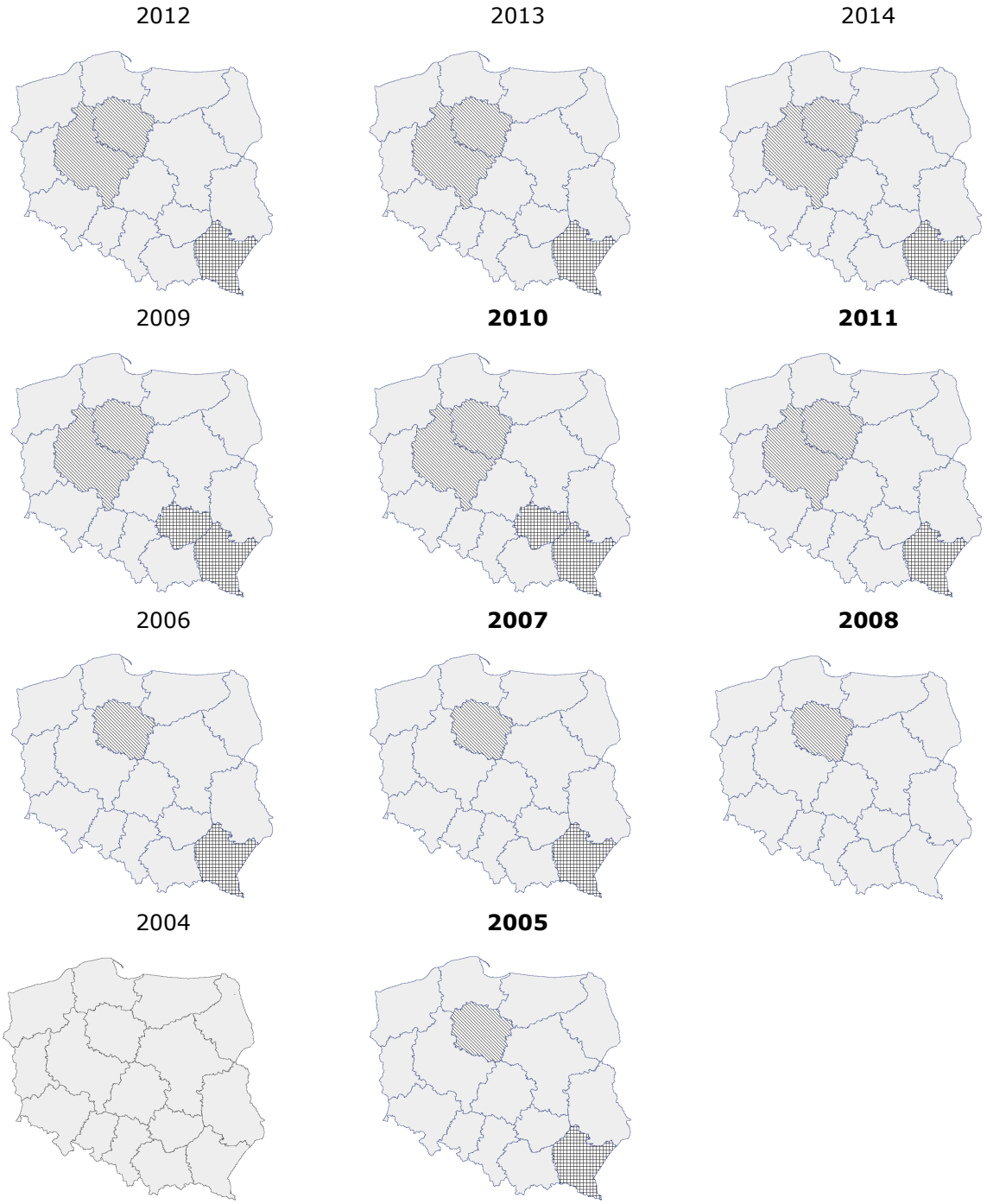
and Lubelskie). Farmland prices in Kujawsko-Pomorskie were significantly higher than in neighbouring regions. The same situation was reported to have happened in 2005-2007. In 2008, the only significant spatial correlation was recorded again in Kujawsko-Pomorskie region. Statistically significant spatial correlations did not occur in other regions. In 2009-2014, a cluster of two regions, Wielkopolskie and Kujawsko-Pomorskie with similar (high) values appeared on the map. During this period of time Podkarpackie (and Swietokrzyskie in 2009-2010) are characterised by low value of local Moran's statistic.



Source : author's calculations

Fig. 5. **Moran scatter plots for land prices in the individual voivodeship**



Source: author's calculations

Fig. 6. **Location of statistically significant Moran's values for farmland prices by regions**

Conclusions

Farmland market in Poland is characterised by a significant diversity, in terms of space and time. In 2004-2013, the lowest relative rise in prices (three times) was evidenced in Malopolskie region, whereas the highest (6.5 times) in Opolskie region. The analysis of data presented in Figure 3 reveals that farmland prices have a clear general tendency to rise. The aim of the study was to determine spatial correlation between the prices of farmland in specific regions in Poland in 2004-2014. By means of spatial statistics, statistically significant spatial correlations were proved. Global Moran's statistic value calculated for each year was not statistically significant. These findings are proved by the analysis of the Moran scatter plot data (Figure 5). For each year, the distribution of spots (regions) seems to be quite regular, which means that spatial autocorrelation does not appear. Additionally, the

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analysis of data in scatter plots proves low linear regression (2004-2014). The analysis of local correlations shows that in two regions (Wielkopolskie and Kujawsko-Pomorskie) the prices of farmland are definitely higher than the prices in neighbouring regions. This situation did not occur until 2009. Before that time only Kujawsko-Pomorskie (2005-2008) was characterised by high negative Moran's spatial statistic. Podkarpackie is the only region close to which neighbouring areas are characterised by similar farmland prices. It can be noticed that this region offers the lowest farmland prices in the country (Figure 3). The results are consistent with the research of other authors (e.g. Pietrzykowski, 2011).

Although the trend towards an increase in farmland prices is clear, it should be noticed that average farmland prices per hectare are not influenced by the prices in neighbouring regions. General economic situation or changes in laws and regulations might be the reasons behind the increase in prices.

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ASSESSMENT OF REGIONAL ECONOMIC CONVERGENCE FACTORS INFLUENCE IN EU COUNTRIES

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Abstract. Recently countries set the goal to achieve both rapid economic growth at current period and long-term growth resulting in high national economic level. This goal cannot be achieved if vast economic disparities exist among regions determining unequal conditions to the local population, and if economic development potential of some regions is not applied. A period of economic growth revealed the existing measures as inefficient for reduction of regional economic disparities in the countries due to potentially adverse effect of economic boost on convergence. During economic recession, lacking the financial resources, the objective to reduce regional economic disparities becomes too difficult to implement both in the EU advanced countries and developing ones. The listed reasons determine the relevance of research area and require reassessment of regional economic disparities in the EU countries and underlying causes thereof, considering different national economic level of the EU members and their distinct economic growth, integration to common free market zone as well as different market economy experience. The empirical research allowed identifying the factors, which directly positively (national economic development level, economic integration level) and negatively (economic growth, economic system transformation, rate of economic integration) effect regional convergence.

Key words: economic growth, convergence, economic integration, national economy development level, economic system transformation

JEL code: R11, F15, O11, P20, R13

1. Introduction

Attention to the demand for harmonized economic growth by decreasing regional economic disparities was paid in the sixth decade of previous century, at the commencement of European economic integration. The above served as a basis for initiation of programmes intended to decrease disparities among regions. While developing such programmes, the assessment of regional economic disparities and identification of causes has become especially relevant, and regional economic convergence – main approach of regional policy with its key goal to promote harmonized and balanced economic growth, its rapid convergence and social cohesion. On the basis of programs under implementation during the last decade over EUR 70 billion were allocated from the EU funds to promote regional economic convergence, thus, the analysis of regional convergence in the EU countries is essential due to both economic and financial reasons. Regional policy can be considered successful if regional disparities decrease; however, any research on convergence/divergence issue does not provide unambiguous conclusions.

The aforementioned circumstances induced the regional economic convergence in the EU countries to turn into the subject of relevant and controversial theoretical discussions as well as empirical analysis, and attracted attention of researchers of various fields. International conferences arranged, respective reports of worldwide organizations show how globally relevant are the regional convergence problems.

At the beginning of transition to market economy in Eastern Europe countries in 1989 – 1991, a rise in production efficiency was expected to be a basis for swift economic growth enabling to catch up with the developed Western Europe countries. However, economic development factors were not territorially homogenous and the market itself was not a warranty for balanced regional development of a country. As countries have got more and more integrated, free competition and unrestricted production factor mobility amplified territorial imbalance of market economy in the EU countries due to intense trade and financial resources reallocation. Such processes are running despite on increased scopes of the EU structural support and regional policy in the countries.

The listed reasons determine the relevance of research area and require reassessment of regional economic disparities in the EU countries and underlying causes thereof, considering different national economic level of the EU members and their distinct economic growth, integration to common free market zone as well as different market economy experience. **The aim of the research** – on the bases of analysed scientific studies and created model to evaluate regional

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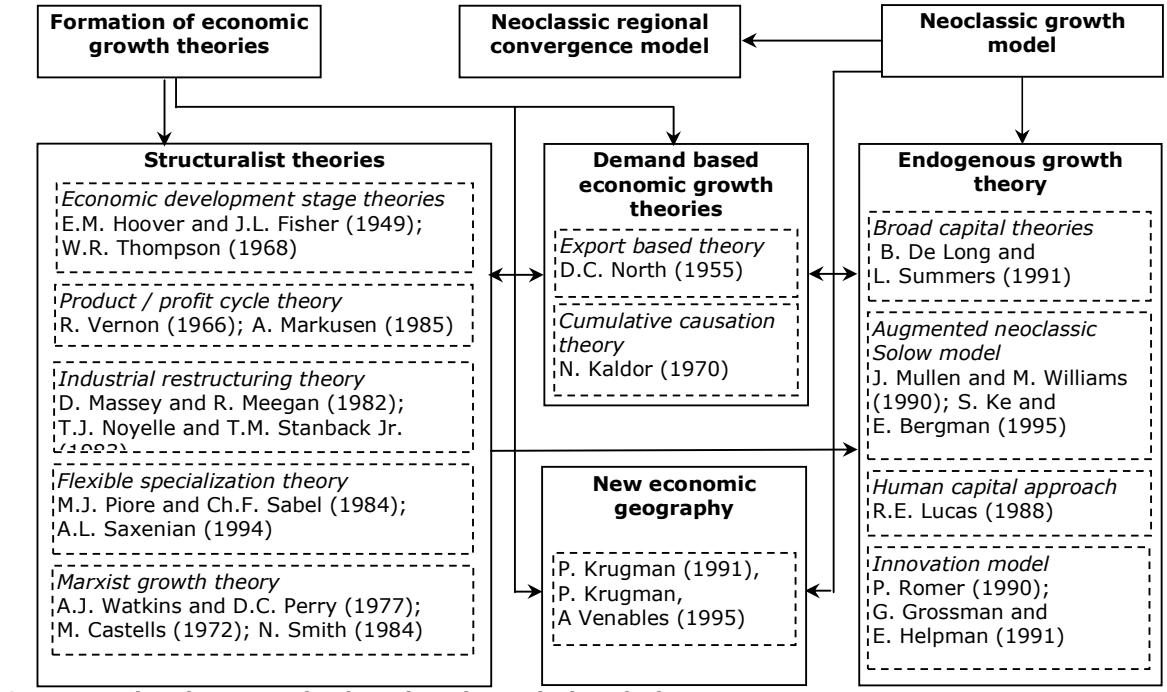
economic convergence factors. **Tasks:** identify factors influencing regional economic convergence; develop model to assess regional economic convergence factors; empirically evaluate regional economic convergence factors in the EU countries at NUTS3 level.

2. Theoretical analysis of regional economic convergence factors

Economic theories provide different attitude towards regional convergence stimulating and limiting factors. There is no common consent in the empirical regional convergence researches what factors should be included into the impact assessment model, since this depends on: (1) subjective research purpose; (2) theory concept application in the research and (3) relevant data and data availability.

Upon systematic analysis of theory research it was decided to assess regional convergence in terms of national development level and economic changes. Since the trend of factor impact on regional convergence indicated by separate theories differs, the attitude of neoclassic, cumulative causation, industrial restructuring, new economic geography and Marxist theories was observed when formulating the hypotheses of the research. The relations between theories which directly and indirectly explain regional disparities and their convergence / divergence are displayed in Figure 1.



Source: authors' construction based on theoretical analysis

Fig. 1. **Development and interrelationships of theories explaining regional economic convergence/divergence factors and their founders**

The theories analysing regional economic convergence in a country have been developing in parallel with the theories of economic growth. Due to this reason, the neoclassic model of economic without significant changes was adapted for the analysis of the differences among regional economies. Regional economic convergence was based on this model, i.e. the differences of economies existing among a country's regions were considered as a short-term imbalance, which is corrected by free market mechanism through the decreasing efficiency of capital investments, the mobility of resources, and other ways of influence. Despite this, in subsequent models formulated on the basis of neoclassical theory (e. g. Siebert, 1970; Richardson, 1973), the technological level and insufficient dissemination of technologies among the regions creating innovations and following them but not the supply of resources, were identified as the key factors determining the differences of regional economies in a country.

Contrary to the neoclassic theory, regional economies growth differences are explained by the theoretical conceptions of demand approach that were actively developed in the 1980s. The model of economic growth by D.C. North (1955) based on export is the simplest version of this group of theories.

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According to this model, the usage of local resources provides the initial impetus to the regional economic growth and later, their export embodied in goods. While export and its diversification as well as the mobility of resources are increasing, regional economic convergence is promoted in a country. By means of this model, it was not explained what creates the demand for production produced in the regions and what conditions determine the specialization. More complex model of this group is the model of cumulative causation developed by N. Kaldor (1970). In this model, the demand remains the primary factor determining the growth of economy, however, another factor – the growth of productivity occurs as well, which is determined by the growth of production volume and which determines this growth by feedback process. This concept is based on the influence of increasing return to scale on regional economic divergence in a country, which was highlighted in former theories of the economic growth. The model of N. Kaldor (1970) can be considered as precursor of the endogenous economic growth model, as it applies the effect of learning by doing, and the factors of economic growth are considered to be export specialization and economy of scales.

The endogenous economic growth theory is based on the idea proposed by P. Romer (1986) that the factors of production are not emphasized in decreasing efficiency. Under a constant or increasing productivity, the capital accumulation will cause the constant or increasing rates of growth. On the basis of this theory, regional economic growth and dynamics of their differences in a country are related to the characteristics of human capital (innovative activity, education, and skills). Moreover, there are other factors, which determine economic growth, e.g. public capital, which, while interacting with private capital, increases the productivity of the latter. In this way, the initial differences of the factors influencing the economic growth in the regions determine the fact that the rates of their growth will be different and the differences among a country's regional economies will not decrease.

The theoretical direction of new economic geography developed by P. Krugman (1991), P. Krugman and A. Venables (1995) at the beginning of the 10th decade analysed the factors determining centralization and decentralization of economic activity and gained attention in explaining the convergence of regional economies. In this theory, employing the ideas of agglomeration economies and cumulative causation, it is explained that transportation costs, the advantages presented by agglomeration – the size of local market, under low level of country's economy integration, determines the concentration of economic activity in some areas as well as regional economic divergence. The decrease of transportation costs and the elimination of trade barriers can promote the decentralization of economic activity and regional economic convergence in a country.

The group of structuralistic theories of economic growth was developed alongside with generalized neoclassic (exogenous and endogenous), new geographic theories. It explains the economic growth not as the movement determined by various factors towards to or backwards from equilibrium but as evolution transferring in various stages. Considering regional economic convergence in a country, it should be noted that structuralistic theories have interrelationships with demand approach economy growth theories, as growth is perceived as the process starting in the region itself, encouraged by the increase of demand. The group of structuralistic theories involves a lot of different approaches, on the basis of which, regional economic convergence in a country can be justified or denied. In the economic development theories (Hoover, Fisher, 1949; Thompson, 1968), it is explained that the assumptions to regional economic divergence in a country are created when the regions transfer from one development stage to another in different time. Product/profit cycle theories (Vernon, 1966; Markusen, 1985) propose that regional economic convergence is expected in the countries that have high level of national economic development, however, the creation and development of the products are more typical to country's industrialized regions and this means that in a new cycle of economic growth the assumptions for regional economic divergence will occur again. According to the industrial restructuring theory (Massey, Meegan, 1982; Noyelle, Stanback, 1983), it is possible to state that the integration of countries' economies encouraged by globalization, and, due to this, the increased flows of direct foreign investments destroy the traditional structure of economy, determine the de-investment in majority of industrial branches that were considered to be traditional and encourage regional economic divergence in a country. According to the flexible specialization theory (Piore, Sabel, 1984; Saxenian, 1994), the scenario of regional economic divergence in a country is

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more likely because of different structure of industry from the territorial point of view and the dissemination of technologies which is determined by it as well as the interaction of enterprises. Marxist theory of economic growth (Watkins, Perry, 1977; Castells, 1972; Smith, 1984) analyses the economic changes as a result of historical evolution of domineering society group production form, and the cause of regional economic divergence in a country is considered to be the nature of capitalist system which does not create the theoretically balanced structure of economy growth. It is impossible to achieve the economic growth encouraging the convergence due to unbalanced structure of public relations, and the process of cumulative causation encourages regional economic divergence in a country.

The approach of analysed theories to the assessed influence of the level of national economy development and economy changes on the regional economic convergence in a country are presented in Table 1.

Table 1

Summary of analyzed theoretical positions regarding economic development level and economic changes impact on regional convergence

Theory	Development level of national economy	Economic changes		
		Economic growth	Economic system transformation	Economic integration
Neoclassic exogenous	**+**	**+**	**+**	**+**
Cumulative causation/ Growth poles	**0**	**–**		**+**
Neoclassic endogenous	**+/–**	**+/–**		**+/–**
New economic geography				**+**
Economic development/ stage	**+**	**+/–**		
Product/profit cycle	**+**			
Industry restructuring				**–**
Flexible specialization		**–**		
Marxist		**–**	**–**	

+ Induce regional economic convergence.
– Reduce regional economic convergence or induce its divergence.
+/– Impact on regional economic convergence depends on other factors.
0 Do not have significant impact on regional economic convergence

Source: authors' construction based on theoretical analysis

The results obtained in the evaluated empirical research of regional economic convergence in EU countries are different. On the one hand, in the research that are based on neoclassic exogenous economic growth model, the tendencies of regional convergence in the countries dominate (e. g. Barro, Sala-i-Martin, 1991; Sala-i-Martin, 1994, 1996). On the other hand, this tendency of convergence is criticized in the studies based on endogenous economic growth model (e. g. Armstrong, 1995b; Dunford, 1994, Rodríguez-Pose, 1998; Cuadrado-Roura ir kt., 2002; Fingleton, 1999; Magrini, 1999). Furthermore, in other research it is stated that the convergence in the EU countries is taking place only in individual regional groups (clubs) (e. g. Chatterji, 1992; Quah, 1996a,b).

Several reasons determine the differences of these results of researches. One of them is the contradictions between theoretical concepts, on the basis of which the models of β convergence are created. The differences of approaches determine different interpretation of the facts as well as the stronger position from the point of view of regional convergence or the divergence in the countries. Other reason – the number of countries and regions covered by the research as well as the period of research. It should be mentioned that the evaluation of the differences of regional economies in the EU countries is related to the problems of data access. This is especially evident when long period is researched and the data are available only from few countries.

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It should be noted that the approach of different theoretical directions to the influence of the level of national economy development and the changes of economies on the convergence of regional economies of a country are different. Not only the factors which are considered as determining the convergence are different but the direction of influence is different as well. This ambiguity encourages to empirically proving or disproving the influence of factors generalized in Table 1, and thus, to justify how well the analysed theoretical directions explain the convergence of regional economies determining the factors in the EU countries in 1995 – 2012.

Evaluation model

In this part we contain a model, based on theoretical and empirical research, demonstrating the impact of national development level and economic changes: economic growth, economic integration and economic system transformation on regional convergence.

Mean logarithmic deviation (MLD) is selected as key index to measure economic disparities and regional convergence as well as dependent variable of the model. Such selection is justified by the fact that the above index belongs to generalized entropy class meeting strict conditions required for σ convergence analysis.

Taking into account regional convergence factors analysed in the first part of the article and ambiguous assessment of impact of national development level and economic changes on regional convergence, with the intention of quantitative assessment of the impact, the following hypotheses are formed in the empirical research:

H1: The higher is national economic development level the faster is regional convergence.

H2: National economic growth and regional convergence rates are related by inverse relationship.

H3: Economic growth in the countries that had experienced shifting from a command economy to a market economy has more negative impact on regional convergence than in the countries without such shift experience.

H4: Regional convergence runs faster in the countries with more integrated economy.

H5: There is inverse relationship between integration rates and regional convergence rates.

The hypotheses formed in the empirical research are verified by assessment method for impact of national economic development level and economic changes on regional economic convergence (Figure 2). Empirical research experience suggests segregating the channels through which the regional convergence factors might assert in separate countries. Segregation is based on potential impact duplication (multicollinearity) and relatively small research sample limiting the number of factors subject to analysis.

This model was realized using panel data and fixed effects estimation. The selection was caused by both systemized empirical research and relatively short time series available that conditions panel data usage, involving in the analysis all the countries together and having advantage of higher number of degrees of freedom:

$$\Delta r_{j,t\to t+s} = \alpha + \delta_1 dT_1 + \ldots + \delta_n dT_n + \beta_1 \cdot \mu y_{j,t\to t+s} + \beta_2 \cdot \Delta y_{j,t\to t+s} + \beta_3 \cdot k_j \cdot \Delta y_{j,t\to t+s} + \beta_4 \cdot \mu e_{j,t\to t+s} + \beta_5 \cdot \Delta e_{j,t\to t+s} + a_j + \varepsilon_{jt}; \quad (1)$$

Here t=1,…,18 (research time frame: 1995 – 2012 divided into separate t→t+s periods considering business cycles in each country examined);

Δrj,t→t+s – measures the changes in regional disparities at NUTS3 level of j-country, i.e. if any convergence or divergence takes place within the period t→t+s and its intensity thereof;

μyj,t→t+s – measures j-country national development level within the period t→t+s;

Δyj,t→t+s – measures j-country economic growth rate within the period t→t+s;

μyj,t→t+s – measures j-country's integration to the EU level within the period t→t+s. The bigger trading of j-country with EU states, the higher level of economic integration to the EU of such country is assumed in the research;

μyj,t→t+s – measures j-country's integration to the EU rate within the period t→t+s;

kj – indicates if j-country experienced economic system transformation in 1989 – 1991. This categorical variable will be involved into independent variable set using dichotomic dummy variable;

aj – unobserved country effect;

α – intercept;

δ1,…, δn – intercept for time dummies representing each separate t→t+s period considering business cycles;

β1, β2, β3, β4, β5 – regression equation parameters which are of interest in this research:

β1 – coefficient of national development level impact on regional convergence;

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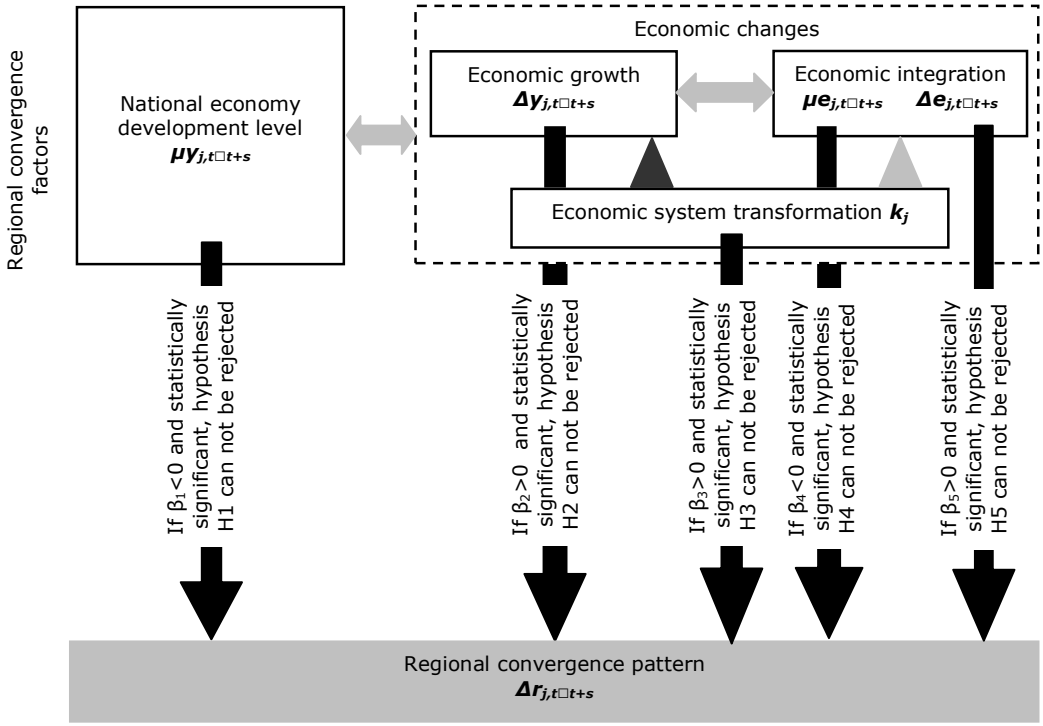
β2 – coefficient of economic change impact on regional convergence;

β3 – coefficient of additional economic growth impact on regional divergence in the countries that had experienced economic system transformation;

β4 – coefficient of economic integration to the EU degree impact on regional convergence;

β5 – coefficient of economic integration to the EU rate impact on regional convergence;

εjt – idiosyncratic error or time-varying error, with zero serial correlation and constant variance.



Source: authors' construction

Fig. 2. **Empirical assessment model for impact of national economic development level and economic changes on regional economic convergence**

The time frame (1995 – 2012) of the research is considerably long to reflect short-term cyclic economic fluctuations and long-term tendencies. The research period was selected due to the fact that statistics at NUTS 3 level was started to collect in 1995 and the end of period – the beginning of the economic downturn. Data of 2012 is last the research year due to presented data of the regional GDP in EUROSTAT.

Main conclusions of empirical research

All hypotheses were confirmed upon empirical verification of the elaborated assessment method for impact of national economic development level and economic changes on regional economic convergence in the EU:

1) **National economic development level** has a positive impact on regional convergence. Regional convergence in highly developed countries is 7.5% faster, or diverges 7.5% slower than in less advanced countries, after controlling for other factors. The above determines that regional divergences in highly developed countries are lower at the mean.

2) **Economic growth** has a negative impact on regional convergence. Upon economic growth rate increase by one percentage point divergence runs up by 0.526 percentage point, after controlling for other factors.

3) **Economic system** shifting from a command to a market economy in 1989 – 1991 has a negative impact on regional convergence. Intensity of economic growth impact on regional convergence differs in the countries with and without economic system transformation experience. Upon economic growth rate increase by one percentage point, regional divergence runs up by 1.022 percentage point (if compared with 0.526 in the countries without such experience), after controlling for other factors.

4) **Economic integration** level has a positive impact on regional convergence. Higher level of national economic integration to the EU-27 provides

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faster regional convergence or slower divergence. Upon economic integration level increase by one percentage point, regional convergence speeds up or divergence slows down by 0.806 percentage points, after controlling for other factors.

Conclusions

1) Intensity of national economic integration has a negative impact on regional convergence. More intensive national economic integration to the EU-27 provides slower regional convergence or faster divergence. Upon economic integration intensity increase by one percentage point, regional convergence slows down or divergence speeds up by 1.450 percentage points, taking other factors constant.

2) The factors of economic integration level and rate have the same impact on regional convergence rate in both highly developed countries and less developed countries.

3) It may be stated that out of all regional economic convergence factors tested economic system transformation and economic growth has the major impact on regional convergence; however, economic integration level and national development level has the minor impact thereon. The factors of major impact negatively affect regional convergence and the factors of minor impact – positively. Taking into account that intensity of national economic integration also has a negative impact on regional convergence (medium degree of impact), the factors of negative impact counterbalance the factors of positive impact.

Economic system shifting from a command to a market economy in 1989 – 1991 has a residual impact on regional convergence. Comparing the impact degree as of 1995 – 1999, 2000 – 2004 and later, it is determined that the degree diminishes.

National regional convergence is cyclic, i.e. economic growth stimulates regional disparity increase, however the highly developed countries do experience lower regional disparities and the impact of economic growth cycle on regional convergence is lower.

The empirical research allowed identifying the factors, which directly positively (national economic development level, economic integration level) and negatively (economic growth, economic system transformation, rate of economic integration) affect regional convergence.

A possibility of indirect impact of certain factors analysed, differently occurred depending on impact channel, should not be excluded. The empirical research provides that economic growth could be partially deemed the above factor, the negative impact of which on regional convergence shows up at different intensity in the countries with or without experience of transformation from command to market economy as of 1989 – 1991. Economic system transformation in this case could be considered the impact channel causing the different occurrence of economic growth impact.

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YOUTH EMPLOYMENT CHANGES IN RURAL AREAS OF LITHUANIA

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Abstract. The importance of agricultural sector and the significance of employment in rural areas are directly related with the security of a country, manifesting through these security levels: economic security (consisting of output volume, employment, private and global goods, human and social capital), ecologic (food security, bio-economy, agricultural resource efficiency) and social security. The growing export of agricultural and food products, among other indicators, characterizes rural vitality. Structural economic development changes cause employment transformations, both in rural and urban areas.

The object of this study: agriculture and the transformation of Lithuanian youth labour force market in rural areas. The aim of the study: to analyze the economic transformations of agriculture and youth labour force changes in rural areas. Tasks of the study: to characterize the changes of agriculture and the human capital as a main agricultural resource; to characterize the main problems of youth labour force market in rural areas.

The analysis shows that agricultural development causes the transformation in Lithuanian labour force market and is related with productivity growth of agricultural products. It is determined that human capital, including youth labour force, faces inside migration – "rural region-urban region" and emigration. The comparison of agricultural production by type of farming in the period of 2005-2014 showed not only the importance of farmer's and family farms but also the growing role of agricultural enterprises. The youth labour force market is compared with the youth labour force market in Latvia and other European Union Member States (EU). The youth labour force participation rate in Lithuania in all the analysed period is significantly lower than in Latvia or the EU but the unemployment level of youth labour force is more positive in Latvia and Lithuania in comparison with the EU.

Key words: economic development, agriculture, labour force, rural areas, youth.

JEL code: J11, J21, O13, O18

Introduction

The Strategy of European Commission "A Strategy for Smart, Sustainable and Inclusive Growth" promotes employment, seeking to create more work places and to improve the quality of life. In the EU, including Lithuania, this would allow smart, sustainable and inclusive growth. This growth is characterised by various indicators, which can be analysed on many levels, e.g.: administrative/manifestation on a local level – country/national, regional, economic sectors, urban or rural development; population age group level – youth, middle aged, senior employment; gender based – male, female employment and quality of life, increasing the gender equality. Agriculture is a strategically important part of Lithuanian economic development, because the population of Lithuanian rural territories account for 33.4 % of total population of the country. Furthermore, the growth of agriculture is significantly related with a country's security as a multidimensional phenomenon (Gylys P., 2008), occurring though these security levels: economic security (consisting of private and public goods, human and social capital), ecologic (food security, bio-economy, agricultural resource efficiency) and social security.

The importance of changes of agriculture development in Lithuania, including the impact of demographic factors, was analysed by V. Averjanoviene et al. (2008), J. Zukovskis (2009), V. Stankuniene, A. Sipaviciene, D. Jasilionis (2012), B. Gruzevskis, R. Zabarauskaite (2012), G. Kuliesis, L. Pareigiene (2014), D. Vidickiene, R. Melnikiene (2014). The intensive factors of agricultural development, including the labour market problems, their positive and negative aspects are described by M. Leon-Ledesma, P. McAdam (2004), R. Melnikiene (2015). G. Kuliesis, L. Pareigiene (2015), Hart, Baldock, (2011) emphasize the importance of the indicators that characterize the vitality of agriculture, such as the average number of rural population, average population density and its average changes and V. Averjanoviene et al. (2008) give significant attention to its productivity.

One of the most important problems of the rural population is unemployment, especially present for the youth. The employment of a country's population, including rural population, determines the flow of income and economic prosperity significantly depends on it. Scientific literature (Okuneviciute-Neverauskiene L., Pocius A., 2008, Ciburiene J., 2014) states that because of constant changes in youth labour resources

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it is complicated to precisely evaluate the unemployment in this age group. Studies show that rural areas are becoming more of a residential than an employment place. Because of this, the possibilities to get a job there are decreasing. This is due to the transformation of the countryside: the rural areas near the big cities are expanding and the countryside in more distant areas is receding (Kriauciunas E., Ubareviciene R., Pociute-Sereikiene G., 2014; Vidickiene D., Melnikiene R., 2014). More favourable and higher opportunities to get a well-paid job are in big cities in Lithuania, so the biggest emigration comes from distant rural areas (Ubareviciene R., 2014).

The scientific research trends show the significance of agriculture and rural development, the importance of employment motives and the quality of living. Transformations of society and of economy, including agriculture sector and its labour market, must be oriented to affect the problems on the internal and global levels, such as unemployment, especially youth unemployment, social exclusion, low quality of living, famine etc.

The object of this study: youth employment in rural areas in Lithuania.

The aim of the study: to analyze the economic transformations of agriculture and youth labour force changes in rural areas.

Tasks of the study: to characterize the demographic situation of population and labour market and the human capital as a main agricultural resource; to show the influence of agriculture to economic development; to discuss the main problems of youth labour force market in rural areas of Lithuania.

The methods of research: analysis of scientific literature, statistical data classification and comparison, logical comparative analysis and synthesis. The year 2005 was chosen as a base year for the comparison and evaluation of different processes in agricultural sector and youth employment problems in the period of 2005-2014.

Research results and discussion

Integrated economic growth is substantially related with employment, activity of the labour force, including youth labour force. The growth of employment is related with the increase of disposable income and the enlargement of a country's gross domestic product (GDP), including agricultural sector. The growth of common agricultural output volume in all types of farms, both farmer's and family farms and both agricultural enterprises, shows its importance and demand. The growth of agricultural output of Lithuania's export structure shows an increase in demand on an international level. The problem of agricultural food quantity and quality is important for each country, so the country's food sufficiency and changes in the employment trends are always discussed.

Scientific literature (McConnell C., Brue S., Flynn S., 2011) distinguishes pessimistic and optimistic attitudes towards food sufficiency. The pessimists focus on the problem of food shortage because the demand for food is rising faster than the supply. They argue that the land suitable for agricultural activities is limited; in addition due to the expansion of cities, a part of the agricultural land is constantly on urbanization. Optimists argue that part of the land has not even been started to be used for agricultural production purposes. Therefore, agricultural production is expanding because of the continuous increase in labour productivity. The country's economic development is adversely affected by the negative natural population growth, increased migration within the country, translocation from the countryside to the city, and emigration, mainly when the emigration is from rural areas, especially if the population consists of young people (Civinskas R., Genys D., Kuzmickaite D., Tretjakova V., 2011).

The utilized agricultural area and human capital are the main agricultural resources (Melnikiene R., 2015). In Lithuania the trends of agricultural land changes were different, as shown in Table 1. In the period of 2005-2009 the agricultural land decreased by 5.3 % but in the period of 2010-2014 it increased by 6.5 %. Therefore, in the period of 2005-2014 the agricultural land increased by 3. 9%. Rural population and its share in Lithuania's population decreased in the period of 2005-2009 as well as in the period of 2010-2014, by 0.6 % and by 0.9 % respectively and the relative value of the urban population increased. Employment fluctuated during the analyzed periods: in the period of 2005-2009 it decreased by 42.9 %, while it increased in the period of 2010-2014. The tendency of employment decrease in agriculture occurred in the long term period of 2005-2014 - the decrease was by 34.3 % and the index of aging increased by 35.5 %.

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Table 1

The main characteristics of agricultural sector development in Lithuania in the period of 2005-2014

Indicator/Year	2005	2009	Change 2005-2009, %	2010	2014	Change 2010-2014, %	Change 2005-2014, %
1.Utilized agricultural area, thou. sq.km	28.4	26.9	-5.3	27.7	29.5	6.5	3.9
2.Rural population of average annual population, %	33.4	33.2	-0.6	33.2	32.9	0.9	-1.5
3.Population density, beginning of the year, %	51.4	48.8	-5.1	48.1	45.1	-6.2	-12.3
4.Total age-dependency ratio	49	49	0.0	48	50	4.2	2.0
5.Index of ageing	93	98	5.4	116	126	8.6	35.5
6.Share of employees, engaged in agricultural and related activities in the total number of employees, %	14.0	8	-42.9	8	9.2	15.0	-34.3
7.Employment in second job by kind of economic activity, %:- in agriculture, hunting, forestry and fishing, in %	10051.1	10056.2	-110.0	10046.5	10035.0	--24.7	--31.5
8.Structure of agricultural production by type of farming:- on farmer's and family farms- in agricultural enterprises	76.923.1	73.526.5	-4.414.7	72.727.3	72.727.3	0.00.0	-5.518.2
9. Export of agricultural products and food in total export, %	14.0	16.6	18.6	18.0	19.1	6.1	36.4
10.Total export growth, billion EUR	9.5	11.8	24.2	15.6	24.4	56.4	56.8

Source: author's calculations based on the World Bank Group Data; Lithuanian Statistics data

One of most important indicators of the agricultural sector in Lithuania, as given in Table 1, is the structure of gross agricultural production produced by a type of farming. The analysis of statistical data, according to Table 1, shows that the share of agricultural production produced on farmer's and family farms in the period of 2005-2014 was contracted by 5.5% and the share of agricultural production produced in agricultural companies and enterprises increased by 18.2 %. Otherwise, employment in agriculture, hunting, forestry and fishing is popular in Lithuania as a second job by kind of economic activity, which had increased in the period of 2005-2009 by 110.0 %. In the period of 2010-2014, the employment in agricultural activity as a second job decreased by 31.5 %. The growth of labour productivity determined that the share of employees, engaged in agricultural and related activities in the total number of employees, decreased in the period of 2005-2009 by 42.9 % but increased by 15.0 % in the period of 2010-2014. As a result the share of employees engaged in agriculture and related activities decreased by 34.3 % in the period of 2005-2014.

The importance of agricultural sector is characterized by the growth of share of agricultural products and food in total export. Export increased by 18.6 % in the period of 2005-2009, by 6.1% in the period of 2010-2014 and by 36.4 % during all analyzed period. It is important that the growth of total Lithuanian export in the period of 2005-2014 was 56.8 % and the growth of agricultural products and food in the same period was 36.4 %.

The changes, which occur in Lithuanian agricultural sector in the period of 2010-2014 (Table 1), as the increase of share of employees, engaged in agricultural and related activities in the total number of employees, show the rural vitality and importance of agricultural sector (Hart K., Baldock D., 2011). Scientific literature (Kuliesis G., Pareigiene L., 2014) determines that the main indicators characterizing the vitality of agriculture are the average number of rural population, average population density and its average changes.

Significant growth of total age-dependency ratio and index of ageing, decrease of the share of rural population and population density, are related with the

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negative effects of world financial crisis and with the decline of aggregate demand and employment and job seeking opportunities abroad. The decline of population, especially young people, in rural areas is associated with the rise of local migration and international emigration. The number of youth living in rural areas is 2 times smaller than living in the city. Studies (GruzevskisB., Zabarauskaite R., 2012) show that when young people are leaving to work abroad, the donor countries experience a multipartite loss: firstly, by losing people who create value added, GDP, gain income and pay taxes; secondly, by losing family creating youth, which is the demographic potential. Declining employment opportunities in rural areas increase social problems: alcoholism, depression, social isolation and so on. It is expected that in the future the number of employees will decrease in low-quality and low productivity farms, which is often characteristic of small family farms (Averjanoviene et al., 2008).

Table 2

The main characteristics of youth labour force in Lithuania, Latvia and the EU in the period of 2005-2014

Indicator/Year	2005	2007	2009	2011	2013	2014	Change 2005-014, %
1.Labor force participation rate for ages 15-24 in the total number of this age group, %							
-Latvia	38.0	42.9	41.4	37.7	40.9	41.4	8.9
-Lithuania	26.0	27.6	30.8	29.8	32.3	32.5	25.0
-EU	44.8	44.8	44.3	42.9	42.6	42.8	-4.5
2.Early leavers from education and training aged 18-24, %							
-Latvia	15.4	15.6	14.3	11.6	9.8	8.5	-44.8
-Lithuania	8.4	7.8	8.7	7.4	6.3	5.9	-29.8
2.1.Males early leavers from education and training aged 18-24, %							
-Latvia	19.0	20.6	17.6	15.8	13.6	11.7	-38.4
-Lithuania	11.0	10.1	11.6	10.0	7.8	7.0	-36.4
2.2.Females early leavers from education and training aged 18-24, %							
-Latvia	11.8	10.5	11.0	7.5	5.8	5.1	-56.8
-Lithuania	5.7	5.5	5.8	4.6	4.7	4.6	-19.3
3.Unemployment total, %							
-Latvia	8.9	6.0	17.1	16.2	11.9	10.0	12.4
-Lithuania	8.3	4.3	13.7	15.4	11.8	11.3	36.1
-EU	8.9	7.1	8.9	9.6	10.9	10.2	14.6
4.Unemployment of youth labour force for ages 15-24, in % (of labour force age group 15-24)							
-Latvia	15.1	8.4	29.6	31.0	23.2	19.6	29.8
-Lithuania	15.6	8.5	18.4	32.6	21.9	19.3	23.7
-EU	20.0	16.6	20.8	23.0	23.8	22.2	11.0
4.1. Unemployment of youth male labour force for ages 15-24, in % (of labour force age group 15-24)							
-Latvia	11.9	11.3	37.8	31.2	21.7	19.0	59.7
-Lithuania	16.0	6.9	35.2	34.1	23.0	22.4	40.0
-EU	19.4	15.8	21.5	22.9	25.8	25.4	30.9
4.2.Unemployment of youth female labour force for ages 15-24, in % (of labour force age group 15-24)							
-Latvia	16.2	10.1	28.5	30.7	24.9	19.7	21.6
-Lithuania	15.4	10.1	21.6	29.1	20.4	20.4	32.5
-EU	20.7	17.4	20.2	23.1	25.8	24.9	20.3

Source: author's calculations based on the World Bank Group data

In scientific literature the definition of youth is described differently, because there is no unified definition on a global level. Youth is described as young persons, whose age differs in distinct publications and ranges from 14 to 34 years. According to the united Eurostat method for the EU in employment research, youth should be seen as individuals in the 15-24 year range (Ciburiene J., 2014). This allows comparing youth's employment/unemployment situation on the rural and urban levels. This age group of population will be adopted as youth in the article. The main characteristics of young labour force, such as

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participation in the labour market, early leavers, early leavers from education and training and unemployment, are given in Table 2. The labour force participation level was smallest in the period of 2005-2014 in Lithuania, in comparison with Latvia and the EU. Despite this, the biggest growth rate of labour participation rate was in Lithuania and it achieved 25.0 %. Labour force participation rate in Latvia increased by 8.9 % and decreased by 4.5 % in the EU.

The data show that Latvia, Lithuania and the EU successfully decreased unemployment level until the year 2007 but the financial crisis significantly reduced economic activities and increased unemployment. In Latvia and Lithuania positive tendencies in youth labour market began to occur from the year 2011, when the indicator of early leavers from education and learning market (both male and female) began to decrease, accordingly, 44.8% and 29.8%. The smallest level of unemployment in the year 2005 was in Lithuania – 8.3% but the highest level – 18.7% - was in Latvia in the year 2010. The highest unemployment rate in Lithuania – 17.5% was in the year 2010. The most significant rise of unemployment during the analysed period was in Lithuania – 36.1%, in the EU – 14.6% and in Latvia – 12.4%.

The smallest unemployment level of youth labour force age group 15-24 was in Latvia – 14.6% in the year 2005. The unemployment level of youth labour force in the year 2005 was bigger in the EU than in Latvia and Lithuania, and reached 20.0%. Later the unemployment of youth labour force for ages 15-24 in Latvia and Lithuania changed similarly. Due to the financial crisis, unemployment significantly rose and in the year 2011 it was 31.0% in Lithuania and 32.6% in Latvia. The unemployment level of youth labour force in the year 2011 in the EU was 23.0%. The data show that this indicator in the period of 2005-2014 mostly increased in Latvia – by 29.8%.

The unemployment level according to gender differs in Latvia and Lithuania. Male unemployment in the year 2005 was the smallest in Latvia (11.9%). Unemployment also fluctuated because of the economics fluctuation during the financial crisis. Unemployment level of youth male labour force in the year 2014 in Latvia stayed the smallest – 19.0%, however this indicator rose the most in Latvia – by 59.7% in comparison with the year 2005. In Lithuania male youth unemployment during the financial crisis rose from 16.0% in the year 2005 to 35.2% in the year 2009 but during the post-crisis period it did not reach the level before the crisis. In Lithuania the unemployment level of youth male labour force in the year 2014 was 22.4%. The biggest unemployment level of youth male labour force – 19.4% in the year 2005 was in the EU. In the year 2014, it stayed the largest – 25.4%, although the growth rate during the year 2005-2014 was smallest – 30.9%.

Unemployment level of youth female labour force was smallest in the year 2005 in Lithuania and reached 15.4%. In Latvia it was 16.2% and in the EU - 20.7%. The unemployment level of female youth mostly increased in Lithuania by 32.5% and was 20.4% in the year 2014. In Latvia, the increase was less intensive – 21.6% and in the year 2014 unemployment level of female youth was 19.7%. The highest unemployment level of youth female labour force in the year 2005 was in the EU and reached 20.7%. In the EU, the increase was less intensive – 20.3% but in the year 2014 it was the biggest among the analysed countries and was 24.9%.

The situation of labour force market in Lithuanian urban and rural areas significantly differs, as shown in Table 3. The unemployment level in urban areas in Lithuania in the year 2005 was 8.6% and was bigger than the unemployment level in rural areas, which was 7.6%. Unemployment level both in urban and rural areas in Lithuania decreased in the period of 2005-2009 by 33.7% and 11.7%, respectively. Unemployment rate in the year 2010 during the financial crisis increased in urban areas more than 1.8 times and in rural areas – about 3 times in comparison with the year 2005. Implementation of government policy caused a decrease in unemployment in urban regions from 8.6% to 8.4% during the year 2005-2014. The unemployment level in rural areas in the year 2014 was 16.1%. During the period of 2005-2014 it increased by 111.8%. People, mostly previously employed in agriculture, forestry and fishing, were added to the ranks of unemployed people in rural areas. In the year 2005 the percentage of unemployed people, previously employed in agriculture, forestry and fishing, in rural areas were 13.2% and in urban areas – 4.7%. The share of unemployed people previously employed in agriculture, forestry and fishing decreased in the period of 2005-2009 and in the period of 2010-2014. This shows that employment places are decreasing in rural areas because there are more use various machinery that lower the need for low quality labour force.

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Table 3

The main characteristics of unemployment in urban and rural areas in Lithuania in the period of 2005-2014

Indicator/Year	2005	2009	Change 2005-2009, %	2010	2014	Chang 2010-2014, %	Change 2005-2014, %
1.Unemployment total, %-- urban areas-- rural areas	8.67.6	5.7*6.7 *	-33.7-11.7	15.922.7	8.416.1	-47.2-29.1	-2.3111.8
2.Unemployed, previously employed in agriculture, forestry and fishing, %							
-- urban areas-- rural areas	4.713.2	4.09.8	-14.9-25.8	3.510.7	1.77.5	-51.4-29.9	-63.8-43.2
3.Unemployment of youth labour force age 15-24, %							
-- urban areas-- rural areas	15.616.8	29.332.7	87.894.6	31.443.0	19.924.6	-36.6-40.0	27.646.4

** - data of year 2008.*

Source: author's calculations based on Lithuanian Statistics data

Unemployment level of youth labour force age group 15-24 in the year 2005 in Lithuanian urban areas was 15.6% and rural areas – 16.8%. The unemployment of youth labour force in rural areas in the period of 2005-2009 increased by 94.6% and reached 32.7%. The unemployment of youth labour force in urban regions in the period 2005-2009 increased less – by 87.8% in comparison with rural areas and reached 29.3%. During the financial crisis period the unemployment level of youth labour force increased significantly and in the year 2010 in the urban areas was 31.4% and rural areas – 43.0%. The unemployment of youth labour force age group 15-24 in the period of 2005-2014 in urban and rural areas increased, accordingly, by 27.6% and 46.4% and was 19.9% and 24.6% in the year 2014.

Due to different transformations of particular economic sectors unemployment levels are different in the urban and rural areas. The labour market of youth labour force, as shown in Table 3, faces a higher unemployment level. The unemployment of youth labour force in the year 2005 was twice bigger than total unemployment in rural areas, however this difference in urban regions was big too and reached about 1.8 times. The unemployment of youth labour force in rural areas in the period of 2005-2014 increased by 46.4% and was 24.6%. The unemployment of youth labour force in urban areas increased by 27.6%, and was 19.9%. The comparison shows that the unemployment of youth labour force in rural areas in the year 2014 was by 23.6% bigger than in urban regions in Lithuania.

Conclusions

1) The utilized agricultural area and human capital are one of the main agricultural resources. The utilized agricultural areas in Lithuania increased by 3.9% in the period of 2005-2014. The rural population decreased by 1.5% and the population density decreased by 12.3%. Share of employees engaged in agricultural and related activities in the total number of employees decreased by 34.3% during analysed period. These changes characterise, firstly, the changes of the quantitative factor of agriculture as economic activity development, and secondly, the changes of qualitative factors related with the growth of the export share of agricultural products and food in total export, which directly is related with the growth of productivity.

2) The export of Lithuanian agricultural products and food sector is characterised as smart, because in this sector the export increased while the employment decreased. In the period of 2005-2014 Lithuanian export of agricultural products increased by 36.4% in total country export. The share of export of agricultural products and food sector in total Lithuanian export in the year 2005 was 14.0%. In the year 2014 it increased to 19.1%. The tendency of export of agricultural products and food sector growth was permanent during all analysed period: from the year 2005 to the year 2014. In the period of 2005-2009 the growth was 18.6% and in the period of 2010-2014 the growth was 6.1%. The growth of the export share of Lithuanian agricultural and food sector products shows that this sector is a strong competitor on the international agricultural and food products market and its products successfully compete in the global area.

3) The youth labour force market in rural areas faces with inside (migration) and outside (emigration) problems, which are based on the internal (economic activity transformations) and global factors (open market, financial crisis and free

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movement of labour force). These reasons cause youth unemployment hysteresis, even when the financial crisis is over the unemployment rate stays high and does not reach the pre-crisis level. Lithuanian youth labour force participation rate for ages 15-24 in the total number of age group 15-24 in the year 2014 was the smallest – 32.5% in comparison with Latvia – 41.4% and the EU – 42.8%. The unemployment of youth labour force in the period of 2005-2014 in rural areas increased by 46.4% and in the year 2014 it reached 24.6%. However, on the positive side the youth unemployment level decreased from 43.0% to 24.6% in the year 2010-2014. This shows that the economic policy has a positive effect on the youth employment rate in the rural areas.

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MIGRATION TOWARDS SECOND TIER CITIES IN LATVIA: THE CASE OF JELGAVA CITY

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Abstract. The paper discusses the concept of second tier city and migration patterns towards Jelgava city. The migration to Jelgava was examined by means of analyzing unpublished data from the Population Register of Latvia concerning persons declared and registered in the city from 2000 to the first half of 2015. The results showed that the main migration flows towards Jelgava were from municipalities near the city as well as from Riga. The spatial distribution was observed of migrants in different neighbourhoods of Jelgava. Such factors as municipality origin and age have influenced the process of choosing certain neighbourhood. It was found out that the city attracted youth, families with small children and people in working age. Therefore, migration can positively affect the cities' economic situation and development.

Key words: second tier city, internal migration, Jelgava.

JEL code: R110, R120, R230

Introduction

One of the most important resources of economy is human resource - inhabitants and the structure displayed are the main preconditions for sustainable development and economic growth for every region, city and town. Nowadays, when the rate of natural increase in Latvia is negative, migration becomes the main option to improve demographical situation. According to the statistics (Central Statistical Bureau of Latvia, 2015), urban localities have lost their inhabitants more rapidly than rural localities – in the past 15 years the decrease of urban population is 16.7%, while in rural population it is 16.3%. Therefore, each city and town should evaluate its potential to attract migrants from other regions in that way improving its social and economic situation.

In urban theory, there are several typologies of cities but one of the most recent approaches is hierarchy by tiers. It should be mentioned that an official list with specific tier qualifications does not exist but still there are general characteristics that apply to each tier. Usually cities can be classified in three tiers (Table 1): first tier cities typically are the biggest cities in the country, major metropolitan hubs. First tier cities have dominance in global market orientation, scope and function. While it is easy to identify first tier cities, the classification of second and third tier cities is slightly complicated. One author can classify a certain city as a second tier city whilst another – as that of third tier. According to definition proposed by the authors of Cities Alliance (Roberts, Hohmann, 2014), second tier cities are geographically defined urban jurisdictions or centres performing vital governance, logistical, and production functions at a sub-national or sub-metropolitan region level within a system of cities in a country. Third tier cities are with less important role in national level with municipality level government.

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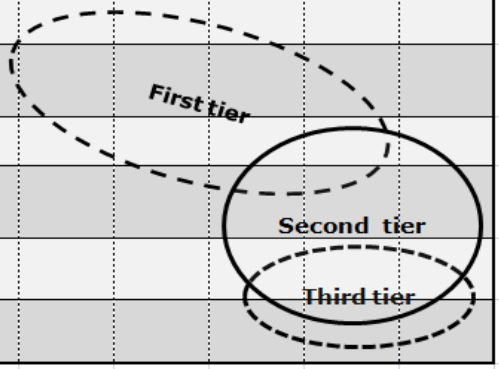
Table 1

Spatial, scale and functional framework to defining systems of second tier cities

Order of City	Functional and Market Orientation	The number of inhabitants					
		Supra 50 m+	Mega 10 m+	Metro 5-10 m	Meso 1-5 m	Micro 0.2-1 m	Mini <0.2 m
Global	Large multiple clusters of high value services and manufacturing engaged in global trade						
Sub - Global	Clusters of services and manufacturing engaged predominantly in regional trade						
National	National government, logistics, services and manufacturing centres						
Sub-national	Sub-national provincial Government, logistics, services and manufacturing centres						
District	District level Government, services and processing						
Sub-district	Resource rural-based service industry centre						



Source: Roberts, Hohmann, 2014

Three tier classification can be applied to Latvian cities as well. In the first tier, there is the capital city Riga - with a little less than 700 thousand inhabitants it is the largest metropolis in the Baltic States, surpassing Latvia's second largest city - Daugavpils - 7 times. The second tier consists of regional centres with populations of 35 000 – 100 000 each (Daugavpils, Liepaja, Jelgava, Jurmala, Ventspils). The third tier of Latvian cities (under 35 000 inhabitants), for instance, Valmiera, Kuldiga, Bauska, may have a city status but it would be more precise to refer to them as towns. Although in comparison to other European countries second tier cities in Latvia are smaller, and according to some European studies, for example, ESPON methodology (ESPON, 2013), there is only one second tier city in Latvia – Daugavpils, the above mentioned cities as Liepaja, Jelgava, Ventpils have an important role in the national and regional economy, cultural and social life and thus can be classified as belonging to the second tier.

Recently studies about second tier cities have become more popular. Studies capture the interest of scholars with their performance to first-rank cities. Many authors investigate urban processes in them. British authors (Parkinson et al., 2015) discuss the contribution of second tier cities to the economic performance of national economies across Europe; Italian researchers (Camagni et al., 2014) have studied the role of second tier city in agglomeration economies. In contrast to large metropolises, only a few authors have studied migration patterns to second tier cities, for example, there are several studies about migration and social mobility (Champion et al., 2013), residential preferences of people from the field of design and advertising to choose the second tier cities in Germany (Alfken, 2015), post-socialist residential preferences and ethnic residential segregation, the case of Tartu (Leetmaa et al., 2015).

Although internal migration processes are studied in Latvia through mainly researching the capital - Riga, its suburban area (Krisjane, Berzins, 2012; Berzins et al., 2010; Zeberga, 2011) or rural areas (Kruzmetra, 2011), researchers have paid less attention to migration in other national cities. Still, there are some studies about Daugavpils – for instance, Menshikov (Menshikov, 2014) has studied the characteristics of mobile lifestyle perceived by the youth of Daugavpils; Gentile and Sjoberg (Gentile, Sjoberg, 2010, 2013) have researched the allocation of housing during the Soviet period.

The aim of the study is to evaluate migration processes in Jelgava – city that is chosen as an example of second tier city in Latvia. The tasks of the study are: 1) to characterize the amount of migration to Jelgava city and to ascertain where the main migration flows come from; 2) to investigate which neighbourhoods of the city are more preferred for migrants; 3) to characterize the portrait of migrant to Jelgava city.

Jelgava is one of 9 centres of national development significance, the fourth largest city in Latvia and it is situated in the central part of Latvia, conveniently near the capital Riga. The urban area of Jelgava covers 60.5 square kilometres, and its population size is 61.8 thousand (Population Register, 2015). The size of population is declining but during the past ten years the

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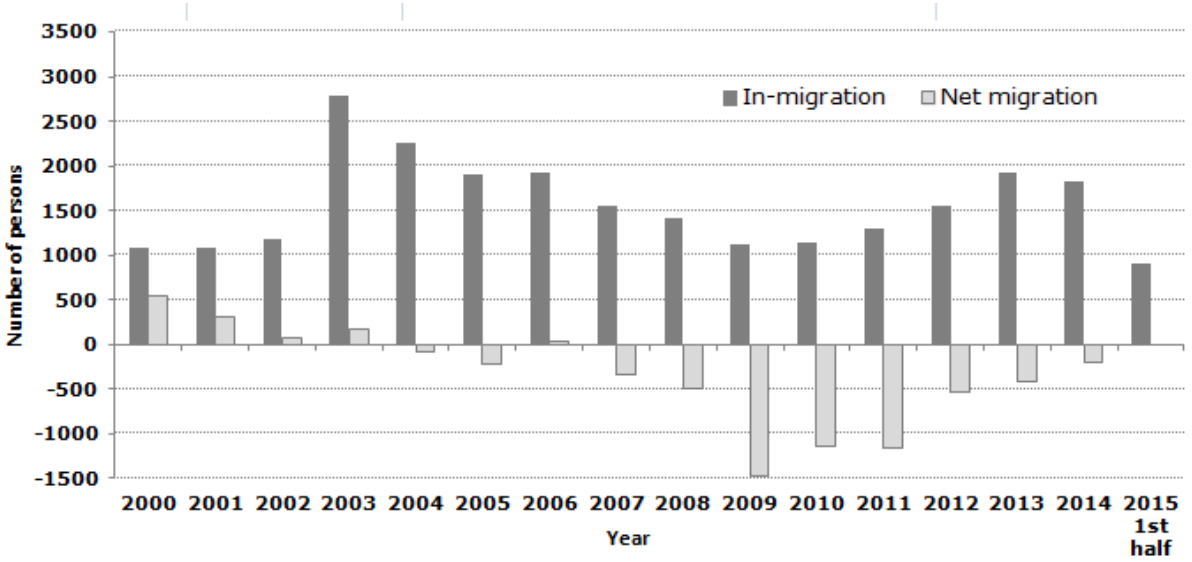
decrease was not as high as in the country on average. The population of the city is younger and more educated than in the country on average due to location of Latvia University of Agriculture. In order to evaluate migration processes in Jelgava unpublished data from the Population Register of Latvia were studied. Data array contained information about persons who have migrated in Jelgava from other municipalities in time period from 2000 to 1 July 2015.

Research results and discussion

Convenient position at the crossroads from North to South and from East to West, closeness to capital Riga as well as strong cultural, scientific and educational background have always attracted people to Jelgava. Situation has not changed until nowadays and people from different regions of Latvia choose this city as suitable for living.

The Population Register data show that within the last 15 years the total amount of people who have chosen Jelgava as their permanent place of residence has been approximately 25 000. Tendency shows (Figure 1) that few years after beginning of the 21st century slightly over 1000 persons each year declared or registered their residence in the city but the highest amount of newly declared persons – 2786 - was observed in 2003; after that the number gradually decreased reaching the lowest point in 2009 with only 1117 new inhabitants. It should be noted that the rapid increase in 2003 is likely related to changes in legislation – on 1 July 2003 the Act on Declaration of Residence came into force (Saeima, 2002) - requesting that citizens declared their residence. Therefore, those who had not declared the residence before, did it in 2003 and 2004.

The fall of the number of migrants after 2007 can be explained with the global financial crisis which in 2008 – 2010 affected Latvia as well. Until 2007 along with the improvement of economic situation in the country a considerable amount of people enhanced their living conditions and changed housing as well as residence – people from rural areas were attracted by city life, while inhabitants from the capital Riga searched for more convenient housing in quieter towns and cities. During the financial crisis the possibility to change residence declined and this reflected also on migration patterns to Jelgava. After 2010 the number of migrants to Jelgava increased again and in recent years the average number has been around 1870 people per year.



Source: authors' construction based on the data of Latvia Population Register and Central Statistical Bureau of Latvia

Fig. 1. **Number of migrants and net migration toward Jelgava from other municipalities in period 2000 – 1 July 2015**

According to theoretical literature (Knox, Pinch, 2006), the majority of migration moves has been found to be relatively short, although the distances involved clearly depend to a certain extent on the overall size of the city concerned. Abovementioned tendency can be observed also in Jelgava. Even though in the period considered there were migrants from all the municipalities of Latvia, a noticeable dominance of certain sourcing municipalities existed. The highest flow of migrants to Jelgava came from the surrounding

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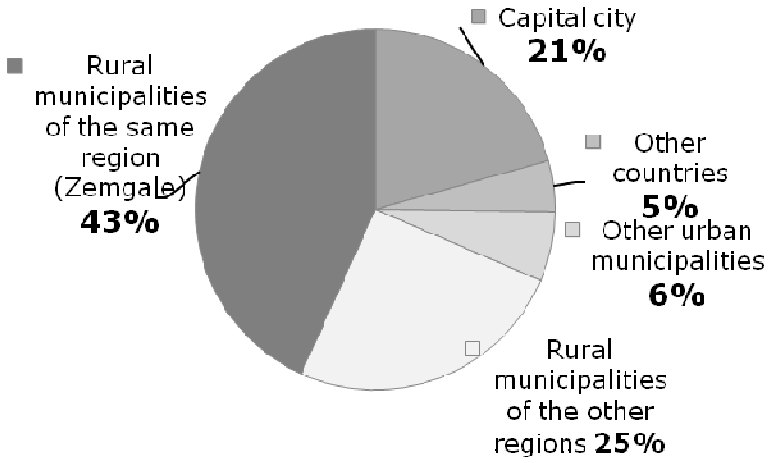
municipality and capital city Riga, whilst other municipalities were considerably less represented (Figure 2) - approximately 22% of all migrants previously lived in Jelgava municipality (5486 persons) and 20.6% in Riga (5149 persons). It means that Jelgava as a second tier city can attract people even from larger economic, social un cultural centre (as Riga) and usually these are persons who are looking for better, more peaceful living environment and cheaper living conditions. It should be noted that the closeness to Riga allows them to continue working in the capital, thus, approximately 21% (12 682 in 2014) of all citizens of Jelgava commute daily to Riga for work (Jelgava, 2015).

Slightly less but still important amount of migrants come from two other nearby municipalities – Ozolnieki municipality (8.9% or 2237 persons) and Dobele municipality (4.1% or 1028 persons). Other municipalities are represented by number of in-migrants less than 1000 in this period of time, comparatively often from such municipalities as Bauska municipality (512 persons), city of Jurmala (480 persons), Olaine municipality (401 persons), Tukums municipality (396 persons), Saldus municipality (389 persons) and Auce municipality (315 persons). Although the numbers of migrants from other municipalities are below 300 persons, it can be observed that also people from remote areas of Latvia choose Jelgava as a residence. It is likely due to Latvia University of Agriculture, which is situated in the city and attracts students from different municipalities; after studies part of them find job or settle down to family life and stay in Jelgava. Previous studies reveal (Alfken, 2015, cited Falk, Kratz 2009 and Krabel, Flother, 2014) that the percentage of graduates who remain in the university region varies considerably. In regions with good economic conditions, up to 80% of graduates remain; this number decreases to 40% in less prosperous regions. The likelihood to remain in a region further increases if graduates were able to establish links to local employers through internships during university or if they became self-employed.



Source: authors' construction based on the data of Latvia Population Register

Fig. 2. **Structure of migrants to Jelgava based on their origin municipality in period 2000 - 1 July 2015, %**

In order to clarify if there is a statistically significant difference among years and municipality origin, data were processed with a Single factor analysis and no significant differences were found – the flow of migrants to Jelgava from other municipalities is similar from year to year and the most popular origin municipalities do not change.

The data array shows that not only inhabitants from other municipalities of Latvia choose their residence in Jelgava but also people who previously permanently or temporary lived in other countries migrated to Jelgava. Unfortunately authors did not have information about specific countries, where migrants came from but the overall tendency shows that the number of in-migrants from foreign countries has increased: in 2000–2004 on average there were only 5 such persons per year but starting from 2011 - more than 100 persons a year, whilst in 2014 this number reached as high as 291.

The territory of Jelgava covers 60.5 square kilometres. Despite the fact that there are no official neighbourhoods divisions in Jelgava, almost every inhabitant knows some names of neighbourhoods, for example, RAF and Linijas. In this study, neighbourhood division created by M.Ozols (Ozols, 2014) is used,

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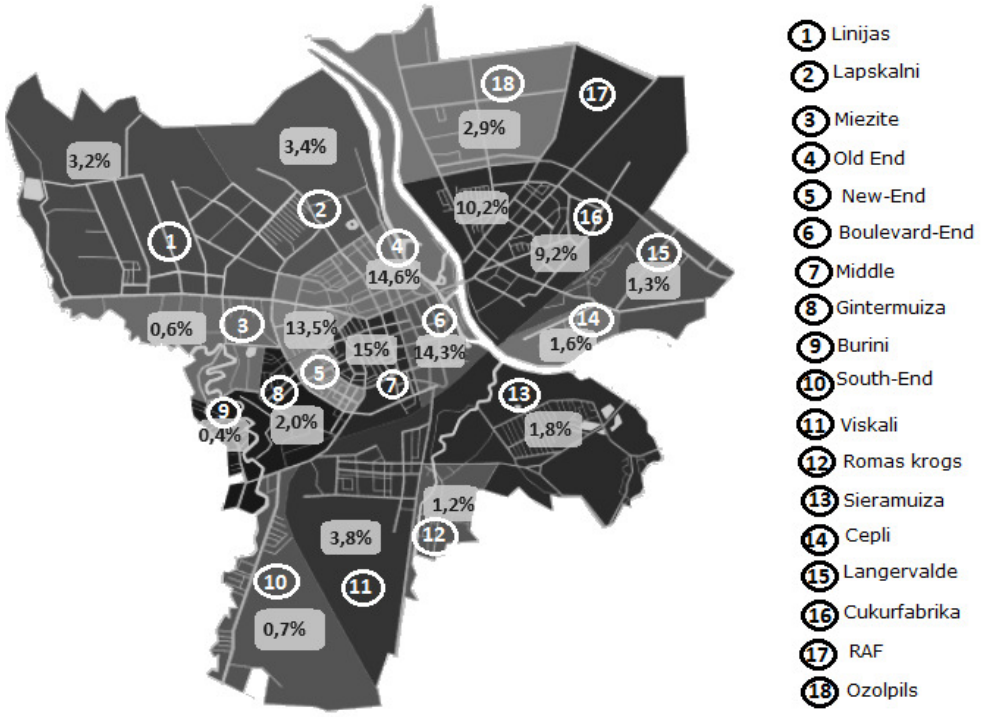
which offers to divide Jelgava in 18 neighbourhoods based on historical and housing structure indications. All data about migrants to Jelgava were divided in neighbourhoods depending on the first address where they were registered after arrival to the city. As a result (Figure 3), the most popular part of Jelgava for new inhabitants turned out the central part of the city (Old-End, New-End, Boulevard-End, Middle). There are mainly apartment houses and all services next to each other and 57.4% of all in-migrants lived here. The second main part of migration flow goes to the Eastern part of Jelgava - RAF (10.2% of migrants) and Cukurfabrika (9.2% of in-migrants). These neighbourhoods are popular because they are located en route to Riga and have a good public transport connection both to the city centre and to the capital city, thus many commuters have chosen this part as their residence.



Source: authors' construction based on the data of Latvia Population Register and Ozols M., 2014

Fig. 3. **Division of in-migrants among neighbourhoods in Jelgava, %**

A single factor analysis was applied in order to ascertain if choosing certain neighbourhood is an important factor for migrants from different sourcing municipalities. As a result at Fischer criteria α = 0.05 factor "neighbourhood" impact proportion is significant because F = 5.3813> Fcrit = 1.62754. It means that there are neighbourhoods which are more favourable for migrants from, for example, Riga and others that are more popular amongst migrants from other municipalities. With *t-test* some of neighbourhoods were compared taking into account in-migrant diversity of former residences and there was no significant difference found between RAF and the most popular neighbourhoods in central part of Jelgava (for example, RAF and Middle t_{stat} = 0.86127 < t_{crit} = 1.97015), while significant difference was found between Middle and neighbourhood "Linijas" (t_{stat} = 2.6848293 > t_{crit} = 1.977560). Overall tendency shows that migrants from Riga and Ozolnieki municipality most often choose residence in neighbourhoods on the right side of the river Lielupe on the direction towards capital (RAF, Cukurfabrika, Cepli, Ozolpils), migrants from Jelgava municipality have found appropriate Central part of the city as well as North-West part (Linijas), while people from Dobele municipality choose Central part of the city. It means that there are spatial distributions of migrants taken into account when choosing their spatial preferences.

Not only the volume of migration flow but also the structure of migrants is important when migration patterns and influence to social and economic situation of hosting city are analyzed, because people in working age can give more contribution to local economy than retired persons. According to the theory (Pacione, 2005; Rees et al., 1998), moves are usually related to

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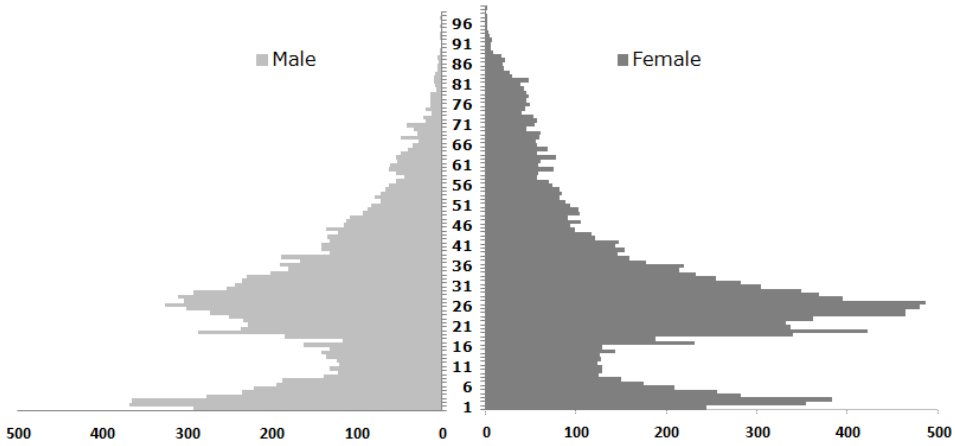
employment and life-cycle factors: transitions in life-cycle or major life-cycle events have been related to residential adjustment or relocation. The main life-cycle events at the young age are, for example, completion of education, marriage, birth of first child, thus the majority of migration events takes place before people reach the age of 30. Age dynamics of migrants in Jelgava (Figure 4) confirms above mentioned statements, because 27.1% of all migrants were between the age 20 and 30, and the most common - at age 26, while amount of migrants above age 30 gradually decreases.



Source: authors' construction based on the data of Latvia Population Register

Fig. 4. **Age and sex dynamics of in-migrants to Jelgava in period 2000 - 1 July 2015**

A significant number of in-migrants was also between age 0 – 5, and it can be concluded that young families with small children find Jelgava as an appropriate living environment. Overall, most in-migrants are comparatively young and a lot of them are in working age – this factor could have a very good influence on the city's development.

With Single factor analyses significance of age factor in choice of certain neighbourhood was verified and at Fischer criteria α = 0.05 factor "age group" impact proportion is significant because F = 7.781346 > Fcrit = 1.935. It means that the age group affects migrants' neighbourhood choice in Jelgava. Tendency shows that families with small children more often comparing with other groups choose neighbourhoods near the border of the city where mainly private houses such us Langervalde, Sieramuiza, Viskali, Gintermuiza are located, while people after the age of 50 usually migrate to Central part of the city. People in age group between 20- 30 are attracted to the Centre as well as RAF and Cukurfabrika. Research results approve previous studies about migration and residential preferences, for example, the study which was conducted in Great Britain (Clark, Huang, 2003) showed that households consisting of members in age groups 19–29 and 30–49 increased the living space and number of rooms when changing residence, while people after age of 50 usually chose smaller residence than the previous one.

Conclusions

1) Migration dynamics towards one of the second tier city in Latvia – Jelgava – is influenced by economic situation in the country but starting from 2010 migration flows have increased and in recent years the number of in-migrants has been approximately 1870 people per year.

2) Most migrants have come to Jelgava from the surrounding municipalities, as Jelgava municipality, capital city Riga, Ozolnieki municipality, Dobele municipality and Bauska municipality and it confirms previous studies that the majority of migration moves has been found to be relatively short.

3) A spatial distribution of migrants in different neighbourhoods of Jelgava was observed, the most popular were neighbourhoods in the city centre (Old-End, New-End, Boulevard-End, Middle), as well as RAF and Cukurfabrika. An influence of such factors as municipality origin and age was discovered in the process of choosing certain neighbourhood. In-migrants from capital Riga more often choose neighbourhoods on the right side of the river Lielupe (RAF, Cukurfabrika), while people from rural areas more often choose their residence in the centre of the city. Families with small children more often choose neighbourhoods near the border of the city, people in age group between 20 and 30

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find more attractive the Centre as well as RAF and Cukurfabrika, while elderly ones prefer city centre.

4) Jelgava attracts youth, families with small children and people in their active working age, thus migration can have a positive effect on the city's economic situation and development.

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IMPACT OF AGRICULTURAL ACTIVITIES IN POLAND ON THE ENVIRONMENT IN THE REGIONAL CONTEXT

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Abstract. The main aim of the study is to evaluate the significance of agricultural activity as a threat to the natural environment of the region. The study shows the potential of the agricultural production environment in Poland, presents the evaluation of the significance of changes I n agricultural land in the region and describes changes in setting-aside and their causes, the changes in the intensity of production with regard to mineral fertilisation as well as changes in stocking density in each region of Poland. It has been found that in Poland there are significant regional disparities in agricultural production, which may result in different impact on the environment in every region. Poland is a country with good conditions for agricultural production, although in recent years the agricultural area has decreased significantly. Over the last decade, most provinces recorded a significant increase in the use of mineral fertilisers. This is not positive for the natural environment but the level of fertilisation in Poland is far from that, which exists among others in Western Europe. Another negative factor is the increase in stocking density in some regions. The analyses carried out show that in Poland there are areas, where too intense agricultural production may have an adverse impact on the natural environment.

Key words: resources, environment, farms agriculture
JEL code: Q15, Q20, Q5

Introduction

The effects of wasteful economy in many areas, including farming, imposed the need to protect natural resources. From the moment, when the man started to carry out an intentional agricultural production, the process of transformation of the nature and its resources began. As it was pointed out in the 1950s by Dudziak, it had been understood that the devastation of these resources could be avoided by establishing the economy based on knowledge of the laws of nature and broadly meant protection of the natural resources (Dudziak J., 1958). Initially, these processes were slow and focused mainly on the deforestation of land for areas under crops. Currently, it is pointed out that there is a potential threat to the quality of the natural environment related to the agricultural production due to regional intensification of agricultural production. It covers simplified crop rotation (even crop monoculture) and excessive doses of mineral fertilisers and chemical pesticides. An important factor is also maintaining a significant area of fallow and idle land as well as abandonment of farming and changing the status of land from agricultural land to other economical use unsuited to the countryside (Prognoza …, 2014). It also includes an intensive use of natural resources resulted in many changes both to the environment and the natural resources, which are, in many cases, irreversible. Examples are numerous species of animals that are extinct or threatened with extinction.

In economics, the environment is seen as a kind of capital or a value "providing" many services to humans, and there are no substitutes for many products and services offered by the environment. As it was pointed out by Tietenberg and Lewis, if the environment was defined broadly enough, then the relation between the environment and the economic system could be regarded as a closed system. A closed system means that there is no "input" (of matter or energy) or "output", which could be transmitted to the outside of the system (Tietenberg T., Lewis L., 2015).

The main aim of the study is to evaluate the significance of agricultural activity as a threat to the natural environment of the region. The evaluation was done using selected rates characterising the impact of agriculture on the environment. Important aspects of the evaluation concern: quantity of mineral fertilisers used, changes in agricultural area (e.g. degraded soil), increased intensity of agricultural production and concentration of production (including the increase in stocking density, which indicates the impact of animal feces: manure and slurry, on the environment). Of course, livestock production may have various effects on the natural environment (e.g. greenhouse gases), thus the study gives only general information on the stocking density that might indicate indirectly the threat to the environment due to livestock production.

Analyses of agricultural production and its impact on the natural environment become more and more important nowadays. They are applied to a defined

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agricultural policy and to create mechanisms of state intervention. The following research tasks serve for achieving main aim of the study:

- presentation of the potential of agricultural production environment in Poland;
- assessment of the significance of changes in the agricultural area in each region
- indication of changes in setting-aside and their causes
- presentation of changes in the intensity of production with regard to fertilisation
- drawing attention to the stocking density in different regions of Poland.

As it has been demonstrated by many studies, negative elements of the agricultural activities become more and more severe (among others, Wos A., Zegar J., 2002; Maciejczak M., 2010; Zegar J., 2013; Golebiewska, Pajewski, 2015), so this is a relevant issue, which should be thoroughly researched and constantly monitored. Many authors indicate, in addition, that in Poland there are considerable disparities in agricultural activities between regions (among others, Kusz D., 2009; Szymanska E., 2014; Musial W., Wojewodzic T., 2014).

The study describes the diversity in suitability of every region for areas of agricultural activity, pointing to the evaluation of agricultural production environment in Poland. The author conducts an analysis of land set aside, stocking density and use of mineral fertilisers. The source materials for analysis were studies and data from the Central Statistical Office (GUS), from the Institute of Soil Science and Plant Cultivation - State Research Institute (IUNG-PIB) and the available literature on the subject.

Research results and discussion

In Poland, until the last decade of the previous century, fundamental problems of environmental protection in agriculture concerned soil erosion, which covers vast areas in every continent. As it was pointed out by Dudziak, this process began in the 1950s, primarily as a result of the destruction of forests and irrational exploitation of agricultural land (Dudziak J., 1958). The degradation of the natural environment resulted largely also from the fact that in most developing countries wood was the primary source of fuel. The global-scale importance of forests in the context of climate change and economic development is also underlined in the State of Europe's Forests Report, which states that the increased area of forests and sustainable forest management have a positive influence on the climate through binding CO_2 from the atmosphere and on storing carbon in biomass, soils and forest products (Report…, 2015). The importance of this problem is evidenced, among other things, by the Climate Agreement signed in Paris on 12 December 2015 by 195 countries, which provides that a balance between greenhouse gas emissions and their absorption should be achieved by the end of the century, among other things, by a positive influence of forests.

The discussion of the extent of erosion processes devastating the soil should take into account, among other things, climatic conditions, slope of the terrain and variability of the soil cover. Soil conditions, including soil quality, as it was indicated by Krasowicz et al. (Krasowicz S. et al., 2011), are of particular importance in the valorisation of the agricultural production environment (Figure 1).

Index of area evaluation has been developed at the Institute of Soil Science and Plant Cultivation (IUNG) in Pulawy in the 1980s. It allows the researcher to evaluate the quality of agricultural production environment in a point scale. For Poland, the average value of the index, which takes into account soil conditions, topography and agroclimate, was 66.6.

The figures for each province shows that Poland is a country providing good conditions for agricultural production, although there are significant regional variations.

However, as indicated by the data provided by the Central Statistical office, over the subsequent years there was a significant decrease in agricultural area. Figure 2 shows the changes in agricultural area in each province between 2005 and 2014. It shows that the decrease of agricultural area was highest in the provinces of Zachodniopomorskie (by 400 000 ha) and Mazowieckie (by about 300 000 ha). The reason for this was mainly devoting part of the land for residential and industrial buildings as well as the use of low-quality land for afforestation.

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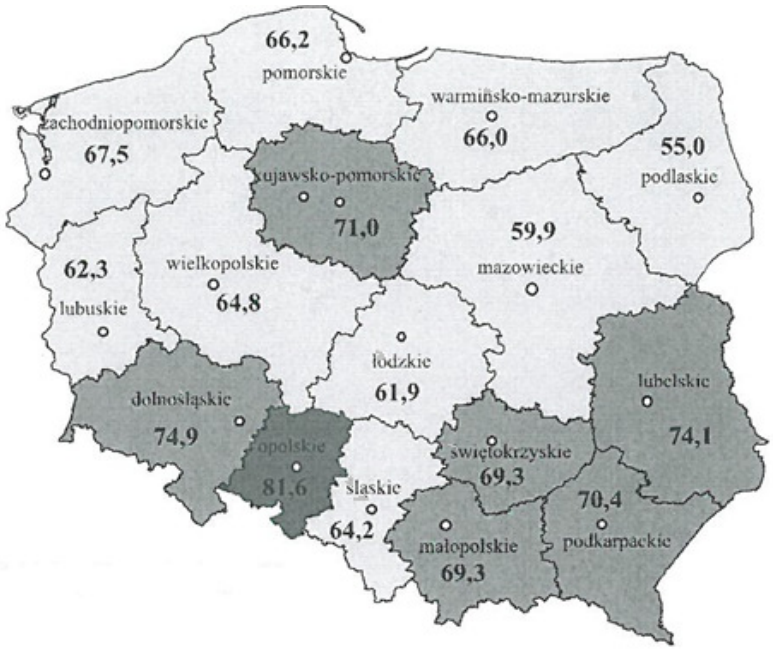
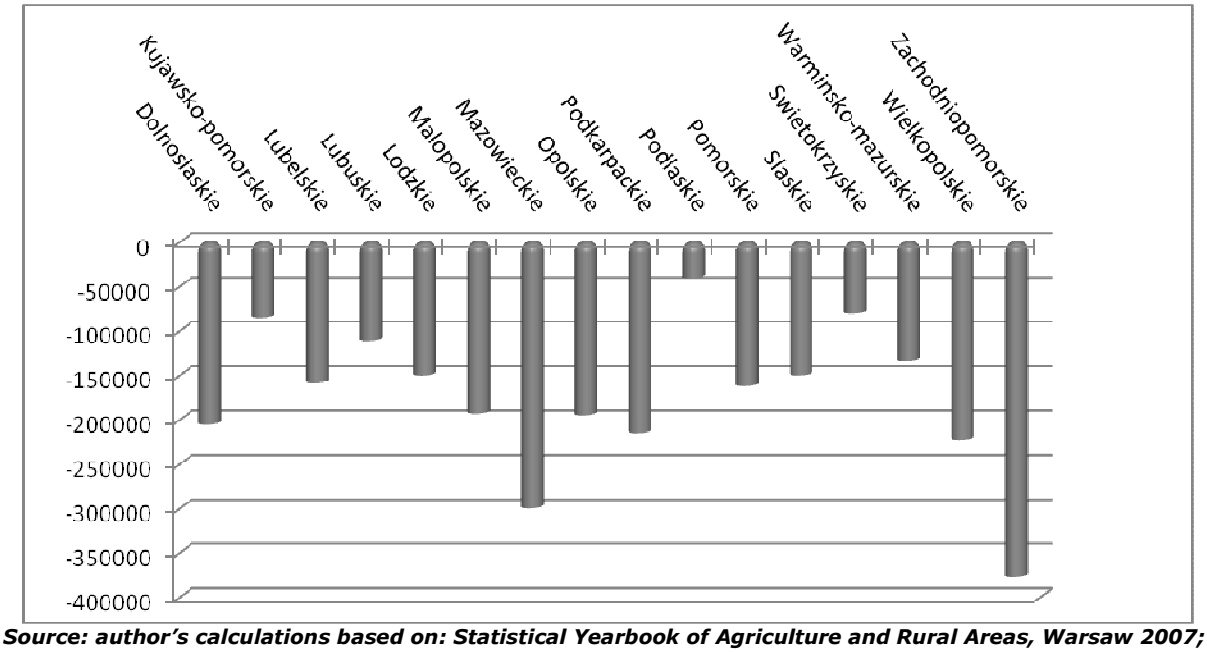


Source: author's construction based on: Krasowicz, S. i in. (2011).

Fig. 1. **Index of agricultural area evaluation in Poland (acc. to IUNG)**

The data provided by the Central Statistical Office show that many agricultural areas in Poland are excluded from the agricultural use (Figure 3). However, in the years 2005-2014 a decrease in the set aside land in Poland took place, which was mainly due to the introduction of subsidies under the Common Agricultural Policy. Only in the province of Kujawsko-Pomorskie, the area set aside slightly increased. As it has been pointed out by Krasowicz and Kopinski, regional differences in share of land set aside depend not only on the natural conditions but also the fragmentation of the agricultural land and terrain. It is confirmed, among other things, by a large percentage of land set aside in the province of Podkarpackie (Krasowicz S., Kopinski J., 2006).



Source: author's calculations based on: Statistical Yearbook of Agriculture and Rural Areas, Warsaw 2007; Uzytkowanie Gruntow i Powierzchnia Zasiewow w 2014 r. GUS, Warsaw 2015.

Fig. 2. **Changes in the agricultural area by province between 2005 and 2014**

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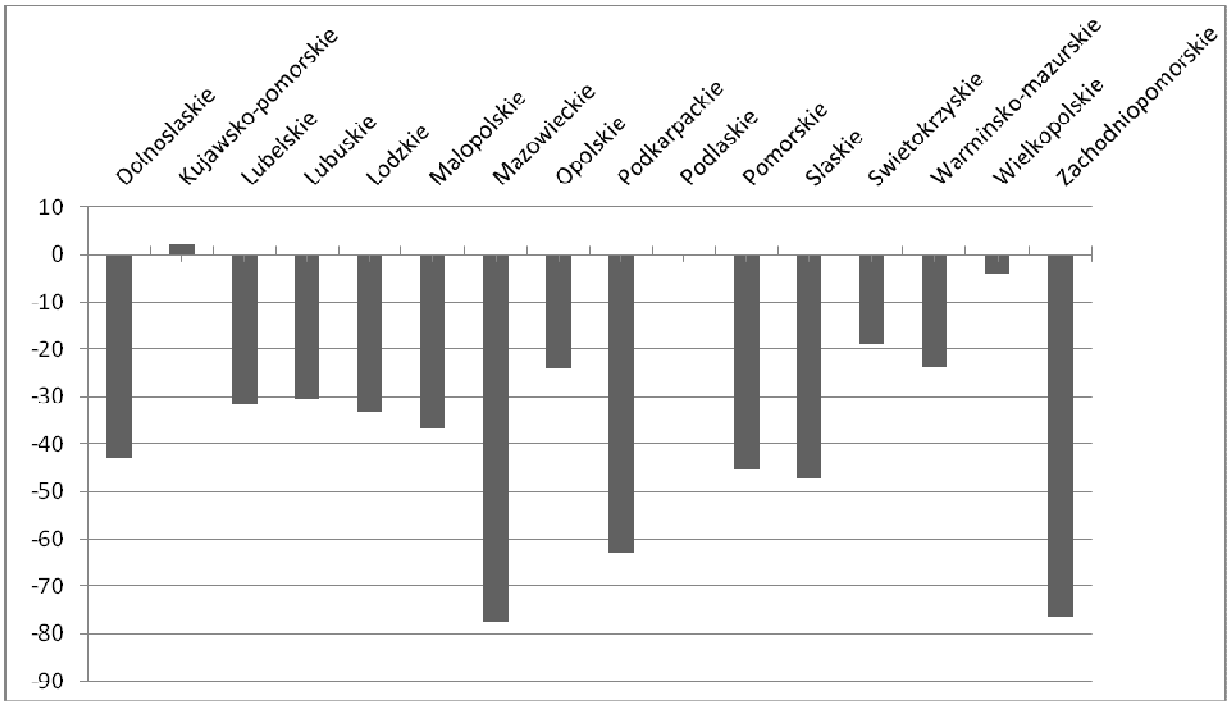
Level of the crop production depends in the first place on the natural conditions but it is also to a great extent a result of using modern technology, including mineral fertilisers and pesticides. In the second half of the 20th century, global agricultural production increased 2.6 times compared to the beginning of the century, and the level of mineral fertilisation increased as much as 8 times (Szkirudz Z., 2015).

As evident from the research carried out by Wicki, the consumption of mineral fertilisers in the years 1992-2009 increased by 50%, while total volume of crop production in cereal units increased by 4% (Wicki L., 2011). This means that the intensification of agricultural production led to an increase of the environmental footprint resulting from components of fertilisers without proportional increases in yield.

It is estimated that in Poland the state of the environment is relatively good compared to other countries of the European Union. Indeed, in the post-war period, the problem of thread to the natural environment due to excessive use of mineral fertilisers did not exist (Golebiewska B., 2015). In 1950, an average fertilisation in Poland was 18 kg NPK/ha and by 1989 it increased up to nearly 200 kg NPK/ha (Statistical…, 2014). Changes, which took place in Poland after 1989, resulted in a significant increase in the prices of production materials, forcing farmers to limit production expenses. At the same time this involved a reduction in the negative impact on the environment. Subsequent years again brought a slow growth of consumption of NPK and in 2014 the average consumption was 133 kg NPK/ha. The highest level was reported in the province of Opolskie, nearly 188 kg NPK/ha (Fig. 4). More than 160 kg of fertilisers were used also in the Provinces of Kujawsko-pomorskie and Dolnoslaskie.



Source: author's calculations based on: Statistical Yearbook of Agriculture and Rural Areas, Warsaw 2007; Uzytkowanie Gruntow i Powierzchnia Zasiewow w 2014 r. Informacje i Opracowania Statystyczne. GUS, Warsaw 2015.

Fig. 3. **Changes in the set aside land by province between 2005 and 2014**

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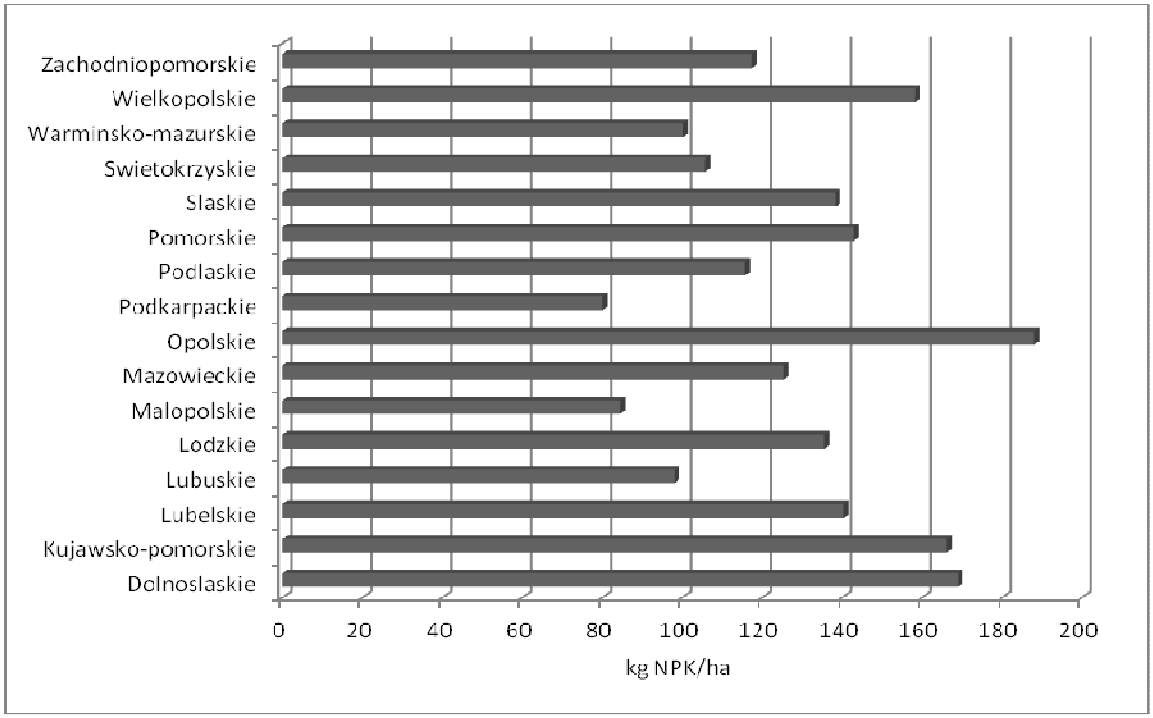
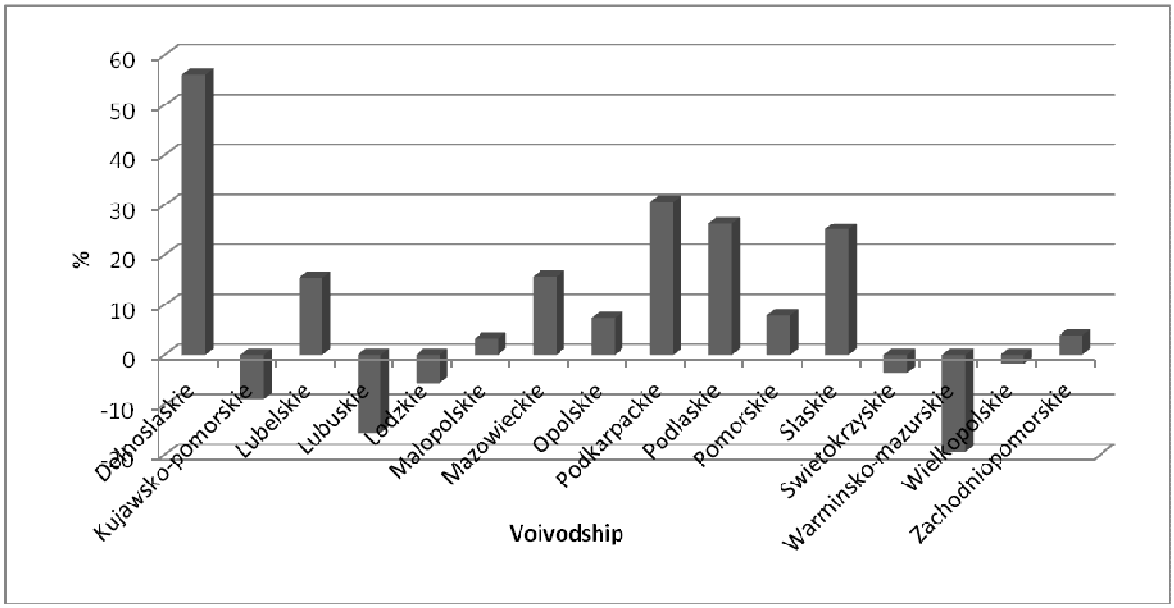


Source: author's calculations based on: Means of Production in Agriculture in the 2013/2014 farming year, Warsaw 2015.

Fig. 4. **Consumption of mineral fertilisers (NPK) per 1 ha of agricultural area in the farming year 2013/2014 by province**



Source: author's calculations based on: Statistical Yearbook of Agriculture and Rural Areas, GUS, Warsaw 2007 and Means of Production in Agriculture in the 2013/2014 farming year, Warsaw 2015.

Fig. 5**. Changes in the consumption of mineral fertilisers (NPK) per 1 ha of agricultural area in the farming year 2013/2014 compared to 2005/2006 by province**

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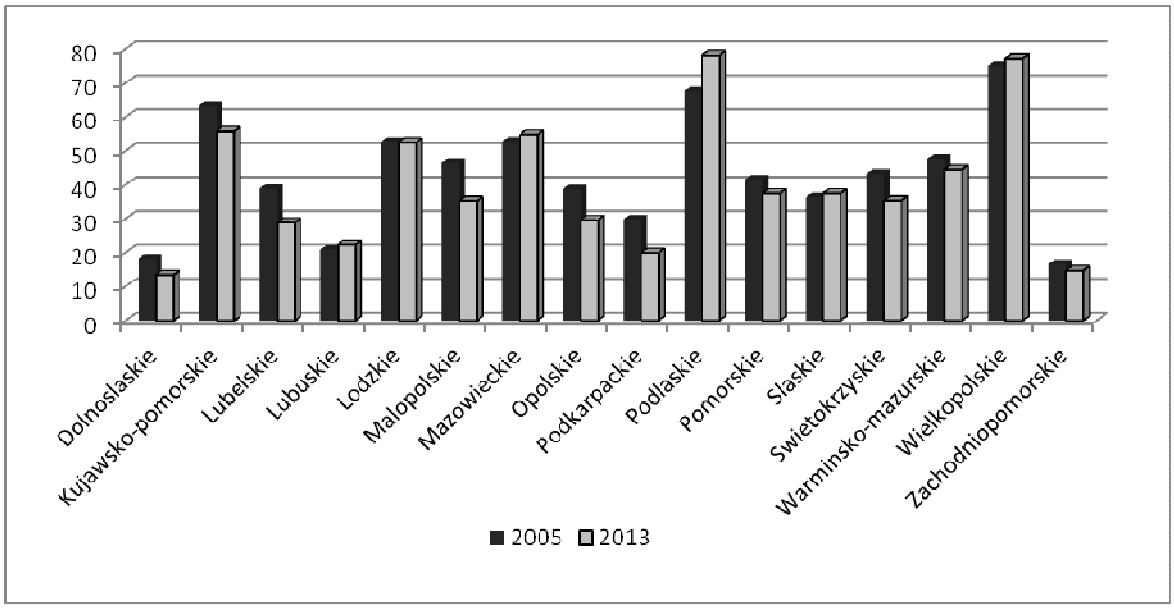

Source: author's calculations based on: Statistical Yearbook of Agriculture, Central Statistical Office, Warsaw 2014 and Statistical Yearbook of Agriculture and Rural Areas, Warsaw 2007.

Fig. 6. **Livestock in large livestock units per 100 ha of the agricultural area between 2005 and 2013 by province**

In most provinces there was a significant increase in the use of mineral fertilisers in comparison to 2005. It was nearly 56% in the province of Dolnoslaskie (Fig. 5). Only in six provinces the use of mineral fertilisation decreased. The largest decrease, by nearly 20%, was reported in the province of Warminsko-Mazurskie and, by 15%, in Lubuskie. This shows the growing threat of generating adverse environmental effects due to agriculture. As indicated by studies carried out by Czyzyk, rates of consumption of mineral fertilisers, especially nitrogen-based, in farms, which carry out an intense crop production, are too high, in excess of the recommended values for sustainable agriculture (Czyzyk F., 2011).An excessive stocking density has also an adverse impact on the natural environment, including air, soil and water. Figure 6 shows the number of animals per 100 ha of agricultural land.

The data presented in Figure 6 show significant regional differences in stocking density. The provinces of Podlaskie and Wielkopolskie as well as Mazowieckie and Lodzkie were characterised by the highest stocking densities. The increase in the number of animals can be seen there in the analysed period. This is not a positive phenomenon from the environment protection perspective.

Conclusions, proposals, recommendations

It has been found that in Poland there are significant regional disparities in agricultural production, which may result in different impact on the environment in each region. Poland is a country with good conditions for agricultural production, although in recent years a significant decrease in the agricultural area could be seen due to change of land use from farming to residential and industrial buildings as well as the use of low-quality land for afforestation. A significant part of the agricultural land is also excluded from the agricultural use, despite the fact that in the years 2005-2014 a decrease in area of set aside land took place, which was mainly due to the introduction of subsidies under the Common Agricultural Policy. So the researchers should consider the legitimacy of subsidies in the context of increased use of areas, which are not suitable for agriculture.

Over the last decade, in most provinces there has been a significant increase in the use of mineral fertilisers. In some provinces it even exceeded 50%. This is not a positive phenomenon from the perspective of ecology; however, the level of fertilisation in Poland is far from that which exists among others in Western Europe (the Netherlands, Denmark, Germany etc.).

In assessing the changes in the stocking density, it should be noted that there are areas predestined to livestock production and in these areas there are many animals in livestock units per 100 ha of agricultural area.

The analyses carried out show that in Poland there are areas, where too intense agricultural production may have an adverse impact on the natural

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environment. Therefore, it can be concluded that, when making decisions with regard to agriculture in the context of the protection of the environment, the analyses should be carried out regionally, and sometimes even locally, because the average for the country can be confusing. In addition, the cooperation of specialists in various fields is required to make reliable evaluations.

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MEASURING TOURISM SEASONALITY IN REGIONS OF LATVIA

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Abstract. Tourism seasonality is a global problem which affects the tourism in the regions of Latvia especially during the quiet season. Determination of seasonality in Kurzeme, Zemgale, Vidzeme and Latgale regions would allow reducing the influence of the causal institutional, social or economic factors. Qualitative and quantitative methods were used: content analysis of scientific and applied literature; quantitative - time series analysis method. Within the research the tourism seasonality in regions was ascertained whereupon in Vidzeme and Latgale an upward trend of seasonality was observed while in Kurzeme and Zemgale – a *downward*

Key words: tourism seasonality, regions, tourist accommodation, time series analysis.

JEL code: R12

Introduction

The tourism seasonality is seldom a subject of research in Latvia, while it is a traditional theme of research in the international arena. The impact of seasonality to the tourism industry can cause losses for the national economy of Latvia and harm the ecological, social and cultural environment – this is the main reason for the necessity and importance of such research theme.

Research object: tourism seasonality;

Research aim: estimating of the tourism seasonality in the regions of Latvia.

Research tasks:

1) to investigate theoretical materials on the tourism seasonality, the methods for its estimation; 2) to define and to assess the tourism seasonality of regions of Latvia.

Research methods:

qualitative method is used – content-analysis of scientific and applied literature; quantitative - time series analysis method.

Theoretical background

The concept of tourism seasonality

Tourism seasonality is one of tourism sustainability problems which havs been studied by multiple researchers (Butler R.W., 1994; Chung I.Y., 2009; Kolomiets A., 2010; Bigovic M. 2011; Rana A., 2014). Despite the long history of tourism seasonality research it is "one of the most problematic and one of the least examined tourism specifics" (Amelung B., Nicholls, S., 2007).

Each researcher defines the tourism seasonality differently. For instance, "seasonality is fluctuation within a year period which is directly connected with a certain part of season" or as it is described a global trend in the tourism industry caused by "a temporary movement of people" (Bender O., Schumacher K.P., Stein D., 2005; Chung I., 2009). Thereby, the fluctuation is one of the most frequent characteristics of tourism while the demand for tourism services is changing on an annual basis.

Seasonality is characterized by its cyclicality. The high-season during the warm period of year, the cold, quiet or empty season during the cold period of year as well as the mid-season in between the both seasons (Gilbert D., 1990). Nevertheless, there are some exceptions of seasonality, e.g. Singapore and Hong Kong where no cyclicality can be observed due to the destinations availability throughout the year, and the state of *Dynamic Seasonality* or the *multiple-demand seasonality* which is not associated with a fixed period of year.

Seasonality is defined and evaluated by different elements, such as "number of visitors, use of certain types of transport, employment dynamics, and the number of tourist destinations." (Baum T., Lundtorp S., 2001).

Effect of the tourism seasonality

Seasonality can cause both positive and negative effects. The positive effects – the quiet season can create conditions for 1) period of rest for both the regeneration of the natural resources and the renewal of economy; 2) the local inhabitants to preserve their traditional lifestyle and identity and to "transfer it through time" (Butler R., 2001). While a restless use of natural resources can cause harm to the tourism destination the seasonality by reducing the flow of visitors can have beneficial attributes for sociological and ecological "refreshing of environment" (Hartmann C.J., 1986).

Seasonality's negative aspects include serious economic and ecological effect which can be further

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divided into distinct groups in accordance to their affect – economic, employability, ecological and social-cultural impact.

Economic impact is mainly related to the loss of profit due to the inefficient use of resources, lower investment return yields, problems related to employability as well as problems related to serious lack of visitor' accommodation space during the high season etc. (Chung I., 2009).

Meanwhile the employability impact cause a rapid growth during the high season, high levels of unemployment during the quiet season and besides "instability within the job market, further facilitated by the short-term nature of employment in the tourism destinations". (Kellens W., 2012).

The author notes that the tourism seasonality causes interruption in the employment continuity within all of the employment cycles, especially the cycles related to job acquisition and retention, training and development etc.

On the one hand, it affects the competitiveness; the entrepreneurs are not willing to invest in the employee training and development. These factors meanwhile impact the quality of end product and services, which eventually can negatively affect the consumer satisfaction and their plausible return to the destination. On the other hand unbalanced flow of tourists can undermine the sole existence of the ecology of the tourism destination.

Ecological impact – is mainly defined as a pressure of visitor concentration intensity on the vulnerable environment of the tourism destination territory during the *hot season*, which often causes further environmental contamination and loss of natural resources (Batler R., 2001; Corluka G., Matoševic M., 2013).

Socio-cultural impact – changes of the social characteristics of the tourism destination which can be related to foreign cultural influence, interference with the lifestyle of the local societies. The socio-cultural impact can also be related to such problems as increase of traffic, overpopulation, noise pollution, as well as significant increase of cost of public services and crime index due to the increased flow of people. Besides during the hot season the necessity for police, sanitary and medical personal is increased due to the increased risk of accidents which further negatively affect the traditional lifestyle of the locals etc. (Chung J.Y., 2009).

The positive and negative effects of the tourism seasonality are caused by factors, which have been investigated by researchers R.W. Butler (1994), I.Y. Chung (2009), A. Kolomiets (2010), M. Bigovic (2011), A. Rana (2014) et.al., who further classify the tourism seasonality by three main groups: 1) natural factors; 2) institutional factors; 3) social and economic factors.

Natural factors are related to natural phenomenon, i.e. annual precipitation, number of sunny days, temperature which all affect the tourism demand. Natural seasonal phenomenon has traditionally been considered as a permanent indicator, which nevertheless has been affected by the global climate changes, thus, making it less expectable. Meanwhile, tourists prefer destinations during warm season and are less likely to visit it during the cold and rainy 'quiet' season (Baum T., Lundtorp S., 2001).

Institutional factors – are a result of human interaction and influence politics, culture, religion and social life as such. For instance, school and national holidays are called *calendar effects*. These factors despite their various occurrence can be observed in almost every single country worldwide (Baum T., Lundtorp S., 2001).

Social and economic factors are related to employability, income, efficient use of buildings, emigration and social capital deficit of the population, quality of life etc. These factors are most often manifested in relation to regions where tourism has or might have a significant role in the development of the national economy (Butler R.W., 1994, Corluka G., et al., 2013).

In the existence of globalisation, the influencing factors of the tourism seasonality are complemented with calendar effects, traditions, sport events, inertia, social pressure, fashion etc.

While carrying out the analysis of theory, the author concludes that in the theory different authors portray the tourism seasonality factors in a similar fashion while determining the natural and institutional factors as being of an equal importance for affecting the tourism seasonality which is then to be followed by social and economic factors.

Research methods of tourism seasonality

Tourism seasonality can leave an impact both on physical and financial aspects of tourism development. Monetary indicators influence the profit whiles the non-monetary indicators – the number of attendees. The comparison of such indicators is of significant

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importance when developing the strategy for reduction of impact of seasonal factors (Ridderstaat J., 2013).

When carrying out the analysis of theory in the field of tourism seasonality author recognized use of six different methods: seasonal range method, seasonal ratio method, seasonal indicator method, estimation of Gini coefficient method and time series method.

Methods for estimation of tourism seasonality:

1) seasonal range estimation method is the difference between the highest and lowest index;

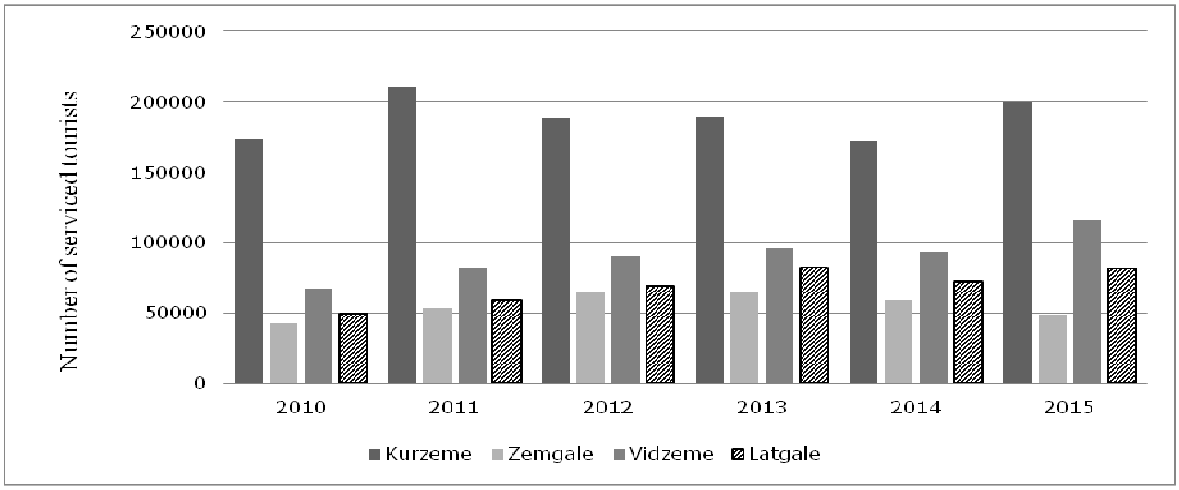
2) seasonal ratio estimation method, when the largest value of indicator is divided by the average;

3) seasonal indicator estimation method, when the average indicator value is divided by the largest value;

4) Gini coefficient estimation method is based on Gini coefficient, which is a statistical unit derived from the Lorenz curve. 1) Gini coefficient is calculated as the area between the curve and the imagined absolute equality line, positioned in a 45 degree angle, divided by the zone located underneath the equality line; 2) Gini index is calculated as the interrelation between the number of tourist arrivals and the cumulative number of tourist arrivals;

5) *seasonality index estimation method* – seasonality index (ω) is the proportion between the average number of tourist arrivals on a monthly basis and the largest number of estimated arrivals during a month (Chung J.Y., 2009; Petrevska B., 2012; Rana A., 2014);

6) time series analysis method is based on comparison of periodical data, i.e. time series, which determine the changes of the statistical object or phenomenon. This method is used in order to discover and analyse seasonal fluctuation, estimate the seasonality depth in a perspective of a year and to determine its changes (Salo A., et al., 2012; Sharma A., Bose M., 2013).



Source: author's construction based on CSB, 2015a

Fig. 1. **Number of tourists serviced in hotels and other tourist accommodation establishments in regions of Latvia (2010-2015)**

Research methodology

For determination the tourism seasonality in the regions of Latvia, namely – Kurzeme, Zemgale, Vidzeme and Latgale the author used data from the Central Statistics Bureau (CSP). Such information included the number of tourists which have settled in the tourist lodgings from 2010 to 2015 per quartiles. It must be noted that no data on earlier activity nor data on crosscut monthly activity is publicly available. Number of tourists who settled down in the tourist lodges has been used for the determination because it displays the real number of tourists in certain location. Author used both quantitative and qualitative methods: content-analysis of scientific and applied literature and time-series method for determination of tourism seasonality in the regions of Latvia: Kurzeme, Zemgale, Vidzeme and Latgale. The use of time series method was justified by the availability of reliable data which cover annual quartiles which further constrained the use of other methods and the in-depth analysis of seasonality. The calculated dynamic series average level, the average absolute increase, increase rate and the average increase rate, standard deviation of each year as well as other descriptive statistics data allowed determining the tourism seasonality in Latvia.

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Research results and discussion

When comparing the regions of Latvia by the serviced number of tourists in the tourist lodgings in period from 2010 to 2015 (Fig.1), it is acknowledged that Kurzeme regions has advantage over other regions in this regard.

Maximum number of serviced tourists in hotels and other tourist accommodation establishments in 2011 (Table 1) reached 106 623. The largest quantity of serviced tourists in Vidzeme was in 2015 – 48 006 tourists, in Latgale in 2013 at 30 920. Meanwhile in Zemgale the largest quantity of visitors was serviced in 2014 at 25 095. Author notes that the largest number of tourists can be attributed to the 3rd quarter, i.e., July, August and September. Meanwhile, the number of serviced visitors in first and fourth quartile is significantly smaller. In Kurzeme in 2010 it was 17 411, in Zemgale in 2015 – 2 500, in Vidzeme in 2010 – 8866, but in Latgale – 7968 serviced visitors which indicates towards presence of seasonality. One should agree with Butler (2001), that such significant fluctuation of the number of serviced visitors can only be attributed to the phenomenon of tourism seasonality.

Table 1

Descriptive statistics on the serviced number of tourists in hotels and other tourist accommodation establishments in regions of Latvia from 2010 to 2015

Year	Descriptive	Kurzeme	Zemgale	Vidzeme	Latgale
2010	Minimum	17 411	6 217	8 866	7 968
	Maximum	98 946	14 419	29 051	17 930
	Mean	43 536	10 593	16 795	12 499
	Std. deviation	37 762	3 448	8 618	4 123
2011	Minimum	21 859	9 825	14 819	10 487
	Maximum	106 623	17 014	31 618	20 405
	Mean	52 722	13 383	20 469	14 766
	Std. deviation	38 132	2 972	7 617	4 228
2012	Minimum	25 761	11 611	17 194	12 942
	Maximum	89 607	21 957	32 461	18 270
	Mean	47 233	16 277	22 462	14 712
	Std. deviation	29 342	4 428	6 872	2 447
2013	Minimum	23 798	11 524	18 223	12 894
	Maximum	91 507	22 201	36 148	30 920
	Mean	47 408	16 205	23 862	20 592
	Std. deviation	30 918	4 430	8 418	7 768
2014	Minimum	242	13 348	16 852	14 181
	Maximum	98 738	25 095	49 278	31 394
	Mean	50 301	18 050	28 996	22 263
	Std. deviation	34 100	5 718	14 160	8 208
2015	Minimum	25 464	2 500	18 577	13 226
	Maximum	95 103	18 661	48 006	29 479
	Mean	50 023	12 098	29 078	20 336
	Std. deviation	31 815	6 903	13 311	684

Source: author's calculations based on CSB, 2015b

The phenomenon of tourism seasonality is determined by using the time series model, in which the changes of indicators are indicated by specific indicators, i.e., dynamic series average level, the average absolute increase, increase rate and the average increase rate, standard deviation of each region (Table 2). Meanwhile the descriptive statistics was used l for determination of seasonality. It showed that the highest number of serviced tourists in Hotels and other Tourist Accommodation Establishments in regions of Latvia during the time period from 2010 to 2015 (Table 1) can be attributed to Kurzeme region – 189 347 tourists accordingly. The large quantity of serviced visitors can be attributed to the large number of tourist lodges in the region in comparison to that of Latgale and Zemgale, and the larger quantity of bed places in the lodges themselves, and finally with the increased interest by the tourists about the attractions

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and tourism products in Kurzeme region, for instance Venstpils municipality (CSB, 2015b).

The average absolute increase determines the average amount by which the studied phenomenon has increased over the whole series of period of interest. The research reveals that in time period from 2010 to 2015 the average absolute increase of number of serviced visitors in Kurzeme region is negative (Table 2), while in Vidzeme the highest increase amounts to 9 827 tourists. The growth is indicated by the average absolute increase and the average increase of pace 101.73%, this defines the average intensity of changes of the phenomenon. On one hand as it was indicated by Butler (2001), the seasonality offers a relief for the natural resources and it plays a positive role, while Hartman (1986) suggests that a "refreshing" of both sociological and ecological environments take place. Meanwhile on the other hand – as it was indicated by Chung (2009) and Kellen (2012) – seasonality's negative influence can cause economic, employment, ecological and social-cultural impact.

Standard deviation (SD) of number of serviced tourists in hotels and other tourist accommodation establishments of each regions of Latvia indicates the data dispersion around the average arithmetic. For instance, in 2015 (Table1) in Kurzeme region in the distance of two Standard deviations from the average value (50023 - 2 * 31815; 50023 + 2* 31815), or in interval (-1 607; 113 653) all of the data can be located. Correspondingly during the same year intervals are: in Zemgale region (-1 708; 25 904); Vidzeme region (-23 644; 55 700) and Latgale region (-6 660; 34 012). When comparing the dispersion of the number of tourists serviced in Hotels and other Tourist Accommodation Establishments around the average arithmetical, author notes that in Zemgale and Latgale regions the tendency was similar, while the Kurzeme region is described by a larger dispersion. This means that the seasonality can be traced in all regions, but in Kurzeme region the author observed more articulate fluctuations. One of the reasons for such differences may be attributed to the larger number of visitors of hotels and other tourist accommodation establishments than that of other regions while the different reasons should be further investigated (CSB, 2015b).

It should be noted that the average increase pace of serviced tourists in hotels and other tourist accommodation establishments in regions of Latvia is not significant. In Vidzeme and Latgale it corresponds to 2% and thus the base-trend of tourism seasonality can be described as *upward,* meanwhile in Kurzeme (despite its larger number of visitors in comparison with other regions) and in Zemgale stagnation caused by the tourism seasonality can be observed and the base-trend in these regions is *downward*. The growth in Latgale and Vidzeme is more pronounced, which might be due to an offer of more high quality tourism services. In Vidzeme, it is fostered also by the larger number of hotels and other tourist accommodation establishments. Meanwhile in Kurzeme the saturation stage in tourism sphere has been reached and action aimed at the renewal of tourism destination offer as well as provision of new innovative services is needed. Altogether the author notes that there is an increased need for an in-depth research in the field of tourism seasonality in regions of Latvia in order not only to recognize the current situation but also to acknowledge the influential factors and to find ways for reducing the effect of seasonality. Besides for determination of tourism seasonality in regions of Latvia due to different reasons the current methods may not offer complete, in-depth analysis and for that reason combined methods i.e. triangulation should also be used.

Table 2

Indicators of number of serviced tourists in hotels and other tourist accommodation establishments from 2010 to 2015 in regions of Latvia

Indicators	Kurzeme	Zemgale	Vidzeme	Latgale
Average number of serviced tourists	18 9347	55 496	90 650	69 012
Average absolute increase of number of serviced tourists	-349	1 204	9827	6270
Average growth pace (%)	100.44	100.41	101.73	101.53
Average increase of pace (%)	0.44	0.41	1.73	1.53

Source: author's calculations based on CSB, 2015a; 2015b

Conclusions

1) Tourism seasonality is a global challenge which is a characteristic of Latvian tourism. Seasonality is characterized by its cyclicality which is described by the hot season, the cold, quiet or empty season and the midseason. The positive side effects of seasonality include 'refreshing of environment'. The negative impact of seasonality is caused by natural

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factors; institutional factors; social and economic factors. The tourism seasonality is mainly determined with the help of seasonal range, determination of seasonality ratio, determining of indicator, and calculation of Gini coefficient and time series methods.

2) The average number of serviced tourists in regions of Latvia from 2010 to 2015: in Kurzeme – 18 9347; in Zemgale - 55 496 with an average increase of pace 0%, in Vidzeme – 90 650 and in Latgale – 69 012 with an average increase of pace with a slight increase (from 1.53% to1.73%).

3) In Vidzeme and Latgale the tourism seasonality base-trend is *upward,* while in Kurzeme and in Zemgale – *downward*. The growth of tourism and the number of serviced tourists is more distinct in Latgale and Vidzeme. In Kurzeme reconstruction as well as renewal of tourism destination offer as well as provision of new innovative services is needed.

4) In Zemgale and Latgale regions the tendency is similar, while in Kurzeme region it is described by a larger dispersion. This means that the seasonality can be witnessed in all regions, meanwhile in Kurzeme region the author notices more articulate fluctuations due to larger number of visitors of Hotels and other Tourist Accommodation Establishments during the season.

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LOCAL ACTION GROUPS IN THE DEVELOPMENT OF RURAL AREAS IN LUBELSKIE VOIVODESHIP (POLAND)

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Abstract. The aim of the study was to identify, basing on a literature review, the importance of Local Action Groups (LAGs) in the creation of rural development and to determine (basing on an empirical study) the role of LAGs in stimulating the neo-endogenous development mechanism of Lublin voivodeship. The area of the study included 40 municipalities of Lublin voivodeship (30 municipalities from the group with the highest environmental preciousness and 10 comparative municipalities from the group with the lowest environmental value in Lublin voivodeship, according to the index developed by D. Guzal-Dec). The study was conducted on a group of 16 LAGs (61.5% of total in the voivodeship), associating the above-mentioned 40 local governments.

The study used the method of document analysis and diagnostic survey with an interview questionnaire addressed to the heads of municipalities. LAGs' local development strategies as well as the official websites of associations and projects of cooperation were the source of information about the LAGs. As shown, the investigated LAGs constitute an important but under-used instrument for creating local development, basing on the innovative use of local resources in supra-local projects. It is then appropriate to provide educational support for LAGs and to promote good practices in the area of the innovative use of resources in the LAGs.

Keywords: LEADER initiative, Local Action Groups, neo-endogenous development, Lublin voivodeship.

JEL Code: O 17

Introduction

The development of peripheral regions is a challenge of the EU regional policy. That is why it is important to search for the factors accelerating the processes of development and ways to enhance positive impacts of these factors. Lublin voivodeship was the study area because it is not only a national (Polish) example of such an peripheral region but also a supranational (the EU) one. Lublin voivodeship is located in the border zone, in the macro-region of the Eastern Poland, showing the lowest level of economic development in Poland and one of the lowest in the European Union*. Lublin voivodeship is one of the least populated and urbanized regions of the country. Its demographic situation is unfavourable and continues to deteriorate as a result of its number of births and migration outflow. Lublin voivodeship is characterized by low transport accessibility and the low availability and consistency of communication within the region. The share of the agricultural sector is relatively large in the production structure of the gross added value in Lublin voivodeship. Poland's accession to the EU enabled development of external financial support, implemented mainly under the Rural Development Programme (RDP) and the Regional Operational Programme of Lublin voivodeship (ROP) in the period 2007–2013. Additionally, the Operational Programme Development of Eastern Poland (OP DEP) was specifically dedicated to the problematic areas of the Eastern Poland. The LEADER initiative, as implemented under the Rural Development Programme (RDP), was of major importance to the enhancement of bottom-up development initiatives. The initiative served and supported the creation and functioning of Local Action Groups. The aim of the study was then to determine the role of Local Action Groups (LAGs) in stimulating the neo-endogenous development mechanism of Lublin voivodeship. Implementation of the aim was to provide verification of the following hypothesis: LAGs in Lublin voivodeship contribute to the development of innovative supra-local projects. It was assumed, following S. Michalska and K. Zajda, that projects using local resources in accordance with the specific trajectory and the general trajectory with specific features will be recognized as innovative (Michalska S., Zajda K., 2011).

The area of the study included 40 municipalities of Lublin voivodeship – 30 municipalities from the group with the highest environmental preciousness and 10 comparative municipalities from the group with the lowest environmental value in Lublin voivodeship, according to the index developed by D. Guzal-Dec – the procedure is detailed in Guzal-Dec 2013. The study was conducted on a group of 16 LAGs† (61.5% of total in

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*The lowest in Poland and 11th in the list of the 20 poorest regions in the EU, according to EUROSTAT, 2014.

† "Bialskopodlaska LGD", "Roztocze Tomaszowskie", "Zielony Pierscien", "Lepsza przyszlosc Ziemi Ryckiej", "Poleska Dolina Bugu", "Ziemia Bilgorajska", "Ziemia Zamojska", "Polesie", "Lesny Krąg", "Nasze Roztocze", "Krasnystaw Plus", "Jagiellonska Przystan", "Owocowy Szlak", "Zapiecek", "Dolina Wieprza i Lesnym Szlakiem", "Grzeda Sokalska".

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the voivodeship) associating the above-mentioned 40 local governments. The study used document analysis and diagnostic survey with an interview questionnaire addressed to the heads of municipalities and analyses of documents. Analysis of local development strategies of LAGs and the official websites of associations and projects of cooperation enabled preliminary general characteristics of associations (their financial potential, membership structure) and the characteristics of the projects of cooperation (their range of subjects, description of projects). The questionnaire interview included questions about the most important benefits achieved through cooperation and evaluation of cooperation by local authorities. The report was prepared as part of the research project No. 2011/01/D/HS4/03927, entitled "Environmental Conditions and Factors of development of the economic functions of the valuable natural areas of Lublin voivodeship" funded by the National Science Centre.

Research results and discussion

1. Problematic issues of the development of Lublin voivodeship – in the light of national studies

The research conducted in Poland by P. Swianiewicz, concerning the absorption of the EU funds by local governments in the financial perspectives 2004–2006 and 2007–2013, indicates a problem in adjusting the directions of applications to the availability of funds and applying for funding for projects previously unplanned, not urgently needed. Poor strategic management with the use of the EU funds is an example of an inefficient approach of local governments to the implementation of their own development strategies (Swianiewicz P., 2013)*.

Research conducted by a team of B. Plawgo, in the analysis of the impact of the local government sector on the processes of socio-economic development in 120 municipalities of the Eastern Poland, confirms the serious problem of the dysfunctional absorption of the EU funds. Development activities implemented with the absorption of external funds focused on creating and developing infrastructure aimed at meeting the basic needs of the local community. To a limited extent, efforts are being aimed at creating conditions for endogenous development based on cooperation in production networks implementing new projects, clusters and the formation of social capital conductive to entrepreneurship and innovation (Plawgo B., 2010).

The analysis of the potential impact of the activities of municipalities in applying for the EU funds on the development of the surveyed local governments does not enable reliable inferring any positive impact of the support obtained on the dynamics of development (there is no statistically significant importance to the rate of socio-economic development indicators' changes) (Plawgo B., 2010). Absence of any statistically significant correlations is largely due to the short period from the end of individual investments but also to the character of the implemented investments. The selected projects were aimed at meeting the most immediate needs of the local community. However, the extent of the impact of this type of investments is mainly local. This conclusion can be confirmed by the results of the implementation of the project entitled: "Evaluation of the Impact of the Implementation of the Cohesion Policy 2004–2006 on Strengthening the Capacity of the Socio-economic Development of the Eastern Polish Regions". In the surveyed municipalities of Eastern Poland, the projects implemented were primarily those with a range not exceeding the regional, dominated by local ones (the Ministry of Regional Development, 2010). Local investments, due to their small value, do not always receive the appropriate "critical mass" for starting self-acting endogenous development. They do not solve the problem of remoteness which has been for years faced by local governments of Eastern Poland (Grosse T.G., 2007).

In 2013, under the order of the Department of Economy and Innovation of the Marshall's Office of Lublin voivodeship, a study was conducted on the level of competence and capabilities of the public administration to manage growth and create innovation. The study was carried out in 167 municipalities (98% of all rural municipalities in the voivodeship) (P. Czyz et al., 2013). The study showed a low level of activity of local governments of rural municipalities of Lublin voivodeship in the sphere of development and application of innovative solutions. Indirect actions were by far the most common form of activity in supporting innovation of enterprises, e.g. shaping relevant local laws, tax facilitations/exemptions or stimulating cooperation between enterprises.

2. Cross-sectoral partnership – LAGs as determinants of rural development

Local authorities are the not-contested main entities stimulating development processes (Blakely E.J., 1989) but, as representatives of local communities, they

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* research carried out in 50 municipalities of the regions of Lublin, Malopolska, Podlasie and Slask.

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should consider and determine the place of the communities in setting the vision and goals of development. The concept of sustainable development, in contrast to the paradigm of globalization, highlights the subjectivity of the local community. The greater the involvement of the various social partners in the system of local governance, the greater the chances of sustained growth – the co-governing concept enables better identification of problems in the area and enables faster overcoming them (Adamski T., 2008).

According to Böcher M. (2008), the LEADER type initiatives are instances of regional (territorial) governance which can be characterized by such important features as: increasing self-governing responsibilities of regions; replacing the principle of "administrative" territory by a functional principle; inter-sectoral co-operation through regional networks and partnerships; hierarchical steering of incentives through various instruments and forms (i.e. support programs and their eligibility rules). LEADER is based on an economic development model of rural areas called: "Community-led rural development theory". This model, presented by I. Terluin in the paper "Rural Regions in the UE: Exploring Differences in Economic Development" identifies "the main precondition for generating and sustaining economic development in rural regions: the existence of community capacity to function on a self-help basis. The community-led rural development theory focuses on the strengthening of the self-help capacity of local actors, which is considered to be a major precondition for establishing and sustaining local economic development. Partnerships and adjustments of the institutional structures are seen as the main tools in the process of capacity building (Terluin I.,2001).

Due to the ever-increasing role the LEADER approach has played in realising the Rural Development Policy, Local Action Groups (LAGs) have become crucial to the institutional system of rural development (Kis K., Gal J., Veha A., 2012). LAGs are made up of public and private partners from a rural territory and must include different socio-economic sectors. They receive financial assistance to implement local development strategies by awarding grants to local projects. The LEADER 2007–2013 financing perspective included three actions carried out in Poland: implementation of local development strategies, implementation of cooperation projects and the functioning of LAGs, acquiring skills and mobilization.

The main aim of LAGs is to develop, update and implement the objectives identified in local development strategies (LDSs). They are the basis of each LAG operation and include directions for developing areas belonging to the group. The action of "implementing cooperation projects" enables the realisation of joint projects within the framework of interregional and international cooperation. Under the measure, support is granted for projects included, or not, in the relevant LDS but consistent with the objectives of the LDS. These projects must establish joint ventures and may involve, in addition to LAGs, other partnerships with other EU Member States or third countries that deal with the issue of rural development. Cooperation projects provide an opportunity for networking on an international scale; the networks' participants exchange experience and know-how. They also open up the possibility of creating social capital resources (Zajda K., 2013b).

The functioning of LAGs is then for the use of external and internal factors in the creation of local development. The European Union support is to spur development impulses through the use of local resources in the process of development. LAGs, through cooperation projects, should also become an important entity in the creation and diffusion of innovation. It can be assumed that participation in cooperation projects of foreign partners will promote the diffusion of innovation, the use of local resources by LAGs in a unique manner, linked to the specificity of the area covered by support (Zajda K., 2013a).

LAGs can use the definition of innovation contained in the "Rural Review", according to which "innovation can simply be the introduction of technologies and good practices used elsewhere and adapting them to specific conditions and circumstances prevailing at the new location or the introduction of proven concepts, in a new, more effective manner. Innovations understood in this way often result from intensive contacts and cooperation with entities that operate elsewhere, from teamwork and the created networks as well as inter-regional and transnational cooperation" (Creativity and Innovation, 2009). The Guide to the RDP Axis 4 Cooperation Projects 2007–2013 reads, however, that innovation is understood as: the use of ideas and solutions elsewhere common but with innovative nature, on a given area; innovative use of local resources; development of new types of production or services; new ways of involving the local community in the development process. It is also noted that partners

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can extend the definition given above, indicating other, innovative solutions. It is necessary, however, for cooperation project to describe how the partners perceive the concept of innovation (Guide to RDP..., 2012). It should be noted that the concept of innovation and the innovation of LAG activities are defined very broadly. This provides a great freedom of interpretation and LAGs often recognize any action absent earlier on the supported area as innovative. As noted by Zajda K. and Michalska S. (2011) such a belief becomes a real barrier to the implementation of innovations. According to the authors, innovative use of local resources in the processes of development may be granted only where:

- unique resources are used in a custom way, in conjunction with local tradition, specificity – the "specific trajectory" of using local resources or
- common resources, typical of many areas, are used in a custom, unique manner, linked to local specificity – the "general trajectory with specific features".

Summing up, it is clear that the functioning of LAGs can be identified as a model example of cooperation, the essence of which is to mobilize the local potential of human resources (human, social, relational capital) to identify and mobilize utilization (by assumption, in an innovative manner) of resources (especially natural and cultural) in the process of local development.

3. LAGs in Lublin voivodeship – activities in cooperation projects

As of 31 December 2013, 26 LAGs operated in Lublin voivodeship, they included all (193) rural and urban-rural municipalities of the voivodeship. In-depth studies were conducted among 40 municipalities of the voivodeship, they belonged to 16 LAGs (61.5% of total), bringing together 133 municipalities of the region. The studied 16 LAGs associated from 3 to 17 local governments. The structure of the studied LAGs complied with the rule of at least fifty-percent representation of economic and non-governmental sectors – other than public partners of the members of the groups accounted for, on average – 82% and 64% in the case of councils. In relation to the proportion of the members of LAGs, the social sector was over-represented (45%) in councils, the public sector accounted for 36% of total. The LAGs associating the studied municipalities dealt mainly with protecting and promoting the local natural and cultural heritage and the promotion of tourism. The studied LAGs joined 17 projects of cooperation, including 2 international. The number of cooperation partners ranged from 2 to 12.

The determinant of the financial capacity of LAGs in the context of supporting the development of municipalities belonging to these associations is not so much the value of the LDS budget but the value of budget funds per 1 municipality. In the case of the studied LAGs, the LDS total budget value ranged from PLN 6.2 to PLN 22 million, and the rate – the amount of budget per 1 municipality is in the interval of PLN 0.7 to PLN 3.1 million. It could seem that cooperation projects should be an important item in the LDS budget – as the partnership idea. Unfortunately, as demonstrated by the analysis of the LDS budgets of the studied LAGs, the value of cooperation projects ranged from PLN 0.1 to PLN 1.9 million and did not exceed more than 9% of the budget*.

Table 2 presents the thematic scope and activities of the undertaken cooperation projects.

The cooperation projects primarily invested in tourism infrastructure and promotion of tourist attractions. All of the analysed cooperation projects have signs of innovation within the meaning of the definitions and guidelines of the "Guide to RDP..." and "Rural Review ...". However, only eight projects (including 2 international) used local resources in an innovative way in accordance with the specific trajectory* or the general trajectory with specific features**† (as interpreted by the innovative use of resources by Michalska S. and Zajda K.). Following, there are the assumptions of the most interesting projects.

* It should be noted, however, that the actual budget for the cooperation project, as a whole, is the sum of contributions made by all of the project partners (Guide to RDP, 2012)

†"Eco-museum of Lublin Living Tradition"*, "In the footsteps of the past historical and cultural heritage of the central and eastern part of Lublin region"* "Treasures of nature and culture"*, "Learning by doing – International Youth Project"**, "Local Investor Service Centres, Eastern European Gateway"**, "Virtual Tourist Zone"**, "Tourism – Ecology – Activity – Management (TEAM)"**, "Virtual walks as a bridge between the Lublin and Podkarpacie LAGs"**.

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Table 2

Thematic scope and activities of the cooperation projects implemented by the LAGs associating the studied municipalities

Project title	Thematic scope of the project	Activities of the project
Tourism – Ecology – Activity – Management (TEAM)	improvement of rural infrastructure, rural tourism, ecology and environment, support for new technologies	delineation and marking a new and innovative system of bicycle routes, the creation of innovative forms of three-sector cooperation "Region Home" and promotion at home and abroad
Welcome to Roztocze	promotion of local natural and cultural heritage	preparation and publication of a tourist brochure, installation of information boards, participation in tourism fairs, a conference summarizing the results of the project
Eco-museum of Lublin Living Tradition	promotion of local products, promotion of local natural and cultural heritage, ecology and environment, rural tourism	marking objects constituting the Eco-museum, development of tourist passports and promotional leaflets, a website, training for facility managers
Creation of a canoe route - The Wieprz Valley	protection of culinary heritage,river tourism, rural tourism	creating a network tourist product in the form of a marked canoe route and organizing joint promotion by creating a Polish-English Internet portal, printing a tourist guide with a map and organizing canoeing events
KRAM (The MASTER Forge of Regional Artists)	promotion of local natural and cultural heritage	conducting workshops for residents in the field of folk art, organization of a summarizing conference, publishing a brochure on folk art, creating centers of artistic creativity in each cooperating LAG, setting up and running a website of the cooperation project
The extraordinary charm of rivers — NURT Tourism	river tourism, rural tourism	organization of canoeing trips, photography workshops and a photo competition, publishing a local folder aimed at promoting local rivers and local action groups
In the footsteps of the past historical and cultural heritage of the central and eastern part of the Lublin region	promotion of local natural and cultural heritage, support for new technologies, rural tourism	establishment of an inventory, renovation and marking historical – cultural heritage resources, publishing a Regional Atlas of the project area, creating a multimedia guide as an extensive application that contains proposals for routes, description of interesting places, a multimedia guide as a stand-alone web portal associated with the parties to the partner LAGs
Get a Taste of Tradition	protection of culinary heritage, promotion of local products, agritourism	organizing cooking workshops, carrying out a cycle of television programs, developing a gourmet guide, organizing a Festival of Traditional Products
Treasures of nature and culture	protection of cultural heritage, support for new technologies	development and publication of an album, developing an interactive promotional and informational website, preparation of large information boards, purchase and distribution of promotional materials, organization of conferences, preparing a promotional video, publishing articles in the local press
Cooking as the Region's Attraction	protection of culinary heritage	developing and printing a gourmet guide, organizing cooking workshops
Between the Bug and the Wieprz	river tourism, rural tourism	Internet portal execution, development and distribution of a folder, production of promotional spots
The Wieprz Valley	river tourism, rural tourism	marking a canoe route, setting up a website, publishing a guide
Learning by doing – International Youth Project	development of entrepreneurship, support for new technologies, improvement of rural infrastructure	providing group services on the basis of a diagnosis of the needs and professional aptitude of individual beneficiaries, group meetings, establishing international cooperation with a group of young people from Finland and Russia in the use of web-based platform, study visits, on the basis of the developed programs, the project's closing conference
Local Investor Service Centres, Eastern European Gateway	development of entrepreneurship, support for new technologies, improvement of rural infrastructure	creating a modern system of business communication and communication of business information on the basis of the latest IT technology
Virtual Tourist Zone	promotion of local natural and cultural heritage, support for new technologies, rural tourism	promotion of LAG areas through an innovative tool, a "virtual walk" – including panoramas using modules
Our heritage as an attraction - DNA	promotion of local natural and cultural heritage, rural tourism	participation in fairs, organization of conferences aimed at promoting the tourist offer of the region, involving local communities in restoring and preserve their cultural heritage (the Youth Academy of Cultural Heritage), publishing a tourism folder,
Virtual walks as a bridge between the Lublin and Podkarpacie LAGs	promotion of local natural and cultural heritage, support for new technologies, rural tourism	promotion of LAG areas through an innovative tool, the "virtual walk" – including panoramas using modules

Source: author's construction based on information from the websites of the LAGs' projects of cooperation. Retrieved: http://ekomuzeumlubelszczyzny.pl, http://lgdkram.pl, http://dna.lgd-region-wloszczowa.pl.Access: 14.10.2015

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According to the representatives of municipal authorities, the studied associations made it possible to achieve very good results of cooperation (score of 4.7 at a five-point rating scale, where 1 means unsatisfactory and 5 means very good). The most important benefits of cooperation in the framework of the LAGs, as pointed out by mayors, included mainly: increase in social activities of the inhabitants – 20 indications and the possibility of financing through the development of LAG projects that have a large impact on improving inhabitants' quality of life and which exceeded the financial capabilities of the budgets of individual municipalities – 15 indications.

The following benefits were also pointed out: promotion of municipalities – 7 indication, tourist base development – 6 indications and sustaining tradition – 5 indications. Local authorities perceived benefits from membership in LAGs mainly in the context of the possibility of obtaining additional funds for the development of municipalities and the development of social ties and the creation of conditions for the development of tourism. The benefits mentioned did not directly include the effects that supported innovation development and diffusion (for example, exchange of experience and good practices between the members and partners of LAGs).

Conclusions

1) In the light of the literature, a significant potential influence of LAGs was shown on rural development. LAGs serve the development of social capital. The pro-development impact can also result from the possibility of creating innovation (thanks to the cooperation of many entities representing various sectors) and diffusion of innovation – especially through cooperation projects.

2) However, as shown in the study on LAGs from Lublin voivodeship, at their present stage of functioning, they are an important but under-used instrument for creating local development based on innovative use of local resources in supra-local projects. As a result of the study carried out, the hypothesis set up in the paper has been negatively verified.

3) The studied LAGs mainly influenced the development of tourism and social integration through numerous cultural events organized within cooperation projects.

4) For LAGs to become a more efficient tool to support the development of rural areas they should contribute more to the formation of stable, long-term effects of development and not primarily to the initiatives characterized by a local and short-term impact range.

5) It is then advised to provide educational support and promotion of good practices within the area of the innovative use of LAGs' resources.

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POSSIBILITIES OF LABOUR PROTECTION IMPROVEMENT IN MICRO- AND SMALL ENTERPRISES

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Abstract. Possible improvements of labour safety and protection in Latvia's micro and small enterprises are crucial for sustainable development of national economy. The paper analyses the significance of small enterprises for Latvian economy and provides a survey of labour protection issues in Zemgale region. Study of enterprises at locations of their economic activity allows to conclude that most of microenterprises are facing problems with essential non-observance of labour protection requirements. Visually evaluating the workplace environment, it appeared to be incompliant with the labour protection requirements. Recommendations for specific companies were developed, shaping the employer's motivation in establishment and maintenance of labour protection system, development of reporting and information system.

Key words: small and microenterprises, labour protection, labour protection efficiency
JEL code: J28, N84

1. Introduction

In business environment, more than 94% of all enterprises registered in Latvia are micro- and small enterprises. This situation has especially developed in recent years when registration of new microenterprises and commencement of economic activity has become more intense in connection with the EU programmes implemented in cooperation with the State Employment Agency and with support of ALTUM programme of the State JSC "Latvian Development financial institution "Altum". Labour protection legislation and regulations issued by the Cabinet of Ministers in the field of labour protection are applicable to absolutely all enterprises, not sorting them by size and imposing each of them with the liability to establish own labour protection system. However, it is observed that the enterprises have not at their disposal the equal amounts of financial assets as well as human resources in order to successfully solve the problems of labour protection system. With such development of business activity, the government in its care of the population has to organize and supervise the field of labour protection on the state level in order the newly established micro- and small enterprises would independently solve the problems of labour protection within the framework specified by law and regulatory enactments.

Still, the practice demonstrates that micro- and small enterprises face problems in application of financial and other resources, which result from regulatory enactments in the field of labour protection. Likewise often, micro- and small entrepreneurs fail to understand the necessity of labour protection standards and consider them as a regular bureaucratic manifestation from the state. Several conceptual models of occupational safety and health performance have been proposed by researchers (Cagno et al., 2014; Hasle P., Limborg H., 2006). However, these models are not fully exploitable by managers and entrepreneurs of small and medium enterprises (SME) because they do not take into account the particular factors and the particular structure of the cause-to-effect chain of interactions characterizing all the relevant occupational safety factors and the safety performance of an SME in an intervention-oriented way and providing the whole picture of the issue.

The main aim of the article is to review the labour protection aspects in small enterprises activities. The task of the research is to study the possibilities of labour protection measures in micro- and small enterprises, and to deliver proposals for guidelines on labour protection measures in Latvia's microenterprises. The hypothesis is Latvian small enterprises face problems with essential non-observance of labour protection requirements and need guidelines for the improvement of labour protection. In the article traditional theoretical study methods are used: deconstruction method, descriptive method, as well as the empiric study methods: experts' poll, analysis of documents. The article is methodically based on scientific literature sources as well as on Latvia's regulatory enactments.

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2. Importance of micro- and small enterprises in Latvian economy

Micro- and small enterprises in Latvia as well as elsewhere in Europe, constitute a large sector of national economy and play a significant role in economy and employment. The number of economically active merchants and registrations of business companies per 1,000 inhabitants has notably increased within the last 12 years. It is evidently demonstrated by the fact that in 2001 there were 17 registered merchants, while in 2012 – already 36. It is explained by changes in the entrepreneurship legislation, allowing to found LLCs with a reduced fixed capital in order to promote the development of microenterprises. Latvian scientists have addressed the problems of small enterprises. Pavuk O. (2014) has analysed the effect made by microenterprises on the employment, Bruna, I., Sneidere, R. (2011) analysed the activities of small enterprises. The authors can agree with Ratanova et al. (2014) that the development of small enterprises is of a great importance in provision of balanced and sustainable regional development. Changes are made in the tax policy for the development of small enterprises, introducing the microenterprises tax and providing the microenterpreneurs with favourable conditions for commencement of their business, which, in turn, was described by Mazure, G., Viksne, D. (2014) and Engelschalk, M., Loeprick, J. (2015).

In order to determine the category of micro and small enterprises, the study uses data from the last approved reporting period: number of employees and turnover or balance (Table 1). Data for the newly established enterprises is taken from the operative balance sheet. Classification in Table 1 to a certain extent corresponds to Sceulovs, D., Gaile-Sarkane E. (2012).

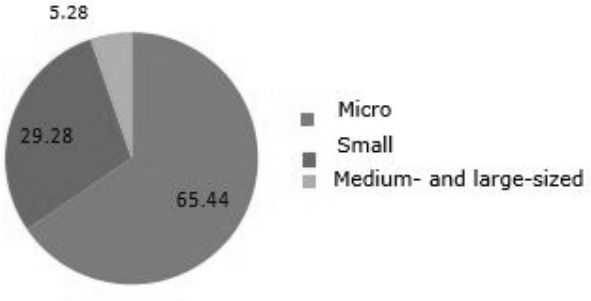
Study carried out by LURSOFT demonstrates that micro- and small enterprises occupy 94% of total number of enterprises registered in Latvia, which evidences a very important role of micro- and small enterprises in Latvian economy.

Table 1

Classification of categories of Micro- and Small Enterprises

Category	Number of employees	Turnover	Balance
Micro	<10	<= EUR 2 mln	<= EUR 2 mln
Small	<50	<= EUR 10 mln	<= EUR 10 mln

Source: EU Regulation 364/2004



Source: authors' calculations based on LURSOFT (2014)

Fig. 1. **Distribution of enterprises by categories**

Review of activities of micro- and small enterprises demonstrates that the most popular are trade, services and real estate. Data of study carried out by LURSOFT demonstrates that the main activity of almost a quarter (24.5%) of all Latvian microenterprises is retail or wholesale trade (except motor cars and motorcycles). In turn, main activity of 6.2% of enterprises is associated with real estate and 5.65% are connected with accounting and legal services.

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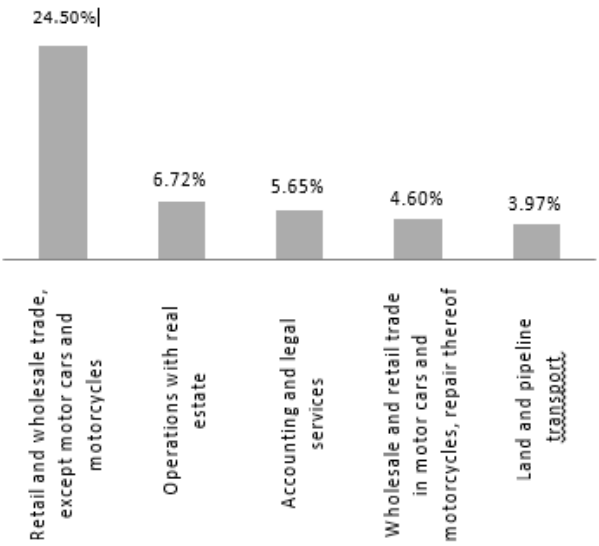

Source: authors' calculations based on .LURSOFT (2014)

Fig. 2. **Most popular activity fields of enterprises**

Although the biggest share of micro- and small enterprises is concentrated in Riga and its suburbs, their role is permanently growing also in the regions since they allow the inhabitants to establish and develop their business themselves, providing their families with subsistence as well as establishing new jobs. Just this fact is very essential in the regions because of unemployment spread therein.

3. Micro- and small enterprises survey data

In order to obtain additional information, the authors in their study have polled the micro- and small enterprises, putting the similar questions, and have made also a survey on additional issues that had not been reviewed previously. The questions were intended to find out whether the labour protection system had been established and the risk assessments had been made, what improvements had been made in working environment, and whether the established system was actually working or only created on paper. The survey also help to find out circumstances or reasons for the failure to meet the requirements of labour protection standards.

The survey was carried out as anonymous in order to obtain possibly true data. If the survey were carried out as an open poll, a big part of businessmen in order to avoid possible consequences would misrepresent the true data and present a highly coloured picture of their labour protection system.

The study survey involved the enterprises from Zemgale Region within the period from 15 November 2014 to 15 April 2015. The survey authors chose to interview several enterprises in each of various fields. The polled enterprises were mainly wholesale and retail trade businesses, dental offices, woodworking plants, construction companies and enterprises in other fields. In total, 50 micro- and small enterprises were surveyed, as a result of which the problems were identified with the implementation of the labour protection systems in micro- and small enterprises.

All surveyed respondents were interviewed at the place of their economic activity in order the authors themselves could examine and assess the actual situation. Study of enterprises at locations of their economic activity revealed that most of microenterprises are facing problems with essential nonobservance of labour protection requirements. Visual evaluation of workplace environment evidenced its incompliance with the labour protection requirements; for example, in the carpentry shop the extension cords were laid in the passage between the circular saw and the electric plane, and during the examination one of the workers caught on these cords and almost stumbled. Personal protective equipment is not used in work with chemicals as well as unsuitable containers are used, such as drinking water bottles etc. Insufficient lighting was observed in the storehouses, or on the contrary, too much sun light that cannot be eliminated because the windows had no blinds or

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curtains. The survey data clearly shows that nonobservance of the labour protection rules is associated with the lack of motivation. To do something, humans as intelligent beings need a motivation why to do. The motivation can be different - financial gain motivation, survival motivation, reward motivation, etc. In this case, the authors want to mention the motivation of survival but its manifestation requires knowledge that would motivate to avoid accidents. In addition, different motivation principles are observed between the employer and the employee. The employer is interested in possibly least investment of funds and own time into labour protection, while the employee, on the contrary, wishes to receive as much as possible from the labour protection system.

4. Increase in employer's motivation to establish and maintain labour protection system

Current situation in Latvia, when the state supervising institutions have no enough resources and cannot carry out a full control of merchants, requires searching for various efficient solutions of labour protection problems. Currently, the effective legislation provides no preconditions (such as brief training in labour protection prior to registration of the enterprise in order the employer would know all issues he will have to arrange in his enterprise) for registration of new enterprises. Therefore, a businessman, when starting own business activity, is absolutely uninformed about requirements of regulatory enactments in the field of labour protection.

One of basic principles in relations between the Republic of Latvia and the merchant is the principle of mutual trust. The state confides in the merchants that they will fairly follow the laws and provisions of subordinated regulatory enactments while the merchants trust the state that it will in no way restrict the legal business that in good faith fulfils regulations imposed thereon by law and subordinated regulatory enactments.

The authors' proposal based on the abovementioned is to introduce an annual reporting declaration on the labour protection system of enterprises, which would be submitted to the controlling institution – the State Labour Inspectorate. The reporting declaration would more fully inform the state controlling institution about situation at the enterprises with the labour protection problems, it would allow to beforehand find out enterprise with a very high risk of accidents, to plan the controlling measures for respective group or sphere of enterprises.

Implementing such type of declaration, it should be made easily understandable and not create problems when filling it out as well as not take too much time that is a very expensive resource for the businessmen. Besides, it is essential that it does not require any additional money from the businessmen. The reporting declaration should be created in electronic environment since then it will be possible to quickly fill it at own acceptable time from own computer. Reviewing by the State Labour Inspectorate will also be facilitated, not spending time to enter the system.

The reporting declaration should consist of two parts. The first part should include information about the enterprise and persons responsible for labour protection while the second part would be in the form of a questionnaire where the corresponding answer (Yes/No/N/A) should be ticked. Filling out the reporting declaration in this way will not take more than 20 minutes. The reporting declaration will be also a document attesting that the enterprise has arranged the labour protection requirement within a year. The reporting declaration in essence is based on the Labour Law and the labour protection standards.

In the first part, the businessman would have to enter such data about the enterprise as the enterprise name, registered office, business address, structural divisions (if any), person-in-charge of labour protection and its contact details, NACE code, number of staff etc. The second part is made like a questionnaire consisting of ten sections, each of them in its specific field, respectively:

- organization of labour protection system at the enterprise;
- assessment of working environment risks;
- mandatory health examination;
- conditions of working environment;
- control of personnel training and knowledge;
- use of personal protection equipment;
- fire safety;
- use of chemicals;
- hazardous equipment;
- imperfections established in working environment.

In the second part, the questions are formulated to find out the general situation at the enterprise and collect information about labour protection problems to be solved. The section "Controlling of employees' training and knowledge" should be especially

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emphasized, since it includes the identification of the working environment risks, being currently one of the most vulnerable spots according to statistical data. Although Paragraph 19 and 20 of the Cabinet Regulation No 479 "Procedure for Training in Labour Protection Issues" establish that after the instructing, the employee's knowledge should be tested. If after test employee's knowledge found unsatisfactory, the employee should not be allowed to work and should pass a repeated instructing. Unfortunately, in practice it does not work since often there is no information about mandatory testing of employees' knowledge. In another important paragraph "Imperfections established in working environment" the businessman voluntarily admits imperfections are established (for example, insufficient lighting, inner transport roads are not separated etc.).

In order the businessmen would fairly indicate the established imperfections, they should be made aware that the sanctions will not be imposed for imperfections shown in the reporting declaration. Moreover, the controlling institution will give time for elimination of these imperfections. Respectively, if the established imperfections are insignificant, the controlling institution may even not to plan examining such enterprise until submission of a new reporting declaration in the next year. If in the next year the imperfections established in the previous year are found eliminated, then the controlling institution has information that the enterprise is arranging the labour protection problems and thus there is no need to plan the examination at this enterprise. On the contrary, if it is found that the imperfections still are not amended, then the controlling institution has the reason to carry out the examination at the enterprise, clarifying why the enterprise does not solve the labour protection problems. In turn, if the enterprise indicates that serious violations are established, there is the reason to get in touch with the enterprise in order to clarify the situation as well as to examine it onsite.

With implementation of such reporting declaration, the financial resources would only be required from the state in order to establish an organized and provided acceptance of the declaration and their storage in databases specially provided for this purpose.

As already mentioned above, the best variant for submission of the reporting declaration is its electronic filling. Searching for other alternatives, the authors met the head of Panevezys Region Department of Lithuania State Labour Inspectorate (See Vdt.lt (2015)). It appeared that something like the reporting declaration (in Lithuania called the "questionnaire of control questions") had been introduced already two years ago in Lithuania. In case if submission of the reporting declaration cannot be organized via the State Revenue Service electronic declaration system (EDS system), then it could be arranged in the same way as it is carried out today in Lithuania: the reporting declaration is submitted via homepage of the State Labour Inspectorate. To do so, the additional information storage sites (servers) should be created as well as the reporting declaration electronic environment with its modules added to the homepage of the State Labour Inspectorate.

In order the businessmen fill out and submit such reporting declaration, it should be defined legally as an obligatory annual measure in accordance with procedure established by law or by Cabinet regulations. Besides, the sanctions should be defined if the abovementioned is not fulfilled, e.g. EUR 50, specifying the date until which the submission should be made, otherwise a repeated penalty can be imposed until the requirements are met. What are benefits from introduction of the reporting declaration for both the businessmen and the state? For a businessman, the declaration itself already gives information about the most essential requirements in labour protection issues. Moreover, if a businessman had any unclear questions in the reporting declaration, then he would be forced himself to get acquainted with requirements specified in the Labour Protection Law and other regulatory enactments. As a result, the businessman would widen their knowledge of requirements in the field of labour protection and shape the understanding of the necessity to take the labour protection measures. Besides, for a businessman it is an incentive to independently, without a special impact by the State, solve the problems of labour protection at own enterprise. Likewise, in order to answer questions of the reporting declaration, a businessman himself will obtain the necessary knowledge or employ a qualified labour protection specialist with the appropriate educational level, or also will involve a competent outsourced specialist or institution.

Notwithstanding the businessmen's choice to arrange the labour protection issues, the establishment and assessment of the working environment risks will be carried out at the enterprise, the necessary risk prevention measures will be taken as well as the instructing, health examinations and other routine

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events for uninterrupted and efficient operation of labour protection system. Whereas, when filling the reporting declaration, a businessman will spend less time than in a situation when the requested document has to be submitted to the State Labour Inspectorate and time has to be spent for verification by the controlling institution.

In turn, the state would obtain an actual data about performance of labour protection events at the enterprises and currently existing imperfections in the working environment. Respectively, it could allow to organize both the preventive and controlling operations, find out unfair businessmen who maintain the labour protection system formally or have no such at all. It is necessary to carry out a selective verification of the submitted reporting declarations and the correspondence of submitted data to the actual situation at the workplace.

Conclusions, recommendations

The labour protection and safety working environment is part of the effective entrepreneurship. According to the survey and interviews conducted, hypothesis was approved and most of microenterprises face problems with essential non-observance of labour protection requirements.

Current legislation provides no preconditions (such as brief training in labour protection prior to registration of the enterprise in order the employer would know all issues he will have to arrange in his enterprise) for registration of new enterprises. Therefore, a businessman, when starting own business activity, should be informed during the registration process about requirements of regulatory enactments in the field of labour protection .

Authors recommend introducing an annual reporting declaration on the labour protection system of enterprises, which would be submitted to the controlling institution – the State Labour Inspectorate. The reporting declaration will inform the state controlling institution about situation at the enterprises facing labour protection problems, it would allow an early identification of enterprises with a very high risk of accidents, to plan the controlling measures for respective group or sphere of enterprises.

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EUROPEAN UNION COHESION POLICY

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Abstract. Cohesion Policy is the only policy in the world that implements equalization of the development of so different territorial units. The impact of Cohesion Policy on the development of Member States has to be attributed to the economic development levels of the Member States, the size of the Member State, its economic structure, political situation, administrative traditions and the ability to exist and overcome economic crises. The most significant financial instruments used for attaining the objectives of the Cohesion Policy are the various EU Funds. Regarding the assistance of the strategy Europe 2020, the most significant investment in Member States is related to the development of less developed regions, rural support and the Cohesion Fund. During the researched period, the Cohesion Policy has affected the economic achievements of the Member States. Evaluating the economic development indicators of the EU Member States, it can be concluded that they differ significantly from the indicators described in the EC third and fourth report and move away attainment of the goal of Europe as a developed economic region to unforeseen future. The current experience indicates that the funding allocating for implementing the Cohesion Policy has been insufficient. In the future, the Cohesion Policy requires looking for additional alternative types of resources along with the existing ones, developing new forms of governance, developing qualitative indicators for measuring the development. The research aim: to analyse the development of the Cohesion Policy from 1988.

Key words: cohesion, policy, strategy, funds, indicators.
JEL code: R

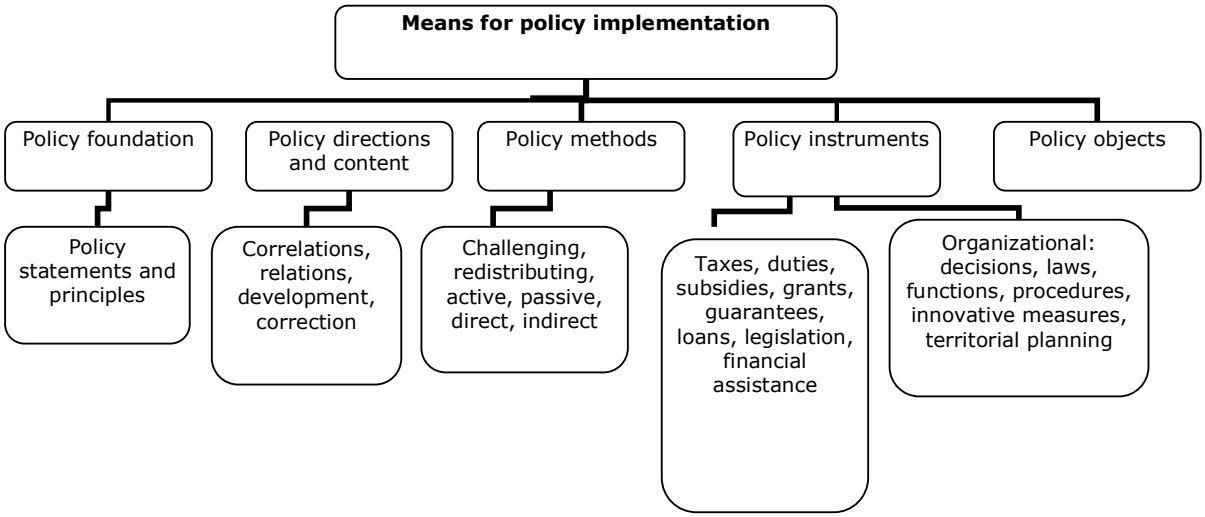
Introduction

Nowadays, the preconditions of a policy and the processes related to it have to be attributed to the structuring of the Member States of the European Union (EU), which causes the development of various interests between different EU Member States and their groups as well as the understanding of the policy makers about the policy goals to be attained at different levels of its implementation. Alternatively, what one participant requires is not suitable to another. At present, the EU Cohesion Policy can be considered the most progressive policy because through constant introduction of innovations for the common EU development, it attempts to preclude the differences of the development levels currently existing between the Member States in order to make the dream about an ideal, democratic society come true, trying to balance interests of every EU member.

Hence, it can be considered that policy is an instrument for beneficial social and economic changes to occur in society. Therefore, a policy requires means for its implementation.

As it can be seen in the figure (Figure 1), the means for policy implementation comprise the foundation on which a policy is based: statements and principles; direction and content; methods; instruments and objects.

According to EUROSTAT data, in 2015 the European Union (EU) comprises 28 Member States, which form a single community with a domestic market of 508.2 million inhabitants. Economic and social differences between these states and their 274 regions are self-evident. The larger the single European region becomes, the larger the level of life differences can be observed. The Cohesion Policy is applied to reduce these differences between the Member States.



Source: authors' construction

Fig. 1. **Means for policy implementation**

Since 1986, the goal of the Cohesion Policy has been to strengthen economic and social cohesion. The Lisbon Treaty and the EU new high-level strategies ("Europe 2020") are introduced the third dimension – territorial cohesion. The notion of territorial cohesion indirectly includes a more harmonized and sustainable development that would allow a more balanced and sustainable use of resources creating economic benefits from less overload and reducing pressure on prices, and thus the quality of both environment and life would improve.

Officially, the European Parliament (EP) approved the Cohesion Policy in 1988. The policy was founded on four basic principles – concentration, programming, partnership and co-financing. In the governance mechanism of the new policy, a special attention was paid to the partnership principle and to many-level governance because the decisions would be made at the Community, national and subnational levels.

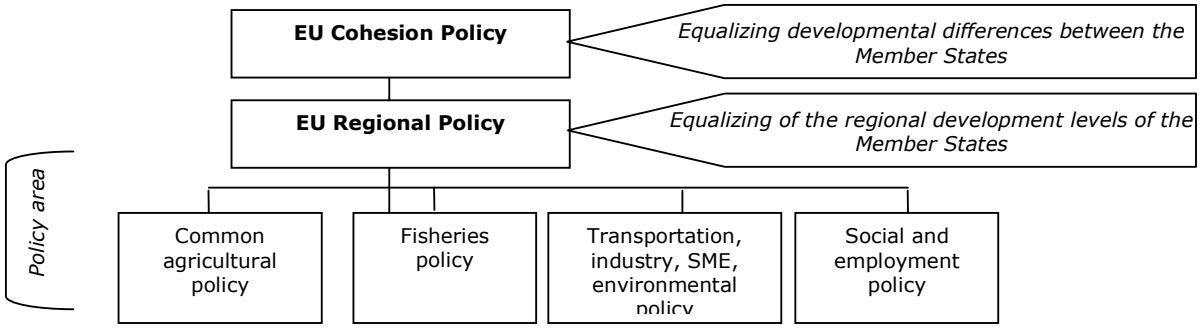
For the first time, the notion 'cohesion' was used in the Article 174 of Section 18 of the Treaty on the EU, and it provides that economic, social and territorial cohesion are related to a general and harmonious development of the Union's territories, especially to reducing the backwardness of the least developed regions and the differences between the development levels of various regions. The Treaty provides that the Union develops and executes measures; the Member States implement and coordinate their economic policy to attain the goal of economic, social and territorial cohesion. Likewise, the Treaty provides the instruments for implementing the Cohesion Policy – the EU Structural Funds: the European Agricultural Guidance and Guarantee Fund (EAGGF), the European Social Fund (ESF), the European Regional Development Fund (ERDF), the European Investment Bank and other existing financial instruments. Along with the approved policy, the Treaty introduced the Cohesion Fund (CF) (Liguma par Eiropas…, 2012).

Research results and discussion

Summarizing the essence of the definition of cohesion by B. Melnikas (Melnikas B, 2013), J. Bachtler, C. Mendez and F. Wishlade (2013), the EU dictionary of terms (EuroVoc, 2014), Latvian Academy of Science (Akadterm, 2014), it can be seen that it is related to the effective use of territorial resources, single market for goods and services, increasing the labour force qualification, reducing the gap between different social layers and territories. Various authors possess similar opinions about the significance of Cohesion Policy.

According to several theoreticians, the Cohesion Policy is placed as the top one in the hierarchy regarding its significance (Figure 2). Modern English economist C. Rumford (2000) sees the Cohesion Policy as a combination of different EU policies. J. Bachtler, C. Mendez and F. Wishlade (2013) consider the EU Cohesion Policy to be the most difficult EU political project to be implemented, which provides indications about the Union's values, and the development of the Cohesion Policy is closely related to the expansion of the EU as a single region – the wider the single European region becomes, the bigger changes take place in the Cohesion Policy. Economists-theoreticians in Latvia – E. Dubra, E. Kassalis, I. Skribane, S. Eglite, A. Ozola (2003) emphasize the Cohesion Policy as the

primary one and the other policies as its components. Therefore, the objective of the Cohesion Policy is to reduce differences at the level of the EU Member States. The objective of the regional development policy is to reduce differences between the regions of the Member States through implementing various structural policies. Based on its essence, the Cohesion Policy can be placed at the top of a hierarchy because it comprises smaller territorial elements of the regional policy and various policy areas are used for reducing their differences applying instruments directed at structural changes.



Source: authors' construction

Fig. 2. **Components of the EU Cohesion Policy**

The Cohesion Policy has both supporters and critics. As the economists J. Bachtler and G. Gorzelak (Bachtler J., and Gorzelak G., 2007) consider, one of the biggest problems of the Cohesion Policy is difficulties to ensure reliable policy of economic matters, based on convincing evidence on its effective outcomes. After more than thirty years of policy implementation, its contribution to economic development and growth is still questionable and unclear.

However, G. Cotella (2013) is of an opposite opinion. He has concluded that the EU Cohesion Policy is being implemented in a multi-level environment in which there is a movement: to enhancing social and economic approaching in Objective 1 regions, maintaining competitiveness in Objective 2 regions and strengthening territorial cooperation in Europe in Objective 3 regions. Although the goals are different, each of them increases the territorial capital of the region. However, it can be unequivocally concluded that the development of backward regions is possible only on the expense of the developed states but the single European region is as strong as its weakest member is. Along with these opinions, the Cohesion Policy can be related to ensuring regional balance in the territories of the Member States, which has to be considered the economic category, which allows for mutual comparison the development levels of the Member States of the entire EU region.

Hence, the main idea of cohesion is related to reallocation of resources, where the richer territories support the less developed ones. The EU Parliament and Commission regulate the flow of the necessary resources. For ensuring the principle of justice while implementing the Cohesion Policy, the EU NUTS system has been introduced based on the policy. NUTS is used to structure the European Community Cohesion and other policies, determining regions that qualify for the support of the EU funds. In 1988, criteria were introduced to have the possibility to define geographical suitability for receiving funding, based on statistical data. To define the average size of a NUTS region, the EU regulation provides the minimum and the maximum limit for the population size, which in certain cases may be insignificantly increased (Common, 2003). Every NUTS Level 1 region is divided into smaller NUTS Level 2 regions, which in turn are divided into NUTS Level 3 regions. According to the definition of the Statistic Bureau of the European Community (*Eurostat*), in 2015 there were 274 NUTS Level 2 regional units in total. Likewise, the Cohesion Policy uses the notion 'target regions'.

The EU funds were established to facilitate the development of economic and social processes in the Member States and their regions with the help of financial resources. The Cohesion Policy is implemented through three funds:

- the goal of the European Regional Development Fund (ERDF) is to strengthen the regional economic and social cohesion investing in growth facilitating industries in order to improve competitiveness and create workplaces. The ERDF also finances cross-border cooperation projects;

- the European Social Fund (ESF) invests in population education with the aim to improve employment and education opportunities;
- the Cohesion Fund ensures investment in the 'green growth' and sustainable development, and it improves compatibility within the territories of the Member States in which the GDP does not reach 90% of the average EU-27 Member States' indicator. The Cohesion Fund, together with the European Agricultural Fund for Rural Development (EAFRD) and the European Marine and Fisheries Fund (EMFF) form structural and investment funds (ESIF) for the period of 2014-2020.

The use of the resources of Structural Funds and other funds is organized through different projects. Administrative and legal framework for governance has been developed at both EU and Member State level. At the EU level, these are regulations, at the Member State level – legislative documents about the use and administration of funds, strategic planning documents for acquiring the resources. An administrative framework has been developed in the Member States to administer the resources. Agreements are signed between the EU and the Member State on the planned measures of the Cohesion Policy and the required funding.

The Cohesion Policy is planned and implemented for a specific period. Initially, in the period 1989-1993, it was planned for five years, in the period 1994-1999 the policy implementation lasted for six years but starting from 2000, the Cohesion Policy is planned for a seven year period.

The significance of the Cohesion Policy has increased over time. The funding allocated for attaining its goals has increased more than 7 times from 1988 to 2020. The largest investment is planned for the period of 2014-2020 – EUR 453 bln, which is 36% of the total amount of financing. The Policy, since its introduction until 2020, will use Euro 1.2 trillion. In every policy period, the largest proportion of funding, about 64%, is devoted to regions whose development significantly lags behind.

Since 1988, goals have been set and strategic planning has been performed for every period of the Cohesion Policy. The basis of strategic planning is formed by regional development plans submitted by the Member States, which establishes settings for the negotiations between the EU and a Member State about receiving the support. Each Member State develops its vision on the measures to be taken. In the periods of 1994-1999 and 2000-2006, the improvement of the effectiveness of the Cohesion Policy, strategic planning was connected with Objective 1 – support for regions whose development is lagging behind. Likewise, since 1994, the Policy **(Objective 1)** has supported territories with low population density. Starting from the period of 2007-2013, the EC and the EP adopt strategic principles, based on which the Member States define their strategic needs. Initiatives are advanced; goals are defined and integrated in the action programmes of the Member States at the community level. The Policy has supported the developed regional territories since 2014.

In the periods of 2000-2006 and 2007-2013, a decentralized responsibility has been assigned for the execution of the programmes to be implemented by the Member States, which was not determined at all until 2000. Decentralization means that the Member State should take the lead and develop its vision. As a result, the basis for the mutual partnership of public structures and public sector is being established, with a number of involved stakeholders – social partners, chambers of commerce, enterprises, development agencies, housing organizations, semi-autonomous non-governmental organizations, environmental agencies, social organizations, educational establishments of all levels, architects and artists.

The largest allocated funding, exactly for regional convergence - 84% - can be observed in the period of 2007-2013. The largest investment in the entire history of the Cohesion Policy is planned for the 2014-2020 period; a combination of various factors is used when implementing the Cohesion Policy for making the social and economic situations in the Member States more favourable. Thus the governance policy of the EU region – the Cohesion Policy – is designed taking into consideration the specific characteristics of the territory as well as by combining different mutually related policies – regional, youth, social, rural, fisheries etc. in order to attain wise, sustainable and integrating growth.

The world recession of 2009 showed the structural drawbacks of European economy, how much mutually dependant the economy of the EU Member States is. In 2010, the European Commission proposed the strategy document "Europe 2020". It argues the need for new goals for the development until 2020, and it can be considered the strategic framework for the Cohesion Policy and other structural policies. A single strategic

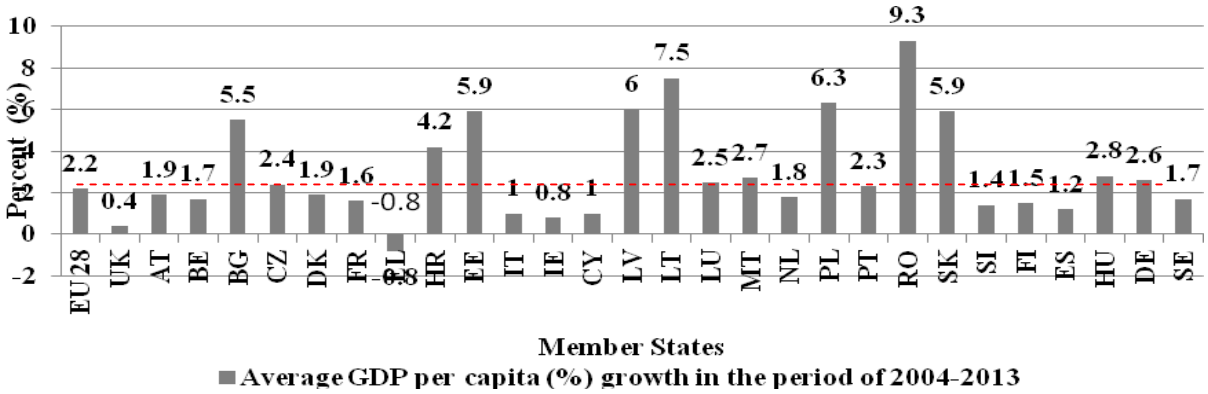
framework, which substitutes the strategic guidelines of the community and implements the main EU priorities, will refer to all funds, including the rural development and fisheries and marine policy as well as will provide better coordination of the EU funding.

In the period of 2014-2020, to ensure a better reporting responsibility, more attention is paid to the outcomes. Clearer and measurable targets are defined for the Policy, a new term has been adopted – the EC can terminate funding payments to a Member State that does not provide correspondence to the EU requirements in economy. The Cohesion Policy has defined 11 thematic goals that support growth.

Evaluation of the Cohesion Policy should be linked to the economic development levels of the Member States, the size of the country, the structure of the economy, the political situation, administrative traditions, and the ability to exist and overcome the economic crisis. Economic and social inequality between the Member States has deepened due to the expansion of the European region because the twelve new EU Member States had significantly fallen behind the old Member States in their development.

To determine the impact of the Cohesion Policy on the development indicators of the Member States, the available Eurostat data - GDP per capita - was analysed for the period of 2004-2013. This is the indicator of the economic welfare of a country and it allows evaluating the economic activity and development, and is considered a resultative indicator of the Cohesion Policy. Having analysed the average economic growth from 2004 to 2013 (Figure 3), it has to be stated that the economic achievements of the impact of the Cohesion Policy vary. The average GDP per capita indicator in the EU is 2.2%. Member States in which these indicators are above the average can be stated: Sweden, the Netherlands, Malta, Denmark, the Check Republic, Bulgaria, Belgium and Austria. In six Member States, these indicators are significantly higher – Estonia, Latvia, Poland, Rumania, Slovakia, Germany, there the average growth indicator increases the average EU indicator within 20-60% limit. In the other Member States, the average GDP per capita is below the EU average. The forecasted indicators mentioned in the third and the fourth progress report on the Cohesion Policy by the EC are much higher but the forecast did not take into account the potential impact of the recession on the economy of the Member States. As a result, the goals defined by the Cohesion Policy have been only partly attained.

However, reports have shown poor results of the impact of the Cohesion. In Greece, the GDP per capita has decreased by 0.8% a year on average per period (Figure 3), which indicates that the development of a Member State has worsened during the period because of the Policy. Already long before the recession, the budget policy of Greece indicated to the inability of Athens to limit the country's liabilities. Since accessing the Eurozone, Greece had not been capable of ensuring deficit below 3% of the GDP, as the agreements of the European Union provide. The budget deficit was constantly increasing, from 4.8% in 2002 to 6.5% in 2007. The national debt in Greece increased and already before the recession, it exceeded 100% of the GDP. A higher effectiveness of the Policy investment is possible in Member States that are implementing a certain financial discipline of the state, which allows concentrating the Cohesion Policy instruments on equalizing the development differences. A similarly significant is the ability of the Member States to design national development strategies that solve reduction of differences within the regions. The authors do not want to agree with the opinion of the Greek economist and Eurosceptic Y.Varoufakis (2012) who considers that the case of Greece indicates to the weakness of the EU Cohesion Policy, which is a strong signal that not everything is good with the Policy. As it is being announced in the public space of Greece, the policy requires serious changes in the future. According to the authors of this research, changes are necessary but at all possible levels. The failure of the implementation of the Cohesion Policy is not always the EU responsibility.



Source: authors' construction (Eurostat)

Fig. 3. **The average GDP per capita growth in the EU Member States in 2004-2013 (%)**

Once in three years, the European Commission submits a report to the European Parliament, the Council and Committee on Social Affairs and Regional Committee about the achievements in the economic, social and territorial cohesion and about how the different resources provided in this article have facilitated it (Liguma par Eiropas…, 2012).

The Member States need to: emphasise the specific advantages of the internal regions; follow and strictly observe the principles of competent regulation, ensuring the dynamics of entrepreneurship, especially supporting the development of SMEs; strengthen the innovation ability, quality of life, social cohesion and environmental sustainability. The goals of the Cohesion Policy should be measurable by applying qualitative measures, which have to be developed so that not only the growth but also the development was stated.

Conclusions

The Cohesion Policy is the only one in the world that implements equalizing of the development of so different territorial units.

The main idea of the Cohesion Policy is reallocation of resources where the richer territories support the less developed ones.

The notion 'cohesion' was used for the first time in the Treaty on the EU that states its goal – reducing differences between the Member States and their regions.

Historically, the year 1988 can be considered the starting point of the Cohesion Policy. The policy is founded on four basic principles: concentration, programming, partnership and co-financing. The policy management mechanisms are the principle of partnership, multi-level governance, decision making at the Community, national and subnational levels.

The Cohesion Policy comprises diverse more detailed territorial elements of the regional policy in order to reduce territorial differences when applying instruments targeted at structural changes.

The Cohesion Policy implementation tools – the EU Structural Funds and funds. Structural Funds are envisaged to enhance structural adjustment in particular industries or their combinations. The objective of the Fund – to reduce differences at the level of the Member States. Use of the resources of Structural Funds and funds is being organised using various projects as intermediaries.

The Cohesion Policy is planned and implemented for a certain period; its significance has grown over time. The funding allocated for attaining goals from 1988 to 2020 is EUR 1.2 trillion.

The impact of the Cohesion Policy on the economic achievements of the Member States differs. A higher effectiveness of the Policy investment is potential in the Member States that have a particular state financial discipline, concentrating funds on equalizing exactly regional differences as well as competently following the regulation principles of the policy implementation.

The impact of the Cohesion Policy on the economic achievements of the Member States depends on the ability of the Member States to develop national development strategies on the specific regional advantages.

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ANALYSIS OF WELL-BEING INDICATORS IN SATELLITE TOWNS, CASE OF LATVIA

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Abstract. A satellite town or satellite city is a concept in urban planning that refers essentially to smaller metropolitan areas which are located somewhat near to but are mostly independent of larger metropolitan areas (Evans & Evans, 2007). Taking into account the rapid social economic development of satellite towns, which leads to the population growth in these municipalities, it is important to ensure the well-being for their citizens. As the well-being concept is holistic and includes different dimensions, the methodology on evaluation of the well-being on local level should be developed taking into account the peculiarities of the satellite towns. The aim of the paper is to analyse the well-being indicators in satellite towns of Latvia. Main results and conclusions of the paper: based on designed methodology on identification of satellite towns, 14 satellite towns around Riga were determined. The expert survey on selection of well-being indicators proved that indicators of different areas were needed to evaluate the well-being at satellite towns. The indicators related to remuneration, employment, demography, social safety and safety were selected. On the bases of selected well-being indicators, the Well-being index for satellite towns was designed and satellite towns of Riga accordingly evaluated.

Key words: satellite towns, municipality, well-being, well-being index.
JEL code: I31, I38, O21, R58.

Introduction

Satellite town development has attracted much attention in the research field worldwide. The history of Satellite Towns has been extensively studied (Merlin, 2013; Osborn, 2003; Thomas, 1997); however, the experiences of Satellite Towns in Central and Eastern Europe have only recently been brought into focus (Cole, 1990; Prasca & Olau, 2013; Kissfazekas, 2015).

Satellite towns in many cases have complicated history, as they have been built for different purposes (especially in post-socialist countries) and during the time change the initial motivation for constructing them is not topical anymore. Regarding the questions on how a satellite town can deal with this kind of historic heritage today and whether it can replace its lost identity with new elements in a very different social political situation, it highlights the challenges of municipality of satellite towns in promoting well-being for its citizens.

Indeed, satellite towns as all municipalities are playing crucial role in promoting well-being for its citizens as local governments are instrumental in the judicious use of natural resources, providing public services and creating local jobs - through land use and transit planning, building and infrastructure construction and rehabilitation, investments in energy, water and waste management, and economic development strategies.

In order to promote well-being in satellite towns, the relevant background information should be provided on current situation on well-being in the municipality. For this purpose researchers use different well-being indicators. Among social researchers there is confidence that well-being could be evaluated using measurable indicators (Rinne et al., 2013; Hezri, 2004; Bauler, 2012; Rydin et al., 2003). Traditional indicators of well-being are variety of socio-economic indicators - population health, salary and allowances, distribution of income between different groups of households, their use (Bikse et al., 2009) etc. These factors are typically rated, and regions and cities are ranked on this basis (e.g. Savageau, 2007; Mercer, 2015; Jordison and Kieran, 2003). Another approach for measuring well-being is developing indexes that allow to include different indicators in one index (Briec et al., 2013; Smith et al., 2013; Osberg & Sharpe, 2009).

In case of Latvia, usually the municipalities in Pieriga region are being considered as the satellite towns of the capital city of Latvia - Riga. Different criteria like distance, migration etc. have been used to determine the possible satellite towns – in many cases, the number of satellite towns differs (State Regional Development Agency, 2009). However, there is no common understanding on concept of satellite towns in Latvia.

Taking into account above mentioned, the aim of the paper is to analyse the well-being indicators in the satellite towns of Latvia. The research object is satellite towns of Latvia.

In order to achieve the aim, following tasks are formulated: (1) to determine the satellite towns of Latvia; (2) to select the well-being indicators

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representing the well-being in the satellite towns of Latvia; (3) to design the Well-being index for the satellite towns of Latvia.

The hypothesis of the paper: the well-being indicators describe different dimensions of the well-being in the satellite towns.

During the preparation of the paper, the following methodology was used: a survey of experts, standardization of empirical statistical data, analysis and comparisons of empirical statistical data. The theoretical and methodological basis of paper: special literature of economics, published scientific researches, statistical database.

Research results and discussion

In this section, the description of concept of satellite towns would be provided as well as methodology of determination of the satellite towns in Latvia and selection of the well-being indicators for them.

The concept of satellite towns

The concept of "Satellite Cities" was introduced by Graham Romeyn Taylor in 1915. At that time, factories were proposing to move to satellite cities which should be built in suburbs of big cities to relieve excessive concentration of metropolis downtown (Taylor, 1915).

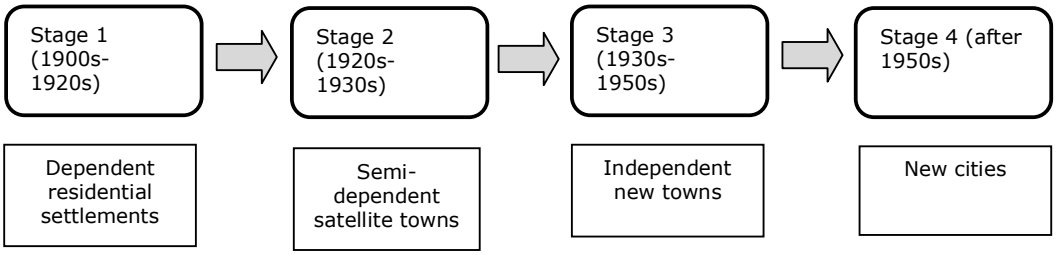
Some elements of satellite towns have been identified by many scholars as follows:

firstly, the distance of a satellite town from a major urban area differs due to availability of land, accessibility, transportation network etc. but the distance should be close enough to justify both a rapid commuting distance and the open space needed to separate the town settlements (Golany, 1976);

secondly, satellite towns should be totally economic dependent on the neighbouring urban center where the majority of satellite town residents find their jobs (Fisher-Cassie, 1943);

thirdly, an independent local government should present and run the town to give it identity so that it is different from normal urban suburb (Golany, 1976).

The development of process of satellite towns is revealed in Figure 1.



Source: adopted from Mengui, 2011

Fig.1. Evolvement process of satellite towns

The earliest satellite towns (first stage) were basically dependent residential settlements attached to metropolises. People only lived there with basic service facilities and needed to go to urban centre for work and entertainment. So these towns then were called "dormitory towns". The second stage was semi-dependent satellites towns. These towns were equipped with some industries and service facilities. At the same time, they were linked to urban downtown through subways. This concept was attempting to realise "organic decentralization" of urban functions. The third stage was to build fully independent satellite towns after World War II. They were located 30-50 kilometres from urban downtown, provided reasonable portion of living place and employment opportunities, together with culture and entertainment facilities. The fourth stage of satellite towns appeared in the context that single cantered cities were developing into polycentric cities. All the towns were linked together with city centre by rapid transit and became important part of urban spatial structure (Mengui, 2011).

Further would be analysed the concept of satellite towns in Latvia.
1. The determination of satellite towns of Latvia

As it was mentioned above, the number of satellite towns of Latvia differs in different sources. Usually, the cities of Pieriga region like Salaspils, Ikskile, Olaine are mentioned as typical satellite towns of Riga. Taking into account that by definition only towns in agglomeration of Riga city could be called as satellite towns, in further research the interaction between Riga and potential satellite towns would be examined and described in following sections. In addition, only cities (*republikas pilsetas*) and municipality towns (*novada pilsetas*)

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according to the Law on Administrative Territories and Populated Areas would be considered as the satellite towns of Riga.

In order to determine the satellite towns of Riga, it is assumed that satellite towns of Riga are towns in agglomeration of Riga that have strong tendency to the centre of agglomeration (Riga), taking into account following indicators:

1) the intensity of commuting of working population to Riga from towns (based on data from personal income tax) in 2014;

2) the evaluation of provision of public transport and attainability of city to Riga.

Each indicator is characterized by a certain strives process that shows a different intensity of the agglomeration territory. Quantitative indicator values allow distinguishing five centripetal power levels characterized by the coefficient aij described in Table 1.

Table 1

The description of centripetal power aij for indicators

Indicators	Levels				
	Very high (1)	**High (0.75)**	**Medium (0.5)**	**Medium low (0.25)**	**low (0)**
The intensity of commuting of working population to Riga from towns in 2014	The commuters proportion of the working age population is greater than 40 %	The commuters proportion of the working age population is 30- 40%	The commuters proportion of the working age population is 25- 30%	The commuters proportion of the working age population is 20-25%	The commuters proportion of the working age population is less than 20%
The evaluation of provision of public transport and attainability of city to Riga	Great public transport diversity, attainability of Riga is less than 30 min	Relatively large variety of public transport, attainability of Riga is 30–45 min	There is considerable variety of public transport, attainability of Riga is 45–60 min	There is considerable variety of public transport, attainability of Riga is 60–90 min	The city is accessible by public transport, but the cruising intensity is insufficient for easy and quick accessibility of Riga (more than 90 min)

Source: authors' construction

The cumulative strives intensity for cities is calculated using the following formula:

$$Tp_i = \sum_{j=1}^{2} Ka_{ij} \quad (1)$$

where **j** – number of indicators;

Tp_i – cumulative strives intensity for the i-th city;

a_{ij} = 1, if there is very strong tendency in the i-th city for the j-th indicator;

0,75, if there is strong tendency in the i-th city for the j-th indicator;

0,5, if there is medium tendency in the i-th city for the j-th indicator;

0,25, if there is weak tendency in the i-th city for the j-th indicator;

0, if there is no tendency in the i-th city for the j-th indicator.

K – significance coefficient:

K = 2, if indicator is very significant;

K = 1 for other indicators.

It was decided that coefficient K is equal to two for the intensity of commuting of working population to Riga from towns (first indicator).

According to the cumulative strives intensity **Tp_i**, all towns would be grouped:

1) town that is included in the agglomeration of Riga and would be considered as a satellite town, if Tpi ≥1.5;

2) town that is included in the agglomeration of Riga, however the tendency is not strong enough to call the town as a satellite town, if 0.75 ≤Tpi P<1.5;

3) town out of the agglomeration areal, if Tpi <0.75.

According to the current Law on Administrative Territories and Populated Areas in Latvia are 76 towns, of which 9 are cities. In order to reduce the number of towns, which further would be used for the data analysis, the information was compiled on how long does it take for the particular town to get to Riga. It was assumed that those towns that are further away than 2 hours away from Riga have the weak link with Riga. Consequently, the further analysis was conducted

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for 40 towns. After calculation, 14 satellite towns of Riga were determined and summarised in Table 2.

Table 2

The calculation of satellite towns of Riga

No	Town	Time (min)	Coefficient aij [0; 1]	The commuters proportion (%)of the working age population, 2014 (%)	Coefficient aij [0; 1]	Cumulative strives intensity Tpi [0; 3]
1	Balozi	23	1	48.8	1	3
2	Salaspils	27	1	48.0	1	3
3	Olaine	26	1	42.7	1	3
4	Ikskile	36	0.75	43.9	1	2.75
5	Baldone	43	0.75	40.8	1	2.75
6	Saulkrasti	50	0.5	42.9	1	2.5
7	Jurmala	26	0.75	37.1	0.75	2.25
8	Vangazi	40	0.75	35.3	0.75	2.25
9	Ogre	43	0.75	33.5	0.75	2.25
10	Jelgava	47	0.5	30.4	0.75	2
11	Kegums	52	0.5	32.8	0.75	2
12	Sigulda	54	0.5	32.5	0.75	2
13	Aizkraukle	76	0.25	30.0	0.75	1.75
14	Lielvarde	57	0.5	30.0	0.5	1.5

Based on the calculations provided above, further analysis would be conducted in context of these 14 towns.

Source: authors' calculations based on the State Revenue Service and public transport traffic data

The selection of well-being indicators for satellite towns

In order to select the indicators that could describe the well-being in the satellite towns, the authors conducted an expert survey. The list of all available indicators (overall 111 indicators) that are measured at the local level were provided for experts for evaluation. The experts were selected at local level (development specialists in municipalities), at regional level (representatives from Riga planning region) and at national level (Ministry of Environmental Protection and Regional Development of Latvia, State Regional Development Agency, Latvian Association of Local and Regional Governments). The experts were invited personally and later a questionnaire via e-mail was sent to 10 experts, the answers were received from 6 experts. All provided data were processed using SPSS, calculating different statistical indicators.

Table 3

The analysis of the results of the expert survey: selection of key indicators

Dimension	Area	Indicator	Mean	Standard deviation
Economic	Salary	Municipal budget personal income tax revenue per 1 inhabitant	9.40	0.548
		Average monthly gross wages and salaries	9.00	1.225
	Employment	Unemployment rate	8.20	1.924
		Long-term unemployed in the total number of unemployed	6.80	1.095
Social	Demography	Population change per year as a result of migration,%	8.80	1.095
		Birth rate	7.80	2.168
	Social safety	The proportion of persons who were found to meet the poor family status, % of the total population	7.60	1.949
Environment	Safety	Registered criminal offenses per 1000 inhabitants	6.60	2.881

Source: authors' calculations based on the results of expert survey conducted in November–December 2015

Analysing the results of the expert survey, eight well-being indicators were selected on the basis of average evaluation on them and dispersion of the evaluations. Indicators characterise different well-being dimensions from salary and employment to social safety and safety. As the indicators represent different

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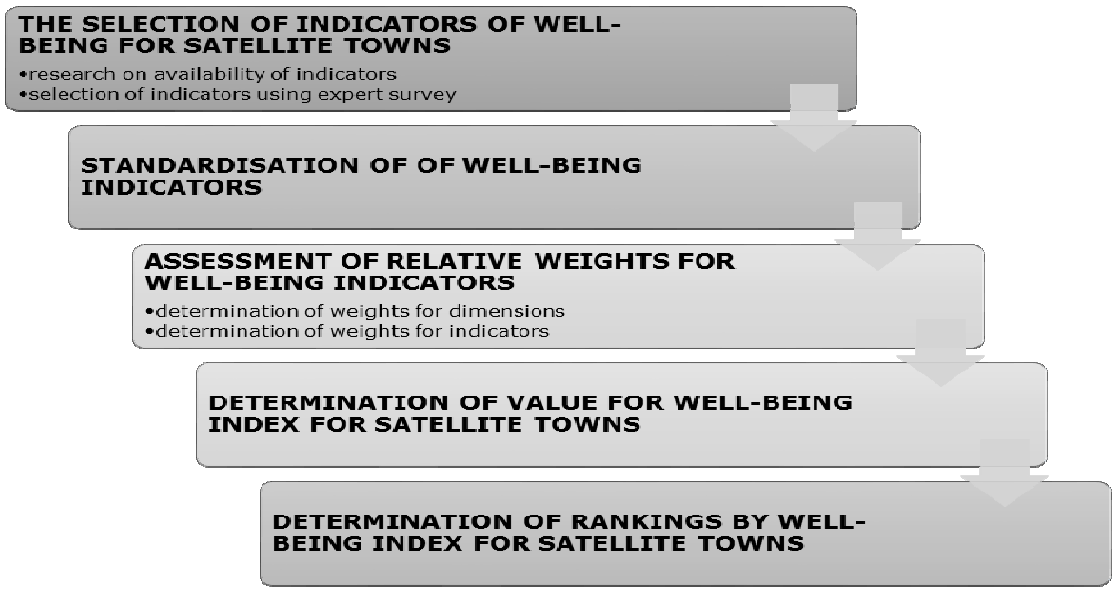
edges of the well-being concept, it was decided to develop the index where all indicators would be included.

The development of well-being index for satellite towns

The methodology of development of the well-being index for the satellite towns is presented in Figure 1



Source: authors' construction

Fig.1. **The methodology of development of well-being index for satellite towns**

The selection of indicators was discussed in the previous sub-part.

To combine the well-being indicators, expressed in different units and to create well-being index for satellite towns, there have been done statistical standardization:

$$t = \frac{x - \bar{x}}{s}, \tag{2}$$

Where:

t – standardized value of the well-being indicator in a given satellite town;

x – well-being indicator in their specific unit of measurement in a given satellite town that has to be standardized;

$\bar{x}$ – the annual weighted arithmetic average of the well-being indicator;

s – standard deviation, which is calculated for a given year, according to the formula:

$$s = \sqrt{\frac{\sum (x - \bar{x})^2 f}{\sum f}}, \tag{3}$$

where

f – statistical weight (Vanags et al., 2005).

Analyzing different studies on usage of significance weights in different well-being studies (especially in the development of indexes), it was concluded that there is no reliable basis to determine the significance weights for well-being indicators. In the scientific literature it is mentioned that the most common method to characterize the well-being indices are choosing arbitrarily or similar scales (Mayer and Jencks, 1989). In the most of the studies significance weights are determined arbitrarily without a quantitative analysis and in this case "it is impossible to determine, which of elements of common index are more important, it is based only on the researchers' psychological beliefs" (Fleurbaey, 2009). A lot of the researchers believe that "despite the popularity of the use of significance weights, more appropriate is to use the similar weights as in any case, their use is controversial but in this case, at least simple" (Chowdhury and Squire, 2006).

Taking in to account the above mentioned as well as the analysis of scientific literature (Legatum Institute 2012; Redefining Progress and Earth Day Network, 2002), in addition conducted studies of well-being indicators in Salaspils municipality (Jekabsone & Sloka, 2014a, Jekabsone & Sloka, 2014b), the authors decided to grant the following importance weights of well-being of three dimensions:

economic - 60% (each indicator – 15%),

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social – 30% (each indicator – 10%),

and environmental - 10%.

The next step after the assessment of significance weights is the determination of the value for well-being index for satellite towns. These values were calculated for defined satellite towns of Latvia. Next, the ranking of each satellite town was determined by well-being index for satellite towns. The results are revealed in Table 4.

As it is presented in Table 4, all determined satellite towns were ranked according to the values of the well-being index. According to the well-being index, the level of well-being is the highest in Kekava, Ikskile and Salaspils municipalities. The lowest values of the well-being index are in Sigulda, Kegums, Jelgava and Aizkraukle municipalities.

Table 4

The rankings of satellite towns of Latvia by well-being index in 2015

Satellite town	Value	Rank
Kekava	0.129	1
Ikskile	0.116	2
Salaspils	0.082	3
Saulkrasti	0.042	4
Olaine	0.028	5
Baldone	0.024	6
Jūrmala	0.006	7
Ogre	-0.013	8
Lielvarde	-0.028	9
Incukalns	-0.059	10
Sigulda	-0.064	11
Kegums	-0.064	12
Jelgava	-0.071	13
Aizkraukle	-0.127	14

Source: authors' calculations based on statistics from module for regional development indicators

Conclusions, proposals, recommendations

1) Nowadays, the local government is becoming more and more important regarding ensuring the well-being of the society, as they have different administrative, financial and political instruments, that's why it is important to research well-being at local level.

2) Satellite towns are municipalities that have great challenges regarding providing the well-being for its citizens due to historical, demographical and political reasons.

3) Though developing the methodology for defining the satellite towns of Latvia on the basis on availability of core city and intensity of commuting population, 14 satellite towns of Rīga were determined: Balozi, Salaspils, Olaine, Ikskile, Baldone, Saulkrasti, Jurmala, Vangazi, Ogre, Jelgava, Kegums, Sigulda, Aizkraukle, Lielvarde.

4) Well-being is a complex concept – in order to represent its many-sided nature, different indicators should be used. During the expert survey, eight indicators were defined that could characterise the well-being in the satellite towns. All selected indicators represent different dimensions of well-being – employment, safety, social safety etc. Thereby, the proposed hypothesis could be approved - the well-being indicators describe different dimensions of well-being in satellite towns.

5) In order to describe the well-being in the satellite towns in more complex way, the authors developed the methodology for determination of the well-being index for satellite towns. According to the developed index, the level of well-being is the highest in Kekava, Ikskile and Salaspils municipalities. The lowest values of well-being index are in Sigulda, Kegums, Jelgava and Aizkraukle municipality.

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PRIVATE AND PUBLIC SECTOR COOPERATION IN TOURISM

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Abstract. Cooperation in tourism has been one of the key topical issues for many years. The paper deals with solutions to cooperation problems for three different kinds of tourism: rural, bicycle and health tourism. A qualitative research method – structured interviews with experts and entrepreneurs involved in tourism – was employed to acquire information. The key interview results showed that the representatives of both the public and the private sector considered cooperation to be necessary, while its activation required interest in it or a common goal. Private sector entrepreneurs were not always the initiators of cooperation – it could be a local authority as well.

Keywords: rural tourism, bicycle tourism, health tourism, cooperation.

JEL code: L32

Introduction

Exports of tourism services rose by 4.4% in Latvia in 2014. Expenses of foreign tourists on recreational and other private trips in Latvia increased by 14.7%, whereas their expenses on business trips declined by 3.1%. In 2014, the tourism trade balance remained positive, with a surplus of EUR 182.5 mln. The tourism balance for Latvia has been positive since 2011 when its surplus amounted to only EUR 3.6 mln. The key priorities of the government's tourism policy declare that further development of tourism products has to be based on such basic values as quality, sustainability (including introducing environment-friendly technologies and approaches), individualisation, high value-added, cooperation, tourist engagement/gaining experience and cooperation to ensure competitiveness (Ministry of Economics, 2015).

Tourism problems specified in Latvia's strategic documents and solutions to the problems require in-depth research.

The research aim is to identify key effective cooperation activities for representatives of the private and public sectors aimed at contributing to various kinds of tourism. The specific research tasks are to reveal similar and different activities for private sector organisations, local authorities, nongovernmental organisations and governmental organisations aimed at developing rural, bicycle and health tourism in Latvia, based on qualitative research studies performed by the students of Latvia University of Agriculture (LLU).

Research results and discussion

Tourism involves certain social and economic relations, i.e. obligations in which intermediary agents play some role; it provides a better flow of information among all cooperation partners, thereby resulting in more successful and close cooperation in the tourism industry.

Cooperation is important in tackling various problems by stakeholders engaged in a system. Literature stresses that cooperation takes place to solve some structural problems rather than only occasional situations. In the context of tourism industry, it means that cooperation among partners in tourism is necessary to create a harmonised and sustainable tourism policy, an optimum environment for entrepreneurship and new tourism products. Cooperation partners from the governmental, private and nongovernmental sectors are involved in these processes (Kaufmane D., Eglite A., 2012).

Cooperation is often based on rational considerations, which are justified by various theories. For example, social change theory states that individuals, engaged in interaction, focus on the principle of exchange – to make maximum gains (friendship, profit, respect, love etc.) by making minimum investments; rational choice theory stresses that individuals, when choosing whether to engage in one or another relationship, first of all, rationally identify the maximum gain from the relationship (Roberts B., 2006). V.Vugt defines cooperation as a special form of assistance that may be important in tackling various problems among the elements involved in a cooperation system. Cooperation can be individual or structural. Structural cooperation takes the form of interaction that specifies the system's structure and regulates the requirements of all the stakeholders as well as laws, power and resources, considering the motives of participants in cooperation to be the key aspect (Van Vugt, M. et al., 2000).

Fyall and Garrod (2005) analysed such cooperation aspects as a voluntary relation of stakeholders to their common interests and goals, problems, actions,

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decision making, management, research and common institutions, which are linked by laws and social norms. Cooperation is some kind of effective interaction, including concentrated relations or simple forms of relations without a dynamic and explicit purpose; yet, it has to be emphasised that in cooperation, its participants need a common problem category that unites those engaged in it. Fyall and Garrod based their theory also on judgements by Himmelman, Krot, Haivod and Murphy regarding the manifestations of cooperation. Cooperation means mutually beneficial information exchange, common activities by stakeholders in the distribution of resources and the achievement of common goals. The existence of organisations in a long-term is also based on successful cooperation among partners (Kaufmane, D., 2011).

Depending on the context, the following synonymous terms are used instead of the term cooperation: partnership, joint action, communication, collaboration, social contact networks etc.

Cooperation in tourism is defined as a joint activity of several individuals or companies to achieve interrelated goals based on information exchange, agreements, partnership, joint ventures, membership in associations and other groups of people and companies. Cooperation involves a link that unites individuals and organisations, thereby raising their competitiveness in the tourism market (Ministry of Economics, 2008).

Research on cooperation in tourism became urgent in Latvia after the Lisbon Strategy was adopted; yet, no focus was placed on assessing and examining in detail cooperation until 2010. Inactive cooperation among the governmental, private, municipal and public sectors as well as the unclear division of responsibilities among the sectors were repeatedly mentioned as a weakness in tourism development in Latvia, whereas solutions referred to the establishment of an efficient tourism industry management mechanism and the enhancement of mutual cooperation (regular exchange of information, coordination of activities and financing and implementation of joint activities) with tourism-related areas (transport, culture, the environment, education, rural development etc.) (Kaufmane D., 2011).

Research on cooperation in tourism is urgent, and the findings might be a conceptual basis for the further tackling of practical problems in the tourism industry and the creation of development strategies. The urgency of this problem is justified by the themes of tourism-related scientific and practical conferences held in recent years. For example, the introduction of the section Public and Private Partnership Potential in Attracting Tourists of the 72nd conference held by the University of Latvia (University of Latvia, 2014) states that the capability of tourism organisations and companies to cooperate is one of the prerequisites of successful development and competitiveness of tourism. The Latvian Tourism Forum was held in Jurmala on 4 December 2015. The forum discussed opportunities for cooperation between the government and the tourism industry, the promotion of medical tourism as well as opportunities for business tourism in Latvia. Representatives of six ministries (the Ministries of Economics, Health, Culture, Environmental Protection and Regional Development, Foreign Affairs and Transport) addressed cooperation and government support for tourism (Latvian Tourism Forum, 2015).

Theories on tourism reveal that cooperation emerges if providers of tourism services purposefully cooperate with partners directly and indirectly related to tourism, tourism products are developed, new kinds of tourism are introduced and new resources are integrated in tourism offerings.

Over the last five years, Latvia University of Agriculture conducted a number of qualitative research studies related to cooperation in selected kinds of tourism: rural, health and bicycle tourism.

A methodology for research on rural tourism was designed and approbated by integrating the system approach to tourism analyses and the social network method and carrying out 75 standardised interviews (Kaufmane D., 2011). The research on cooperation systems in rural tourism in Zemgale region identified cooperation partners at municipal and regional levels. The research revealed motives for the formation of cooperation systems and their performance in Zemgale region. The region's providers of rural tourism services named 28 cooperation partners that represented all tourism-related areas: education, culture, service sector companies and the nongovernmental, municipal and governmental sectors.

The identification of cooperation stakeholders revealed each sector's role in tourism. Zemgale planning region's administration, when working on rural tourism development, has to involve cooperation partners from all the sectors: governmental, municipal, nongovernmental and private.

An assessment of the role of the governmental sector showed that the institutions which performed their functions close to providers of rural tourism

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services were rated positively and integrated in cooperation networks. In Zemgale region, the providers of rural tourism services mentioned the Rural Support Service (RSS), rural advisory bureaus and educational and cultural institutions in their cooperation networks, as their cooperation was mainly associated with the development of tourism products.

Local authorities as cooperation partners, according to the providers of tourism services, did not play an explicitly motivating and productive role in the cooperation system. In their cooperation networks, the local authorities marked 67 of the 75 interviews providers of rural tourism services in Zemgale, noting that a municipality is a territory where business is done rather than an institution that supports the tourism industry.

The research revealed organised cooperation of providers of rural tourism services – a rural tourism cluster – that covered some territory around the lake of Sauka. The providers of rural tourism services rated the local authority as an initiator and coordinator of the organising process, presenting some cooperation motives and performance results in their cooperation networks.

The providers of rural tourism services wanted the municipalities to review their information and knowledge support system for residents who would like to integrate local tourism resources in their businesses.

Nongovernmental sector cooperation partners, which were related to the tourism industry both directly and indirectly, were identified in the cooperation system for rural tourism in Zemgale region. Of the 75 providers of rural tourism services, 46 cooperated with the tourism industry's associations and 25 – with organisations of other fields. The research revealed that in rural tourism the nongovernmental sector could be associated not only with tourism, for example, the association Rural Traveller and Zemgale Tourism Association but also with the specifics of tourism products or the basic occupation of providers of rural tourism services and their interests – the Association of Palaces and Manors of Latvia, the Latvian Museum Association, the Latvian Camping Association, the Association of Wine Producers and Growers, the Association of Latvian Bath-houses, the Association of Goat Breeders, the Organic Farming Association, the Association of Beekeepers, the Union of Museums, the Association of Seedling Growers, the Association of Hotels and Restaurants, Jelgava rural partnership Lielupe, Tervete Park Association, the Daugava Union, Sauka Nature Park Association and the Partnership of Selija.

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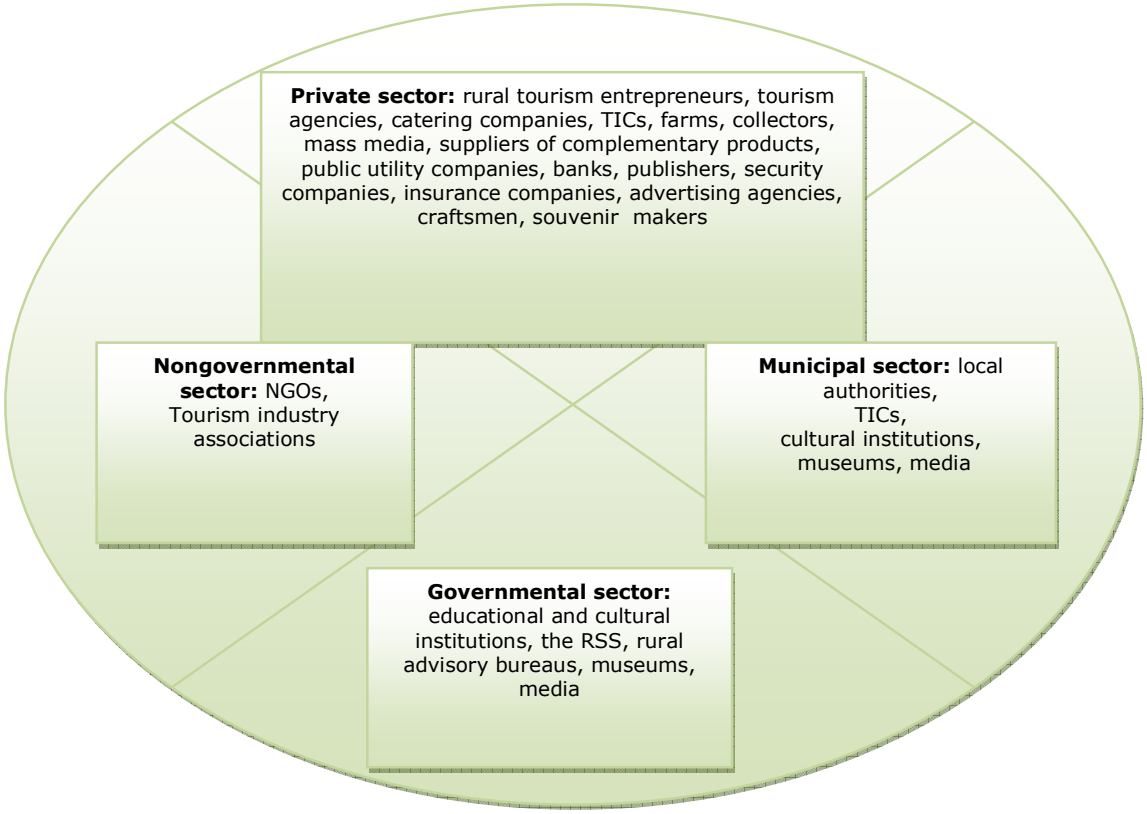

Source: authors' construction based on their research on tourism cooperation systems in Zemgale planning region

Fig. 1. **Structure of the private, nongovernmental, municipal and governmental sectors in the rural tourism system in Zemgale region**

Owing to the specifics of tourism products, the providers of rural tourism services are associated with interest organisations (Iecava Sports Club, the Association of Bicyclists, the Association of Jekabpils Rafters, the Angler Club Rotanss, the Orienteering Club, the Association of Book Friends) and public organisations established by local residents of municipalities (congregations, the Lady Club Mikslis, the Women Club Liepas, the Rural Women Club Dore and the Women Club Efeja).

The providers of rural tourism services cooperate with tourism industry associations and other NGOs to acquire and exchange information, knowledge and experience and to implement joint projects for the development of tourism products and for security, while their cooperation with the nongovernmental sector results in their recognition, additional knowledge, greater profit, new offers and security.

The private sector is characterised by a greater diversity of cooperation partners, as the areas the providers of rural tourism services cooperate with are mainly associated with other companies and service providers.

Similar problems in cooperation among various sectors and solutions to the problems were revealed carrying out partially structured interviews that focused on cooperation among organisations in the field of bicycle tourism in Selija (Rizga S., 2014). In the interviews, 11 professionals, entrepreneurs and representatives of municipal councils associated with the tourism industry expressed their opinions on prospects for bicycle tourism, the role of cooperation, specific activities and events to be held to contribute to the development of bicycle tourism. The interviews identified organisations and necessary functions to be performed by the organisations from the perspective of other potential cooperation partners (Figure 2).

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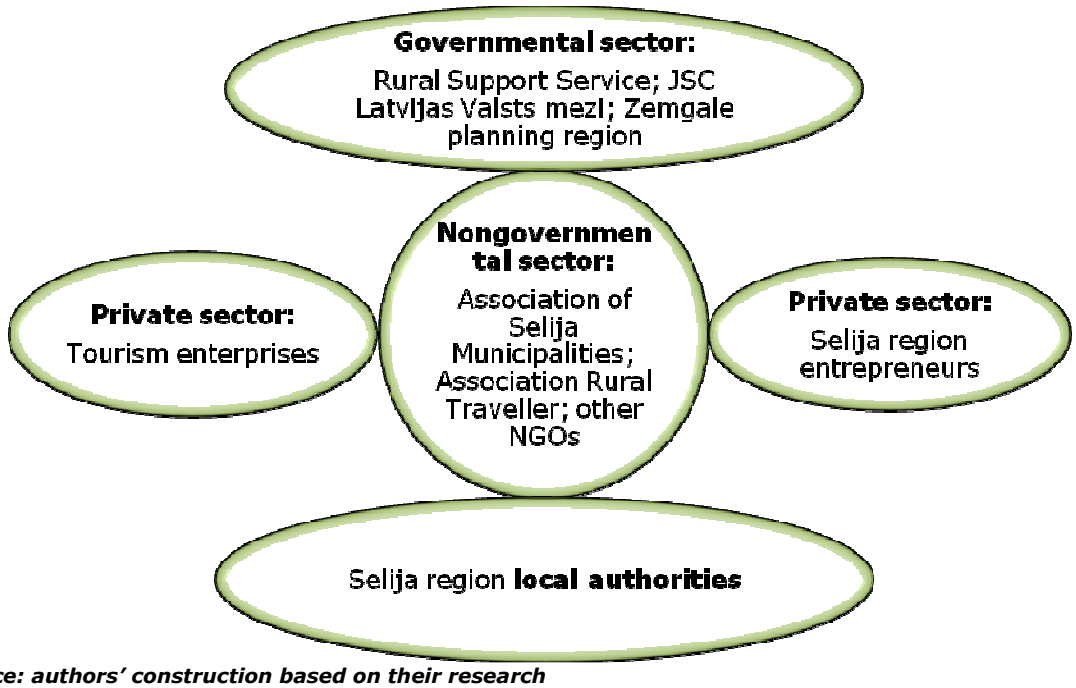

Source: authors' construction based on their research

Fig. 2. **Structure of the private, nongovernmental, municipal and governmental sectors in the rural tourism system in Zemgale region**

The research finds that cooperation among the organisations involved in bicycle tourism has to be activated in order to develop bicycle tourism in Selija, and a public-private partnership and cooperation among local authorities, nongovernmental organisations and entrepreneurs are the most preferred forms of cooperation in bicycle tourism. Public-private partnerships have to be established to attract more funds, reduce risks and have an opportunity to employ the competences of organisations involved. Cooperation in bicycle tourism is necessary for exchanging experience, conducting joint market studies, making advertisements as well as providing mutual support. Te research identified activities to be performed by each sector (Table 3).

Cooperation-related issues were examined with regard to health tourism as well. To identify the institutions necessary for cooperation and their role in health tourism development in Jurmala, a study was conducted in 2012 to identify the opinions of providers of tourism services on the cooperation of relevant institutions for health tourism development in Jurmala city. Health tourism, which is also referred to as recreational or medical tourism, is a term used by travel agencies and the mass media to describe the fast-growing practice of travelling across international borders for healthcare services. It is also attributed to the practice of providers of healthcare services to travel internationally to provide healthcare services.

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Table 3

Necessary functions to be performed by the stakeholders for bicycle tourism development

Organisation	Functions to be performed
Nongovernmental sector	
Association of Selija Municipalities	Initiating and holding cooperation in the field of bicycle tourism, identifying the interests, needs and resources of a municipality and representing the interests of Selija municipalities regarding bicycle tourism development, initiating and supervising joint bicycle tourism development projects, coordinating the development of bicycle routes and the provision of information about bicycle tourism in Selija, providing regular communication and the flow of information among various stakeholders of bicycle tourism
Association Rural Traveller	Popularising and marketing bicycle tourism products in the mass media, holding the training of tourism entrepreneurs, participating in making laws related to bicycle tourism
Municipal sector	
Selija region local authorities	Implementing joint projects, holding joint activities, holding trips for experience exchange, developing new bicycle routes, coordinating the redistribution of funds for the development and maintenance of infrastructure, coordinating the placement of quality information on the websites of municipalities and activating cooperation with local NGOs and entrepreneurs
Private sector	
Selija region entrepreneurs	Coordinating cooperation to develop new tourism services, coordinating the provision of information, participating in making laws related to bicycle tourism
Governmental sector	
Zemgale planning region	Coordinating the development of sustainable development policy documents, carrying out activities in regional development
Rural Support Service	Administering national and EU financial assistance, receiving and evaluating project proposals, making decisions on granting funding, participating in making laws related to bicycle tourism
JSC Latvian State Forests	Expanding the forest road network, establishing recreational places, information marketing

Source: authors' construction based on their research

Because of the global financial crisis, health tourism becomes increasingly popular – people travel to another city or even country to get medically treated. Travelling beyond national borders for dentist and plastic surgery services is particularly widespread. However, ayurveda, spa services and wellness, by means of which people can purify their organisms and get rid of cigarette, alcohol or other addictions, also become popular. Health tourism is based on the wish to buy as cheap medical services as possible. Medical services of the same quality in Latvia are much cheaper than in the USA, Norway etc. Travellers usually seek an opportunity to undergo also planned medical procedures as well as complicated specific operations, for example, joint replacement, heart, dental and cosmetic surgery. More than 50 countries have declared health tourism as a tourism industry of national significance (United Nations World Tourism Organization, 2011).

A detailed identification of cooperation in tourism in Jurmala was performed at micro level, based on the structured interviews and the opinions of providers of health tourism services on potential cooperation partners.

A research study (Kaufmane D., Polaks J., 2013) found that:

1) cooperation for health tourism development has to be based not only on cooperation between providers of healthcare services and health tourists but, in the future, also on insurers, tourism firms, various providers of services and leisure time companies;
2) the providers of health tourism services pointed that the most important partners for health tourism development were government institutions whose key functions concerning promoting health tourism were associated with the enhancement of the legal framework for resorts and medical services for tourists. Complications are created by the fact that the issues health tourism entrepreneurs are interested in are the fields of responsibility of various ministries – the Ministries of Economics, Health, Environmental Protection and Regional Development, Foreign Affairs etc.

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Municipal institutions are considered to be cooperation partners whose key tasks are to support the initiatives of providers of healthcare services and to promote health tourism in cooperation with government institutions. In future cooperation, the providers of health tourism services see similar functions to be performed by the nongovernmental sector.

In the conceptual cooperation model, the private sector is represented by real entrepreneurs whose primary task is to create and develop health tourism products in Jurmala (outpatient services, aesthetic procedures, spa and other services, complex medical services at medical institutions) as well as other service providers necessary for tourists (catering companies, transport companies, hotels, leisure time companies etc.). The private sector's key task is to create new higher value-added tourism products through expanding the assortment and including in it offerings related to other kinds of tourism (gastronomic, cognitive, cultural, active, urban tourism).

The nongovernmental sector has to be also involved in health tourism development. Tourism industry associations have to play the coordinating role in promoting product specialisation and innovation, thereby developing the cluster and engaging new cooperation partners in it.

An advantage of qualitative research involves the acquisition of detailed information and the elaboration of detailed solutions. All the above-mentioned research studies conclude that regular qualitative research studies are necessary for cooperation optimisation, mainly at micro-level, focusing on best practice examples in tourism.

The tourism industry is characterised by regional institutionalisation. It is indicated by the regional development agencies being responsible for development in municipalities and regions, the fact that the functions of municipalities are directly related to tourism development in their territory, the cooperation of the Latvian Tourism Development Agency with regional tourism associations and the establishment of tourism information centres (TIC) and points in municipality centres and rural territories according to the territorial principle. Tourism development plays an essential role in the region; thus, it is important for national, municipal, nongovernmental organisations and entrepreneurs to cooperate and support one another; yet, not always their cooperation and support were sufficient.

One of the scenarios for cooperation optimisation is the expansion of tourism institutional influence in the region having synergy centres whose establishment has to be based on three main principles: voluntary participation, initiative and creativity. A synergy centre could unite providers of tourism services, administrators of cultural and historical heritage, educational and cultural institutions, representatives of the nongovernmental sector and creative individuals for the purpose of creative activity. The centre could combine and seek common solutions to problems and ideas for cooperation among the stakeholders (Kaufmane D., 2014).

The providers of tourism services cooperate with representatives of various fields through establishing networks, which also shows the tourism industry's influence on other industries. Latvia's municipalities and regions need strategic policy documents for the tourism industry's development, which would be based on careful examinations of the industry and in-depth analyses of selected kinds of tourism.

Conclusions, proposals, recommendations

1) Cooperation is one of the ways how to react and productively work in the modern environment that becomes increasingly complicated and unpredictable and changes fast. It is clear that many issues are not the field of responsibility of one organisation or sector, as they require a complex perspective and broad participation.

2) The nongovernmental and private sectors may be viewed as the drivers in the tourism industry, and the cooperation of both sectors with the governmental and municipal sectors can contribute to the enhancement and maintenance of the flow of information. Initiators of cooperation might be not only private entrepreneurs but also representatives of the public sector.

3) Cooperation optimisation has to be based on the understanding of it and on information exchange, which may be promoted by new and current forms of cooperation between the public and the private sector, for example, public and private partnerships, cooperation, public discussions and experience exchange.

4) The detailed results of research on cooperation would serve as a conceptual basis for the further tackling of practical problems in the tourism

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industry and the elaboration of tourism development strategies.

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FARMERS' PERCEPTIONS OF AGRICULTURAL LAND AFTER ACCESSION TO THE EU - CASE STUDY

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Abstract. Poland's accession to the European Union and the resulting availability of direct payments to farmland owners increased the prices of agricultural property. The main aim of the study was to identify the most desirable attributes of agricultural property and to verify whether those features affect the prices of traded farmland. The survey was conducted in the region of Warmia and Mazury. A statistical analysis (a multiple regression model of real estate prices was based on the conducted transactions) revealed that the market price of farmland is affected by factors: the location of land relative to rural settlements, soil quality, land fragmentation, forest cover and location of farms in less-favoured areas with natural handicaps for agricultural production. Location was the most robust predictor of agricultural property prices - about 1565.48 PLN/ha. Farmland situated far from rural settlements is associated with higher production costs and lower income. Soil quality was also an important determinant of property prices - about 574.88 PLN/ha. Land fragmentation and forest cover have a negative impact on property prices. Every additional land plot traded in a single notarial transaction reduced the price of 1 ha by PLN 60.88. A 10% increase in forest cover decreases the value/price of 1 ha of farmland by PLN 48.71. The price of agricultural property situated in less-favoured areas with natural handicaps (LFAs) was higher by PLN/ha 363.46 (EUR 1 = 4 PLN). The last attribute results from Poland's membership in the European Union and participation in the Common Agricultural Policy. The support scheme increased the prices of agricultural property. Results are largely consistent with the findings of international studies. They provide valuable inputs for prospective buyers of agricultural property, investors and developers.

Key words: price of agricultural property, natural handicap.
JEL code: R14

Introduction

There are three groups of factors determining the prices of agricultural property: (a) natural (soil quality, hydrological conditions, landform, climate), (b) spatial and (c) organizational factors (urban development, demographic relationships, transport networks, retail networks, agrarian relations, prices of agricultural products and means of agricultural production, credit market constraints, state agricultural policy, taxes and charges levied on farmers, state-funded investments in agriculture, level of education, availability of agricultural support services).

The Polish real estate market is governed by several legal acts, including the Act on Real Estate Management of 27 August 1997 (Journal of Laws of 1997, No 115, item 741, as amended), the Act on the Management of State-owned Agricultural Property of 19 October 1991 (Journal of Laws of 1991, No 107, item 464, as amended) and the Act on the Formation of the Agricultural System of 11 April 2003 (Journal of Laws of 2003, No 64, item 592, as amended). The first two acts define the basic attributes that have to be taken into account in property appraisals. They include the type and location of property, land-use structure, designation and condition of property (Act on Real Estate Management, Act on the Management of State-owned Agricultural Property). The provisions of the above acts are supplemented by the National Valuation Standards, Interpretative Notes and Provisional Interpretative Notes. The latter instrument has been developed for professional property appraisers. Provisional Interpretative Note V. 4 for the Appraisal of Agricultural Property contains a detailed list of attributes that are taken into account in agricultural property valuation, including type of agricultural land, composition, fertility and agricultural suitability of soil, factors that influence soil's productive capacity (erosion, suitability for the production of specific crops, soil culture/agricultural condition, ease of cultivation, stoniness), availability of farming production facilities and devices, alternative land use (TNI 2004).

European integration and the implementation of Common Agricultural Policy instruments have led to changes in the structure of farms and the prices of agricultural property. The above processes have expanded the list of factors that affect the prices of traded property. Several studies have attempted to estimate the extent to which support policies increase farmland prices (Lattrufe et al., 2008; Strelecek et. al., 2010). Ciaian et al. (2012) also investigated the effect

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of institutional factors, including transaction costs, credit market constraints, profitability, contract enforcement, alternative land use and social capital.

The aim of this study was to identify the attributes of agricultural property that are regarded as significant by Polish farmers (after Poland's accession to the European Union) and to determine whether those attributes affect the prices of farmland. The value of agricultural property is determined by legal regulations, physical attributes, location and productive capacity of land. The objective of this study was to determine the significance of various attributes for property market actors.

Materials and Methods

The survey was conducted in the region of Warmia and Mazury. The analyzed region has the area of 241.73 km^2 and occupies 7.7% of Poland's territory. Population density is 59 persons/km^2, 40.1% of the region's population inhabits rural areas, and 15.9% of residents work in agriculture (CSO, 2008). The region is situated in the northern Poland. It borders with Russia (Kaliningrad region) in the North, the region of Pomorze in the West, the region of Kujawy and Pomorze and the region of Mazowsze in the South, and the region of Podlasie in the East.

The model was built with the use of multiple regression analysis to determine the statistical significance of the listed attributes and their impact on the quoted prices of agricultural property. According to many authors (Pawlukowicz, 2007; Hozer et al., 2002), the econometric model (regression analysis, regression model) is a basic statistical tool that supports analyses of trends on the real estate market.

The initial database contained the prices of 1354 agricultural properties traded by private owners and the state in 2008-2010. Preliminary contracts and prices quoted in non-market transactions (donations, inheritance, life annuity) were removed from the database. In the following stage, developed property, property covered by forests, property situated in the direct vicinity of recreational water bodies, property situated in areas zoned for non-agricultural use (recreational, residential, industrial) and property in the vicinity of such areas, property that is subject to an easement, leased property and property that holds mineral resources were also removed from the database. Property intended for other types of land use (industrial, recreational, residential) in the local zoning plan were also removed. The final database comprised transaction prices of 504 agricultural properties (54% transactions involved properties in less-favoured areas and 46% transactions involved properties outside those areas). Data processed in the Statistica v.10 application.

A multiple regression model was used in the study. A general regression model can be expressed by the following formula:

$$P_i^t = \alpha_0 + \sum_j \alpha_j z_{ij}^t + \varepsilon_i^t \quad (1)$$

where:

P – property price;

a – regression coefficient;

z – property attribute;

ε – random modelled component;

i – ith property;

j – jth property attribute;

t – time.

Based on the results, the following attributes were selected to describe the analyzed prices of agricultural property: date of transaction (TIME), location (DIST), area (AREA), fragmentation (FRAG), soil quality (SQL), location in less-favoured areas with natural handicaps (LFAs), landform (SLOP), forest cover (FCOV), percentage of agricultural land (ALAN) and population density (PDEN). Similarly to the study by Sawilow (2011), a time variable was incorporated into the model. Data obtained from orthophotomaps (www.geoportal.gov.pl), the Ministry of Agriculture (www.minrol.gov.pl), the Central Statistical Office and the Land and Building Register.

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Table 1

Description of nominal data

Attribute	Description	Aver.	Min.	Max.
TIME	Month and year of transaction between 1 January 2008 and 31 December 2010	19.00	1.00	36.00
AREA	Area of property in hectares	10.1704	2.0000	49.0200
FRAG	Number of land plots per transaction	1.7976	1	14
DIST	Location (distance in kilometres from compact settlements)	1.5952	1.0	3.0
LFA	Location in and outside less-favoured areas with natural handicaps	0.5615	0.00	1.00
SQL	Soil quality	0.7539	1.00	3.00
FCOV	Forest cover in the respective municipality	25.99%	4.00%	63.00%
ALAN	Percentage of agricultural land in the respective municipality	59.26%	20.00%	82.00%
PDEN	Population density (persons/km2) in the respective municipality	33.06	12.16	80.50
SLOP	Landform	0.5357	0.0000	1.0000

Source: author's calculations

Research results and discussion

Price distribution, analyzed by the F-test for 10 independent variables and 493 (N-m-1) transactions, was F=277.8153 (F_{crit} = 1.89). Therefore, the hypothesis that regression coefficients are not significant should be rejected, and an alternative hypothesis should be adopted. The linear model explained total variance of the dependent variable in 73%, and standard deviation of the residuals was determined at SD=761.76. The developed model was characterized by satisfactory quality. Five out of ten analyzed independent variables describing property attributes were statistically significant. They were: soil quality (SQL), location in less-favoured areas with natural handicaps (LFAs), land fragmentation (FRAG), location (DIST) at significance level α=0.05, and forest cover (FCOV) at significance level α=0.10 (Table 2). The remaining variables – transaction date (TIME), landform (SLOP), area (AREA), population density (PDEN) and percentage of agricultural land in the respective municipality (ALAN) – were not significant on the analyzed market of agricultural property. The coefficients in the regression model and their statistical significance are presented in Table 2.

Table 2

Significance of multiple regression coefficients

LINEAR MODEL				
Independent variable	**Coefficients**	**SD**	**t-distribution**	**P**
CONST.	8993.44	206.27	43.59	0.0000
LFA	363.46	88.31	4.12	0.0000
SQL	574.88	66.31	8.67	0.0000
FRAG	-60.68	23.86	-2.54	0.0113
DEST	1565.48	44.06	35.53	0.0000
FCOV	-48.71	26.84	-1.81	0.0702
R2=0.7361		**Adjusted R2=0.7334**		
SD=761.76		**F=277.82**		

Source: author's calculations; results were processed in STATISTICA v. 10.

According to Kocur-Bera (2005), the percentage of agricultural property on the local market in the respective municipality (ALAN) can considerably influence farmland prices. On the analyzed market, this attribute was highly correlated with forest cover (FCOV) because both attributes are mutually complementary. The discussed attribute (ALAN) was removed from the model because it was less correlated with price than forest cover (FCOV). The remaining variables were not

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highly correlated, and the coefficient of correlation was determined below 0.60.

Location (DIST) was the most robust predictor of agricultural property prices (Abelairas-Etxebarria, Astorkiza, 2012). Farmland situated far from rural settlements is associated with higher production costs and lower income. According to estimates, farm incomes decrease by 4-50% per every kilometre separating farmland from rural settlements (Woch et al., 2011). This attribute was analyzed in view of the distance separating farmland from compact rural settlements where most farm households are situated. A change in farmland location by one category (distance of 2 km towards compact settlements) increases the price per 1 ha by PLN 1565.48 (EUR 1 = 4 PLN). Farmland situated further than 6 km away from compact rural settlements fetched the lower prices.

Soil quality (SQL) was also an important determinant of property prices. This attribute was divided into three quality categories: high quality soils – Class I, II and IIIa arable land and Class I and II meadows and pastures, medium quality soils – Class IIIb, IVa and IVb arable land and Class II and IV meadows and pastures, and low quality soils – Class RV and VI arable land and Class V and VI meadows and pastures. This attribute increased the price per 1 ha of agricultural property by PLN 574.88 (EUR 1 = 4 PLN).

Farmland prices were also influenced by land fragmentation (FRAG). The most desirable for owners are that the property consists of adjacent plots of land that form a single arable field. In analysis, several adjacent plots of land were classified as a single plot, and for properties comprising fragmented land plots, the number of land plots traded in one notarial deed was entered into the database. Land fragmentation (FRAG) has a negative impact on property prices. Every additional land plot traded in a single notarial transaction lowered the price of 1 ha by PLN 60.88 (EUR 1 = 4 PLN).

The price of agricultural property situated in less-favoured areas with natural handicaps (LFAs) was higher by PLN 363.46 (EUR 1 = 4 PLN). The above increase was noted after Poland had joined the European Union when the land situated in less-favoured areas received additional financial support.

In Poland, agricultural property situated in less-favoured areas (LFAs) has been classified by the Institute of Soil Science and Plant Cultivation in Pulawy based on the provisions of Council Regulation (EC) No 1257/99. LFAs are classified mainly based on low land productivity and evaluations of productive farmland that reflect the agricultural potential of natural resources. Farmland is assessed in view of soil quality, climate, landform and hydrological conditions as well as social and economic factors such as employment in agriculture and income per farming unit (Zalacznik D). The smallest farming unit in LFAs is a cadastral unit in a municipality. Farming units are classified as belonging to a less-favoured area when more than half of agricultural producers in a given cadastral unit cultivate land that falls into one of the three categories of LFAs. In line with the provisions of Council Regulation (EC) No 1257/99, there are three types of LFAs in Poland:

1) mountainous LFAs situated at altitudes higher than 500 m above sea level (this category covers 197 770 ha of land, i.e. 1.2 % of Polish farmland);
2) hilly LFAs situated at the altitude of 350-500 m above sea level (this category covers 489 140 ha of land, i.e. 3% of Polish farmland);
3) lowland LFAs: lowland Zone I with unfavourable conditions for agricultural production and lowland Zone II with highly unfavourable conditions for agricultural production (both zones cover 8 541 380 ha of land, i.e. 52.3 % of Polish farmland).

In Poland and other EU Member States, efforts are currently being made to develop a new classification system for LFAs (Matthews et al., 2013). The following criteria should be included in the new system: (a) geophysical conditions (soil, climate); (b) harmonization of natural conditions; (c) economic and environmental models; (d) land-use structure; (e) models at NUTS 2 level; (f) reference methods for analyzing water quality (Nitrates Directive); (g) risk of pesticide; (h) identification of high nature value (HNV) farming areas; (i) reference methods for determining the risk of farmland abandonment; (j) reference methods for the classification of remote and peripheral areas; (k) farmland, including permanent grasslands, excluding forests; (l) indicative thresholds for the EU 27; (m) the new criteria should be straightforward, scientifically clear, internationally accepted and formulated as the result of negotiations; (n) the new criteria should not be crop specific (previous criteria included reference crops, such as wheat and corn); (o) common criteria should apply to overall areas and should not deal with eligibility for LFA payments at farm

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level (ISPRA, 2007). The new system of common criteria is scheduled for introduction in Poland in 2018.

The last statistically significant determinant of agricultural property prices is forest cover (FCOV). A 10 % increase in forest cover decreases the value/price of 1 ha of farmland by PLN 48.71. The effect of forest cover on agricultural production is determined by various factors. In general, the influence of forest cover is manifested in three areas: losses resulting from the spread of invasive species, presence of wild animals near forests, and changes in crop yield resulting from land improvement and climate conditions.

The results of a comprehensive study carried out by the Institute of Soil Science and Plant Cultivation in Pulawy (IUNG), the Forest Research Institute and the Polish Academy of Sciences have confirmed the hypothesis that the influence of forest cover on the yield of primary Polish crops can be diverse and difficult to quantify (Jakubczak and Wolk 1977; Talalaj and Wegorek 1995). Forest cover has a beneficial effect on biomass production in light soils (in particular sandy soils) characterized by low water holding capacity, high permeability and high susceptibility to wind erosion as well as in years with extreme weather conditions, in particular drought and strong freezing winds (Koreleski, 2006). Polish farmers are generally of the opinion that direct vicinity of forests has a negative effect on agricultural production, and the results of survey confirm this observation. Several studies have demonstrated that crop yields are 60-92% lower in fields located in direct proximity of forests (Talalaj, 1997; Woch, 2001). Cereal yield within immediate reach of the trees is determined by their height and depends on the species of grain and the quality of arable land (Podolski, 2007). In the Polish region of Lower Silesia, damage caused by wild animals reduced the price of agricultural land by 3-10%, and the greatest losses were observed within a radius of 100-300 m from forest boundaries (Koreleski, 2006).

Audited attributes apply to the region of Warmia and Mazury. Region keeps mainly on agriculture and tourism. The research shows that two attributes - the land fragmentation and forest cover, reduce prices of agricultural properties in the study area. The impact of three attributes - location, soil quality and location on less-favoured areas have positive effect on property prices. For farmers from the region of Warmia and Mazury payments from the Common Agricultural Policy is a very important factor in household budgets. Therefore, they are willing to pay for agricultural property situated in less-favoured areas more money.

Conclusions

The main aim of this study was to identify the most desirable attributes of agricultural property and to verify whether those features affect the prices of traded farmland. The model was built with the use of multiple regression analysis to determine the statistical significance of the listed attributes and their impact on the quoted prices of agricultural property. The following attributes were selected to describe the analyzed prices of agricultural property: date of transaction, location, area, fragmentation, soil quality, location in less-favoured areas with natural handicaps, landform, forest cover, percentage of agricultural land and population density. Five out of ten analyzed independent variables describing property attributes were statistically significant. They were: soil quality (influence 574.88 PLN/ha), location in less-favoured areas with natural handicaps (influence 363.46 PLN/ha), land fragmentation (the impact of lowering 60.68 PLN/ha), location (influence 1565.48 PLN/ha) and forest cover (the impact of lowering 60.68 PLN/ha). The remaining variables were not significant on the analyzed market of agricultural property on the region of Warmia and Mazury (Poland). A statistical analysis revealed that the market price of farmland is affected by new factors – land plots located in areas with difficult farming conditions (LFAs) are expensive than other, such as Poland's accession to the EU and the availability of direct payments.

A thorough knowledge of attributes that affect the prices of agricultural property provides valuable inputs for land owners, prospective buyers, investors and developers.

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PERSONAL COMPETENCES FOR FUTURE LABOUR MARKET IN VIDZEME REGION, LATVIA

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Abstract. This article analyses personal competencies that will be necessary for employers in Vidzeme region in Latvia within the next 5-7 years in the context of rapid changes in the labour market and technologies. This article confirms the importance of quality of education in sustainable development and highlights the most important preconditions. The data were analysed after they were collected through electronic questionnaire of employers and Delphi method - interactive forecasting method which relies on a panel of experts, and both confirm the growing role of personal competencies for future labour market. The article reflects the most important reasons for insufficient vocational training mentioned by employers, such as lack of motivation and inadequate choice of profession as well as the role of schools and their challenges in order to improve this situation. Delphi experts answered questionnaires in two rounds and rated the most important personal competences of the future workforce, and the most important were the ability to learn, the ability to change and the ability to make decisions. As a result, 11 personal competencies groups were created, and 5 of them were analyzed in more detail. The study confirmed the high importance of foreign language skills, engineering needs for future labour market as well as the high quality requirements of the labour force in large enterprises.

Key words: future, forecast, labour market, business, competencies.

JEL code: R23, J2

Introduction

The most important goal of this article is to explore the competencies that will be important for the future workforce in Vidzeme region, Latvia. The significance of the research is reinforced by the expected change in the labour market in future that will affect not only changes in professions (the emergence of new and disappearance of some professions) but also the ongoing changes in the demand of competencies in the labour market. There is a long-lasting point of view that the education offer is forming the future workforce according to the demand of the labour market by performing structural changes in the state supported study programmes, by education institutions updating the existing study programmes, and by creating new study programmes. However, employers and society as a whole publicly express their dissatisfaction with the existing education offer and quality. Consequently, it is important to find out the future preferences of employers regarding competencies of workforce, emphasizing the role of the personal competencies, as each employer and employee naturally expects the education programme to provide professional competencies at the highest quality level. A survey of employers was used for the study on labour market demand; review of other research and literature, and Delphi expert method was used for identifying changes in labour market and priority competences.

As a result of the research the authors conclude that the acquired results both from survey of employers and Delphi method experts confirm the growing role of personal competencies in future labour market. This is consistent with the previous research and the problems highlighted in the national and international policy documents and reports. Future labour market needs a person with improved personal competencies, certain traits of character and at the same time with technical skills and knowledge of languages.

Theoretical background

Incheon Declaration "Education 2030: Towards inclusive and equitable quality education and lifelong learning for all" sets out a new vision for education. One hundred and twenty ministers committed that "quality education fosters creativity and knowledge, and ensures the acquisition of the foundational skills of literacy and numeracy as well as analytical, problem-solving and other high-level cognitive, interpersonal and social skills. It also develops the skills, values and attitudes that enable citizens to lead healthy and fulfilled lives, make informed decisions, and respond to local and global challenges" (UNESCO, 2015). This declaration confirms that quality education is significant for sustainable development on global and local scale, including reference to personal and social skills in decision making. In this study, these skills were also assessed as significant in the future labour market.

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The Student Union of Latvia in its conference report (Zarina, 2015) indicates four important aspects about learning and quality of learning: development of teacher pedagogic skills, appropriate teaching and assessment methods, use of technology and student-centred learning approach.

In particular, this report emphasized the competencies to be acquired in a practical way and its assessment in study courses. It was argued that the competencies to be acquired during higher education studies are well described and listed in a written forma but the practical acquisition and assessment during studies was put forward as a problem. In the authors' opinion, this is one of the reasons that creates a gap between education offer, competencies to be acquired and their inadequate application in the labour market. The report of The Student Union of Latvia also highlighted four directions of employability of graduates, requiring an action to be taken in the future: a rapidly changing work environment, balance between theory and practical tasks, entrepreneurial development and study and internship mobility (Zarina, 2015).

The experts expect that in 2025 automation and robots will take over almost 30% of our work, and even officials are not protected (Kapitals, 2016). These issues are discussed also by American professor and the director of Digital Business Centre (MIT) Erik Brynjolfsson in the book "The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies". His study helps see the world of tomorrow through an exponential rather than arithmetic lens. Brynjolfsson believes that massive technological innovation will radically affect our world, and we need to develop new business models, new technology and new policies to deepen our human capabilities, so that each person could remain economically viable in an era when automation is increasing (Brynjolfsson&McAfee, 2014).

Methods

Delphi method was applied among experts of various sectors, including both qualitative and quantitative analysis in order to explore the most required personal competencies in the labour market in Latvia and abroad in the next five years. The Delphi expert panel involved employers of Vidzeme region and the Latvian experts, including entrepreneurs from various sectors, leaders and staff of local municipalities, members of Parliament, heads of education institutions and teachers, researchers representing engineering and social sciences – 37 experts in total.

Employers' quantitative survey was used from quantitative research methods. The survey was carried out using the on-line platform JotForm. General set according to the CSB (Central Statistical Bureau) 2014 data was formed by 16393 economically active enterprises of Vidzeme region, including 15200 market sector companies (CSB, 2015). The most represented industries in the general set market sector were agriculture, forestry and fishing (38%), services (19%) and trade (11%). The number of active enterprises in the municipalities of Vidzeme region varies. According to NACE2 classifier 18 industries are represented in total in Vidzeme region. The numerical relationships of companies of various sizes may vary in municipalities and towns. Therefore, the study designed a typological two-stage selection that corresponds to the characteristics of the general set - all economically active enterprises of Vidzeme region. These factors encourage the choice of stratified sampling method. The first stage sample set building technique is defined as a three-stage stratified sampling. On the first stage, companies are divided as a separate stratum by their activity. On the second stage, companies in Vidzeme region are divided by size: micro, small, medium, large and others. On the third stage, economically active companies are divided as a separate stratum by territorial principle – the city of Valmiera and the municipalities of Vidzeme region. The selection of sample set according to the listed criteria was performed by the Central Statistical Bureau on request of the researchers. The total sample size was 579 employers. The sample size of each activity was calculated by total size of the sample according to the total number of companies by the following formulae:

Formulae 1

$$n_i = n \cdot \frac{N_i}{N} \text{ , where} \quad (1)$$

n_i - sample size by activity; n - total size of the sample;

N_i - size of the general set by activity; N - total size of the general set.

The size of the general set of activity corresponds to the number of economically active companies in a particular sector. Sample size was 579 and size of the general set – 16393. Confidence probability of sampling

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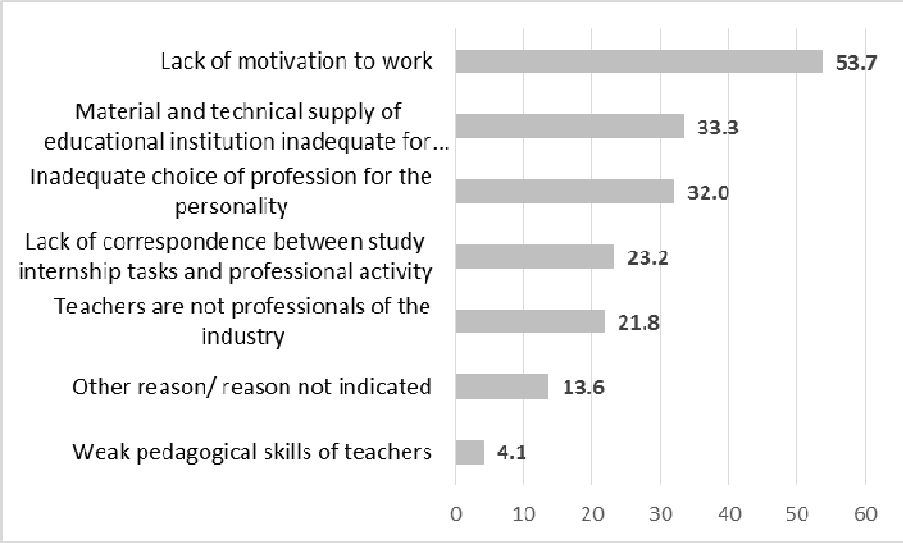
results p = 0.95. The response rate from the size of the sample was 25.4% and the general set – 10%.

Research results and discussion

In the survey, the employers provided their opinion on most important reasons why employees are not sufficiently prepared professionally. Out of six factors most respondents 53.7% have indicated "the lack of motivation to work" (Figure 1). The respondents could indicate several reasons. In 32% of answers the employers indicated the reason "the chosen profession inadequate for personality". The two above-mentioned reasons indicate the importance of improving the personality skills, character traits including motivation, persistence.



Source: authors' construction based on the survey results

Fig. 1. **Reasons why employees are insufficiently prepared professionally, according to employers, %**

During the expert interviews it was expressed that the crucial factors affecting the labour market included the teachers' attitudes in school and learning conditions in the institution, opinions expressed by politicians and community leaders.

Figure 1 shows that 23.1 % of employers have indicated that the objective of study internship does not correspond to professional activity. In reply to the question on the main forms of cooperation with education institutions, 57% of respondents indicated the internships, which validated the answers in respect to study internship content creation.

Figure 2 shows the performance of the company and its attitude towards accepting students from vocational schools and universities for internship according to the size of companies. More than a half (53.7 %) of respondents have answered that they take on or want to take on students for internship in their company, while 15% of respondents indicate that they do not accept and do not want to accept students for internship, out of which 77 % are micro-enterprises, which can be explained by the amount of work and working conditions such as work from home

According to the assessment of Delphi experts, the most important personality competencies for future workforce were determined in two stages. Eleven groups of personality competencies were created from the answers acquired during the first stage by combining similar ones. In the second stage, Delphi experts were asked to priority order all 11 groups of competencies as well as five groups of competencies in more detail. Results are shown in Table 1.

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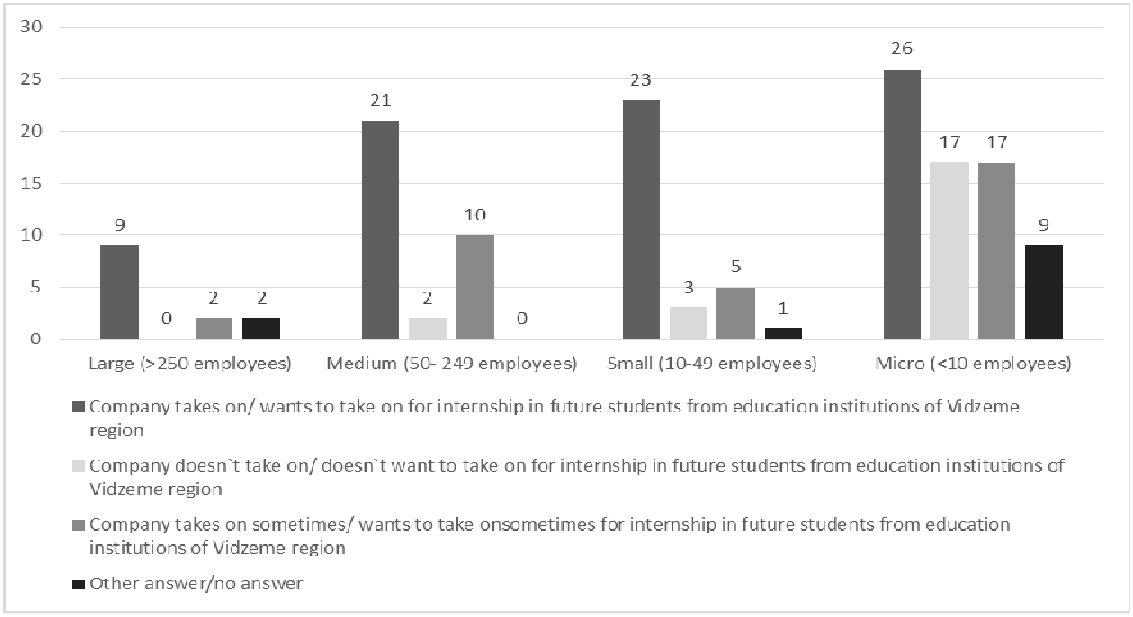

Source: authors' construction based on the survey results

Fig.2. **Receiving of students of Vidzeme region in companies**

Table 1

Experts' rating of personality competencies groups

Groups of personality competencies	Mode	Minimum	Maximum	Weight according to mode
Ability to learn	11	1	11	0.22
Knowledge of languages	10	3	11	0.07
Technological knowledge	10	3	11	0.07
Communication skills	10	6	11	0.08
Ability to change	11	3	11	0.10
Cooperation. Work in team	10	3	11	0.09
Ability to work in international environment	10	1	11	0.07
Ability to make decisions	10	4	11	0.10
Emotional intelligence, leadership	10	2	11	0.07
Many-branched competencies	9	1	10	0.08
Creativity, innovations	10	2	11	0.07

Source: authors' construction based on Delphi results

In the expert assessment, some competencies stand out, since the expressed opinions of many experts on priorities match; ability to learn, ability to change and ability to make decisions are most highly valued. At the same time, there are some drastically different ratings among experts, for example, the ability to learn is indicated as the least important by one of experts. The ability to change quickly was commented on by one of the experts "real progress is determined by the skills and profoundness of work, not some quick reorientation"; at the same time, the importance of skills to achieve results is explicitly pointed out.

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Table 2

Detailed view of the competencies group "ability to learn"

Competencies	Mode	Minimum	Maximum	Weight according to mode inside the competency group
Self-learning ability	7	3	8	0.13
Willingness and ability to improve knowledge	8	1	8	0.16
Ability to acquire new knowledge in a short time	6.5	1	8	0.13
Intellect	7	2	8	0.09
Continuous improvement, lifelong learning	8	2	8	0.13
Thirst for knowledge and openness	6	1	8	0.11
Ability to continuously learn in your profession, as well as retrain	8	2	8	0.14
Acquiring new work methods and technologies	8	1	8	0.11

Source: authors' construction based on Delphi results

According to the experts, the competencies group "ability to learn" was the most important among other 10 groups of competencies. These results confirm the findings of the research on furniture companies in Romania, Brasov region, that transversal competencies such as learning capacity, availability for self-development, orientation to quality, team work will be the most crucial in the future (Constantin et.al., 2015). In this group experts were assessing eight competencies, out of which the most important is willingness and ability to improve knowledge; minimum value for this competence is 3. The second most important competence in this group is related to the ability to continuously learn in the profession as well as retrain. The high evaluation of this competence shows that the future labour market will appreciate not only the ability to self-educate in areas of interest but specifically in the profession.

There are no doubts among experts on the English language competence, it is a must in order to be able to work; Russian is indicated as the second most important language which has not received the lowest priority by any expert. German is marked as less important for the labour market, overtaken by knowledge of Spanish and Chinese.

The improvements and innovations in the ICT sector generate necessity for new skills in different professions at the right time (The e-Skills Manifesto, 2014).

Table 3

Priorities of technological knowledge competencies group

Competencies	Mode	Minimum	Maximum	Weight according to mode inside the competency group
Programming skills	7	1	8	0.10
Math skills	6	3	8	0.10
Physics skills	5	2	8	0.12
Chemistry skills	6.5	1	7	0.10
IT skills	7	1	8	0.13
Skills to work in electronic information systems	7	1	8	0.10
Ability to discern and integrate possibilities of modern technologies in everyday work	8	3	8	0.19
Technical engineering skills	7	3	8	0.16

Source: authors' construction based on Delhi results

The experts have assessed that the ability to use possibilities of technical solutions in daily work will be the most important in the future, the minimum value 3. Just knowledge is not enough but one should acquire the skills to apply it in everyday work. The research in furniture industry in Romania shows the same principle

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of applying the competences in daily work, for example, to design furniture products using IT systems (Constantin et.al., 2015).

From the competencies group "ability to communicate", the experts have given the highest priority in the future labour market to social competencies that are necessary for professional cooperation with people of various generations and cultures. This competence has received the maximum values as well as the highest weight calculated according to mode 0.25 within its competencies group. Expert interviews took place in autumn 2015 when the question on refugees was very topical in the European public space, which is related to the competence "cooperation with various cultures" that in future can be even more urgent.

In the competencies group "ability to change" four skills were rated as important: ability to adapt to a changing environment, ability to react quickly, ability to see new possibilities and openness to changes. The ability to adapt to changing environment received the highest weight 0.26.

Table 4

Overview of competencies group "ability to make decisions"

Competencies	Mode	Minimum	Maximum	Weight according to mode inside the competency group
Problem-solving skills	7	2	7	0.18
Predicting skills	6	1	7	0.15
Sense of responsibility	7	1	7	0.21
Ability to estimate benefits and losses	6	2	7	0.11
Ability to discern and analyse the cause and effect relationship	6	1	7	0.13
Independence	6	1	7	0.10
Logical thinking and argumentation skills	6	2	7	0.11

Source: authors' construction based on Delhi results

Within the competencies group "ability to make decisions", the sense of responsibility is considered to be the most important future competence by frequency with the weight 0.21. The sense of responsibility can be related to the opinion expressed by the employers in the questionnaire on insufficient professional qualification of employees, which is explained by 57% by lack of motivation to work (Figure 1).

According to the hierarchy analysis, the first three competences in the future labour market in general are: ability to see new possibilities, knowledge of the English language and openness to the change.

Nearly a quarter of employers (24%) will need managers over the next 5-7 years, 46% senior experts, only 4% will need servants, 17% service group professions and 12% skilled agricultural, forestry and fishery staff group professions. Employers have pointed out the following important competencies in these profession groups in the future: in manager group – the ability to make decisions and the use of modern technologies in daily work; in senior expert group - the use of modern technologies in daily work and teamwork; in servant group – teamwork, punctuality, precision and interest in the work of the industry; in service and sales staff profession group – joy and the ability to work with people, and the understanding of consumer behaviour; in agriculture, forestry industry - self-discipline and interest in the work of the industry; in qualified workers and craftsmen group – skills to apply ICT in daily work, the ability to collaborate with others; in common profession group – the willingness to work and responsibility about the work to be done. Other research on entrepreneurial education concludes that there is a need to strengthen entrepreneurial skills at higher education institutions (Kucel et.al., 2016).

In comparison, study results in Latvia in Kurzeme region on knowledge and skills required by employers showed that there were significant differences among industry groups (Sloka et. al., 2014). Unlike the results of Sloka's research in Kurzeme where foreign language knowledge was not indicated as highly necessary, this study in Vidzeme region revealed that employers considered foreign language knowledge in English, Russian, Spanish, Chinese and German important in the future.

The competencies for the future workforce mentioned here by both experts and employers are included in current study programme descriptions, as

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these include a lot of competencies, but it is important, as indicated by both the Student Union of Latvia and the employers, that the competencies are acquired during the studies, including internships in companies. Other studies confirm this significance of the qualitative education (Dezelan et al., 2016).

The survey on adult skills focused on skills for wage inequality. One of the conclusions of this survey is that investments in skills which have high demand in the labour market are significant for various reasons: to reduce inequality of wages, to raise productivity, to develop economy (OECD, 2015).

One of the experts has mentioned that "work is an essential part of our lives, so a person wants to gain recognition, self-fulfilment, public or work collective appreciation and meaningful work that is consistent with the values of individual".

Conclusions

1) The personal competencies alongside high professional competencies will play a growing role in the future labour market.

2) Education policy in Latvia emphasizes the significance of technical and natural science professions in economic development but the Incheon Declaration on education for sustainable development indicates that education quality and personality competencies acquired in different education stages have a growing importance.

3) There are no significant differences between expert opinions and employer views on future competencies, both groups point to the significance of personality and characteristic traits in the future labour market.

4) For the future labour market, a special emphasis is laid on skills to practically apply acquired knowledge, use technologies in daily work; the ability to independently acquire new skills and knowledge to be used in the profession.

5) When analysing the data by company size, it can be concluded that large companies will have high-quality requirements for the workforce also in the future as well as requirements for specific skills in technologies and processes.

Acknowledgment

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IMPORTANCE OF BEES IN POLLINATION OF CROPS IN THE EUROPEAN UNION COUNTRIES

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Abstract. The main task of bees is pollination. The results achieved with pollination are many times higher than the value of the products of these insects. Due to changes in production technologies, reduction of the surface of non-productive areas, environmental pollution and improper use of pesticides, the importance of bees in pollination is constantly growing. This applies especially to countries with highly developed agriculture.

According to FAOSTAT, in the years 1961-2013, the number of bee colonies in the EU countries increased by 30%. At the same time, the acreage of open-pollinated crops increased more than 3 times. The biggest growth of the acreage was observed in the case of rape and sunflower. The area of these crops in the EU is too large to be entirely pollinated by bee colonies, especially because the flowering time of rape is similar to that of some fruit plants. In addition, sunflower crops are concentrated in several EU countries which do not have a sufficient number of bee colonies needed for pollination of the entire acreage of the plant. This results in losses, on the one hand – caused by reduction of the crop yield, and on the other hand – by the unused potential of plants for honey production.

Key words: bees, pollination, pollination needs, the European Union.

JEL code: Q51, Q57

Introduction

Beekeeping provides two types of benefits for humans. On the one hand, bees produce various products, among which the most important is honey as well as pollen, propolis, royal jelly, beeswax and bee venom. On the other hand, bees perform the function of a 'service provider' in terms of plant pollination, including pollination of crop plants. Plant pollination is the most important benefit provided by bees. It is estimated that these insects, by pollinating crop plants, provide the economy with ten times, or according to some calculations – even one hundred times, greater effects than the value of their products (Prabucki J. (ed.), 1998). In addition, insect pollinators are an important contributor in terms of maintaining biodiversity.

Most plant species are pollinated by insects, the most important of which are apidae, with the predominant role played by the honeybee. The significance of the honeybee in plant pollination is constantly growing. This is due to changes in production technologies (e.g. vast area of agricultural land where access of wild pollinators is largely prevented), reduction of the surface of non-productive areas as well as environmental pollution and improper use of pesticides, which limits the number of wild insect pollinators (Majewski J., 2011).

The aim of the article was to point to the growing importance of bees in pollination of entomophilous crop plants in the European Union countries. Comparisons were made between the acreage of entomophilous crops and the estimated number of bee colonies needed for their pollination. The study took into account 27 major crop plants, whose total acreage in the EU countries in 2013 amounted to more than 14.5 million hectares.

The study is based on the data provided by FAOSTAT and the subject literature. Statistical data were used to determine the quantities of crops of major entomophilous plants and the number of bee colonies in the EU countries. Based on the subject literature, the author was able to define the impact of bees on the plant yield and the number of bee colonies needed to pollinate a single unit of acreage of the surveyed crop plants.

Research results and discussion

The importance of crop pollination

Pollination by insects is an essential process which enables us to obtain satisfactory yields of many crop plants. It is estimated that approximately 35% of the food produced worldwide depends on pollination, and this figure has shown an upward trend in recent years (Klein et al., 2007; *Lautenbach et al., 2012)*. In the European Union, the crops grown on approximately 12% of arable land are dependent on pollination (Schulp et al., 2014).

Figures related to plant pollination by insects are difficult to estimate. This is due, inter alia, to

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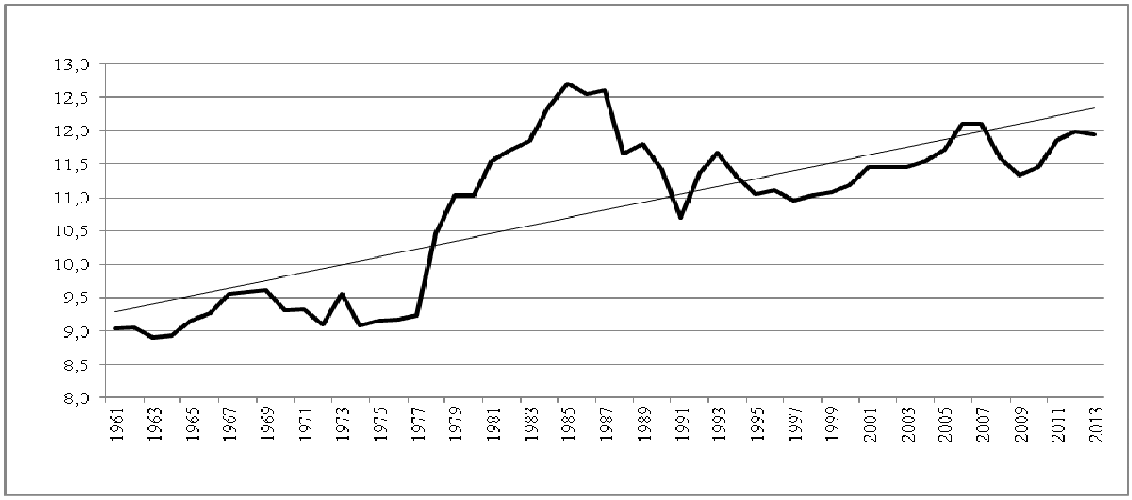
unavailability of uniform results of research into the influence of pollinators on the yield of crop plants, and the varied approach to the definition of pollination values (Morse R.A., Calderone N.W., 2000; Mburu et al., 2006; Allsopp et al., 2008; Gallai et al., 2009; Winfree et al., 2011). This gives rise to significant differences in the results obtained. Gallai et al. (2009) estimated the value of pollination of crop plants worldwide at EUR 153 billion, of which more than a half was attributable to Asia, approx. 15% to Europe (with EUR 14.2 billion attributable to the EU-25), less than 10% to North America and South & Central America respectively, and 8% to Africa. In terms of figures by plant, the largest share in the value of pollination was as follows: fruit and vegetables (approx. $^1/_3$ of the value of pollination each) and oil plants with 25% of the global value of crop pollination (Gallai et al., 2009). Leonhardt et al. (2013), based on the figures from the years 1991-2009, estimated the average value of insect pollination of crop plants in the European Union countries at EUR 14.6 billion per annum. The research involving estimates of the value of pollination was also carried out for individual countries. In the USA, the value of pollination of crop plants, taking into account the value of fruits, vegetables and seeds produced using pollination, increased from USD 9.3 billion in 1989 to USD 14.6 billion in 2000 (Morse R.A., Calderone N.W., 2000). In England, in 2007, this value was estimated at more than GBP 918 million (Breeze et al., 2011), while in Poland, in 2012, it was estimated at more than EUR 825 million (Majewski J., 2014).

The estimated figures point to the significant role of bees as pollinators in agriculture. However, it should be noted that bees are also the main species involved in the pollination of wild growing plants. Therefore, it may state that the value of pollination performed by these insects is higher than the value resulting from the figures given above.

The number of bee colonies in the EU

According to the figures provided by FAOSTAT, in 2013, approximately 12 million bee colonies were utilised in the EU countries. In comparison to the early 1960s, this number increased by more than 30%. Over the last fifty years, there have been significant changes in the number of bee colonies bred by humans, including a rapid growth of their population in the years 1977-1985, and a decrease in the population of bees by approx. 17% in the second half of the 1980s. In subsequent years, the number of bee colonies grew by approx. 0.4% per annum. Throughout the study period, the number of bee colonies in the EU countries showed a slight upward trend (Figure 1). In 2013, the countries with the largest number of bees included: Spain (2.4 million), Poland (1.5 million), Greece (1.3 million) and Romania (1.2 million). In total, the population of bees in these countries accounted for more than 50% of the overall number of bees utilised in the EU countries.

In the years 2000-2013, the number of beehives utilised in the European Union countries increased by less than 7 %. The changes in the population of bees in individual countries were varied. During that period, the largest growth in the number of bees was recorded in Croatia (3-fold), Romania (2-fold), Estonia and Bulgaria (over 60 %). Therefore, the most significant drop in their population was observed in Slovenia and Luxembourg (over 60 %), Italy (almost 50 %) and France (over 30 %) (Table 1).



Source: FAOSTAT data

Fig. 1. **The number of bee colonies in the EU in the years 1961-2013 (by bee colony, in millions)**

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Table 1

Changes in the number of bee colonies in the years 1961-2013 and 2000-2013

Country	Changes in the number of bee colonies in 2013, in comparison to:	
	2000	1961
Austria	123%	82%
Bulgaria	162%	87%
Cyprus	88%	398%
Estonia	167%	na
Finland	102%	215%
France	69%	89%
Germany	78%	35%
Greece	104%	197%
Hungary	115%	168%
Croatia	347%	na
Italy	56%	81%
Latvia	111%	na
Lithuania	121%	na
Netherlands	na	na
Czech Republic	100%	na
Poland	115%	125%
Portugal	111%	166%
Romania	204%	192%
Slovenia	33%	na
Slovakia	91%	na
Spain	114%	334%
Sweden	91%	24%
United Kingdom	na	na
Belgium	109%	81%
Luxemburg	39%	29%
Total	107%	131%

na – no data available.

Source: author's calculations based on FAOSTAT data

The number of bee colonies in the EU countries in 2013, in comparison to the figures from 1961, increased by more than 30%. The number of bee colonies grew in countries with a lower level of agricultural development, and gradually decreased in countries with a higher level of agricultural development. This may be attributable to the production technologies and the quantity of chemicals used in these countries as well as the degree of industrialisation of their agriculture.

Need for pollination of crop plants in the EU countries

Pollination determines the possibility of obtaining yield of adequate quality. In most cases, pollination is performed by bees. Their significant role in the pollination of plants is associated with several factors. These insects live in swarms and form bee colonies, each of them consisting of several thousand to tens of thousands of individuals. Unlike the bumblebees, where the only overwintering individual is the fertilised mother, in the case of bees, the entire bee colony hibernates during the wintertime. This means that bees are able to pollinate large areas of entomophilous plants already in early spring. A hive with a bee colony can be transported to honey pastures, which enables the use of these insects in pollination of different species of plants. Bees are also characterised by the so-called flower fidelity, i.e. during their flight they tend to visit flowers of one species only, which increases the quality of pollination. In addition, with appropriate measures, people are able, in a way, to force the bees to pollinate the flowers of a particular plant species. That is why, in the case of many crops, bees are the best pollinators.

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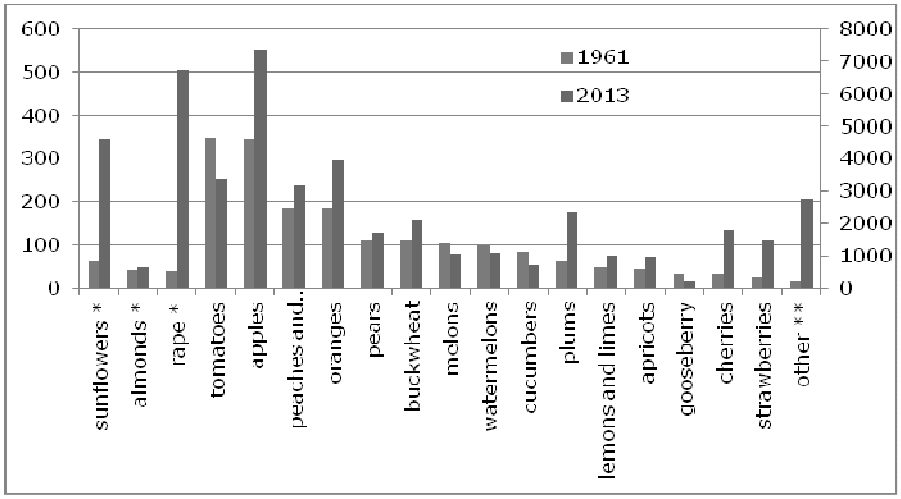

** - right axis.*

*** - other – applies to the total acreage of the following plants: raspberries, currants, sweet cherries, grapefruit, avocado, cranberries, blueberries and bilberries.*

Source: FAOSTAT.

Fig. 2. **Changes in the acreage of entomophilous plants in the EU in the years 1961 - 2013 (in thousand hectares)**

It has been pointed out that among the 115 most important crop species, 87 require pollination by animals. For 52 of these plant species, bees are the most important pollinators, and in the case of 21 species, absence of pollination may result in the yield reduction by at least 40% (Klein et al., 2007).

The influence of plant pollination by insects on the quantity and quality of the yield has not been subject to any thorough research yet. Both Polish (Majewski J., 2010), and foreign (Morse R.A., Calderone N.W., 2000; Losey J.E., 2006) literature provides varied figures with regard to the influence of pollination on the crop yield. This is probably due to a large number of factors, including those beyond human control, determining the levels of crop yields. Table 2 presents figures, most frequently quoted in the literature, regarding the influence of insect pollinators on the yield of some of the major open-pollinated crops in the EU.

In terms of crops, pollination needs are mainly determined by their acreage. In the years 1960-2013, the acreage of entomophilous plants in the EU increased by more than 10 million hectares. The main contributors to this growth were rape, with the 13-fold increase in the area of cultivation (by more than 6.2 million hectares), and sunflower, with the 5.5-fold increase in the area of cultivation (by more than 3.7 million hectares). In 2013, these crops accounted for approximately 2/3 of the area of the entomophilous plants covered by the studies.

Similarly in the case of other crops, in the period in question, there was a growth in their acreage. In the same period, years 1960-2013, the acreage of these plants increased by more than 1.2 million hectares. However, there were several exceptions – in the case of tomatoes, cucumbers, watermelons, melons and gooseberries, the acreage decreased by a total of approx. 20 % (Figure 2).

In 2013, the area of the main entomophilous crops in the EU exceeded 14 million hectares. In order to pollinate the main crops humans needed more than 40 million bee colonies (Table 2). This does not mean that the same number of hives would be required in order to pollinate the crops. Some of the plants bloom at different times, thus, the bees may be used to pollinate various crops. Nevertheless, the number of bees in the EU is insufficient to pollinate all the plants. According to the data provided by FAOSTAT, in 2013, less than 12 million bee colonies were utilised in the European Union. However, in order to pollinate rape crops humans needed more than 20 million bee colonies. This indicates that the number of pollinators is insufficient, given the actual needs. In the case of pollination of sunflower crops, more than 9 million bee colonies were required – a number which also exceeded the actual number of bee colonies available in the countries with concentrated cultivation of this plant. In the case of other plants, the number of hives required for pollination is much lower. However, it should be noted that some of them bloom at approximately the

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same time. Furthermore, some crops, for example fruit plants, are characterised by a relatively low yield of honey, which does not encourage the use of these plants as honey pastures.

Table 2

Acreage of the main entomophilous plants, the effect of pollination on their yield, and the number of bee colonies needed to pollinate the crop plants in the EU in 2013

Plant	Acreage in thousand hectares	Effect of pollination by insects on the yield	Number of bee hives needed to pollinate 1 hectare	Number of bee colonies needed to pollinate the crop plant in thousand hectares
Rape	6724	0.3	3	20172
Sunflower	4559	1.0	2	9118
Almonds	636	1.0	4	2544
Apples	553	1.0	4	2210
Oranges	294	0.3	4	1177
Peaches and nectarines	237	0.6	4	949
Plums	177	0.7	5	885
Cherries	136	0.9	5	678
Pears	129	0.7	4	518
Buckwheat	159	0.4	3	476
Sweet cherries	60	0.9	5	302
Lemons and limes	75	0.3	4	299
Apricots	73	0.7	4	294
Currants	64	0.7	4	256
Watermelons	80	0.7	3	241
Melons	79	0.7	3	236
Strawberries	110	0.2	2	220
Cucumbers	52	0.9	3	157
Raspberries	39	0.8	3	117
Avocado	23	1.0	4	91
Gooseberry	18	0.6	4	74
Blueberries and cranberries	15	1.0	2	30
Grapefruit	4	0.8	4	14
Cranberry	0.6	1.0	3	2
TOTAL	14297	-	-	41061

Source: author's calculation based on FAOSTAT, Morse and Calderone 2000.

Conclusions

Pollination is the most important task of insect pollinators, among which the dominant role is played by the honeybee. Its importance in the pollination of crops and wild growing plants is constantly increasing, among others, due to the growing surface of agricultural fields, increasing use of chemicals, reduction of non-productive areas and environmental pollution.

The importance of bees is also growing due to the increase in the acreage of entomophilous crops in the EU, in particular rapeseed and sunflower. Since 1961, the area of open-pollinated crops in the EU has risen more than 3 times (i.e. by more than 10 million hectares), with the increase in the number of bee colonies, at the same time, by 30%. The significantly lower rate of bee population growth, in relation to the arable land of entomophilous crops, confirms the growing importance of bees in plant pollination. Their significance is even more pronounced due to the fact that the population of wild pollinators is growing smaller as a result of human activity.

Conclusions and recommendations arising from the studies:

1) The increasing importance of pollinating insects, especially bees as pollinators of crops, should be taken into account in the agricultural policy of the European Union. Providing support to beekeeping seems necessary, especially given the fact that the

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'outcomes' of pollination performed by bees are consumed by the owners of plantation crops and by the society in general (ensuring biodiversity).

2) The effects of pollination on the yield of crops are varied. Apart from the plants in the case of which pollination by insects determines the yield to a large extent, such as sunflower, almonds, apples, sweet cherries, avocado, blueberries and cranberries, there are also plants for which the impact of pollination on the yield is relatively low. These include, inter alia: strawberries, oranges, lemons and rape. However, it should be noted here that apart from the growing yields, the use of pollinators also affects their quality, Therefore, a quantitative analysis of yields itself is insufficient, and as a result, the limited knowledge about the importance of pollinators in yielding crops gives rise to the lack of motivation to use the 'services' of insect pollinators.

3) The varied changes in the size of population of bee colonies in different countries of the European Union indicate different development opportunities for beekeeping in the individual EU countries. The absence of data on the number of bee colonies in such countries as the Netherlands and the United Kingdom may be perceived as marginalisation of this area of agriculture in these countries.

Another important issue is the economic value of pollination. As indicated in the study, the results of calculations in this respect are varied and depend, among others, on the approach applied. It seems advisable that the existing methods of estimating the economic value of pollination should be refined, especially in the case of determining the economic value of pollination of wild growing plants.

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POSSIBILITIES OF FIRE SAFETY IMPROVEMENT IN REGIONAL SOCIAL CARE INSTITUTIONS

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Abstract. Fire risk assessment is essential for evaluation of fire safety goals and objectives. Modern studies concentrate on risk assessment for dwellings but evaluation of fire safety for public buildings is significant for analysis and decision-making. Paper provides assessment approach based on expert evaluation. The point diagram method of fire risk quantitative assessment is modified for its application in social care institutions in the Republic of Latvia; to assess by means of this method the fire safety condition in social care institutions and develop proposals how to prevent violations and imperfections of fire safety standards. After the fire risk assessment, the facility's risk level can be identified, wherefrom the actions are further planned for the improvement of fire safety condition. Assessment method is approbated for some regional social care institutions developing specific recommendations for fire safety improvement.

Key words: social care institutions, civil defence, fire safety

JEL code: I39, H75

Introduction

As mentioned by Hurley, M.J. et al. (2016), fire risk indexing is a link between fire science and fire safety. As more learned about the behaviour of fire, it is important to implement new knowledge to meet fire safety goals and objectives. One of the barriers to implementing new technology is the lack of structured fire safety decision making. Fire risk indexing is evolving as a method of evaluating fire safety that is valuable in assimilating research results. Detailed risk assessment can be an expensive and labour-intensive process, and there is a considerable room for improving the presentation of results. Indexing can provide a cost-effective means of risk evaluation that is both useful and valid. In modern research studies, authors are mainly focused on fire risk evaluation in residential buildings, as analysed in Kobes, M. et al. (2010), the traditional approach to fire safety has to be supplemented by scientific knowledge from this field. Also studies by Della-Giustina, D.E. (2014), Rasbash, D. et al. (2004) provide approach to the risk evaluation. However, there is no attention paid to specific social care institutions. About 205 social institutions registered in Latvia render services of continuous social care and social rehabilitation with accommodation (Ministry of Welfare, 2015). These social care institutions provide maintenance of disabled people with physical and/or mental disturbances, pension-aged persons, orphans and children left without parental support. The importance of problems with fire safety in social care institutions was discovered when in February 2007 a tragic accident happened in Alsunga: fire in a social care centre "Regi" where disabled persons with mental disturbances lived. Twenty-four people lost their lives in the fire and the centre building was totally destroyed. Indeed, along with the accident in "Regi", fires with human losses took place also in other care houses but this accident fairly demonstrated the restricted possibilities to evacuate at night time a big number of people who themselves are disabled. After this fire accident, the State Fire and Rescue Service carried out enhanced inspections in social care institutions.

The goal of the present article is to modify the point diagram method of fire risk quantitative assessment for its application in social care institutions in the Republic of Latvia; to assess by means of this method the fire safety condition in social care institutions and develop proposals how to prevent violations and imperfections of fire safety standards.

The article employs the methods of theoretical studies: deconstruction method, descriptive method as well as the methods of empiric study: experts' survey, analysis of documents. The article is methodically based on the scientific literature sources as well as on Latvia's regulatory enactments.

1. Analysis of fire safety condition in Latvian social care institutions

Evacuation measures in case of fire is an important problem with social care institutions in Latvia rendering the services of continuous social care and social rehabilitation. If the fire breaks out at night, usually

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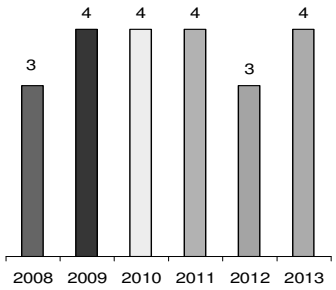
only few duty employees are present in the institution, who cannot timely evacuate all clients, especially those with motoric disturbances. The number of fire accidents in Latvian social care institutions within the period 2008-2013 (according to the data of the State Fire and Rescue Service, hereinafter, referred to as SFRS) is shown in Figure 1. These data allow concluding that within the period 2009-2014 about 3.66 fires took place yearly in Latvian social care institutions.



Source: authors' calculation based on the State Fire and Rescue Service, 2014

Fig. 1. **Fires in social care institutions of Latvia**

In 2015, the fire safety supervision inspectors of the SFRS have carried out 199 (in 2014 – 191) fire safety inspections in social care institutions throughout the country (State Fire and Rescue Service, 2014). Typical violations of fire safety regulations (information on fire safety inspections in social care institutions, sent by the SFRS territorial units) are presented in Table 1.

Table 1

Violations of fire safety regulations requirement in Latvian social care institutions

Violation of fire safety regulations requirements	Number of violations in 2013	Number of violations in 2014	Number of violations in 2015
Practical training in evacuation is not performed	31	34	25
Civil defence plan is not developed	22	12	16
Civil defence plan needs correction	11	15	14
Measurements of electric installation insulation resistance are not performed	8	16	12
Person responsible for fire safety is not trained	15	12	11
Fire safety instruction needs correction	12	12	11
Inner fire safety water supply system is not in working order	6	2	9
Escape routes do not comply with requirements of fire safety	3	8	6
Automatic fire detection and alarm system is not in working order	2	3	6
Plan of actions in case of fire needs correction	6	6	5
External fire extinguishing system (within the object, management) is not in working order	3	7	4
Illuminated indicating signs of escapes and evacuation directions are not in working order	1	4	4
Inadequate provision with fire extinguishing equipment and accessories	11	7	4
Voice fire warning system is not in working order	1	3	2
Plan of actions in case of fire and other emergency situations is not developed	1	1	1

Source: State Fire and Rescue Service, 2015

Analysis of fire safety situation in Latvian social care institutions shows that there is no essential changes with the number of individual violations within the last three years. The following violations can be mentioned among those most frequent:

- practical training is not carried out since it requires certain efforts, especially in evacuation of people with motoric disturbance;

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- civil defence plan is not developed or updated – preparation of such plan requires time and knowledge.

Therefore, the problem of risk management, risk assessment and methodology for assessment of respective risks is of current urgency.

2. Fire risk quantitative assessment for social care institutions

Fire safety evaluation of dwellings and assessment of risks is described in scientific literature for health care institutions (Stollard, P. 1984), using a different technique (Zhao, C.M. et al. 2004). To assess the fire safety risks in social care institutions, the authors have chosen the quantitative assessment methodology using the point diagram method since these cases do not require especially precise results of risk assessment, as it would be, for example, at high hazard objects (Hurley, M. J. et al. 2016, Copping, A. 2004). As an initial source, the table "Indicators and their weight coefficients for public buildings" was used (Jemeljanovs A., Ievins J. 2007), modifying and supplementing it with aspects specific for the field of social care. Based on own experience and taking into consideration the specificity of objects, the authors have developed the "Questionnaire of fire safety level assessment in a social care facility". The survey in total involved 47 fire safety specialists and 14 students of Riga Technical University - fire safety specialists. The most part of experts (39 %) were in the age group from 31 to 40, experts of age 20-30 and 41-50 were in the same proportion (17 %), and only 3 fire safety specialists were in the age group 51-60. Slightly more than a half (51 %) of the experts had 6 to 15 years of work experience in the field of fire safety while experts with work experience to 5 years and 16-25 years were represented in similar proportions: 23 % and 26 %, respectively. Each question of the questionnaire was evaluated by the experts in a 10-point system where 1 means insignificant and 10 – most important. Important fire safety indicators in the experts' evaluation are the fire resistance degree, number of storeys, fireproof walls, fireproof doors, hidden ways of fire spread (eaves, technical shafts), fire safety condition of cellars, compliance of evacuation routes and escapes, antismoke protection of evacuation routes, emergency and evacuation lighting, voice fire warning system.

In order to create an actual insight into fire safety condition of particular social care institutions, the authors examined and evaluated the fire risk degree at 3 objects:

- Skriveri Region local government agency "Social Care Centre Ziedugravas";
- Koknese Region Council Family Crisis Centre "Dzeguzite";
- Plavinas Region local old and disabled people care home "Plavinas".

The study includes also information fixed during the inspections carried out within 2010 and 2014 in social care institutions under the supervision of Aizkraukle territorial unit of the State Fire and Rescue Service. Fire safety situation is reviewed in 4 institutions:

- Skriveri Region local government agency "Social Care Centre Ziedugravas";
- Plavinas Region local old and disabled people care home "Plavinas";
- Nereta local government Nereta social care centre;
- state social care centre "Latgale" branch "Memele".

The results of inspections carried out by the SFRS evidence that the fire safety standards in social care institutions are followed properly enough. Among violations, such imperfections can be noted in internal documents – the civil defence plan of the institution or the plan of actions in case of fire needs reviewing and correction. In 2010 and 2011, reports of administrative violations were made and decisions on imposition of administrative penalty were taken in relation to Skriveri Region local government agency "Social Care Centre Ziedugravas".

3. Identification of fire safety level in social care facility

Based on the experts' evaluations, the weight coefficients (x) are calculated as the arithmetic average by formula (1) for all described fire safety indicators of social care facilities:

$$x = \frac{\sum_{i=1}^{n} x_1}{n}, \quad (1)$$

where

xi – expert's evaluation;

n – number of experts.

Fire safety of social care institutions and the calculated weight coefficients (x) of indicators are summarized in Table 2. This table follows Cabinet of Ministers (2003) and is developed based on data of the

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experts' survey and is practically applicable in the State Fire and Rescue Service in order to assess the fire safety level in facilities of social care institutions.

Table 2

Indicators and their weight coefficients for social care institutions

No	Indicators affecting fire safety of building	Weight coefficient, x	No	Indicators affecting fire safety of building	Weight coefficient, x
1.	Fire resistance degree of building	8.46	2.	Number of storeys	7.92
3.	Fireproof walls	8.51	4.	Fireproof doors	8.57
5.	Fire safety gaps from other buildings and structures	8.23	6.	Hidden fire spread ways (eaves, technical shafts)	8.75
7.	Fire safety of cellars	8.46	8.	Antifire treatment of materials and structures	8.43
9.	Filling of passages in fireproof structures with sealing smokeproof materials	8.9	10.	Roof enclosure, exits to roof	7.79
11.	Accessibility of public buildings environment	7.23	12.	Specially lockable space for isolation of dangerous and aggressive patients	6.34
13.	Alternative power supply	7.23	14.	Compliance of evacuation routes and exits	9.23
15.	Antismoke protection of evacuation routes	9.05	16.	Illuminated indicating signs of evacuation exits	8.64
17.	Emergency and evacuation lighting	8.62	18.	Possibility to quickly get keys from entrance doors	8.92
19.	Automatic fire detection and alarm system	9.56	20.	Area protected by automatic fire alarm system	9.28
21.	Automatic fire alarm system has 24h duty	9.38	22.	Voice fire alarm system	8.52
23.	Maintenance of automatic fire alarm system	9.15	24.	Indoor fire extinguishing water supply	8.05
25.	Outdoor fire extinguishing water supply (fire hydrants, natural and artificial water sources)	9.43	26.	Provision with access roads to building and external water intakes	9.46
27.	Stationary water extinguishing system	8.03	28.	Provision with fire extinguishing equipment and fire extinguishing accessories	8.98
29.	Fire extinguishing service of facility	5.89	30.	Measurements of electric installation insulation resistance, condition of electric equipment (regular inspections)	9.02
31.	Condition of lightning protection equipment	8.75	32.	Compliance of heating and ventilation systems with requirements of standards	9.31
33.	Telephone communications (possibility to call SFRS)	9.33	34.	Safety, including fire safety, signs	8.26
35.	Observance of fire safety rules during performance of fire-dangerous works	9.1	36.	Observance of fire safety rules when working with combustible and inflammable substances	9.21
37.	Observance of smoking regime	8.98	38.	Trained person-in-charge of fire safety	8.7
39.	Performance of fire safety instruction	8.87	40.	Development of civil defence plan, evacuation plans	7.75
41.	Escape plans are placed in all spaces where people stay over night	8.02	42.	Development of plans of action in case of fire	8.61
43.	Practical training in evacuation and actions in case of fire	9.02	44.	Activity of voluntary fire safety formations	6.38
45.	Compliance of SFRS units arrival time with requirements of standards	8.95	46.	Execution of SFRS inspection reports	9.49
47.	Whether fires took place in the building within the last 10 years	6.51			

Source: author's construction based on the survey data

The authors propose to carry out the identification of the facility's fire safety level, using formulas (2) and (3) corrected by the authors.

The facility's fire safety level K is determined as the arithmetic average, calculating individual fire safety indicators of buildings and structures of the facility – Ki.

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$$K = \frac{\sum_{i=1}^{n} K_i}{n}, \quad (2)$$

where:

n - number of buildings;

Ki – fire safety indicator of the facility's building or structure.kur n – number of buildings;

$$K_i = \sum_{i=1}^{N} x \bullet f, \quad (3)$$

where x – weight coefficient;

f – coefficient affecting the building's fire safety indicator;

N – number of fire safety indicators.

Coefficient f is provided in order to correct the building's fire safety indicators in accordance with the building's fire resistance degree and number of storeys. This coefficient is:

U1a fire resistance degree buildings - 1;

U1b fire resistance degree buildings – 0.68;

U2a fire resistance degree buildings – 0.60;

U2b fire resistance degree buildings – 0.35;

U3 fire resistance degree buildings – 0.30;

1-storey buildings – 1;

2-storey buildings – 0.81;

3-storey buildings – 0.74;

4-storey buildings – 0.60;

5-storey buildings – 0.50;

6-storey and higher buildings – 0.35.

For other fire safety indicators, coefficient f is:

1 – if this indicator is available and meets the requirements of standards or does not relate to this facility;

0 – if this indicator is not available and does not meet the requirements of standards.

If coefficient K is within the limits (developed by the authors):

313 – 470, then the risk level at the facility is adequate;

157 – 312, then the risk level is medium and requires taking additional fire safety measures;

lower than 156, then the risk level is unallowable and it is recommended to suspend the facility's work until accomplishment of risk reduction measures and repeated risk assessment.

Calculating the fire safety level of the family crisis centre "Dzeguzite" in order to verify the proposed methodology, fire safety indicators Ki are calculated by the formula (2). Calculating by the formula (3), coefficient K = 364.61, thus, the risk level at the facility is adequate. It means that the fire safety requirements are met no essential violations of regulatory enactments take place. It is recommended to eliminate minor, insignificant imperfections in the field of fire safety. In turn, calculation of fire safety level by the formula (3) for the old and disabled people care house "Plaviņas" gave the coefficient K = 306.53, so the risk level at the object is medium and measures should be taken in order to improve the situation. In the social care centre "Ziedugravas", buildings 11 and 3 were chosen for determination of fire safety level. Fire safety indicators Ki are calculated by the formula (2). Calculating by the formula (3), coefficient K = 337, so the risk level at the object is adequate. It means that the fire safety requirements are met at the object, no essential violations of regulatory enactments take place.

Conclusions and recommendations

1) Presence of many people with motoric disturbances in social care institutions requires a proper observance of fire safety standards that provide the evacuation possibilities, functionality of fire protection systems, provision with fire extinguishing means and water supply, compliance and regular inspection of electric equipment and lightning protection systems, maintenance and inspection of heating and ventilation systems, regulation of fire-hazardous works.

2) Fire safety at the object can be ensured in two ways. One of them is that the national legislation defines the fire safety standards and, if all these established standards are fulfilled at the object, it is assumed that almost no risk of fire exists there; while the second method is the fire risk assessment. After the fire risk assessment, the object's risk level can be identified, wherefrom the actions are further planned for the improvement of fire safety condition.

3) The fire risk assessment used the quantitative risk assessment methodology with the "experts' method" where the industry specialists, based on personal experience, evaluated the internal and external parameters of the building's fire safety system, which were summarized by the authors.

4) In Latvian social care institutions rendering the services of continuous social care and social rehabilitation, an important problem is the evacuation measures in case of fire. If the fire

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breaks out at night, usually only few duty employees are present in the institution, who cannot timely evacuate all clients, especially those with motoric disturbances.

5) Taking into consideration that serious problems with people evacuation exist in social care institutions, the possibility of fire should be reduced maximally through provision of fire extinguishing means and fire alarm systems and strictly meeting the requirements of regulatory enactments.

6) Taking into consideration the existing situation in social care institutions where insufficient number of employees work at night, the authors conclude that quick enough relocation of clients with motoric disturbances by stairs will not be possible; therefore the construction of terraces would be a unique solution for Latvia's care houses with more than one storey. The authors' proposal would be to supplement the Latvian Building Codes with the following paragraph: "… if social care and accommodation buildings are designed to have more than one storey, the ramps (for example 2 m wide) should be constructed between the storeys to move people with all beds down to the first storey".

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SMART SPECIALISATION ASSESSMENT IN LATVIA

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Abstract. The paper compiles different explanations and definitions of smart specialisation in Latvia. The development of smart specialization strategies (RIS3) should promote the competitiveness of countries or regions. For national level, RIS3 helps concentrate resources and support innovations. Desk research identifies lack of regional level when comparing smart specialisations in different countries. Nevertheless, some regions in Latvia have still stated RIS3 when elaborating their regional development strategy.

The research performed is mainly based on desk research by using content analysis and the monographic method. An assessment tool from the RIS3 Assessment Wheel elaborated using the S3 Platform may be also used for assessment of RIS3 development in Latvia.

The RIS3 of Latvia and Lithuania were compared and the differences were connected with transportation, usage of natural resources and society development. The RIS3 of Lithuania referred to the development of a sustainable environment, which was not present in the RIS3 of Latvia.

The development of Latvia's RIS3 has been assessed by using the RIS3 Assessment Wheel. The development of a tool for the synthetic representation of the progress made in drafting/designing a RIS3 allows condensing a huge amount of information in one visual model.

There is measured development of Latvia's RIS3 by comparing Latvian state institution official opinion with articles authors, performed as a first probation. There should be continued research on the regional level of Latvia, involving more experts and specialists particularly from the sectors representing smart specialisation priorities.

Key words: smart specialisation strategy, specialisation fields (priorities), innovation.

JEL code: Q 25; R 11; O 31

Introduction

In many European Union Member States, including Latvia, an urgent problem is how to mobilise the country's potential in a way that contributes to the reduction of disparities in average indicators between developed and other countries as well as how to catch up leaders in innovation, to make cooperation among entrepreneurs, research institutions and higher education institutions more effective and to prevent the lack of skills and the outflow of labour.

Since 2009, smart specialisation strategies, which serve as the determinant drivers of competitiveness of countries and/or regions, have been designed in the EU. The strategies envisage setting smart specialisation priorities that have the greatest potential to raise the competitiveness of national economies and mobilising resources for the purpose of implementing the priorities.

Both at national and regional levels, state administrations in particular play an important role in implementing the Europe 2020 strategy and in executing its decisions. Growth and the creation of new jobs considerably depend on the objectives and particular commitments set at the EU, national, regional and local levels. The purpose of smart specialisation strategies is to transfer innovations from theory to tangible results, namely, make the innovations understandable to producers and introduce them into production. A smart specialisation strategy is a strategic approach to economic development through targeted support for research and innovation. Investments from the European Union Structural Funds into research and innovation are directed based on it.

The aim of this research is to assess smart specialization of Latvia by benchmarking and smart specialization assessment tool.

The tasks of the research:

- to clarify content and interpretations of concept of smart specialization;
- to compare smart specialization strategies and priorities included for Latvia and Lithuania;
- to understand assessment for smart specializations;
- to test self-assessment tool - 'RIS3 assessment wheel', to find out development of smart specialization strategy in Latvia.

Research results and discussion

In 2010, the European Union adopted the notion "smart" in its new ten-year growth strategy Europe

2020 stating that Europe should become a smart, sustainable, and inclusive economy (Europe 2020, 2010). A smart specialisation strategy involves designing a vision, identifying competitive advantages, setting strategic priorities and making government policies that maximally release the knowledge-based development potential of a country or some region.

In an explanatory dictionary, the term smart refers to broad knowledge, well-developed thinking, ample experience, wisdom, ideas and deductions. The term intelligent is used along with the term smart. The uses of the terms are explained by a number of authors (Holland R.G., 2008; Wolfram M., 2012; Pardo T., Nam T., Brian Burke G., 2012). They come to a conclusion that both terms involve the same meaning. However, in the Latvian language, the concepts "prudent specialisation strategy" or "intelligent specialisation strategy" are also used along with "smart specialisation strategy". At present, all the three terms are used as synonyms in national documents, meaning the same idea; besides, their abbreviations are also used: S3 – Smart Specialisation Strategy and RIS 3, which stands for Research and Innovation Strategies for Smart Specialisation.

S3 can provide a suitable platform for that transformation, as it is fundamentally based on a process of entrepreneurial discovery — an "entrepreneurial selection" of market opportunities or a "self-discovery process" (Hausman R., Rodrik D., 2013). The objective is not about telling the innovation system actors what the right specialisations are but accompanying emerging trends and improving coordination by providing the necessary public goods and creating additional incentives at critical bottlenecks to help the new activity grow. Therefore, the outcome of the process is a structural evolution of the whole economy (Foray D., 2011).

At the early stage, when the production of an innovative product is tested, a potential producer as well as a potential investor is not interested in it, as it requires large resources and it is not possible to predict what this activity can result in. A solution has to be found regarding how to combine resources – from the part of both scientists and producers. A number of research studies point to the complicated and time-consuming process of adaptation of all stakeholders – national and local government institutions, research institutions, entrepreneurs, investors, the civil public and various experts – to each other (Sandu S., 2012; Rusu M., 2013; Paliokaite A. et al., 2015).

A number of innovation researchers have expressed an opinion that innovative growth stagnates and has low growth rates in the whole Europe. In their research studies on designing and introducing smart strategies, representatives of the new European Union Member States in particular emphasise that entrepreneurs and investors are little interested and lack motivation and a wish to promote and implement smart specialisation strategies. For example, Lithuanian scientists A.Paliokaite, Z.Martinaitis and R.Reimeris stress that the government and its institutions as customers and consumers of innovations have to think "beyond boundaries", crossing usual and traditional patterns. New patterns for growth and modernisation have to be searched for in traditional industries (Asheim B. et al., 2011).

Scientific discussions often refer to regional development problems with regard to innovation; it is frequently associated with the mobility of scientists and entrepreneurs and their wish or, on the contrary, their reluctance to work in less developed regions (Foray D. et al., 2009). Unlike Latvia and Lithuania, several EU Member States, for example, Romania and Bulgaria set their priorities in their smart specialisation strategies not at national level but at regional level, i.e. for each region. Such an approach takes into account the uneven development level of their regions and the traditional areas being developed in some region (Paliokaite A. et al., 2015; Sandu S., 2012). The territorial size of a country is also taken into consideration.

It is expected that the economic growth in Latvia in the period 2014-2020 is determined by investment in three important sectors: traditional industries, which bring changes in their output and exports; industries that develop high value-added goods and services; industries that make significant horizontal effects on and contributions to economic transformation (Smart Specialisation Strategy…, 2014). The special areas that will receive the largest amount of support in Latvia in future and that are set as priorities in the Smart Specialisation Strategy are as follows: knowledge-intensive bioeconomy; biomedicine, medical technologies, bio pharmacy and biotechnologies; information and communication technologies; smart energy; smart materials; technologies and engineering systems.

However, it has to be also noted that setting priorities does not guarantee that all the objectives are achieved in the strategy implementation period. A

strategy for smart specialisation should evolve and adjust to changes in economic and framework conditions as well as to emergence of new evidence during implementation (Martinaitis Z. et al., 2013; Foray D., Goenaga X., 2013). Some "priorities" can fail, and new prospective fields can emerge, hence intelligence and review procedures should allow for flexibility.

After analysing the smart specialisation strategies of selected European countries, one can find that the priorities set by several countries are quite similar; yet, their interpretations are different. For comparison, the priorities set by two neighbouring Member States – Latvia and Lithuania – in their smart specialisation strategies are summarised in Table 1.

Table 1 shows that although several priorities of Latvia and Lithuania overlap, the smart specialisation strategies of both countries significantly differ. The greatest differences relate to transport, exploitation of natural resources and social development. Logistics and transport are set as priorities in Lithuania, whereas in Latvia this sector is not prioritised. It is, of course, determined by the location of the country and the previous pace of development of this sector in Lithuania. In contrast, the exploitation of natural resources by various economic sectors and complex solutions to the use of such resources in Latvia do not relate to the priority "bioeconomy". In Lithuania, agriculture and food processing are set as priorities. So, the exploitation of natural resources as a priority is defined in Latvia in a much broader context, as the bioeconomy involves the production of renewable biological sources and their transformation into food, feed, biological products and green energy. The components of bioeconomy are agriculture, forestry, fisheries, food, pulp and paper production as well as partially the chemical industry, biotechnologies and energy (Lenerts A., Strikis V., 2013). In part, these areas match with environmental sustainability referred to in Lithuania's strategy, which is not highlighted in Latvia's strategy.

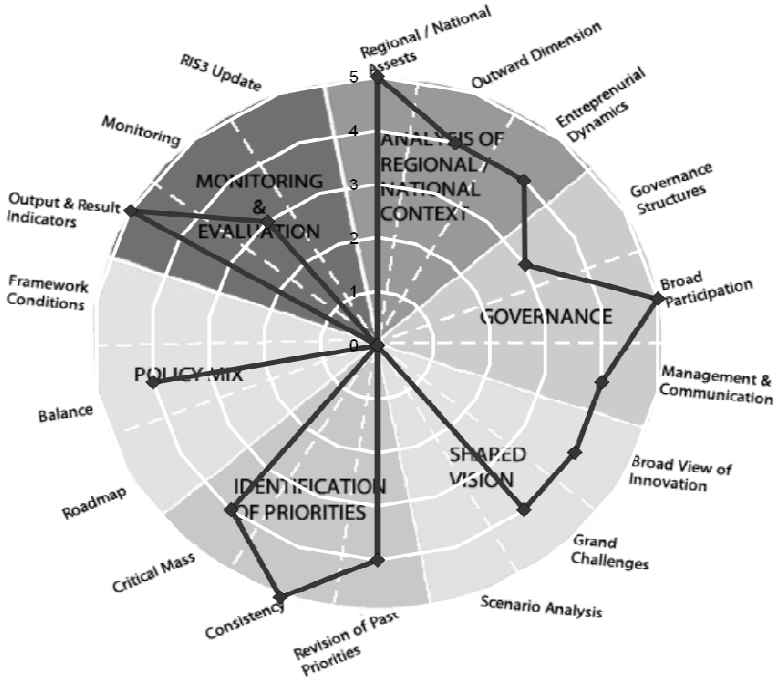
The **RIS3 Assessment Wheel** can be used performing the Smart Specialisation Strategy (RIS3). It is a synthetic tool to position a country and its RIS3. The final layout of the RIS3 Assessment Wheel was elaborated using the S3 Platform on the basis of the original contribution by Christian Saublens, Executive Manager of EURADA – the European Association of Development Agencies.

Table 1

Priorities defined in the smart specialisation strategies of Latvia and Lithuania

No	Latvia	Lithuania	Comments
1.	Smart energy	Efficient energy system and sustainable environment	Sustainable environment dimension is not set as a priority in Latvia
2.	Knowledge intensive bioeconomy and biotechnologies	Food technologies and agri-innovation	Scope of Latvia's strategy is broader
3.	Biomedicine, medical technologies, biopharmacy and biotechnologies	Health, health technologies and biopharmaceuticals	Both countries focus on medical technologies and biopharmacy
4.	Information and communication technologies	E-systems	Latvia also particularly focuses on biotechnologies
5.	-	Transport and logistics	Different explanation; Latvia focuses on ICT on the whole.
6.	-	Inclusive and learning society	In Lithuania – the e-environment
7.	Smart materials, technologies and engineering systems	New processes, materials and technologies for industry	It is not set as a priority in Latvia

Source: authors' construction based on an informative report by the Cabinet of Ministers of Latvia, 2013 and Paliokaite A. et al., 2015



Source: authors' construction based on Policy mix and implementation of the RIS3, presentation materials, 2014

Fig. 1. **Informal self-assessment on Latvia's work on the RIS3**

The development of the RIS3 Assessment Wheel for the examination of the progress made while developing the RIS3 allows fitting a huge amount of information in one model. The assessment wheel can support a number of activities, e.g. self-assessments, peer-reviews, expert contributions, presentations at dissemination, discussion and negotiation meetings etc.

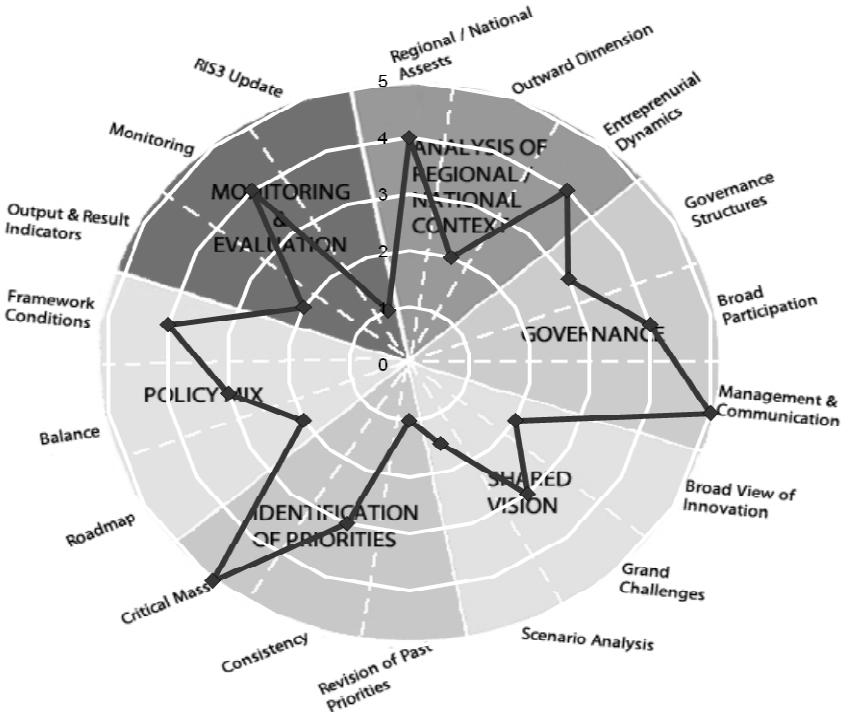
A. Kiopa, a Deputy State Secretary from the Ministry of Education and Science, when discussing the topic "LATVIA: Policy Mix and Implementation of the RIS3", mentioned that this wheel can be used for an initial/informal self-assessment of Latvia's work on the RIS3 as well as presented the wheel (Figure 1).

The wheel is built on the basis of the six steps described in the RIS3 Guide and the identification of three critical factors for each of the steps. The scaling tool (from 0 to 5) estimates the seriousness of the evidence provided in the process as far as each critical factor is concerned with the following meaning: 0 means no information available on the specific element, 1 means poor, 2 means to be improved, 3 means fair, 4 means strong, 5 means excellent. The Homepage Smart Specialisation Platform offers a description of the Assessment Wheel, an assessment tool and the RIS3 Guide (RIS3 Guide, s.a.).

Guidance is structured around six practical steps: analysing the innovation potential; setting out the RIS3 process and governance; developing a shared vision; identifying the priorities; defining an action plan with a coherent policy mix; monitoring and evaluating.

The final result of assessment appears in a form of "spider graph" where the strongest and weakest positioning would be easily highlighted. This immediate visual recognition of strengths and weaknesses would allow more focusing on further activities.

The authors of the research paper also tried to use the RIS3 Assessment Wheel to find out if the RIS3 could be further developed in Latvia, as this tool was tested by government officials (Figure 2).



Source: authors' construction

Fig. 2. **Self-assessment on Latvia's work on the RIS3**

When comparing the assessments, there can be seen that the authors have not valued any of the factors at zero, which means that there can be always found reasons to support the factors. In Figure 1, it is obvious that the factors such as scenario analysis, roadmap, framework conditions and RIS2 update were valued at zero. However, Figure 2 shows these factors to be a little bit higher than zero because a little less than a year has past since the first measurement. There are developed RIS3 supporting documents and organised popularisation seminars and conferences. A good example is research on Vidzeme planning region organized by the Norway Grants and the Ministry of Environmental Protection and Regional Development of Latvia which supports many of the wheel factors (Smart Specialisation Opportunities…, 2014).

In order to make an in-depth assessment of smart specialisation for Latvia, it is envisaged to adapt this assessment tool for regional evaluation – in Zemgale, Kurzeme, Latgale, Vidzeme and Riga.

Conclusions, proposals, recommendations

1) The European Union Member States have developed smart specialisation strategies in line with the objectives set in the Europe 2020 strategy. In their strategies, each Member State defines its priorities to foster economic growth by using its current potential, while at the same time promoting innovation. Some Member States, particularly small ones in terms of territory, have set priorities on a national scale, while several Member States have set priorities for their every region.

2) A comparison of the smart specialisation strategies of Latvia and Lithuania reveals that a great deal of their priorities is similar, having different definitions. However, there are some differences, particularly for transport and logistics that are prioritised in Lithuania and for the exploitation of natural resources, which is defined in Latvia's strategy in a broader sense.

3) An assessment of smart specialisation development by using a tool – the RIS3 Assessment Wheel – needs further steps to be taken, such as: upgrade of the national and/or regional RIS3; appropriate consideration of territorial features, priorities and needs in the multi-level governance process at country level; preparation and negotiation of funding programmes such as the EU cohesion policy operational programmes; reviews, comparisons and benchmarking; reflection on training/coaching activity needed in a particular defined segment; definition of co-operation activities and establishment of mutual learning / twinning tools.

4) Further research will also involve an assessment of RIS3 for separate regions of Latvia, which may give different results and emphases. This will be done by involving experts and field specialists to boost the assessment's usability and objectivity.

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IMPACT OF ESTONIAN RURAL LOCAL GOVERNMENTS CAPACITY ON THE ARABLE LAND USE

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Abstract. The land use pattern is affected by different factors. One group of factors related to studies of land use change are socio-economics. The aim of the study is to test if the various indicators describing local government capacity have any impact on changes in arable land use. The study focuses on Estonian rural municipalities. The first task was determination of land use changes for the period 2009-2015. The GIS overlay technique was implemented for this. The second task was a correlation analysis among indicators of changes in arable land use and indicators of local government capacity. Finally, the construction of multiple regression models was the third task of the study. The overall results show that arable land area has decreased by 14.7% from 2009 to 2015. The results of the correlation analysis show that five components (indicators) of the capacity index had statistically significant correlations with changes in arable land use. According to the multiple regression models those factors described approximately one - fifth of the variation of utilised changes in arable land.

Key words: land use change, capacity indicator, regression analysis.

JEL code: R14; Q24

Introduction

Land use patterns are constantly changing and this process has a manifold character. For example, some areas of agricultural or forest land can be transformed into build-up areas, while other agricultural areas are only left out of use for certain periods of time. New areas of arable land are taken into use at the same time. Changes in arable land use are a constituent part of all changes in land use patterns. However, there is no detailed information about those changes on an Estonian regional scale (counties, municipalities). The publication Statistics Estonia (Agriculture in Figures, 2014, 2015) for example only gives data about agricultural land use for the country as a whole. The importance of land information has been underestimated in the last two decades in Estonia. For example, land as a basis for all human activities is not addressed in the publication of Statistics Estonia regarding indicators of sustainable development (Indicators, … 2015). Insufficient knowledge about land and land use changes can lead to making wrong decisions in the perspective of a sustainable future.

Land use and its changes are affected by different factors. The nature and character of those factors is complex and complicated. However, it is necessary to distinguish two groups of factors that have an impact on land use. The first group of factors is the physical properties (geophysical, physiographic, ecological etc.) of land itself (B. Zaragozí et al., 2012). It includes, for example, land type, soil productivity, location of plots etc. Those properties are called natural conditions and they are directly related to the plots in question. Two neighbouring plots can have different characteristics. The socio-economic conditions of a particular region constitute the second group of factors that have an influence on land use. A typical feature of socio-economic conditions is that they are similar for all plots of a region (village, municipality, county or even the whole state).

The socio-economic conditions of regions can be characterised from different points of view. S. Krusell (2015) investigated the prerequisites for the economic success of local government units. The impact of socio-economic conditions on the quality of life in counties was the topic of a study (R. Põldaru and J. Roots, 2014). S. Rozentale and A. Livina (2015) investigated the possibilities of measuring regional entrepreneurial potential. These are just a few examples of the various topics related to the study of the socio-economic conditions of regions.

The aim of the study is to test if the local governmental capacity of Estonian rural municipalities has an impact on changes in arable land use. The study focuses on two research questions: 1) What are the directions of changes in arable land use (do areas used increase or decrease)? and 2) What kinds of factors describing municipalities' capacity are correlated with changes in arable land use? The tasks of the study were: 1) an overlay analysis in GIS in order to find changes in arable land use for the period 2009-2015; 2) a correlation analysis among indicators of land use changes and indicators describing local government capacity; and 3) the construction of multiple regression models. This study contributes to a better

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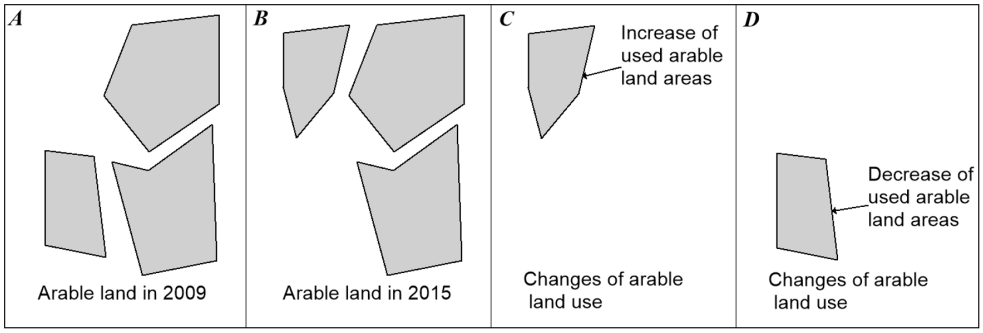
understanding of the changes in Estonian agricultural land use patterns.

In this study, the socio-economic conditions of municipalities are meant as a set of factors that are components of local governments' general capacity index. That index was used for assessment of the capacity of Estonian local governments (Kohaliku omavalitsuse …, 2014).

Materials and methods

Rural municipalities are the units of observations in this study. Two data sources have been used for the research. The first data source was the database of agricultural plots of the Estonian Agricultural Registers and Information Board (hereinafter, ARIB). It is considered in this study that if there is an application for subsidies then the plot is in use. Missing of the application for the subsidies indicated that land is left out of use. Comparison of the digital maps of arable plots boundaries for 2009 and 2015 allows for determining any changes of arable land use. ArcGIS software was used for comparison of the boundaries of arable plots of two different years (Figure 1).



Source: authors' construction

Fig. 1. **Comparison of arable land of different years and detection of any increases or decreases of arable land use area**

Part A and Part B in Figure 1 show the boundaries of arable land parcels in different years. The results of the comparisons of the boundaries are presented in Part C and Part D of Figure 1. Increases and decreases of arable land were calculated by municipalities. The absolute changes (hectares) were recalculated to the relative values (per cent) in order to make land use changes comparable among municipalities of different size. Areas of arable land in 2009 were taken as the basis for calculation of changes. Finally, three indicators of changes in arable land use were calculated for all investigated rural municipalities:

- new area of arable land taken into use in 2015 compared to 2009 (increase of arable land in per cent);
- area of arable land left out of use in 2015 compared to 2009 (decrease of arable land area in per cent);
- total change of arable land area in the period from 2009 to 2015 (increase of arable land area minus decrease of arable land area in per cent).

Municipalities around bigger cities (Tallinn, Tartu and Pärnu) were excluded from the study because the land use changes in those municipalities are influenced by real estate development activities. Some municipalities were excluded from the study because of their joining in the administrative reform process. The data for such municipalities were not comparable for the entire study period. Finally, some municipalities in extreme conditions, for example, municipalities on a small island like Kihnu and Ruhnu, have also been excluded. The total number of rural municipalities included in the study is 150. The digital map of municipalities' boundaries was provided by the Estonian Land Board.

The second data source for the study was the list of different indicators that were used for establishing the local government capacity index. The index was elaborated by the Geomedia Consulting and Training Centre (http://geomedia.ee/eng/definition-of-local-government-index/) and the initial data on Estonian municipalities is publicly available (Kohaliku omavalitsuse …, 2014). V. Sepp et al. (2009) presented the theoretical explanations for the calculations of the local government capacity indices. There are all together 28 socio-economic indicators that characterise different aspects of local government capacity as components of a general index. Those indicators are divided in the following six groups:

- population and land (4 indicators);
- local economy (4 indicators);
- population welfare (4 indicators);
- local government organisation (3 indicators);

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- financial status of local governments (5 indicators);
- local government services (8 indicators).

The indices and indicators were presented by years for the period 2006-2013 and two averages were also available – the first one for the period 2006-2009 and the second one for the period 2010-2013.

A correlation and regression analysis has been implemented in order to find the possible impact of indicators of local government capacity in changes of arable land use. At the beginning, all indicators for all years were included in the correlation analysis. Averages of the indicators for the period 2006-2009 and for the period 2010-2013 were also included. The multiple regression analysis was followed to a correlation analysis. The indicators of local government capacity as independent variables for the multiple regression analysis were selected on the basis of the correlation analysis results. Statistica software (version 12) was used for all statistical analyses and the statistical significance level was set on α=0.05.

Research results and discussion

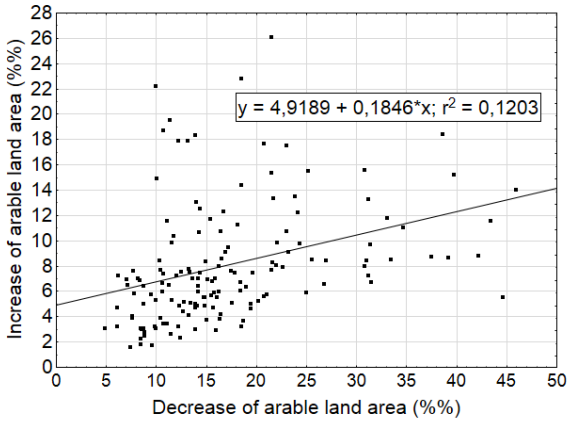
The results of the study show that in all investigated municipalities some new arable land have been taken into use and some areas have been left out of use in the period 2009-2015. It means that the processes of increase and decrease of used arable land area went in parallel. The total area of used arable land in investigated municipalities was 962 074 hectares in 2009 and 821 123 hectares in 2015, respectively. The difference is 140 951 hectares, which makes 14.7 % of the total decrease of used arable land area in investigated municipalities. The main statistics of changes in arable land use are presented in Table 1.

Table 1

Descriptive statistics of changes in arable land use (per cent) in investigated rural municipalities in the period from 2009 to 2015

Variable	Mean	Minimum	Maximum	Std. Dev.	Std. Err
Increase of arable land area	8.07	1.68	26.18	4.64	0.378
Decrease of arable land area	17.08	4.82	45.90	8.72	0.712
Total change of arable land area	-9.01	-38.96	12.35	8.34	0.681

Source: authors' calculations on the basis of the Agricultural Registers and Information Board and Estonian Land Board data



Source: authors' construction the basis of ARIB data

Fig. 2. **The scatterplot of increases and decreases of used arable land areas in investigated municipalities**

The increases and decreases of arable land are combined differently among the municipalities. The increase of used arable land was higher than its decrease only in 13 municipalities while the contrary was true in 137 municipalities. This makes 91.3% of all investigated municipalities. Figure 2 depicts the distribution of changes in (increase and decrease) arable land areas in investigated municipalities.

There is a modest determination (r^2=0.12) between the increases and decreases of used arable land areas. However, Figure 2 shows that there are municipalities with small changes of used arable land areas (increases and decreases of used arable land are less than 10 %), while in some municipalities these changes are bigger (more than 10 %). The location of investigated municipalities and the changes of arable land areas are presented in Figure 3.

Decreases of used arable land area tend to occur in remote areas. However, some municipalities with decreases of used arable land areas of more than 10% are not located in the periphery but quite close to Tallinn. Municipalities with increases of arable land use do not form any clear clusters.

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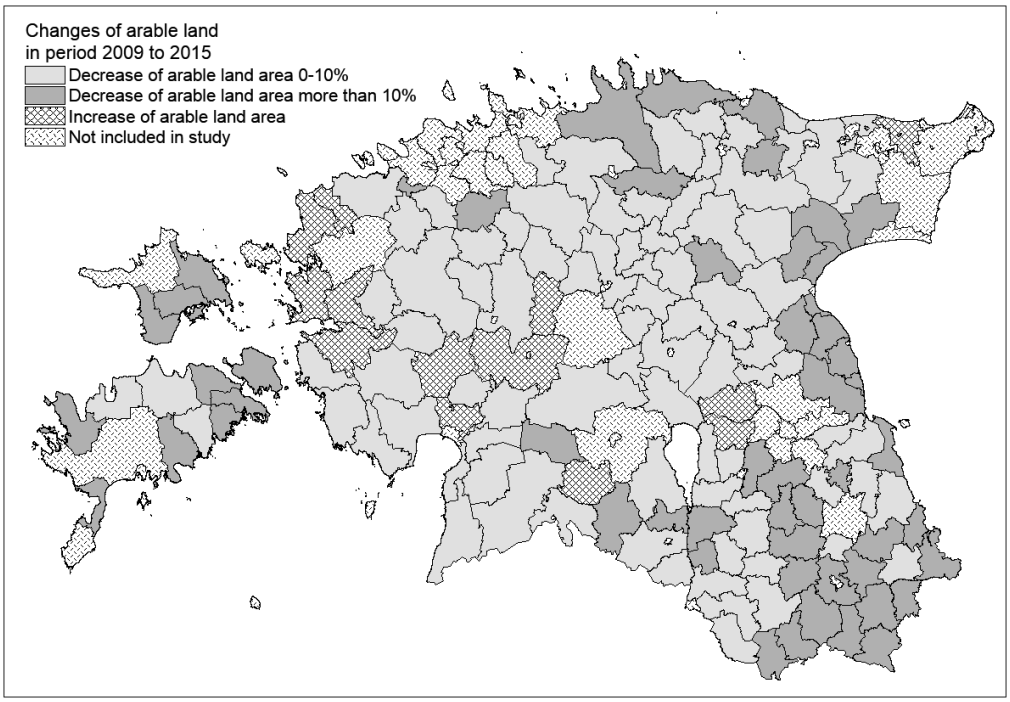

Source: authors' construction the basis of ARIB and Estonian Land Board data.

Fig. 3. **Location of study areas and the groups of average arable land in investigated municipalities**

The results of correlation analysis show that most socio-economic indicators of local government capacity do not correlate with changes in arable land use or those correlations are weak. However, five indicators describing some aspects of local government capacity had statistically significant correlations with changes in arable land use or they raised the determination coefficient if included in models. The following indicators remained in the last step of the study:

- the number of economic units per capita of working age (hereinafter No EU) is calculated by multiplying the number of economic units in the statistical profile of Statistics Estonia by 100 and divided by the number of residents in the age group 15–64;
- the level of employment as the measure that shows the ratio of employed persons among residents in the age group 15-64 (hereinafter Lev Emp) is calculated by dividing the number of employed by the number of residents;
- the capacity of the local government for self-financing (hereinafter Cap SF) characterises the health of the budget and is calculated by dividing net revenue by expenditures;
- the relative extent of recreational services (hereinafter Rec Ex) characterises the amount of local government expenditures in euros for recreational services per resident;
- the relative extent of management and environmental protection expenditures (hereinafter ME Ex) characterises the amount of local government expenditures in euros for the management and environmental protection per resident.

Table 2 shows the descriptive statistics of capacity indicators included in regression models. There are no big differences between the average data for the periods 2006-2009 and 2010-2013. The difference between minimum and maximum values is much bigger at the same time. For example, the maximum amount of local government expenditures for recreational services per resident was about 16 times higher than the minimum for the period 2006-2009. The highest difference between minimum and maximum values in Table 2 is for the amount of local government expenditures for the management and environmental protection per resident.

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Table 2

Descriptive statistics of variables (indicators of capacity) included in regression models

Variable	Mean		Minimum		Maximum		Std. Dev.		Std. Err	
	2006 - 2009	2010-2013	2006-2009	2010-2013	2006-2009	2010-2013	2006-2009	2010-2013	2006-2009	2010-2013
No EU	10.03	14.35	4.86	6.97	21.13	26.49	2.30	3.22	0.196	0.261
Lev Emp	0.75	0.70	0.51	0.46	0.85	0.81	0.06	0.06	0.005	0.005
Cap SF	1.08	1.09	0.90	0.98	1.90	1.89	0.10	0.09	0.008	0.007
Rec Ex	129.4	124.5	29.1	42.7	476.4	426.9	69.25	67.22	5.654	5.488
ME Ex	175.4	193.2	61.3	46.7	1131.1	1090.1	103.55	132.30	8.455	10.803

Source: authors' calculations based on the previously conducted study (Kohaliku omavalitsuse üksuste …, 2014)

The correlation between arable land changes and local government capacity indicators is presented in Table 3 and Table 4. The increase of arable land has the highest correlation with the number of economic units per resident. More arable land has been taken into use in municipalities with a higher number of economic units per resident. The expenditures for management and environmental protection have a statistically significant correlation with increases of arable land only for the period 2006-2009.

Table 3

Correlations between arable land changes and local government capacity indicators (average for the period 2006-2009)

Variables	AL inc	AL dec	AL cha	No EU	Lev Emp	Cap SF	Rec Ex	ME Ex
AL inc	1	0.347*	0.194*	0.306	0.004	-0.101	-0.008	0.219*
AL dec	0.347*	1	-0.853*	0.099	-0.321*	0.027	0.190*	0.159
AL cha	0.194*	-0.853*	1	0.066	0.338*	-0.085	-0.203*	-0.044
No EU	0.306*	0.099	0.066	1	0.270*	0.100	-0.020	0.102
Lev Emp	0.004	-0.321*	0.338*	0.270*	1	0.187*	0.097	0.012
Cap SF	-0.101	0.027	-0.085	0.100	0.187*	1	-0.032	0.045
Rec Ex	-0.008	0.190*	-0.203*	-0.020	0.097	-0.032	1	0.140
ME Ex	0.219*	0.159	-0.044	0.102	0.012	0.045	0.140	1

*Note: * Correlation coefficients statistically significant at α=0.05*

Source: authors' calculations

Table 4

Correlations between arable land changes and local government capacity indicators (average for the period 2010-2013)

Variables	AL-inc	AL-dec	AL-cha	No EU	Lev Emp	Cap SF	Rec Ex	ME Ex
AL-inc	1	0.347*	0.194*	0.281*	0.022	-0.079	0.094	0.094
AL-dec	0.347*	1	-0.853*	0.208*	-0.325*	0.093	0.148	0.185*
AL-cha	0.194*	-0.853*	1	-0.062	0.352*	-0.141	-0.102	-0.141
No EU	0.281*	0.208*	-0.062	1	0.163*	0.023	-0.005	-0.024
Lev Emp	0.022	-0.325*	0.352*	0.163*	1.	0.103	0.182*	0.083
Cap SF	-0.079	0.093	-0.141	0.023	0.103	1	0.078	-0.002
Rec Ex	0.094	0.148	-0.102	-0.005	0.182*	0.078	1	0.271*
ME Ex	0.094	0.185*	-0.141	-0.024	0.083	-0.002	0.271*	1

*Note: * Correlation coefficients statistically significant at α=0.05*

Source: authors' calculations

Decreases of arable land have the highest correlation with the level of employment for both study periods. Less arable land is left out use in municipalities with higher levels of employment. The number of economic units per resident has a statistically significant correlation with decreases of arable land

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areas only for the period 2010-2013. The positive correlation between the abovementioned variables indicates that more land is left out of use in municipalities with a higher number of economic units per resident. The fact that the number of economic units per resident has a positive correlation with increases and decreases of arable land areas indicates that more changes in arable land use occur in municipalities with higher levels of economic activity. This is in accordance with the correlation between the simultaneous increase and decrease of arable land areas (Figure 2).

The total change of arable land area has a statistically significant correlation with the level of employment in both periods of study. More arable land has been taken into use if the level of employment is higher. The amount of local government expenditures for recreational services per resident has a significant correlation with the total change of arable land only for the period 2006-2009.

The results of stepwise forward multiple regression analysis are shown in Table 5 and Table 6. The multiple regression model describes the joint impact of different local government capacity indicators on changes in arable land use.

The regression models do not describe the impacts of different capacity indicators on increases of arable land well. The main drawback of those models is the high p-value of intercept. This is valid for both periods of study. The number of economic units per resident was included in the regression model for both study periods, while the amount of local government expenditures for the management and environmental protection per resident was included in the regression model only for the period 2006-2009.

Table 5

Main characteristics of regression models for the period 2006-2009

Variable name	b	Std.Err. of b	β	Std.Err. of β	t	p-value	Adjusted R^2	F
Dependent variable: increase of arable land area								
Intercept	0.780	1.652	x	x	0.47	0.639	0.117	10.87
No EU	0.578	0.156	0.286	0.077	3.70	0.000		
ME Ex	0.008	0.003	0.190	0.077	2.45	0.015		
Dependent variable: decrease of arable land area								
Intercept	47.551	7.938	x	x	5.99	0.000	0.177	11.69
Lev Emp	-56.221	10.905	-0.4000	0.078	-5.16	0.000		
Rec Ex	0.0294	0.0094	0.2333	0.074	3.12	0.002		
No EU	0.8038	0.2934	0.2116	0.077	2.74	0.006		
Dependent variable: total change of arable land area								
Intercept	-30.404	9.145	x	x	-3.32	0.001	0.180	11.94
Lev Emp	52.739	10.195	0.3926	0.076	5.17	0.000		
Rec Ex	-0.030	0.0089	-0.2468	0.075	-3.31	0.001		
Cap SF	-13.414	6.1012	-0.1662	0.076	-2.20	0.029		

Source: authors' calculations

Decreases of arable land depend on the level of employment, the number of economic units per resident and the amount of local government expenditures for recreational services per resident in both study periods. The amount of local government expenditures for the management and environmental protection per resident has an impact on decreases of arable land areas for the period 2010-2013. The adjusted determination coefficient R2 was 0.177 and 0.233 for the periods 2006-2009 and 2010-2013, respectively.

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Table 6

Main characteristics of regression models for the period 2010-2013

Variable name	b	Std.Err. of b	β	Std.Err. of β	t	p-value	Adjusted R^2	F
Dependent variable: increase of arable land area								
Intercept	2.276	1.670	x	x	1.36	0.175	0.072	12.64
No EU	0.404	0.114	0.280	0.079	3.55	0.000		
Dependent variable: decrease of arable land area								
Intercept	45.22	7.79	x	x	5.81	0.000	0.233	12.32
Lev Emp	-62.99	11.163	-0.418	0.074	-5.64	0.000		
No EU	0.7623	0.197	0.282	0.073	3.87	0.000		
Rec Ex	0.0118	0.0049	0.179	0.075	2.40	0.017		
ME Ex	0.0230	0.0098	0.177	0.076	2.34	0.021		
Dependent variable: total change of arable land area								
Intercept	-27.65	10.165	x	x	-2.72	0.007	0.169	11.11
Lev Emp	55.53	10.856	0.385	0.075	5.11	0.000		
Cap SF	-16.705	6.9233	-0.181	0.075	-2.41	0.017		
ME Ex	-0.0110	0.0047	-0.174	0.075	-2.32	0.022		

Source: authors' calculations

Total change of arable land area depends on the level of employment and the capacity of the local government for self-financing in both study periods. The amount of local government expenditures for recreational services per resident and the amount of local government expenditures for the management and environmental protection per resident were included in the regression models for the periods 2006-2009 and 2010-2013, respectively.

The conducted study shows that the capacity of rural municipalities has some impact on arable land use. However, the indicators of local government capacity are not the only possible factors that have an impact on land use changes. M. Müürsepp (2014) used in her study, for example, a spatial development index and sustainability index. I. Reinholde (2015) points out the role of indicators in the policymaking process. A deeper understanding of the impact of socio-economic conditions on land use patterns in general and on land use changes in particular play an important role in elaborating sustainable land policy.

Conclusions

1) The capacity of Estonian rural municipalities has an impact on changes of arable land use. According to multiple regression models, socio-economic factors described approximately 17-23% of the variation of changes in utilised arable land area.

2) The most significant impacts on changes of arable land use were demonstrated by the number of economic units per resident of working age, the level of employment among residents in the age group 15-64, the capacity of the local government for self-financing, the relative extent of recreational services provided by local governments and the relative extent of management and environmental protection expenditures provided by local governments.

3) The results of the study showed that two opposite trends of arable land use occurred simultaneously in Estonian rural municipalities. Some arable land is left unused, while new areas of arable land have been taken into use. Those two processes are parallel: the decrease and increase of utilised arable land area.

4) The increase of utilised arable land areas was higher than its decrease in 13 municipalities (8.67 % of investigated municipalities). The situation in 137 (91.3 %) municipalities was the opposite: the decrease of arable land areas was higher than its increase.

5) There are big differences in the changes of utilised arable land area among the investigated municipalities. The smallest total increase of arable land was 1.68 %, while the biggest total increase was 26.18 %. The difference is about 15 times. The smallest total decrease of arable land was 4.82 % and the biggest total decrease was 45.9 %. The difference is about 9.5 times.

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EXPERIENCE OF DESIGNING DEVELOPMENT STRATEGIES FOR AREAS OF ACTIVITY IN ESTONIA USING THE EXAMPLE OF THREE NON-GOVERNMENTAL ORGANISATIONS

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Abstract. The article presents and in–depth look at the concepts and methodology of designing rural development strategies. Empirical studies were conducted in three non-governmental organisations (NGOs) in Estonia from 2010 to 2015. The purpose of these studies was to determine how the local developers comprehend the strategy of the design process, what kind of problems they might encounter as well as the ways and situations in which the experts could aid them in this process. This was accomplished using the multiple case study method, which is suitable for (1) describing the methodology used in the development of strategies and (2) uncovering the problems and opportunities that experts and NGOs may face during the strategy development. The main aims were to discover how the local developers (NGOs) understand the strategical planning concept, how they develop a methodology and implement it as well as the obstacles and opportunities that occur in the strategy design process, including in the cooperation of the local activity groups and the expert group from the university.

It became clear that there was no common methodology for creating development strategies in Estonia. The local activity groups required cooperation with the experts from the very first steps in the design process. The appropriate procedure and methodology should be developed before the design process begins.

This research is in progress and will be continued.

Key words: non-governmental organizations (NGOs), strategy design, cooperation, multiple case study

JEL code: L310, O210

Introduction

Strategic planning is one way to help organizations and communities deal with changed circumstances. Its purpose is to enhance an organization's ability to think and act strategically (Bryson, 1995). The development strategy is a long-term tool aimed at keeping the mind on the goal and involves, among other things, an agreement between the parties involved.

A good strategy recognizes the presence of obstacles that it faces and offers solutions for overcoming them. A bad strategy discards the freedom of choice and the task of concentrating attention to the most important issue and, instead, tries to deal with a large number of different and conflicting demands and interests (Rumelt, 2011; Akker, 1999).

Along with the public and private sectors, the third sector has become an important power in shaping and altering the society. To survive in the rapidly changing environment, the organizations of the third sector have now also started to use strategic planning.

During the last ten years, significant changes have taken place in rural life. Young, working-age population has decreased in rural areas and relocated to towns, to municipalities near towns or even to foreign countries. Meanwhile, civil activism has been on the rise in rural communities as their members have understood that the quality of local life can only be improved locally. They have started to create regional development strategies using not only the resources of their own NGOs but also those from other sources, including experts.

Because of the scarcity of financial resources, local developers usually begin designing the development strategies themselves. In this process, they have used different approaches: (1) they have designed strategies themselves and together with local activists (2) a complete strategy has been requested from the experts in the field or (3) they have used a combination of the above two approaches in which the analysis of the current situation was carried out by the NGOs but the following stages in the process took place in cooperation with the experts. In the last approach, aims had not been set and a sound methodology designed before the experts from the Estonian University of Life Sciences were invited to join the process.

In this article the third approach will be studied using the methodology of multiple case studies**.** The multiple case study method has been chosen as it enables the researcher to explore similarities and differences within and between cases (Yin, 2013; Campbell, Ahrens, 1998). The goal is to generalise findings across cases.

Methodology

The article describes and analyses the process and methodology of designing development strategies and

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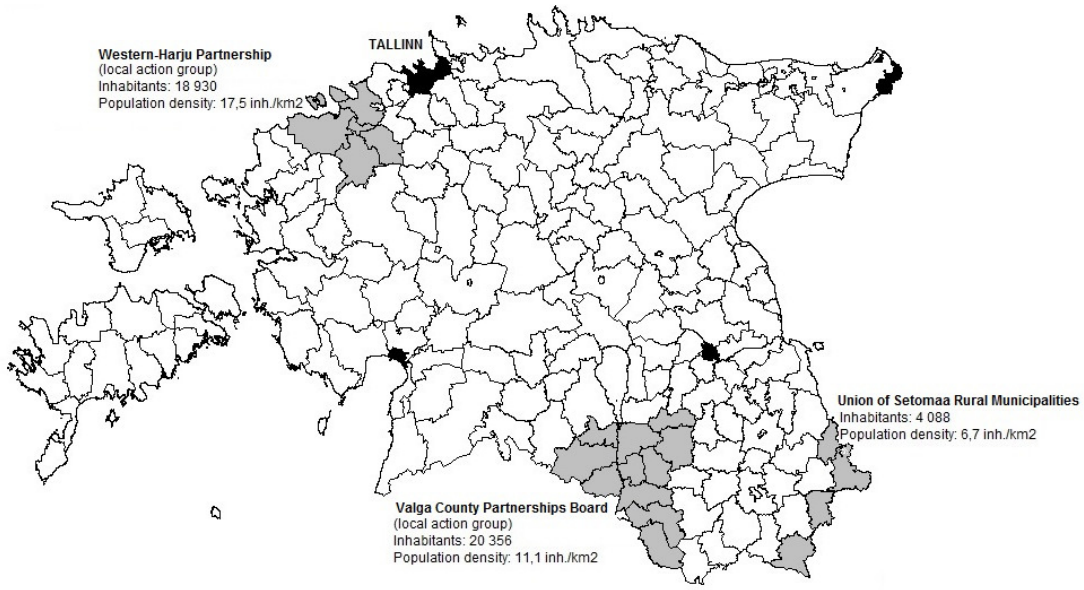
the empirical experience gained. The study involved three NGOs – the Valga County Partnerships Board, the Union of Setomaa Rural Municipalities and the Western-Harju Partnership – over a period of three years (2012-2015). All three NGOs are bodies that promote and support rural life on the local level. The Union of Setomaa Rural Municipalities was founded in 1997 and the other two are local activity groups of LEADER that were established in 2006.

The areas under study have certain similarities. They are characterized by their location in the outlying districts of the country, small communities, ageing populations, and the decrease in population because of mobility and negative natural growth (Figure 1).



Source: the authors' construction based on the Estonian Land Board map; Western-Harju …, 2015; Union of Setomaa …, 2014; Valga County …, 2010

Fig. 1. **Location of the investigated NGOs**

According to a contemporary approach, research of development is a multifaceted complex process which contains a good methodology and the knowledge of the processes of rural life. New economic, technological, psychological and other aspects bring along new behaviours, attitudes and values (Bienkowska-Golasa, 2015).

In order to attain the goals of the research and fulfil research assignments, the approach of Yin (2013) was adopted. According to this approach, a phenomenon is thoroughly investigated in its natural environment and, thus, the entire character and the qualities of this phenomenon are preserved in the course of the analysis. A multiple case study involves using different sources of information as well as approaches.

A multiple case study can be divided into three stages (Figure 2). The first of these involves a theoretical study of the research problem based on various literary sources. The second stage concerns the analysis of the secondary data relevant to the respective context. This includes documents (e.g., development strategies of local municipalities, reports regarding the fulfilment of action plans etc.) and national statistical data (population and its structure, entrepreneurship etc.). Data were collected during the period of time when the strategy was formulated (2010−2015). The data were coded using the inductive approach.

In the third stage of the case study, group interviews were conducted and brainstorming sessions as well as seminars were organised. The questions that the interviews and brainstorming sessions were engaged with included three topics: an overview of the current status of the strategy, the perceptions of the leaders and members of the NGOs of the strategy formulation and the strategy formulation practices of the local municipalities. The interviews were recorded and then transcribed. The analysis of the interviews was conducted using inductive content analysis. This involved defining the distinguishing codes and categories for the interviews instead of relying on theoretical knowledge. Open coding was implemented in the definition of the codes (Elo, Kyngäs, 2007).

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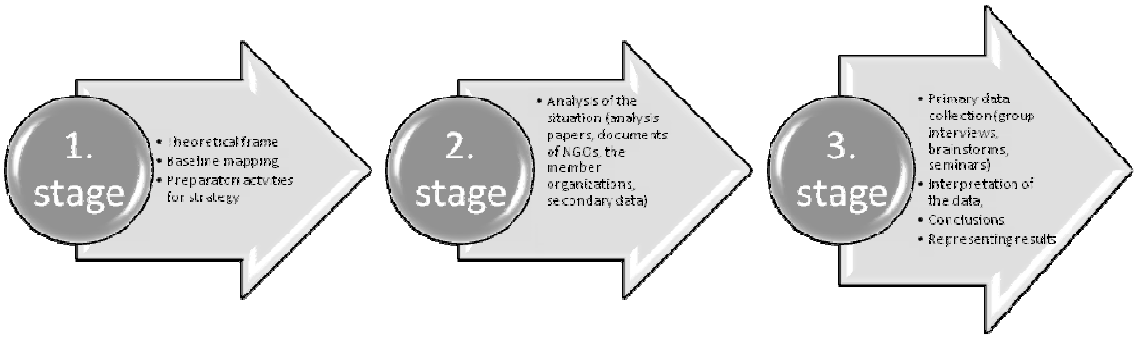

Fig. 2. **The Stages of multiple case study**

The collection and systematisation of the data were followed by the interpretation of the qualitative material, generalisation and presentation of the results. In the final stage of the case study, conclusions were drawn and the NGOS were informed about the experts' assessment of the research problem and of the possible solutions.

Research results and discussion

All the development strategies discussed were designed between 2010−2015. The experts were involved in the renewal of the strategy of the Valga County Partnerships Board and in the design of the new strategies for the other two local activity groups.

NGOs are spending large amounts of time and money on developing strategies. Research has shown that the typical planning process takes six to twelve months to complete (Andrews, 2008). In the cases discussed, the experts were involved in the process of designing the strategy for a comparatively short period of time – from three to eight months in order to complete the formulation of an effective implementation process (Figure 3). However, from both the academic and purely practical perspectives, it is essential for planners to identify communities equipped with the required social toolset for embracing change from those that are not yet ready before they can move on with the implementation of any plans (Cimdins et al., 2015). This, unfortunately, was not the case in the research carried out.

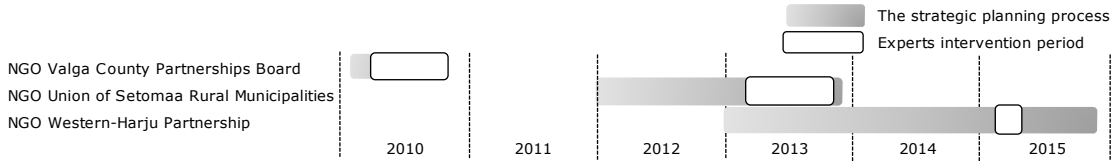

Fig.3. **The strategic planning process**

In designing the strategies, the constructive methodology categories by Iivari (1991) and Akker (1999) were taken into consideration by the experts. These include conceptual and technical development, formal-mathematical categories, field studies, group-interviews and action research. In the design process, both primary and secondary data were used by the experts. The primary empirical data were collected by (1) the local activity groups, who started designing the strategy without assistance (the sources included questionnaires, local seminars, and unorganised data from different studies) and (2) the experts (researchers), who took over the designing of the strategies and collected the qualitative data using interviews, brainstorming sessions and cooperative meetings.

The collected data were not always associated with the content and aims of the strategy. The NGOs were unable to analyse and interpret the data as the collection had been unsystematic and there was no appropriate methodology. For example, the representatives of the NGOs had attempted to carry out the SWOT analysis themselves by writing down all the ideas that came up during brainstorming sessions in an unsystematic manner (e.g., 15 strengths and weaknesses). Attempts were made to determine the preconditions, vision and goals of development from the same unsystematic data.

The expert group wished to begin with evaluating the local aims and problems and determining the key characteristics to reach generalisation and decisions. In order to reach a common understanding, the following leading questions were used: "What is wrong in the

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area at present?", "How to improve the situation and make the development efficient?" and "Which measures, activities and methodology can support the aims?".

Parallel to that, the experts tried to systematise of data previously collected by the NGOs by using the principle of "the unity of general-specific-single" (Vooglaid, 2008) as the methological basis of categorisation. The experts had to discuss all the steps of the design process with the NGOs.

One of the most time-consuming activities in designing the development strategy was agreeing on the exact wording of the vision, mission, priorities and goals and establishing the key characteristics and the way how to measure the reaching of the goals. The outcome of one strategy serves as the basis for setting plans for new development. A good strategy does not only answer the question of what is planned to do but also why and how it is done (Rumelt, 2011).

The simple question of "Whose strategy is this?" showed how the local developers comprehended and understood strategy development. The NGOs comprehended the strategy as a development plan for the NGO itself rather than as the development plan for the whole area. Interpretations differed between the members of the NGOs as well. The speakers for the local municipalities perceived the strategy as part of the strategy of their municipalities; the board members of the village NGOs understood this as a document for the development of their villages, whereas the views of entrepreneurs were more oriented towards the development of the whole area. The entrepreneurs were more open to the cooperation with the experts, stakeholders and target groups. The wider understanding of the strategic aims, visions and priorities was finally created in cooperation with the experts. The systematising of the data added clarity to the strategies' outcomes. Working in co-operation, the focus of the strategies was arrived at, sometimes after hard discussions.

In Estonia, there is no generally agreed on methodology or tools for measuring the outcomes of strategies, including those designed by NGO local activity groups. The strategy planning discussed here used Rumelt's (2011) three stage approach, which includes the following steps:

(1) diagnostics (an overview of economic, social and cultural influences, the demographic analysis of the area, the specific geographical features of the location and the analysis of the area´s geographic unity, the cultural unity and its specificity, the comparative analyses of social unity, cooperation and collaboration etc.), which laid the basis for assessing the social-economic situation and enabled to make the SWOT analysis;

(2) working out leading ideas and principles (preconditions for development, values, visions, missions, priorities, goals, measures) and

(3) coherence creation (coherence with other development documents on the vertical, horizontal and diagonal axes, coherence between other target and coherent groups, stakeholders and between strategy measures).

The research revealed why the NGOs needed the assistance of experts. NGOs lack a long-term experience in designing strategies. The experts contributed the theoretical basis as well as systematic knowledge and an ability to generalise. Additionally, the experts were able to add the outsiders' point of view. However, the benefits were mutual as the experts gained a better understanding of the local needs and the local NGOs started to think strategically.

As only one of the three approaches to designing strategies was employed in this article, the other two approaches should be implemented using the same multiple case study method.

Conclusions

The following conclusions can be drawn from the study of the different experiences of designing development strategies for the NGO activity areas.

The initial data collected by the NGOs for designing the development strategy and the results of the primary data analysis:

(a) were of unequal quality and required extra time and alternative methods to consolidate them;

(b) were insufficient for conducting analyses and drawing conclusions and it was necessary to collect additional materials (necessary secondary data from other sources);

(c) had a weak connection to the theory of strategy design, which necessitated the development of theoretically grounded methodology for designing the strategy;

(d) gave little importance to the collection of qualitative data and their analysis.

The NGOs that had begun to design a development strategy for their areas fulfilled their task (to guarantee sustainable and high quality living environment and human activity) at different levels. In designing the

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strategies for their own areas, the NGOs were guided by their internal situation and local capability where the knowledge and skills of strategic planning are on different levels.

The NGOs and the experts have different kinds of knowledge and understanding of the process of designing development strategies.

The time-schedule had been planned by both sides (the NGOs and the experts) too optimistically. The relatively brief involvement of the experts in the process of strategy design has an impact only when various competences and resources are available and when suitable methodology is used.

The NGOs need methodological assistance in designing their strategy starting from the phase of planning the process of designing the strategy.

The NGOs face a number of similar problems when designing strategies. This can be studied and generalised and, thus, the problems avoided in future development of strategies.

The participation of experts in designing strategies gives them the opportunity to create and improve the methodology of development research and add to the skills of strategic planning of NGOs.

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PORT ACTIVITIES COMPETITIVENESS ASSESSMENT METHODOLOGY

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Abstract. The article analyses ports competitiveness. Due to increased demand, competition, the internal complexity of the process and requirements for high performance in the service market, ports must be able to effectively organize their business activities by offering nowadays appropriate range of services. With the aim of promoting the port position in the market they need to identify their own performance indicators and to develop strategic objectives and solutions to improve their competitiveness. There is a need for regular evaluation of the effectiveness of port operations in order to facilitate future growth.

Key words: ports, efficiency, KPI index.

JEL code: F63, R41, R42

Introduction

The industry of transportation is developing dynamically. The volume of transportation is increasing not only in individual states but also on the level of international transportation. The international transportation system includes all the main modes of transportation. International shipments form the very basis of the worldwide market economy. An increasing international turnover of goods leads to the increase of the cargo shipment. International shipments and the transit traffic monitoring via the territory of the Republic of Latvia are the main economic priorities of the state. The organizational structure of every port is unique, thus, it is far from being an easy task to measure and analyze the port performance efficiency according to one specific standard.

The aim of this research is to analyze performance indicators of the ports, analyze the the port performance efficiency assessment methodology of the existing ports.

In order to achieve the aims of this research, the following tasks have been set:

- to analyse the port performance efficiency evaluation methods as well as to analyse the latest scientific conclusions (on the basis of the chosen bibliography);
- to come up with proposals in order to improve the port performance efficiency. It is necessary to carry out a study of economic theory widely used in the performance characteristics of different economic processes in the assessment.

In order to achieve the aim of this research successfully and to complete the tasks given, the authors used the following research methods: In order to batch and to analyze the data, the *Analytical method* has been applied, in order to make the *economical calculations*, the quantitative data analysis method has been applied. Novelty in the research is in comparison of different methods for evaluating the effectiveness of ports and evaluation is taken which of these methods are more appropriate for the ports to assess the effectiveness.

Research results and discussion

The organizational structure of every port is unique, therefore it is far from being an easy task to measure and analyze the port performance efficiency according to one specific standard. The difficulty to determine a united standards is based on the fact that there is not a united method of how to summarize all the important aspects to measure the port's performance efficiency. The port's performance evaluation is significant to any country since the ports efficiency are very important condition to providing economic growth. Ports further economic growth in such aspects like participating in the international trade; drawing in investments; facilitating the development of production and services; creating jobs as well as advancing the development of an entire region (Bichou, 2006; Bichou, 2004). In order to measure the economic influence of the port, mainly the performance indicators and the related resources (such as the turnover of cargos and employment) are being used to make these calculations. The researcher Talley proposes that one of the options to achieve the economic goals of the port is to increase the turnover of the cargos (Tongzon, 2005). The ports are being classified by the amount of reloaded cargos and these data are further being published on the websites of port administrations or put in the databases of statistics offices. It is a common belief that the increase of the cargo turnover is an indicator of the increase of port performance efficiency. Researcher De Langen opposes to that by stating that the increase of the cargo turnover is mainly related to the flow of international

trade and it does not have much to do with the increase of efficiency (De Langen, 2007). Many other researchers also admit that the amount of reloaded cargos does not indicate its economic influence on a port. It is not possible to choose unequivocal port performance indicators in order to evaluate port performance efficiency. There are many different opinions among researchers regarding this matter (Brooks, 2010; Cullinane, 2004). There is a significant lack of concrete solutions and so far from unified formulas for calculating the port performance efficiency (employing the port's performance indicators) have been proposed. Those port performance indicators related to market tendencies and market structure are supposed to be used for the internal use of the industry in the context of development and competitiveness (Newton, 2010). The indicators of market tendencies and structure would allow the port administrations and the European Commission to oversee such important aspects as the development of port capacity; the cargo concentration; the level of differentiation in different geographical levels of port systems as well as to oversee various segments of the market (Port performance indicators, 2012).

At present there is no developed a common approach in the World on how to assess the port's performance. Some studies and publications thinking of port's efficiency evaluation are analyzed separately in the terminals, but those analysis does not show the overall efficiency of the port.

Looking at the various literary sources (Wang T-F., Cullinane K., Song D.W.,2003), it can be concluded that the most practical uses three data processing methodologies to assess port and terminal performance and efficiency:

1) through Data Envelopment Analysis - DEA;
2) through Stochastic Frontier Analysis - SFA;
3) through port performance indicators.

After literature analysis it can be concluded that the first and second methodology is used to assess the individual, mainly terminal performance, while the third methodology is used to evaluate the overall results of the port. DEA and SFA are parametric and non-parametric statistical methods which port's researchers used to assess mainly container terminal performance, as a basis for assessing the decision-making unit. Performance indicators are indicators that the company makes it easier to assess whether its objectives set are achieved in a given period of time, as well as discover the strengths and weaknesses. They are regularly monitored to ensure the port long-term development. Performance indicators are those that show what actions are needed to be taken to improve performance.

Trends show that more and more port industry appears more progressive ideas on how to assess the operation of ports, however it is not easy to develop appropriate performance indicators to evaluate the functioning of the port as a whole, without offering a specific methods. Looking at several indicators that perspective, it is possible to assess, but it is not developed a common, unified methodologies.

Port authorities with data on market trends and structures oversee the ongoing activities for various port development issues and cargo flows as well as other market segments binding:

- Maritime transport index shall be determined after the shipping port transshipped cargo volume and passenger traffic at a given time period.
- Modal breakdown of the flows calculated for the purpose of use in modal breakdown of freight port.
- The share of containers in the port shows the ratio between the entire amount of cargo unloaded at the port for containerized cargo and containerized setting the trend in port.
- Vessels entering indicator is calculated to determine the ratio between the total capacity of the vessel and the total number of vessels in the port in specified period of time - a distinction between passenger and freight ships.
- Port cargo operations involved in road or railway modal shares is determined by using modal breakdown indicator.

The author believes that the compilation of trends and structure of performance indicators is obtained an overall picture of the current situation, thus it is able to set both positive cues and missing points as well as to identify the vital common position on the market. Using this information in strategic planning and operational policy, the terminal, the port in the region and at the national level are able to appreciably increase the accuracy of the direction and guidance in the choice.

The author believes that the most popular indicators by which to assess the efficiency of ports - port performance indicators - is a Key Performance Indicators (KPIs). KPIs are a critical tool for port management and for authorities to perform their oversight role. The government and municipalities fix

objectives for ports as part of their overall strategy, which port management then needs to implement. The main tools used worldwide for the measurements of these objectives are KPIs. They are designed to measure the performance of the port relative to stated objectives, and hence to allow boards and management to assess progress in improving performance, to monitor trends as well as to identify issues and possible remedies. The selection of appropriate KPIs is critical as it will largely define the focus of efforts and attention (Review of the Ports, 2013).

KPIs which are currently used in the ports provide an incomplete picture of port competitiveness. These KPIs are primarily describing the gross level of port activity (e.g. total TEU or total tonnage). These are commonly reported indicators worldwide, especially for landlord ports (since they are not directly involved in cargo handling operations) and are frequently used to rank ports. However, traffic volumes often present a distorted picture:

- they are not always accurate (e.g. transhipment ports double count containers, once when unloaded and then when reloaded);
- container volumes given;
- equal weight to empty and loaded boxes;
- cargo tonnages often include container tare weight;
- they do not distinguish between low-value/high-volume bulk cargoes and high-value unitized cargoes;
- they are affected by a number of exogenous factors which makes it difficult to establish solid correlations with a port's competitiveness. (Review of the Ports, 2013)

Ports used a different set of KPIs. These KPIs measure market shares (relative to other ports serving the same hinterland), which provide a better measurement of competitiveness. These are complemented by financial ratios and capacity utilization figures. Additional indicators are used to measure the factors that contribute to port competitiveness, especially the quality of service: the quality of logistics services, as perceived by the users of the port, is an important factor in the competition for traffic. Quality of service is measured through various proxies such as:

- berth and gate turnaround times;
- cargo dwell times with and without clearance times;
- average port charges per unit of cargo;
- frequency of scheduled ocean and rail services;
- access to value added services.

The author agrees with that (Haddad E., Hewings G., Santos R.,2006) to put forward the definition of the need to assess the efficiency of the port in order to identify such activity relevant factors as turnover figures (of handled cargo and passenger traffic quantity), necessary for the operation of resources (land, labor, technical solutions, etc.), competitor assessment, internal growth and market trends in advance to meet the objectives of customer satisfaction with the service. The above-mentioned results of the identification, collection and evaluation allows to outline the guidelines, which are directly linked to the future performance of policies and objectives, or in other words, the definition of strategies allowing the port to increase their efficiencies and strengthen its position in the future.

The benefit possible set to weigh effectiveness of present benefit indexes by the method of data envelopment analysis (DEA). Its results lay a solid foundation for further study on ports effectiveness performance evaluation.

These proxies can be further complemented by more detailed and differentiated indicators:

$$\sum_{i=0}^{N} C = C^N \times E \quad (1)$$

N – time period,

C – contribution effectivness,

E – effectiveness.

$$E^N = \sum_{E=0}^{N} i \quad (2)$$

E-Efficient investment

N-time period

i-investments

In order to evaluate efficiency of the port using the following formula you need to collect port investment volumes in specified time period, and the resulting ratio indicates the degree of efficiency of investment. If the resulting ratio is higher, the more effective is the ports investment policy.

Port performance indicators:

- national and regional market shares by cargo;
- tonnage by cargo type;
- turnover of these port companies;
- the number of jobs created near the port (in logistics clusters).

Income (salaries) distributed by terminal:

- berth occupancy;
- average vessel turnaround;
- average vessel waiting time;
- average tons or TEU per vessel;
- revenues per Terminal versus investment.

For bulk terminals:

- tonnes per berth or meter quay;
- average wagon turnaround.

For container terminals:

- box volume per berth;
- TEU per vessel per hour per berth; average berth occupancy;

Supply Chain Performance by cargo type:

- vessel calls by cargo type;
- average vessel size by trade;
- container shipping services and frequency of calls;
- modal split for inland transport;
- average rail travel time border to port station;
- average rail transit time station to terminal; average time and cost for land transport to inland origins/destination.

Port web pages and statistical databases displaying the port's operating results are identified the cargo turnover handled and the number of vessels, as well as comparing these indicators with past performance, and based on their anticipation of future prospects.

Conclusions, proposals, recommendations

The authors draw the following conclusions:

1) The organizational structure, location and services offered are varying from port to port. The combination of these factors makes every port unique, however it is far from being an easy task to measure and analyze the port performance efficiency according to one specific standard.

2) After evaluating the efficiency of port analysis it can be concluded that efficacy can be evaluated after the port cargo turnover is realized, and which depends on a number of factors such as the port area and the use of equipment and is measured as a port turnover per hectare of the total area of the port.

3) The most practical uses three data processing methodologies to assess port's and terminal performance and efficiency: Data Envelopment Analysis, Stochastic Frontier Analysis and port performance indicators.

4) Data Envelopment Analysis and Stochastic Frontier Analysis are parametric and non-parametric statistical methods which the port's researchers used to assess mainly container terminal performance, as a basis for assessing the decision-making unit.

5) Performance indicators are indicators that the company makes it easier to assess whether its set objectives are achieved in a given period of time, as well as discover the strengths and weaknesses. They are regularly monitored to ensure the port long-term development.

6) Theoretical knowledge of the performance characteristics and practical experience in their application gives reason to say that there is no one set of efficiency indicators system, which would be applicable to different economic processes in the study of both the macro level and the micro level. Therefore, for any given study it is necessary to develop its own unique the effectiveness system of indicators, which determine the content and objective of the study.

7) According to the author's most usable indicators to assess the efficiency of ports is the Port performance indicators = Key Performance Indicators (KPIs) which are a critical tool for port management, and for authorities to perform their oversight role. Port authorities are easier to identify, calculate and analyze KPI indices.

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LABOUR COSTS AND PRODUCTIVITY IN LATVIA

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Abstract. One of the determinant factors for economic growth in any country is the supply of labour to the national economy. However, labour creates costs for enterprises. The sustainable operation and expansion of any enterprise is determined not only by the cost of labour but also by the quality and productivity of it.

The research aim is to examine and compare labour costs and productivities between Latvia and other competing European Union Member States. The research employed the following methods: monographic and descriptive, analysis and synthesis, graphic, data grouping and statistical analysis. The research results showed that the total cost and productivity of labour rose in Latvia in recent years. The correlation and determination coefficients, calculated in a regression analysis of the productivity and cost of labour in Latvia, indicate a medium strong linear relationship between the variables.

Key words: labour cost, labour productivity, enterprises, industries.

JEL code: J3, E2

Introduction

The labour market is an important component of a modern market economy. Researchers such as M.Hazans (2011, 2013) as well as others have focused on researching the labour market. Researcher R.Karnite (2012) as well as Bank of Latvia economist O.Krasnopjorovs (2011) have analysed labour productivity and labour costs and incomes.

For many years prof. M.Hazans has collected and processed data on the emigration of population from Latvia to abroad, its causes and its consequences to the economy, which significantly affected the labour market in Latvia. As the labour market situation changes, many earlier scientific research studies lose their urgency because of the labour market's supply and demand shift. For this reason, the labour market needs to be continuously researched to examine the situation in the labour market and its development trends in future.

Labour plays the key role in an economy's functioning and development. One of the determinant factors for economic growth in any country is the supply of labour to the national economy. However, labour involves costs for enterprises. A rise in labour costs for enterprises can endanger the external competitiveness of the country. As labour costs rise, enterprises have to continue raising the quality and productivity of their labour force. Rising labour costs prompt the government to implement structural reforms faster in the country – to enhance the business environment and reduce administrative barriers, to increase the quality and efficiency of government services and to decrease labour market imbalances –, which contribute to the country's competitiveness and faster economic growth.

According to the Research, Technological Development and Innovation Framework 2014-2020, the current competitive advantage of Latvia's economy is cheap labour – the cost of labour in Latvia is considerably lower than in the EU-15. Both the cheap labour and relatively high profitability margins do not stimulate the change of the business pattern and the creation of other competitive advantages. It is not possible to maintain low labour costs for a long period because of the free flow of labour; thus, stimuli have to be created to have new competitive advantages (Ministry of Education and Science, 2013).

In February 2014, the DNB bank and the research centre SKDS conducted a survey of the population in Latvia and found out that the majority or 79% of 1005 respondents believed that Latvia was a country of cheap labour (DNB bank, 2014).

The **research hypothesis** is as follows: the productivity of labour affects the costs of labour in Latvia.

The **research aim** is to examine and compare the costs and productivity of labour between Latvia and other competing EU Member States.

To achieve the aim, the following specific **research tasks** were set:

1) to examine the costs of labour and its components and the productivity of labour in Latvia;
2) to compare the costs and productivity of labour between Latvia and other competing EU Member States.

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Research methods used: the monographic and descriptive methods, analysis and synthesis, the graphic method. Time series analysis and data grouping were employed to analyse statistical data. Regression analysis was used to identify a causal relationship between the independent and dependent variables.

The present research was based on various scientific publications, publicly available documents, information available in databases and other sources.

Research results and discussion

Labour cost and its elements are defined in the Commission Regulation (EC) No 1737/2005 of 21 October 2005. Total labour cost consists of remuneration for employees (wages and salaries as well as employer social insurance contributions), professional education costs etc. (European Commission, 2005). Data on labour cost and its structure are used to acquire information on the total expenditure on labour and its percentage distribution by industry and sector and to obtain basic data for calculations of quarterly labour cost indexes in line with the regulations of the EU's Parliament, Council and Commission.

According to the Central Statistical Bureau, the cost of labour in Latvia rose from year to year. In 2014, the cost of labour in Latvia rose by 36.53% compared with 2010 (Table 1).

Table 1

Labour cost and its key components in Latvia in 2010-2014, EUR

Indicator	2010	2011	2012	2013	2014	Change, % (+-) 2014/2010
Total labour cost	6100396	6609063	7177390	7768884	8328812	36.53
Total wage and salary	4871343	5298911	5762034	6237027	6739604	38.35
Total employer social insurance contributions	1226603	1307618	1412723	1529130	1586513	29.34
employer mandatory social insurance contributions	1153075	1243347	1335882	1441483	1497477	29.87
employer voluntary social insurance contributions	28882.55	29977.25	33735.52	36628.86	40012.87	38.54
entrepreneur risk state fee	2450.02	2534.40	2633.11	2727.03	2694.41	9.97

Source: authors' calculations based on data of the CSB of Latvia

According to the statistical data, the total wage and salary income rose by 38.35%, employer social insurance contributions increased by 29.34% as well as other labour cost components increased in Latvia in 2014 compared with 2010. In the private sector of Latvia, the cost of labour rose even faster – at a rate of 8.5% a year, while in the public sector it increased by 5.2% (Central Statistical Bureau, 2014).

A comparison of hourly labour costs by kind of activity for the period 2010-2014 reveals that the labour costs rose persistently and relatively steadily almost in all industries, except for professional, scientific and technical activities; the hourly labour cost for administrative and support service activities was volatile. In the period 2010-2014, the highest hourly labour costs were reported for the sector of financial and insurance activities, followed by information and communication as well as electricity, gas and water supply. The lowest hourly labour costs were observed for arts, entertainment and recreation, followed by real estate activities. Overall, the average hourly labour cost rose by EUR 1.13 or 18% over the five-year period (Central Statistical Bureau, 2014).

In Latvia, the greatest annual increase in labour cost per hour (in the period 2005-2013), EUR 0.7, was reported in 2006; later the economic situation deteriorated, and this indicator was negative in 2009 and 2010. However, as the situation started improving in 2011, the indicator equaled EUR 0.3 in 2013. Compared with the base year 2005, the highest relative increase in labour cost per hour was reported in 2013, reaching 110.5%. Compared with the previous year, increases in labour cost per hour were the highest in 2006 and 2011, at 22.7% and 9.9%, respectively (Table 2).

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Table 2

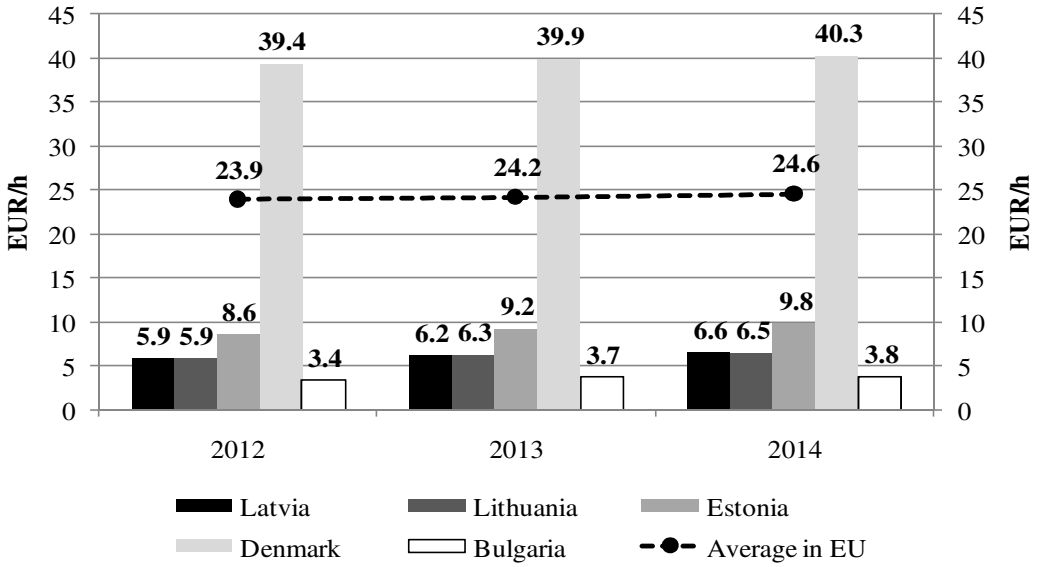
Changes in hourly labour cost in Latvia (EUR) in 2005-2013

Year	Hourly labour costs (EUR)	Absolute change		Index change (2005=100)		Change (%)		1% change in tm in absolute terms
		Annual Δm(a)	From base year Δm(b)	Annual Tm(a)	From base year Tm(b)	Annual tm(a)	From base year tm(b)	
2005	2.86	x	x	x	x	x	x	x
2006	3.51	0.7	0.7	122.7	122.7	22.7	22.7	0.0
2007	4.62	1.1	1.8	131.6	161.5	8.9	61.5	0.0
2008	5.68	1.1	2.8	122.9	198.6	-8.7	98.6	0.0
2009	5.56	-0.1	2.7	97.9	194.4	-25.1	94.4	0.1
2010	5.26	-0.3	2.4	94.6	183.8	-3.3	83.8	0.1
2011	5.49	0.2	2.6	104.4	192.0	9.9	92.0	0.1
2012	5.71	0.2	2.8	103.9	199.5	-0.5	99.5	0.1
2013	6.02	0.3	3.2	105.5	210.5	1.6	110.5	0.1

Source: authors' calculations based on data of the CSB of Latvia

In 2014, the cost of labour in Latvia stood at 6.6 EUR/hour (Figure 1), which was the fourth lowest rate in the European Union. Compared with 2013, the cost of labour in Latvia rose by 6%, which was the second fastest increase in the Euro Area behind Estonia where a 6.6% increase was reported (Central Statistical Bureau, 2014).

A comparison of labour costs between Latvia and Lithuania and Estonia (Figure 1) shows that the highest labour cost per hour was reported in Estonia, while those in Latvia and Lithuania were very similar. All the three Baltic States significantly lagged behind the average of the EU Member States. One of the highest labour costs was reported in Denmark, whereas the lowest was in Bulgaria.



Source: authors' construction based on the Eurostat, CSB of Latvia, Statistics Lithuania data, Statistics Estonia data

Fig. 1. **Labour costs in the national economy, except for agriculture and public administration, in Latvia and other Member States in 2012-2014, EUR/hour**

In recent years, the value added by labour per hour worked has increased in Latvia, reaching EUR 8.6 in 2014, while in Lithuania it was EUR 10.7 and in Estonia EUR 11.6. Nevertheless, the Baltic States lagged behind the EU average in terms of labour productivity (Figure 2).

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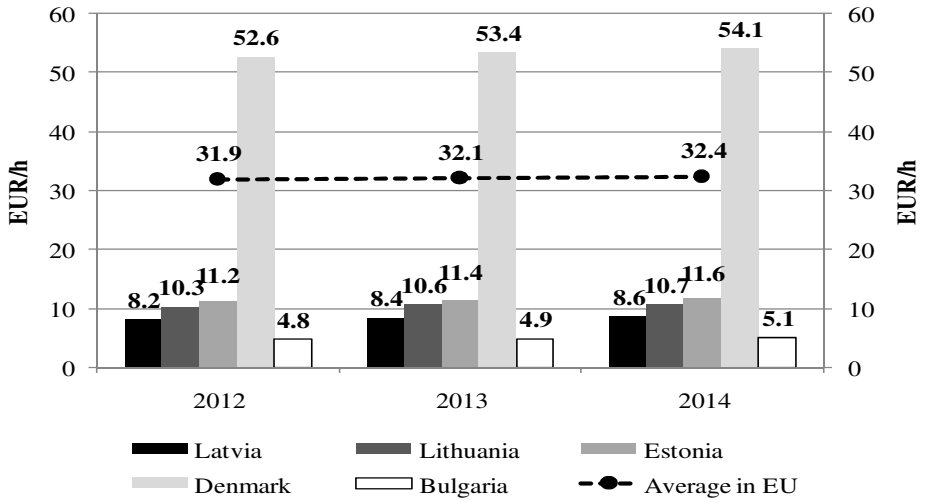

Source: authors' construction based on the Eurostat data

Fig. 2. **Labour productivity in Latvia and other EU Member States in 2012-2014, EUR/hour**

The greatest annual increase in labour productivity per hour worked (in the period 2005-2013) in absolute terms at EUR 0.4 was observed in 2006 and 2010. Over the period from the base year 2005, the highest percentage increase in labour productivity per hour worked at 193.7% was registered in 2013. The greatest annual increase in labour productivity per hour worked at 18.6% was reported in 2007 compared with the previous year (Table 3).

Table 3

Changes in labour productivity per hour worked in Latvia in 2005-2013 (EUR)

Year	Labour productivity per hour worked (EUR)	Absolute change		Index change (2005=100)		Change (%)		1% change in tm in absolute terms
		Annual Δm(a)	From base year Δm(b)	Annual Tm(a)	From base year Tm(b)	Annual tm(a)	From base year tm(b)	
2005	5.90	x	x	x	x	x	x	x
2006	6.30	0.4	3.4	106.8	220.3	6.8	120.3	0.1
2007	7.90	1.6	5.0	125.4	276.2	18.6	176.2	0.1
2008	7.30	-0.6	4.4	92.4	255.2	-33.0	155.2	0.1
2009	7.20	-0.1	4.3	98.6	251.7	6.2	151.7	0.1
2010	7.60	0.4	4.7	105.6	265.7	6.9	165.7	0.1
2011	7.90	0.3	5.0	103.9	276.2	-1.6	176.2	0.1
2012	8.20	0.3	5.3	103.8	286.7	-0.1	186.7	0.1
2013	8.40	0.2	5.5	102.4	293.7	-1.4	193.7	0.1

Source: authors' calculations based on the Eurostat data

In order that enterprises in Latvia can increase their labour productivity, a higher value has to be added to products, particularly in manufacturing, and more innovations have to be introduced, particularly in the sector of information technologies.

Analytical papers by specialists of the Bank of Latvia focused on the correspondence of changes in labour costs to those in wages and salaries, which was compared with labour productivity. In his research, Bank of Latvia economist O.Krasnopjorovs reveals that the industries that reached a balance between labour earnings and labour productivity faster also started recovering from the crisis earlier (Krasnopjorovs, 2011).

In her expert analysis "Factors Influencing Labour Productivity and Opportunities for Raising the Productivity", R.Karnite stresses the relationship between labour productivity and labour costs. She writes that labour costs affect labour productivity. Low labour costs promote increases in labour productivity,

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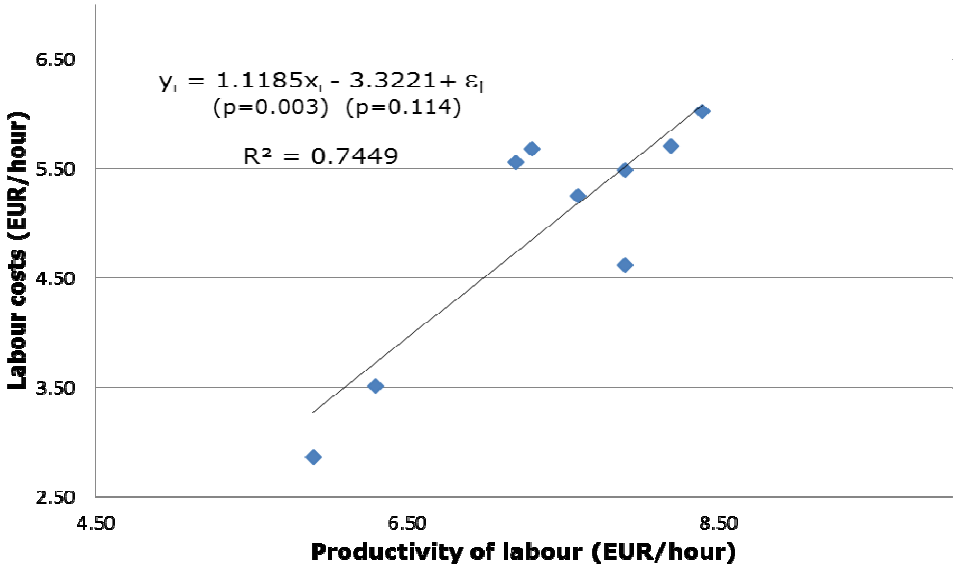
and decreasing labour costs through reducing wages and salaries was the key factor that helped Latvia get out of the economic crisis (Karnite, 2012).

In their research, for this reason, the authors wished to identify the nature of the relationship between labour productivity and labour costs in Latvia.



Source: authors' construction based on the Eurostat data and Arhipova, 2003

Fig. 3. **Relationship between the productivity of labour (EUR/hour) and the cost of labour (EUR/hour) in Latvia in 2005-2013**

The correlation coefficient r=0.86 and the determination coefficient R2=0.745 (Figure 3), calculated in a regression analysis of the productivity and costs of labour in Latvia, indicate a medium strong linear relationship between the variables and are significant at a probability of 99% (p = 0.003). The regression analysis coefficients show that an increase in labour productivity by 1 EUR/h leads to an increase in labour costs by 1.12 EUR/h.

Higher labour productivity results in higher value-added per unit of time and higher wages and salaries for employees, which, in their turn, increase labour costs. However, as labour costs rise, enterprises have to continue raising the quality and productivity of their labour force.

The higher labour costs are, the lower proportion of value-added is contributed to investment that can raise the productivity of labour. In Latvia, enterprises have to, first of all, create their value-added and only then they may pay wages and salaries. In the public sector where wages and salaries are decided administratively, the wages and salaries are raised without taking into account the productivity of labour. In Latvia, enterprises have to follow data on their labour productivity and increase wages and salaries based on increases in this indicator.

A comparison of the Baltic States in terms of average gross wage and salary income for the period 2010-2014 shows (Figure 4) that the lowest wages and salaries were paid in Lithuania, followed by Latvia and Estonia.

Wages and salaries are the key component of labour costs. In the period 2010-2014, the average gross wage and salary income rose by EUR 132 or 20.9% in Latvia, EUR 101 or 17.5% in Lithuania and EUR 213 or 27.0% in Estonia.

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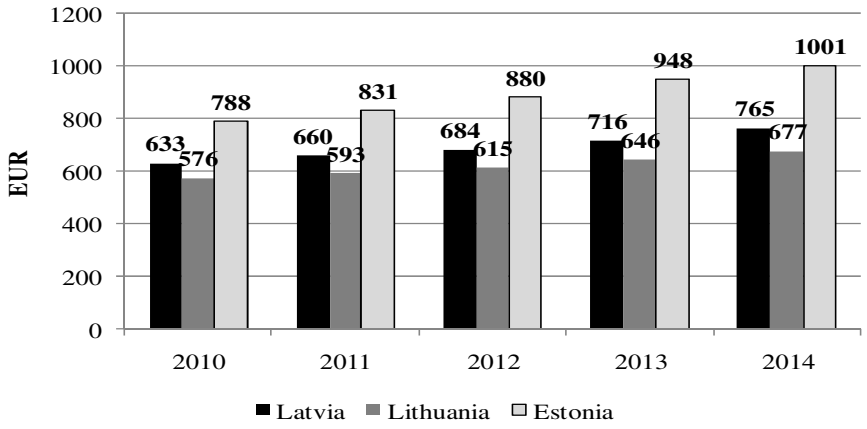

Source: authors' construction based on the Statistics Lithuania data

Fig. 4. **Average gross wage and salary income in the Baltic States in 2010-2014, EUR**

The average gross wage and salary income by industry considerably differs in Latvia and Estonia. Mostly in all industries, the average gross wage and salary income in Estonia was higher than in Latvia but there were some exceptions, for example, in the sector of financial and insurance activities, the average gross wage and salary income in Latvia was slightly higher than in Estonia in 2010. Overall, the smallest difference in average gross wage and salary income between both countries was reported for financial and insurance activities and real estate activities. In 2010, no great differences were observed, whereas over the last years differences in average gross wage and salary income significantly rose between both countries in agriculture, forestry and fisheries as well as in the sector of professional, scientific and technical activities. A large average gross wage and salary income gap between both countries was reported in mining and quarrying, which increased from EUR 260 in 2010 up to EUR 446 in 2014. A similar trend was observed for electricity, gas, steam and air conditioning supply where the average gross wage and salary income in Estonia was EUR 191 higher than in Latvia in 2010, while in 2014 the wage and salary income gap reached even EUR 418.

A comparison of average net wages and salaries between Latvia and Estonia reveals that even though the wage and salary income gap was significant, it tended to decline in recent years in the following industries: administrative and support service activities, financial and insurance activities, accommodation and food service activities, construction, manufacturing etc. (Statistics Lithuania, 2014; Statistics Estonia, 2014; Central Statistical Bureau, 2014).

Conclusions, proposals, recommendations

1) In 2014, the cost of labour rose by 38.35%, employer social insurance contributions increased by 29.34% and other labour cost components increased as well in Latvia compared with 2010.

2) In the period 2010-2014 in Latvia, the highest rise in labour cost per hour, i.e. by 34.2%, was reported in state administration, followed by 29.0% for real estate operations and 26.0% for financial and insurance activities.

3) The Baltic States considerably lagged behind the EU average level of labour costs. One of the highest labour cost levels was reported in Denmark, whereas the lowest was in Bulgaria.

4) Wages and salaries are the key component of labour costs. In the period 2010-2014, the highest average gross wage and salary increase among the Baltic States was reported in Estonia, followed by Latvia and Lithuania.

5) In recent years, labour productivity per hour worked has increased in Latvia, reaching EUR 8.6 in 2014, while in Lithuania it was EUR 10.7 and in Estonia EUR 11.6; yet, the Baltic States lagged behind the EU average labour productivity.

6) The correlation coefficient r=0.86 and the determination coefficient R^2=0.745, calculated in a regression analysis of the productivity and costs of labour in Latvia, indicate a medium strong linear relationship between the variables and are significant at a probability of 99% (p = 0.003). The regression analysis coefficients show that an increase in labour productivity by 1 EUR/h leads to an increase in labour costs by 1.12 EUR/h.

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7) In order that enterprises in Latvia can increase their labour productivity, a higher value has to be added to products, particularly in manufacturing, and more innovations have to be introduced, particularly in the sector of information technologies.

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INTANGIBLE CULTURAL HERITAGE IN PROMOTION OF DEVELOPMENT OF LOCATION

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Abstract. At the times of modern technologies, a contemporary traveller differs from a traveller ten years ago. Tourist's motivation and desire for adventure has changed.

In the past ten years culture and tourism relations have been one of the main drives promoting growth of the tourism industry. Therefore, the use of intangible cultural heritage in tourism and research would be topical.

The aim of the present research is to determine the impact and describe the use of intangible cultural heritage in tourism on the local community and location.

The question of the research: What is the impact of the use of intangible cultural heritage on development of the territory?

The author of the research used theoretical (studies of scientific literature, analysis of documents, analysis of international experience) and empirical research methods (partly structured interviews, observations).

Eight culture experts from Latvia and Poland were interviewed during the research. The author also analyzed 23 laws, regulations, binding documents in the Latvian, Lithuanian, English, Spanish and Polish languages.

After analyzing data of literature sources and interviews, it can be said that the activities and events organized in Latgale culture centres are quite uniform and similar. There is not much attention paid to intangible cultural heritage as a tourism product. Preservation of intangible heritage promotes awareness of the community's national identity, promotes the economic and social development of the location in a long term.

Key words: intangible cultural heritage, tourism, development.

JEL code: R 11

Introduction

Ruta Cibule said in her Master's Thesis: "The way we are speaking about values of our nation determines whether they are heard or ignored by others. Today, there is a conflict in preservation of intangible cultural heritage. On the one hand, we are aware that cultural heritage is the basis of the diverse cultural identities of the humanity. On the other hand, its preservation is under threat today because its functionality is decreasing." (Cibule R., 2009)

Today, when people speak about humanism so much, it is worth remembering that humanism is based on values of human beings. Presence and development of humanism values are closely related with cultural heritage (Pukis M., 2011) manifested in the values achieved, accumulated, inherited in the previous centuries and millenniums. Humanism is based on diversity of the cultural heritage but national self-confidence is based on the different forms of this national expression. National culture is one of the basic elements of national identity (Pukis M., 2011).

Latvia started paying more attention to the term "intangible cultural heritage" in 2003 after the General Conference of UNESCO adopted Convention for the Safeguarding of the Intangible Cultural Heritage. The Law on UNESCO Convention on Safeguarding of the Intangible Cultural Heritage was adopted by the Parliament of the Republic of Latvia on November 25, 2004.

The goal of the Convention is to safeguard the intangible cultural heritage; to ensure respect for the intangible cultural heritage of the communities, groups and individuals concerned; to raise awareness at the local, national and international levels of the importance of the tangible cultural heritage, and of ensuring mutual appreciation thereof; to provide for international cooperation and assistance (UNESCO, 2015).

The Convention defines intangible cultural heritage: "The "intangible cultural heritage" means the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage. This intangible cultural heritage, transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and provides them with a sense of identity and continuity, thus, promoting respect for cultural diversity and human creativity" (UNESCO, 2015).

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The Convention explains manifestation forms of the intangible cultural heritage: oral traditions and expressions, including language as a vehicle of the intangible cultural heritage; performing arts; social practices, rituals and festive events; knowledge and practices concerning nature and the universe; traditional craftsmanship (UNESCO, 2015).

Among the countries of the world, Japan was the first to internationally raise the issue on safeguarding intangible cultural heritage in 1950 when it adopted the first law on intangible cultural heritage in the world, regulating protection of cultural values (Jarutis, 2013). Then Bolivian Ministry of Foreign Affairs and Religion in 1973 sent a letter to the UNESCO director general, saying that all existing instruments were aimed at the protection of tangible objects, and not forms of expression, such as music and dance (Hafstein V., 2015).

Living in the EU, we have to be aware that respect towards cultural diversity of its countries is a joint European value, uniting the EU Member States. Protection and development of the cultural heritages is one of the priorities of this union (Pukis M., 2011).

In the era of modern technologies when people have so many other alternatives for spending their leisure time, the natural transmission ability is disappearing and it is necessary to look for new forms and ways to preserve intangible cultural heritage and its viability. The concept on safeguarding of the intangible cultural heritage says that in the 21st century protection of the intangible cultural heritage, especially in the expressions of Latvian ethnic culture, is becoming endangered as its functional necessity and usefulness has decreased when intangible cultural heritage skills lose their topicality in everyday routines, being replaced by more convenient methods to solve everyday problems and ways to spend leisure time (Cabinet of Ministers of the Republic of Latvia, 2008, ER). Even though today, despite the fact that a large part of people's minds is occupied with new technologies, their achievements and material values, the public attention is tending to focus also a great deal on active lifestyles, there are more discussions about healthy living and the role of recreation in people's lives (Smuka I., 2012). This opens an opportunity for intangible cultural heritage in the quality of a tourism product as research suggests that in the past ten years culture and tourism relations have been one of the main drives promoting growth of the tourism industry. Contemporary people are witnesses of the growing role of creativity that adds to the existing models based on cultural heritage and culture tourism with new forms based on intangible cultural heritage and contemporary creative work (OECD, 2014).

The profile of a contemporary tourist has changed from what it was ten and more years ago. Today many tourists are looking for active recreation opportunities and emotional, physical, social and psychological engagement. They are looking for authentic experience, rejecting mass tourism and standardized packages (Ferrari S., 2013).

But what are social or economic benefits to the local community?

The research has been developed with the support of the National Research Programme EKOSOC-LV 5.2.8. project.

Research results and discussion

In order to answer the above-mentioned question, the aim of the research was defined: to determine the impact and describe the use of intangible cultural heritage in tourism on the local community and location.

The following theoretical research methods were selected:

1) studies of scientific literature (research, scientific publications);
2) analysis of documents (legislation, manuals, methodological materials);
3) analysis of international practices.

Empirical methods with direct participation of the author:

1) partly structured interviews to analyze the existing situation in the use of intangible cultural heritage in tourism;
2) observations with an aim to analyze attitude of other nations to preservation of their intangible cultural heritage and its transmission to further generations.

Eight culture experts from Latvia and Poland were interviewed during the research. The author also analyzed 23 laws, regulations, binding documents in the Latvian, Lithuanian, English, Spanish and Polish languages. As use of intangible cultural heritage in tourism has not been studied much in Latvia or abroad, the majority of the analyzed studies dealt with problems in preservation and transmission of intangible cultural heritage. During the research, the author

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studied the situation regarding use of intangible cultural heritage in cultural centres of Latgale.

Based on analysis of literature sources, it can be said that all cultural resources have their scientific, educational, historical and aesthetic value, and both tangible and intangible cultural heritage have a potential to be used in tourism. Both tangible and intangible cultural heritage have the attraction, and elements of rest, recreation, culture and history (Puente et al., 2012). A contemporary tourist prefers activities based on authenticity, cultural heritage and uniqueness as well as rural communities (Hodur N. M., 2010), thus, tourism organizations when making their tourism offers prefer such components as dances, traditions, practices as nowadays it is a strong tourism resource, and by combining them, a new tourism product can be developed that would promote the region's economic and social growth (Puente et al., 2012).

One of the most popular forms of intangible cultural heritage in Latvia and abroad used for attraction of tourists is traditional festivities. Spanish researcher Javier Escalera underscores that organization of traditional festivities brings economic benefits to the local community, ensuring workplaces in the accommodation and catering sectors as well as giving work to craftsmen who are making, for example, flamenco outfits and jewellery, as well as to carpenters, blacksmiths and others throughout the year. In the conclusion it is said that organization of traditional festivities undoubtedly brings large economic benefits to the community and is a strong instrument for attraction of tourists to Andalusia (Escalera J., 1998). Speaking about the above-mentioned craftsmen, craftsmanship as use of intangible cultural heritage in tourism can also benefit to the community. As Polish professor Jan Adamowski has said in an interview, demonstration could also be a tourism product (interview, 2015). Development of craft (theme) villages can be mentioned as the good practice in use of craftsmanship in tourism. There are such examples in Latvia and Poland.

For example, education and crafts centre "Roskosz" (Poland) is located in the border area – 25 kilometres away from the Belarus border and 30 kilometres away from the Ukrainian border. The goal of the centre is to ensure conditions for youth development and promote international cooperation.

On July 31, 2015 an education and crafts centre "Roskosz" completed a project that ensured 120 hours of training to young people in traditional crafts: baker, shingle, bricklayer, wheelwright, blacksmith, weaver and potter.

In the summer of 2015, 30 youngsters of the age of 18-25, lived in the village and were trained in crafts. There were 20 instructors in the programme. The main goals of the project were to protect the traditional crafts skills from oblivion and extinction, and allow youngsters to obtain professional qualifications in a traditional trade by their choice. The project was financed by the European Social Fund. The project coordinator in a conversation underscored that the majority of participants in the project (80 %) received a job offer in October 2015 or developed their own individual companies (interview, 2015).

In Poland, there is no much information about such theme villages in tourism centres which is the reason they do not have many visitors. In Poland, festivals that can be called "business" festivals are more popular for attraction of tourists, for example, porridge festival, dumpling festival and other food festivals. Every region is organizing its own festival. Every municipality is aware of the role of intangible cultural heritage in improvement of the economic situation therefore local mayors are cooperating with tourism organizations, organizing conferences, publishing books, for example, there are five books about Lublin's region folklore alone – songs, games, dances (interview, 2015).

Development of theme villages as the activity to safeguard and transmit the intangible cultural heritage took place in Latgale through a cross-border project in 2012-2014. Theme villages were developed under the project "Development of Theme Business and Expansion of Opportunities of Theme Village Teams in Latgale and Radviliskio Regions". The general goal of the project was to promote cross-border economic and social development, expanding the idea of theme village business based on traditional activities, develop entrepreneurship and labour market, improve living conditions, increase population's capacity and attractiveness of the region (Latgale Planning Region, 2015).

As a result of the project there are 20 new theme villages developed in Latgale region, information about them is published on regional Internet portal www.latgale.lv. Business plans for the Hemp Village in Kalkune county of Daugavpils district, the Spotted Dowry Chest Village in Sakstagals of Rezekne district, the Forest Goodies Village in Ziguri of Vilaka district were developed under the project. Consultants also

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developed samples of theme village brands for Liksna village of Daugavpils district, Sakstagals village of Rezekne district, Ziguru village of Vilaka district in addition to the business plans. The developed brand concepts can be used by any theme village involved in the project. The theme villages are being operated successfully so far.

The research of the World Tourism Organization on intangible cultural heritage and tourism has collected several good practice examples in several countries of the world, demonstrating how intangible cultural heritage is used in tourism products, bringing financial and social benefits to the local community. The good practice example in Senegal: Senegal, international folklore and percussions festival in the city of Louga. The goal of the festival is to promote tourism as one of the main economic and social drives for small local communities through the rich Senegalese music cultural heritage. During the festival visitors get acquainted with the intangible culture of the community, including in folklore evenings with local storytellers, visits to music instrument workshops, learning the local language, attending percussions and dance classes. At present, the offer of cultural activities in tourism is very important for Louga as the city is using it to solve the region's swelling problems in a long term, such as economic problems and emigration among young people. This project is a good example, showing how to make culture the drive of social and economic development in the region or city where several ethnic communities have merged (WTO, s.a.).

Such festivals or culture activities might also bring side effects, for example, a festival in Bosnia and Herzegovina was attended by 10,000 people, and one third of them were tourists from different countries of the world, while another 1,000 people visited the location of the festival also during other seasons. Local residents also benefit from getting involved in the process as the crafts workshops and other workshops and training programmes receive financial support. The value of the local culture is raised and safeguarding of the intangible cultural heritage is ensured through tourism thanks to these activities. There are, however, also negative features in all mentioned above, including restricted resources, low business infrastructure level, low ecological awareness, and in this respect tourism might cause significant problems (WTO.s.a.)

Art festival in India (Kolkata) is another good example. The art festival was started out by 3,200 artists from six economically underdeveloped Bengali regions. The idea of the art festival was to achieve sustainable development of rural regions and to reduce poverty by using intangible cultural heritage and creativity of the local communities. The document says that this project visibly shows that cultural heritage can be used as a resource to improve people's level of living. Such festivals are an important part of tourism marketing when developing cultural heritage as a tourist destination (WTO.s.a.)

The Estonian Ministry of Culture representative Anton Parn in his research speaks about social and economic benefits of the location. It is interesting that not only the community benefits from that but also the location benefits from sensible management of its cultural heritage and cooperation in the area of intangible cultural heritage. The researcher says that the old manors should be grateful for their survival to the fact that schools, orphanages and shelters had been housed in their buildings. Thanks to that they are in such a good condition today. In the 1950s, out of the 227 schools located in different municipalities, every fifth one was located in a building of a manor. The Estonian Association of Schools, local governments and property owners were involved in solving problems related with preservation and renovation of school buildings. These joint activities resulted in introduction of training for school directors and municipal officials in preservation, renovation and maintenance of buildings and organization of tourism seminars, attraction of tourists. Teachers and pupils obtained basic skills in tourism management and were motivated to develop tourism activities. Tourism game "visit manors" was a popular tourism product. During the visit, school staff members guided a 30-40-minute excursion around the manor, after the excursion tourists could enjoy a local cake in the local café, and finally receive a recipe of this cake. Tourists were also able to buy souvenirs made by local artists and craftsmen. During the visit of a school in a manor, it is possible to see uniqueness and interaction of the object. Preservation and renovation of the historical manor ensemble is conducted in line with the contemporary requirements. Preservation of the unique historical object through use is underscored and there are many beneficiaries in this process. One of the beneficiaries is the object that is well-maintained, pupils are also beneficiaries as they are being trained at school in the necessary skills in maintenance of preservation of such an object, and also the society in general who has access to such objects (Pärn A., 2009).

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Looking at the situation in Latgale in use of intangible cultural heritage in tourism, analyzing the interviews with cultural workers (heads of culture centres), one can say that there might be problems in a long term with use of craftsmanship in tourism because there are fewer and fewer old craftsmen and the new generation is not eager to take over the trade: "It is often so that one cannot make a living with this trade and people find a different workplace. Initially Latgale had quite many craftsmen but they have found other jobs. The average age of weavers is the retirement age. When they are retired, then they can weave and earn some extra money" (interview, 2015).

Different activities are organized in the surveyed Latgale culture centres to preserve intangible cultural heritage, for example, "vakaresana", joint handicraft evenings, or cooking classes in Silukalns culture centre, different year-round festivities, such as Meteni, masked processions of winter, or Ligo, celebrations of the summer solstice, and collection of local folk songs in Atasiene culture centre. All the events in Silukalns and Atasiene are free of charge also for tourists. The surveyed municipalities, though, do not think about tourism development. It was admitted by Atasiene culture centre, "… in fact, we could think about tourism but we are not doing it." (interview, 2015).

Based on research, it can be concluded that the situation is not unambiguous. One of the problems in the tourism sector today is the use of intangible cultural heritage in tourism, neglecting its protection and preservation. Referring to what has been said in the previous chapter on economic benefits from using intangible cultural heritage, responsible promotion of tourism would create new workplaces, help reduce poverty and stop outflow of youth from the rural regions as well as would increase the sense of pride and loyalty into their own community.

There are many studies reflecting importance of intangible cultural heritage in tourism today, speaking about economic and social benefits but several authors admit that organization of activities to attract tourists might also bring negative consequences to authenticity of the intangible cultural heritage. For example, Spanish researcher Javier Escalera says about organization of events in Andalusia that such a form of tourist attraction is a "big furuncle" on the body of Andalusia. The dates of traditional festivities are frequently changed, adapting them to the needs of tourists, and organizers are making new festivity offers to tourists which are not natural, not authentic but created artificially just to attract tourists (Escalera J., 1998).

Anna Goral in her research "The Role of Local Government in Sustainable Management of Intangible Cultural Heritage" emphasised that there was an alarming trend that use of cultural heritage might become too commercialized and turned into a business commodity, often disarranging the natural relations among local communities. The research demonstrates the role of the local community in preservation, development, transmission of the cultural heritage in the context of sustainable and harmonic development of the local community (Goral, 2013).

Ilze Griezane, the head of Latgale crafts centre, said in an interview that "when using intangible cultural heritage in tourism, it should always be born in mind that the tourism product at some point will be adapted for the needs of tourists" (interview, 2015).

A Bulgarian researcher, meanwhile, underscores in her research that there is no clear vision in Bulgaria on intangible cultural product as a tourism product and local development resource (Ganeva-Raycheva V., 2013).

Therefore, in the conclusion, it can be said that using intangible culture heritage in tourism has a positive impact on the community both socially and economically, still the question is open about what we want to offer to the tourist. What is the goal of the event? Is the goal just to have a good time and entertain or to offer something authentic and special? How will the economic and social impact change as the goal of the event is changed?

Conclusions, proposals, recommendations

1) During the research the author analysed studies of 16 scientists from different countries. Based on analysis of literature, it can be said that the contemporary tourist has changed and is looking for more than just traditional tourist sites, the tourist is looking for new attractions and adventure. Tourists have started to prefer activities and attractions that are based on authenticity, cultural heritage and uniqueness.

Practices of other countries also show trends of using intangible cultural heritage in attraction of tourists, offering tourists experience through engagement in different processes.

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2) Judging by results of interviews, it can be concluded that the organized activities and events are quite similar. One of the most popular activities using intangible cultural heritage in local culture centres to attract local and foreign tourists are annual festivities, craft fairs and Christmas gift fairs. Organization of such activities is mostly related with interests of the local community but less so with attraction of tourists and benefits from that. Latvian local communities are not aware of the role of intangible cultural heritage in tourism and development of the location, and there is little thought given to tourism development. Analyzing the situation in Latgale, it can be said that the events organized to promote intangible cultural heritage are uniform.

3) Use and preservation of intangible cultural heritage promotes awareness of the community's national identity and its use in tourism may be the drive for social and economic development of the community. There is a long-term and direct benefit from use of intangible cultural heritage in tourism. It means that the value of the tourism product is higher than the immediate economic value it can ensure.

In order to correctly and properly use intangible cultural heritage as a tourism product in a long term, it would be necessary to educate and explain to the stakeholders, especially representatives of the community, concerning the role of the intangible cultural heritage, and that it may not be used as a source of income only. If the earned income is invested, for example, in new community projects or education programmes, it will promote long-term development. Use of intangible cultural heritage in tourism may promote solution to the economic and social problems, such as emigration of youth or shortage of workplaces. Threat to authenticity of the intangible cultural heritage is a negative trend in this respect.

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TRANSNATIONAL COOPERATION IN THE BALTIC SEA REGION PROGRAMME 2007-2013 AND ITS INFLUENCE ON RURAL AREAS' ENVIRONMENT

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Abstract. The main aim of the paper is to assess the scale of cooperation under the Baltic Sea Region 2007-2013 Programme and show its effects on rural areas basing on the example of one selected transnational project. The specific tasks were to present the territorial, financial and subjective diversity of cooperating institutions from countries around the Baltic Sea. For deeper analysis, the author has chosen project Baltic Ecological Recycling Agriculture and Society Implementation, in which 24 partners from 9 countries were involved and which was concentrated on environment in the rural areas and agriculture. The research was conducted using programme documents and brochures, statistical data gathered by the Joint Technical Secretariat of the Baltic Sea Region Programme, the author conducted also individual interviews with partners of the project. The main results show that the transnational cooperation was quite intense. The structure of 1050 institutions which took part in BSR projects was rather balanced; the number of projects implemented in most EU countries was similar and varied from 56 in Denmark to 81 in Germany. Number of project partners was more diversified, both on country and NUTS-3 level. The cities with the highest number of participations were Riga, Tallinn, Vilnius and Helsinki. The Baltic Deal and Beras implementation projects have had a direct, although not very strong, impact on rural areas environment, their effects were newly established ecological agriculture demonstration centres and promotion of the principles of sustainable agriculture and food production on the basis of regional distribution systems.

Key words: Baltic Sea Region, transnational cooperation, rural areas, BSR Programme 2007-2013.
JEL code: R11, R58

Introduction

The Baltic Sea Region (BSR) Programme 2007-2013 was one of the European Transnational Cooperation programmes and has been designed in order to strengthen the development towards a sustainable, competitive and territorially integrated Baltic Sea region by connecting potentials over the borders (Celata F., Coletti R., 2015). As the BSR Programme implementation time is coming to an end, it is worth assessing the level of cooperation and effects of spending EUR 200 mln from the European Regional Development Fund. The main aim of the paper is to assess the scale of cooperation under the Baltic Sea Region 2007-2013 Programme and show its effects on rural areas. Due to the limited length of the article also the scope of investigation was limited to a few selected issues. The specific tasks were to present the territorial, financial and subjective diversity of cooperation of institutions from countries around the Baltic Sea. For deeper analysis, the author has chosen project BERAS Implementation, in which 24 partners from 9 countries were involved and which was concentrated on rural areas and agriculture.

The author used desk research, descriptive methods and comparative analysis. The research was conducted using programme documents, brochures and statistical data gathered by the Joint Technical Secretariat of the BSR Programme. The project database has been corrected by the author, as many names of cities and institutions were given with some errors. However, the results of the study may contain some inaccuracies, e.g. in the number of partners, as sometimes the different departments of one institution were recognized as separate entities. The effects of the project were also discussed with Polish partners of the project – individual interviews were conducted. The period of analysis covers the project implementation period, the years 2010-2013. The data were presented using tables, figures and maps created using MS Excel and QGIS software.

Research results and discussion

1. General information on the BSR Programme

The Baltic Sea Region (BSR) Programme 2007-2013 was built on the experience of its two predecessor programmes supporting transnational cooperation in the Baltic Sea region under the Initiatives "INTERREG IIC" (1997-1999) and "INTERREG III B Neighbourhood Programme" (2000-2006) (Hącia E., 2010).

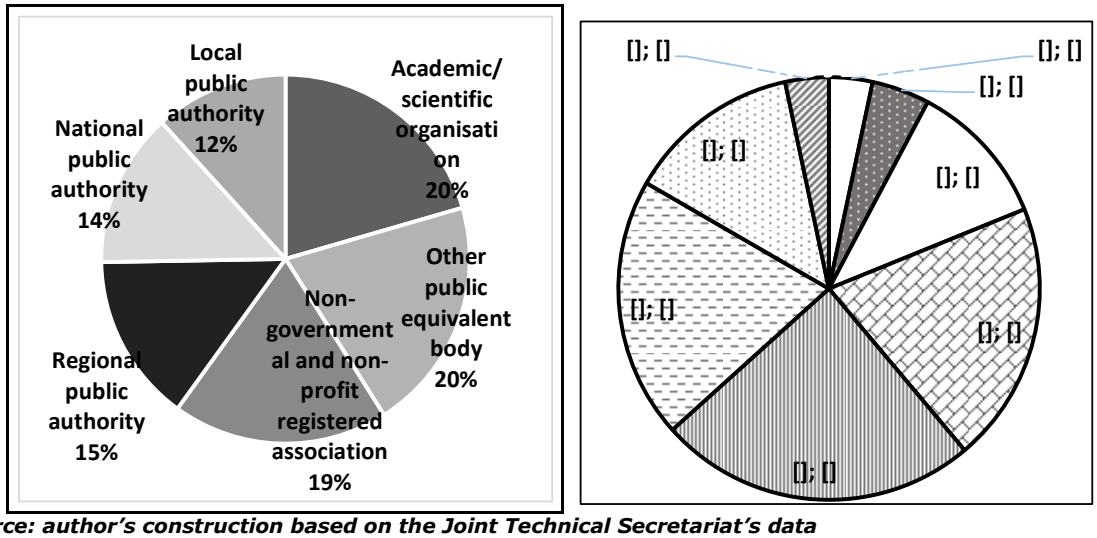
The BSR Programme had a requirement to form a partnership consisting minimum of three benefiting institutions from at least three different countries (Baltic Sea Region Programme, 2012). The potential beneficiaries comprised scientific organizations,

national, regional and local level public authorities and public equivalent bodies (such as research and training institutions, business development institutions). Private organisations could also cooperate in projects but only as additional partners with their own financing.

The BSR Programme area included the whole territories of Denmark, Estonia, Finland, Latvia, Lithuania, Poland and Sweden, and Northern parts of Germany (Executive summary…, 2014). Also the neighbouring non-EU countries: Norway (whole country), Russia (North-Western regions) and Belarus (whole country) belonged to the programme area.

2. Intensity and regional disparities of cooperation

The structure of 1050 institutions which took part in the BSR projects was quite balanced (Figure 1). About 220 academic & scientific organizations and similar number of public equivalent bodies were involved in 90 contracted projects. The number of project participants, on the contrary, was varying: ¼ of the projects had 7 partners, 20% of partnerships consisted of 6 or 8 institutions. The minimal required number of participants characterized only 3% of all projects, so it is clear that the networks of cooperation were much wider and stronger than the minimal requirements.

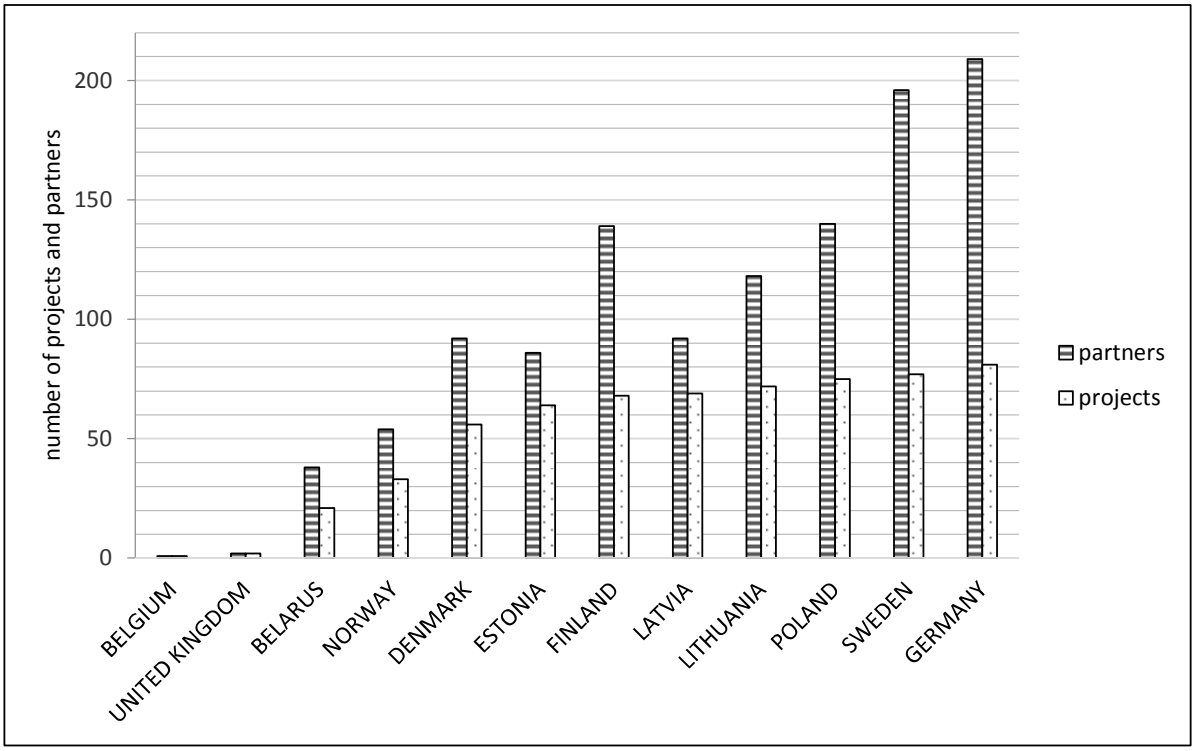


Source: author's construction based on the Joint Technical Secretariat's data

Fig. 1. **Structure of project partners - legal status name (left) and number of project participants (right)**

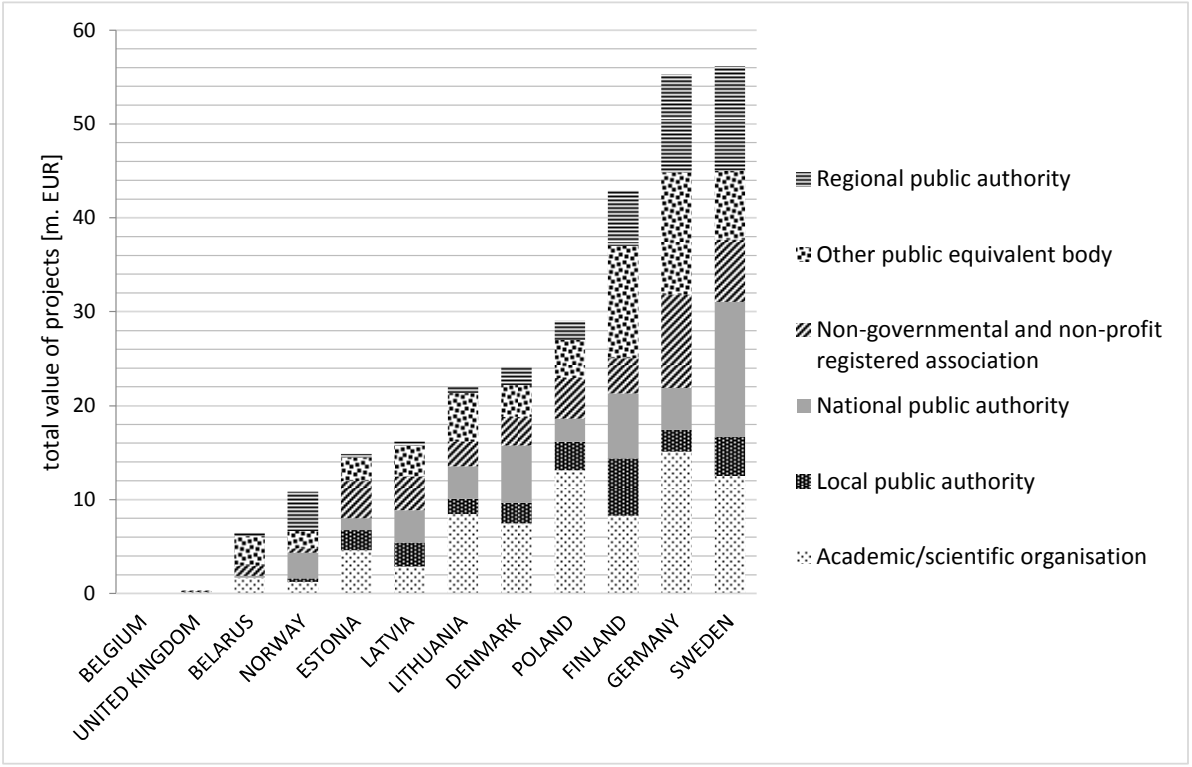
The national disparities in project involvement are shown on Figure 2. Number of projects implemented in most EU countries was similar and varied from 56 in Denmark to 81 in Germany. Number of project partners was more diversified – from around 90 in Denmark, Estonia and Latvia to around 200 in Sweden and Germany.

Total value and structure of projects in the BSR Programme is shown on Figure 3. The highest total value had projects implemented by partners from Sweden, Germany (about EUR 58 million in each country) and Finland (EUR 43 million). The structure of beneficiaries was similar although Sweden had a higher share of funds acquired by national public authorities as Swedish Board of Agriculture, Swedish Forest Agency, Swedish Transport Administration. Germany and Finland had a higher share of other public equivalent bodies as port authorities and technology centres. The detailed spatial disparities in NUTS-3 regions are presented on Figure 4. In 2 countries academic institutions were more active. In Poland, more than EUR 1 million was raised by Maritime Institute in Gdansk, Motor Transport Institute and Gdansk University of Technology and in Germany the leaders were: Deutsches Elektronen-Synchrotron, Flensburg University of Applied Sciences and University of Rostock (EUR 750-900 thou. each).



Source: author's construction based on the Joint Technical Secretariat's data

Fig. 2. **Number of projects and partners in the BSR Programme**



Source: author's construction based on the Joint Technical Secretariat's data

Fig. 3. **Total value and structure of projects in the BSR Programme**

Table 1

Activity of cities in the BSR Programme

No	City	Country	Number of participations*	Share in all country participations %
1.	Riga	LV	86	77.5
2.	Tallinn	EE	64	59.3
3.	Vilnius	LT	63	42.0
4.	Helsinki	FI	52	28.3
5.	Hamburg	DE	42	18.1
6.	Stockholm	SE	39	16.7
7.	Gdansk	PL	36	21.7
8.	Berlin	DE	32	13.8
9.	Klaipeda	LT	32	21.3
10.	Kaunas	LT	27	18.0
11.	Rostock	DE	23	9.9
12.	Tartu	EE	22	20.4
13.	Warsaw	PL	21	12.7
14.	Minsk	BY	20	50.0
15.	Oslo	NO	20	35.1

**) when 1 institution took part in 2 different projects it is calculated as 2 participations*

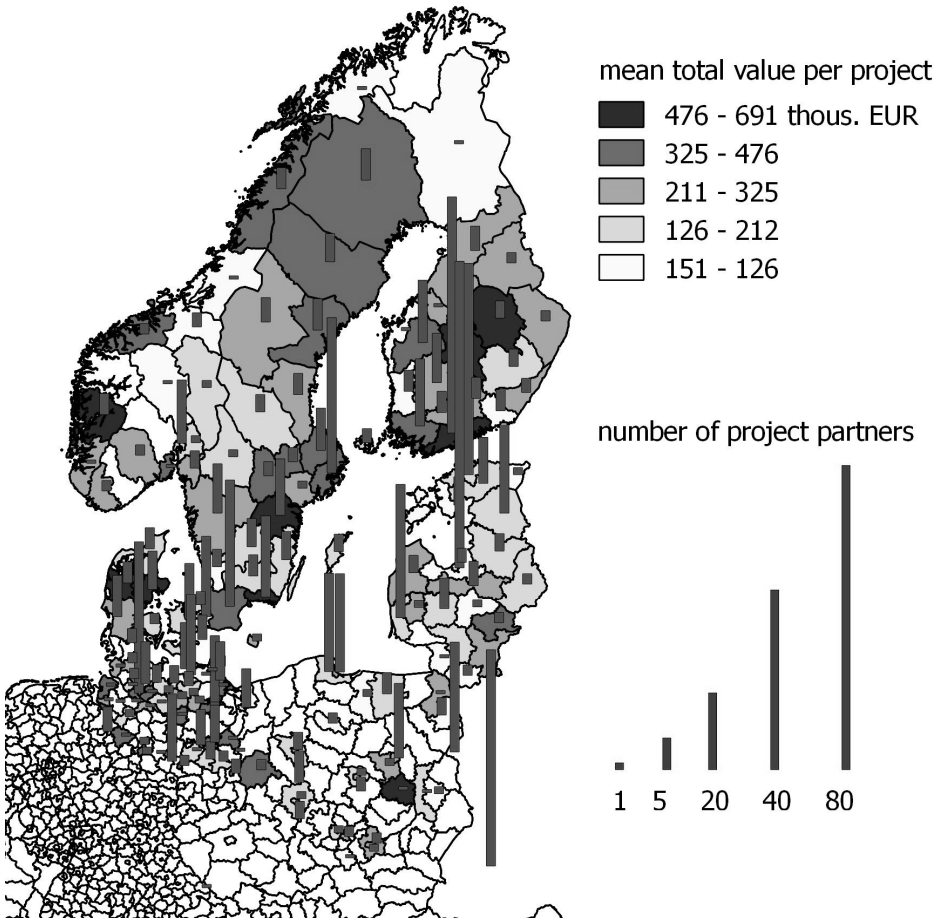
Source: author's calculations based on the Joint Technical Secretariat's data

Comparing the countries' cooperation activity with the number of participants from the entire cities of the region, it is clear that the entities cooperating in the BSR programme were highly spatially concentrated in the three Baltic States and Belarus. Institutions from Riga, Tallinn and Minsk implemented more than half of all projects in these countries. In other states, the institutions were more disperse, which can also be seen at Figure 4.

The mean total value of project in NUTS-3 regions was calculated by dividing the total amount of projects by the number of participating institutions located in the region. The highest values can be observed mostly in regions of the Scandinavian countries and also in Radomski sub-region in Poland. This was a result of one project Baltic Deal implemented by the Radom Branch Office of Agricultural Advisory Centre. The aim of the project was to improve the Baltic Sea environmental status by supporting farmers to reduce the nutrient losses from agriculture. This shows the weakness of the database, as the project was implemented in all Polish regions (47 demonstration farms were established) but the funds were assigned to one NUTS unit.

Characteristics and goals of the project

The BERAS Implementation Project was continuation of an earlier research project Beras implemented in the years 2003–2006 and its goal was to implement the idea of organic farming in countries around the Baltic Sea in order to protect Baltic water against leaching of plant nutrients and chemicals having its source in agriculture. As in many other projects, it was initiated by a research sector (Mikhaylov, A., Bolychev, O., 2015), the lead beneficiary was Södertörn University in Sweden, there were also 23 partners: institutes, universities (Estonian University of Life Sciences, University of Helsinki, Lithuanian University of Agriculture), Rural and Agricultural Advisory Centres (2 from Poland, one from Latvia), foundations, municipalities, NGOs. In addition, 35 other organizations such as ministries, financial institutions, supply chain actors, NGOs and environmental organizations from all Baltic Sea countries, including Russia and Norway participated in the project. The project lasted three years from June 2010 to September 2013 and its total value amounted to EUR 4.6 million, with value of the subsidy of EUR 3.4 million.



Source: author's construction based on the Joint Technical Secretariat's data

Fig. 4. **Mean value of projects and number of partners in the BSR Programme**
Influence on rural areas environment - case study of the project BERAS Implementation
(Baltic Ecological Recycling Agriculture and Society Implementation)

The analysed project - due to its scope and pro-environmental interaction - was complementary with many projects, among other ETC programmes: the mentioned Baltic Deal project, Modern Water Management in the South Baltic Sea Area (Operational Programme South Baltic CBC), the Protection of the Baltic coastal water - NEFA BALT II and Integrated Development and Implementation of the New Waste Water Treatment Facilities for the Reduction Pollution of the Baltic Sea - Acronym IntegroProBalt (Cross-Border Cooperation Operational Programme Lithuania - Poland - Russia).

The Beras Implementation project aimed at improving the state of the Baltic Sea, among others, through the promotion and implementation of the ERA (Ecological Recycling Agriculture) - sustainable agriculture based on the recycling of nutrients on the farm based on the closed circuit (WYG PSDB, 2015). As required by the ERA, a sustainable farm should result in the production of animal and plant with closed circuit of nutrients - nitrogen and phosphorus. Number of animals should be kept at a reasonable level allowing their diet to be based mainly on feed produced in the same farm. The management of the ERA system is also associated with the use of diversified crop rotation and the abandonment of the use of the means of production (synthetic fertilizers, chemical pesticides etc.). It is also assumed that farm income should come from a variety of sources. As most farms operating in Poland and other Central European countries did not implement the requirements of the ERA, one of the project goals was to raise the awareness of farmers and promote this system of farming.

Therefore, the project goals were strictly connected with rural areas, one of them was to establish demonstration centres and promote the principles of sustainable agriculture and food production on the basis of regional distribution systems. These Beras Information Centres (BICs) were located in Sweden in the Rural Development Centre Järna, Gotland,

Agriculture High School in Kalmar, 5 farms in different regions in Poland, Finnish agriculture museum and organic Heikkilä farm (Heinonen S., 2011), Research Centre of Organic Farming of the Estonian University of Life Sciences in Tartu, Advisory Centre in Ozolnieki (Latvia), Lithuania established a Mobile BIC (Staniszewska M., 2011). Also the project promoted environmentally safe food products and took specific actions to increase entrepreneurship in rural areas.

Benefits, costs and effects of the project in the rural areas

Due to the nature of the project, financial benefits were assessed as low, comprised mainly part financing of the jobs of workers involved in the project. In some institutions for the implementation of the project new staff was employed, usually not more than 1-2 people. Non-financial benefits were assessed as higher: the most important was extending knowledge of the people involved in the project about the mechanisms and way of functioning of the market for organic products in other EU countries. Other issues included public education, promotion of organic products and distribution channels of organic products in selected countries. Significant are also established contacts with universities and institutions participating in the project. In this way the institutions gained the possibility to continue similar actions in the future in partnerships created during the project implementation. An additional benefit was the knowledge and intercultural experience, both over the project during meetings and training as well as after its completion - the training centres in farms belonging to the project are now being visited by farmers from different countries (also from Asia and Africa). For farmers holding demonstration farms, the project became an opportunity to acquire new teaching skills and learn and practice foreign languages.

The costs included mainly the own financial contribution of institutions, which in the case of non-governmental organizations was a significant load. Generally, the cost-benefit relationship can be assessed positively.

The direct results of the project were the created demonstration farms operating in the ERA system which were chosen on the basis of Agricultural Advisory Centres knowledge. These farms operate according to the principles of the ERA also after completion of the project, conduct training on organic farming and the opportunities to reduce emissions of pollutants into groundwater. The knowledge about the real number of farms that through participation in training have switched to environmental activity is limited but a network of at least 42 ERA farms for developing and communicating best practices was established (Annual Implementation Report…, 2014). In addition, trained students of agricultural schools and university students may in the future implement the ideas of organic farming on their own farms. The impact of the project on the state of natural environment is difficult to assess. The activities in the project, although of great potential importance to improve water quality in the Baltic Sea and the inhibition of eutrophication processes were soft in nature, and thus, they are difficult to be measured.

Conclusions, proposals, recommendations

To sum up, the study shows the intensity and effects of the Baltic Sea Region Programme implemented in the years 2007-2013(2015). The transnational cooperation around the Baltic Sea was quite intense. About 1050 institutions took part in 90 projects funded by the BSR Programme. Number of project partners was diversified, both on country and NUTS-3 level. The cities with the highest number of participations were Riga, Tallinn, Vilnius and Helsinki. Other conclusions are presented below:

1) The BSR Programme contributed to creation of many partnerships consisting most often of 6-8 institutions;
2) There was a balanced number of implemented projects and balanced structure of institutions which took part in BSR projects;
3) Higher developed EU countries acquired more funds from the BSR Programme;
4) Although Finland and Poland had a similar number of implemented projects and participating partners, the total value of project was Finland 50% higher than in Poland;
5) Entities cooperating in the BSR programme were highly spatially concentrated in the three Baltic States and Belarus (in the capitals: Riga, Tallinn, Minsk, Vilnius);
6) Partner organizations on NUTS-3 level were more evenly distributed over the German, Danish, Swedish and Finnish regions.

The Baltic Deal and Beras implementation projects have had a direct although not a very strong impact on

environment at rural areas. Their effects were newly established ecological agriculture demonstration centres and promotion of the principles of sustainable agriculture and food production on the basis of regional distribution systems. Farms transformed into demonstration centres function according to the Ecological Recycling Agriculture rules, they conduct training on organic farming and inform about the opportunities to reduce emissions of pollutants into groundwater. The knowledge and experience gained in the project contributes continuously to promote the idea of organic farming and inspires farmers to transition to ERA farming, which may positively affect the reduction of agricultural pollutants emissions into the Baltic Sea.

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FORECASTING ROAD FREIGHT TRANSPORT ALTERNATIVES FOR SUSTAINABLE REGIONAL DEVELOPMENT IN ESTONIA

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Abstract. Transportation has always been one of the main driving forces of any country's economic development, and Estonia is no exception. Transport influences other economic sectors and the service sector, and these sectors in turn have a strong influence over the transport sector. Road transport plays an important role in the regional and sustainable development of economy. Road transport, however, is the main source of greenhouse gas (GHG) emissions. Therefore, it is important to be aware of the factors which affect both road freight and the amount of greenhouse gases emissions by road freight transport. One way to acquire information about the future is by using econometric models which, in addition to forecasts, illustrate interconnections between different factors. This study looks at the use of the econometric simultaneous equations model for forecasting the effect and the negative impact that road freight transport has on environment. Forecasts are made in three different variants, considering different growth rates of Gross Domestic Product (GDP) per capita. The analysis showed that the most important factors in forecasting both freight volumes and GHG emissions were GDP per capita and the number of inhabitants in Estonia.

Key words: econometric model, road freight transport, GHG emissions

JEL code: C3, R4, Q01

Introduction

The European Commission is planning to reshape the European transport system, and according to the Transport 2050 Roadmap to a Single European Transport Area, there is a need to significantly reduce Europe's dependence on imported oil, and to reduce transport-related CO2 emissions by 60% compared to the 1990 level. According to the Roadmap, 30% of road freight over 300 km should shift to rail or waterborne transport by 2030, and more than 50% by 2050 (Transport 2050, 2011).

Road freight transport is an important factor in the development of a national economy but on the one hand, road freight transport has a negative impact on the environment and on people's health. For a long time, the main criterion of planning road freight transport was the minimisation of expenses (Crainic T.G., 2000; Forkenbrock D.J., 2001). A classic example of minimising freight costs is using a linear transport problem to define optimal transport routes (Taha H.A., 2003). The situation today is different. Increased global attention to climate problems and environmental protection has encouraged logistics experts and representatives of road freight transport companies to pay more attention to the downsides of their activities. The main negative impacts are the generation of pollutants, road traffic accidents, noise pollution, land use deterioration etc. but the main focus is on limiting the increase of GHG emissions (Demir E. et al., 2014; Lin C. et al., 2013; van Veen-Groot D.B., Nijkamp P., 1999).

At local and regional levels, lorries, though being a significant cause of pollutants, are the main means of freight transport. Although the technology of lorry production is being continuously improved and the quality of fuel is improving, lorries will remain the main cause of pollution in the near future. In the context where the effect of greenhouse gases must be taken into account, a new road transport development trend – green road freight transport – has appeared (Lin C. et al., 2013).

At the level of individual countries and areas, the volume of road freight transport, turnover and GHG emissions have been addressed in various articles (Brizga J. et al., 2014; Ofei-Mensah A., Bennett J., 2013; O'Mahony T. et al., 2013; Piaggio M. et al., 2015; Singh B. et al., 2015; Sobrino N., Monzon A., 2014; Streimikiene D., 2015; Yan X., Crookes R.J., 2009).

At the global level, the increasing GHG levels in the atmosphere cause the increase of the Earth's temperature. In the road transport sector, the main component of GHG is CO2, which is created when motor fuel burns. GHG is thus directly dependent on the amount of fuel used by a vehicle.

Estonia's low population density has caused road freight transport to have the leading role in providing nationwide services in the transport of goods, as well as ensuring mobility. In terms of domestic freight

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transport, local businesses and competitiveness, road freight transport is irreplaceable. Economic growth leads to the society's increased welfare, whereas adverse effects caused by road freight transport reduce welfare.

The objective of this study is to forecast the key indicators of road freight transport (freight volumes, freight turnover), and the amount of GHG emissions (CO_2 equivalent) caused by the transport sector.

The following problems must be solved in order to meet this objective:

1) building an econometric model and forecasting the freight volumes of road freight transport and the size of the adverse impact (emission of greenhouse gases) that road freight transport would cause to the environment during the period from 2015 to 2030;

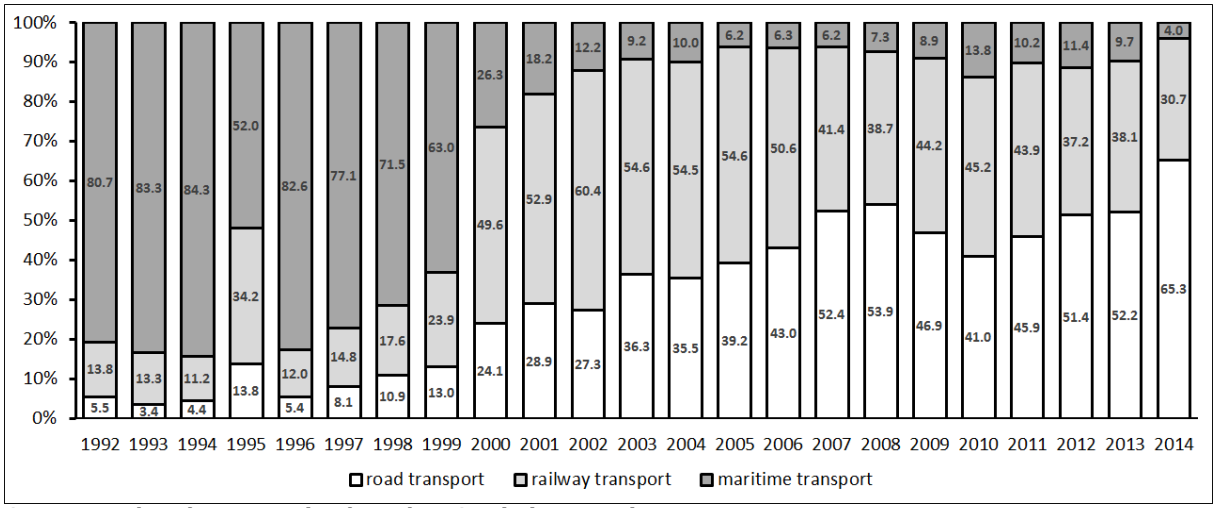
2) analysing the modelling results and defining the factors whose modification would allow road freight transport to reduce the emission of greenhouse gases, or, at least, reduce their increase rate.

Research results and discussion

1. Overview of transport sector in Estonia

In Estonia, the main types of transport are road, rail, maritime and air transport. The share of air transport in freight transport is unremarkable and is not used in further analysis. Freight volumes are best characterised by freight turnover, since it comprises two components: the amount of goods transported, and transport distance. Freight turnover is measured in tonne kilometres (tkm). One tonne kilometre equals transporting one tonne of goods to the distance of one kilometre (Statistics Estonia, 2015).

In the 1990s, after Estonia had regained its independence, the main type of transport was maritime transport but since 2000, the proportion of maritime transport in freight turnover has significantly decreased, and only made up 4% in 2014, whereas the proportion of both rail and road transport has increased (Figure 1) (Statistics Estonia, 2015).



Source: authors' construction based on Statistics Estonia

Fig. 1. **The proportions (%) of main types of transport out of freight turnover from 1992 to 2014**

During the years 2000-2006, rail transport constituted the largest proportion. Since the economic recession in 2007, road freight transport has grown rapidly, making up 65.3% of the total freight turnover in 2014, and the proportion of rail transport has decreased (30.7%) (Figures 1 and 2) (Statistics Estonia, 2015). The decline in rail freight transport is caused by the fact that oil transportation is decreasing and shifting to Russian ports. This is a positive development in terms of reducing environmental risks but also shows that Estonia has not been successful at impeding the growth of road freight transport and shifting it to railways.

In recent years, freight turnover on roads and railways has been smaller than economic growth (Figure 2). In Estonia, 21.8 million tonnes of CO_2 equivalent were emitted in 2013, 10.3% of which was transport-related (Eurostat, 2015). CO_2 (carbon dioxide) equivalent (CO_2 eq) is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential (GWP), by converting amounts of other gases to the

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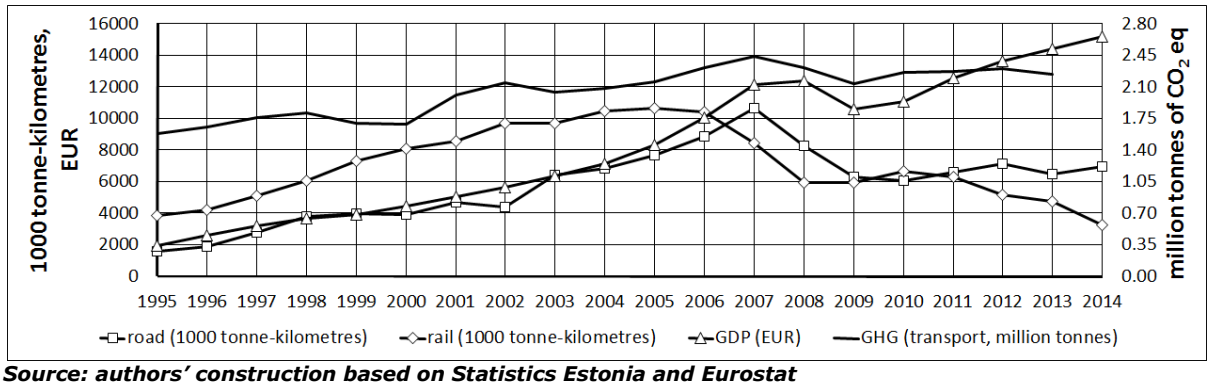
equivalent amount of carbon dioxide with the same global warming potential (Eurostat, 2016).



Source: authors' construction based on Statistics Estonia and Eurostat

Fig. 2. **Freight turnover (tkm) on roads and railways, GDP per capita (EUR) and the amount of GHG emissions by transport (million tonnes of CO_2 equivalent)**

2. Model description

In order to meet the objective, an econometric simultaneous equations model was built, which allows modelling the studied processes using several equations that have a simultaneous effect (Greene W.H., 2008). The model includes stochastic, i.e. structural equations, and identities. The exogenous variables of the model are external variables, which are presented as given values from the perspective of the model. Endogenous variables are variables with values set by the model, i.e. each endogenous variable has a separate equation (a stochastic equation or identities), thanks to which there is an equal number of equations and endogenous variables in the model.

The parameters of the model were estimated using the data collected by Statistics Estonia and Eurostat on road freight transport freight volumes, CO_2 emissions, and macroeconomic indicators characterising Estonian national economy during the period from 1992 to 2014.

Freight transport and CO_2 emissions are modelled using a model with 7 exogenous variables. Exogenous variables and their main statistics are reported in Table 1.

Table 1

Exogenous variables of the econometric model, and their main statistics

Symbol	Exogenous variable	Statistics			
		Average	Max	Min	Standard deviation
X1	Trend	1.50	13.0	-10.00	7.07
X2	GDP per capita (thousand)	7.03	10.3	3.98	2.35
X3	Estonian average monthly salary (EUR)	468.6	1006	35.0	314.1
X4	Consumer price index (CPI)	1.173	1.90	0.98	0.275
X5	Recession dummy variable	0.167	1.00	0.00	0.38
X6	Estonia's population (thousand)	1365	1533	1282	78.1
X7	Total GDP (billion EUR)	9.44	13.2	5.72	2.74

Source: authors' calculations based on Statistics Estonia

The model has 10 endogenous variables. The descriptive statistics of the data used for the model parameter estimation are reported in Table 2.

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Table 2

Endogenous variables of the econometric model, and their main statistics

Symbol	Endogenous variables	Statistics			
		Average	Max	Min	Standard deviation
Y1	Road freight transport freight volume (million tonnes)	24.57	52.4	9.6	11.6
Y2	Road freight transport freight turnover (million tkm)	4183.7	7026.0	1056.0	1876.4
Y3	Total CO_2 emissions (million tonnes of CO_2 eq)	20.695	37.560	16.290	4.374
Y4	CO_2 emissions caused by the transport sector in Estonia (million tonnes)	1.972	2.420	1.160	0.353
Y5	CO_2 emissions caused by road freight transport in Estonia (million tonnes)	1.787	2.230	1.010	0.343
Y6	Proportion of CO_2 emissions caused by the transport sector of total CO_2 emissions	0.098	0.131	0.042	0.0232
Y7	CO_2 emissions caused by the transport sector per one transported tonne	0.087	0.147	0.030	0.0341
Y8	Freight turnover per one euro of GDP (tkm/EUR)	0.423	0.554	0.167	0.1131
Y9	CO_2 emissions caused by the transport sector per one euro of GDP (kg CO_2 eq/EUR)	0.218	0.345	0.176	0.0425
Y10	CO_2 emissions caused by the transport sector per one tkm (kg CO_2 eq/tkm)	0.528	1.220	0.304	0.2696

Source: authors' calculations based on Statistics Estonia and Eurostat

The parameters of the stochastic equations of the econometric model were estimated using the FP programme package (Fair R.C., Parke W.R., 2012). Three different methods were used for the estimation of the parameters: 2SLS – two-stage least squares, 3SLS – three-stage least squares, and FIML – full information maximum likelihood.

3. Forecasts up to the year 2030

Forecasts are made in three different variants, considering different growth rates of the exogenous variable X2 (GDP per capita). The values of exogenous variables X1, X3, and X6 are forecasted based on possible developments. The values of other exogenous variables remain the same in each forecast.

The amount of goods in tonnes (Y1) and freight turnover in tonne kilometres (Y2) are used to estimate the parameters of road transport freight volumes (Figures 3, 4). Freight volumes are modelled based on the following equation: Y1 = F(X1 – trend, X2 – GDP per capita, X3 – Estonian average monthly salary, X5 – recession dummy variable).

Forecast curves (Figure 3) show that the pre-recession level of road freight transport (38.5 million tonnes in 2007) could not be reached until 2030, even when using the most optimistic estimation (GDP growth rate of 2.2% per year). If the annual average growth of GDP will be 1.3% (GDP1.013) or 1.5% (GDP1.015), freight volumes would decrease, since the multiplier of the trend variable is negative. As a result, negative influence would gradually increase with the passing of time.

The following equation is used in modelling freight turnover: Y2 = F(Y6 – proportion of CO_2 emissions caused by the transport sector of total CO_2 emissions, X2 – GDP per capita, X4 – consumer price index, X5 – recession dummy variable).

Figure 4 shows that in case of 0.6% annual GDP growth rate, the pre-recession level (7026 million tkm) would not be reached until 2028. If GDP increased by 1.4% per year, the pre-recession level would be achieved by 2020 according to the forecast, and by 2018, if GDP increased by 2.2% annually.

The analysis of Figures 3 and 4 demonstrates that economic recession has affected the growth of freight volumes more than it has affected the growth of freight turnover (the pre-recession level will be reached later).

The endogenous variables that harm the environment are the total CO_2 emissions (Y3), CO_2 emissions caused by the transport sector (Y4), and the amount of CO_2 emissions caused by road freight transport (Y5).

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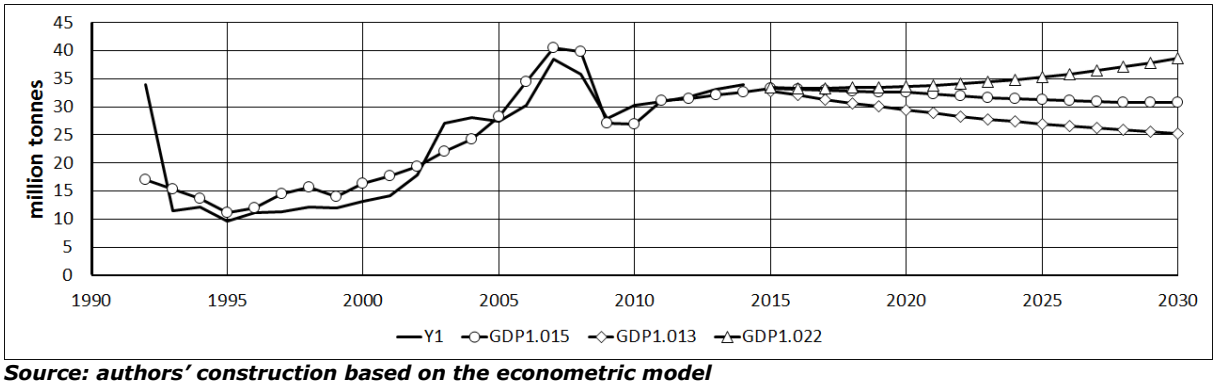
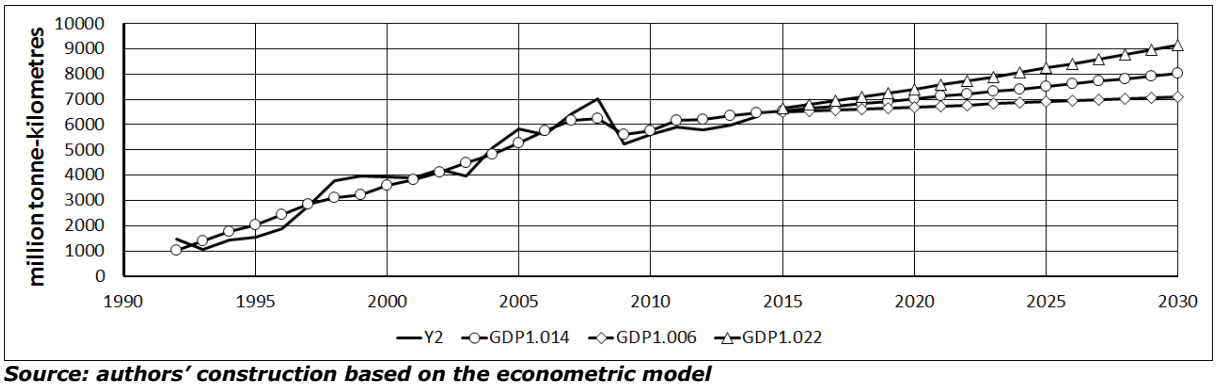


Source: authors' construction based on the econometric model

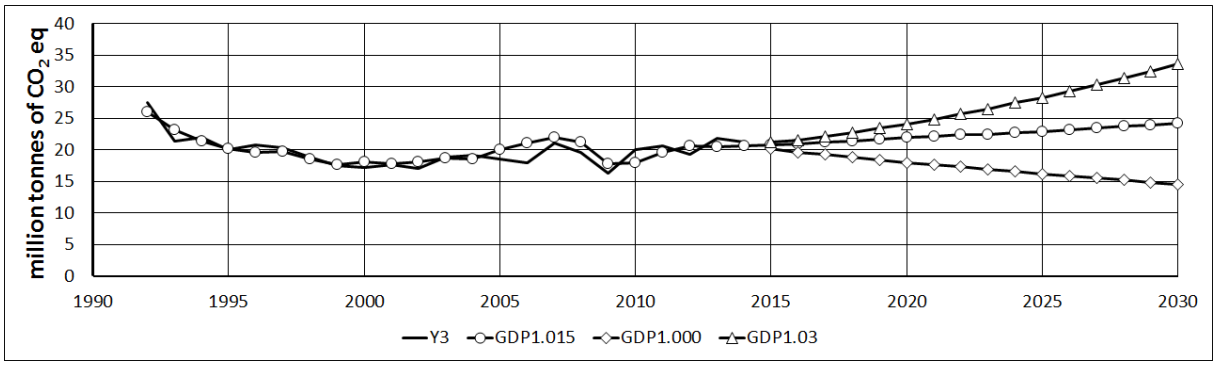
Fig. 3. **Road freight transport freight volumes in Estonia from 1992 to 2014, and freight volume forecasts for 2015 to 2030 considering different GDP per capita growth rates**



Source: authors' construction based on the econometric model

Fig. 4. **Road freight transport freight turnover in Estonia from 1992 to 2014, and freight turnover forecasts for 2015 to 2030, considering different GDP per capita growth rates**

The total CO_2 emissions were modelled using the equation Y3 = F(Y10, X2, X4, X5, X6). Total CO_2 emissions are largely defined by two exogenous variables: GDP per capita, and population. If GDP per capita remains unchanged (grows by 0.0% per year), the total CO_2 emissions decrease due to the forecasted decline in population (Figure 5). According to forecasts, total CO_2 emissions will fall from the 20.2 million tonnes forecasted for 2014, to 14.6 million tonnes, i.e. by 28.0%, meaning that total CO_2 emissions would decrease on average by 2.2% per year.



Source: authors' construction based on the econometric model

Fig. 5. **Total CO_2 emissions in Estonia from 1992 to 2014, and total CO_2 emissions forecasts in Estonia for 2015 to 2030, considering different growth rates of GDP per capita**

Forecasts show that if GDP increased by 1.5% per year, the pre-recession level (21.1 million tonnes) could be reached by 2017. If, however, GDP grew by 3% per year, the pre-recession level could be reached by 2015. The increase of total CO_2 emissions is caused by the increase of GDP (per capita), but the negative effect of the population size will remain.

CO_2 emissions caused by road freight transport are modelled using the following equation: Y5 = F(X2, X3, X5, X6). CO_2 emissions caused by road freight transport are forecasted to increase in the coming

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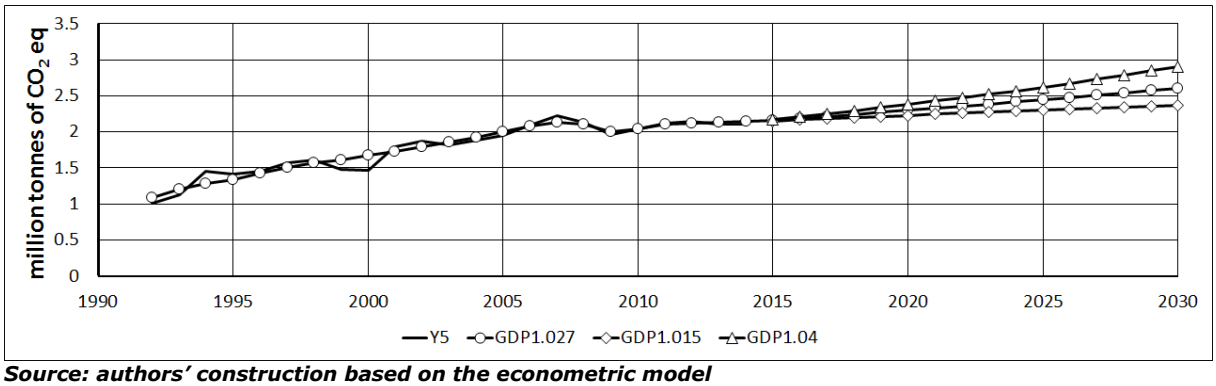
years (Figure 6). Such situation is caused by the fact that in addition to the variable X2 (GDP per capita), CO_2 emission is also affected by X6 (the population size), which is expected to decrease during the forecast period, and X3 (average salary), which is expected to increase during the forecast period. These two variables balance each other out in such way that their total impact will be negligible during the forecast period.

The forecasts show that if GDP increased by 2.7% per year, the pre-recession level (2.23 million tonnes) could not be achieved until 2019, whereas if GDP increased by 4.0% per year, the pre-recession level could be achieved in 2016.

If GDP per capita increased by 4.0% per year, CO_2 emissions caused by road freight transport would rise from 2.15 million tonnes to 2.90 million tonnes by 2030, which would mean an average 1.97% annual growth of CO_2 emissions caused by the transport sector.

This analysis demonstrates that the growth of CO_2 emissions caused by road freight transport is significantly smaller than the average increase of economic growth. Therefore, the development of road freight transport is sustainable.

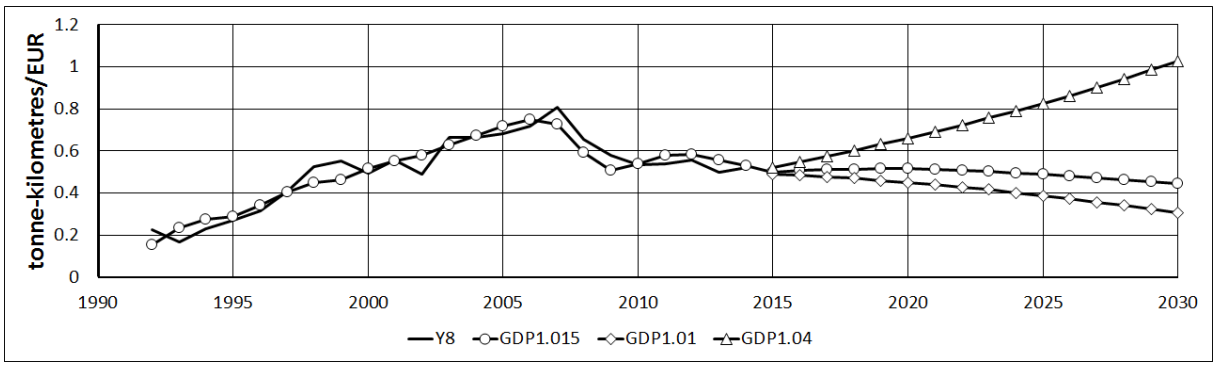


Source: authors' construction based on the econometric model

Fig. 6. **CO_2 emissions caused by road freight transport from 1992 to 2014, and forecasted CO_2 emissions caused by road freight transport from 2015 to 2030, considering different growth rates of GDP per capita**

The economic efficiency of the transport sector is modelled using three variables: freight turnover per one euro of GDP (Y8), CO_2 emissions caused by the transport sector per one euro of GDP (Y9), CO_2 emissions caused by the transport sector per one tkm (Y10).

Freight turnover per one euro of GDP (Y8) is modelled using the following equation: Y8 = F(Y6, X2, X3, X6). Freight turnover per one euro of GDP increased at a relatively stable rate from 1992 to 2007 (Figure 7). Following that, freight turnover per one euro of GDP decreased during the economic recession, and stabilised at the level of 0.6 by 2010, remaining unchanged until 2014.



Source: authors' construction based on the econometric model

Fig. 7. **Freight turnover per one euro of GDP in Estonia from 1992 to 2014, and forecasts of freight turnover per one euro of GDP in Estonia for 2015 to 2030, considering different growth rates of GDP per capita**

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Freight turnover per one euro of GDP is highly dependent on GDP per capita (X2). If GDP per capita grew by 4.0% per year, freight turnover per one euro of GDP would start to increase significantly, and reach its peak by the end of the period. By 2030, freight turnover per one euro of GDP would have risen from 0.519 to 1,027, i.e. a 0.508 (tkm/EUR) growth, meaning that freight turnover per one euro of GDP would increase by an average of 4.63% per year.

If GDP per capita changes little (approximately by 1.0% per year) – GDP1.01, then freight turnover per one euro of GDP declines by an average of 3.1% per year due to the decrease of the population. Such relatively significant decrease of freight turnover per one euro of GDP (Y8) is caused by the fact that the growth of variable X2 (GDP per capita) does not outweigh the negative impact of variable X6 (the population size) yet.

If GDP per capita increased by 1.5% per year, freight turnover per one euro of GDP would start to grow, reach a peak in 2020 (0.519 tkm/EUR), and then start to decline. By 2030, freight turnover per one euro of GDP in Estonia would thus have fallen from 0.519 to 0.443, i.e. a 0.076 (tkm/EUR) decrease, meaning that freight turnover per one euro of GDP would decrease by an average of 0.82% per year.

Conclusions

1) A simultaneous equations model was constructed and used to forecast the freight volumes and freight turnover of road freight transport, the adverse impacts that road freight transport has on the environment (greenhouse gas emissions), and the economic efficiency of the transport sector for the period of 2015-2030.

2) The most important exogenous variables turned out to be X2 (GDP per capita) and X6 (the population size). In most cases, the growth of GDP also increased the value of the endogenous variable, i.e. X2 has a positive (enhancing) effect in the model. X6 (Estonia's population size), on the one hand, is an exogenous variable that diminishes the endogenous variable, since the population is forecasted to decrease during the period of 2015 to 2030.

3) The economic recession has affected the growth of freight volumes more than it has affected the increase of freight turnover (the pre-recession level will be reached later). According to the most optimistic estimation (GDP growth rate of 2.2% per year), the pre-recession level of freight volumes will be achieved in 2030 at the earliest. Freight volumes will decrease if the annual average growth of GDP is 1.5%. The pre-recession level of freight turnover would be achieved by 2020 if GDP increased by 1.4% per year, and by 2018, if GDP increased by 2.2% annually.

4) The average growth of CO_2 emissions caused by road freight transport is significantly smaller than the average increase of economic growth. If GDP per capita increased by 4.0% per year, CO_2 emissions caused by road freight transport would rise from 2.15 million tonnes to 2.90 million tonnes by 2030, which would mean an average 1.97% annual growth of CO_2 emissions caused by the transport sector. Hence, currently prevailing development trends in the field of road freight transport will ensure sustainable regional growth.

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POSITION OF ENERGY OBTAINED FROM AGRICULTURAL BIOGAS IN SUSTAINABLE POWER INDUSTRY

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Abstract. Sustainable power industry ought to be based on access to electrical and thermal energy that is continuous and relatively harmless to the environment. In this aspect, renewable energy sources play a particular role. One of the methods of the acquisition of renewable energy is the production and energy-related use of agricultural biogas. Agricultural biogas plants produce energy in a highly efficient manner. The production of thermal and electric energy combined allows them to reach as much as 87% efficiency in processing the energy contained in biogas.

The aim of this article is to determine the position of energy obtained from agricultural biogas in sustainable power industry.

From the conducted analysis of the subject literature and reports concerning the acquisition of energy from agricultural biogas, it follows that in Poland, energy obtained from agricultural biogas makes up a tiny per cent of the whole sustainable power industry. This results from the necessity to bear high expenditures for investments in biogas plants as well as the long period of return-on-investment.

Key words: biogas plants, agricultural biogas, sustainable energy, sustainable development.

JEL code: Q01, Q42, Q56

Introduction

Sustainable development ought to guarantee access to basic economic and social services as well as the natural environment for all residents of a community, yet it should not cause harm to ecosystems and social-economic systems on which those services depend. The primary aim of sustainable development is, thus, a harmonic establishment of relations between man and the environment as well as an increase in social and individual welfare.

The principles of sustainable development also include issues concerning broadly-understood power industry. The current method of using energy does not correspond with the principles of managing sustainable development. In the sustainable transformation of power industry, the priority should be to relieve the environment in relation to the production and distribution of various forms of energy, to limit primary fossil energy media, and to decrease the extent of dependency between the production of various forms of energy and these resources while maintaining the current level of energy services.

There is no sustainable development in the field of energy without renewable energy sources (RES). One of the segments of RES is energy obtained from biogas.

The aim of this paper is to determine the position of energy obtained from agricultural biogas in sustainable power industry. The method used is an analysis of subject literature and reports on obtaining energy from agricultural biogas.

In Poland, the acquisition of energy from biogas is a relatively new technology, unfortunately however, high investment costs and a long period of return-on-investment constitute the main barrier for the development of biogas. In spite of the fact that the document entitled *Directions for the Development of Biogas Plants in Poland for 2010-2020* assumes that every borough in Poland will have at least one agricultural biogas plant by 2020, there is a long way to achieve that.

Research results and discussion

1. Basic principles of the functioning of sustainable power industry

Humankind's interference with nature results in an increasing ecological crisis of which the principal negative effect is the inability to keep humankind's activity within limits safe for humans and the natural environment (Wielewska I., 2007).

The worsening condition of the natural environment as well as the prospect of depleting the energy supplies from fossil fuels have largely affected the formation of a sustainable energy policy, both in the European Union Member States and in Poland (Wielewska I., Zuzek D., 2015).

Sustainable power industry is described as a conversion of primary energy to electrical and thermal energy as well as its distribution to the end customer in a manner that allows to meet the needs of present and future generations which concern economic, social and

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environmental aspects of humankind's development (Prandecki K., 2014).

Sustainable development of the power industry means a long-term growth of its potential while maintaining a balance between: energy security, satisfaction of customers' energy needs, environmental protection and competitiveness of the economy. The features of conventional vs. sustainable energy systems are presented in Table 1.

Table 1

Features of conventional vs. sustainable energy systems

Conventional energy system	Sustainable energy system
Emphasis on the GNP growth	Emphasis on long-term economic and environmental targets
Prevalence of fossil fuels	Increasing RES use
Energy policy focused on production	Energy policy oriented towards natural resources protection
Centralised energy services	Distributed generation
Centralised energy production	Growing trust in medium-scale systems
Prevalence of economic targets	Balance between social, environmental and economic targets
Classic technological and management solutions	Increasing penetration of new technologies in production and management
Profits arising from activities on monopolised markets	Activities on competitive and regulated markets
Complete omission of external costs	Growing emphasis on including external costs
Activity on the internal market, protected by the state	Activity on international markets with uniform rules of competition

Source: Wyszogrodzki, Z. (2012). Plan dzialan na rzecz zrownowazonej energii (Plan of Actions for Sustainable Energy). Wladyslawowo: UG. p. 7

When considering energy sources in a sustainable energy system, these should be used:

- energy sources that are not be considerably depleted through further use;
- energy sources whose usage does not bring about large-scale emission of pollution or other substances harmful to the environment;
- energy sources whose usage is not related to perpetuating important health hazards or social injustice (Prandecki K., 2014).

There is no sustainable development in the power industry without renewable energy sources (RES). Renewable energy sources (RES) are "such energy sources which do not consume the depleting natural resources and are constantly being replenished by nature. Their major ecological advantage is the use of natural processes and no emission of pollution, the economic advantage being no cost of fuel, or – in case of biomass – no cost of long distance transport" (Lucki Z., Misiak W., 2010).

Renewable energy sources are conducive to respecting the rules of sustainable development in the aspect of energy management. This principle is in accordance with the basic targets of the European Union energy and climate policy (Table 2).

Sustainable energy policy allows to support ecological bases of life on the Earth, to protect the environment and to consider people's health (European Energy Policy..., 2007) and to aim at a satisfactory level of energy services for all people, within the limits of nature's tolerance (Wielewska I., Prus P., 2015).

Although RES still satisfy but a fraction of the country's energy demand, they do constitute a considerable share in the energy balance for the energy security. Their ecological advantage is also important as they do not emit pollution into the environment (Wielewska I., 2014; Wielewska I., Prus P., 2015).

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Table 2

Aspects of sustainable, competitive and secure energy in the EU policy

Energy security	Economic competitiveness	Sustainable development
limitation of the increase in demand for energy, diversification of sources and supply channels of imported energy carriers and use of internal sources (including renewable),	improvement in competitiveness of EU businesses and obtainment of benefits for consumers, related to opening gas and electricity markets,	development of competitive sources of renewable energy as well as other sources and carriers of low-emission energy, particularly alternative fuels used in transport,
providing all citizens and businesses with access to energy,	keeping Europe's position as the leading region, as regards development of modern energy technologies,	limitation of the increase in demand for energy in Europe,
better preparation of the EU to react in case of crises or disruptions in energy supply,	improvement in competitiveness related to production of clean energy and rational use of energy,	leadership in world's attempts to stop climate change and improvement in cleanness of local air,
support of businesses' ambitions to gain access to world's energy carrier resources,	alleviation of the impact of increase in international energy prices on the EU economy and well-being of the citizens,	
creating a free frame of incentives for energy investments,		

Source: Bujak-Szwaczka, B., Kolos, P. (2006). Zrownowazony Rozwoj (Sustainable Development). Retrieved: http://www.popt.gov.pl/konfszkol/Documents/Zasady_ zrownowazonego_rozwoju.pdf. Access: 19.02.2015

3. Energy obtained from agricultural biogas in Poland

Biogas, also called landfill gas, is a mixture of gases formed in the process of methane fermentation. The process of gaseous fermentation occurs spontaneously in nature and has long been known to humankind as sewage gas, mud gas or mine gas (Pabis J., 2011). It is gaseous fuel generated by microorganisms under anaerobic conditions. Its main component is methane. The composition of the biogas generated varies, depending on the type of substrate organic matter – methane (CH_4) from 40 to 80%, carbon dioxide (CO_2) from 20 to 55%, hydrogen sulphide (H_2S) from 0.1 to 5.5% and hydrogen (H_2), carbon monoxide (CO), nitrogen (N_2) and traces of oxygen (O_2) (Borowski P., 2010). It should also be noted that biogas has an advantage over fossil fuels – there is a smaller number of nitrogen compounds being generated during its burning.

The properties of biogas used for energy purposes are not very different from those of earth gas. Power industry generally uses biogas which is generated in the process of fermentation of the following substrates:

- organic waste in dumping grounds;
- sewage waste in sewage processing plants;
- animal waste in agricultural households (Dec B., Krupa J., 2012).

Biogas made from the above substrates may be used for the production of electric and thermal energy in cogeneration and the created energy carrier in the form of heat is mostly used for the household's own needs. It may also be sold at competitive prices to owners of buildings adjacent to the biogas plant. Biogas may also be used as engine fuel for vehicles. After refining, it may be pumped into gas pipes carrying earth gas (Borowski P., 2010). Post-fermentation sludge mixed with dolomite may be pelletized and used as fertilizer of very good quality (Czapiewska G., 2011).

Agricultural biogas is defined as gaseous fuel obtained from agricultural material, side products of farming, liquid or solid animal faeces, side products or remains of agricultural and food industry or forest biomass in the process of methane fermentation (European Energy Policy..., 2007)

In the production of agricultural biogas, each installation has its own unique construction which is adjusted to different compositions, input material. The choice of the technological-processing equipment for a given installation primarily depends on the available substrates. The quantity of the substrates is determined by the size of all machines and the volume of all containers. The quality of the substrates (dry mass content, structure, origin etc.) is determined by good planning of the processing method (Tytko R., 2011).

Technological options for agricultural biogas plants are presented in Table 3.

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Table 3

Technological options for agricultural biogas plants

Criterion	Technological options
Number of stages of the technological process (division of fermentation phases: hydrolytic, acidophilic, acetate-generating, methane-generating)	one-stage two-stage multi-stage
Temperature of the technological process	mesophilic 32-38°C, (85% of the installation) thermophilic 52~55°C
Input loading mode	non-continuous (important with dry fermentation), quasi-continuous, continuous
Content of dry mass in the substrates	Wet fermentation up to 12% (more common), dry fermentation over 12% (technology in development)

Source: Tytko, R. (2011). Odnawialne zrodla energii (Renewable Energy Sources). Warszawa: OWG, p. 473

Agricultural biogas plants produce energy in a highly efficient manner. The production of electrical and thermal energies combined allows to achieve as much as 87% efficiency in transforming energy contained in the biogas, out of which 37% is electricity and nearly 50% is thermal energy, which can be used within the local area without much loss (Czapiewska G., 2011).

The production and energy-oriented use of agricultural biogas is presently one of the most advantageous methods of obtaining renewable energy. In Poland, the acquisition of energy from biogas is still a relatively new technology which, however, does have a very high potential for development.

Estimated usage of the economic potential of energy obtained from biogas, against RES in 2020 and the real market potential in Poland are presented in Table 4.

According to the data in Table 4, the estimated usage of the economic potential of energy obtained from biogas ought to amount to 72609.1 TJ in 2020, which will bring 59% of the capacity. This places biogas energy on a further position amongst the ranks of usage of other renewable energy sources.

High initial (investment) cost constitutes the main obstacle for the development of biogas plants in Poland. Table 5 presents simple return-on-investment periods for investments in micro biogas plants against other RES installations.

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Table 4

Estimated usage of the economic potential of energy obtained from biogas, against RES by 2020 and the real market potential in Poland

Type of RES	Real economic potential – end energy	Usage of the economic potential in 2020 (real market potential)	
	TJ	TJ	%
Biomass:	600 167.8	533 117.5	88.8
solid dry waste	165 930.8	149 337.7	90.0
biogas (wet waste)	123 066.3	72 609.1	59.0
wood (forests)	24 451.8	24 451.8	100.0
energy farming	286 718.9	286 718.9	100.0
Wind energy	444 647.6	119 913.3	27.0
Solar energy	83 312.2	19 422.2	23.3
thermal	83 152.9	19 262.9	23.2
photovoltaic	159.3	159.3	100.0
Hydro energy	17 974.4	11 144.2	62.0

Source: Mozliwosci wykorzystania odnawialnych zrodel energii w Polsce do roku 2020 (Possibilities for Use of Renewable Energy Sources in Poland by 2020). Retrieved: http://www.paiz.gov.pl/sektory/odnawialne_zrodla_energii. Access: 30.12.2015

Table 5

Simple return-on-investment periods for investments in micro biogas plants against other RES installations

RES Micro-installations/power range	below 10 kW	10 - 40 kW	above 40 kW
RES Micro-installations – production of electricity, return-on-investment with net measurements (no energy storage, 30% own consumption)			
Photovoltaic installations	18.3	14.9	14.2
Small wind plants	>20	19.0	13.5
Micro biogas plants	no data	>20	13.9
Cogeneration systems for bio-liquids	>20	14.5	11.8
RES Micro-installations – production of heat, return-on-investment w compared with a gas boiler			
Geothermal heat pumps	>20	17.9	16.8
Solar panel installations	17.2	15.2	13.2
Small, automatic biomass boilers	11.2	11.1	10.2

Source: Wisniewski, G. (2013). Odnawialne zrodla energii dla rolnikow – potencjal oraz prawne i ekonomiczne uwarunkowania rozwoju (Renewable Energy Sources for Farmers – Potential and Legal and Economic Conditions for Development) [in:] OZE_dla_rolnictwa_24-01-213.pdf. Access 26.09.2014

Return-on-investment period for micro biogas plants of 10-40 kW is about 20 years; for those above 40kW it is a little less – 13-14 years. The exact period in RES is difficult to estimate. It is a combination of many factors (energy prices, types of materials used for the investment, installation costs, extra costs etc.). In case of biogas plants, it is the availability of substrates that determines the profitability of the investment. Therefore, the location of the plant should therefore be determined by the possibility of acquisition of considerable amounts of post-farming waste, slaughterhouse waste or making target farms (Energy in an Agricultural Household, 2011).

Because of such high costs of investments, Polish rural households are not able to self- finance investments in small and medium-size agricultural biogas plants (Podstawka M., Golasa P., 2014).

Towards the end of 2012, there were 32 actively used agricultural biogas plants in Poland. The total electric power of the active installations was 32.2 MW (Wisniewski G., 2014). On 4 September 2014, there were 47 energy businesses which dealt with the production of agricultural biogas (Registry of Energy

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Companies…, 2014), and in December 2015, there were 69 (Registry of Energy Companies…, 2014).

In spite of the fact that the document entitled *Directions for the Development of Biogas Plants in Poland for 2010-2020* assumes that every borough in Poland will have at least one agricultural biogas plant by 2020, there is a long way to achieve that.

Conclusions, proposals, recommendations

Research conducted leads to the conclusion that energy produced from agricultural biogas in Poland takes a very small share in sustainable energy management. The basic obstacle for the development of agricultural biogas plants is the cost of investment and long periods of return-on-investment.

It is expected that support for this sector will be increased and its amount adjusted to the sizes and needs of those particular agricultural biogas plants.

Energy obtained from agricultural biogas cannot be underestimated as it is environment friendly and useful. In scattered areas, distribution of energy is ineffective and expensive for the customer. Agricultural biogas plants, like other renewable installations, partly solve the problem. Production of bio-energy from biogas using local resources is a great chance for development and activation of micro-regions and increases energy security. Advantages for investors are the sales of produced electricity and heat and fertilizer obtained from fermented sludge. Any residents neighbouring the agricultural biogas plant gain access to cheap electricity and heat. Also, they can reduce usage of artificial fertilizers and pesticides thanks to the possibility of using the post-fermentation sludge. Farmers also have the possibility to grow energy plants used in the neighbouring biogas plant.

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SMART GROWTH AS PERFORMANCE TRENDS IN THE RURAL ECONOMY OF LATVIA

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Abstract. Any country is interested in economic growth regardless of its development level at some period; yet, the term smart growth takes an increasingly important position in defining growth. The EU Development Strategy until 2020 defines smart growth as an objective to strengthen knowledge and innovation as drivers of our future growth. Given the World Bank's global competitiveness index for Latvia, such a perspective on national economic growth opportunities is of great importance for Latvia as a country.

The authors' research, based on a framework for rural analysis that is accepted in the European Union and is referred to as "the EDORA cube", gives insight into socio-economic performance trends towards smart growth regions and particularly municipalities, which are typical local administrative units in Latvia, and economic processes. The research employed LURSOFT, CSB and RAIM databases, performed a horizontal and a vertical analysis and particularly focused on high-tech and medium high-tech industries and the sector of knowledge-intensive services to identify an accumulation of positive/innovative changes. Zemgale statistical region was selected as a territory of medium development level in the country to assess the mentioned phenomena. An analysis of vertical economic growth and horizontal restructuring allows drawing several conclusions on smart growth as performance trends particularly in Zemgale region, while at the same time putting forward hypotheses for assessing the processes being in place in the other regions of the country.

Key words: performance**,** smart growth, smart specialisation

JEL code: R11

Introduction

Any country is interested in economic growth regardless of its development level at some period; yet, the term smart growth takes an increasingly important position in defining growth. The EU Development Strategy until 2020 defines smart growth as an objective to strengthen knowledge and innovation as drivers of our future growth (EC, 2010).

Aim of the research: to assess quantitative and qualitative changes in entrepreneurship in the period 2009-2013 in the regions and municipalities of Latvia that indicate their performance trends towards smart growth.

Hypothesis:

A count of enterprises in high technology and knowledge intensive of sectors in districts of Zemgale region are growing faster than the total number of enterprises in districts of Zemgale region.

Tasks:

1) To study the changes in the number of enterprises in districts of Zemgale region in period from 2009 to 2013.

2) To study the changes in the number of enterprises in districts of Zemgale region in period from 2009 to 2013. in high technology and knowledge intensive of sectors.

3) To study the changes in specific share of enterprises in districts of Zemgale region in period from 2009 to 2013. in high technology and knowledge intensive of sectors.

4) To carry out a horizontal-vertical analysis, comparing changes in number and specific share of enterprises working in high technology and knowledge intensive of sectors in period from 2009 to 2013 g in districts of Zemgale region.

Methodology of the research: the present research is based on a methodology for rural analysis accepted in the European Union, which is known as "the EDORA cube" and involves a three dimensional framework for analysis – rurality/accessibility, degree of economic restructuring and socio-economic performance, with a special focus on smart growth, as the scope of factors influencing economic performance (ESPON, 2013). The understanding of smart growth in research studies begins with a broad multidimensional approach through the observation of this phenomenon in a particular public life sphere, for example, the economy, which generally means developing an economy based on knowledge and innovation (Giovanella C.,s.a., Centre of Regional Science,2007, EC,2010). Partly, it means modernising existing industries or lagging sectors to improve their competitiveness through the adoption of ICTs (OECD, 2013) and developing GPT (general purpose technologies) (Jovanovic B., Roussean P.I., 2005,Lipsey R.G., Carlaw K.I., Bekar C.T., 2005). The

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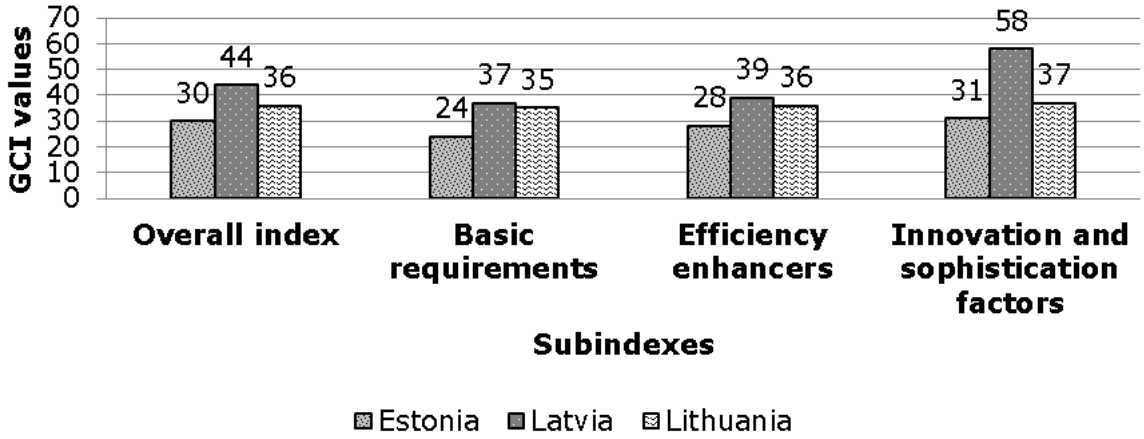
authors' research gives an insight into socio-economic performance trends towards smart growth regions and particularly municipalities, which are typical local administrative units in Latvia, and economic processes.

Research resultsand discussion

Starting the discussion about smart growth in Latvia, it is necessary to mark a place of Latvia in a context of global competitiveness index. Given the World Bank's global competitiveness index for Latvia, which is lower than that for, Estonia and unfortunately that for Lithuania too, such a view on national economic growth opportunities is of great importance for Latvia as a country (Figure 1).



Source: World Economic Forum, 2015

Fig. 1. **Global Competitiveness Index and Subindexes for Estonia, Latvia and Lithuania in 2015 - 2016**

Latvia lags behind its neighbouring countries not only in terms of the overall index but also in terms of sub-indexes and particularly in terms of the innovation and sophistication factors sub-index. Accordingly, the economic performance trends towards smart growth and smart specialisation have become an urgent problem for scientific research.

The present research employed LURSOFT, CSB and RAIM databases, performed a horizontal and a vertical analysis and particularly focused on high-tech and medium high-tech industries and the sector of knowledge-intensive services to identify an accumulation of positive/innovative changes. Zemgale statistical region was selected as a territory of medium development level in the country to assess the mentioned phenomena (see Figure 2).

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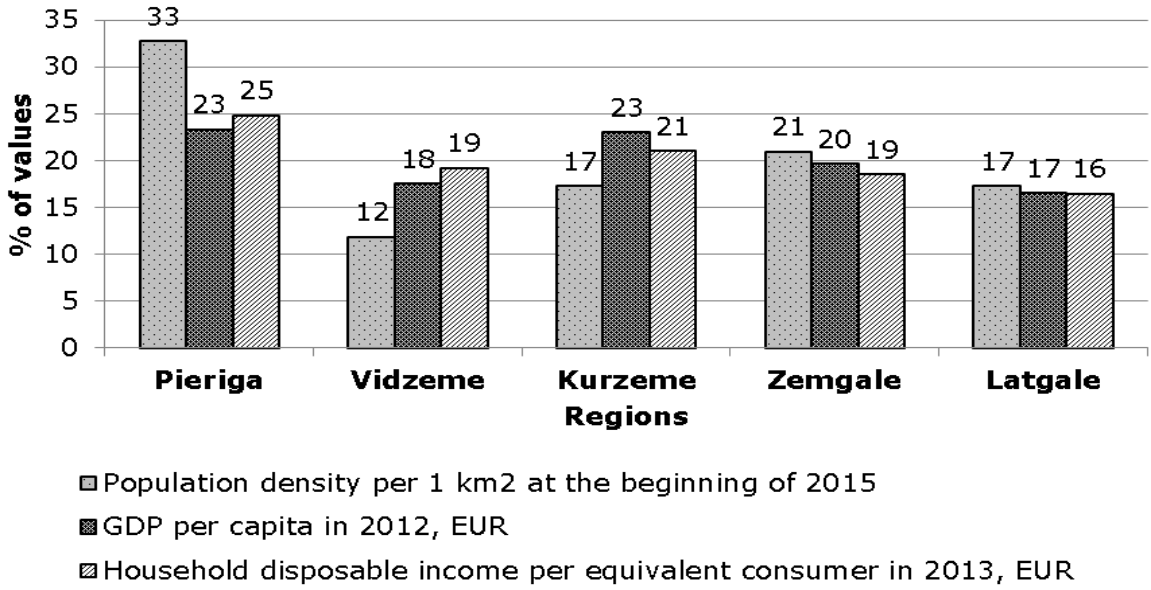

Source: CSB, 2015[a]

Fig. 2 **Internal disparities (%) in population density, GDP per capita and Household disposable income per equivalent consumer in Latvia, at the level of regions**

Economic growth is an important objective of any territorial unit. It traditionally relates to, first of all, increases in the number of entities engaged in entrepreneurship, which involves quantitative vertical change.

1. Vertical change in entrepreneurship in Zemgale region

Even though the years from 2009 to 2013 were the initial period of overcoming the global economic crisis, raising of economic activity was specific to Zemgale region's municipalities. In 2009, according to Lursoft data, 2604 enterprises operated in the region, while in 2013 their number rose to 4215, which was a considerable 161.9% increase in the total number of enterprises. The performance trends by municipalities are quite different, as the percentage increases in the number of enterprises are considerably different. In Vecumnieki municipality, the increase was 206.3%, while in Auce municipality it was only 132.9% (Table 1).

Table 1

Performance variety in the quantitative growth of entrepreneurship (changes in the period from 2009 to 2013)

Accumulating 188.0 – 206.3%	**Above average169.6 – 188.0%**
Municipalities of Jekabpils, Koknese, Skriveri, Tervete and Vecumnieki	Municipalities of Iecava, Jaunjelgava and Nereta
Low growth 132.9 – 151.3%	**Below average151.3 – 169.6%**
Municipalities of Auce, Jelgava and Rundale	Municipalities of Aizkraukle, Akniste, Bauska, Dobele, Krustpils, Ozolnieki, Plavinas, Sala and Viesite

Source: authors' calculations based on LURSOFT data

An opinion prevails that the closer a municipality is located to a city (is predominantly accessible), the greater opportunities it has for development and it is characterised by higher socio-economic indicators, whereas remote territories are subject to lagging behind. The mentioned municipalities of Vecumnieki and Auce as examples of maximum and minimum growth of entrepreneurship belong to the so-called remote territories, as both of them are border area municipalities and are located in the same distance from the capital city of Riga as well as the regions' centre – Jelgava. This leads to a conclusion that the location beyond the agglomeration of Riga not always can affect everything and perhaps, in the mentioned cases, some subjective factors such as the capability of municipalities to play the role of a leader and to contribute to economic activity and the population's readiness to engage in the process of change, which have influenced the pace of growth of entrepreneurship, are in place. This is a matter of

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capacity and the use of it to contribute to smart growth trends, which is stressed both by the government policy documents and in research studies (EC, 2014;EC,2014[a]Stankevics Z., 2014:74; Skinkis P., 2015).

Since the focus of the research is not only the growth of entrepreneurship on the whole but particularly those directions of entrepreneurship that are characterised by smart growth trends, only the directions of entrepreneurship involving technological and knowledge intensity, according to the NACE Rev.2 classification, were selected for analysis. For this reason, data were processed separately for high-tech, medium high-tech and knowledge-intensive service enterprises (HT, MHT, KIS) for the period 2009-2013. During a five-year period, the number of enterprises of this group increased by 198.7%; it exceeded the overall economic growth rate by 36.8 percentage points. So, knowledge- and innovative technology-based entrepreneurship rose faster than overall economic growth, which, of course, is a positive fact. Second, an increase was observed in all municipalities except one, in which no quantitative changes took place. Third, there were municipalities where an increase in the number of this group's enterprises was very sharp (see Table 2)

Table 2

Performance variety in the quantitative growth of HT, MHT and KIS (NACE Rev.2) entrepreneurship (Changes in the period from 2009 to 2013)

Accumulating 233.3 – 350.0%	**Above average 116. – 233.3%**
Municipalities of Koknese,Krustpils, Nereta, Skriveri and Vecumnieki	Municipalities of Aizkraukle, Akniste, Auce, Bauska, Dobele, Iecava, Jaunjelgava, Jekabpils, Jelgava, Ozolnieki, Plavinas, Rundale, Sala and Tervete
Unchanged– 0.0%	**Below average 0.0% - 116.7%**
Viesite municipality	-

Source: author's calculations based on LURSOFT data

A comparison of Table 1 and Table 2 data shows that during the five year period in the region, strong economic activity increases were reported in five municipalities – Koknese, Skriveri, Vecumnieki, Iecava and Jaunjelgava – where both overall economic growth and the part of it featured by high technological and knowledge intensity were simultaneously observed.

Since quantity is not always directly associated with quality, let us go to an analysis of the distribution of enterprises in the region and broken down by selected municipalities.

2 Horizontal/structural changes in entrepreneurship in Zemgale region

If we keep in mind the objectives set in the EU development strategy until 2020 and the characteristics of Latvia's economy according to the Global Competitiveness Index, changes in the percentage distribution of entrepreneurship has to become a focus in order to judge about the implementation of smart growth in Latvia's rural economy, as structural change is a driver of economic growth (OECD, 2013).

A comparison of the proportions of HT, MHT and KIS enterprises in the total enterprises in 2009 and 2013 reveals that the proportion has increased by 2.7% points. Vertical growth – the increase in the number of HT, MHT and KIS enterprises – has contributed to an increase in the share of this group's enterprises in the total enterprises in the entire region (see Table 3).

Table 3

Increase in the proportion of HT, MHT and KIS enterprises (NACE Rev.2) in the total enterprises

	Total enterprises in the region	**HT, MHT and KIS enterprises**	**Proportion of HT, MHT and KIS**
2009	2604	308	11.8 %
2013	4215	612	14.5 %
2013/2009	161.9%	198.7%	122.9%

Source: author's calculations based on LURSOFT data

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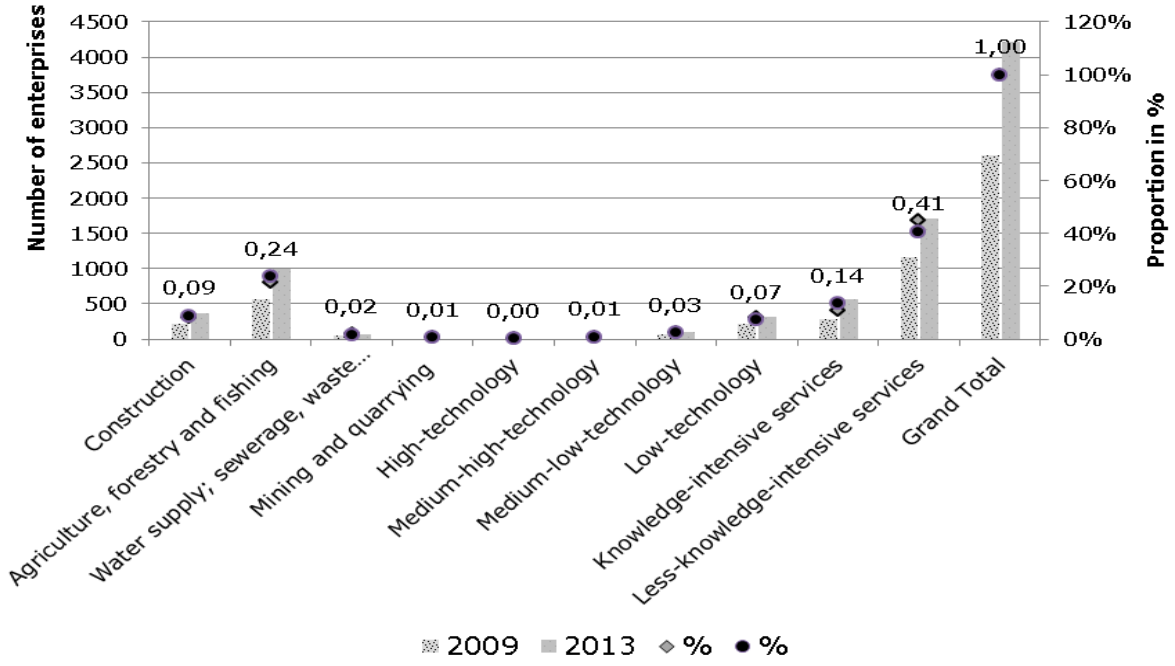
However, the increase in the proportion of HT, MHT and KIS enterprises does not considerably change the situation in the region in entrepreneurship in general; as the proportion of other kinds of business unfortunately is significantly greater (see Figure 3). Enterprises producing less-knowledge intensive services (40.7%), agricultural and forestry enterprises and fisheries (23.5%) prevail in the total enterprises in Zemgale region.



Source: author's construction based on LURSOFT data

Fig. 3. **Proportions of groups of enterprises by sector (NACE Rev.2) in Zemgale region in 2009 and 2013**

If focusing on this problem through a breakdown of municipalities, one has to underline again that the proportions of groups of enterprises are different across administrative units, including the group of HT, MHT and KIS enterprises. In 2009, it ranged from 4.7% (in Akniste municipality) to 18.5% (in Iecava municipality), while in 2013 – from 4.3% (in Akniste municipality) to 22.6% (in Iecava municipality). The comparison of the data for 2009 and 2013 leads to several important findings. First, the maximum and the minimum relate to the same municipalities. The fact that the leading municipality remains the same may be assumed to be a positive result, while the fact, that the municipality performing the decline remains the same may not be considered to be a positive situation. Second, an increasing in the proportions of HT, MHT and KIS enterprises reported only in 14 municipalities (from 1.2% to 6.6%), while in 6 municipalities a decrease was observed (from 0.4% up to 3.7%). So, there was no positive restructuring of business towards knowledge-based entrepreneurship at equal paces and extents in all municipalities (see Table 4).

Table 4

Proportion of the HT, MHT and KIS sector in the total number of enterprises in 2013

High – 18.025 - 22.6%	**Above average 13.45 – 18.025%**
Municipalities of Iecava, Ozolnieki, Rundale and Vecumnieki	Municipalities of Aizkraukle, Auce, Bauska, Dobele, Koknese, Plavinas and Skriveri
Low 4.3 – 8.875%	**Below average 8.875 – 13.45%**
Municipalities of Akniste, Jaunjelgava, Jekabpils, Krustpils, Nereta, Sala and Viesite	Municipalities of Jelgava and Tervete

Source: authors' calculations based on LURSOFT data

The lowest proportion of HT, MHT and KIS enterprises is specific to the municipalities where the primary sector – agriculture and forestry – takes the dominant position in the distribution of enterprises. So, in the region there are territories where HT, MHT and KIS enterprises expand their business and territories

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where traditional industries continue developing (Veveris A., 2015), as the proportion of the agricultural and forestry sector in the total enterprises rose from 21.5% in 2009 to 23.5% in 2013. This is the second largest sector behind LKIS (less knowledge-intensive services), which was dominant in both 2009 (45.0%) and 2013 (40.7%). The increase in the proportion of agricultural enterprises, even though the number of employees in agriculture was persistently declining (CSB,2015), may be explained by the rising demand for organic food, which was, to a great extent, met by small farms that entered the market (Tisenkopfs et al., 2015).

In general, one can state that a sufficient basis for stimulating smart growth has emerged in Zemgale region. In 2013, of the total HT and MHT enterprises, 21 represented producers of chemicals and chemical products, six were producers of computers, electronics and optical equipment, six enterprises manufactured unclassified equipment, mechanisms and machinery, three were electronic equipment producers, one was engaged in the production of pharmaceutical substances and pharmaceutical preparations and one dealt with manufacturing automobiles, trailers and semitrailers and other vehicles. The data prove that entrepreneurship develops in line with the distribution of GPT industries in a region (Lipsey R.G., Carlaw K.I., Bekar C.T., 2005). Of the enterprises providing knowledge intensive services, a third (34.2%) is also oriented towards such support activities as legal services, computer programming, specific programming activities, data collection and processing, advertising services and even research services.

The only question is – does the growth rate of HT, MHT and KIS are sufficient to raise the competitiveness of Zemgale region both on a national scale and on the European Union scale, where products of Latvia must to occupy a market share?

Conclusions, proposals, recommendations

An analysis of vertical economic growth and horizontal restructuring allows drawing several conclusions on smart growth as performance trends particularly in Zemgale region, while at the same time, putting forward hypotheses for assessing the processes being in place in the other regions of the country.

1) Technology-intensive industries and knowledge-intensive service industries expand at higher growth rates than the overall economy both in the region and in each municipality, which may be viewed as a very positive trend in the economic development of rural areas. At the same time, the growth rates by municipality are diverse both in terms of business extent and in terms of HT, MHT and KIS.

2) There were municipalities where both overall business growth and the HT, MHT and KIS sector's expansion were simultaneously observed, which could be called innovation leaders. The skill to be innovation leaders becomes a task of further research to identify factors that contributed to this growth, as Zemgale region is comprised of only municipalities having no towns; this indicates that on certain objective and subjective conditions a trend towards smart growth is also possible in rural territories.

3) The fast vertical growth of HT, MHT and KIS is not followed by equally fast horizontal growth, as an increase in the sector's proportion compared with an increase in the numbers of enterprises and services provided, is smaller; besides, the increase takes place at the expense of KIS rather than HT and MHT. MLT (medium low technology) and LT (low technology) industries and LKIS (low knowledge intensive service) industries continue prevailing. Since the analysis period – the years from 2009 to 2013 – was the global economic crisis period, the cause of minimum structural change might be this phenomenon; yet, there might be other causes that need to be identified in order to understand further opportunities with regard to smart economic growth. One of the causes could be the relatively small number of employees in the HT, MHT and KIS sector and the high standards set for the employees compared with other kinds of entrepreneurship.

4) The analysis period revealed a division in the dominant directions of entrepreneurship; some municipalities focused on developing HT, MHT and KIS, whereas the others focused on traditional industries – agriculture and forestry, which reflected several variations of cohesion trends that have to be taken into account when designing a development strategy by each group of municipalities.

5) Smart growth as knowledge-based economic development is a process that involves a number of problems. The identification of such problems and solutions to the problems is a task of further research through, first of all, analysing the situation in entrepreneurship in the other regions of Latvia based on the same criteria and identifying

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similarities in all the regions that have to be perceived as the characteristic features of Latvia as a whole and through identifying the specifics of smart growth as performance trends in each region. Only after the situation has been analysed in all the regions, science can offer a smart growth strategy suitable for the real conditions and appropriate for every region and the rural areas of Latvia on the whole.

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ATTITUDE TOWARDS GMO IN LATVIA – RESULTS OF INHABITANT'S SURVEY

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Abstract. The aim of this paper is to analyse attitude of Latvia's inhabitants towards genetically modified organisms (GMO). Tasks of the current research: analysis of scientific publications; assessment of inhabitant's attitude towards genetic modified food, feed, pharmaceuticals and other GMO. Research methods applied: scientific publications studies, survey of inhabitants of Latvia. Survey questionnaire was designed based on the theoretical research results and experience of such research in other countries. The evaluation scale 1–10 was used for most of the aspects going to be evaluated in the survey to reflect better the attitude of consumers and to have a possibility make deeper statistical analysis of the survey results including use of multivariate statistical analysis. Descriptive statistics (indicators of central tendency or location and indicators of variability), cross tabulations, Mann-Whitney U test, Kruskal Wallis test were applied for survey data analysis. The empirical research results indicated that Latvia's inhabitants boost for the use of GMO was low. The inhabitants did not support at all or had little support for genetically modified (GM) animals, GM feed, GM crops resistant to herbicides, GM resistant to pests, GM crops with improved nutritional values, GM crops resistant to diseases and viruses.

Key words: attitude to GMO, consumers, inhabitants, survey.
JEL code: D81, I18, O31, Q18, M30

Introduction

Attitude towards GMO has been discussed on different levels: policy makers, scientists, mass media and public. The regulations adopted in the European Union are very precautious towards GMO but in some countries of the world, including the USA the support for GM food, feed and pharmaceuticals is higher. Researchers world-wide have made numerous research on GMO issues in almost all branches of the national economy. Research on consumer's attitude towards GMO is monitored by Eurobarometer on regular basis in all European countries.

The aim of this paper is to analyse attitude of inhabitants towards GMO in Latvia. Research methods applied: scientific publications' studies, survey of Latvia's inhabitants. The tasks for research are: to evaluate scientific publications related to consumer's attitude towards GMO; to evaluate Latvia's people attitude towards GMO in relation to food, feed, pharmaceuticals and compare the results of the survey by age groups and gender. The survey of Latvia's inhabitants was conducted from September 2014 to June 2015. It was used systematic sample to ensure a random sample approach telemarketing company inhabitant data base and made telephone calls to respondents with invitation to participate in the survey and giving instructions on participation in the survey. The questionnaire was designed especially for the respective inhabitant's survey. The evaluation scale 1–10, where 1 – do not support at all; 10 – fully support was applied in questionnaire to evaluate the attitude of inhabitants. descriptive statistics (indicators of central tendency or location and indicators of variability or dispersion), cross tabulations, Mann-Whitney U test, Kruskal Wallis test were applied for survey data analysis.

Research results and discussion

Scientific publications on public attitude towards GMO are developed in many countries and related to all aspects of GMO in relation to consumers attitude and acceptance of genetically modified food in multi–country studies is published in extensive scientific monograph, edited by scientists from the USA and Italy (Evenson and Santaniello edit., 2006), research results on EU expert's attitude towards GMO (Aleksejeva, 2014), on determining group and individual concerns regarding genetic engineering (Frewer, et al., 1997), on consumer acceptance of transgenic crops (Frewer, et al., 1998). Scientific discussions are carried out also on issues of consumers knowledge level and influence of this knowledge on attitude towards genetically modified food (Cuite, *et al.,* 2005) and on consumers attitude and policy makers (Baker and Burnham, 2001).

Multi-country assessment on consumer acceptance and willingness to pay for GM vegetable oil and salmon was performed by researchers from the USA, Japan,

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Norway and Taiwan (Chern, et al., 2002), research on consumer's attitude towards labelled and unlabelled genetically modified food products (Soregaroli, et al., 2003); on applications of GMO for food (Brady and Brady, 2003); on consumers knowledge on GMO and choice of GMO (Noussair, et al., 2002); on consumers trust in new technologies including GMO (Roller, 2001); on how much the consumers trust in food selection and GMO across national cultures (Priest, et al., 2003). Research has been conducted to evaluate consumers attitude towards GMO for feed (Turkac, 2016). Extensive research on consumers' attitude towards GMO for pharmaceuticals was carried out in several countries and was published by publishers in many countries (Vàzquez-Salat, 2013; Straub, 2002). Researchers have paid attention also to use of GMO for wine production (Plahuta, 2007; Pretorious, 2000).

American researchers have investigated and evaluated several aspects of labelling of GMO in the USA – how consumers want to see it done (Teisl, et al., 2003). There are many publications on performed comparative analysis on consumers' attitude towards GMO in different countries: in Italy (Bocaletti and Moro, 2000); in Italy and the USA (Harrison, *et al.,* 2004); in Norway (Grimsrud, 2002); in Spain (Lujan and Todt, 2000); in Singapore (Subrahmanyan, et al., 2000) and in the USA (Hallman, et al., 2002).

Several research methods are used in scientific publications world-wide to measure consumer's attitude towards GMO and GM: indicators of central tendency or location, indicators of variability as well as regression analysis (Soregaroli, et al., 2003; Hossain and Onyango, 2004).

In research community the extensive scientific discussions are carried out on experimental investigation of consumer willingness to pay for non-GM foods when an organic option is present (Bernard, et al., 2006).

The European Commission performs extensive document publications and legislation updates on regular basis (European Commission, 2016).

The survey of Latvia's inhabitants was conducted from September 2014 to June 2015. In all regions of Latvia there were surveyed 1184 persons. The database of inhabitants was purchased from a telemarketing company. A mechanical sampling was applied for selection of respondents to guarantee random sampling – every twentieth inhabitant was selected and included in the sample. At first the respondents were called on the phone and invited to answer survey questionnaire questions. If the respondents did not fill in the questionnaire in two weeks, the respondents were called by phone once more and asked to do it; in total respondents were called three times. The response rate of survey was 23%.

Among inhabitants of Latvia support for the use of GMO was low. Most of the respondents did not support GM animals (characterised by arithmetic mean – 1.9, median 1, mode 1). Respondents have covered all possible evaluation options from 1 to 10 but most responses were given to the lowest evaluation 1 (characterised by mode), half of respondents gave evaluation 1 (characterised by median). The evaluations of respondents were homogenous (characterised by standard deviation – 1.995). The support for GM feed by respondents was also very low (arithmetic mean – 2.4, median 1, mode 1), GM crops resistant to herbicides (arithmetic mean – 2.8, median 1, mode 1), GM crops resistant to pests (arithmetic mean – 3.0, median 1, mode 1), GM crops with improved nutritional values (arithmetic mean – 3.2, median 1, mode 1), GM crops resistant to diseases and viruses (arithmetic mean – 3.2, median 1, mode 1). Slightly more respondents supported the pharmaceuticals obtained by GMO (arithmetic mean – 4.2, median 4, mode 1), the evaluations were not homogenous (characterised by standard deviation – 3.149). The main statistical indicators of evaluations by inhabitants of Latvia on attitudes toward GMO are reflected in Table 1.

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Table 1

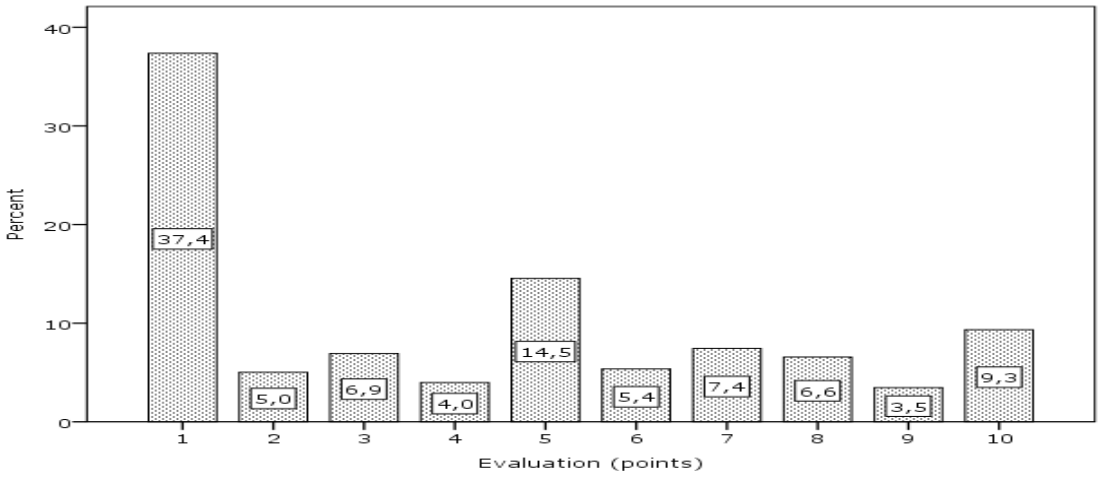
Statistical indicators of evaluations by Latvia inhabitants on attitudes towards GMO

Statistical indicators	Pharmaceuticals obtained with GMO	GM crops with improved nutritional values	GM animals	GM feed	GM crops resistant to pests	GM crops resistant to herbicides	GM crops resistant to diseases and viruses
Mean	4.18	3.21	1.90	2.38	3.01	2.75	3.24
Std. error of mean	0.093	0.084	0.058	0.069	0.080	0.075	0.083
Median	4	1	1	1	1	1	2
Mode	1	1	1	1	1	1	1
Standard deviation	3.149	2.872	1.995	2.380	2.734	2.548	2.858
Range	9	9	9	9	9	9	9
Minimum	1	1	1	1	1	1	1
Maximum	10	10	10	10	10	10	10

Source: authors' calculations based on Latvia inhabitants survey conducted by Inese Aleksejeva, 2014 – 2015, n=1184, evaluation scale 1 – 10, where 1 – do not support at all; 10 – fully support

Results on consumer attitude towards GMO in Latvia indicated that about 37.4% of inhabitants in Latvia did not support the pharmaceuticals obtained with GMO, only about 9.3% of respondents had fully supported and about 17.5% of respondents had supported. The distributions of evaluations by inhabitants of Latvia towards GMO in pharmaceuticals are reflected in Figure 1.

Although male respondent evaluations on support for GMO were low, the male respondents' comparatively more than female respondents supported the use of GMO in food and in production of goods in different sectors of national economy. Male attitude toward GMO was more heterogeneous than female attitude (characterised by standard deviations). The main statistical indicators of evaluations on attitudes toward GMO by female and male in Latvia are reflected Table 2.



Source: authors' calculations based on survey of inhabitants in Latvia conducted by Inese Aleksejeva, 2014 – 2015, n=1184, evaluation scale 1 – 10, where 1 – do not support at all; 10 – fully support

Fig. 1. **Distribution of evaluations of inhabitants of Latvia on attitude toward the pharmaceuticals with GMO**

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Table 2

Statistical indicators of evaluations by inhabitants of Latvia on attitude toward GMO by gender

Use of GMO	Female				Male			
	Mean	Median	Mode	Standard deviation	Mean	Median	Mode	Standard deviation
Pharmaceuticals obtained with GMO	4.0	3	1	3.05	4.9	5	1	3.31
GM crops with improved nutritional values	2.9	1	1	2.71	3.9	3	1	3.20
GM animals	1.7	1	1	1.69	2.5	1	1	2.49
GM feed	2.0	1	1	2.02	3.2	1	1	2.95
GM crops resistant to pests	2.6	1	1	2.47	3.8	3	1	3.12
GM crops resistant to herbicides	2.3	1	1	2.27	3.5	2	1	2.90
GM crops resistant to diseases and viruses	2.9	1	1	2.64	4.0	3	1	3.16

Source: authors' calculations based on survey of inhabitants of Latvia conducted by Inese Aleksejeva, 2014 – 2015, n=1184, evaluation scale 1 – 10, where 1 – do not support at all; 10 – fully support

Table 3

Average values of evaluations of inhabitants in Latvia on attitude toward GMO by age groups

Use of GMO	Age groups									
	18-28		29-39		40-50		51-61		62 and more	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Pharmaceuticals obtained with GMO	4.87	5	3.92	3	4.34	4	3.87	3	3.57	2
GM crops with improved nutrition values	4.18	4	3.04	1	2.63	1	2.36	1	3.35	1
GM animals	2.39	1	1.61	1	1.80	1	1.63	1	2.30	1
GM feed	2.97	1	2.07	1	2.23	1	2.04	1	2.61	1
GM crops resistant to pests	3.93	3	2.51	1	2.82	1	2.44	1	2.78	1
GM crops resistant to herbicides	3.47	2	2.29	1	2.40	1	2.44	1	3.00	1
GM crops resistant to diseases and viruses	4.25	4	2.79	1	2.86	1	2.55	1	3.61	2

Source: authors' calculations based on survey of inhabitants of Latvia conducted by Inese Aleksejeva, 2014 – 2015, n=1184, evaluation scale 1 – 10, where 1 – do not support at all; 10 – fully support

The differences in the female and male attitude toward pharmaceuticals obtained with GMO, GM crops with improved nutritional values, GM animals, GM feed, GM crops resistant to pests, GM crops resistant to

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herbicides, GM crops resistant to diseases and viruses were statistically significant with high probability as proved by the results of the Mann-Whitney U test (z= -3.893, p=0.000; z= - 4.795, p=0.000; z= -5.722, p=0.000;. z= - 6.185, p=0.000; z= -5.994, p=0.000; z= -6.793, p=0.000; z= -5.466, p=0.000, respectively).

Young people (age 18-28) comparatively more supported the use of GMO in food and products created by GMO in different sectors of national economy. Young people's (age 18-28) attitude toward pharmaceuticals obtained with GMO was – medium support (characterised by arithmetic mean 4.97 and by median 5 – it means that half of respondents from this age group gave evaluations 5 or less) but older people attitude was – medium lack of support (characterised by arithmetic mean 3.57 and by median 2). Young people had higher evaluation for use of GMO for all evaluated aspects included in analysis.

The average values (arithmetic mean and median) of evaluations of inhabitants of Latvia on attitude toward GMO by age groups are reflected in Table 3.

The differences in attitude toward the use of GMO by age groups were statistically significant with high probability as proved by the results of the Kruskal Wallis test (p=0.000). The attitude toward pharmaceuticals obtained with GMO differed statistically significant between the people aged 18-28 years and older people (p<0.005). The attitude toward GM crops with improved nutritional values differed statistically significant between the people aged 18-28 years and older (p<0.019). The attitudes toward GM animals, toward GM feed, GM crops resistant to herbicides, GM crops resistant to diseases and viruses differed statistically significant between the people aged 18-28 years and older (p<0.001), except respondents aged 62 years and more. The attitude toward GM crops resistant to pests differed statistically significant between the people aged 18-28 years and older (p<0.004).

Further analysis on survey results is going on by use of multivariate statistics.

Conclusions, proposals, recommendations

1) Support for the use of GMO by inhabitants of Latvia was low. Most respondents did not support genetically modified animals, the evaluations of respondents were homogenous.

2) The support for genetically modified feed by Latvia's inhabitants was also very low.

3) Slightly more respondents supported the pharmaceuticals obtained with GMO but the evaluations by respondents were not homogenous.

4) Although male respondent evaluations on support for GMO were low, the male respondents' comparatively more than female respondents supported the use of GMO in food and in production of goods in different sectors of national economy comparatively more than female respondents. Male attitude toward GMO was more heterogeneous than female attitude.

5) The differences in the female and male attitude toward GMO (the pharmaceuticals obtained with GMO, GM crops with improved nutritional values, GM animals, GM feed, GM crops resistant to pests, GM crops resistant to herbicides, GM crops resistant to diseases and viruses) were statistically significant with high probability as proved by the results of the Mann-Whitney U test.

6) Young people (age 18-28) comparatively more supported the use of GMO in food and in products produced in different sectors of economy. Young people (age 18 to 28) attitude toward the pharmaceuticals obtained with GMO was – medium support but older people attitude was – medium lack of support. Young people had higher evaluations on GMO in different fields of national economy.

7) The differences in attitude toward use of GMO by age groups were statistically significant with high probability as proved by the results of the Kruskal Wallis test.

8) The attitude toward the pharmaceuticals obtained with GMO differed statistically significant between the people aged 18-28 years and older people.

9) The attitude toward GM crops with improved nutritional values differed statistically significant between the people aged 18-28 years and older.

10)The attitude toward GM animals, toward GM feed, GM crops resistant to herbicides, GM crops resistant to diseases and viruses differed statistically significant between the people aged 18-28 years and older, except age group of inhabitants of 62 years and more.

11)The attitude toward GM crops resistant to pests differed statistically significant between the people aged 18-28 years and older.

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GLOBALIZATION PROCESSES IN POLISH FOOD INDUSTRY

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Abstract. The main aim of this paper is to determine if there is any correlation between the degree of globalization of individual sectors of the Polish food industry and their productivity. In the first stage of the research, 17 sectors of the food industry were divided into 3 groups: with a very high degree (Group 1), high degree (Group 2) and low degree (Group 3) of globalization. This division was based on the share of global companies (trans-national corporations) in the value of sales revenues in individual branches of the food industry. Then, the author compared the groups with the use of traditional factors (labour productivity, land productivity) and multi-dimensional productivity factors from the Data Envelopment Analysis. The research indicates that the sectors with very high and high degrees of globalization report definitely higher labour productivity and wages and salaries, with a slightly higher DEA-measured productivity but lower fixed asset productivity.

Key words: globalization, food industry, productivity.

JEL code: F6

Introduction

Globalization is one of the most important processes which is taking recently place in the global economy. However, in literature there is no single widely accepted definition of globalization. It is worth noting that the definitions of globalization also change in time, as this process keeps continuously evolving. The changes in the globalization processes are fuelled by the scientific and technological revolution.

The term 'globalization' first entered the Webster dictionary in 1961, and then Marshall McLuhan introduced the term 'global village' (Oziewicz, 2012). Twenty years later, John Naisbitt, a futurologist, pointed to the shift from local to global economy as one of the ten mega-trends which would shape the future (Godlewska-Majkowska, 2013). In the 1980s, the term of globalization was commonly used as the description of deep transformations in the global economy due to the liberalization of economic ties, the reduction of state interventionism, the internationalisation of capital, IT revolution and the increase of importance of trans-national corporations (Gorecka, Rokicki, 2014; Rokicki, Baran, 2015).

The International Monetary Fund describes globalization as "increasing co-dependence among countries all over the world in the relation with the increase of the volume and number of transactions which include the exchange of goods and services and capital flows, along with a fast and widespread dissemination of technology" (Pietrzak, Roman, 2014). The World Bank defines globalization as the increasing co-dependence of countries due to the increased integration of commerce, finance, people and ideas (Globalization and International Trade, 2013).

The European Commission defines globalization as the process in which markets and products in various countries become more and more co-dependent due to the dynamics of the exchange of goods and services, flows of capital and technology. In the Polish literature, the multi-faceted scope of globalization was described by authors like: Zorska, Kolodko, Lubbe, Czyzewski and Poczta-Wajda (Zorska, 1999; Kolodko, 2007; Lubbe, 2010; Czyzewski, Poczta-Wajda, 2011).

The research for this paper concerns the food industry, and thus, it is worth to mention M. E. Porter's definition of the globalization of industry. Porter believes that such globalization takes place if a competitive position of a given enterprise on one market is largely shaped by its position on other markets, and vice versa. Globalized sectors of industry are no longer a collection of separate branches located in various countries but they create a chain of inter-connected markets which serve as competing grounds for companies which use global strategies to gain an edge (Porter, 1998).

Globalization increased the power and influence of trans-national corporations on the global economy. In Poland, the process of globalization of the food industry by trans-national corporations started in the late 1990s, along with the growth of the free market economy. The way trans-national corporations entered and acted in individual branches of the food industry was varied (Wysokinski et al., 2015). Faster processes of globalization in individual branches of the food industry were affected first and foremost by (Chechelski, 2013):

- option to buy big enterprises, sometimes with market share, relatively cheap;
- high profitability of the branch;

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- expected very high growth of the market;
- scale of the production concentration in the branch worldwide;
- restricted market access for competitors;
- option to get lower production costs.

On the one hand, the branches which experienced deep globalization processes were mainly industries with high level of food processing, little connections with domestic raw resource providers and high imports (Baran et. al., 2016). On the other hand, factors which discouraged trans-national corporations were: low production concentration (small and numerous companies) and high number of raw resource providers (Rokicki, 2015).

Polish food and tobacco industry hosts major global corporations, i.e. Coca-Cola, Nestle, Danone, PepsiCo, Unilever, Kraft Foods. One can safely say that all the biggest trans-national corporations from Europe and North America are present in Poland. The Asian ones include: Tabacco and Lotte (Japan), Tata Group (India), Elite (Israel) (Chechelski, 2013).

In the Polish food industry, there is a high variety of globalization degrees in individual sectors: from the highly globalized tobacco or beer industry to the lack of global enterprises in baking or wine industries. Therefore, the main purpose of this research is to define the degree of globalization in individual sectors of the Polish food industry and to determine if there is any correlation between the degree of globalization and effectiveness of a given sector. To achieve the aim, several research tasks were set: 1) to identify the degree of globalization in individual sectors of the Polish food industry; 2) to identify the efficiency of branch of the Polish food industry; 3) compare branches with a different degree of globalization base on sales revenues, wages and salaries and efficiency factors. For the purpose of this study the following hypothesis was assumed: the sectors of the Polish food industry which received very high and high degree of globalization achieved better efficiency indicators than sectors with low degree of globalization.

The research used data for 2010−2013 on 17 Polish sectors of the food industry published in GUS Industry Manuals. Based on Chechelski's methods (2008), the author determined the share of global companies (trans-national corporations) in the value of sales revenues in individual branches of the food industry. In this way, the author identified branches with a different degree of globalization:

Group 1 − very high degree of globalization (more than 60% share of global companies);

Group 2 − high degree of globalization (30%−60% share of global companies);

Group 3 − low degree of globalization (less than 30% share of global companies).

For comparison, the author used traditional economic factors like labour productivity, fixed asset productivity, sales revenues per company and DEA-based productivity. DEA is the non-parametric approach relied on the linear programming (Baran, Rokicki, 2015). The DEA model may be presented mathematically in the following manner (Cooper et al., 2007):

$$\max \frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \tag{1}$$

$$\frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \leq 1$$

$$u_r, v_i \geq 0$$

where:

s – quantity of outputs;

m – quantity of inputs;

u_r – weights denoting the significance of respective outputs;

v_i – weights denoting the significance of respective outputs;

y_{rj} – amount of output of r-th type (r =1,…,R) in j-th object;

x_{ij} – amount of input of i-th type (i =1,…,I) in j-th object; (j =1,…,J).

In the DEA model, m of inputs and s of diverse outputs come down to single figures of "synthetic" input and "synthetic" output, which are subsequently used for calculating the object efficiency index (Baran, 2015). The quotient of synthetic output and synthetic input is an objective function, which is solved in linear programming. Optimized variables include μ_r and v_i coefficients which represent weights of input and output amounts, and the output and input amounts are empirical data (Cooper et al., 2007).

By solving the objective function using linear programming it is possible to determine the efficiency

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curve called also the production frontier, which covers all most efficient units of the focus group. Objects are believed to be technically efficient if they are located on the efficiency curve (their efficiency index equals 1, which means that in the model focused on input minimization there aren't any other more favourable combination of inputs allowing a company to achieve the same outputs). However, if they are beyond the efficiency curve, they are technically inefficient (their efficiency index is below 1). The efficiency of the object is measured against other objects from the focus group and is assigned values from the range (0, 1) (Charnes et al., 1978).

Research results and discussion

Taking into account the share of global companies in the value of sales revenues of the individual branches of food industry, the author identified sector with varied degrees of globalization (Table 1). The sectors with a very high degree of globalization (more than 60% share of global companies) include: manufacture of vegetable and animal oils and fats, manufacture of beer, manufacture of rusks and biscuits, manufacture of preserved pastry goods and cakes, manufacture of cocoa, chocolate and sugar confectionery, processing of tea and of coffee, manufacture of sugar. The sectors with a high degree of globalization include: manufacture of soft drinks, production of mineral waters and other bottled waters, manufacture of prepared animal feeds, manufacture of ice cream, distilling, rectifying and blending of spirits. The branches with a low degree of globalization are: processing and preserving of fruit and vegetables, operation of dairies and cheese making, processing and preserving of meat and production of meat products, manufacture of grain mill products and manufacture of macaroni, noodles, couscous and similar farinaceous products, manufacture of starches and starch products, processing and preserving of fish, crustaceans and molluscs, processing and preserving of fish, crustaceans and molluscs, manufacture of bread, manufacture of fresh pastry goods and cakes. The examples of trans-national corporations in individual branches of the Polish food industry are given in Table 1.

In the next stage of research, the author compared the three groups of food industry sectors as to sales revenues, wages and salaries and efficiency factors. The research indicates that the branches of food industry with a high degree of globalization reported a significantly higher level of sales revenues per one company and in 2013 it was 50% more than in sectors with a high degree of globalization and 75% more than in sectors with a low degree of globalization (Figure 1).

The author could also speculate that the average wages and salaries in branches with a high share of trans-national corporations should be higher, too. The research confirmed that in the food industry sectors with a very high and high degree of globalization, monthly wages and salaries in 2013 were higher by ca. 30% than in the sectors with a low degree of globalization (Figure 2). Research by other authors (Chechelski, 2008) confirm that trans-national corporations provide higher remunerations than companies with domestic capital. Therefore, they may gain an edge as to the qualifications and commitment of their employees. However, this phenomenon may lead to negative effects like increasing the gap in wages and salaries among food industry sectors and increasing the competitive edge of trans-national corporations over companies with domestic capital, especially the smaller ones.

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Table 1

Trans-national corporations in the Polish food industry

Branches of food industry	The share of TNCs in the revenue of sectors [%]	Average sold production per company [PLN million/company] (2013)	Example of transnational corporation in the Polish food industry by sector
Branches of food industry with a very high degree of globalization			
manufacture of vegetable and animal oils and fats	92	353.7	Bunge Investment
manufacture of Beer	86	429.4	Heineken International, Carlsberg
manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes	68	67.3	Kraft Foods, PepsiCo, Mars, Nestle, Ferrero
manufacture of cocoa, chocolate and sugar confectionery	72	169.4	Kraft Foods,Nestle
processing of tea and of coffee	72	132.0	Unilever, Tata Group
manufacture of sugar	62	1076.7	Nordzucker, Pfeifer&Langen
Branches of the food industry with a high degree of globalization			
manufacture of soft drinks; production of mineral waters and other bottled waters	51	176.0	Coca-Cola, PepsiCo
manufacture of prepared animal feeds	49	307.5	Cargill, Nestle, Smithfield Foods
manufacture of ice cream	42	85.5	Unilever, Nestle
distilling, rectifying and blending of spirits	38	185.9	Pernod Ricard, Philips Beverage, CDEC
Branches of the food industry with a low degree of globalization			
processing and preserving of fruit and vegetables	21	89.8	Bonduelle, Royal Numico, H.J. Heinz
operation of dairies and cheese making	19	187.8	Hochland, Zott, Danone
processing and preserving of meat and production of meat products	18	112.9	Smithfield Foods, Danish Crown
manufacture of grain mill products and manufacture of macaroni, noodles, couscous and similar farinaceous products	15	86.5	Nestle, Dr Oetker
manufacture of starches and starch products	12	47.6	Cargill
processing and preserving of fish, crustaceans and molluscs	4	100.7	Frosta
manufacture of bread; manufacture of fresh pastry goods and cakes	0	19.2	

Source: author's calculations based on Statistical Yearbooks of Industry – Poland and Chechelski (2013)

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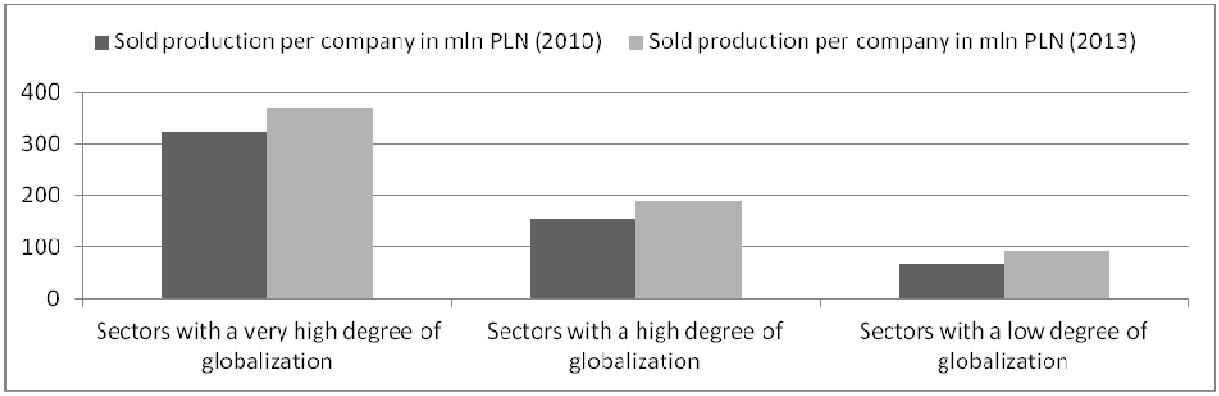
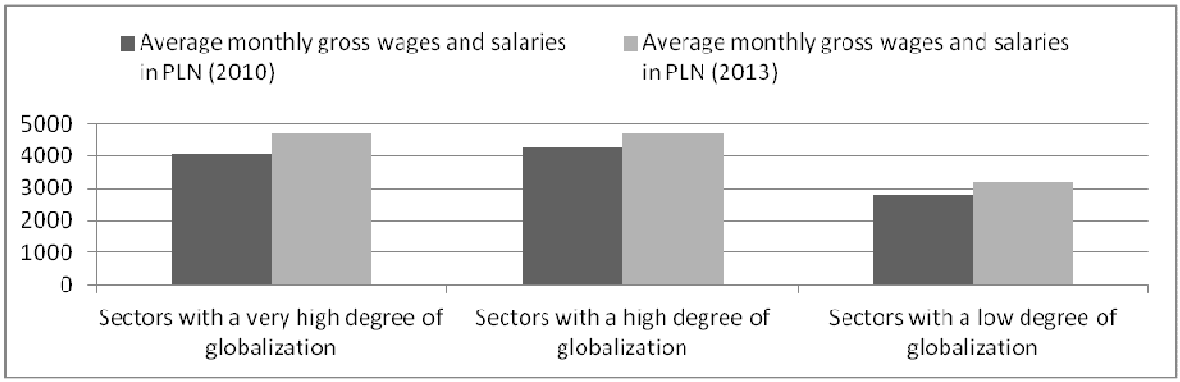


Source: author's calculations based on Statistical Yearbooks of Industry - Poland

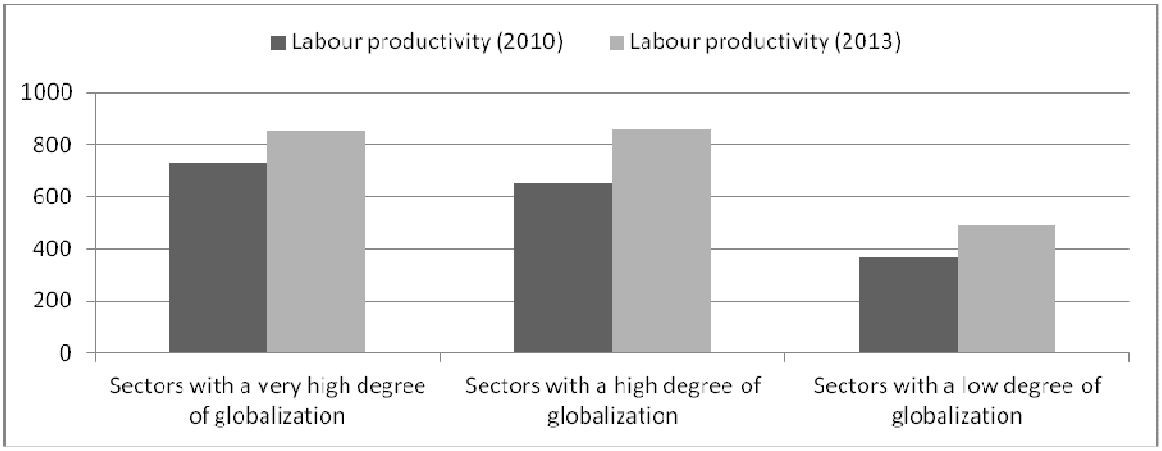
Fig. 1. **Average sold production per company (PLN million/company) among the groups**



Source: author's calculations based on Statistical Yearbooks of Industry - Poland

Fig 2. **Comparison of average monthly gross wages and salaries in PLN**

One of the most important efficiency indicators is labour productivity. It is particularly important in the food industry, which is labour intensive. Branches of the food industry with a very high and high degree of globalization reported labour productivity in 2013 at PLN 854/person and PLN 856/person, respectively. Such labour productivity was ca. 40% higher than in the sectors with a low degree of globalization (Figure 3). On the one hand, the author can speculate that in the branches with a high share of foreign capital, employment decreased and capital-to-labour ratio increased. On the other hand, the branches with a low share of trans-national corporations experienced a higher rate of production growth, lower employment reduction and lower dynamics of the capital-to-labour ratio.



Source: author's calculations based on Statistical Yearbooks of Industry - Poland

Fig. 3. **Comparison of labour productivity among the groups (PLN thousand/person)**

When comparing fixed asset productivity, one can see that the group of sectors with a very high degree of globalization has lower fixed asset productivity than the group with a low share of trans-national corporations

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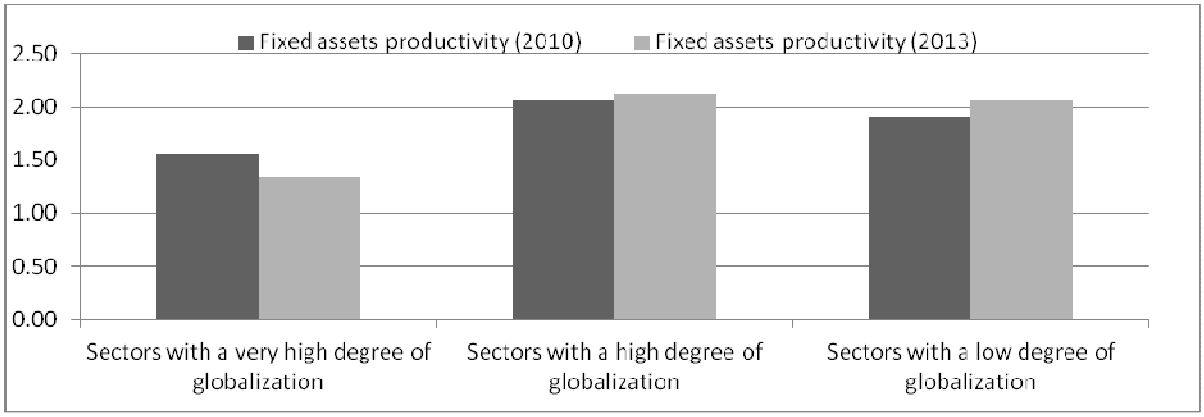
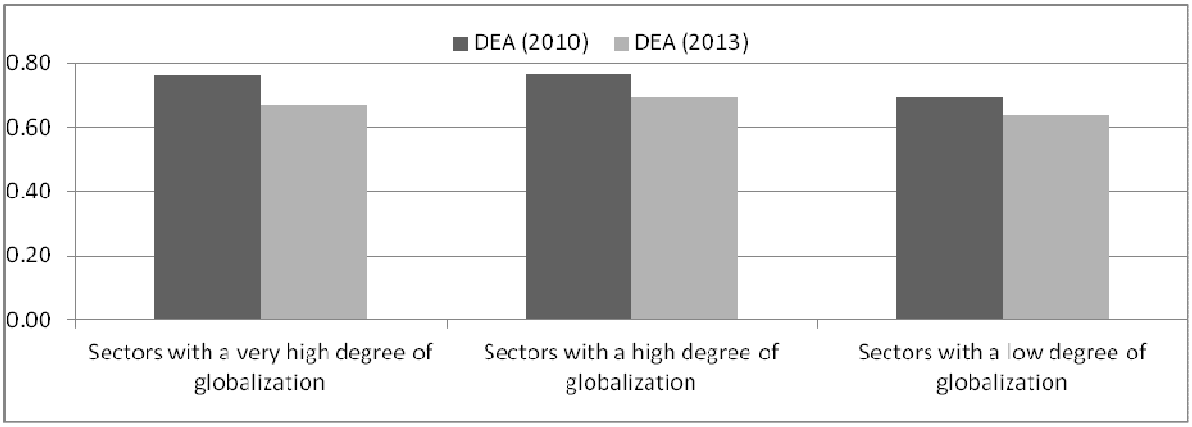
(Figure 4). Therefore, one can question in the highly globalized sectors are indeed more efficient – does their higher labour productivity compensate for their lower fixed asset productivity? (Baran et al., 2016).



Source: author's calculations based on Statistical Yearbooks of Industry - Poland

Fig. 4. **Comparison of fixed asset productivity among the groups**

Considering the above issue, the author also made a comparison on the basis of a multi-dimensional method of measuring productivity with DEA. The results indicate that in 2010−2013, the studied groups of industries reported lower DEA-measured productivity (Figure 5). Sectors with a very high or high degree of globalization reported on average a higher productivity than branches with a low degree of globalization. However, this gap significantly decreased in 2010−2013 from 10% to 5%.



Source: author's calculations based on Statistical Yearbooks of Industry - Poland

Fig. 5. **Comparison of group as to their DEA-measured productivity**

Conclusions, proposals, recommendations

The analyses conducted in this paper can be used to draw the following conclusions:

In Poland, as everywhere else in the world, the food industry sectors with the biggest share of trans-national corporations are sectors related to stimulant production: tobacco or beer. Most trans-national corporations which do business on the global food market are present in Poland, too. The branches in Poland with the highest share of global companies include: manufacture of vegetable and animal oils and fats, manufacture of beer, manufacture of cocoa, chocolate and sugar confectionery, processing of tea and of coffee. However, there are industries with virtually no presence of global companies, e.g. baking.

High wages and career opportunities at trans-national corporations lead to an outflow of the best employees from domestic companies to big corporations. Innovative resource management at trans-national corporations make them use their employees much better than the sectors with companies based on Polish capital, which in turn gives them competitive edge. On the top of that, this translates into labour productivity, which is much higher in branches with a high degree of globalization than the others.

1) The DEA measurement method indicates that the sectors with a high degree of globalization have

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a slightly higher productivity than the sectors with a low degree of globalization; however, this gap decreased in 2010−2013.

2) The author can expect the share of global companies in the Polish food industry to continue to grow. The presence of trans-national corporations in the food industry activates domestic companies, thus helping the entire food sector grow. On the one hand, the author can expect that in the upcoming years, labour productivity and efficiency of food companies will increase, along with the volume of foreign trade in agricultural and food products. On the other hand, the competitive edge of trans-national corporations may cause problems to small and medium Polish companies or even drive them into bankruptcy.

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SPATIAL DIFFERENTIATION OF MILK MARKET DEVELOPMENT IN POLAND

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Abstract. The aim of the paper is to recognize spatial differentiation of milk market development in Poland. The authors present spatial differentiation of milk production in Poland. The highest production was observed in Mazowieckie province (543.42 thou. cows) in 2010 and Podlaskie province (457.68 thou. cows in 2010). The number of cows and total milk production in Poland decreased and the milk yield per unit increased. The milk price changed in the years 2010-2015. The integration processes in the milk market vary. The biggest number of milk producers is in Wielkopolskie province, which is the third largest milk producer in Poland, whereas Podlaskie province, which is the second largest milk producer, has only one group.

Key words: milk market, price volatility, milk, efficiency.
JEL code: Q11, Q14

Introduction

Milk production is an important agricultural activity in the world. The world milk production is increasing. It increased from 490.4 million tonnes to 614.3 million tonnes from 2000-2011. The European Union has a significant part of world production (24.3%) (Mickiewicz B., Mickiewicz A., 2014).

The production of milk is diversified in the world. New Zealand, North America, Europe and Australia are regions with an overproduction of milk. The surplus of production over consumption increased in the USA to 8% in the years 2005-2010. Other regions such as Asia and Africa recorded an increase of milk consumption because of population increase, which led to an increase of imports (Seremak-Bulge J., Bodyl M., 2013).

Milk production is a fundamental part of agricultural production in Poland, with production of about EUR 2.5 bln, which accounts for 20% of Polish agricultural production in 2005. The milk production quality is represented by producers on one hand and by milk cooperatives on the other hand. The cooperatives process the production to satisfy EU rules (Wasilewski M., Chmielewska M., 2006).

The dairy sector is a key part of the Polish food economy. The competition on the market is created not only by farmers but also by dairy enterprises, which create the market (Zietara W. et al., 2013). It is responsible for the 2.5% of the production value of all industry and 15% of the value of the food industry. Poland plays a significant role in milk production compared to other countries of the European Union and the world, and is the fourth producer of milk in the European Union (EU) (Roman M., 2014). Poland has a climate well suited for milk production, good infrastructure, the potential for grassland development, and access to deep water (Johnson M., 2014). The location of many Polish dairy farms, the economic size of dairy farms and milk efficiency have an impact on the profitability of dairy farms (Borawski P., Dunn J.W., 2015).

However, the milk market in Poland faces challenging conditions recently due to the Russian embargo and the instability in the Middle East and North Africa, which together reduced world market prices and negatively impacted Polish milk prices (Milk market, 2015). The liquidation of the quota system may result in many changes on the milk market. Most dairy farms in Poland are small and the elimination of the quota system may result in the liquidation of small farms, increasing the share of milk supply and more development of larger farms (Koloszyc E., Switlyk M., 2015).

The milk market was the most regulated market in Poland. The Common Agricultural Policy introduced special tools to regulate milk production. The quota system that was introduced in 2003 ended after 2014 (Borawski P., Dunn J.W., 2015). In the new perspective 2015-2020, the EU prepared many changes, including negotiation between producers and processors. The convention concerning delivery of milk will be signed by farmers and processors on the one hand but the production limits were abandoned on the other hand (Wilczynski A., Switlyk M., 2012). The latest introduced tools support a cheese-production programme and the possibility to create a multi-branch organization (Guba W., Dabrowski J., 2012).

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One of the determinants of breeding cows and milk production is the capacity to feed and the amount of certain types of agricultural land (forage area). The size of the meadows and pastureland in Poland decreases over time, due to changing agricultural practices (Zuba-Ciszewska M., 2014; Pawlewicz A., 2014). However, Poland still has an agrarian structure with mainly small farms that limits farm efficiency. This has been a weakness. This agrarian structure is a remnant of the history of the country and region and depends on political and socioeconomic relations (Klepacki B, Zak A., 2013).

The production of milk in Poland in 2015 is expected to be 12687 mln l (13059 mln kg) or 0.6% higher than the previous year. This is the effect of increasing productivity of dairy cows (2.9%) and technological progress, regardless of the worsening relationship between milk prices and the prices of grains and fodders (Milk market, 2015).

The consumption of milk per capita is increasing in the world. In the years 2005-2013, the consumption of milk increased by 8.1% from 101.4 kg/person to 109.6 kg/person. This is the result of an increased awareness of society on the importance of healthy food (*The World Dairy Situation,* 2015). Milk is a product rich in calcium, potassium and albumin, which are all necessary in the human diet. The success of milk in the market depends on its ability to fulfill specific needs. The product ensures buyers certain benefits (Zuchowski I. et al., 2014).

The aim of this paper is to present the spatial differentiation of milk production in Poland after integration into the European Union. To develop the problem of milk differentiation, the authors attempt to answer the following questions:

1) What is the density of cows in Poland?
2) How does milk production vary regionally?
3) Is the production of milk integrated?

The authors used tabular, graphic and descriptive methods to present the changes of milk production. The authors presented data about milk market development in Poland in the years 2005-2015 mostly in analysis of the milk price and dairy herds.

Research results and discussion

In 2010, Poland produced 12270 thousand tonnes of milk. The production of milk in Poland increased in the years 2005-2015 by 12.6%. In the same period, the number of dairy cows decreased in Poland from 2750 thousand in 2005 to 2180 thousand in 2015 (Table 1).

Table 1

Dairy cows, milk production, sale and milk yields in Poland (2010-2015)

Years	Specification				
	Dairy cows (in December in thousand units)	**Milk production (in thousand tonnes)**	**Total sale (in million litres)**	**Total purchase (in million litres)**	**Milk yields per cow (in litres/cow)**
2005	2750	11600	9050	8378	4190
2010	2529	12270	9521	9761	4488
2011	2446	12405	9735	9043	4618
2012	2346	12659	12125	9584	4845
2013	2299	12710	12219	9643	4978
2014	2248	12976	10707	10326	5164
2015	2180	13059	10837	10522	5270
Changes 2005=100	79.3	112.6	119.7	125.6	125.8

Source: author's construction based on data from the Ministry of Agriculture and Rural Development, 2015

There are many factors behind the decrease in the number of dairy cows. The most important is the decline in the profitability of production. Particular attention should be paid to lower milk prices, especially given the introduction of the Russian embargo on food products from the EU. The other reason for decreasing

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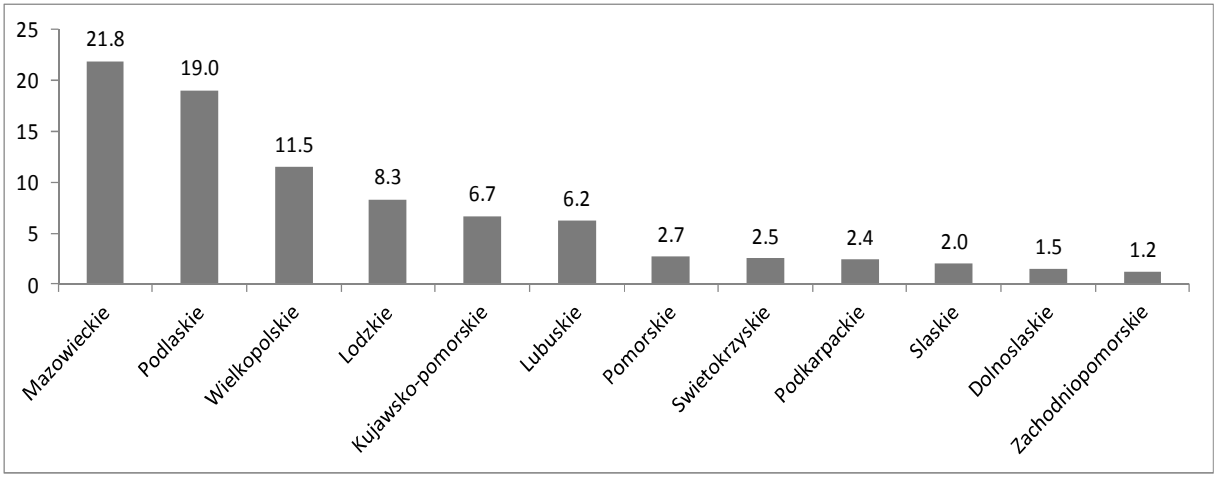
cow numbers was the cost for exceeding milk quotas and the poor base of roughage for some farms, with the rotation of dairy cows. The reduction of dairy cows was caused by the elimination of poorer cows and replacing them by more productive cows.

One of the most important issues is that higher yielding cows are more profitable. A higher milk yield decreases unit production costs while freeing labour on the farm (Manko S., 2007). But an important question is how to measure profitability, or economic surplus, which the farmer can use (Skarzynska A., 2012). Milk per cow increased 25.8% in the period 2005-2015. This was the effect of better fodders and better cows.

As Sosnowski J., et al. (2014) point out, the milk yield on the Polish farms having more cows was up to twice as high as farms having 10 or fewer dairy cows. In the years 2004-2012, the rise of yield per cow in Poland was 18.7%, with the highest increase in Mazowieckie province (40.9%), Wielkopolskie (35.4%) and Kujawsko-pomorskie province (22.9%).

The dairy cow population is diversified in Poland. The share of dairy cows in 2014 was the highest in three provinces: Mazowieckie, Podlaskie and Wielkopolskie (Figure 1). The share of the national population of dairy cows exceeds 52% in these three provinces.



Source: author's construction based on Milk Market (State and Perspectives 2015)

Fig. 1. **The share of dairy cows population by provinces (%)**

The integration with the EU has caused changes in the level and structure of livestock production. There has been a differentiation of dairy cows in particular provinces in Poland (Figure 2). This trend proves that the indicator of dairy cows changes is below 100 in most provinces in Poland. Only Swietokrzyskie (100.5), Wielkopolskie (103.4), Podlaskie (103.9) and Kujawsko-pomorskie (104.5) provinces increased the number of dairy cows in 2015 in comparison to 2014. The indicator of dairy herd size increased in the years 2005-2015 in the following provinces: Wielkopolskie (10.6%), Slaskie (8.9%) Podkarpackie (6.8%), Malopolskie (4.9%), Swietokrzyskie (1.7%), Kujawsko-pomorskie (0.9%), Podlaskie (0.3%). Other provinces recorded the decline of dairy cows herd in the years 2005-2015 mainly, in: Lubuskie (-27%), Lubelskie (-11.9%), Warminsko-Mazurskie (-7.1%), Lodzkie (-7.0%), Mazowieckie (-4.0%), Dolnoslaskie (-3.3%) and Pomorskie (-1.8%).

The number of dairy cows has declined between June 2014 and June 2015 in 12 of 16 provinces by 1.0-23.9%. The number of cows decreased almost 25% in Lubuskie province. The provinces of Lodzkie, Dolnoslaskie, Mazowieckie and Opolskie reduced the number of cows by 4.8-7.7%. The dairy herd decreased by 2.4-3.1% in Warminsko-Mazurskie, Pomorskie, Podkarpackie and Lubelskie, and in Slaskie and Malopolska by approximately 1%.

According to estimates by the European Commission, the population of dairy cows will decrease in 2015 by 0.3% in the European Union. In the old Member States trends may be different, and the number of cows may increase in the north-European countries (Ireland, the Netherlands, Denmark, Belgium, Germany), which have so far exceeded the limits and they face penalties for exceeding them, and have favourable natural conditions for milk production. Countries with less favourable conditions that underproduce their quotas are likely to reduce cow

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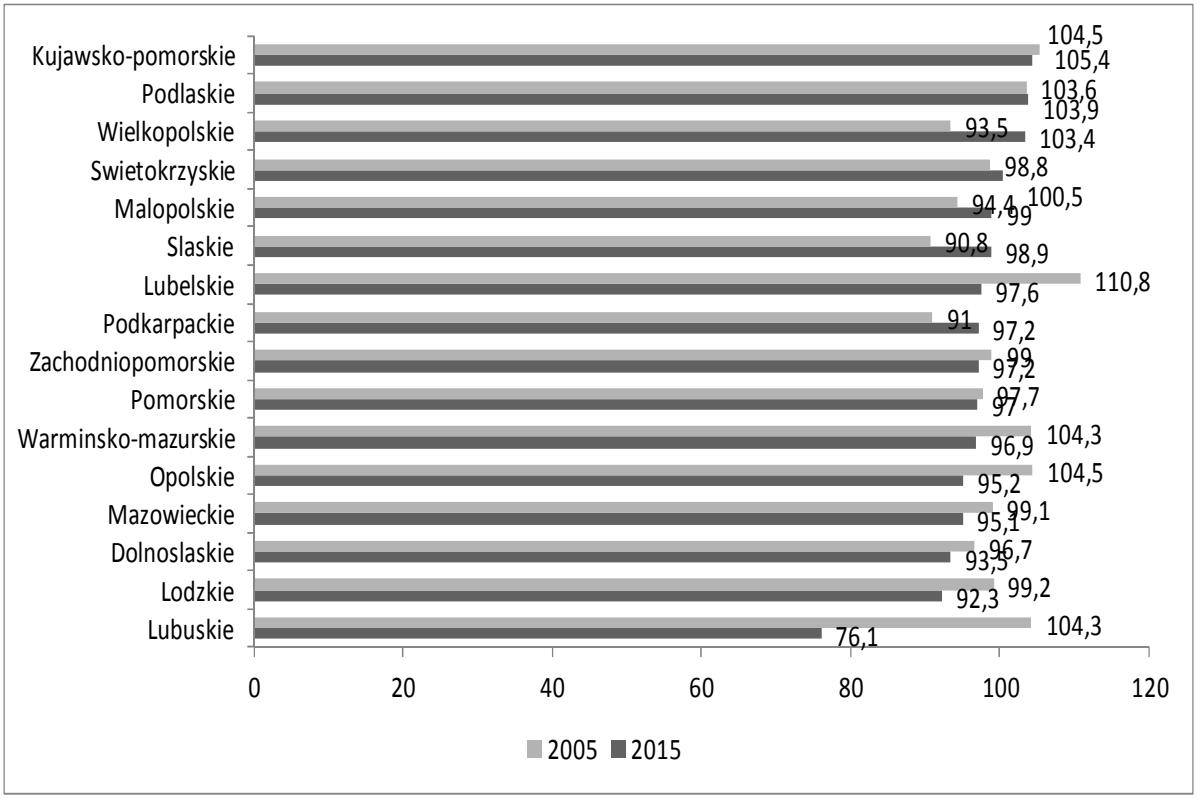
populations (Italy, Greece, Spain, Portugal, Finland, Sweden, the United Kingdom) (Milk market, 2015).

Milk producers in the EU countries face different conditions. The increase of farms area led to increase of dairy efficiency in Hungary, Slovakia, the Czech Republic, Lithuania, Latvia and Estonia (Poczta W., Sadowski A., Sredzinska J., 2008).

Self-sufficiency of milk production varies across the EU countries. The Netherlands (140%), Poland (119%), Germany (115%) and France (114%) were the countries with the highest self-sufficiency of milk production in the EU in 2007 on the one hand, while the self-sufficiency was the smallest in Italy (75%) and Great Britain (86%) on the other hand. Such diversification was the effect of specialization and concentration in the EU countries (Borawski P., 2015, Zekało M., 2015). Concentration led to the increasing production within a single economic unit (Runowski H., 2004,Wysokinski M., et al. 2015).



Source: author's construction based on Milk Market (State and Perspectives 2015)

Fig. 2. **Rate changes of dairy cows herd in June 2004 and 2015 (June 2014 and 2004 = 100)**

The average density of cows on 100 hectares farmland has declined by 0.2%. There was a slightly increased diversification of cow density per unit of surface (Figure 3). The province of Podlaskie has the highest cows density. After falling in 2014, average herd size grew by 0.4% to 42.6 cows/100 hectare of arable land. At the same time in the provinces with a density less than 8 dairy cows/100 ha of arable land (Dolnoslakie, Zachodniopomorskie and Lubuskie), had cow density decrease by 0,1-1,3 units (Milk Market State and Perspective, 2015).

The regional differences in purchase prices of milk increased. During the 12 months from July 2014 to July 2015, the purchase price fell in all provinces, from 13.4% (Podlaskie) to 24.9% (Pomorskie) (Milk market, 2015). The price of milk increased in all provinces in the years 2005-2015 (Figure 4). The highest increases were in: Podkaprackie (35.3%), Malopolskie (30.8%), Lubelskie (23.5%) and Slaskie (22.1%) provinces. The lowest increase occurred in Kujawsko-pomorskie (6.1%), Zachodniopomorskie (10.7%), Pomorskie (11.3%) and Lodzkie provinces (11.6%).

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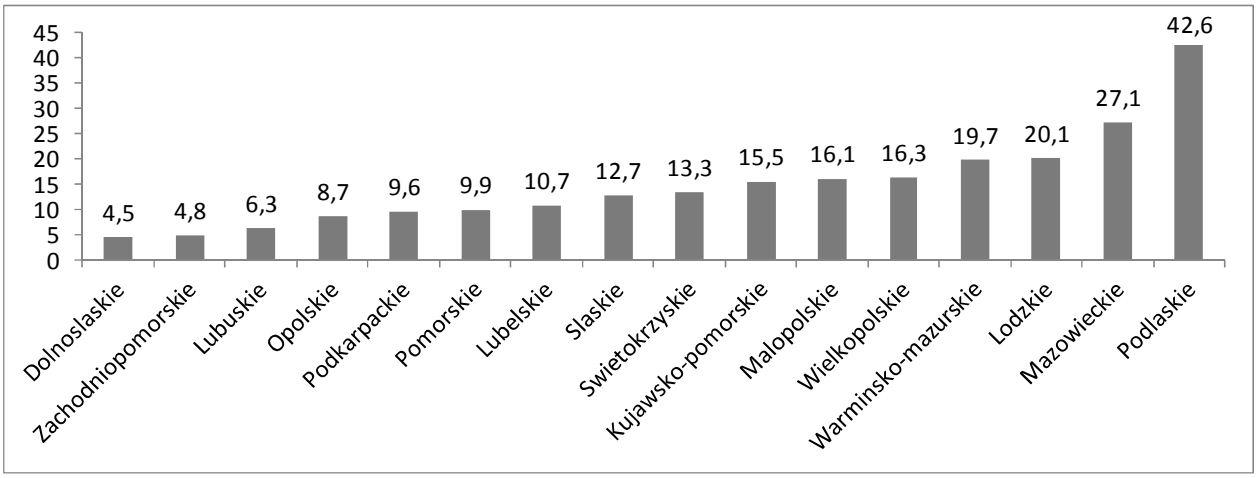
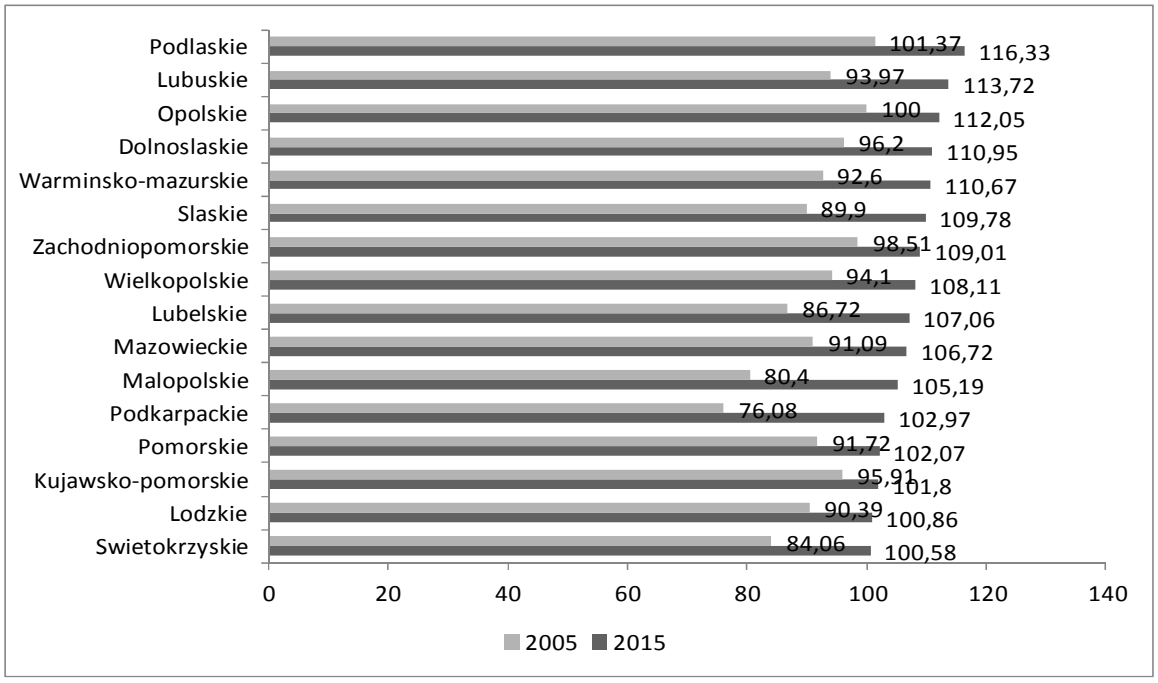


Source: author's construction based on Milk Market (State and Perspectives 2015)

Fig. 3. **Density of dairy cows on 100 ha of arable land in June 2015**

The price of raw milk also dropped in the European Union. Price began to decrease in January and continued to fall in 2015 . But the average annual prices remained high because of the 2013 prices. Prices of raw milk in the EU-28 decreased 5.9% to 31.08 EUR/100 kg. in the first half of 2015 from December 2014 levels, with somewhat greater decreases in the EU-13 than the EU-15. In July and August, the fall in the price of raw milk has continued (Figure 4). Finally, from December 2014 to August 2015 prices of raw milk have declined on average in the EU-28 by11.7%, with the EU-15 lower by 11% and the EU-13 prices lower by 16%. (Milk market, 2015).

An important factor in the development of milk production is the price at all points of the marketing chain. Price volatility creates uncertainty mainly for milk producers, but also for processors and customers. The relationship between prices in the marketing channel reflects the efficiency and the degree of market competition (Weldesenbet T., 2013).



Source: author's construction based on Milk Market (State and Perspective 2015)

Fig. 4. **Purchase milk price in July 2005 and 2015 (by province)**

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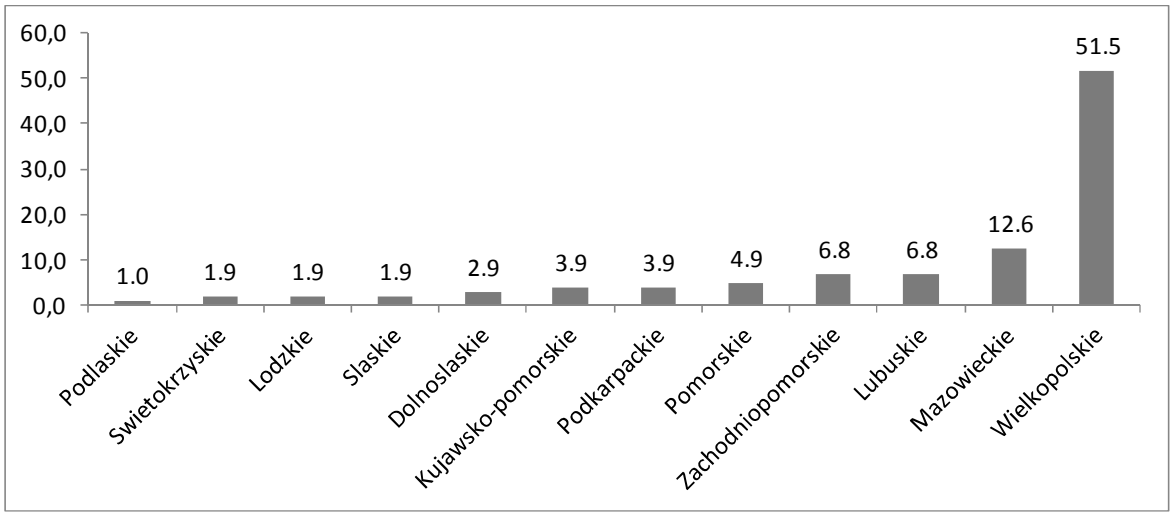

Source: author's construction based on Milk Market (State and Perspective 2015)

Fig. 5. **The share of milk producers groups by region (as of 08.07.2015).**

An important factor of the development of milk production is the creation of producer groups. From the end of 2009, the number of producer groups of milk in Poland quadrupled to 103 in 2015, of which 52% in the Wielkopolskie province, with 900 members. In the region the number of milk producer groups more than seven times compared to 2009 (Figure 5). This may be the effect of this province's proximity to Germany and stronger international competition.

Mazowieckie province, in which farmers have the biggest share in production and procurement of milk, created 13% of all milk producer groups (more than tripled an increase in the analyzed period). In Podlaskie, which delivered 20% of the national milk procurement, only one group of milk producers operated, which brings together the largest number of members.

Seven percent of the milk producer groups worked in the provinces of Lubuskie and Zachodniopomorskie. In four provinces (Opolskie, Warminsko-Mazurskie, Lubelskie and Dolnoslaskie) no groups of dairy farmers operate (Milk market, 2015).

Conclusions

The dairy herd is diversified in Poland. Only four provinces in Poland increased their dairy herds in 2015 in comparison to 2014. These provinces were: Kujawsko-pomorskie (104.5), Podlaskie (103.9), Wielkopolskie (103.4) and Swietokrzyskie (100.5). The dairy herd increased in the years 2005-2015 in Kujawsko-pomorskie, Podlaskie, Wielkopolskie, Swietokrzyskie, Slaskie and Podkarpacie provinces.

The elimination of the quota system in 2014 had an effect on milk markets in Poland. The supply of milk in Poland increased, and the price of milk decreased. Such solutions in the European Union had also an impact on milk consumption, which increased. It also forced both producers and the dairy industry to be more competitive.

The density of dairy cows on 100 ha of arable land varies in Poland. The four provinces with the highest cow density are: Podlaskie (42.6), Mazowieckie (27.1), Lodzkie (20.1) and Warminsko-Mazurskie (19.7). These regions have good conditions for milk production development including meadows and pastures.

The purchase price of milk is diversified in Poland, too. The three provinces with the highest purchase price of milk in Poland in 2015 were: Podlaskie (116.33 PLN/tonne), Opolskie (112.05) and Dolnoslaskie (110.95). The price of milk increased in the years 2005-2015. This was the effect of opening access to European markets, higher prices and higher demand for milk and dairy products.

The milk market is not well integrated and the process of integration varies widely regionally. The scale of milk production is not correlated with the integration process, because Podlaskie province, which is one of the biggest milk producers in Poland, has only one producer group, whereas Wielkopolskie province, which is also a big producer of milk in Poland, has got almost 52 producer groups.

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ECONOMIC ASSESSMENT FOR THE PRODUCTION OF STARCH POTATOES ON FARMS IN LATVIA

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Abstract. Growing potatoes has long traditions in Latvia; yet, potato production is fragmented due to the traditional pattern of consumption of potatoes, as the crop is used as food and feed. Uses of potatoes in industrial processing change with the development of science. The most important component of potato is starch, the composition of which depends on variety and growth conditions.

The area cropped with starch potatoes totalled 494 ha in Latvia in 2014, which accounted for only 1.8% of the total potato area in the country. The organic starch potato area considerably increased, reaching almost 50% of the total starch potato area in 2014.

The production of starch potatoes by farms in Latvia is economically efficient under stable and correct farm management, reaching a margin of safety of more than 80%. However, farm size does not determine the economic efficiency of starch potato production.

The research *aim* is to examine economic indicators for the production of starch potatoes by farms in Latvia. To achieve the aim, the present research analysed the economic indicators of three starch potato farms: Aloja Agro Ltd, Burtnieku Grauds Ltd and the farm Piekalnes, which are located in the region of the only starch potato processing company in the Baltics – Aloja Starkelsen Ltd.

Keywords: starch potato, farms, area cropped with potato, contribution margin, profit.

JEL code: D24; M21; Q12

Introduction

In 2014 in Latvia, the total output of agricultural products at constant prices (agricultural subsidies included) reached EUR 1105 mln, which was a 5% decrease compared with the previous year. Crop farming accounted for 55.60% and livestock farming comprised 44.40% of the total value. According to statistics for recent years, farms returned to a more balanced production structure (Ministry of Agriculture, 2015).

The proportion of final products in the distribution of agricultural products for potatoes increased from 4.30% in 2012 to 5.80% in 2014, which was determined by an increase in the value of potatoes, even though the potato area decreased in Latvia not only in absolute terms (from 30.1 thou. ha in 2010 to 26.80 thou. ha in 2014) but also in relative terms – of the total sown area, the area under potato accounted for 27.30% in 2010 and 23.20% in 2014. This may be explained by the fact that potato production is more labour-intensive and costlier, if expressed as a percentage of total revenue earned, than grain production. The economic role of potato increased and the kinds of use of potato diversified with the development of science and processing industry. In Latvia, only 9.5 thou. tonnes or 20.1% of the total quantity of potatoes consumed are industrially processed, which provides great opportunities for potato production for this purpose in particular.

According to Figure 1, the consumption of potatoes as food comprised only approximately a third of the quantity produced, and there are great opportunities to increase the output of potatoes for industrial processing, thereby reducing consumption of potatoes as feed.

Potato production is fragmented in Latvia. According to the Central Statistical Bureau (CSB), in 2014, 96.4% farms had a potato area of less than 1 ha, accounting for 69.3% of the total potato area. In Latvia, only 12 farms had a potato area of more than 75 ha, farming 5.45% of the total area cropped with potato. On these farms, the average potato yield reached 26.2 t ha^{-1}, which was 1.43 times higher than the average in Latvia (18.3 t ha^{-1}). By concentrating the production of potatoes, it is possible to considerably increase the total output of the crop and to focus on the industrial processing of potatoes.

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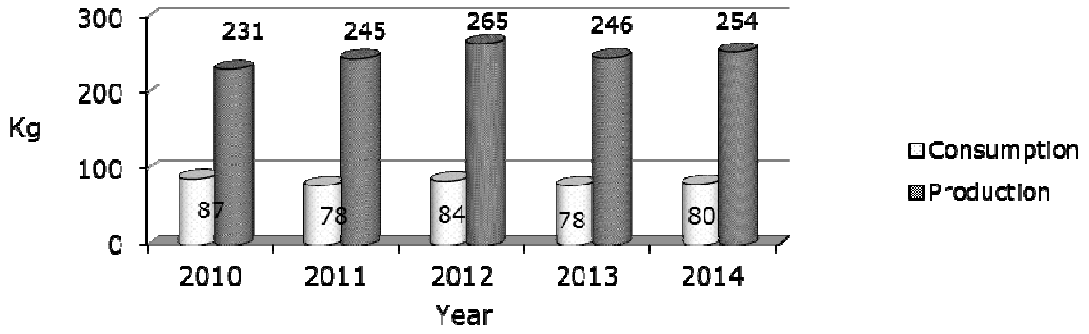

Source: authors' calculations based on the CSB data

Fig.1. **Per capita production and consumption of potato in Latvia in the period 2010-2014, kg**

The most important component of potato is starch, the composition of which depends on variety and growth conditions. The content of starch in a naturally moist product ranges from 10 to 20%.

The food industry mainly exploits the capability of a component of starch – amylopectin – to form paste or jelly (Munck L., 1994; Alexander R.I., 1995; Peerenboom E., 1997). However, the second component of starch – amylase – is used in the manufacture of plastics, in the chemical industry and in the production of seeds, pesticides and fertiliser coatings (Soest J.J.G., 1996; Wang T.L. et al., 1998).

On the whole, 80% of the total quantity of potato starch produced is now used in the non-food industry (Wang T.L. et al., 1998).

Lots of starch is used in the textile industry, metallurgy (to produce precise castings), the oil industry to stabilise oil wells and in the production of medicines, matches and glue. Modified starch has a broad range of uses – in the production of sausages, ice-cream, yogurt, mayonnaise and ketchup (Ivanova A., 1999; Spogis K., 1999; Skrabule I., 2003).

The research puts forward a *hypothesis* – the production of starch potatoes is economically efficient in Latvia. The research *aim* is to examine economic indicators for the production of starch potatoes by farms in Latvia. To achieve the aim, the following specific research *tasks* were set: 1) to examine preconditions for and the situation in the production of starch potatoes in Latvia; 2) to analyse the economic indicators for the production of starch potatoes.

To achieve the aim set, the present research analysed the economic indicators of three starch potato farms: Aloja Agro Ltd, Burtnieku Grauds Ltd and the farm Piekalnes, which were located in the region of the only starch potato processing company in the Baltics – Aloja Starkelsen Ltd.

Statistical analysis was employed to process data. The present research analysed indicators of the mentioned farms and other farms in Latvia for the period 2006-2014 based on the availability of data.

Research results and discussion

The industrial production of starch from potatoes began in Germany in the 18th century. Nowadays, too, Germany together with the Netherlands is the key producer and exporter of food starch in the world (Willard M., 1993). Compared with other crops such as maize *(Zeamays)* and wheat *(Triticum)* that are also used for starch production, potatoes provide higher starch output per land area unit. Besides, starch produced from potatoes, in terms of properties, is more valuable than that from maize or wheat. Potato starch features higher viscosity, its particles are greater in size and it contains natural phosphate groups, while an admixture of protein and lipids is relatively small. Potato starch is white in colour and unlike, for example, starch from maize or wheat lacks any specific taste (Munck L., 1994; Alexander R.I., 1995; Ellis R.P. et al., 1998).

To produce starch from potatoes, the **following indicators are important**:

- the minimum content of starch has to be 17% (the higher the content, the greater premiums are paid) (Ivanova A., 1999);
- the extent of grime is not more than 7%;
- the content of protein is low;
- the proportion of small tubers (with a diameter of 30 mm) has to be less than 25% (Ivanova A., 1999);

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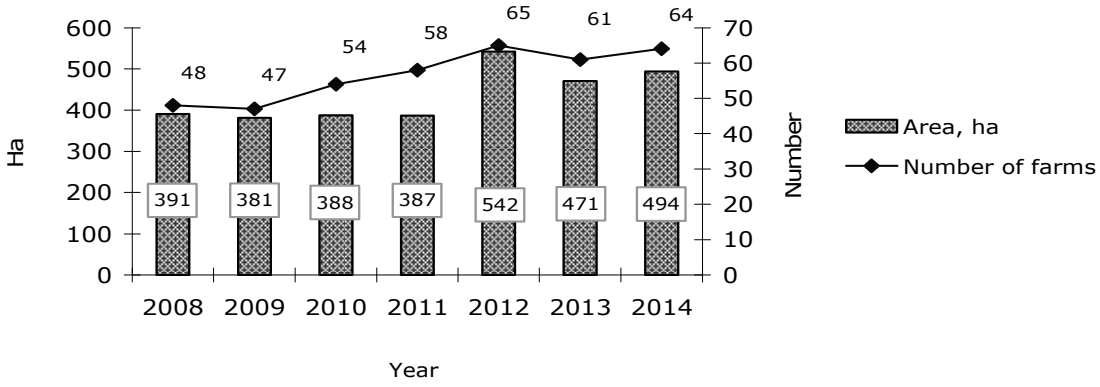
- starch particles are evener and greater. However, given the further use of starch, some enterprises might prefer fine-grained starch (Peerenboom E., 1997; Wang T.L. et al., 1998);
- a specific ratio of amylase to amylopectin in starch, depending on the further use of it (Munck L., 1994; Alexander R.I., 1995; Soest J.J.G., 1996; Ellis R.P. et al., 1998; Wang T.L. et al., 1998).



Source: authors' calculations based on the MoA data

Fig.2. **Starch potato area and the number of starch potato farms in Latvia in the period 2008-2014**

Table 1

Production of starch potato in Latvia in the period 2012-2014

Indicator	2012		2013		2014	
	quantity	%	quantity	%	quantity	%
Area, ha	542	100.0	471	100.0	494	100.0
incl. organic	161	29.7	159	33.8	224	45.3
integrated	381	70.3	312	66.2	270	54.7
Average yield, t ha-1	23.4	100.0	20.0	100.0	26.4	100.0
incl. organic	16.0	68.4	13.8	69.0	11.6	43.9
integrated	28.5	121.8	23.3	116.5	38.7	146.6
Number of farms	65	100.0	61	100.0	64	100.0
incl. organic	35	53.8	34	55.7	37	57.8
integrated	30	46.2	27	44.3	27	42.2
Average area cropped with starch potato per farm, ha	8.3	100.0	7.7	100.0	7.7	100.0
incl. organic	4.6	63.0	4.7	61.0	6.1	79.2
integrated	12.7	174.0	11.6	150.6	10.0	129.9

Source: authors' calculations based on the MoA data

As once found by scientist and economist K.Spogis (1999), growing more potatoes for starch production by farmers in Northern Vidzeme could considerably contribute to Latvia's national economy. Geographically, particularly this region of Latvia should produce starch potatoes because of appropriate soils and the short distance to the processing company.

To examine trends in the production of starch potatoes in Latvia, the further analysis focuses on the sown area, the number of farms and yields.

A summary of the data presented in Figure 2 leads to a finding that over the analysed period, two periods may be distinguished in Latvia: 1) from 2008 to 2011 the sown area was relatively unchanged; yet, the

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number of potato farms tended to increase; 2) in 2012, a sharp increase in the sown area and the number of farms took place, which was determined by an increase in the output of organic starch in line with change in consumer demand in the entire world.

The data and calculation results in Table 1 show that the agrotechnological situation and trends in producing starch potatoes are diverse:

the area cropped with starch potatoes was the greatest in 2012, which, compared with 2011, increased by 40%. This change was due to starting producing starch potatoes by the organic method. The area of potatoes grown organically tended to increase and reached 45.3% of the total area in 2014;

starch potato yields were volatile due to weather conditions. Organic potato yields were lower in 2014 (only 43.9% of the average potato yield and 3.3 times lower than on integrated farms);

the number of farms producing starch potatoes organically rose. In 2014, the number of organic farms exceeded that of integrated farms by 15.6%;

the average area under starch potato per farm tended to decline, which was affected by an increase in the number of relatively small organic farms. The starch potato area on organic farms rose over the analysed period, which indicated development opportunities for organic farming.

To achieve the research aim, three farms – limited liability companies (Ltd) Aloja Agro and Burtnieku Grauds and the farm Piekalnes – which were different both by legal status and by area cropped with potato were selected for the present research.

Burtnieku Grauds Ltd with 480 ha was the greatest farm in terms of size. Aloja Agro Ltd had the largest area sown with starch potatoes; yet, this farm needed a greater rented area to ensure crop rotation, which contributed to the production risk. On the whole, the analysed farms had larger areas under starch potatoes than the average in Latvia (Table 1).

In assessing economic performance, an important indicator is not only a farm's land area but also its economic size, which, according to the methodology of the Farm Accountancy Data Network (FADN) of Latvia, is expressed in terms of total standard output (Table 3).

Table 2

Characteristics of the analysed potato farms in 2014, ha

Indicator	Aloja Agro Ltd	Burtnieku Grauds Ltd	Farm Piekalnes
Total land area	150.00	480.00	250.00
incl. utilised agricultural area	150.00	478.00	245.00
potato area	150.00	48.20	38.00
starch potato area	96.00	20.00	15.00

Source: authors' calculations based on Aloja Agro Ltd, Burtnieku Grauds Ltd and farm Piekalnes data

Table 3

Economic sizes of the potato farms in 2014, EUR

Crop	SO of the crop	Aloja Agro Ltd		Burtnieku Grauds Ltd		Farm Piekalnes	
		ha	***SO***	***ha***	***SO***	***ha***	***SO***
Potato	2 321	150.00	348150	48.20	111 872	38.00	88198
Rapeseed (winter)	747	-	-	45.40	33 914	30.00	22410
Wheat (spring)	587	-	-	150.00	88 050	68.00	39916
Grass	113	-	-	30.40	3 435	-	-
Oats	246	-	-	29.00	7 134	22.00	5412
Wheat (winter)	587	-	-	100.00	58 700	35.00	20545
Faba bean	459	-	-	22.00	10 098	12.00	5508
Fallow area	-	-	-	55.00	0	15.00	0
Rye (winter)	379	-	-	-	-	25.00	9475
Total standard output	X	**348 150**		**313 203**		**191 464**	

SO – standard output

Source: authors' calculations based on farm and the FADN data

All the analysed farms are located in Vidzeme region. In 2013 in **Vidzeme region**, the economic size of FADN farms was equal to **EUR 35 767**. According to the calculations, the standard output of Aloja Agro Ltd was the highest at EUR 348 150, that of Burtnieku Grauds totalled EUR 313 203, while the standard output of the farm Piekalnes was the lowest at EUR 191 464. Compared with the average for Vidzeme region, the enterprises had great standard outputs. If measuring the farms' sizes by standard output, one can conclude

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that all the analysed farms were large ones, as all the three farms belonged to size class 5, the SO of which ranged within EUR 100 000-500 000.

To assess the economic efficiency of producing starch potatoes, the following economic indicators were employed: contribution margin, profit and margin of safety.

The *contribution margin* is an indicator that is used for analyses and planning of an enterprise's economic performance and that reveals a surplus of the market value of the enterprise's products sold over proportionally changing variable costs.

Table 4

Contribution margins of the starch potato farms, EUR ha^{-1}

Indicator		2010	2011	2012	2013	2014
Burtnieku Grauds Ltd	revenue	948.72	1 174.36	1 364.16	1 335.92	1 602.94
	variable costs	536.00	616.00	565.00	1 312.04	432.61
	contribution margin	412.72	558.36	799.16	23.88	1 170.33
Aloja Agro Ltd	revenue	2 293.34	2 052.92	1 982.58	2 092.05	1 590.77
	variable costs	753.90	958.98	1 148.90	1 304.27	891.42
	contribution margin	1 539.44	1 093.94	833.68	787.78	699.35
Farm Piekalnes	revenue	1 529.75	1 626.55	1 625.77	1 734.40	2 010.80
	variable costs	416.60	503.55	515.70	639.30	495.00
	contribution margin	1 113.15	1 123.00	1 110.07	1 095.10	1 515.80

Source: authors' calculations based on farm data

The contribution margin shows the economic efficiency of farming a crop or some group of livestock. The starch potato farms examined in the present research did all field works by their machinery and did not outsource services. The cost of exploiting the farm's machinery belongs to fixed costs in the form of fixed asset depreciation, repairs, maintenance and fuel consumption. Variable costs involve seeds, fertilisers and plant protection products.

Table 4 reveals that the value of products produced per ha of starch potato for the farm Piekalnes and Burtnieku Grauds Ltd tended to increase, whereas that for Aloja Agro Ltd was volatile and tended to decrease. This situation was due to persistent changes in the rented area. However, the farm Piekalnes featured stable business management.

Seeds make up the highest proportion of variable costs, and periodic purchases of the seeds contributed to the volatility of variable costs for Aloja Agro Ltd and Burtnieku Grauds Ltd.

The mentioned farming preconditions determined the greatest and most stable contribution margin for the farm Piekalnes. On the whole, one can conclude that particularly farm management rather than the size of cropped area determines the economic efficiency of production of starch potatoes. The contribution margin is a sum of revenue that covers fixed costs and contributes to an enterprise's profit.

Profit is determined by two factors: sales price and production cost. The sales price of starch potatoes consists of the basic price and a premium. The ratio of the two variables changed over the analysed period (Table 5), as the proportion of the premium increased. A premium is a stimulus for producing products of high quality. The sales price for the analysed farms did not significantly differ; yet, the farms' production costs were different. It was affected by both variable and fixed costs. The relatively low profits made and even losses suffered by Burtnieku Grauds Ltd and Aloja Agro Ltd were determined by the size of fixed costs, as the farms purchased expensive machinery for potato production. Nevertheless, under optimum farm management (on the farm Piekalnes), the profit per tonne of starch potatoes sold exceeded EUR 30, reaching a profit margin of 61.3% in 2014.

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Table 5

Profit or loss from the production of starch potato in the period 2010-2014, EUR t^{-1}

Indicator			2010	2011	2012	2013	2014
Burtnieku Grauds Ltd	sales price	total	53.70	61.16	68.20	88.05	51.88
		basic	36.00	32.00	35.30	48.36	27.05
		premium	17.70	19.16	32.90	39.69	24.83
	production cost		40.15	41.87	37.95	99.19	20.96
	profit or loss		13.55	19.29	30.25	-11.14	30.92
Aloja Agro Ltd	sales price	total	65.51	63.93	63.03	66.27	54.66
		basic	38.00	36.00	35.00	39.06	27.34
		premium	27.51	27.93	28.03	27.21	27.32
	production cost		47.10	54.23	60.13	65.28	62.53
	profit or loss		18.41	9.70	2.90	0.99	-7.87
Farm Piekalnes	sales price	total	55.57	58.50	52.26	55.95	52.00
		basic	31.00	27.00	30.00	28.00	27.09
		premium	24.57	31.50	22.26	27.95	24.91
	production cost		22.58	24.71	23.45	27.59	20.12
	profit or loss		32.99	33.79	28.81	28.36	31.88

Source: authors' calculations based on farm data

In economic analysis theory, financial safety is a complex term characterised by the extent of use of not only financial but also all the other resources available to an enterprise. Financial safety is an enterprise's economic condition that involves the preconditions for a steady surplus of the enterprise's revenue over its expenditure, efficient use of resources and a continuous production process that are influenced by endogenous and exogenous factors (Koleda N., 2011).

The margin of safety is calculated by Equation 1 employing the break-even point:

$$MS = \frac{SR - BP}{SR} * 100 \quad (1)$$

where MS – margin of safety;

SR – sales revenue;

BP – break-even sales revenue.

According to Table 6, the following conclusions may be drawn: 1) starch potato production by farms in Latvia provides a sufficiently high margin of safety. In 2014, Burtnieku Grauds Ltd and the farm Piekalnes reached a break-even point by selling less than 20% of their products produced; 2) the margin of safety does not depend on the quantity produced.

Conclusions

1) The area cropped with starch potatoes totalled 494 ha in Latvia in 2014, which accounted for only 1.8% of the total potato area in the country. The organic starch potato area considerably increased, reaching almost 50% of the total starch potato area in 2014.

2) The enterprises analysed have to put a special focus on gradually restoring their seed resources, as the situation of Burtnieku Grauds Ltd in 2013 showed that in case seeds are repeatedly purchased for the entire area to be sown, the seed cost makes up 67% of the total cost. In case seeds are produced by the farms themselves, the seed cost accounts for 25-40% of the total cost.

3) The production of starch potatoes by farms in Latvia is economically efficient under stable and correct farm management, reaching a margin of safety of more than 80%. However, the size of the farms does not determine the economic efficiency of production of starch potatoes.

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Table 6

Margins of safety for the starch potato farms in the period 2010-2014

Indicator		2010	2011	2012	2013	2014
Burtnieku Grauds Ltd	output, t	530	480	500	437	618
	break-even output, t	223	162	121	3 519	114
	margin of safety, %	57.9	66.3	75.8	-705.3	81.6
Aloja Agro Ltd	output, t	3 151	3 051	2 988	3 134	2 794
	break-even output, t	1 832	2 182	2 662	3 011	3 710
	margin of safety, %	41.9	28.5	10.9	3.9	-32.8
Farm Piekalnes	output, t	551	695	560	620	580
	break-even output, t	102	114	108	122	106
	margin of safety, %	81.5	83.6	80.7	80.3	84.6

Source: author's calculations based on farm data

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IS SPECIALIZATION A WAY FOR SMALL FARMS IN CENTRAL AND EASTERN EUROPEAN COUNTRIES TO ADJUST?

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Abstract. The paper deals with specialization of small farms in the EU with particular respect to the EU-10 (Central and Eastern European) countries. It analyses the structure and growth of small farms in terms of types of specialization and their performance in production (Standard Output), labour (Agricultural Working Unit) and land use (Utilized Agricultural Area) between 2005 and 2013. The aim of the paper is to point out to what extent specialization can help small farms to survive. The paper underlines the main directions of specialization small farms have found to follow in different Central and Eastern European countries, thereby strengthening their chances of survival. It has been concluded that the growth and development of small, specialized farms has gone in different directions. Some types of small, specialized farms have achieved faster development and achieved better results in increasing efficiency than others. Analysis provides grounds to support the contention that small farms have found further specialization as path of development helping them to survive; but that the speed with which specialization has been achieved varies according to countries and according to farm types.

Key words: Small farms, SSFs, specialization, CEECs

JEL code: Q10, Q12

Introduction

The issue of small farms and their survival has always been one of the key questions for the EU and Member States' national policy-makers. This paper discusses the specialization of small farms in the EU-10 from 2005 to 2013. The definition of the term 'small farm' became a topic of discussion among researchers aiming to achieve a clearer understanding of this farm category. Hubbard gives a good background to this debate (Hubbard C, 2009). However, the performance and role of small and family farms is not always clearly interpreted. Small farms are family farms but family farms are not always small farms (Matthews A, 2011).

Two criteria are used for defining small farms by size in the EU. One is the size of land, although, different countries use different thresholds for small farms. Farms having less than 5 ha of Utilized Agricultural Area (UAA) are regarded as small farms in this paper. Small farms can also be categorized according to the economic size by the Standard Output (SO).

In literature, role, importance, development and policy aspects of small farms has been discussed (EP resolution, 2014; Davidova S, - Bailey A, 2014; Dwyer J, 2014; Davidova S, 2014). It was emphasized that small farms have to make changes in farming in order to have a successful adjustment concerning their possible integration into modern food chains (Forgacs, 2006; Csaki C, - Forgacs C, 2008; Gordon M. et al., 2014; Rabinowitz E, 2014). Social capital aspects of small farms were also investigated (Wolz A. et al., 2010). Structural change of Semi-Subsistence Farms (SSFs) in 2004 NMSs was discussed from agricultural policy point of view (Erjavec E. et al., 2014). Roles and dynamics of small farms in rural development were focused in Romania (Popescu D-L, 2014). However, specialization aspects of small farms in the EU-10 in general have not yet received special attention since the EU Eastward Enlargement. This is the first time specialization of small farms in the EU-10 has been analysed in-depth and compared to that of the EU-17 and EU-27 between 2005-2013.

The question is: to what extent are small farms in the EU-10 able to further specialize in order to have a better chance of market survival?

The following hypotheses will be investigated:

- Hypothesis 1: Share of number of specialized small farms in the small farm category does not decline.
- Hypothesis 2: Specialization of small farms has regional characteristics.
- Hypothesis 3: Specialized small farms have higher growth in labour productivity than non-specialized small farms.
- Hypothesis 4: Increase of area productivity of specialized small farms exceeds that of non-specialized small farms.
- Hypothesis 5: Growth in production output of specialized small farms is higher than that of non-specialized small farms.
- Hypothesis 6: Specialization offers better grounds for small farms to survive.

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1. Methodology

To have a deep insight into small farms' performance from specialization point of view EUROSTAT data set of 2005-2013 was used for analysis. Besides the structural development of specialized smallholdings their labour use (Agricultural Work Unit AWU), land use (UAA) and production (SO) were analysed. Dynamic analysis was used to provide insight into small farms development in 9* out of 10 specialized farm types.

2. Analysis of specialization of small farms

Number of small farms

In 2005 there were 8.6 million farms in the EU-10 of which 80.3% belonged to the small farm category. Within that category three out of ten belonged to specialized small farms. The number of farms as well as that of small farms have declined in all EU-10 countries significantly from 2005 to 2013 exceeding the decrease of number of specialized small farms (20.8%) that indicates specialized small farms have become more viable during the farm restructuring process but their number also started to decline in 5 CEECs after 2010 (Figure 1).

In Lithuania, Romania and Slovenia, the decline of small, specialized farms did not reach 5.5%. In all EU-10 countries, the number of specialized farms went back in each farm type but the relative share of number of specialized small farms within total small farms did not decline in any country. The increase in relative share was significant in the Czech Republic, Romania, Hungary, Latvia and Lithuania. Specialization of small farms in CEECs went to different directions mostly fitting to local traditions and the potential of possible comparative advantages.

In some specialized farm type, the number of small farms increased significantly, e.g. Bulgaria (horticulture indoor; fruit and citrus fruit), Estonia (horticulture outdoor; poultry), Latvia (cattle-rearing and fattening; poultry; cereals, oilseed and protein crops), Lithuania (cereals, oilseed and protein crops; poultry; horticulture outdoor), Hungary (cattle-rearing and fattening), Romania (cattle-rearing and fattening; vineyards; fruit and citrus fruit), Slovakia (cattle-rearing and fattening) and Slovenia (the number of specialized small farms declined only in two out of 9 special farm types).

The picture of specialization of small farms has not been uniformed in the EU-10, the direction of it has been changed over time. (E.g. the number of small, specialized pig farms increased by 33.7% from 2005 to 2010; however, within this group of farms a decline of 58.8% can be observed in 2013 as compared with 2005). Among the total number of small farms, the share of specialized small farms increased by 54.6% in the EU-10. In the Czech Republic, the number of specialized small farms has declined in all 9 farm types while in Slovakia it has declined in 8; however, their relative share has not been decreased in either of the two countries.

If we examine the concentration level of TOP-3 type of specialized farms, it can be seen to have slightly increased in the EU-10 from 2005 to 2013 with a drop in 5 countries and with an increase in the other 5 (Figure 2). In 2015 the highest concentration of specialized farms was achieved in Poland (91.2%), Lithuania (89.5%) and the Czech Republic (88%).

However, there has been change in composition of TOP-3 farm types in smallholdings (Table 1). In the EU-10 more than one small specialized farm in every three belongs to cereals, oilseed and protein crop farm type putting it into TOP-3 in 8 countries. In the EU-10 29.8% of small specialized farms run poultry farming with a share between 35-40% in Romania and Hungary.

At the other end of the spectrum, specialization in horticulture-indoor and that of outdoor and cattle-rearing and fattening are the least attractive options for small farms.

Land Use of Small Specialized Farms

In 2005 small farms used 9.1 million ha of UAA in the EU-10 having a share of 61.5% of the total EU-27 this share maintained in 2013. 5.6 million UAA is cultivated by small farms in two countries (Romania and Poland). Land use of specialized small farms in the EU-10 amounted to 1.8 million ha in 2013, 12.5% more than in the EU-17, from 2.2 million ha in 2005.

The total land area used by specialized small farms went back by 14.8% in the EU-10 (21.8% in the EU-17) while the decline in case of small farms in total was two times higher (28.7%). Poland, with her mostly stabilized small farm structure is the only country in the EU-10 where UAA of small specialized farms increased

*The following specialized farm types give the basis for analysis: 1. Specialized in cereals, oilseed and protein crops. 2. Specialized in horticulture indoor. 3. Specialized in horticulture outdoor. 4. Specialized in vineyards. 5. Specialized in fruit and citrus fruit. 6. Specialized in dairy farming. 7. Specialized in cattle-rearing and fattening. 8. Specialized in pig production. 9 Specialized in poultry production.

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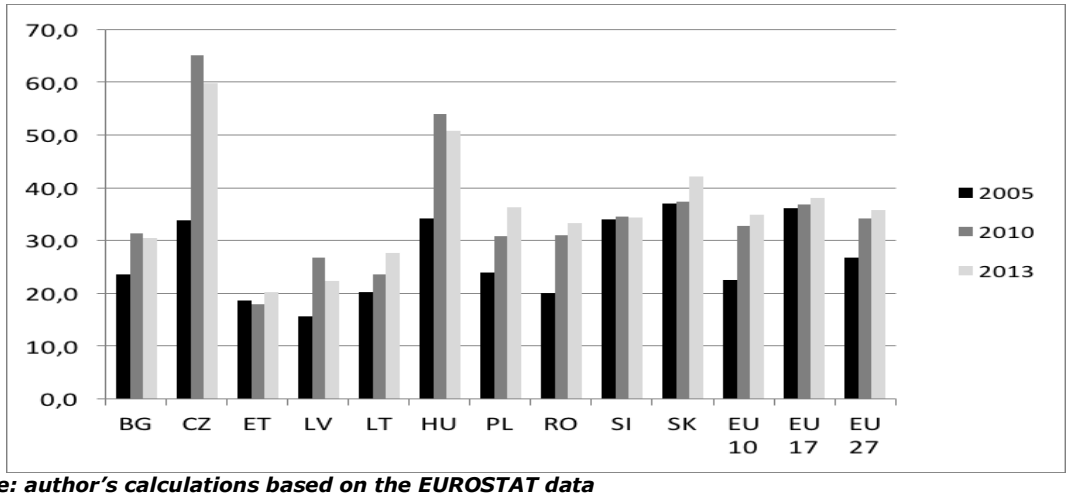
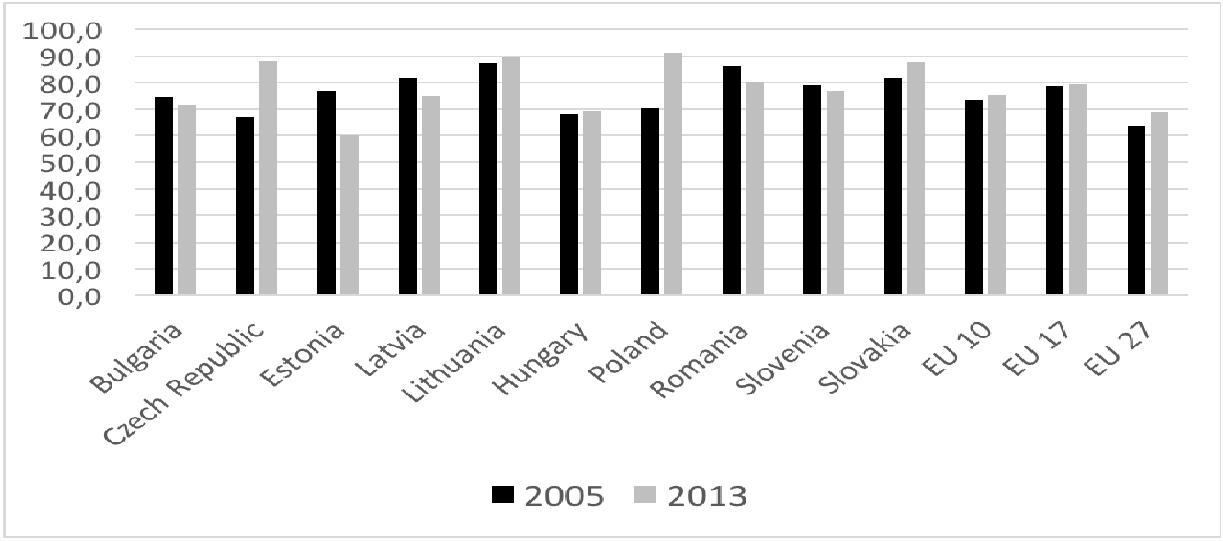
(7.3%). In the EU-10 UAA has been increased only in 2 types of specialized small farms as cattle-rearing and fattening (36.7%) and slightly in fruit and citrus fruit over the 9-year period. The highest decline in land use took place in specialized pig farms.

If we examine the dynamics of land use by farm type, controversial trends can be observed. The UAA of small specialized cereals, oilseed and protein crops farms amounted to 58.2% of total specialized small farms' land in 2013 (50.8% in 2005) without there being any significant increase in farm average land use. The UAA of specialized farms increased in 7 countries, significantly in Lithuania (343.6%), Slovenia (94.4%), Latvia (64.9%) and Poland (63.6%).



Source: author's calculations based on the EUROSTAT data

Fig. 1. **Share of small specialized farms within total small farms in EU10, %, 2005, 2010, 2013.**



Source: author's calculations based on the EUROSTAT data

Fig. 2. **Concentration level of TOP-3 type of small specialized farms in CEECs, %, 2005, 2013.**

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Table 1

Change in TOP-3 type of specialized small farms in the EU-10, 2005-2013.

Country	Stable (no change)	IN	OUT
BG	dairy, vineyards,	fruit	poultry
CZ	vineyards, cattle-rearing	fruit	dairy
ET	dairy, cereals	horticulture-outdoor	fruit
LV	dairy, cereals, fruit	no	no
LT	dairy, cereals	horticulture-outdoor	horticulture-indoor
HU	poultry, vineyards	cereals	pigs
PL	cereals, fruit, dairy	no	no
RO	cereals, poultry	vineyards	dairy
SI	cattle-raring, vineyards	cereals	dairy
SK	Dairy	cereals, cattle-rearing	vineyards, pigs
EU 10	cereals, poultry, dairy	no	no
EU 17	fruit, vineyards, cereals	no	no
EU 27	cereals, poultry fruit	no	no

Source: author's calculations based on the EUROSTAT data

A strong decline in UAA took place in small farms specialized in cereals, oilseed and protein crops in Slovakia (29.8%) and Romania (65.6%) and, all 1660 specialized small farms of this type in Czech Republic in 2005 had totally disappeared by 2010.

In specialized poultry farms UAA went up in 5 countries significantly including all three Baltic states and declined also in 5 countries (sharply so in Czech Republic and Slovakia), thus indicating a certain regional character of specialization.

At the other end of the spectrum, the UAA of small specialized farms declined in all EU-10 in specialized dairy, in 7 countries in specialized pig farms and in 6 countries in specialized farms in cattle-rearing and fattening and horticulture indoor. The relative share of UAA of specialized small farms within small farms has increased in 8 CEECs with outstanding growth observable in the Czech Republic (86.4%) followed by Latvia, Lithuania and Poland. Specialized fruit and citrus fruit farms have also increased their relative share in all EU-10 countries. The number of specialized small farms in the EU-10 fell by 20.8%, thereby exceeding the decrease in their UAA.

The level of specialization was especially remarkable in the Baltics in poultry, in cereals, oilseed and protein crops, horticulture outdoor and to a less extent in fruit, pig and cattle-rearing and fattening farms. In Bulgaria, specialized small farms in horticulture (indoor and less extent in outdoor) and fruit production achieved significant growth. Cereals, oilseed and protein crops farms increased their UAA in Hungary, Poland and Slovenia. Growth in UAA in Romania was achieved by specialized farms in vineyards, fruit and citrus fruit and cattle-rearing and fattening farms. The latter was also significant in Slovakia. UAA went down for all specialized farm types in the Czech Republic.

Labour Use in Specialized Small Farms

The Agricultural Working Unit (AWU) of small farms in the EU-10 amounted to 4.1 million in 2005 and went down by 37.5% in 2013. AWU of small specialized farms accounted for 1 million in 2005 decreased by 21%. Specialization of small farms offers jobs still for great number of people, decreasing to a lesser extent than can be observed with small farms overall. The AWU increased in three specialized farm categories as cereals, oilseed and protein crops, cattle-rearing and fattening and fruit and citrus fruit farms. However, a significant decline can be observed in the case of dairy and pig farms (Figure 3).

The picture of labour use is not homogeneous in the EU-10. Among the three most labour intensive farm type only cereals, oilseeds and protein crops farms could increase AWU (25.3%) with a peak in Lithuania and in Poland. In all CEECs a decline in AWU of specialized small farms took place both in specialized dairy and poultry farms; meanwhile, AWU in specialized cereals, oil seed and protein and fruit and citrus fruit

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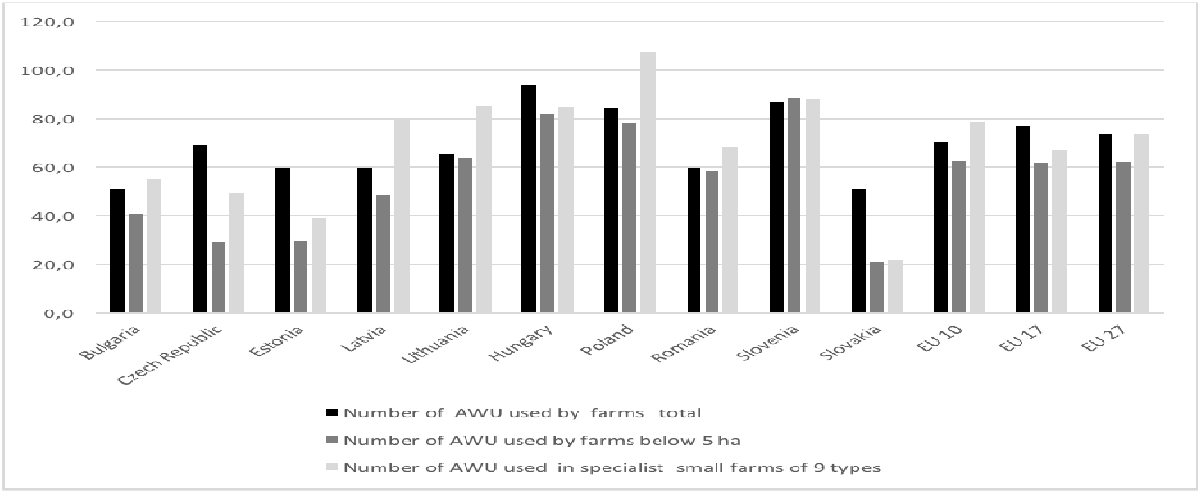
farms was increased in 6 countries. Specialized pig farms had a decrease in labour use in all EU-10. All countries, apart from Poland, used less AWU in specialized small farms in 2013 as compared with 2005.



Source: author's calculations based on the EUROSTAT data

Fig. 3. **Dynamics of labour (AWU) used in different farm categories in the EU-10, %, 2005-2013.**

Production Potential of Small Specialized Farms

Farms in the EU-10 produced EURO 42.3 billion of SO in 2005 of which EURO 11.9 billion went to small farms. Small, specialized farms had SO of 3.4 billion EURO. In 2013 these figures were 53.6, 10.2 and 3.4 billion respectively. In the EU-10 the SO of farms in total went up by 26.7%, while that of small farms declined by 14%. The SO of specialized small farms went up by 0.8%; at the same time, the number of specialized small farms declined by 20.8%. However, the SO of small farms in the EU-17 in average declined by 18.3% (Figure 4). SO of small, specialized farms of the EU-10 increased in specialized farms of cattle-rearing and fattening, fruit and citrus fruit and cereals, oilseed and protein crops. The highest rate of decline took place with specialized pig and dairy farms.

As regards the dynamics: in the case of cattle-rearing and fattening, SO increased in 9 countries; in cereals, oilseed and protein corps and fruit and citrus fruit, it increased in 8 countries; and in poultry specialist farms it increased in 6 countries. If we examine SO by farm type, an above 100% increase was achieved in cereals, oilseed and protein crops farms in 7 countries; in cattle-rearing and fattening farms it was achieved in 6 countries.

Growth of SO in specialized small farms in some countries was extraordinary high in cattle-rearing and fattening farms: Latvia (11130%), Hungary (352.3%) and Slovakia (240.9%). In Cereals, oilseed and protein crop small specialized farms SO increased in 8 countries most in Lithuania (636.2%), Poland (269%), Latvia (250%) and Slovenia (182.4%). As far as the relative share of SO is concerned the expansion of small, specialized farms grew by 17.2% in the EU-10 between 2005 and 2013. The increase can be observed across all countries with the Baltics and Bulgaria in the front line. Generally, specialized small farms have achieved high growth rate between 2005 and 2013 in the EU-10 doing a better performance in compare to non-specialized small farms.

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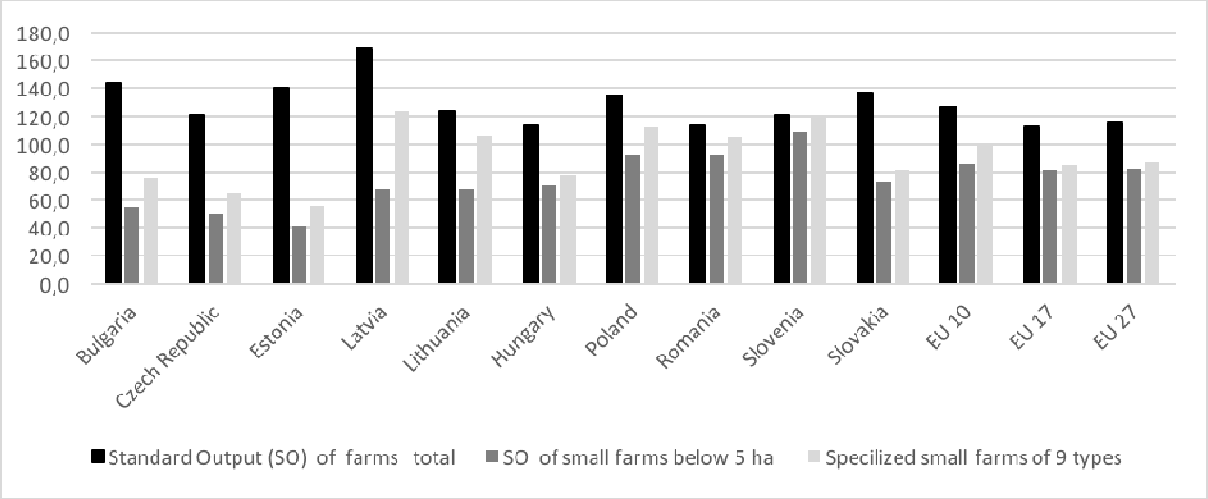

Source: author's calculations based on the EUROSTAT data

Fig. 4. **Dynamics of Standard Output (SO) in EU 10, %, 2005-2013.**

Productivity and Efficiency of Small Specialist Farming

Average size of small, specialized farms by UAA in the EU-10 is below that of the EU-17 both in 2005 and 2013 (1.02 versus 1.8 and 1.1 versus 2.1 ha/farm respectively). On average, specialized cattle-rearing and fattening farms had the highest UAA over the 9-year period both in the EU-10 and EU-17. Among specialized farms, indoor horticulture has been the most labour intensive farm type across the EU-10 and in the EU-17 for the entire period producing the highest per farm SO in the EU-10 and EU-17 in 2005 and, in the EU-10 in 2013. In the EU-10 specialized small farms increased labour use; the highest increase took place in specialized outdoor horticulture and fruit and citrus fruit farms, while in the EU-17 specialized poultry farms had growth in AWU.

Table 2

Dynamics of some farm indicators in the EU, %, 2005-2013.

	Group of countries	Total farms	Small farms below 5 ha	Specialized small farms of 9 types
Number of farms	EU10	72.3	70.1	79.2
	EU17	76.0	65.5	67.8
	EU27	73.8	68.7	75.2
AWU/UAA	EU10	68.2	87.6	92.7
	EU17	77.0	85.4	85.6
	EU27	73.0	86.8	90.0
SO/UAA	EU10	122.9	120.6	118.3
	EU17	113.3	112.3	109.1
	EU27	114.3	115.2	106.7
SO/AWU	EU10	180.1	137.6	127.7
	EU17	147.0	131.5	127.3
	EU27	156.6	132.8	118.6
SO/Farm	EU10	175.3	122.7	127.2
	EU17	148.6	124.8	125.9
	EU27	155.8	120.7	116.0

Source: author's calculations based on the EUROSTAT data

The dynamics of area productivity in all three farm categories of the EU-10 (total, small and specialized small farms) exceeded that of those of the EU-27 with increasing relative competitiveness showing only a little difference between farm categories in the EU-10. Growth of labour productivity shows the same tendency with a higher amount of divergence in the EU-10 (Table 2). However, the dynamics of the total productivity of

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specialized small farms of the EU-10 exceeded that of the EU-27, providing evidence that the growth of per farm SO of specialized small farms in the EU-10 helped slow down the decline of number of farms; in the meantime, these farms were able to increase their AWU relative to small farms and to all farms in general.

Conclusions

The decrease in number of small farms and of specialist small farms was higher in the EU-17 than in the EU-10 between 2005 and 2013. Based on this paper's analysis the original hypotheses were approved or rejected as follows:

- Hypothesis 1: Share of number of specialized small farms in small farms category does not decline. Approved.
- Hypothesis 2: Specialization of small farms has regional characteristics. Partly approved. In case of specialized poultry and pig farms it is approved but rejected in cereals, oilseeds and protein crops small farms.
- Hypothesis 3: Specialized small farms have higher growth in labour productivity than non-specialized small farms. Rejected.
- Hypothesis 4: Increase of area productivity of specialized small farms exceeds that of non-specialized small farms. Rejected.
- Hypothesis 5: Growth rate of production output of specialized small farms is higher than that of non-specialized small farms. Approved.
- Hypothesis 6: Specialization offers better ground for survival for small farms. Approved. Number of specialized small farms declined less when compared to that of small farms.

Small farms found further specialization as a means for survival in the EU-10 generally. A move towards a specialist orientation of small farms was in the frontline in Lithuania, Bulgaria and Romania, while the number of small, specialized farms declined in all 9 farm types in the Czech Republic and in 8 types in Slovakia. The CAP 2020 intends to increase support to small farms but how farms fare very much depends on how Member States will see value, role and further development of small farms.

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ACCURACY OF ECONOMIC SITUATION PROJECTIONS IN THE POLISH AGRICULTURE

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Abstract. The aim of the article is to estimate a degree of compatibility of economic situation projections in the Polish agriculture with opinions on actual changes expressed at the end of the forecast period by farmers. The article includes a graphic analysis and statistical indicators designed for estimating the accuracy of economic situation projections. In Poland in the years 2012-2015 the balances of the farmers' projections of the general situation of farms and their profitability and the balances of evaluations of the real economic situation were negative. The values of projection balances were always greater compared with the values of the subsequent evaluations. The highest accuracy of projections of the general situation of farms and the production profitability pertained to the direction of the economic situation changes. The indicators of the compatibility of the economic situation balance sign almost always equalled to one. The worst projections concerned the similarity of the tendency of the analysed categories. In most cases, the correlation coefficients of projection and opinion were low or very low. The analysis proved that the Polish farms much better predict the future economic situation on a qualitative basis than on the quantitative basis. This complies with the logical analysis of people's behaviour and with empirical research.

Key words: projection, business surveys, agriculture.

JEL code: C19, E37, Q19

Introduction

One of the most fundamental functions of entrepreneurs is to predict the direction, dynamics and force of changes in the environment of their enterprises (Drucker, 2014). The proper prediction results in increasing the effectiveness of the market competition and improving the profitability. This rule also refers to farmers. The mainstream economists want projections to forecast changes to the analysed categories in a precise time and quantity manner. As a result of the complexity of the economic processes, the predictions based on the qualitative-nature measures become increasingly popular. The key method of this type is the business survey. In Poland the business survey has been surveying the agricultural situation since 1992 by the Institute of Economic Development of the Warsaw School of Economics (Szajner, Walczyk, 2015) and since 2012 by the Central Statistical Office (Koniunktura…, 2015).

This article is of an empirical nature. It aims at evaluating a degree of compatibility of economic situation projections in the Polish agriculture with the opinions on actual changes expressed at the end of the projection period by the farmers.

The surveys were conducted in the years 2012 - 2015. This article is based on the original data provided by the Central Statistical Office.

The research methods employed in this article include the graphic analysis and statistical indicators designed for evaluating the accuracy of the economic situation projections. They apply to the compatibility of the economic situation balance sign, the economic situation balance change direction, and the harmonised data.

Economic situation research methods

It is complicated to study the current and future economic situation in the economy and its individual sectors. This complexity is affected by a vast number of factors impacting upon the economic processes, the variable force and direction to their impact, and the complex and variable relations between the analysed category and the factors explaining its course. The key research methods analysing changes in the companies' economic activity are economic situation barometers, business surveys, econometric methods, balance methods, and expert methods (Lubinski, 2004). In practice, the first two methods are most frequently applied in the sector research.

The economic situation barometer is an index comprising respectively selected economic indicators that enable the observation of the current economic situation and the forecasting of its changes (see Matkowski, 2004). The example of parallel indicators is changes to the industrial production, retail sale, and employment. Whereas, leading indicators include changes, for example, to new orders, stock exchange indexes, and money supply. The reference category that describes fluctuations of the business economy is most frequently the gross domestic product. The forecasting based on the economic situation barometer is primarily of a quality nature. It means that it primarily attempts to indicate the direction of future

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changes and considers the pace of those changes to be of minor importance. The obvious advantage of this measure is its comprehensible and clear structure and simple usage. It has, however, disadvantages. The key reservations about the economic situation barometer are (1) a lack of the theoretical justification for selecting variables for the complex index. This selection is conducted on the basis of statistical correlations; (2) a problem pertaining to statistical data. Time series data are recommended to be long. On the other hand, it is pointed out that no attention should be paid to the historical course of fluctuations.

The business survey is based on opinions of entrepreneurs and consumers in order to evaluate the present and predicted economic situation. This survey is most frequently used in economic sectors such as industry or agriculture. It differs from the economic situation barometer as it only uses entities' subjective responses about changes to the business situation. The business survey, similarly to the barometer, is a qualitative measure (Kowalczyk, 2011). The qualitative information constitutes an important addition to quantitative data (Business ..., 2006). The business survey is voluntary for the respondents. The questions have usually three simple responses: increase, no change, and decrease. Following the answers, the percentage share of each answer is calculated and the balance, i.e. the difference between positive and negative grades, is determined. The balance may range from -100 to +100. The most important advantages of the business survey are the timeliness of information, regularity of opinions, and simplicity of analysis. On the other hand, the key disadvantages are the absence of theoretical principles, the vulnerability of qualitative data to changes to the environment of companies, and the subjectivism of responses (Rog, Strzala, 2011).

Business survey used in the study

The accuracy of projections of processes taking place in the Polish agriculture is evaluated according to the data obtained from the business survey conducted by the Central Statistical Office (Badanie ..., 2012). This is a survey-based test carried out in farms every six months, i.e. in June and December of each year. The farmers express their opinions on the past (the end of the half-year period) and the current economic situation in their farms and forecast its changes within the next half-year period.

The survey covered all (over 2.5 thousand) farms run by legal persons and organisational entities without legal capacity, and a randomly chosen group of individual farms (25.5 thousand) whose economic size exceed EUR 4 thousand (in 2012 - over EUR 2 thousand). This group represents over 850 thousand individual farms exceeding the aforesaid economic size. Most of the analysed farms (57.6%) had the agricultural area of 2-10 ha. The average area of the analysed farms equalled to 13.7 ha. The most farms were run in a traditional way, i.e. without any distinctive production channelling (47.7% of the total farms). About 40% of the farms were involved in the plant production, whereas 12.1% of the total analysed farms specialised in the animal production.

For the analysed single-choice survey questions, a simple economic situation indicator, the so-called balance of responses, was calculated:

1st stage - the aggregation of the number of indications to each of three response variants: positive (+) which means that the farmer believes that his or her economic situation has improved, neutral (=) which means that the economic situation has not changed, and negative (-) when the economic situation of the farm has worsened;

2nd stage - the calculation of the three response variant structure amounting to 100%;

3rd stage - the assessment of the balance of responses as a difference between the percentage share of positive responses (+) and the percentage share of negative responses (-).

The balance of response does not consider the neutral variant.

The calculated balance informs about the advantage of the obtained positive opinions over negative ones (if the balance is positive) or negative over positive ones (if the balance is negative) (Badanie ..., 2012).

Statistical methods of the projection accuracy evaluation

The evaluation of the accuracy of the economic situation projection in the Polish agriculture is conducted according to four statistical measures (y_t means the economic situation evaluation (balance) at the end of the t period, and y_t^* means the economic situation projection regarding to the t period; t = 1, ..., N, where N is a number of data for which the projections and the evaluations are compared) (Guzik, 2009):

1) compatibility of the economic situation balance sign:

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$$M_S = \frac{1}{N}\sum_{t=1}^{N} s_t , \quad (1)$$

$$s_t = \begin{cases} 1, \text{if } y_t \text{ and } y_t * \text{have the same sign} \\ 0 \text{ otherwise} \end{cases} .$$

The value of the M_S indicator shows the compatibility of the development direction of the evaluated quantity with the predicted direction. If M_S = 1, there is a full compatibility.

1) compatibility of the direction of the economic situation balance sign:

$$M_D = \frac{1}{N}\sum_{t=1}^{N} d_t , \quad (2)$$

$$d_t = \begin{cases} 1, \text{if increments } (y_{t+1} - y_t) \\ \text{and } (y_{t+1}{}^* - y_t{}^*) \text{ have the same sign} \\ \\ 0 \text{ otherwise} \end{cases}$$

.

The M_D indicator shows how often the changes to balances of the evaluations and the projections were unidirectional.

2) compatibility of the economic situation level:

$$M_L = \frac{1}{N}\sum_{t=1}^{N} l_t , \quad (3)$$

$$l_t = \begin{cases} 1, \text{ if } y_t - y_t{}^* \le |\Delta| \\ 0 \text{ otherwise} \end{cases} .$$

The M_L indicator measures the compatibility of the projected and evaluated force of phenomenon changes. This study provides that the projection and evaluation of the economic situation are similar, if the difference in their balances does not exceed 10 points (Δ = 10 or 10% of the boundary).

3) correlation coefficient r.

The evaluation of the data harmonisation concerning the yt* projections and the opinions about the situation in the past period yt is carried out by means of a simple correlation coefficient (Sobczyk, 2014). If the correlation coefficient r > 0, both series have the same direction, that is they are harmonised. When r < 0, both series have different development directions, so they are not harmonised.

Evaluation of the accuracy of projections of the general situation of the farms

The compatibility of the half-year projections of the general situation of the farms in Poland in the period from June 2012 to June 2015 with the evaluation of the general situation in the past half a year conducted by those farms begins from the graphical analysis.

Figure 1 shows the balances of responses obtained during the business surveys. These balances only include positive and negative responses. The data analysis proves that in the entire analysed period the balances referring to the evaluation of the farmers' real economic situation and to the projections were negative. The average evaluation balances equalled to -23.1 and the projection balances amounted to -10.1. The lowest balances of the evaluations and the projections were observed in June 2015. Those data prove the advantage of the farmers' pessimistic opinions over optimistic opinions on the real economic situation in agriculture and on perspectives of their farms. In the entire analysed period the most farmers neutrally evaluated the past half a year and predicted the next half year. In each survey, the number of neutral opinions exceeded 50% of the responses and in some periods this number was over 70% of the responses (Koniunktura…, 2015).

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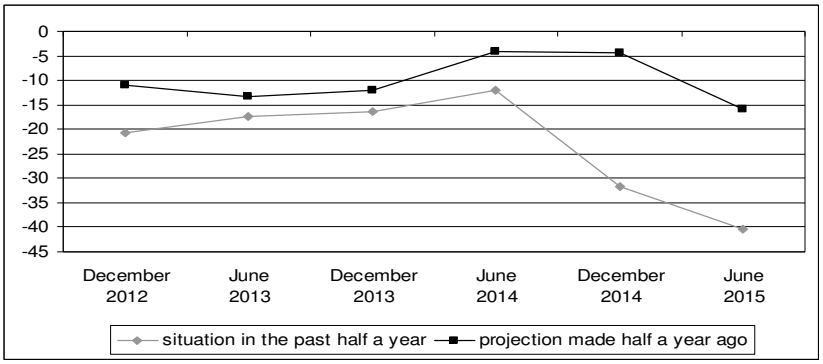

Source: authors' calculations based on Koniunktura...,2015

Fig. 1. **Evaluation of economic situation in the t- period and its projection made a half year ago**

The interesting observation is that in all the analysed half-year periods the values of balances of the general economic situation of farms have been greater for projections than for any evaluations of the general situation formulated at a later date. This proves that the farmers are less pessimistic when projecting or excessively pessimistic when evaluating the economic situation at the end of the half-year period. More negative evaluations may result from the farmers' subjective opinions and the actual deterioration of the economic situation in the Polish agriculture. The identical dependencies were also observed in other sectors of the Polish economy (Guzik, 2009, Kazmierska-Zaton, Zaton, 2014). The general adjustment of the course of projections to the evaluations until the first half of 2014 was good. However, they considerably deteriorated at a later date.

Following the graphic analysis, the quality of predictions obtained from the economic situation surveys concerning the general conditions of the farms will be evaluated more formally, that is by using statistical indicators. The general projections and opinions of particular farm groups (total farms, plant production-oriented farms, animal production-oriented farms, and multidirectional farms) will be examined.

In the years 2012-2015 the compatibility of the economic situation balance sign for most types of the farms equalled to 1 (Table 1). This proves the complete compatibility of the direction of the evaluated development of the farms' general situation with the previously predicted direction. It was, however, slightly lower for the farms specialising in the animal production due to a symbolic positive value of the balance of positive and negative responses obtained in June 2014. The analysed data show that the Polish farmers almost always declared their negative attitude towards the changes in agricultural markets.

Another key measure used to evaluate the results of the business survey which - as a qualitative method - concentrates on the direction of changes to the analysed categories, is the compatibility of the economic situation balance change direction. For all the analysed types of the farms this indicator equalled to 0.8. This is a high value. This proves that 80% of the farmers' predictions of and opinions on the dynamics of changes to the general situation of all the farms were unidirectional. Consequently, the farmers were able to predict correctly the direction of the situation changes in the Polish agriculture to a greater extent.

Table 1

Values of the accuracy of farm general situation projection measures

Compatibility measure	Farms			
	Total	**Plant production**	**Animal production**	**Multidirectional farms**
Balance sign	1	1	0.83	1
Direction of balances	0.8	0.8	0.8	0.8
Level of balances	0.67	0.67	0.50	0.50
Correlation	0.33	0.29	0.55	0.28

Source: authors' calculations based on the data of the Central Statistical Office.

The following measures are employed to support the evaluation of the business survey data: the economic situation level compatibility indicator and the correlation coefficient that is the measures that take quantitative changes into account. In the analysed period, the economic situation level compatibility

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indicator (the prediction and evaluation were assumed to be at a similar level, if the difference between their balances is not greater than 10 points) was the highest for the total farms and for the plant production-oriented farms and amounted to 0.67 (Table 1). This is a relatively good effectiveness of the quantitative-based projections. However, it would be considerably worse provided that the difference in balances did not exceed 5 points.

The poor accuracy of the quantitative-based projections made six months ago is proved by the correlation coefficient data. It may be concluded that only animal production-oriented farms were able to predict effectively on a moderate basis. The Pearson correlation coefficient calculated for the projections and opinions expressed at the end of the past half a year amounted to 0.55. The low quality of projections complies with the assertions of the opponents of the rational expectation hypothesis (O'Driscoll, Rizzo, 1996). They prove that entities, in their projections, are not able to expect correctly the development of the situation in the industries and the entire economy on a current basis due to their subjectivism, and limited and dispersed knowledge. They primarily formulate their projections on the basis of the evaluations of the current and past situation. This opinion is proved by statistical research. The Pearson correlation coefficient for the projections and the evaluations of the Polish farms' general situation formulated in the same period for the total farms amounted to 0.92, 0.82 for the plant production-oriented farms, 0.98 for the animal production-oriented farms, and 0.92 for multidirectional farms. Those figures prove the very strong relationship between the current evaluations and projections of the situation in the agriculture.

Effectiveness of projections of the agriculture production profitability

Identical to the comparison of the evaluations and the projections of the general situation of the Polish farms, all the balances of positive and negative responses obtained from the business survey and referred to the agricultural production profitability were negative (Fig. 2). In the entire period of 2012-2015 the level of those balances was considerably lower than those referring to the general situation of the farms. The average evaluation balances amounted to 39.3 whereas the average projection balances -16.3. The farmers' considerable pessimism which deepened in the second half of 2014 referred to the projections concerning the forthcoming period covered by the survey and to the assessment of the ending half year. The actual changes to the production profitability were particularly negatively assessed. Since then the negative responses have been greater even compared with the neutral opinions. In the first half of 2015 they equalled 70% of all the responses. The key reasons for this situation were sharp declines in prices for basic products manufactured by the farms. This particularly affected products of animal origin. Those changes were a consequence of the increased supply of agricultural products, the decline in prices in the global markets and the Russian restrictions on food import from the European Union, including Poland (Rolnictwo…, 2015, Ceny…, 2015). The decrease in prices for the agricultural products was accompanied by the increase in prices for lands and agricultural production means or by their slight decline that primarily affected all prices for mineral fertilisation and energy products.

In the analysed years of the production profitability projections were systematically higher than the farmers' opinions on the ending half year. The Polish farmers always had more hope for the better situation in the future than it turned out later.

The calculations included in table 2 show that the compatibility indicator of the economic situation balance sign for all types of the farms equalled one. The evaluations made by the total farms, plant production-oriented farms, animal production-oriented farms, and multidirectional farm that refer to the actual direction of the development of the agricultural production profitability completely complied with the projected direction. Unfortunately, those evaluations and projections were always negative. Only the level of this critical approach in specific half-year periods changed.

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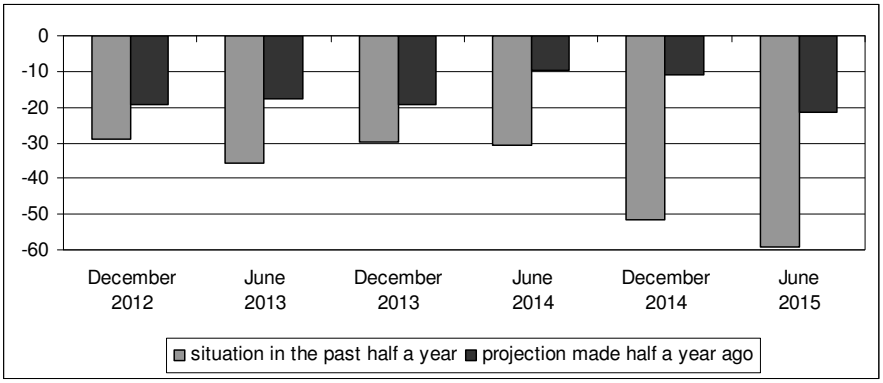

Source: authors' calculations based on Koniunktura...,2015

Fig. 2. **Evaluation of agricultural production profitability in the t period and its projection made at the beginning of the t-period**

Table 2

Values of measures of agricultural production profitability projection accuracy

Compatibility measure	Farms			
	Total	Plant production	Animal production	Multidirectional farms
Balance sign	1	1	1	1
Direction of balances	0.4	0.6	0.8	0.2
Level of balances	0.17	0.17	0.33	0.17
Correlation	0.08	0. 01	0.45	0.07

Source: authors' calculations based on the data of the Central Statistical Office

In Poland, in the analysed period the compatibility indicator of the economic situation balance change direction for the analysed types of the farms was considerably diversified. The highest value was obtained by the animal production-oriented farms (0.8), whereas the lowest one was acquired by non-specialised farms (0.2). For the animal production-oriented farms the changes to the evaluations and the projections were almost always unidirectional. Therefore, the high compatibility of dynamics of changes to opinions on the actual and forecast development of the agricultural production profitability was observed. This high level of the indicator is a result of several reasons. The animal production-oriented farms are highly specialised. Their range of products is usually limited. Their owners must have profound knowledge on the agricultural technology and economics. Further, they have to analyse a fewer number of the detailed agricultural markets compared with the multidirectional farms. They often observe only one market, so they know it better. All this makes their predictions more accurately.

In the years 2012-2015 the accuracy of the half-year production profitability projections with respect to quantitative changes in all types of the analysed farms was very low. This is proved by the economic situation level compatibility indicators and the correlation coefficients (Table 2). The economic situation level compatibility indicator was the highest for the animal production-oriented farms (0.33). This means that only 33% of the predictions about the force of changes to the analysed profitability were in compliance with the opinion on the actual force of changes. If the approved difference in balances does not exceed 5 points, the economic situation level compatibility indicator for most types of the farms equalled to zero.

For most of the analysed types of the Polish farms the correlation coefficient of the projections and of the subsequent evaluations was nearly zero. Therefore, there is no connection between the projections on profitability formulated just before the beginning of the half-year period and at the end of that period. The projections were mainly affected by the current production profitability evaluations. Most of the Pearson correlation coefficients for the projections and for the evaluations formulated in the same period were greater than 0.8. The exception was the plant production-oriented farms.

Conclusions

In Poland in the years 2012-2015 the balances of the farmers' the half-year projections of the general situation of farms and their profitability and the balances of evaluations of the real economic situation

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were negative. This proves the general pessimism of the farmers.

The examination showed that the projections concerning the development direction and the dynamics of changes to the general situation in the agriculture made by all types of the farms covered to a great extent with the opinions on the changes on the actual situation of the farms. The indicators of the economic situation level compatibility were average. In most cases the correlation coefficients of the projections and the opinions were low (from 0.28 to 0.55).

For all types of the farms the evaluations on the actual direction of the development of the agricultural production profitability were in full compliance with the predicted direction. Whereas, the remaining measures prove that the accuracy of the half-year projections of most types of the farms were low or very low. The correlation coefficients of the projections and the subsequent evaluations for most types of the farms were almost zero.

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SPATIAL DIVERSITY OF FARMS BY SIZE AND REGION IN POLAND AND GERMANY

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Abstract. The aim of the article is to present spatial differentiation of changes in the agrarian structure of Poland against changes in the agrarian structure of Germany, with more attention paid to East Germany due to its socialist past. An important element of the paper is to show the nature, pace and direction of changes in the agrarian structure as well as development trends of farms in Poland and East Germany. The time scale of the study covers 2002-2010. The studies show that the agrarian structure in Poland is more fragmented than in Germany. Very small farms (1-5 ha) in northern and western Poland, which make up to 40.0% of the total, do not have the conditions for the efficient use of labour and an adequate income to keep a family and support development. Poland's adoption of the EU's Common Agricultural Policy and the implementation of the Rural Development Programme (2007-13) influenced changes in farm size in northern and western Poland, and - above all - provoked a decline in the number of small farms (by 24%) while increasing average farm size (from 12 to 16 ha). Slow changes in Polish agriculture are the result of the clash of two forces. On the one hand, economic trends seek to concentrate farmland and make better use of its internal potential, while on the other, psycho-social trends put an emphasis on providing jobs in rural areas.

Key words: agriculture, agrarian structure, rural development, Poland, Germany
JEL code: N5, N53

Introduction

A characteristic feature of Poland's agriculture is excessive agrarian fragmentation, much higher than in West European countries. As a result, most farms are not able to generate the economic strength which would allow adjustment to the new conditions of the agricultural commodity market of the European Union. Small farms (on average 9.6 ha of agricultural land) are weaker economically, which significantly affects the scale and volume of their production. According to the Agricultural Census of 2010, small farms up to 5 ha accounted for as much as 58% of all farms and comprised 20% of agricultural land; such farms were most numerous in the voivodeships of Podkarpackie, Malopolskie and Swietokrzyskie. Medium-sized farms (over 20 ha) accounted for 7% of farms covering 26% of agricultural land. The consequences of agrarian fragmentation include small scales of production, high employment in agriculture and low profitability of agricultural production. Poland's accession to the European Union meant that Polish agriculture became a part of the Single European Market. The liberalisation of the agricultural market intensified competition and thus forced agricultural production to be undertaken at an appropriate scale. To cope with the new challenges of the agricultural market, the size structure of Polish farms should change in favour of larger ones. Meanwhile, the agrarian structure in Poland is pejoratively referred to as "archaic and outdated, not congruent with the requirements of the food industry" (Jezierska-Thöle, 2012).

Agronomics plays an important role in the national economy of Germany, although its share is only 0.6% of the GDP (half of the EU average). Agriculture is an important branch in the weaker eastern federal states of Germany, from where 26.6% of the German agricultural production comes. Furthermore, German agriculture shows a high concentration of agricultural land, especially in the eastern federal states (Mecklenburg-Vorpommern, Sachsen). The dominance of large-scale farms makes Germany (after France) the most important agricultural producer in the EU (EUR 50 billion annually), while exports of agricultural products make up 5.4% of German exports.

The aim of the article is to present spatial differentiation of changes in the agrarian structure of Poland against changes in the agrarian structure of Germany, with more attention paid to East Germany due to its socialist past. An important element of the paper is to show the nature, pace and direction of changes in the agrarian structure as well as development trends of farms in Poland and East Germany.

1. Area of study and research assumptions

In order to capture structural changes in Polish agriculture, and determine the nature and pace of development, a comparative analysis was conducted with Germany, a country which has a high proportion of

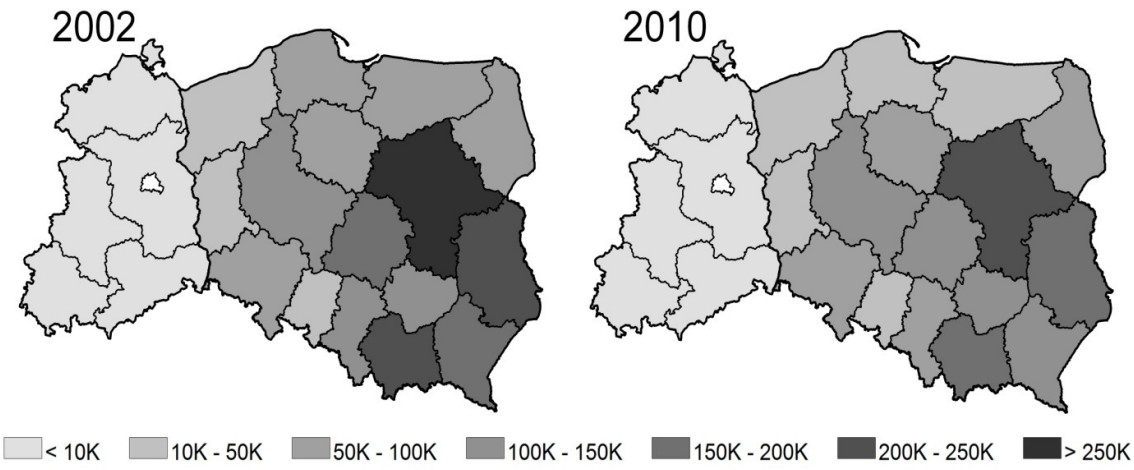
the EU's agricultural production (13.1%). The choice of East Germany for a comparative analysis was associated with similar natural as well as political and historical conditions. Both in Poland and in Germany, farmland accounts for more than half of the country's area (Poland 59.7%, Germany 52%). Poland and the eastern federal states in Germany belonged to the bloc of "eastern countries" pursuing a socialist model of farming, which aimed to enlarge the area of socialised farms in the form of cooperatives and state farms. In the former German Democratic Republic (GDR) this objective was achieved, as 94.5% of agricultural land was in the socialised sector. The private sector accounted only for 5.5% (Brem, 2001). Poland was the only country (besides the former Yugoslavia) which retained private farm property (78% privately owned). Political changes after 1989 in Poland and in the former East Germany contributed to profound changes in the structure of the agricultural economy. New processes to privatise state and cooperative farms, unheard in the economic history of Europe were put into action (Hoffman, 1993). The unification of Germany into a single state in July 1990 within the framework of Economic and Monetary Union triggered a series of measures to improve the economy of the agricultural sector, including the adoption of a new privatisation law and the introduction of the funding system under the EU's agricultural policy. In Poland, the implementation of the Common Agricultural Policy started only upon entry into the EU in 2004 (Jezierska-Thöle, 2010).

The time scale of the study covers 2002-2010, i.e. both the preparation of Polish agriculture for accession to the EU and, since 2004, the period of commissioning and implementing Common Agricultural Policy tools.

2. Changes in the number of farms by size groups

In 2010, the total number of farms in Poland (including those with up to 1 ha of agricultural land) was 2 277 613. In comparison with 2002 the number had fallen by 22.8%. Farms occupied 15 503 000 ha of agricultural land. The number of farms over 1 ha decreased by 20% to 1 562 605. According to Banski (2006) and Rudnicki (2010), the improvement in the size of farms has been very slow because the pace and nature of the changes are affected by both the economic and the social situation, as well as state agricultural policy and the Common Agricultural Policy. In Germany, as in Poland, during the study period there was a decrease in the total number of farms from 420 697 to 299 134, i.e. by 28%. In 2010, the agrarian structure showed that very large farms formed the largest group (25.8%) (Figure 1).

Another big group were large farms (25.5%). The proportion of small farms accounted for just 9%. The farm size structure in Germany is inversely proportional to Poland.



Source: author calculations based on previous original research (Janzen, Jezierska-Thole & Rudnicki, 2014)

Fig. 1. **The number of farms in Poland and East Germany in 2002 and 2010 (in thousands) by region**

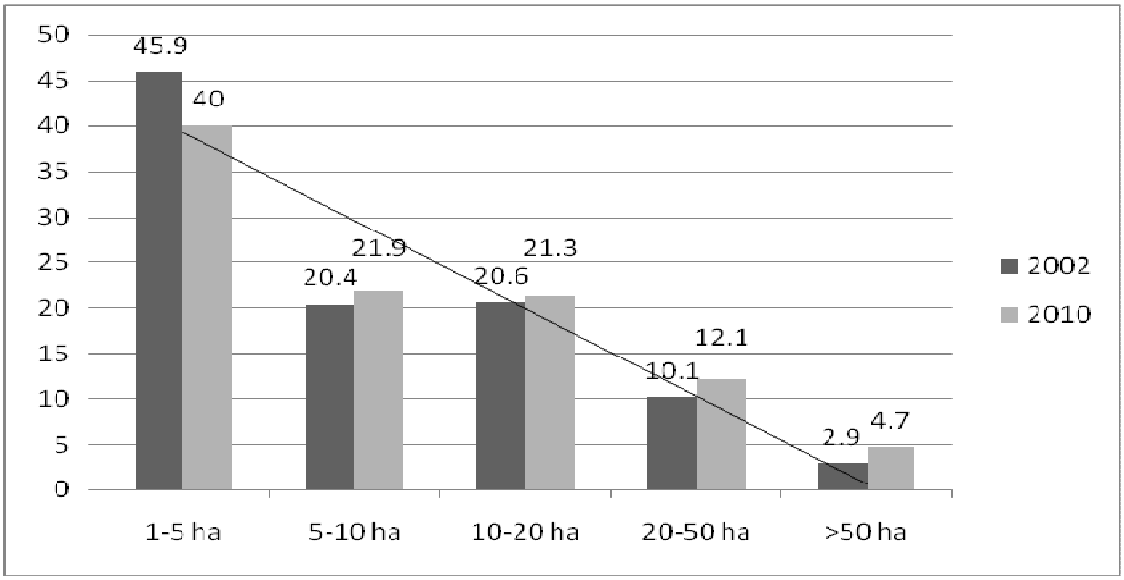
A comparative analysis of changes in the number of farms shows a decrease; this occurred more strongly in northern and western Poland (76 pts). The number of farms dropped from 817 100 to 620 600 i.e. by 24%. In East Germany, the number of farms decreased from 30 100 to 24 400, i.e. by 19%. The decrease in the number of farms varied spatially. By voivodeship, the biggest changes were recorded in Opolskie (60 pts) and

Zachodniopomorskie (68 pts), followed by the federal state of Thüringen (72 pts). Moreover, the region of Zachodniopomorskie recorded the highest increase in private farms, which could be a result of the incorporation of small individual farms into larger ones. The smallest decline was recorded in the federal states of Mecklenburg (90 pts) and Sachsen-Anhalt (85 pts), in which economically strong stabilised farms have an average area of 286 and 278 ha respectively. A smaller rate of change was recorded in the voivodeships of Wielkopolskie and Warminsko-Mazurskie (81 pts each), where the average farm size was 14.2 ha and 19.4 ha, respectively.

An important element for the economic development of farms is to improve the agrarian structure of agricultural holdings. Meanwhile, on the basis of Figure 2, it can be noted that individual size groups show a declining trend in northern and western Poland, while increasing in East Germany.

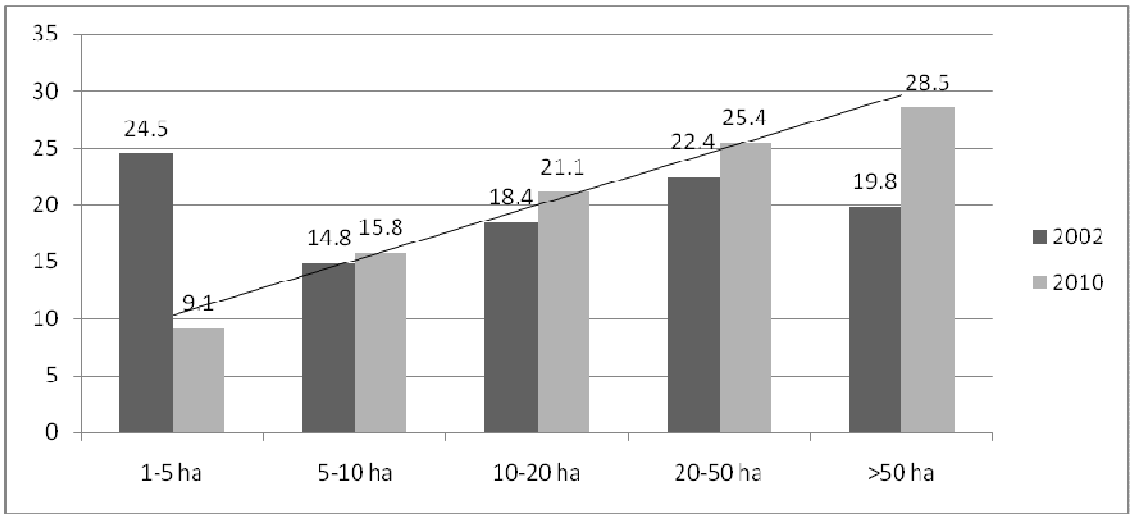
In 2002-10, in northern and western Poland little change was recorded in the number of farms in each size group. A decrease in the number of farms (-5.9%) was recorded for small farms (1-5 ha). Despite the decline in number, their proportion in the total number of farms in Poland is high and many small farms are used as a source of capital investment and intended for commercial non-agricultural purposes, e.g. for housing, recreation or different types of services. In the other groups a slight increase is noted, the largest (+2.0%) for 20-50 ha. A positive manifestation of the changes in northern and western Poland is an increase very large farms (>50 ha) by 1.8% (Figure 3).

A similar trend was observed in East Germany. Relatively big changes occurred in very large (>50 ha) and large (20-50 ha) farms where an increase was recorded, 8.7% and 3.0% respectively. However, the biggest changes were observed in very small farms (1-5 ha) in which there was a decrease by 15.4% (Situationsbericht..., 2012).



Source: author calculations based on data from the Agricultural Census, Statistical Yearbook

Fig. 2. **Changes in the proportion (in %) of farms greater than 1 ha in northern and western Poland in 2002 and 2010**



Source: author calculations based on data from the Agricultural Census, Statistical Yearbook

Fig. 3. **Changes in the proportion (in %) of farms greater than 1 ha in East Germany in 2002 and 2010**

Analysis of the proportions of farms of different sizes by voivodeship in 2010 showed large spatial variations (Table 1). The greatest proportion of small farms (1-5 ha), i.e. more than 50%, was recorded in Lubuskie and Dolnoslaskie. The smallest (below 10%) was recorded by three federal states of East Germany, i.e. Mecklenburg-Vorpommern, Brandenburg and Sachsen-Anhalt. The greatest proportion of very large farms (over 50 ha) was registered in Sachsen-Anhalt (59.2%) and in Mecklenburg (56.6%). For comparison, in northern and western Poland, the highest proportions were only 9.8% (Zachodniopomorskie) and 7.1% (Warminsko-Mazurskie) (Tab. 1).

Table 1

Changes in the proportion of farms by size by region in 2002 and 2010

Voivodeship/ Länders	2002	2010	%	2002	2010	%	2002	2010	%	2002	2010	%	2002	2010	%
	1-5 ha			5-10 ha			10-20 ha			20-50 ha			>50 ha		
Lubuskie	63.0	52.2	-10.8	15.2	18.4	3.2	12.1	14.6	2.4	6.6	8.8	2.3	3.1	6.1	3.0
Wielkopolskie	41.3	38.4	-2.9	23.6	24.5	0.8	23.9	23.5	-0.4	9.3	10.8	1.5	1.9	2.9	1.0
Zachodnio-pomorskie	49.6	41.0	-8.6	16.0	17.9	1.8	18.0	18.5	0.5	10.6	12.9	2.3	5.8	9.8	4.1
Dolnoslaskie	58.2	52.1	-6.2	19.9	21.4	1.5	13.3	14.4	1.1	6.1	7.7	1.7	2.6	4.4	1.8
Opolskie	56.2	45.8	-10.4	19.2	20.5	1.3	14.3	17.1	2.8	7.8	11.6	3.8	2.5	5.0	2.5
Kujawsko-pomorskie	35.2	32.1	-3.0	24.0	24.3	0.3	25.9	25.2	-0.7	12.8	14.9	2.1	2.2	3.5	1.3
Pomorskie	43.8	37.7	-6.1	19.9	22.2	2.4	22.3	23.0	0.7	10.8	12.3	1.5	3.3	4.8	1.5
Warminsko-mazurskie	35.9	30.8	-5.1	15.1	17.2	2.1	26.5	25.6	-0.9	17.9	19.4	1.5	4.6	7.1	2.4
North-Western Poland	45.9	40.0	-5.9	20.4	21.9	1.5	20.6	21.3	0.6	10.1	12.1	2.0	2.9	4.7	1.8
Brandem-burg	23.5	8.1	-15.4	11.2	12.8	1.6	12.3	14.7	2.4	14.5	16.6	2.2	38.5	47.7	9.2
Meklem burg - Vorpommern	16.9	5.8	-11.1	9.6	11.1	1.5	11.0	12.5	1.5	11.9	13.9	2.0	50.6	56.6	6.1
Saksen	33.4	12.1	-21.3	13.9	18.9	5.0	14.6	18.7	4.1	12.7	16.3	3.6	25.4	34.0	8.6
Saksen-Anhalt	20.6	7.2	-13.4	8.0	9.1	1.1	9.4	10.6	1.2	11.1	13.9	2.9	51.0	59.2	8.3
Türingen	33.9	11.1	-22.8	15.2	17.5	2.3	12.9	19.1	6.2	9.3	13.6	4.3	28.7	38.7	10.0
East Germany	26.3	9.0	-17.3	11.8	14.1	2.3	12.3	15.2	2.9	12.1	15.1	3.0	37.4	46.5	9.1

- decrease; + growth; 0 - no change

Source: author calculations based on data from the Agricultural Census, Statistical Yearbook

In 2010, in northern and western Poland small and very small farms (1-10 ha) dominated (42.6%), while in East Germany it was large and very large (>50 ha) farms constituted 46.5%. For medium-sized farms (10-20 ha), the largest proportion was recorded in the northern voivodeships: in Warminsko-Mazurskie (25.6%), Kujawsko-Pomorskie (25.2%), Pomorskie (23.0%) and Wielkopolskie (23.5%). Nationally, the

proportion of these farms was 23.5%. The proportion of large farms (20-50 ha) in the agrarian structure of Poland was 6.2%, greatest in the northern part of Poland: Warminsko-Mazurskie (19.4%), Kujawsko-Pomorskie (14.9%) and Pomorskie (12.3%); as well as in western Poland - Zachodniopomorskie (12.9%). For very large farms (>50 ha), the greatest proportion (over 50%) was recorded in East Germany in the federal states of Sachsen-Anhalt (59.2%) and Mecklenburg-Vorpommern (56.6%). A relatively high proportion of these farms was recorded in Brandenburg (47.7%) and Thuringia (38.7%). In Poland, however, the proportion of very large farms was recorded within the former Prussian partition and in the area which had the large proportion of socialised agriculture in the previous period, i.e. in Zachodniopomorskie (9.8%), Warminsko-Mazurskie (7.1%), Lubuskie (6.1%) and Pomorskie (4.8%), as well as in Opolskie (5%) and Dolnoslaskie (4.4%).

3. Changes in farm size

In 2010 the area of agricultural land in Poland amounted to 15.5 million ha. Compared with 2002, this had decreased by 7.6%. In Germany farms covered 16.7 million ha; compared to 2002 this had decreased by 1.8%. Comparative analysis of changes in farm sizes in 2002-10 shows a decrease in the total area of agricultural holdings in northern and western Poland by 5.0%. In East Germany the decrease was insignificant and amounted to 0.1%. The greatest rate of change was recorded for very small farms. Here there was a decrease in all the surveyed voivodeships in Poland and federal states in East Germany, and was highest in Opolskie (-37.2%) and Zachodniopomorskie (-32.0%). Similarly, a decrease was recorded by medium-sized farms (5-10 ha), with the exception of Mecklenburg and Sachsen, in which increases by 5.2% and 4.5% respectively were recorded. Northern and western Poland also recorded a decline in this group of farms (10-20 ha) by -11.2%. The increase in the proportion of very large (>50) and large (20-50) farms was observed across the entire study area, with the exception of Brandenburg (-5.1%), Sachsen (-1.0%) and Pomorskie (-1.0%) (Table 2).

Table 2

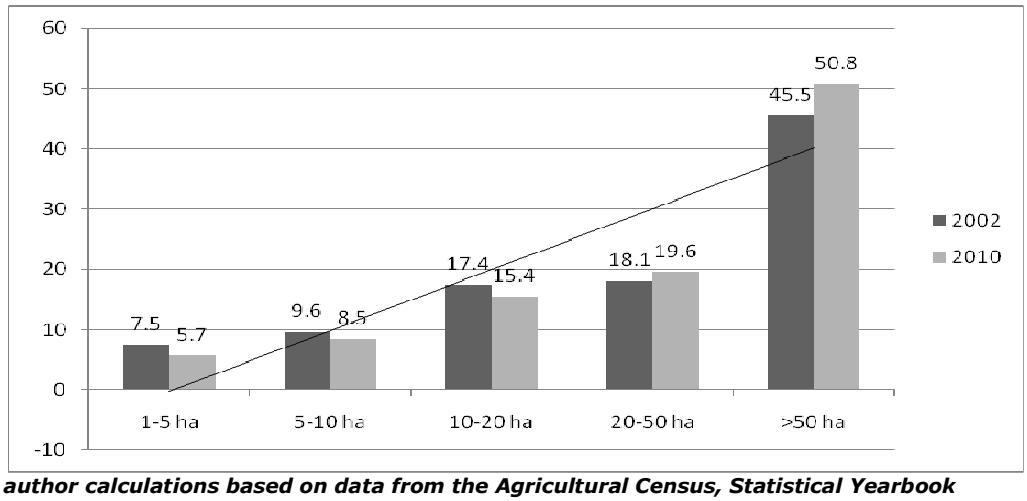
Changes in the proportion of farms by size and region in 2002 and 2010

Voivodeship/ Länders	2002	2010	%	2002	2010	%	2002	2010	%	2002	2010	%	2002	2010	%
	1-5 ha			5-10 ha			10-20 ha			20-50 ha			> 50 ha		
Lubuskie	9.1	6.6	-27.2	7.4	7.0	-5.1	11.0	10.7	-3.0	14.0	14.2	1.6	56.1	61.5	9.6
Wielkopolskie	8.0	6.8	-15.1	13.6	12.5	-8.1	25.1	22.7	-9.6	19.9	22.0	10.6	31.8	35.8	12.4
Zachodnio-pomorskie	5.0	3.4	-32.0	4.8	4.4	-7.8	10.8	8.7	-19.4	12.2	13.4	9.7	65.8	70.1	6.5
Dolnoslaskie	10.6	8.5	-19.9	11.4	10.3	-9.7	14.1	13.1	-7.2	13.8	15.7	13.6	47.3	52.4	10.7
Opolskie	10.0	6.3	-37.2	10.5	8.2	-21.9	14.7	13.3	-9.6	16.8	19.6	16.6	45.1	52.5	16.4
Kujawsko-pomorskie	6.6	5.2	-20.8	13.1	11.2	-14.8	25.5	22.3	-12.7	25.9	27.7	6.9	27.3	33.4	22.3
Pomorskie	6.7	5.1	-23.9	9.7	8.7	-10.6	19.6	17.2	-12.3	19.7	19.5	-1.0	43.0	49.3	14.7
Warminsko-mazurskie	3.7	3.3	-11.7	6.4	5.4	-16.0	18.2	15.5	-14.9	22.4	24.6	9.9	47.8	51.2	7.1
North-Western Poland	7.5	5.7	-24.3	9.6	8.5	-12.0	17.4	15.4	-11.2	18.1	19.6	8.3	45.5	50.8	11.5
Brandemburg	0.3	0.3	-6.3	0.4	0.4	-4.8	0.9	0.9	-0.4	2.4	2.3	-5.1	96.0	96.4	0.4
Meklemburg - Vorpommern	0.2	0.2	-4.5	0.3	0.3	5.2	0.6	0.6	1.3	1.5	1.6	5.5	97.4	97.5	0.0
Saksen	0.7	0.7	-7.4	0.9	0.9	4.5	1.9	1.9	-0.6	3.6	3.5	-1.0	92.9	93.5	0.6
Saksen-Anhalt	0.2	0.2	-9.2	0.2	0.2	-3.1	0.6	0.6	-2.5	1.6	1.6	5.0	97.4	97.5	0.1
Turingen	0.6	0.6	-4.2	0.7	0.6	-17.1	1.2	1.3	6.3	1.9	2.0	5.9	95.6	96.1	0.5
East Germany	0.4	0.4	-6.2	0.5	0.5	-3.0	1.0	1.0	0.8	2.2	2.2	2.0	95.9	96.2	0.3

- decrease; + growth; 0 - no change

Source: author calculations based on data from the Agricultural Census, Statistical Yearbook

A characteristic feature of changes in farm size in northern and western Poland is a drop in farms from 1 to 20 ha and an increase of those over 20 ha (Figure 4).



Source: author calculations based on data from the Agricultural Census, Statistical Yearbook

Fig. 4. **Changes in the proportion (in %) of farms greater than 1 ha in northern and western Poland in 2002 and 2010**

In 2010, the structure of farms in northern and western Poland showed that more than half, i.e. 50.8%, constituted very large farms (over 50 ha). The proportion of large farms (20-50 ha) was relatively big, i.e. 19.6%. In East Germany very large farms occupied 96.2% of the total agricultural area. Very small farms (1-5 ha) covered only 0.4%. Spatial analysis of the agricultural area by region shows that in all federal states the proportion of very large farms (<50 ha) exceeded 90%, and was largest in Sachsen-Anhalt (97.5%). The proportion of very small farms was negligible and did not exceed 1%. In northern and western Poland, a proportion of farms larger than 50 ha was recorded in Zachodniopomorskie (70.0%) and Lubuskie (61.5%). While for very small farms the biggest proportion was recorded in Dolnoslaskie (8.5%) and Wielkopolskie (6.8%).

4. Changes in the average size of farms

In 2010, the average area of farms in Poland amounted to 9.8 ha. Compared to 2002, this figure had increased by 1.4 ha. Changes in the average size in 2002-10 show an increase in all categories with the exception of very large farms (>50 ha). The average farm size over 50 ha decreased from 218.4 ha to 170.3, i.e. by 48.1 ha. This decrease was associated with the transfer of agricultural land from large to family farms. The vast majority of agricultural land belongs to small and medium sized farms, which means that Polish agriculture is characterised by low productivity of labour and capital. In 2010 in Germany the average size of agricultural land per farm increased from 41.2 ha to 55.8 ha. The increase in average size occurred in all categories apart from small farms. The highest increase was observed in farms of over 50 ha from 144.2 to 150.5 ha, i.e. by 6.3 ha (Figure 5)

In 2002-2010, there was an increase in the average size of farms in the study area; in East Germany the increase was much higher and amounted to 24.4 ha, while in northern and western Poland it was by 4.0 ha. By contrast, the growth rate was higher in northern and western Poland (133 pts), which indicates possibilities for the development of agriculture. The greatest rate of change was recorded in Opolskie (148 pts) and Zachodniopomorskie (149 pts), in which the increase in average farm sizes was from 8.5 to 12.6 and from 16.6 ha to 24.8 ha, respectively. Third place went to Thuringia (139 pts) with an increase in the average area from 165.9 to 227.0 ha (Table 3).

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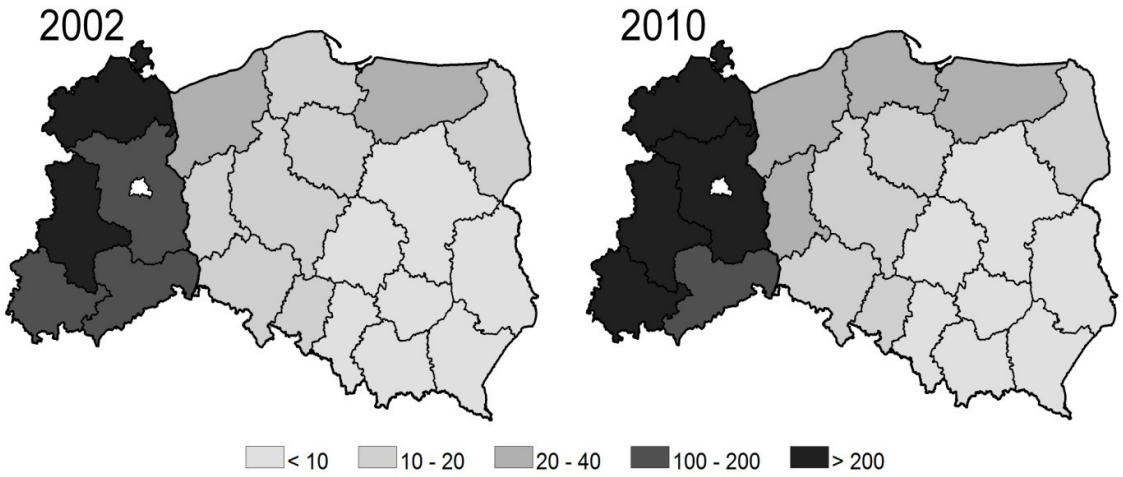

Source: author calculations based on previous original research (Janzen, Jezierska-Thole & Rudnicki, 2014)

Fig. 5. **Changes in average farm size in Poland and Germany in 2002 and 2010**

Table 3

Changes in average farm size in 2002 and 2010

Voivodeship/ Länder	2002	2010	Changes **in** ha	2002**=**100 pts
Lubuskie	10.7	13.6	2.9	127
Wielkopolskie	10.9	14.2	3.3	130
Zachodniopomorskie	16.6	24.8	8.2	149
Dolnoslaskie	7.9	10.7	2.8	135
Opolskie	8.5	12.6	4.1	148
Kujawsko-Pomorskie	11.3	15.4	4.2	137
Pomorskie	13.8	17.4	3.7	127
Warminsko-Mazurskie	16.3	19.4	3.1	119
Northern and western Poland	**12.0**	**16.0**	4.0	133
Brandemburg	195.4	235.6	40.2	121
Meklemburg – Vorpommern	266.6	294.1	27.6	110
Saksen	b.d	148.0	.	.
Saksen-Anhalt	243.3	286.2	42.9	118
Türingen	165.9	227.0	61.1	137
East Germany	**217.8**	**238.2**	20.4	109

Source: author calculations based on data from the Agricultural Census, Statistical Yearbook

The wide spatial variation in average farm size is a weakness of Poland's agricultural policy since 1989, which has further cemented the historical diversity of the agrarian structure. There were no incentive measures to increase land resources in agriculture, such as through the transfer of land from state farms. Only since 2004 have land concentration processes on a large scale been found. They were backed by CAP instruments and led to the formation of a relatively favourable agrarian structure.

Conclusions

1) The studies show that the agrarian structure in Poland is more fragmented than in Germany. Very small farms (1-5 ha) in northern and western Poland, which make up to 40.0% of the total, do not have the conditions for the efficient use of labour and an adequate income to keep a family and support development. Analysis of individual farm size categories by land use show that 40.0% of small farms (1-5 ha) utilised 5.7% of the total agricultural area, while 4.7% of very large farms (>50 ha) used 50.8%. The fragmented agrarian structure does not go with the high incomes and demands of the food industry and commerce, namely large quantities of products of appropriate quality (Zegar, 2009).

2) Keeping pace with the average farm size in Germany would require a reduction in the number of farms in Poland to about 370 000. In practice, this would mean the elimination of more than a million farms, which is impossible because of the dire social and economic impacts on rural areas which are poorly industrialised. To a large extent small farms in Poland act as a security in case of a loss of other sources of income. Additionally, land ownership raises social prestige and is a good capital investment.

3) Poland's adoption of the EU's Common Agricultural Policy and the implementation of the Rural Development Programme (2007-13) influenced changes in farm size in northern and western Poland, and - above all - provoked a decline in the number of small farms (by 24%) while increasing average farm size (from 12 to 16 ha). Slow changes in Polish agriculture are the result of the clash of two forces. On the one hand, economic trends seek to concentrate farmland and make

better use of its internal potential, while on the other, psycho-social trends put an emphasis on providing jobs in rural areas.

4) In East Germany changes in the agrarian structure have occurred since the early 1990s and on a much larger scale. Land concentration processes supported by CAP instruments have led to the formation of a relatively favourable agrarian structure.

5) Therefore, there is a need for further changes, as land use in Poland differs significantly from that in western and northern countries of the EU where the product structure is similar. According to J. Zegar, changes in the agrarian structure in Poland are primarily aimed at increasing the competitiveness of agriculture on the European market, increasing farm incomes, as well as contributing to the sustainable development of rural areas by maintaining agriculture and contributing to socio-economic development. A chance to increase the competitiveness of small farms stems from the concentration of productive forces in the form of various cooperatives and associations, e.g. production cooperatives, producer groups and companies. Such forms of cooperation allow the shortcomings of small farm agronomics to be overcome and make better use of their own potential. In addition, they retain multi-directional production which is a guarantee for sustainable rural development. Small farmers produce organic products sold in local niche markets. Small farms, together with small food processing plants, can successfully work together in an integrated local food system.

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ANALYSIS OF MANPOWER RESOURCES UTILIZATION IN AGRICULTURAL ORGANIZATIONS OF THE RUSSIAN FEDERATION

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Abstract. Stable functioning of agricultural companies requires formation of conditions for labour productivity growth. The aim of this research is carrying out the analysis of labour productivity in interrelation with a salary for an assessment of its stimulating role and identification of potential opportunities of further development. Agricultural companies of Moscow region of the Russian Federation are used as objects of this research. An autoregressive econometric model is used. The research showed that growth potential of labour productivity is higher, than that of a salary. The limit of stimulating possibility of salary in agriculture of the Russian Federation will be reached within 10 years.

Key words: labour productivity, salary, analysis
JEL code: C58, J31, Q12

Introduction

The operation of agricultural company is a complicated system of cooperation between manpower resources, technical equipment, bio assets, financial assets, technologies, agricultural production process arrangement and institutional conditions of economic management. One of the main conditions of its steady operation is the development of reasonable system of actions increasing labour productivity.

The problem of manpower efficiency is described in works of different authors. Different ways are offered such as implementation of foreign manpower or promotion of agricultural work among young people. Foreign manpower inflow increases demand for local manpower in the agriculture (Kimhi, 2015). It happens due to enlarging of agricultural companies. It is considered that good advertisement at schools may increase profile of agriculture and attract young specialists (Nelson, 2011).

The investigation (Stirpe, 2014) proves that the workforce productivity is influenced by ratio of permanent and temporary workers. Application of agricultural clusters helps easier finding of qualified specialists (e.g. Scholleova 2013).

The labour productivity factor is a cumulative expression of efficiency of manpower resources utilization (Davnis, 2008). Naturally salary should be considered as the main factor influencing labour productivity. From the company's point of view salary is a control mechanism influencing general competitiveness of the company (Endovitskiy and Vostrikova, 2007). The aims of this research are to study the dynamics of labour productivity in interrelation with the dynamics of salary in the course of the analysis of efficiency of manpower use; to carry out the comparative analysis of growth rates of labour productivity with growth rates of salary. The analysis of labour productivity in agricultural sector of economy of the region has to answer a number of questions which are defining when developing decisions on the organization of activity of this sector in modern conditions (Artemenko and Anisimova, 2014).

Credibility of such analysis and obtained results depend on the used approach. The approach based on econometric models is the single option from the credibility point. Unlike the other methods, the method of econometric models provides adequacy which is some statistical alternative of credibility.

It should be mentioned that the background of agriculture is quite complicated and the linear regression models are not enough for investigation of agriculture; though, it is the most common method for the analysis of economic processes.

In the article the authors suggest the technique of analysis of labour productivity in interrelation with salary of agricultural companies providing use of a complex of econometric models that allows to carry out the analysis of growth rates of labour productivity in comparison with growth rates of salary offered.

Research results and discussion

Taking into account the abovementioned information, the multimodal approach with both linear and non-linear models will be used for investigation of labour productivity in Moscow region. First of all, the dynamics of labour productivity behaviour should be revealed by means of the econometric models. It

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should be defined whether the dynamics is steadily developed or a bifurcation effect is expected. The analysis of steadiness has become the object of research of Russian economic science during the reformation period after adoption of the market economy principles [1]. As a result of such analysis, as a rule, it is possible to understand: whether stabilizing or destabilizing factors prevail in the process researched.

As a tool the autoregressive model, which is econometric analogue of the non-uniform finite difference equation of the first order, is used. Analogousness is an important point, as conclusions on the stability of modelled indicator

$$P_t = b_0 + b_1 P_{t-1}, \quad (1)$$

are the properties of the finite difference equation P–time series (labor productivity) ; bo and b1 – equation parameters.

The conclusion about steadiness is made from the convergence of values of the factor P to the finite limiting value.

To prove the convergence the authors used the special solution of the equation (1) which is defined by the expression

$$P^* = \frac{b_0}{1 - b_1}, \quad (2)$$

obtained from the following ratio:

$$P^* = b_0 + b_1 P^*, \quad (3)$$

This ratio appears when the steadiness has been achieved and the factor does not change anymore.

If (3) is subtracted from (1) than homogeneous finite-difference first order equation, which specifies relations between deviations from equilibrium of the current value and previous one will be received from the inhomogeneous equation.

$$P_t - P^* = b_1 (P_{t-1} - P^*). \quad (4)$$

Taking the deviation as $u_t = P_t - P^*$ and using equation (4) following chain of the equations can be made

$$u_t = b_1 u_{t-1} = b_1^2 u_{t-2} = \cdots = b_1^t u_0, \quad (5)$$

which provides the conclusion that the convergence of the factor value towards equilibrium depends on the parameter b_1.

If using (5) one write (4) in the following way

$$P_t = P^* + b_1^t u_0, \quad (6)$$

there is an opportunity to evaluate all possible cases of the factor's behaviour depending on the parameter b_1.

1) If $b_1 > 1$, and $t \to \infty$, the deviation of the factor P_t from its equilibrium value P^* is increasing with no limit, but the point itself defined by equation (2), becomes bifurcational the existence of which testifies that there can be a change of the direction of the modelled indicator.

2) If $0 < b_1 < 1$ and $t \to \infty$, the deviation of the factor from the equilibrium is damping but the factor itself is increasing up to the equilibrium as a superior level due to the positive feedback.

3) If $-1 < b_1 < 0$ and $t \to \infty$, the value of the factor vacillates around the equilibrium with the damping range due to the negative feedback. This situation indicates the transition from the unstable to the stable behaviour.

4) The case $b_1 < -1$ is unreal and the authors will not consider it.

The abovementioned cases indicate that the inhomogeneous finite-difference equation (1) is an effective tool for quantitative analysis of the dynamic characteristics of the evaluated factors. The cases also prove the fact that utilized model (1) may reveal three dynamic effects i.e. the steadiness effect, the positive/negative feedback effect and the bifurcation state effect.

Practical implementation of the finite-difference equation in the analysis of the steadiness of economic processes is very limited as this equation relates to the abstract scheme of the steadiness analysis of some general economic process.

The modification of this equation providing its applications for the analysis of concrete processes has to provide such "adjustment" which will secure adequacy of the equation to the studied process. Such opportunity is realized if presents one this equation in the form of econometric model, assuming that there are no functions which absolutely precisely reproduce real economic processes

$$P_t = b_0 + b_1 P_{t-1} + \varepsilon_t, \quad (7)$$

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where ε_t – is non-observable random value, identifying variable part of the factor, which cannot be explained by relations of the current value and previous one. it is accepted to call the equation (7) as autoregressive scheme. Its coefficients are evaluated on the basis of the sample frame values by means of OLS method. The evaluated autoregressive scheme can be considered as unhomogeneous finite-difference first order equation

$$P_t = \hat{b}_0 + \hat{b}_1 P_{t-1} \quad (8)$$

providing the opportunity to analyze the dynamics of the specific process if the coefficients of the scheme have been obtained from the survey data of this process.

The authors created a file characterizing labour productivity and level of compensation on all Moscow regions during three years (tab. 1) for carrying out the analysis.

On the basis of tab. 1 for creation of econometric models the data file with panel structure (tab. 2) was created.

On the basis of tab. 2 the following autoregressive equation was constructed:

$$P_t = 99250{,}9200 + 0{,}8910 P_{t-1}$$

On its basis it is possible to draw the following conclusion: the dynamics of the average level of labour productivity steadily grows in agricultural sector of economy of the region with positive feedback (in each following time point there is increase of this indicator value), but this growth is fading with a limit state

$$P^* = \frac{99250{,}9200}{1-0{,}8910} = 910449{,}9261,$$

which can be reached (with some accuracy) approximately in 30 years.

Let's make similar evaluation of the salary level dynamics Z for comparison. Basic data will be structured in the similar data array.

Autoregressive scheme for the salary with all coefficients will take the following view.

$$Z_t = 5906{,}6886 + 0{,}7684 Z_{t-1}.$$

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Table I

Dynamics of the workforce productivity and average monthly salary in the agricultural company of Moscow region

Factors / Districts	Workforce productivity, RUB			Average monthly salary, RUB		
	2012	2013	2014	2012	2013	2014
Balashikhinskiy	185395	122195	126944	17453	16958	22409
Volokalamskiy	565292	708260	602538	11806	13685	13604
Voskresenskiy	619390	608842	674725	13876	15376	18107
Dmitrovskiy	709598	1165065	818592	16978	19267	21091
Domodedovskiy	1066889	986529	911328	15733	25154	27213
Egorievskiy	848258	627418	608728	10636	11201	11535
Zarayskiy	629446	753192	628417	11603	13984	14730
Istrinskiy	542475	566312	547182	17415	20890	21889
Kashirskiy	375756	551578	293890	11436	13291	15030
Klinskiy	528622	642754	462522	12774	14414	14502
Kolomenskiy	559065	813931	592236	13867	15080	15842
Leninskiy	773345	965325	816660	25498	28487	29640
Lotoshinskiy	345664	560338	489734	12814	13460	13530
Lukhovitskiy	527717	666331	595977	14878	17479	16529
Luberetskiy	44739	407820	347583	24458	23798	23700
Mozhaiskiy	495892	842409	1036654	12527	13617	16036
Mytischenskiy	389322	230908	118491	24572	20246	21876
Naro-Phominskiy	1149572	1358131	1321952	20626	22538	22707
Noginskiy	265938	323887	218686	18619	23228	25968
Odintsovskiy	1101900	1884801	1738134	17402	19621	21214
Ozerskiy	921902	1067394	766755	15654	16889	18308
Pavlovo-Posadskiy	506080	360275	295143	14043	12946	16164
Podolskiy	461769	619853	621287	16499	17946	20737
Pushkinskiy	577796	615271	355522	18567	20293	21853
Ramensliy	436632	1090455	1092175	16362	19169	20150
Ruzskiy	379870	427170	373683	12934	15177	18410
Sergievo-Posadskiy	1625967	1617700	1572894	15110	16482	18609
Serebryano-Prudskiy	660235	631282	535743	12745	13783	15659
Serpukhovsliy	835148	726675	607409	20293	20740	24411
Solnechnogorskiy	204801	770288	761645	18191	22825	21458
Stupinskiy	639971	678762	628019	14965	15354	18507
Taldomskiy	490049	542947	674513	16198	12037	14357
Chekhovskiy	585748	604556	289603	14470	16398	15852
Shaturskiy	433748	533655	1717244	18651	18311	19637
Shakhovskiy	436808	194653	174252	12010	14954	17674
Schelkovskiy	359599	548066	279855	17989	21085	19531

Source: the Ministry of Agriculture of the Russian Federation

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Table 2

Basic data for creation of autoregressive scheme of labour productivity

P_t	P_{t-1}	P_t	P_{t-1}	P_t	P_{t-1}
185395,3401	187373,0608	122195,2358	185395,3401	126943,9731	122195,2358
565292,1574	500395,2279	708260,0079	565292,1574	602537,5865	708260,0079
619389,6490	615453,8764	608841,8926	619389,6490	674725,4712	608841,8926
709598,0160	979049,6186	1165064,8251	709598,0160	818592,2162	1165064,8251
1066889,3340	1107738,1574	986528,5368	1066889,3340	911327,9868	986528,5368
848257,9363	640475,7930	627417,8225	848257,9363	608727,8250	627417,8225
629446,0286	518624,4763	753191,5367	629446,0286	628417,1746	753191,5367
542475,0238	474957,7689	566311,5548	542475,0238	547181,9240	566311,5548
375755,5375	390228,7912	551577,6257	375755,5375	293889,9339	551577,6257
528621,9136	519458,4085	642754,1485	528621,9136	462521,5451	642754,1485
559064,7413	504766,5186	813930,9823	559064,7413	592235,8166	813930,9823
773345,1956	886936,3032	965325,0304	773345,1956	816659,6225	965325,0304
345663,8596	362778,0481	560338,3280	345663,8596	489734,0864	560338,3280
527717,2651	420996,6673	666330,7915	527717,2651	595977,0579	666330,7915
44739,1657	163948,0510	407819,8408	44739,1657	347583,0086	407819,8408
495891,5654	421797,8857	842408,9854	495891,5654	1036654,4779	842408,9854
389322,2130	346494,0756	230908,4918	389322,2130	118491,1824	230908,4918
1149572,0764	999456,9225	1358130,7840	1149572,0764	1321952,1148	1358130,7840
265938,0505	250373,2760	323886,7065	265938,0505	218685,6185	323886,7065
1101899,5578	964572,7709	1884801,1831	1101899,5578	1738134,0165	1884801,1831
921901,8433	766346,4840	1067394,4000	921901,8433	766755,0685	1067394,4000
506079,8182	272703,8485	360274,6027	506079,8182	295142,8904	360274,6027
461768,7940	403625,9770	619853,1690	461768,7940	621286,7376	619853,1690
577796,3839	366924,1997	615270,7410	577796,3839	355522,0439	615270,7410
436631,7007	491704,6312	1090454,9405	436631,7007	1092174,8406	1090454,9405
379869,5548	364983,2134	427170,1527	379869,5548	373683,0882	427170,1527
1625966,7513	1447358,6387	1617700,2259	1625966,7513	1572893,5883	1617700,2259
660235,0789	449086,7539	631281,8968	660235,0789	535742,5124	631281,8968
835148,4606	677926,5661	726674,9306	835148,4606	607408,9766	726674,9306
204801,1027	543070,9970	770288,2584	204801,1027	761645,0938	770288,2584
639970,7003	504879,1505	678762,0607	639970,7003	628018,7097	678762,0607
490048,5912	356659,4008	542946,5101	490048,5912	674513,2563	542946,5101
585748,0518	502349,8804	604556,0765	585748,0518	289603,4653	604556,0765
433747,5136	392686,4554	533655,0087	433747,5136	1717244,2955	533655,0087
436807,6760	605227,3784	194652,6731	436807,6760	174251,8770	194652,6731
359598,6952	926194,8748	548065,8070	359598,6952	279855,0474	548065,8070

In the same way as the dynamics of labour productivity and the dynamics of salary level demonstrate damping growth with positive feedback. The limiting state of average salary level after 10 years which might be obtained is of the following value

$$Z^* = \frac{5906,6890}{1-0,7684} = 25505,5600$$

.

The developed models provide not only the characteristics of growth of each modelled factor but the opportunity for their comparison as well. The comparison shows that growth potential of labour

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productivity is higher, than of salary as the term of achievement of a limit state in which the growth should stop, labour productivity is three times higher, than salary. The comparison carried-out showed that during studied period the policy of compensation in agricultural sector of economy of the region was optimum as far as compensation, carrying out a role of the stimulating factor, provided rather high potential of labour productivity growth. At the same time estimation of the motivating power limit of salary, presented as the limiting state which might be achieved after 10 years, requires improvement of modern salary system right now.

Conclusion

The purpose of work was to find out the connection of labour productivity with salary and to carry out comparative analysis of labour productivity growth rates with growth rates of salary. That is to answer a question – to what extent the increase in salary stimulates labour productivity?

From literature review it is clear that a number of researches was devoted to this issue. The analysis of labour productivity is rather difficult, it is influenced by a set of factors, therefore both linear and nonlinear regression models were chosen.

Objects of this analysis were agricultural enterprises of Moscow region in Russian Federation grouped in districts. Two indicators: monthly labor productivity (how much revenue is to be received by one worker) and a monthly salary in roubles for 2012-2014 were taken.

The following results have been achieved:

- dynamics of level of salary and dynamics of labor productivity shows positive growth,
- labour productivity steadily grows in dynamics, but the growth is fading and a limit will be reached approximately in 30 years,
- the dynamics of level of salary shows fading growth as well and its limit will be reached approximately in 10 years,
- the policy of compensation in agricultural sector is optimum as it caused high growth of labour productivity, the potential of growth of labor productivity is 3 times more, than of that of salary.

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ECONOMIC EFFECTS TRANSMISSION EASEMENT ON AGRICULTURAL LANDS IN POLAND

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Abstract. Right of easement in Poland provide the right to use the foreign real estate by owners of transmission networks. The right transmission easement has been introduced to the Polish law by the Civil Code in 2008. The new law resulted in a large number of financial claims of property owners addressed to the network owners for payment of remuneration for use. Each transmission company must include in its budget claims of property owners. A lot of factors affect the amount of declared claims. This paper proposes a method for calculating the size of claims for all the technical infrastructure. The study used vector maps and software QGIS.

Key words: technical infrastructure, transmission, damage, utility easement.
JEL code: R39

Introduction

In Poland, the right of utility easement (limited property right) entered into force on 3 August 2008 under amendment of the Civil Code Act (Civil Code Act of 23 April 1964 (*Polish Journal of Laws* No. 16 of 1964, item 93, as amended). In Art. 305^1 – 305^4 CC, the Act specifies the issue of utility easement. Art. 305^1 and 305^2 provide that utility easement is established for linear devices specified in Art. 49 §1 (devices used for supplying and disposal of liquids, steam, gas, electricity and other similar devices) if it is required for the correct use of infrastructure devices within the determined scope in the property encumbered. Art. 305^2 emphasizes that if the owner of the property or the entrepreneur-owner of the infrastructure refuses to establish the easement, then the other party may demand its establishment against remuneration. The remuneration for the use of the property is a typical income subject to taxation.

Table 1

Summary of main transmission networks in Poland

Type of transferred media	Length line (km)	Type of line facility
Electricity transfer - alternative current (AC)	13,445	Overhead power lines
Electricity transfer - direct current (DC)	254	Undersea line: Poland – Sweden
Data transfer	141,239	Fibre network
Total cable network (overhead and underground)	154,938	
Gas transport	10,033	Gas pipelines
	685	Transit gas pipeline
Oil transport	1,766	Oil pipelines
Fuel transport	612	Fuel pipelines
Total pipeline network (underground)	13,096	
Total	168,034	

Source: authors' calculations based on previously conducted research (Konieczny, Kowalczyk, 2014)

It should be emphasized that a part of the infrastructure was constructed several decades ago and requires repairs or modernization. There is also a high demand for the construction of new networks. For this reason, regulation of the legal status concerning devices located within the boundaries of third-party properties is a very important factor in the current Polish market economy. To demonstrate the scale of the problem, selected transmission infrastructure networks are briefly characterized below and distribution networks are described in a further point, without lines for connections to the real estate.

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The commonly applied formula for determining the value of the right of utility easement, reflecting (Konieczny, Kowalczyk, 2014):

- establishing the area of utility easement;
- determining the degree of the co-use of the commonly used space, except for the land occupied by infrastructure devices (e.g. by poles, chambers, cabinets and other surface devices of this type), where the owner of the infrastructure uses 100 % of the occupied land;
- establishing the market rental rate for using similar devices and similarly encumbered properties (a possible situation but very unlikely for establishing) or determining the market value of the property, assuming that with a long-term use of the encumbered property, the sum of rent for using the occupied space will correspond to the value of the land occupied (Kowalczyk, 2012).

Research method

The general procedure for establishing the value of the utility easement based on the market value of the encumbered property (Konieczny, Kowalczyk, 2014) results from formula (1) and complementary formulas, necessary to determine the unit value of the property encumbered with an unwanted infrastructure (Brown, 2005; Jäger, 2009).

$$W_{SP} = P_{SP} * k * W_1^* \quad (1)$$

$$W_1^* = W_1 * (1 - S) \quad (2)$$

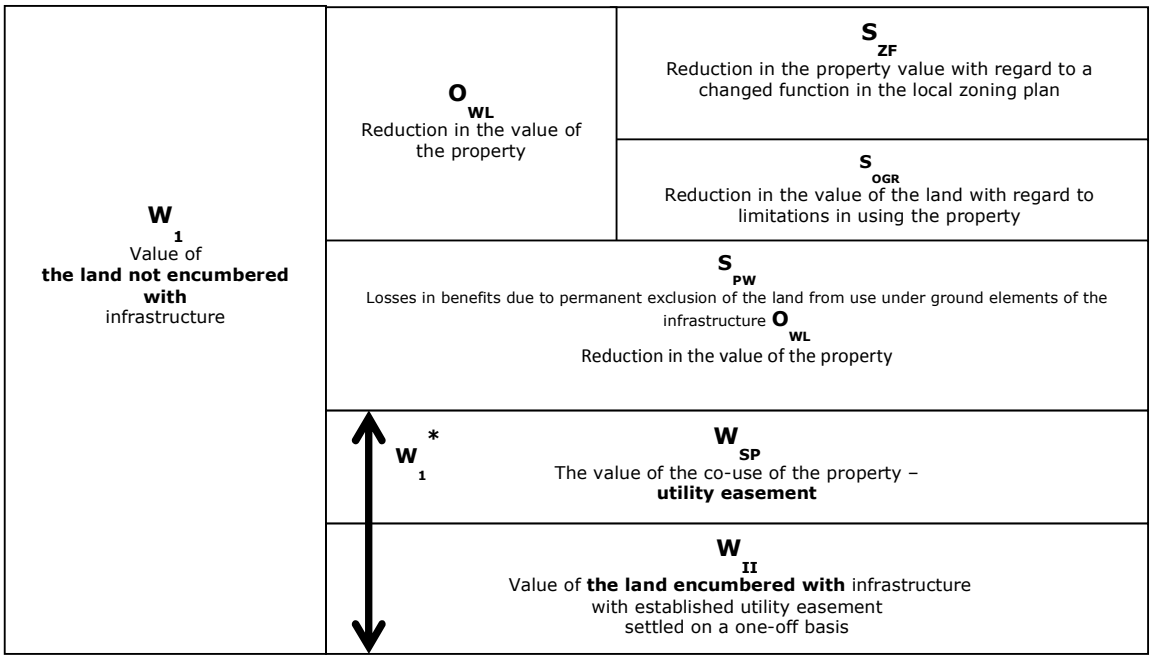
P_{SP} - area of the land for which utility easement should be established;

W_1 - market value of a comparable unit of agricultural property not encumbered with technical infrastructure (PLN/m^2);

W_1* - market value of a comparable unit of property encumbered with the existing technical infrastructure devices (PLN/m^2);

S - ratio describing the reduction in the value of the property resulting from technical infrastructure undesirable for the owner or the perpetual usufruct of the property;

K - percentage share of the infrastructure owner in use of the property (index of the co-use of the property), in practice, an 0.5.



Source: Konieczny, Kowalczyk, 2014

Fig. 1. **Change in the value of the property as a result of locating and operating a transmission device within the real property**

As results from formula (2), the unit value of the property (plot) encumbered with the linear infrastructure should be lower than the value of the property not encumbered, by the value of damage caused by the infrastructure. A loss in the value of the land can be expressed by a property value reduction ratio (S). It should be emphasized that an infrastructure loss will occur at the moment of establishing the location of infrastructure within a given area (planning loss) and at the moment of constructing

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infrastructure devices, including surface items (a loss related to limitation in land use and exclusion of land from use). Losses related to construction of infrastructure are compensated after the completion of investment and are not taken into consideration in the case under analysis. A formula for determining the property value reduction ratio is expressed by the ratio of the value of infrastructure losses (O) to the value of the encumbered property (plot).

Along the gas network are elements on the ground surface (pistils). The study assumes that around pistils should be established buffer zone, which is not expected to land cultivation or other use, in order to protect the facility and lower efficiency of crops (lower yields at higher costs of cultivation).

The surface is excluded from crop was calculated using the following formula:

$$P_{1d} = [5(a+0.5)*(a+2.5) + (a+1.5)*(b+0.5)] / 10000 \quad (3)$$

where:

P_{1d} – the surface is excluded from crop (ha);

a – a long side of the bars trace (m),

b – short side of the bars trace (m).

The dimensions of physical barriers 0.2 m * 0.2 m was obtained by multiplying 11 m2.

Ultimately, the transmission easement was based on the following formula:

$$W_{SP} = \sum W_1^* * P_{SP} * 0.5 + \sum W_1^* * L_{ele.naz.} * P_{ele.naz.} \quad (4)$$

$P_{ele.naz.}$ – excluded from the production area (area under the ground-based elements) – 11 m^2 in every element,

P_{SP} - area of the land for which utility easement should be established (m^2),

$L_{ele.naz.}$ – the number of ground elements (pcs.).

Input data

The input data for the analysis are: vector data and figures. A description of the data used in the study are shown in Table 2.

Table 2

The data used in the study

Type of data	The range of data / data format	Source
Vector	Plots registration / shp	http://www.geoportal.gov.pl/
	BDOT10k (database of topographic objects) - the way land use	http://www.codgik.gov.pl/
	The axis of the pipeline / shp	http://www.codgik.gov.pl/
Numerical	Average prices of agricultural land divided into districts / xls	http://www.stat.gov.pl

Source: authors construction based on website - cited 5 January 2016

Data processing

On a layer of plots registration and data of topographic objects (BDOT10k) placed the axis of the pipeline and plotted girdle of utility easement. Width of girdle of utility easement is 4 m (for pipelines to 150 mm) and 6 m (above the pipeline 150 mm).

Based on data (BDOT10k) the land near the pipeline was divided into categories of use: agricultural land, forests, agricultural land in the distance 100 m from the residential, agricultural land in the distance up to 100 m away from industrial development, agricultural and forestry land situated within a distance of 150 m from lakes and forests, land in the immediate vicinity of residential buildings in the immediate vicinity of developed industrial.

The total number of pistils was estimated based on the average number of posts per kilometer.

The value of agricultural land is the lowest value on the pipeline. The value of agricultural land was used as the base to determine the value of land in other categories of land. The result of analysis is shown on Figure 2. Average prices were calculated based on the prices of each category occurring in the pipeline in areas the districts

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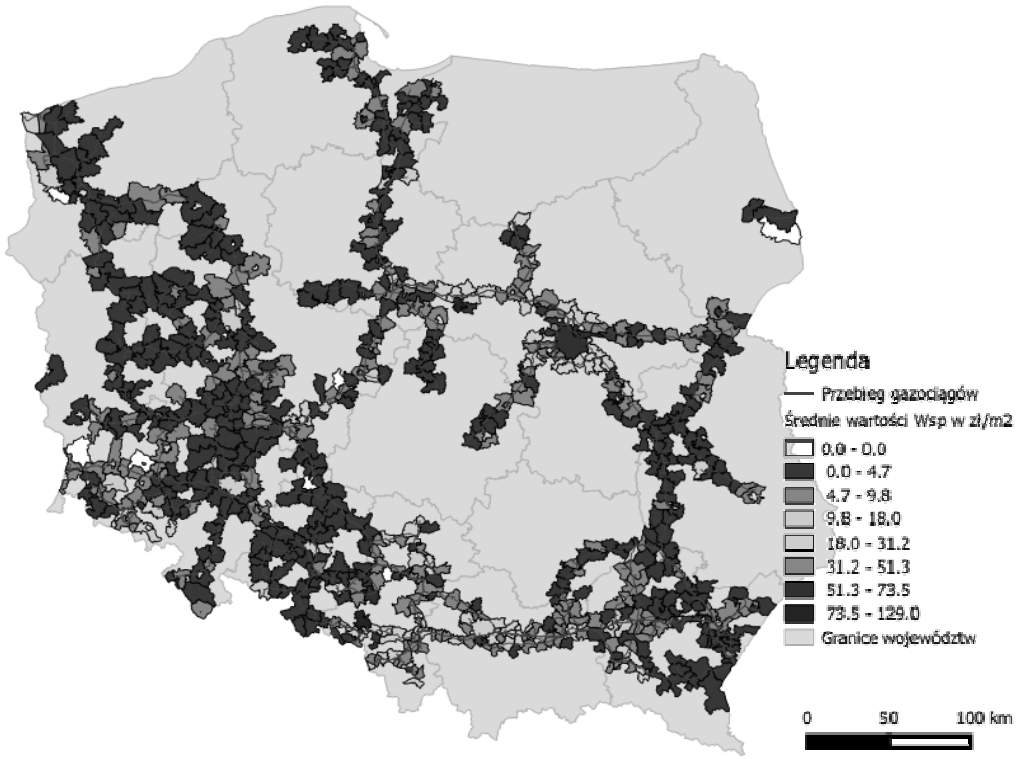
Table 3

Categories of land for the pipeline transmission

Categories of land	The length of the gas pipeline (m)	Participation in the length of pipeline
Agricultural land	7 750 000	78%
Agricultural land situated within a distance of 100 m from residential	47 000	0%
Agricultural land situated within a distance of 100 m from the industrial area	709 000	8%
Agricultural and forest land situated within a distance of 150 m from lakes and forests	47 000	0%
Lands of housing	428 000	4%
Land building industrial and service	44 000	0%
Forest land *	1 024 000	10%
Land under the waters *	20 000	0%
Total	10 068 617	100%

** - excluded from the economic analysis because of other rules of obtaining rights to land*

Source: authors calculations



Source: authors construction

Fig. 2. **The value of land within the pipeline**

Conclusions

Problems related to the determination of the value in use easements are complex since they relate to four groups based on the data that define value. The first is the surface data. The accuracy of calculation of the area influences directly on the result of an estimate of

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the transmission easement. In the present case, the surface was determined based on the vector data.

The second group of data is the data on the value of land in the municipalities.

The research estimated value of the right of transmission easements. The results are summarized in Table 4.

Approximately 90% of the test pipeline is located on the agricultural property which greatly affects the amount of estimated salary. It makes the level of remuneration is low.

There is no doubt that the main beneficiary of the remuneration will be owners of agricultural property

The height of the total cost of establishment of limited property rights (right of transmission easements) must be an important part of the budget of the company (owner of the network infrastructure).

Table 4

Remuneration for the establishment of transmission easements on particular categories of land

Categories of land	The value of transmission easement	
Agricultural land	EUR	24 974 000
Forest land	not tested	
Agricultural land situated within a distance of 100 m from residential	EUR	28 861 000
Agricultural land situated within a distance of 100 m from the industrial area	EUR	2 301 000
Agricultural and forest land situated within a distance of 150 m from lakes and forests	EUR	1 949 000
Lands of housing	EUR	27 579 000
Land building industrial and service	EUR	3 358 000
Land under the waters	not tested	
Total	EUR	89 022 000

Source: authors calculations

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PREDICTED RESULTS OF IMPLEMENTING TRANSATLANTIC TRADE AND INVESTMENT PARTNERSHIP FOR AGRICULTURAL SECTOR

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Abstract. Issues regarding agriculture are the most difficult topics in negotiations of the Transatlantic Trade and Investment Partnership between the European Union and the United States. The aim of the paper was to show the potential influence of the entry into force of the Transatlantic Trade and Investment Partnership at the agri-food sector in Europe. It shows the importance of agriculture in the economies of the United States and the European Union followed by an analysis of the effects of liberalization of the transatlantic agricultural trade. It was stated that relatively easily can be determined issues concerning the reduction of duty tariffs, although larger benefits in this title was reached by the United States than the European Union. Much more difficult it will be to reach agreement on the non-tariff measures and especially some of the sanitary and phytosanitary barriers. This is mainly due to the fact that the EU standards on food safety are much higher than American standards.

Key words: TTIP, agricultural trade, liberalisation.

JEL code: F10, F42, F55

Introduction

The Transatlantic Trade and Investment Partnership (TTIP) is the object of wide interest. The project of this agreement includes a broad range of issues; however, in general, its goal is to establish a free trade area between the European Union and the United States. The objective of this agreement will also be to open both markets for investments, services and public procurement, consolidation of regulations, standards and norms in the scope of trade in goods and services. Removing the majority of barriers in access to the market of both partners, mainly of non-tariff character, as a consequence should trigger demand and supply processes, which are to stimulate considerably mutual exchange and increase their GDP by multiplier effects. Critics of this agreement place particular emphasis that it should grant foreign investors a new right to sue sovereign governments before arbitral tribunals for losing profits, resulting from a decision in public policy. This mechanism of "settling disputes between an investor and a country", in fact, gives equal status of trans-national capital with a national state itself, posing a threat to principles of democracy to the same extent in the European Union as in the United States.

The issues of agriculture are the most difficult in TTIP negotiations. Both the European Union and the United States have competitive agricultural sectors and belong to the biggest exporters of agri-food products. Despite developed international, bilateral and at the level of the World Trade Organization (WTO) cooperation, there are significant problems related to non-tariff barriers, regarding most often sanitary and phytosanitary regulations. Agriculture is an example of a difficult area for negotiations, also when it is related to food safety. The parties differ in provisions regarding genetically modified organisms (GMO), hormone-treated beef, pork containing ractopamine and poultry disinfected with chlorine.

The aim of this paper is to present predicted results of implementing the Transatlantic Trade and Investment Partnership for the agri-food sector in Europe.

TTIP – premises and scope of negotiations

The current trade between the EU and the USA has been performed on non-preferential conditions and has been based on the Most-Favoured-Nation Clause. However, some arrangements were made at the beginning of the 1990s, which aim was to facilitate mutual economic cooperation (Wieczorek J., 2014). They resulted in such initiatives as the New Transatlantic Agenda (NTA), the Joint Action Plan (JAP) and the Transatlantic Economic Partnership (TEP). The activities to "build bridges" were initiated at the end of the 1990s and at the beginning of the first decade of the 21st century, which result was the Transatlantic Business Dialogue (TBD), the Doha Round negotiations on the multistakeholder forum started. However, the effects of these actions were not satisfactory (Hajdukiewicz A., 2014). An important step on the way to build foundations of TTIP was to appoint the High Level Working Group on Jobs and Growth (HLWG) on the EU-US Summit in November 2011. Its task was to identify actions and measures promoting increase of trade and investments between the EU and the USA in order to create employment beneficial for both sides, to

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stimulate economic growth and international competitiveness (Hajdukiewicz A., 2014).

Barack Obama, the President of the United States, officially announced opening of negotiations aiming to establish a complex Transatlantic Trade and Investment Partnership in the address on the state of the country in February 2013. Negotiations of the contract between the United States and the European Union started on 17 June the same year, whereas the first round of talks took place from 8th till 12th of July 2013 in Washington and the next ones were held every few weeks (Transatlantic Trade and Investment Partnership, 2015).

TTIP is not a traditional trade agreement, prepared, above all, to limit import duties between trade partners, as duties between the European Union and the United States are at the minimum level now. Officials from both sides state that in fact, the main objective of TTIP is to remove regulatory barriers, which limit potential profits of trans-national corporations on the markets of the EU and the USA. This includes removing or liberalising key social standards and provisions regarding natural environment, such as labour law, provisions relating to food safety (including limitations concerning GMP), regulations defining the principles of using toxic chemical substances, laws regarding privacy in the field of digital communication and even new safety rules in banking implemented to avoid a repetition of the financial crisis of 2008 (Hilary J., 2015).

In addition, TTIP aims to create new markets, by opening public services and government procurement, for competition from trans-national corporations, which can initiate a wave of privatisation in key sectors, such as protection of health or education. One of the most important objectives of TTIP is "to complete creation of a common market" within the European Union itself, in particular, by opening services and public procurement for private companies in other Member States (Hilary J., 2015).

The role of agriculture in economies of the United States and the European Union

Different approaches to agricultural issues between the USA and the EU result from disparities in economic conditions, in which agriculture functions on both sides of the Atlantic.

The agricultural area of the United States constitutes about 9% of the global area. Agricultural areas cover 45% of the country's land, out of which arable lands and orchards include 20%, whereas grasslands and pastures amount to 25%. The number of farms is 2.2 mln and their average size is about 170 ha (over 7 times higher than in Europe). The overall production value of American farms amounts to USD 287 billion, which constitutes 70% of the European production value. According to the date of the American Ministry of Agriculture about 3 mln persons work in the agricultural sector, which constitutes merely about 2% of all employed persons (this percentage is 3 times higher in Europe) (Marciniuk K., 2013).

About 7.3 mln agricultural farms and over 6 mln microfarms exist in the EU. According to the data of EUROSTAT - over 16 mln of persons are employed in the agricultural sector in the countries of the Union, which constitutes about 5.6% of all employed persons. According to the reports of OECD, the average size of an agricultural farm is 22 ha in Europe, whereas the total production value amounts to about EUR 304 billion (USD 403 billion) (Marciniuk K., 2013).

The European Union and the United States also differ in their opinions on the role and the place of agriculture. The European perspective is dominated by the idea of multi-functionality, according to which the task of agriculture is not only to produce food but also to practice other values, such as protection of rural lifestyle, concern for animal welfare, preventing climatic changes (reducing emission of greenhouse gases and increasing absorption of carbon dioxide or also including agricultural producers in other issues of environmental protection) and even caring for selected cultural and aesthetic values (rural landscape). Landscape is varied and fields are not big in Europe. Due to limited area, prices of land are high and they do not depend only on production costs. The area and use of machines cannot achieve such a scale as in the USA, Argentina or Russia, and thus, European costs will be higher, even if European farmers intensify production to obtain higher yield per hectare. When comparing the American agricultural policy with the European policy, non-economic factors have much lower significance and American agricultural producers are much more confronted with the rules of free market than European producers (Marciniuk K., 2013). Competition on the market forces them to boost performance, which takes place by increasing farm area, switching to monocultures as well as using biological and technological progress in agricultural production, inter alia, GMO. The model of diversified farms ends and

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agricultural landscapes are replaced by monocultures, as a result of which biodiversity and its variability declines. These new agricultural areas are a source of environmental services to a lower extent (Industrial Agriculture: History..., 2013).

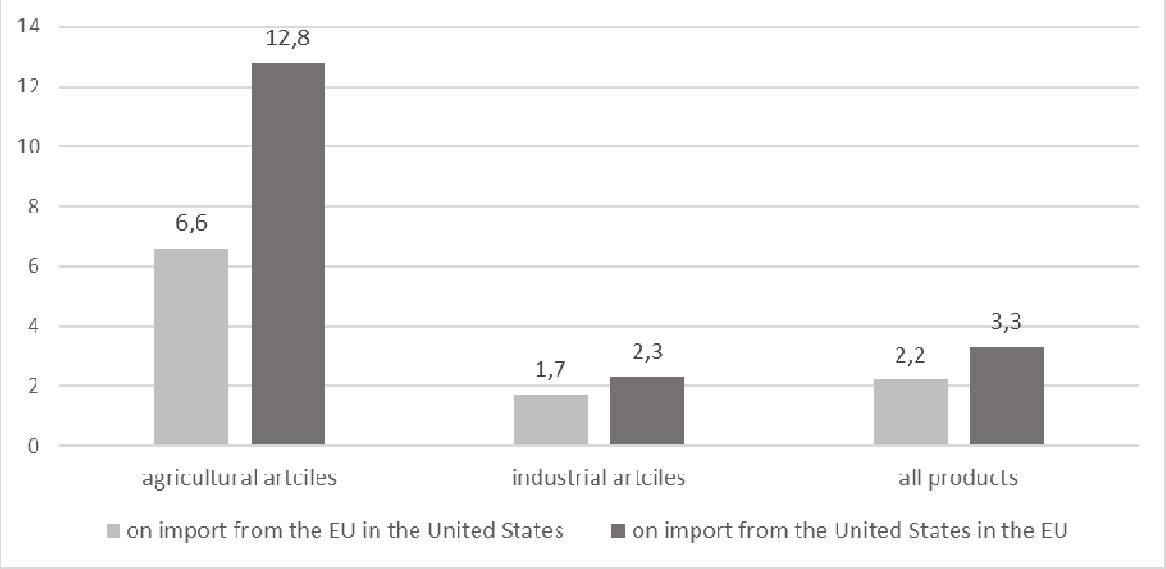
The European Union belongs to the most important trade partners of the United States as regards agricultural products. Export of the United States to the European Union increased from over USD 5 billion in 2005 to the level of USD 7.3 billion in 2013. Share of the European Union in the agricultural export of the United States amounted to nearly 10%, it did not exceed 3% in agricultural import. Starting from 2005, the United States achieve positive trade balance of agricultural products, a surplus has increased from the level of USD 3.7 billion in 2005 to USD 5.7 billion in 2013 (Dugiel W., 2015).

The United States are the biggest market of the Union agri-food products. The volume of exports of the EU to the USA amounted to EUR 15.4 billion, which constituted 13% of the total EU export to non-union countries. Moreover, it should be highlighted that significance of the USA as a partner in export keeps increasing, as on the one hand, demand on food goes down in the EU countries but on the other hand - maintaining the level of export to the external EU partner, namely Russia, which is second as regards importance is threatened (USD 11.9 billion, which constituted 10% of agri-food export in the EU in 2013), both in the context of the last political events and also the embargo on import of the union pork implemented by Russia (Hajdukiewicz A., 2014).

Potential impact of TTIP on liberalisation of agricultural trade

Negotiations conducted to establish the Transatlantic Trade and Investment Partnership (TTIP) are performed within twenty four working groups. At least two of them take up problems regarding trading with agri-food products. The first one deals with issues of agricultural markets. The second group takes up the matter of veterinary and phytosanitary standards. Elaboration of the principles regarding reduction of both tariff and non-tariff barriers include the most important tasks in the course of TTIP agricultural negotiations. In the first case, primary step would be to specify a schedule of duty reduction, then prepare lists of goods/tariff lines for which duties will be maintained and finally create a system of duty free tariff quotas and tariff quotas with reduced duties. The second area covers regulatory problems and other non-tariff barriers. In particular, it is about mitigating severity of protective impact of sanitary and phytosanitary measures as well as technical barriers (Wrobel A., 2015).

High duty rates are still maintained in agricultural trade as regards mutual turnover between the USA and the EU, which results from protectionist policy in this sector (Figure 1).



Source: author's construction based on (Fontagné, L., Gourdon, J., Jean, S. 2013)

Fig. 1. **The average customs tariff applied by the United States and the European Union in bilateral relations in 2010 (in %)**

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A considerably greater scale of protectionism takes place on the side of the EU. The average duty rate applied for agricultural products in the EU amounted to 12.8% in 2010 and was almost twice higher than the average duty rate for these articles in the United States. Over the next years the range of average duty rates for agricultural products in the EU and the United States increased. These rates amounted to 13.2% and 4.7% in the EU and the United States in 2013. In the case of the highest rates, differences were a bit smaller: the duty rates over 100% constituted 0.8% of all tariff lines in the EU in that year, whereas it was 0.5% in the USA. Particularly high duties concerned import to the EU of such products as diary, beef and sugar. The duty rate for cotton was 0%. In general, the market of the United States is more open for import of agri-food products. However, dairy products, sugar, nuts, beverages and tobacco constitute the only exceptions. Duty for these products reaches 95% for dairy products, 132% for nuts and even 350% for some products from the group "tobacco and beverages" (Hajdukiewicz A., 2014).

TTIP is a chance to liberalise agricultural trade between the USA and the EU, then liberalisation of this trade will take place on the forum of the WTO in exchange with other protectionist countries, both developed and developing states. However, the European Union and the United States limited liberalisation of agricultural trade in TTIP in comparison to the Agreement on Agriculture of the WTO. Only liberalisation of duty rates was included in the negotiations about TTIP. The EU and the USA apply high protectionism in agriculture in the form of internal support within the measures of the green box; thus, the USA and the EU can negotiate reduction of duties in the Transatlantic Trade and Investment Partnership, while maintaining protectionism. Evolution of changing forms of protectionism from price to direct support, forced by Doha Round negotiations, allows liberalisation of duties without depriving agricultural producers of high incomes. Support within the green box funds increased from USD 16 billion in 2000 to USD 120 billion in 2011 in the United States, whereas in the European Union it was from USD 22 billion in 2000 to USD 68 billion in 2011. In both cases national support (AMS) was limited, subject to reduction in compliance with the WTO regulations (Dugiel W., 2015).

The problem in agricultural negotiations is not only the present level of protection of agricultural markets for negotiation participants but power of agricultural lobby in the EU Member States and the USA. As agricultural products belong to politically sensitive goods, which means that decisions regarding this sector are made under pressure of internal interest groups as a rule. Prolonged WTO negotiations within the Doha Round can prove that it is difficult to reach agreement in this sector.

Economic power of both parties to the agreement is also an additional obstacle in TTIP negotiations. Current free trade agreements concluded by the EU and the USA were negotiated with partners that were economically weaker, which facilitated imposing solutions preferred by a stronger party. However, in this case there are equal partners, which can result with unwillingness to concessions and accept decisions proposed by the other party. It can be assumed today that the result of negotiations in regulatory issues will be application of the principle of mutual recognition of standard systems. However, such solution will not eliminate problems, which results from regulatory differences, as shown by current disputes on applied sanitary and phytosanitary standards. Ability of participants to negotiate a compromise will depend on the cost and benefit account for liberalisation of trade with agricultural products and possible compensation of losses related with it through benefits resulting from liabilities adopted in other areas of the TTIP negotiations. It seems that the party, which is more interested in liberalisation of transatlantic turnover of agri-food products, is the United States. Available analyses indicate that agriculture of the USA, due to its lower production costs, has considerable competitive advantages over agriculture from the EU. These advantages currently do not lead to excessive competition of American agri-food products on the European market due to protective instruments, which have been applied. Reduction of these barriers, facilitating access to the EU market, will probably lead to asymmetric division of benefits from liberalisation. It will be caused by differences in the level of protecting markets of partners. In such a situation party, with applied lower level of protection before liberalisation of trade benefits more. In this case, these are the United States, whose duties are almost three times lower than those of the EU. Taking into account such division of benefits from liberalisation of agricultural trade as well as disputes and controversies, risen in trade relationships for years, the smallest changes in the systems of the food economy of the parties will only be implemented together with entering into force of the

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agreement on TTIP, including a minor reduction of duty rates spread over time (Wrobel A., 2015).

Points of dispute regarding the agricultural sector in TTIP negotiations

The issues regarding the agricultural sector belong to the most difficult elements of negotiations on transatlantic free trade area agreement. Union standards in this scope are higher than the American ones. Agriculture is an example of a difficult area for negotiations, also when it is related to food safety (Gadomski W., (ed.) (2015).

The degree of restrictiveness of sanitary and phytosanitary standards seems to be the most difficult unresolved issue in the current negotiations. Variation of sanitary and phytosanitary standards was the subject of many conflicts between the USA and the EU in the past, settled on the forum of WTO (Hajdukiewicz A., 2014). The main subject of the dispute is application of "the precautionary principle" by the European Union in accepting food safety standards. On the basis of this principle, it is possible to recall a food product from the market, if there is a risk that it poses a threat for human health, even if there is no sufficient scientific data to make full evaluation of this risk. What is important, the precautionary principle transfers the burden of proof on each company, which wants to sell a potentially hazardous product. Such a company is required to prove that its product is safe, while according to Americans such a product should be proven by adequate public authorities to be dangerous. The USA government applies the precautionary principles and the food safety standards are specified on a considerably lower level than in Europe, taking into account, above all, corporate interests (Hilary J., 2014).

Over 90% of American beef is produced by using bovine somatotrophin, considered as one of the causes of tumour occurrence in humans. Import restrictions regarding beef produced in such a way have been applied in Europe since 1988. The American government appealed against these restrictions to the WTO and the groups of entrepreneurs call to put an end to limitations within the TTIP system, as unnecessary trade barriers. The American producers of chickens and turkeys routinely disinfect poultry carcases with chlorine before putting them for sale, which is a procedure that has not been permitted in the European Union since 1997. As in other cases the USA government appealed against this prohibition on the WTO forum and the American companies call to put an end to these limitations within the TTIP negotiations. The European Commission made an attempt to lift this ban in the past, however, firm opposition of veterinarians and the deputies to the European Parliament prevented such action. The European restrictions concerning application of xenoestrogens (chemical compounds being endocrine disruptors of an organism) specify such low maximum level of food impurities that it is not possible to export 40% of American food to Europe. The American industrial groups look for a way to use negotiations on TTIP to eliminate these restrictions. The American food producers also acknowledged strict European restrictions on using pesticides as one of the most important standards, which should be mitigated within the TTIP. The provisions adopted in 2009 guarantee that the precautionary principle will play a key role in the European system of restrictions regarding use of pesticides, which aim is to protect human health and the environment. However, according to the leading negotiators, the same provisions have already been included on the agenda of the TTIP negotiations with the intent to mitigate them, going further than the standards adopted by the WTO, which should make them less burdensome for the food industry (Hilary J., 2014).

The European Union and the United States also differ as regards the provisions concerning the genetically modified organisms (GMO). Import and turnover of genetically modified food and fodder as well as cultivation of GMO on the area of the Union are allowed according to the current union legislation however, it is strictly regulated. According to the procedure of releasing GMO on the mutual market, the European Food Safety Authority (EFSA) prepares the scientific risk evaluation for a given product, checking if it is equally safe as its unmodified equivalents. After positive verification the European Commission presents to Member States a draft decision on releasing a given product for trade and voting takes place according to the qualified majority principle. If the Member States are not able to agree on a decision, the Commission approves the product on the basis of the positive decision made by the EFSA. In the case of approved genetically modified food and fodder, Member States can limit or prohibit their use only if they are able to prove that a given product can pose a threat to health and the environment. Such principles also regarded GMO cultivation however, since April 2015, as a result

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of amending the union law, there is greater possibility to limit or ban cultivation of GMO species by the union members on their territories, which have earlier been allowed on the Union level. A Member State can issue such a ban on the basis of the environmental protection principles adopted by it as well as spatial development conditions. Implementing the TTIP can lower food standards binding in the Union, implement GMO food and force farmers to GMO cultivation. The European Commission has proposed to change regulatory framework concerning the GMO in food and fodder in order to enable Member States to limit or ban their application, after their previous admission to the internal market of the Union. Strict limits have been indicated in the mandate to the TTIP negotiations for the European Commission by the Council of the EU. Discussions cannot change internal Union legislation regarding the GMO and food safety. These negotiations will be conducted according to the scheme of mutual concessions in "prohibited" zones, e.g. by wide opening of the Union market for GMO in exchange for admitting Union beef to the USA, however, they will consider the principles of further regulatory cooperation of veterinary and phytosanitary services (Gadomski W., (ed.) (2015).

Conclusions

It is difficult to clearly estimate the balance of profits and losses resulting from the transatlantic agreement without knowing the final effects of negotiations. However, it can be noticed that it will be very hard to reach a compromise in the scope of bilateral liberalisation of exchange regarding agri-food products. Negotiations in this scope will be conducted under pressure of various internal interest groups and discrepancies are very big in the scope of applied non-tariff measures, including especially some sanitary and phytosanitary barriers between Europe and the United States. However, it should also be stated that both negotiating parties are key partners in terms of agri-food trade, which can potentially result in big benefits coming from further liberalisation of trade. They can constitute a strong impulse to search for channels for communication.

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IMPORTANCE AND DEVELOPMENT OF FRUIT SECTOR IN POLAND – COOPERATION OF PRODUCERS

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Abstract. The article describes the Polish fruit sector with particular emphasis on entering into cooperation by establishing producer groups and organisations. It underlines the increasing role of this sector in agricultural production in Poland, which was undoubtedly stimulated by the Polish accession to the European Union, which allowed Polish fruit farmers to conquer the European and the global markets. The article presents fruit production in Poland in the years 2011-2015, the data related to the export of the Polish fruit and the status of organisation of fruit farmers into groups and organisations of producers. Accession to the EU enabled taking group action, for which a financial support from the EU funds is available, in accordance with fruit and vegetables market common organising. In addition, the changes in financing of the preliminarily recognised fruit producer groups, which apply in Poland from January 1, 2014 are discussed at The Ministry of Agriculture in Poland and in the EU.

Key words: fruit sector, fruit production, groups and organisations of producers, Poland, cooperation.

JEL code: Q13

Introduction

Poland is one of the main global producers of fruit growing regions with a temperate climate. In terms of fruit production among the countries of the European Union, it takes the place after Italy, Spain and France. Poland is the largest producer of apples in the European Union and the fourth one in the world after China, the United States and Turkey. In the European Union, Poland supplies most cherries, raspberries, currants and blueberries. Fruit production is an important sector of agricultural production. Share of fruit in the market value of crop production is 15%. In recent decades, Polish fruit farming followed changes taking place in the whole food economy, adopting to the rules of the free market economy and changing market conditions.

Poland's accession to the European Union in 2004 has helped Polish fruit farmers in commercial expansion into the Community market. Reasonable use of the EU funds, mainly for the development of the production and storage infrastructure, helped in increasing the competitiveness of Polish fruits and fruit products on the European and global markets. It has been also fostered by organising of farmers in producer groups and organisations. There were more than 300 active producer groups and organisations (111 preliminarily recognised groups of fruit and vegetable producers and 193 recognised producer organisations) by November 2015 in Poland. Seven thousand and three hundred fruit and vegetable producers were members of these groups.

The aim of this article is to describe the Polish fruit sector, with particular reference to integration activity among the fruit producers.

Research results and discussion

In the years 2004-2015, fruit crops in Poland ranged from 5 to 13.5% of fruit production in the European Union. In 2014, they were at a record level of 4.2 million tonnes by 30% higher than the average harvest in the years 2004–2013. Fruit production in Poland compared to the production in the European Union is shown in Table 1.

The growth of fruit production in Poland is fostered by sufficient land and a large number of producers with a high level of expertise and marketing knowledge and by their entrepreneurship and innovation. An important factor is taking group actions, because this makes it possible to consolidate the supply, prepare standardised deliveries and implement innovation in production, preparation for sales and sale of products.

Table 1

Fruit production in the European Union (million tonnes)

Item	2009	2010	2011	2012	2013	2014	20151
EU-15	32.00	30.90	32.40	29.80	30.70	30.90	30.30
EU-28	38.60	36.70	38.60	36.50	37.80	38.00	36.90
Poland	3.60	2.70	3.40	3.80	4.10	4.20	4.00

[1] Estimations of the Institute of Agricultural and Food Economics (IERiGZ)

Source: Rynek owocow i warzyw. Stan i perspektywy (Fruit and Vegetable Market. The Current Status and Prospects). Institute of Agricultural and Food Economics, 2015.

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An important factor in stimulating the development of national fruit production is the export. From accession of Poland to the European Union, total income from export of fruits increased as much as 3.5 times (from EUR 210 million in 2004 to EUR 728 million in 2013 (Rynek owocow…, 2014)). Largely due to an embargo introduced by Russia in 2014, income from sales of fresh fruit fell to EUR 540 million (data provided by the Ministry of Finance).

1. Structure of fruit production in Poland

Poland belongs to the group of the largest fruit and vegetable producers in Europe (Filipiak, Maciejczak, 2008; Jabłonska, 2008; Jabłonska, Olewnicki, 2011; Nosecka, 2012). The development of gardening is the answer to growing demand of the getting rich Polish society and, at the same time, horticultural crops, which are characterised by high intensity, made it possible to increase land productivity and workforce. Poland has fairly good natural climatic conditions for the cultivation of most horticultural plants in the soil, nonetheless for higher and better-quality production its proper zoning is important and irrigation is necessary due to insufficient annual precipitation. However, less favourable are thermal and solar conditions for growing of production under the covers, which makes it highly energy-consuming. A factor favouring the development of horticulture is the increase in market capacity, which is a reflection of the number of inhabitants and level of population's wealth (Jabłonska, Olewnicki, 2014).

Fruit crops in 2015 in Poland were approx. 4.0 million tonnes and were by 4.3% smaller than in the previous year. In the same period, the harvest of apples decreased by 3% to 3.1 million tonnes. It was due to weather in Poland in 2015. During the summer there was a drought and very high temperature prevailed. Approximately 40% of apple orchards fitted with sprinklers and using fertilisation reached high quality yields. In the non-irrigated orchards, many immature apples fell as early as in July. Quality of these fruits was low, they were small and undersized. Table 2 shows the fruit crops in the years 2011-2015.

Table 2

Fruit production in Poland (thousand tonnes)

Item	Fruit crops in thousand tonnes				
	2011	2012	2013	2014	2015
Total fruits	3414.60	3843.20	4128.30	4188.90	4010.00
Tree fruits and nuts, including:	2887.00	3290.00	3526.60	3625.60	3510.00
apples	2493.10	2877.30	3085.00	3195.30	3100.00
plums	91.80	102.50	102.40	106.10	92.00
cherries	175.00	175.40	188.20	176.50	177.00
walnuts and hazelnuts	13.60	16.50	13.20	9.90	10.00
berries including:	527.60	553.20	601.70	563.30	500.00
Strawberries	166.20	150.20	192.60	202.50	206.00
Raspberries	118.00	127.10	121.00	125.90	80.00
High-bush blueberries	8.60	11.30	12.70	12.50	13.00

Source: Central Statistical Office (2015). Crops in 2015. Preliminary Estimate of the Central Statistical Office.

Not only production of apples but also production of berries decreased. A definite factor was the fall of harvest of raspberries (by 36.5%). It concerned especially autumn varieties as well as chokeberries and currants. As mentioned before, direct cause of the fall of fruit harvest in Poland in 2015 was a drought lasting from mid-July to late September. However, at the same time, there was an increase in the harvest of strawberries and high-bush blueberries, by 1.7 and 1% respectively. Lower harvest in 2015 was compensated by price increases. For example, very low prices of apples in the season 2014/2015 were the result of nervous reaction of producers to the embargo imposed by Russia in August 2014. Apples were sold immediately after harvest, which resulted in an increase in their supply. A fairly large export, increase in consumption of apples in the country, the EU's aid to the withdrawal of apples from the market resulted in a significant shortfall by the end of the season 2014/2015. This caused an increase in price of food-

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grade apples, which in June 2015 was averagely EUR 0.50 per kg and were twice as high as in March 2015. In the current season 2015/2016, the Russian embargo still applies; however, decisions concerning the producers distribution are reasonable. The current year's harvest has been transferred to the storage with a controlled atmosphere and will be exported in the second half of the season or withdrawn from the market in accordance with the decision of the EU.

1. Polish fruits as a matter of foreign trade

Poland is a major exporter of fruits, especially apples. In the season 2015/2016, the export of fruits in Poland is to reach 1.17 million tonnes, including apples in the quantity of 940 thousand tonnes. The embargo on import of fresh, frozen and dried fruits and vegetables from the EU countries introduced by Russia in 2014 has resulted in diversification of markets for these products exported from Poland. Among the recipients of the Polish fruits, there is an increase in export to countries such as Belarus, Ukraine, Kazakhstan, Lithuania, Latvia, Romania and the Czech Republic. New markets include Middle East countries – the United Arab Emirates, Jordan, Saudi Arabia and the African countries. Export of fruits to these countries in the season 2014/2015 has increased 10 times compared to last season, from 1.5 thousand tonnes to 16 thousand tonnes. Poland hopes to develop cooperation with and export of Polish fruits also to China and Vietnam. Table 3 shows the basic data regarding the export of Polish fruits in the seasons 2012/2013 - 2015/2016 (forecast) by fruit species and main export markets for Polish apples (Table 4).

Table 3

Export of Polish fruits by fruit species (thousand tonnes)

Item	2012/2013	2013/2014	2014/20151	2015/20162
Total fruits	1558.20	1418.19	1182.50	1170.00
Apples	1261.70	1123.40	941.90	938.00
Pears	36.30	47.10	32.70	28.50
Strawberries	11.70	21.20	14.20	17.00
Raspberries	16.60	16.80	18.20	14.00
Cherries	9.40	11.70	8.30	12.00
Plums	8.00	8.20	12.50	9.00
Tropical fruits (re-export)	170.00	148.80	123.00	115.00
Other fruits	44.50	41.70	31.70	36.50

[1] *inconclusive data*

[2] *estimates*

Source: Rynek owocow i warzyw – stan i perspektywy (Fruit and Vegetable Market- The Current Status and Prospects) . Institute of Agricultural and Food Economics, 2015.

Table 4

Main directions of export of Polish apples (thousand tonnes)

Country	2012/2013	2013/2014	2014/2015
EU-15	169.60	170.80	164.50
EU-13	100.60	101.30	278.40
Latvia	11.70	11.00	60.60
Lithuania	14.60	16.10	60.00
Romania	33.80	34.50	48.50
Czech Republic	11.50	21.70	45.70
Other EU-13	29.00	18.00	63.60
CIS	971.90	840.70	437.90
Belarus	134.80	228.60	290.80
Ukraine	55.40	34.10	62.90
Kazakhstan	47.90	52.80	61.60
Russia	733.10	524.00	18.00
Other countries	19.60	10.50	61.10
Total	1261.70	1123.40	941.90

Source: The Ministry of Finance Data.

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As it is demonstrated by the data of Tables 3 and 4, apples are by far predominant in the export of Polish fruits. Until the Russian embargo, Russia was the main export market for Polish apples. In the season 2012/2013 Russian share in the export of Polish apples accounted for 58%, and in the season 2014/2015 the share had fallen close to 2% (the embargo has been imposed on August 1, 2014). From 2014 the main export market for Polish apples is Belarus, and its share in the season 2014/2015 in the export of Polish apples was nearly 31%. In the 2014/2015 season, the increase in the export of Polish apples to countries such as Latvia (a 5 times increase in relation to the previous period (4 times increase) and the Czech Republic is also clearly noticeable. After the imposition of the Russian embargo, Poland launched many measures to increase the consumption of apples in the country. By the end of the summer and in autumn of 2014 apples were ubiquitous: they were served for free in the trains, the politicians and celebrities encouraged eating them, the campaign was described by foreign media and was supported by guests performing in Poland, Cirque du Soleil, for example. It stimulated the increase in apples consumption by Poles. It is also worth mentioning that in Poland, since its accession to the European Union, nine informational and promotional campaigns have been arranged to convince about the fairness and the benefits of eating fruits and vegetables. From May 2004 the European Commission has granted about EUR 28.8 million to Poland for the implementation of these programmes. In 2015 inter alia, the following programmes have been executed:

- *"European two-colored apples"* – three-year informational and promotional campaign launched in 2014 and run in the markets of China and the United Arab Emirates;
- *"Apples Every Day"* – the campaign carried out in the years 2012-2015 mainly in the markets of Russia and Ukraine;
- *"Five portions of fruits or vegetables or juice"* – the campaign, which was a sequel of the programme *Vegetables and Fruits five times a day.*
- In addition, by 2015 the Agricultural Market Agency signed the agreements for carrying out subsequent campaigns:
- *"Extraordinary properties of ordinary fruits"* – 3-year-old campaign concerning the berries (strawberries, raspberries, currants and blueberries) addressed to Sweden, Finland, Austria, Czech Republic and Poland;
- *"Juices and mousses" - vitamins in a smart form* – campaign to promote the consumption of juices and mousses from fruits and vegetables;
- *"EcoEurope – quality and tradition"* – informational and promotional campaign concerning organic farming products, including fruits, vegetables and their products. It will be carried out in the American, Japanese and Singaporean markets.

In addition, in 2009 a Fund for Promotion of Fruits and Vegetables was established in Poland, financed by the industry. It was created in order to support agricultural marketing and increase fruit and vegetable consumption. There is 40.1 million PLN (about 10 million EUR) on this account, from its opening in 2009, by the end of October 2015. The money comes from about nine thousand companies.

2. Groups and organisations of producers of fruits and vegetables – taking group actions

The accession of Poland to the EU in 2004 allowed the Polish food producers to start the commercial expansion into the European and global markets. This expansion means the conquering of new markets and building strong brands for Polish products, including fruits. This expansion was made possible through the use of EU funds, mainly for the development of the production and storage infrastructure. Also, since accession to the European Union, it has been important to take action for integration among agricultural producers, in particular, the horizontal integration activities. The manifestation of the horizontal integration of fruit producers is the establishment of preliminarily recognised groups of fruit and vegetable producers and recognised producer organisations. These measures made it possible to increase the commercial competitiveness of the Polish fruits on a global scale. Development of the production and export of fruits requires efficient organisation of the market and a proper preparation of the offer in terms of quality, quantity and continuity of supply. Sales and delivery of fruits to the customer in the demanding markets are only possible using modern systems of packing and the principles of modern logistics (Strategia krajowa..., 2013). With the EU funding the groups of fruit and vegetable producers have specialized equipment for harvesting, storage and preparation of fruits for sale. The groups have their own

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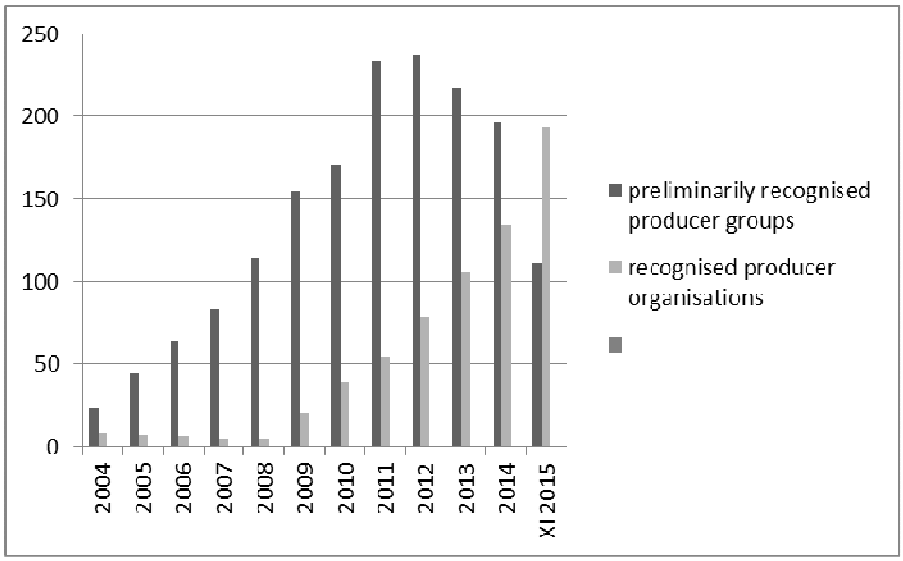
storage bases, specialized for cleaning, sorting, packaging and conditioning of fruits as well as means of transport for delivery of products to customers, while maintaining their quality. Through group actions agricultural producers are able to obtain benefits, which are very hard to achieve by acting alone. These include (Adamowicz, Lemanowicz, 2006):

- planning and adjusting production to demand, especially regarding quality and quantity of supplied agri-products;
- concentrating supply of agri-products, which enables to strengthen farmers' position during negotiations with representatives of next stages of the distribution channel;
- making bigger batches of agri-products;
- implementing quality standards, resulting in higher quality of agri-products;
- creating and promoting proper brands;
- active selling, i.e. searching for new ways of sale both in the country and abroad;
- participation of capital in establishing new primary market entities, e.g. wholesale markets and commodity markets.

Producer groups operating in the fruit and vegetable market are subject to the common organisation of the fruit and vegetable market. After accession to the European Union, preliminarily recognised groups of fruit and vegetable producers and recognised producer organisations could be established in Poland. Preliminarily recognised groups of fruit and vegetable producers received the status of fruit and vegetable recognised producer organisations at the latest after 5-year-long period of implementation of the recognition plan. In 2004, that is in the year of accession of Poland to the European Union, there were founded eight producer organisations and twenty four preliminarily recognised producer groups. In November 2015, there were 193 producer organisations and 111 preliminarily recognised producer groups in Poland. These organisations had 7300 members. Quantitative development of the groups and organisations of producers active in the fruit and vegetable market in the years 2004-2015 is shown in Figure 1.

Within common organisation of the fruit and vegetable market, preliminarily recognised groups of fruit and vegetable producers received a financial support to cover the costs associated with the establishment of a producer group, for administrative activity and for some investment's eligible costs defined in the approved recognition plan. As regards recognised producer organisations, financial aid is intended for financing the operating fund established by the group. The operating fund is established by the producer organisation in order to finance the activities approved in the operational programme.



Source: The Agency for Restructuring and Modernisation of Agriculture Data.

Fig. 1. **Number of preliminarily recognised producer groups and recognised producer organisations in Poland in the years 2004-2015**

A very important event related to the activity of groups of fruit and vegetable producers was the EU Regulation No 1308/2013 of the European Parliament and of the Council of 17 December 2013 establishing a common organisation of the markets in agricultural products and repealing Council Regulations (EEC) No 922/72, (EEC) No 234/79, (EC) No 1037/2001 and (EC) No 1234/2007. The provisions of this Regulation are in

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force from 1st January, 2014. Although they cancel the previous mechanism of the previously separate financial aid to the preliminarily recognised fruit and vegetable producer groups for implementation of the approved recognition plans. From January 1, 2014 there is no legal basis for the granting of financial support to cover the costs associated with the establishment of producer groups, for administrative activity and for some investments eligible costs defined in the approved recognition plan for the new beneficiaries. That is, for the producer groups, which apply for preliminary recognition status after January 1, 2014. However, pursuant to Art 231, Section 2 of the above-mentioned Regulation, all multi-annual programmes adopted before January 1, 2014, after the entry of this Regulation into force shall continue to be subject to the relevant provisions of the previous Regulation (EC) No 1234/2007, until the expiry of these programmes that is up to December 31, 2018. Until December 31, 2013 preliminary recognition status could be granted to producer groups, which had not been able to meet all the conditions for full recognition. In most cases they had not yet had the technical equipment and had no experience in administration, management and conduct of the sale of fruit and vegetables produced by its members (Lemanowicz, 2015). In accordance with the new EU regulations in force from 2014, the support from the EU funds for investments in producer groups related to their establishment and activity has been cancelled but the existing support for producer organisations has been maintained. The lack of financing for the preliminarily recognised groups resulted in impeding the establishment of these groups and it may lead to the collapse of group action in the fruit market.

Conclusions

1) Poland belongs to a group of the largest fruit producers in Europe. In 2015 the fruit crops were 4 million tonnes, including harvest of apples, which totalled 3.1 million tonnes.

2) Fruit crops in 2015 were lower than in the years 2013-2014, which was caused by drought and very high temperatures in the period from July to September.

3) A significant event affecting the situation of the fruit market was the embargo imposed by Russia in August 2014. This has led to a diversification of fruit markets for fruits from Poland. An increase in export to countries such as: Belarus, Ukraine, Kazakhstan, Lithuania, Latvia, Romania, the Czech Republic was visible. New markets include Middle Asia countries: the United Arab Emirates, Jordan, Saudi Arabia and the African countries. Poland hopes to enter into cooperation with China and Vietnam.

4) The acquisition of new markets is possible due to the integration measures consisting in the establishment of producer groups and organisations. The producer organisations and groups make it possible for the Polish farmers to consolidate the supply, prepare standardised product batches and with base storage provide the supply throughout the season.

5) In 2015, 7300 fruit and vegetable producers were members of these groups. One hundred eleven preliminarily recognised groups of fruit and vegetable producers and 193 producer organisations existed in the market.

6) The financial aid is granted within the common organisation of the fruit and vegetable market. Until January 1, 2014 both producer groups and producer organisations could benefit from this support. Currently, there is no legal basis for granting of financial aid to preliminarily recognised groups established after January 1, 2014.

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CALCULATION OF PRODUCT COST IN DAIRY FARMING: EXAMPLES FROM ESTONIA

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Abstract. In order to ensure sustainable milk production and comparison of results, it is important to be able to calculate the unit cost of milk production (unit price). As there is no uniform methodology for calculating milk production and full unit cost, companies themselves have tried to develop suitable methodologies which unfortunately have given incomparable results. This uncertainty prevails in the use of topical concepts. This article investigates dairy output unit cost calculation principles in use in Estonia within the framework of a case study, and offers possible solutions for their harmonisation. This issue has become important in Estonia due to the fall in purchase prices on the dairy market.

Key words: dairy farming, cost accounting, production costs, unit cost.

JEL code: D24

Introduction

The structure and level of production costs are determined by the global food product market and food safety (Bengtsson, 2011; Isermeyer, 2011). Production costs are characterized by production systems and production technology, investments in their development, and ultimately the production potential. Production costs are economic indicators with which the economic results of production are assessed (Värnik, 2008). In evaluating the competitiveness, the calculation and accuracy of production costs are of significant importance in making necessary changes to the selection of inputs and in their usage (Viira, et al., 2015). A production cost can be defined as the value of production factors/inputs in the final output. Therefore, the challenge for agricultural enterprises remains in how and with what methodologies to carry out accurate cost accounting and evaluation (Cesaro, 2008; FACEPA, 2011). One way of assessing the cost of production is the analysis of all costs in the production process (Shadbolt, et al., 2011).

The main goal of cost accounting is to provide management with important information at the right time for different managerial decisions. In a situation where one of the prerequisites for ensuring sustainable milk production is management's knowledge on the composition of the production unit cost of milk, it is especially deplorable that there is a lack of a unified calculation methodology that would ensure the comparability of costs per unit of output (cost object). So far, it has been sufficient in most agricultural companies to know how to take costs into account fairly and correctly but nowadays cost management, forecasting, and budgeting have become increasingly important, which makes it necessary to go beyond cost accounting to cost management. The goal of cost management is to ensure the safeguarding of interest groups with information necessary for their interests in costs of cost objects. The aim of the current paper is to investigate possible means of calculating production costs in dairy farming, presenting theoretical opinions and comparing different production cost calculation schemes, spread in practice in Estonian dairy companies. The authors hope to start a discussion on this topic. Observation and a case study have been used as this article's research methodology. The primary data were gathered in five interviews conducted in October and November 2015. Production costs are trade secrets, and thus in order to ensure the anonymity of the sources, the identities of those interviewed had not been disclosed.

Research results and discussion

1. Overview of the principles of output cost calculation

The output unit cost price of livestock farming is calculated after the determination of the crop production costs and the adjustment of the actual costs of animal nutrition produced and used by the company (Accountancy Guideline Materials…, 1987). A dairy herd's primary product is milk, while calves born to the herd are counted as supplementary products, and manure is a by-product (Soe, et al., 1984).

According to the Estonian Accounting Board guidelines ASBG 7 *Biological Assets*, agricultural products, including by-products, are recorded at an estimated fair value less sales costs. To this end, it is necessary to know the production quantity and the market price of the respective unit. Both figures are estimates, and their value on the basis of various estimates is inaccurate. By-products may be calculated in terms of the costs involved in obtaining by-products (Musallyamova and Antonova, 2014). According to the

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same authors, accounting and assessment of a by-product becomes important if it is used in the production of biogas. Several variants are offered for the calculation of supplementary products:

- after the deduction of the production costs of by-products from the costs of the dairy herd, the remaining costs of feed stuff exchange energy are divided accordingly: milk 90%, calf births 10% (ASBG 7 (2011), Musallyamova and Antonova, 2014, Product Cost Planning …, 1987). Musallyamova and Antonova (2014) believe it would be more correct to calculate 10% of the feed cost for the value of the births;
- calves are recorded at their actual birth weight and budgeted value for one kilogram of body weight (Musallyamova and Antonova, 2014).

One of the goals of cost management is the providing of necessary information on the cost of cost objects (Karu, 2008). In agriculture, a cost object may be defined as any product for which we wish to measure and calculate costs. Dairy farming activities do not result only in the production of the primary product (milk) but additionally in the production of by-products and supplementary products (e.g. manure, calves). The manner of dividing cost objects involves dividing them between direct costs and indirect costs (Ryzhova et al., 2015; Vooro, 2011). Besides information for the choice of necessary cost objects, it is important to focus on specifying points of consumption, which provides information on which part of a company's structure or process costs arise (Karu, 2008). In addition to accurate cost centre cost accounting, a key issue here is the establishment of necessary overhead rates (distribution bases) for the distribution of overheads to cost objects (Musallyamova and Antonova, 2014). For example, the report of the Ontario Dairy Farm Accounting Project (2015) recommends a detailed breakdown of cost bases for dairy enterprises. In ASBG 4 *Stocks*, clause 10, an overhead distribution method is given which should be described in the company's internal accounting regulations. Such a procedure is suitable for a production company with a determined normal production volume but not for an agricultural producer.

Following the guidelines on the calculation of production cost prices in the 1980s (Product Cost Planning …, 1987), certain costs are excluded, such as:

- costs which derive from state budgetary appropriations;
- losses from natural disasters;
- costs recovered from responsible persons for dying or dead animals;
- interest on short- and long-term bank loans.

In light of the foregoing, government grants to offset the cost of dairy cattle should be calculated to reduce costs. In the opinion of Vooro (2011), costs can be reduced by the amount of the subsidies on the decision of management when calculating production costs, keeping the aim of the subsidies in mind.

Belloin (1988) recommends that profits and losses from cattle sales and deaths be reflected not as reductions in costs but as adjustments of dairy revenues (revenue from sales of milk and manure).

As it is not possible give a reliable estimate on the fair value of biological assets, pursuant to ASBG 7 Biological Assets such assets may be recorded in acquisition cost if (a) the asset has not significantly changed biologically after acquisition; or (b) the effects of the biological change to the cost of the asset are not important. Depreciation is calculated from the acquisition cost of biological assets. Herd depreciation is the spreading out of the cow' acquisition cost over the estimated useful life of the animals (Converting the Farm's …, 2006).

Sustainable Food Trust started a new true cost accounting project in 2013. Smith (2015) argues that parts of the production costs (costs related to the environment, e.g. costs related to the disposal of antibiotic residue introduced into the environment through milk sludge; social costs) are hidden. However, there are also positive effects (e.g. job creation in rural areas, maintenance of agricultural land) that should be taken into account. The project proposes the development of a model that takes into account all the costs related to food production, rendering different systems of food production costs comparable (Smith, 2015).

2. Dairy production cost accounting principles in Estonian dairy companies

In order to study the calculations of unit costs in Estonian dairy companies, five interviews were conducted. Table 1 presents the principles and examples in use for calculating production costs in three Estonian dairy companies.

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Table 1

Details on characteristics of calculation of dairy production costs in three Estonian companies

Item	Company 1	Company 2	Company 3
Costs	Production costs and production overheads	Remunerations, feed, direct expenses, interest from loans and leases for specific purposes, depreciation, real operating costs affecting milk price	Production costs and interest costs
By-products as expense reduction	In final sales price	Value determined by board	Unit price set years ago
Supplementary production as expense reduction	(dairy herd costs – by-product) * 10%	0 value	Budgeted price increase per kilogram
Primary production calculation unit	One ton produced milk	One ton produced milk	One ton sold milk
Economic content upon which calculation is based	Production cost per ton of milk produced	Company's total cost per ton of milk produced	Production and financial cost per ton of milk sold
Term used by enterprise	Production cost of milk	Full production cost of milk production	Production cost of milk output

Source: authors' compilation based on interviews

It is always important to clarify what is understood by the term "production cost," and to differentiate between different production cost levels. Table 1 shows (Company 2, Company 3) that production cost entails indicators from many different economic aspects. The data collected for research show the problems of classifying costs as direct and indirect costs (production overheads) or fixed and variable costs. Proper cost accounting management and division of costs between cost centres, cost objects, and cost types is necessary. The distribution of indirect costs (production overheads) was unclear, with no guidelines in the internal accounting rules for cost allocation. In one company, the allocation of costs between dairy and young cattle, housed in one farm complex, was done according to a decision of the management which had no basis in reason. Recognition of the consumption of milk fed to calves and milk waste (own output) in expenses is unregulated and unclear. The interviews revealed the need for training on the topics of the organization of cost accounting and the calculation of output production unit cost.

When calculating unit production cost, these examples of Estonian practice have taken into account interest costs connected with the financing of the acquired assets for the purpose of milk production. It is the opinion of the authors that interest costs may be taken into account in calculations of the full production unit cost of milk. In the examples given in Table 1, the companies have left unresolved the question of incorporating the gain or loss of biological assets (cows) into the calculations. In one case, the company in question presented costs of environmental charges related to the use of the environment (water abstraction permit fee, pollution charges related to pollution over the established norm) which were taken into account in the calculation of the production costs. The future challenge will be to change the so-called true-cost accounting principles, or the calculation of hidden costs.

In evaluating the value of by-products, differences between the companies became clear: the last market price as well as the estimate values were used. The evaluation of the value of supplementary products, calves, in the calculation of the production cost was also different. The practice whereby the value of the by-product is deducted from the total costs of the dairy herd after a presumed 10% for births may distort the production cost. Since this ratio is assessed on the basis of energy exchange for animal nutrition, the authors believe it may be advantageous to consider the birth value at 10% of the cost of feed. In one company, the calf crop was indeed registered but calves were recorded as having 0 value.

A scheme for the calculation of milk unit production cost introduced by one Estonian dairy farmer is presented in Table 2. Using the calculation scheme set out in the table, it is not the milk production cost that is found but the economic indicator of "adjusted costs per ton of milk sold." The result does not reflect the costs incurred per unit of milk produced. The scheme leaves unanswered the deduction of costs from animal sales

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revenues; distribution of general administrative costs for production is unclear; and although milk fed to calves is indeed taken into account, the value of milk waste is not reflected in the scheme.

Changes in the organization of financial accounting on the basis of international standards have led to the need for other adjustments in costs and improvements in cost accounting, where regulations for this are missing. One solution would require cattle deaths, sales revenue and gains or losses from biological assets (cattle), costs of reevaluation of biological assets, and others to be reflected in the calculations of the production unit costs.

The case study shows that one Estonian company has attempted to implement EBITDA-based calculations, whose outcomes reflect margins (i.e. interest costs, asset depreciation and income tax expenses covering the margins) per ton of milk sold but not the production cost of milk. Calculations are based on a company's residual income-based profit and loss account, taking into account both sales revenues as well as state subsidies and support to offset costs to the producer.

Table 2

Company X milk production cost calculation

Item	Unit	Quantity	EUR
Milk production	Ton	3720	
Milk sales	Ton	3380	
Direct expenses:			
Self-produced fodder	'000 EUR	X	520
Milk for calves	'000 EUR	X	32
Purchased feed	'000 EUR	X	92
Other variable expenses (medicine, performance testing, semen, bedding, services etc.)	'000 EUR	X	80
Total fixed expenses (salaries, fuel, depreciation, equipment maintenance, other)	'000 EUR	X	542
Total direct expenses	'000 EUR	X	1266
Sales revenue, cows	'000 EUR	X	98
Milk production cost = (direct expenses – sales revenue) / quantity of milk sold	EUR/ton	X	345.56
Adjustments:		X	
Losses from sales and deaths of animals	'000 EUR	X	+225
Milk fed to calves	'000 EUR	X	-32
Reevaluation of biological assets	'000 EUR	X	0
Birth and growth	'000 EUR	X	-99
Milk production full cost price = direct expenses – sales revenue +/- adjustments / quantity of milk sold	EUR /ton	X	373.37

Source: authors' compilation based on interview

In one formula, EBITDA-based margins took into account agricultural output (e.g. silage, fodder grain, slurry and dry manure) and accounting and outcome evaluation of biological assets; and in the other formula, these were not included in the calculations.

In calculations of production costs, it is the authors' view that it is expedient not to reduce costs relative to government grants, state subsidies but to compare milk production and cost prices with (1) the sales price, and (2) the sales price and the amount of the grants, subsidies per ton of milk sold.

The collection of the data showed that Estonian self-employed persons who keep their accounts on a cash basis are also interested in milk production cost calculations. Unfortunately, there are no clear and simple methodological recommendations for cash-based accounting for carrying out milk production unit price calculations.

Conclusions, proposals, recommendations

1) It is always important to clarify what's the substance under the term of unit cost and to differentiate between different unit cost levels. If all

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costs are distributed to products, these may then be called full unit cost estimates (calculations) but if only production costs are distributed to cost objects, these may be called product production cost estimates.

2) In practice, many different dairy herd output production unit cost calculation methodologies have become prevalent, and as a result the milk unit production costs calculated by different companies are not comparable. In addition, there is confusion in the terminology, meaning that certain companies calculate milk unit production cost, some milk cost, and some cost price of sold milk or another economic indicator. These figures are not comparable.

3) There is a need to find a solution how to take into account gains or losses of biological assets in cost accounting and in the calculation of unit costs.

4) The authors' suggestions:

- state targeted grants and subsidies should not be included in production unit cost calculations but rather output production costs should be compared with sales revenue and subsidies per unit of product sold;
- there is a need to develop methodological guidelines for the calculation of production costs for milk producers, including self-employed persons, using cash-based accounting;
- financial costs relating to milk production should be taken into account in the calculation of the full unit cost of milk;
- companies' knowledge about dairy cost accounting and the principles of calculation of production unit costs should be improved and the results should be more use in managerial decision-making process.

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EFFICIENCY IMPROVEMENT OF THE CZECH AND POLISH PROCESSORS OF POULTRY MEAT IN 2008 - 2013

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Abstract. The consumption of the poultry meat in the Czech Republic has been increasingly covered by imports from Poland. The low competitiveness of the Czech companies could be rooted in the production efficiency of poultry meat processors. Therefore, the aim of the paper was to evaluate the technical efficiency improvement of the Czech and Polish corporate poultry processors. The analysis of 54 medium and large poultry meat processors in the NACE 10.12 covered the period 2008–2013. The Malmquist index, the Data Envelopment analysis and the Kolmogorov-Smirnov test of the differences between the Czech and Polish companies revealed that improvement of the production efficiency of poultry meat processors in Poland was significantly higher than in the Czech Republic. The change of material and energy productivity significantly differed between two countries in contrast to labour and capital productivity. The author expected that the large investments in technology upgrading and concentration would further strengthen the position of Poland as the one of the largest European poultry producers.

Key words: competitiveness, DEA, financial analysis, investment, Malmquist index

JEL code: M21, L66

Introduction

Poultry meat is the most popular meat worldwide. The consumption of poultry meat in the Czech Republic takes the second place after pork meat. The consumption per capita is about 25 kg per year. So, the significance of the poultry meat processing industry is high. However, the Czech poultry meat consumption has been strongly affected by imports because the Czech Republic is not self-sufficient in the poultry meat (Pohlova, Mezera, 2014). More than 50% of the import of poultry meat to the Czech Republic comes from Poland. According to the External Trade Database of the Czech Statistical Office, the foreign trade balance of the poultry meat (code 0207 of Harmonized System 4-digits code) between the Czech Republic and Poland continuously dropped from CZK -1 064.35 million to CZK -2 325.36 million between 2008 and 2014. It indicates that the Czech Republic is not able to compete with the Polish poultry meat processors. One of the possible reasons could be low technical efficiency and low efficiency improvement of the Czech poultry meat processors.

The question of the technical efficiency and the efficiency improvement in agribusiness in the Central Europe was occupied by many authors. Most papers dealt with the technical efficiency of agricultural companies in recent years (Cechura, 2012; Pechrova, Vlasicova, 2013; Bojnec et al., 2014; Nowak, Kijek, Domanska, 2015; Barath, Ferto, 2015). Unfortunately, only a few authors focused on food processing industry (Dankova, Bosakova, 2005; Cechura, Hockman, 2010). Cechura and Mala (2014) analysed the differences in the technology and the technical efficiency of Czech and Slovak processing companies in the period 2003–2012. They compared oils, dairy, milling and other sectors (not specifically the meat processing industry). They concluded that the technical efficiency was high in all analysed sectors. However, the meat industry and poultry processing industry in the Central Europe has not been sufficiently evaluated so far. There are only some articles about poultry farms (Mahjoor, 2013; Heidari, Omid, Akram, 2015), not about poultry processing industry.

So, it is very topical to evaluate a technical efficiency and efficiency improvement in the poultry processing industry. The problem of negative foreign trade balance between the Czech Republic and Poland is a good reason to make the analysis. The aim of the paper is to evaluate the technical efficiency change of the Czech and Polish corporate poultry processors in the period 2008–2013. The article also deals with the differences in partial efficiency indicators between the Czech and Polish companies.

Methods

As Spicka and Machek (2015) introduced, efficiency measurement is often carried out from two perspectives: total factor productivity (TFP) which takes into account all possible inputs and outputs of an industry (firm, process), multifactor productivity (MFP) which deals with the relationship between output and multiple input factors, and partial factor productivity (PFP) which deals with the productivities of individual inputs. The article uses multifactor productivity (MFP) which deals with the relationship between output and

multiple input factors. MFP and Malmquist index quantify change in a company's efficiency over a period of time.

A producer can be defined as an economic agent transforming a set of inputs $\mathbf{x} = (x_1, x_2, \ldots, x_n)$ into a set of outputs $\mathbf{y} = (y_1, y_2, \ldots, y_m)$. Generally, the author considers the components of these vectors to be strictly positive. In order to define the Malmquist index of productivity (Caves et al., 1982), one considers a period during which the production has changed from $(\mathbf{x}_t, \mathbf{y}_t)$ to $(\mathbf{x}_{t+1}, \mathbf{y}_{t+1})$. Let's assume the output-maximizing approach which means the lesser the distance from a production frontier, the better the efficiency score. The Malmquist index of productivity for period t, respectively for period $t + 1$, would be the ratios

$$M_t(\mathbf{x}_t, \mathbf{y}_t, \mathbf{x}_{t+1}, \mathbf{y}_{t+1}) = \frac{D_t(\mathbf{x}_{t+1}, \mathbf{y}_{t+1})}{D_t(\mathbf{x}_t, \mathbf{y}_t)}$$
$$M_{t+1}(\mathbf{x}_t, \mathbf{y}_t, \mathbf{x}_{t+1}, \mathbf{y}_{t+1}) = \frac{D_{t+1}(\mathbf{x}_{t+1}, \mathbf{y}_{t+1})}{D_{t+1}(\mathbf{x}_t, \mathbf{y}_t)}; \quad (1)$$

where D_t denotes the value of the distance function in period t. If the technology has changed during the period, these two indexes would result in different values. Therefore, it is common to employ the geometric mean of the two indexes and specify the Malmquist index of productivity as

$$M(\mathbf{x}_t, \mathbf{y}_t, \mathbf{x}_{t+1}, \mathbf{y}_{t+1}) = \sqrt{\frac{D_t(\mathbf{x}_{t+1}, \mathbf{y}_{t+1})}{D_t(\mathbf{x}_t, \mathbf{y}_t)} \times \frac{D_{t+1}(\mathbf{x}_{t+1}, \mathbf{y}_{t+1})}{D_{t+1}(\mathbf{x}_t, \mathbf{y}_t)}} \quad (2)$$

The index can be further decomposed in the product of two terms (Fare et al., 1992):

$$M(\mathbf{x}_t, \mathbf{y}_t \mathbf{x}_{,t+1}, \mathbf{y}_{t+1}) = \sqrt{\frac{D_t(\mathbf{x}_{t+1}, \mathbf{y}_{t+1})}{D_t(\mathbf{x}_t, \mathbf{y}_t)} \times \frac{D_{t+1}(\mathbf{x}_{t+1}, \mathbf{y}_{t+1})}{D_{t+1}(\mathbf{x}_t, \mathbf{y}_t)}} =$$
$$= \sqrt{\frac{D_{t+1}(\mathbf{x}_{t+1}, \mathbf{y}_{t+1})}{D_t(\mathbf{x}_t, \mathbf{y}_t)} \times \frac{D_{t+1}(\mathbf{x}_{t+1}, \mathbf{y}_{t+1})}{D_t(\mathbf{x}_t, \mathbf{y}_t)} \times \frac{D_t(\mathbf{x}_t, \mathbf{y}_t)}{D_{t+1}(\mathbf{x}_{t+1}, \mathbf{y}_{t+1})} \times \frac{D_t(\mathbf{x}_{t+1}, \mathbf{y}_{t+1})}{D_{t+1}(\mathbf{x}_t, \mathbf{y}_t)}} =$$
$$= \frac{D_{t+1}(\mathbf{x}_{t+1}, \mathbf{y}_{t+1})}{D_t(\mathbf{x}_t, \mathbf{y}_t)} \times \sqrt{\frac{D_t(\mathbf{x}_t, \mathbf{y}_t)}{D_{t+1}(\mathbf{x}_t, \mathbf{y}_t)} \times \frac{D_t(\mathbf{x}_{t+1}, \mathbf{y}_{t+1})}{D_{t+1}(\mathbf{x}_{t+1}, \mathbf{y}_{t+1})}} =$$
$$\Delta TE(\mathbf{x}_t, \mathbf{y}_t \mathbf{x}_{,t+1}, \mathbf{y}_{t+1}) \times \Delta T(\mathbf{x}_t, \mathbf{y}_t \mathbf{x}_{,t+1}, \mathbf{y}_{t+1}) \quad (3)$$

The first term ΔTE reflects the impact of changes in technical efficiency which means that $\Delta TE > 1$ as technical efficiency improves and $\Delta TE < 1$ as technical efficiency deteriorates. The second term ΔT captures the changes in technology (technical change) which can be expressed by the ability of a firm to produce more (or less) with a given level of inputs in t related to the levels feasible in $t + 1$. ΔT is the geometric mean of two terms, when the first term compares the two periods in terms of period t data, and the second term compares the two periods in terms of period $t + 1$ data. $\Delta T > 1$ as technical progress occurred between periods, while $\Delta T < 0$ as technical regress occurred between the two periods.

A value of 1 signifies no change in efficiency, while values greater than 1 or less than 1 signify an increase or decrease, respectively. The Malmquist index is the product of two terms - a "frontier shift" term and a "catch-up" term. The catch-up (recovery) term relates to the degree to which a decision-making unit improves or worsens its efficiency with respect to the frontier in each period, while the frontier-shift (innovation) term reflects the change in the efficient frontiers between the two time periods (Cooper et al., 2006).

The input-oriented Data Envelopment Analysis model assumes the variable returns to scale (DEAVRS method*). The input oriented model was selected because poultry meat processors take price from the market and they are rather able to manage inputs than price. The issue of the returns to scale concerns what happens to units' outputs when they change the amount of inputs they are using to produce their outputs. Under the assumption of the variable returns to scale, a unit found to be inefficient has its efficiency

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* BCC (Banker-Charnes-Cooper) model. The BCC model used in this paper is described in more detail by Cooper et al., 2006.

measured relative to other units in the data-set of a similar scale size only. Three inputs and one output per company were used for efficiency calculation. In order to remove the influence of price development, outputs and three inputs (expressed in monetary units) were deflated using output and input price indices. The indices were taken from the Eurostat database of price indices.

- Output = Sales, i.e. the financial value of production sold to the customers excluding the value added tax. Deflation indicator: Producer prices in industry, total - Processing and preserving of poultry meat (EU-27, 2010 = 100), Eurostat.
- Input 1 (controlled input) = Materials and Energy, i.e. the financial value of material and energy consumption. Deflation indicator: Price indices of agricultural products, output - Poultry (CZ, PL, 2010 = 100), Eurostat. Live poultry produced on farms is the main input in the poultry processing industry.
- Input 2 (controlled input) = Staff costs, i.e. the financial value of wages including all payments of employees and employers. Deflation indicator: Labour input in industry, total – Manufacture of food products – Gross wages and salaries (CZ, PL, 2010 = 100), Eurostat.
- Input 3 (uncontrolled input) = Depreciation and amortization, i.e. the financial value of consumption of the long-term assets within each year. Deflation indicator: Producer prices in industry, total – Capital goods (CZ PL, 2010 = 100), Eurostat.

The Kolmogorov-Smirnov test (K-S) was applied depending on the subjective assumptions about the efficiency determinants. The K-S test was selected because it is not sensitive on normality and equal variances in the sample. Normality test and equal-variance test are not presented in this paper (because of its limited length) but assumption testing through Shapiro-Wilk test and the two-group variance-comparison test rejected the normality and equal-variance of the two subsets.

The DEA method and Malmquist index were applied through Banxia Frontier Analyst 4. The statistical analysis was processed automatically by software Stata 12.1.

Data

The analysis used data from the Amadeus database that provides comparable financial information for public and private companies across Europe. The companies with specialization in the branch 10.12 Processing and preserving of poultry meat in the Czech Republic and in Poland were in focus. The analysis covered the period 2008-2013 that represents the "old" programming period of the Rural Development Programme (RDP). The article focused on the medium and large corporations since they have produced most value of processed poultry meat in both countries. Moreover, small companies do not usually export the products. The Amadeus database generated 19 companies in the Czech Republic and 294 companies in Poland. However, not all companies released complete balance sheet and income statement in the period 2008-2013. So, 10 Czech companies and 44 Polish companies entered into the analysis. It is not random sample but it represents really the largest poultry processors which have significant impact on foreign trade. Table 1 contains the number and turnover (operating revenues) of the companies in the sample and in the population according to the official statistics by Eurostat and the Czech Statistical Office.

Table 1

The comparison of the sample and the population (2013) – 50 and more employees

	Sample	Population	Sample / Population (%)
Number of enterprises (CZ)	10	10	100
Number of enterprises (PL)	44	226	19.5
Turnover (CZ), thou. EUR	352 858	352 858	100
Turnover (PL), thou. EUR	1 122 391	2 826 900	39.7

Source: author's calculations based on Eurostat, Czech Statistical Office, Amadeus

It is an unbalanced panel data set. The sample of the Czech poultry processors is equal to the population of medium and large companies with 50 and more employees. The three largest Czech poultry processors are VODNANSKA DRUBEZ, A. S., DRUBEZARSKY ZAVODKLATOVY, A.S., RABBIT TRHOVY STEPANOV, A.S. The sample of the Polish poultry processors represents 19.5 % of the population number. The three largest Polish poultry processors in the sample are ROLDROB S. A., IKO KOMPANIA DROBIARSKA SP. Z O. O., DROP S. A.

Research results and discussion

The difference in the Malmquist index was tested between Czech and Polish companies. Moreover, development of the technical efficiency over time is described in the Czech Republic and Poland. Table 1 describes the differences of the mean Malmquist index in the period 2008-2013 between two countries.

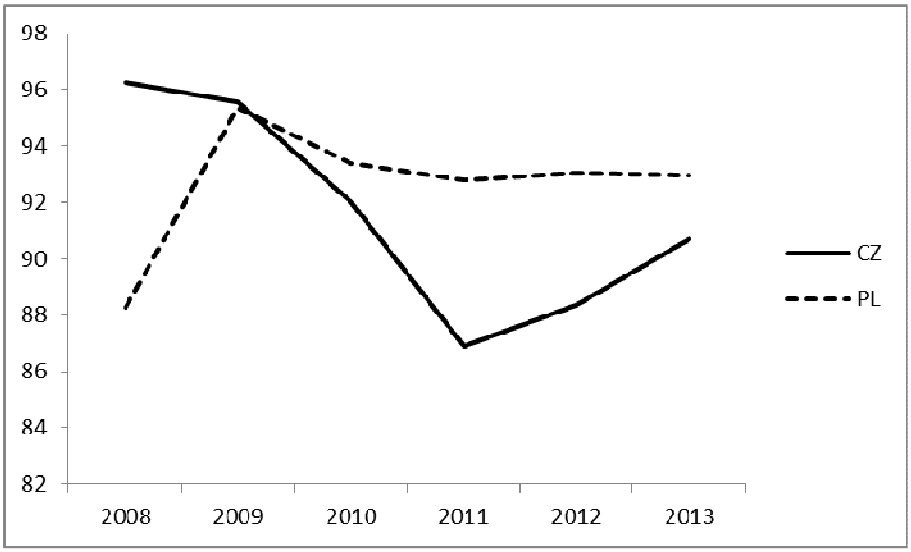
Table 2

Malmquist index (2008–2013)

Country	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
CZ (N = 10)	1.005926	0.0067329	0.0212912	0.9906952	1.021157
PL (N = 44)	1.105276	0.0804417	0.5335897	0.9430503	1.267502
K-S test	D	p-value	corrected	**Significance** (α = 0.05)	
CZ (N = 10)	0.6273	0.002	-	**CZ < PL**	
PL (N = 44)	-0.0455	0.967	-	**-**	
Combined	0.6273	0.003	0.001	**CZ ≠ PL**	

Source: author's calculations based on Amadeus

The Polish companies experienced higher improvement of the production efficiency (by 10.5 % p.a. on average) than the Czech companies (by 0.6% p.a. on average). The result is statistically significant. It should be interesting to view a development of the production efficiency over time and see the critical years in the period (Figure 1). The figure shows a sharp drop of the technical efficiency of the Czech poultry processors from 96.3 % (2008) to 86.9 % (2011). The technical efficiency of the Czech poultry processors then increased in 2012 and 2013 but it has not reached the Polish level until 2013.



Source: author's calculations based on Amadeus

Fig. 1. **Development of the production efficiency**

The Malmquist index can be disaggregated into "frontier shift" and "catch-up" effect. This analysis is important to see whether the companies (country) improved the production efficiency with respect to the frontier or there was a change in the efficient frontiers between the time periods rather than an improvement of country's efficiency. Table 3 describes the catch-up effect and Table 4 contains the frontier shift.

Table 3

Catch-up effect (2008–2013)

Country	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
CZ (N = 10)	0.99372	0.0034899	0.011036	0.9858253	1.001615
PL (N = 44)	1.013314	0.0025594	0.0169771	1.008153	1.018476
K-S test	**D**	**p-value**	**corrected**	**Significance (α = 0.05)**	
CZ (N = 10)	0.6591	0.001	-	CZ < PL	
PL (N = 44)	0.0000	1.000	-	-	
Combined	0.6591	0.002	0.001	CZ ≠ PL	

Source: author's calculations based on Amadeus

It is evident that the catch-up effect positively determined overall improvement of the production efficiency of the Polish poultry meat processors. It means that there was really a positive shift towards frontier. Alternatively, the Czech companies moved away from the efficient companies which; it shows lower competitiveness of the Czech poultry industry. Frontier shift also helped improving the production efficiency of Polish companies. It indicates that there was overall technology progress. However, the frontier shift effect did not differ between the two countries.

Table 4

Frontier shift (2008–2013)

Country	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
CZ (N = 10)	1.005364	0.0053389	0.0168831	0.9932866	1.017441
PL (N = 44)	1.121693	0.1107023	0.7343159	0.8984407	1.344946
K-S test	**D**	**p-value**	**corrected**	**Significance (α = 0.05)**	
CZ (N = 10)	0.3182	0.192	-	-	
PL (N = 44)	-0.0818	0.897	-	-	
Combined	0.3182	0.381	0.267	-	

Source: author's calculations based on Amadeus

The change in production efficiency depends on partial production efficiency. So, material and energy productivity, labour productivity and capital productivity is assessed in the next part of the paper. The partial productivity is measured as a geometric mean of chain index of the indicator in the period 2008-2013.

Material and energy productivity (Table 5) expresses how much sales the company generates from one unit of material and energy used. Unfortunately, the Amadeus database does separate material and energy consumption.

Table 5

Change in the material and energy productivity (index, 2008–2013)

Country	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
CZ (N = 10)	99.55767	0.7085014	2.240478	97.95493	101.1604
PL (N = 44)	102.1746	0.2197733	1.457811	101.7314	102.6178
K-S test	**D**	**p-value**	**corrected**	**Significance (α = 0.05)**	
CZ (N = 10)	0.8091	0.000	-	CZ < PL	
PL (N = 44)	-0.0318	0.984	-	-	
Combined	0.8091	0.000	0.000	CZ ≠ PL	

Source: author's calculations based on Amadeus

Material and energy productivity of the Polish poultry processing industry has increased by 2.2 % on average unlike the Czech Republic. An improvement could be affected by investment in modernization and innovation of the processing capacities. The effects strongly depend on effectiveness of investments and investment support from public sources. Meat processing industry in Poland dynamically increased the investments in tangible assets in the period 2007-2013 unlike the Czech Republic. The meat processing capacities have strongly concentrated in recent years (Naglova, Spicka, 2015). Moreover, research indicates weak effects of investment support in the Czech food industry (Mezera, Spicka, 2013).

Table 6 shows a change in the labour productivity. Labour productivity should also be more progressive in the companies which have upgraded technology to be more automatic. Nevertheless, the rural development policy also focuses on stabilization of labour forces in the rural areas. It is somewhat contradictory target against modernization of companies.

Table 5

Change in the labour productivity (index, 2008–2013)

Country	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
CZ (N = 10)	96.08195	4.858484	15.36387	85.09129	107.0726
PL (N = 44)	103.1932	1.470645	9.755156	100.2274	106.1591
K-S test	**D**	**p-value**	**corrected**	**Significance (α = 0.05)**	
CZ (N = 10)	0.3909	0.083	-	-	
PL (N = 44)	-0.0864	0.886	-	-	
Combined	0.3909	0.166	0.098	-	

Source: author's calculations based on Amadeus

The labour productivity of Polish companies has increased by 3.2 % unlike the Czech Republic. However, the K-S test did not reveal statistically significant difference at α = 0.05. So, the labour productivity is not the major problem of different technical efficiency between the two countries.

The last partial productivity is capital productivity measured as sales to depreciation. Depreciation expresses the annual consumption of capital employed.

Table 6

Change in the capital productivity (index, 2008–2013)

Country	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
CZ (N = 10)	95.11051	8.754118	27.68295	75.30732	114.9137
PL (N = 44)	104.0172	2.541319	16.85721	98.89214	109.1423
K-S test	**D**	**p-value**	**corrected**	**Significance (α = 0.05)**	
CZ (N = 10)	0.1955	0.537	-	-	
PL (N = 44)	-0.2182	0.460	-	-	
Combined	0.2182	0.833	0.740	-	

Source: author's calculations based on Amadeus

Table 6 also shows improvement of capital productivity of poultry meat processors in Poland. Like in case of labour productivity, there weren't any statistically significant difference in capital productivity between Czech and Polish companies. So, material and energy productivity was identified as the only one partial productivity that significantly differs between the Czech Republic and Poland.

The problem of high exports of poultry meat from Poland to the Czech Republic also depends on price relations of poultry meat in both countries. Since the purchaser price of poultry in the Czech Republic was growing in the period 2008-2013, the processors bought the cheaper poultry meat in Poland in order to keep positive profitability. One possible reason is a higher efficiency of poultry production on farms. Polish farmers have special social security system (Vilhelm, Pickova, 2009) provided by the Agricultural Social Insurance Fund (KRUS). Moreover, the more efficient and concentrated vertical of poultry meat headed by the Polish Poultry Council Chamber of Commerce enables to produce cheaper than in the Czech Republic.

Furthermore, the limitation of the research is that the analysis does not comprise meat processing capacities in large grocery retailers (hypermarkets), such as Tesco (Tesco Stores CR a. s. and Tesco Polska Sp z. o. o.), and discounters (Lidl Ceska republika v.o.s. and Lidl Polska Sklepy Spozywcze Sp z. o. o. Spk; Kaufland Ceska republika v. o. s. and Kaufland Polska Markety Sp z. o. o. Spk). Since the meat processing capacities are not separable in the income statement of retailers, the economic efficiency could not be calculated. The trade flows within the vertical of poultry meat in the large multinational grocery retailers enable to produce even cheaper than in conventional customer-supplier vertical. This aspect and the fact that Poland is one of the largest European poultry producers partly explain the high competitiveness of Poland in the poultry meat production and processing.

Conclusions

The aim of the paper was to evaluate the technical efficiency improvement of the Czech and Polish corporate poultry processors. The analysis of 54 Czech and Polish poultry meat processors in the NACE 10.12 covered the period 2008-2013 as the major part of the "old" programming period of the RDP. The article also deals with the differences in partial efficiency indicators between the Czech and Polish companies. The results can be generalized only for medium and large companies with more than 50 employees because of the limited access to financial statements of small companies in the Amadeus database.

1) The improvement of the production efficiency of poultry meat processors in Poland was significantly higher than in the Czech Republic. Polish companies have maintained the average level of the production efficiency above 92 %. However, the technical efficiency of Czech poultry meat processors increased in last two years of the "old" programming period (2012, 2013) which could indicate that their competitiveness is getting better.

2) The catch-up effect indicates positive shift of Polish poultry meat processors towards efficient frontier. Alternatively, the Czech companies slightly moved away from the efficient frontier.

3) The frontier shift effect was higher in Poland which indicates that there was a change in the efficient frontiers between the two time periods. However, there were not statistically significant differences of the frontier shift between the Czech and Polish companies.

4) The only one statistically significant difference of the partial productivity indicators between the Czech Republic and Poland was the material and energy productivity. Poultry processors in Poland were able to increase the efficiency of material and energy consumption unlike the Czech Republic. Change of capital- and labour productivity did not significantly differ between the two countries.

The analysis shows that the Czech Republic will continuously have low competitiveness of the poultry processing against Poland. Moreover, Poland has intensively invested in the meat processing capacities and concentration and will continue to massively supply retailers with cheaper poultry meat products. This is only the author's opinion because the analysis did not cover trade flow of poultry meat through international retail chains due to the data unavailability.

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BENEFITS AND CONSTRAINTS OF VERTICAL INTEGRATION IN THE LIVE PIG MARKET IN POLAND

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Abstract. Production of live pigs is one of the most important branches of agricultural production in Poland; however, it is highly fragmented. The aim of the study was to explore the benefits of integration for the producers of live pigs and constraints on its application. The study covered 110 agricultural holdings specializing in pig farming in 2014. The analysis shows that vertical integration in supply chains allows for strengthening the competitive position through improved quality, reduced costs and shortened delivery times. It is recommended that producers and processors of live pigs develop all forms of cooperation, especially under agricultural procurement contracts. The main constraint on this form of cooperation with meat processing companies is the instability of prices in the live pig market. Certainly, one of the most important advantages is providing an outlet for fattening pigs and the possibility of gaining a higher price.

Key words: pig farms, vertical integration, constraints, benefits.

JEL code: L14, L24, Q12, Q13

Introduction

Production of live pigs is one of the most important branches of agricultural production in Poland. According to the Central Statistical Office of Poland, its share in the structure of global agricultural production in 2012 amounted to 11.7 % and to 14.2 % in commercial production, whereas in livestock production, pigs accounted for 29.8% of global production and 31.7 % of commercial production (Rocznik Statystyczny Rolnictwa, 2013). Poland is also one of the most important pork producers in the European Union, although the share of Polish pork in European markets is decreasing steadily, hitting 8.1 % in 2012. In turn, it is the imports of pork that increase, accounting for 818.9 thousand tons in 2013 while the exports stayed at the level of 705.6 thousand tones. Simultaneously, pork consumption remains fairly stable at around 35.5 kg per person.

A major problem in the pork market is a considerable fragmentation of pig farms and the ensuing constantly insufficient production scale, inhibiting satisfactory economic results and capital accumulation. In 2012 as many as 260.1 agricultural holdings were active in pig farming in Poland, and an average pig herd numbered 44.5 units of this species. In addition, the organization level of farmers producing live pigs in Poland is very low compared to other EU countries. According to the data from the Ministry of Agriculture and Rural Development (MRiRW), in December 2012 there were 199 pig producer groups. The same problem affects the meat production sector. According to the Polish General Veterinary Inspectorate (GIW), at the beginning of 2014 there were 617 domestic operators involved in slaughtering live pigs. Whereas the meat cutting and processing was done by 995 and 1001 companies respectively.

One way to reduce the weaknesses of live pig market and achieve a competitive advantage is to develop different forms of cooperation between operators in the supply chain, one of the most advanced being vertical integration which consists of combining all production stages, i.e. from raw material to the finished product. The aim of the study was to explore the benefits of integration for the producers of live pigs and constraints on its application.

Materials and methods

The data analysis included the studies of Polish and foreign reference books and the data storage statistics from the Central Statistical Office of Poland, the Ministry of Agriculture and Rural Development and the General Veterinary Inspectorate of Poland. The primary data source was the research carried out in pig farms in 2014. The surveyed farms were selected according to the following criteria:

- rearing at least 10 sows in a farm or selling 200 fattening pigs a year;
- a farm specialising in live pig raising, which fact was determined basing on the share of live pigs in the revenues from sales and it being at a minimum of 60 %;
- a farmer's consent to participate in the research.

At the first stage of the study all provinces in the country were taken into account and the Agricultural Advisory Centre was addressed with a request to identify 10 agricultural holdings in each of the provinces that meet the adopted criteria. However, prompt was

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the farms identification, due to a limited number of suitable farms or the farmer's refusal to fill in the questionnaire, the study could not cover Swietokrzyskie and Malopolskie provinces. What is more, some of the remaining provinces provided for the data from a smaller number of farms than it had been expected. Eventually, it was the employees of the Agricultural Advisory Centres who filled in the questionnaires carrying an interview in 110 pig farms in the country. The study takes into account the resources of farms, organization and production costs of pig livestock and the benefits and limitations of the integration in the supply chain of pork, which were presented in this paper. The results of the analyses have been presented in a narrative and graphic forms.

Research results and discussion

The two leading theories of vertical integration are the Transaction Cost Economics (TCE) approach of Williamson (1975, 1985) and the Property Right Theory (PRT) approach of Grossman and Hart (1986) and Hart and Moore (1990). Both approaches emphasize the importance of incomplete contracts and ex post opportunistic behaviour (hold up) on ex ante relationship-specific investments. The TCE approach views vertical integration as a way of circumventing the potential holdup problems. In particular, it predicts that vertical integration should be more common when there is greater specificity and holdup is more costly, and that vertical integration should enhance investments by all contracting parties. In turn, the PRT approach focuses on the role of ownership of assets as a way of allocating residual rights of control, and emphasizes both the costs and the benefits of vertical integration in terms of ex ante investment incentives.

From the economic perspective vertical integration means implementation of actions of successive chain stages from producer to consumer in a single company (Martinez S., 1999). It involves merging different areas of activity belonging to the same chain of production and sales (Kudelko J., 2007). According to Pierscionek (2003), vertical expansion should be adopted especially if the company has a strong but not the strongest competitive position and where the market growth stage is approaching saturation. This is the basis for limiting the development of specialization.

Vertical integration strategies involve identification of processes external to the core activities of the company and allow dividing the entities and individuals associated with the company into groups relevant to its operations and interested in it and other units. The processes of merging with these units or taking over their operations lead to added value based on extending the value chain under the existing product-market system (Rajzer M., 2001).

According to W. Szymanski (1998), vertical integration in agriculture is a form of an economic and production tie between entities producing a given product from raw material to its finished form. The integrator, which is mostly an industrial or commercial company, tries to control (through various forms of contracting and cooperation) or to master part or the entire chain of production, from agricultural raw material through processing to food marketing.

Vertical integration in agriculture began to develop when the market started to predetermine the quality and specific terms of supply of agricultural production (Szymanski W., 1998). Good conditions for the development of vertical integration include: specialization, standardization, disappearance of local markets, development of supermarkets, changing demand for food. These factors inclined farmers to undergo some adjustments to meet the conditions of market integration. This process seems a necessary step to be taken in view of the lack of financial resources and modern means of production hindering effective operating on the market and limited marketing of produced raw materials.

Vertical integration can happen in two directions. Forward vertical integration happens when a company's former activity was limited to production and now it expands to successive stages of production and distribution towards customers (Figure 1). Backward vertical integration is initiated by a company which previously focused on the stages closer to the final consumer and now it takes activities within preceding stages of production or resources (Grega L., 2003).

If the manufacturing company engages in sales or after-sales industries it pursues forward integration strategy. This strategy is implemented when the company wants to achieve higher economies of scale and larger market share. Forward integration strategy became very popular with increasing internet appearance. Many manufacturing companies have built their online stores and started selling their products directly to consumers, bypassing retailers. Forward integration strategy is effective when (Jurevicius O., 2016):

- few quality distributors are available in the industry;

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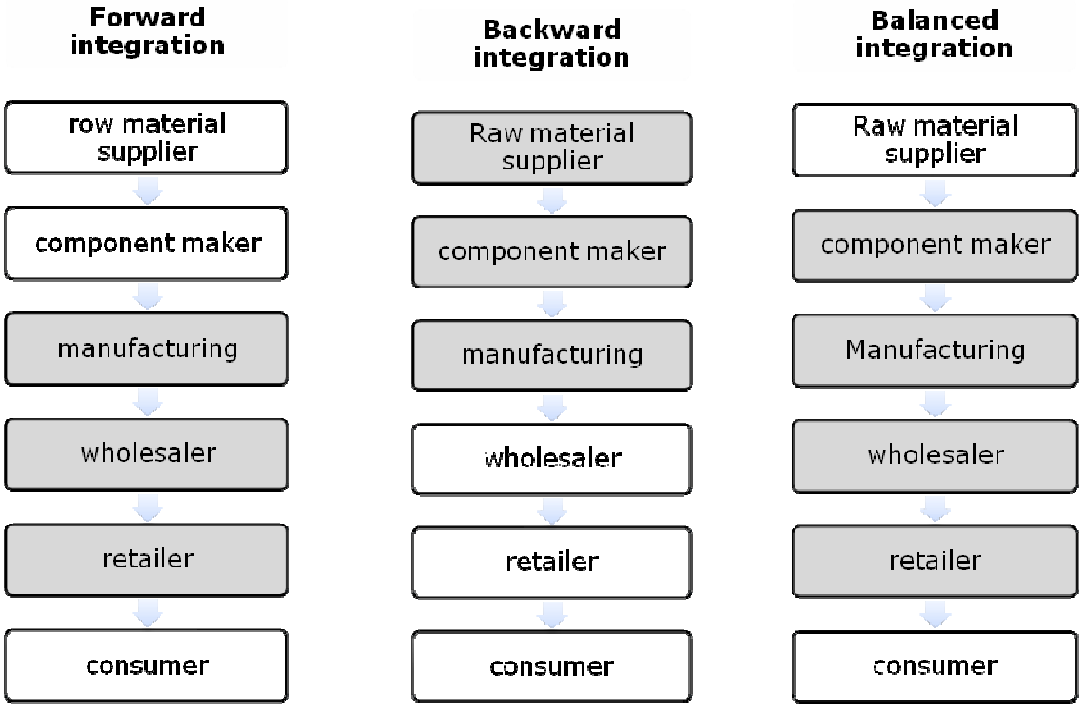
- distributors or retailers have high profit margins;
- distributors are very expensive, unreliable or unable to meet firm's distribution needs;
- the industry is expected to grow significantly;
- there are benefits of stable production and distribution;
- the company has enough resources and capabilities to manage the new business.

When the same manufacturing company starts making intermediate goods for itself or takes over its previous suppliers, it pursues backward integration strategy. Companies implement backward integration strategy in order to secure stable input of resources and become more efficient. Backward integration strategy is most beneficial when (Jurevicius, O., 2016):

- a company's current suppliers are unreliable, expensive or cannot supply the required inputs
- there are only few small suppliers but many competitors in the industry
- the industry is expanding rapidly
- the prices of inputs are unstable
- suppliers earn high profit margins
- a company has necessary resources and capabilities to manage the new business.

In the agriculture the integrators are farmers or horizontal associations of farmers (such as producer groups, cooperatives or capital companies). In turn, the forward integration is to integrate different production stages by food-processing establishments, trade companies (wholesalers, chain stores), stock exchanges and even banks and financial institutions (Lacka I., 2012).

The complete integration involves the creation of agro-industrial establishments combining production and distribution of products. The success of the biggest groups of companies like Animex and Sokołow (with foreign capital) or PKM DUDA shows that complete integration allows establishments to achieve strong competitive advantage as well as growth and development in the long term.



Source: author's construction

Fig. 1. **Types of vertical integration**

The vertical integration may not always be the best choice for an organization due to a lack of sufficient resources that are needed to venture into industry. Sometimes the alternatives offer more benefits. The available choices differ in the amount of investments required and the integration level. For example, short-term contracts require little integration and much less investments than joint ventures.

One form of vertical integration in agriculture is an agricultural procurement contract between companies purchasing agricultural raw materials and farmers. A farmer entering into negotiations with the integrator signs a contract according to which he/she undertakes

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to provide agricultural products in the agreed quantity, quality and at specified time in return for the product marketing, and the use of a credit, instruction and provided means of production. Contracting is first of all a guarantee that the agreed production volume will be marketed on predetermined conditions.

Vertical integration has numerous advantages and allows achieving some economies. First of all it allows building competitive lead through (Drazek Z., Niemcynowicz, B. 2003):

- the security of supply. This is particularly important in the case of a highly captive market of suppliers;
- the cost leadership, e.g. owing to an access to cheap raw materials. An important element is not just security of supplies but also their low cost, which can be achieved by having one's own supply area;
- the security of entering the market. In the case of a high competition on the market having one's own distribution network can be very helpful in introducing new and maintaining existing products on the market;
- differentiation that is standing out among the competitors in what is relevant to the customer. Where an operator takes up the entire production chain, it can be based either on the product or on the sale system or service that is preferred by the client;
- achieving a higher quality, as there is a possibility to control it more effectively and efficiently and to select proper materials and components.

An additional effect of such a system is the possibility to maintain complete secrecy of the used technology. In addition, vertical integration can reduce transaction costs, i.e. expenses occurring as a result of the relations between two entities. These costs include:

- the costs of identifying and negotiating with companies on starting the cooperation;
- the costs of communicating and obtaining information when concluding contracts;
- the costs of lost opportunities and necessary renegotiation if the concluded contract did not cover the changing situation;
- the start-up costs of additional assets arising from specific provisions in the contracts.

Vertical integration, however, also carries certain threats. The primary ones include:

- increasing the risk, i.e. reducing the financial security of the company due to the same economic chain;
- elimination of market forces;
- limited company flexibility;
- difficulties in managing a complex business;
- overcoming entry barriers in new markets, if the integration is carried out by internal methods;
- difficulty in obtaining the optimum production, especially with suppliers who have no external markets;
- the need for large capital to be involved.

The pig market in Poland is characterised by a considerable fragmentation of production, processing and distribution and limited domestic integration ties. Therefore, the producers of live pigs were asked to comment on the causes of such situation. In the study group, 91.8 % of respondents indicated to limited number of concluded procurement contracts. Only 8.2 % of the surveyed farmers did not mention any constraints, 2.7 % of which had not signed any procurement contracts with meat plants. As many as 60.9 % of respondents pointed to the price volatility as one of the major constraints in the live pig market (Figure 2). Farmers who find the price situation precarious are not willing to sign any contracts. Entrepreneurs react similarly. The second top constraint indicated by the farmers is the necessity to sale fattening pigs at a specified price. The producers of live pigs are particularly concerned about being obliged by contract to sell fattening pigs at a lower price compared to the one at the current market. For 30.9 % of the respondents an important factor restraining them from entering into a contract was the meat plants' failure to fulfil their contractual obligations, since when lower prices were reachable, entrepreneurs often did not keep agreements and bought livestock from other producers who were not bound by a contract or they import raw material from abroad.

More than 1/5 of respondents pointed to the lack of state intervention in the pork market. In their view, state institutions cannot be counted on in crisis situations. A similar percentage of respondents stated that the relations with meat companies were marked by the meat plants' unwillingness to enter into a long-term cooperation. It is especially in the case of falling market prices of live pigs that entrepreneurs tend to look for opportunities to reduce purchase costs of raw materials. According to 21.8% of respondents, another

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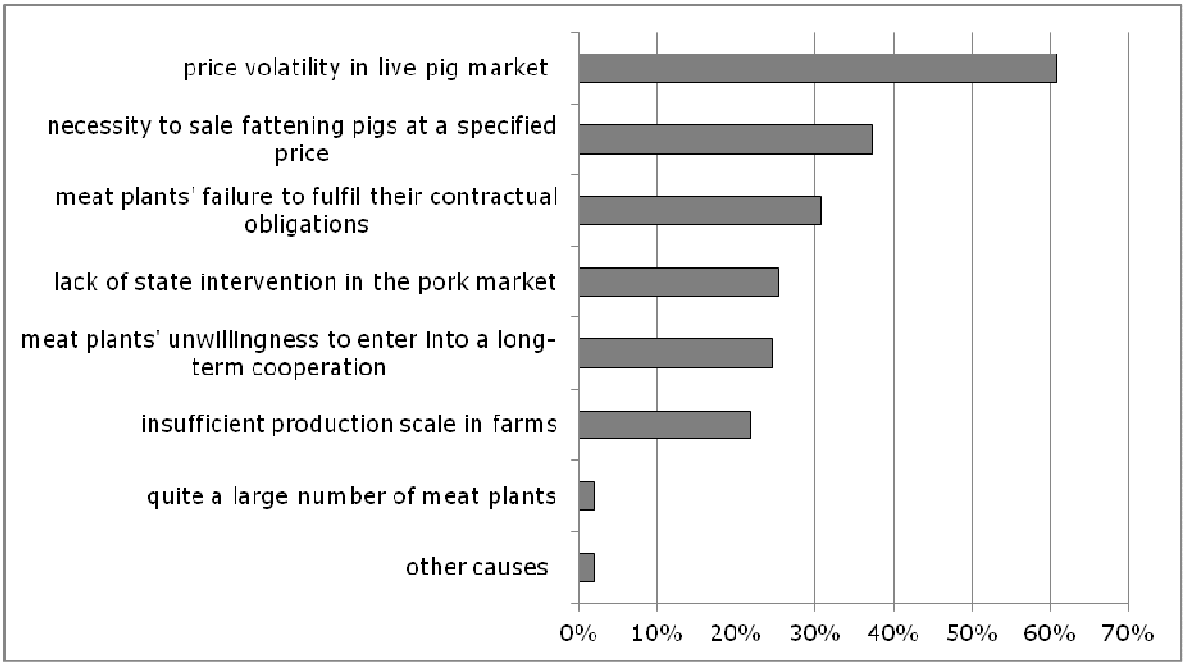
factor limiting the signing of agricultural procurement contracts is an insufficient production scale in farms, whereas large meat plants require regular supplies of large lots of standardized quality fattening pigs. Likewise, producers who buy piglets for further raising look for a large number of piglets of the same origin. Only 1.8% of respondents said that the market displayed quite a large number of meat plants, which did not facilitate their choice of a company to cooperate with. The same percentage of respondents pointed to other causes limiting signing procurement contracts with meat companies.

The producers of live pigs, especially those who cooperate with meat plants under contracts recognize some related benefits. The primary one, in the respondents' opinion (60.9%), is secured sales of fattening pigs (Figure 3). In turn, 35.5% of respondents pointed to the possibility of obtaining a higher price for sold fattening pigs as some companies offer additional margins arising from supplies for signing and execution of an agricultural procurement contract. For 31.8% of respondents a major benefit is the stabilization of production on the farm. In view of the mechanism referred to as a pig cycle, which manifests in cyclical fluctuations of supply and related prices, maintaining a stable production level represents an important basis for live pig producers. According to 1/5 of respondents, agricultural procurement contracts enhance an easier planning of business development since they ensure stabilization to some extent. In opinion of 18.2% of respondents, entering into a contract increases the demands on the technology of fattening. As a result, it helps increase the efficiency of production.



Source: author's construction based on own research

Fig. 2. **Factors limiting signing contracts according to the live pig producers**

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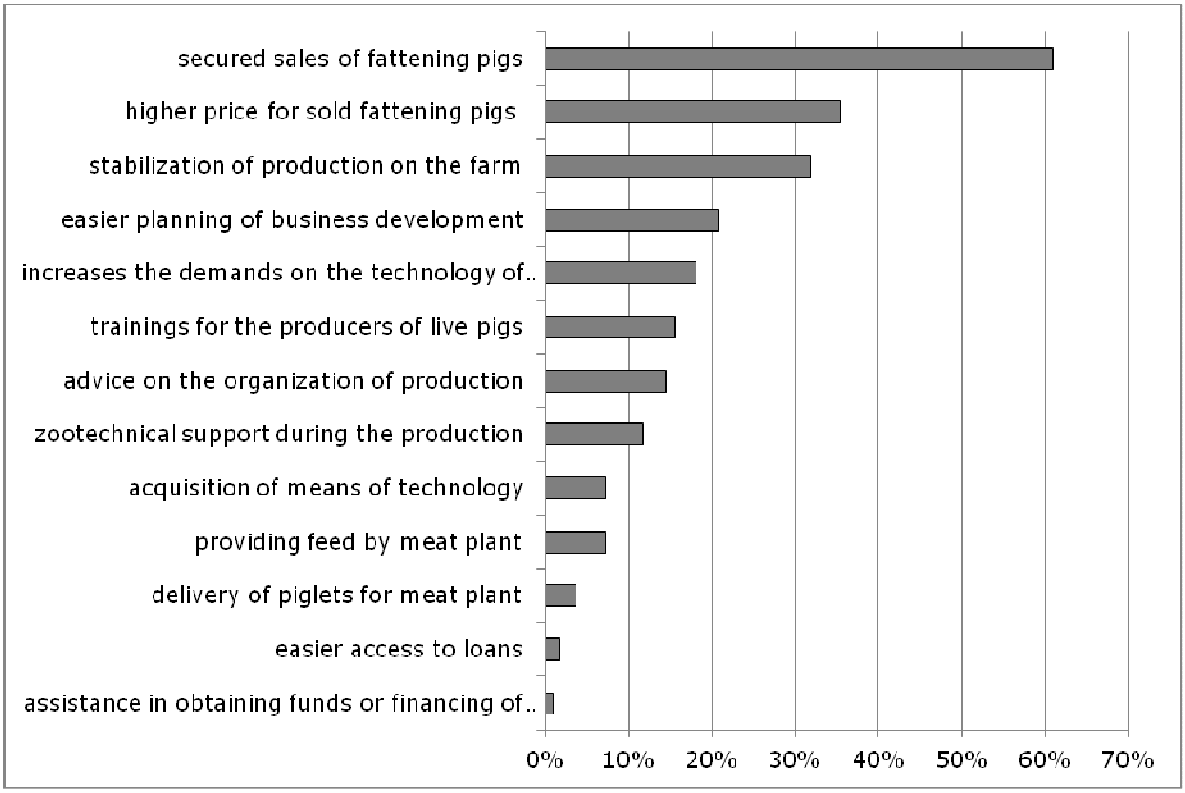

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Fig 3. **Benefits related to signing contract according to live pig producers**

Approximately 15.5 % of the respondents pointed to the training organised for the producers of live pigs as a benefit arising from the conclusion of the procurement contract. Thanks to it farmers acquire the latest knowledge on pig farming. For a similar proportion of respondents (14.5 %), it was essential that they were advised on how to organise production, which would enable higher performance. In turn, 11.8 % of respondents indicated that in the case of agricultural procurement contracts they could count on zootechnical support during the production. Among the benefits of concluding a contract with a meat plant some of the producers of live pigs mentioned the acquisition of means of technology (7.3 %) and feed provisions (7.3 %) guaranteed by the meat company. It was by far less common for the farmers to cooperate with meat plants for the supply of piglets for further fattening. However, this more advanced form of cooperation is gaining in importance especially in case of large companies that want to have an impact on the quality of raw materials. Very few producers have found that one of the benefits of signing an agricultural procurement contract is the meat company's assistance in obtaining funds or co-financing their activities. The research shows that this form of compensation for the execution of the agreement requires further development.

Conclusions, proposals, recommendations

1) Vertical integration in the supply chains allows for discounting a strong and stable competitive position by the acquisition of profits of the producers of raw material and components for their own products and it also enables strengthening the competitive position by improving quality, reducing costs and shortening delivery times.

2) Vertical integration may be performed in various directions and take various forms. There can be found such forms as a top-down and bottom-up integration or full and partial integration. The full integration involves the development of a company whose activities cover the production of raw materials, their processing and distribution. Indirect integration, in turn, results from contractual relationships that protect the economic and legal separation of the partners.

3) Production of live pigs in Poland is highly fragmented and the majority of farms are characterised by a small scale of production, which hinders its competitive strength on the European market. What is more, the absence of capital tie-

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ups between farmers and the meat industry does not facilitate integration in the supply chain. Therefore it is recommended to develop all forms of cooperation, especially under procurement contracts between producers and recipients, i.e. processors of live pigs.

4) According to the producers of live pigs, the cooperation with processing companies is constrained because of various obstacles. The major constraints on signing procurement contracts include price volatility on the market of live pigs, the necessity to sell fattening pigs at a lower price in comparison to the one dictated by the economic situation and the meat plants' failure to fulfil their contractual obligations. Therefore it is important to take actions to reduce these limitations.

5) Farmers who rear pigs are also aware of the benefits of working with meat processing companies. The most import would be providing an outlet for fattening pigs, stabilization of production on the farm and the possibility of obtaining a higher price for the sold fattening pigs as the meat companies offer additional margins from supplies for signing and execution of an agricultural procurement contract.

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INVESTMENT ACTIVITY OF FARMS IN SELECTED BALTIC STATES

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Abstract. The aim of this study was to determine and compare the level of investments in the agricultural sectors of selected Baltic States. The data used for analysis was derived from the European FADN system. The surveys concern the period from 2004 to 2012. Survey results have shown that the annual average value of investments per one farm in the Baltic States was quite diversified. Following the accession of NMS (New Member States) to the European Union in 2004, the investment activity of agricultural holdings accelerated. Despite positive changes in the value of fixed assets in the surveyed countries, the rate of investments was too low to significantly reduce the gap between the new and old EU countries.

Key words: investments, agricultural holdings, FADN, Baltic States.

JEL code: Q12

Introduction

There have been many investment-related changes in the European agricultural sector since 2004. The accession of new members to the European Union was a factor driving strong development, including improvements in agricultural infrastructure. Farms in NMS have become more modern and more competitive in relation to Western European countries. The improvement was also possible thanks to funds from the community or domestic budget, including opportunities for preferential loans. Accession to the EU forced farmers to undertake restructuring activities, such as adjusting production standards to the Community requirements (Dziwulski M., 2011). This was a key factor determining the current state of agriculture condition (Wysokinski M., Baran J., Florkowski W. J., 2015).

Many studies point to the fact that supporting agricultural investments from the EU budget contributes towards improved economic efficiency of farms. This, in turn, allows for implementation of biological, technical, economic and organizational progress which furthers the development of production capacity of agriculture, improves productivity of plants and animals, enhances the effectiveness of management and decreases the impact agricultural production has on the environment (Baran J., 2015; Dziemanowicz et al., 2008; Rokicki T., 2013).

According to Mikolajczyk, investments pay important role in farm production and capacity growth, and highlight their importance in ensuring the profitability and competitiveness of agriculture (Mikolajczyk J., 2009). According to Jozwiak and Kagan (2008), investment activities are evidence for modernization of farms and expansion of the production scale. Investment process has a decisive impact on development opportunities for farms. Such investments show that farmers increase their assets or raise farm quality, which contributes to higher farm capacity in the future (Wysokinski M., Dziwulski M., Jarzebowski S., 2013). Technical improvements, and also introduction of new machinery and equipment used in agricultural production, lead to increased productivity of both crops and livestock. Nevertheless, failure to invest may lead to processes that rely on reducing resource inputs, or limiting the number (or range) of conducted activities (Mikolajczyk J., 2012).

Purpose and method

The aim of this study was to determine and compare the level of investments in agricultural sectors in selected Baltic States. The source of data used for analysis w the Farm Accountancy Data Network (FADN) – a system used as a tool for evaluating the income of agricultural holdings and impacts of the Common Agricultural Policy. The system allowed obtaining information about gross or net investments in surveyed farms. The countries selected for surveying were Lithuania, Estonia, Latvia and to comparison, Poland and Germany. The reason underlying the selection was comparing the level and dynamics of agricultural investments in new Member States in comparison with the old EU-15. The data provided by FADN was analyzed by using the simple comparative method. Moreover, certain investment indicators have been calculated to demonstrate the investing activity of agricultural holdings in selected countries.

Results of surveys and discussion

The agricultural sectors of Baltic States are quite well diversified. Polish agriculture is characterized by significant fragmentation (Wysokinski M., Dziwulski M., 2013; Golasa P., 2013), which is also the case in

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Lithuania, Latvia and Estonia. According to the agricultural census data provided by Eurostat, 34 to 59 % of all holdings in these countries worked an area less than 5 ha, while in Germany the corresponding figure was only 9%. The vast majority of holdings in the Baltic States are small family farms producing for self-sufficiency. Nevertheless, the Lithuanian, Latvian and Estonian agricultural sector is influenced by the pre-transformation system from before 1990 (Unwin T., 1994) that also results in a relatively high share of large area farms in the total structure. For that reason, the average holding size in those three countries is higher than in Poland, where the share of large-scale farms is not as significant. The European FADN data show that the average farm size in the 2012 FADN sample was 18.9 ha for Poland and 48.69, 68.93 and 126 ha for Lithuania, Latvia and Estonia respectively. It should be noted that farms in the last three countries work mainly leased land, which forms 46 to 62 % of the total UAA share. This is also a residue of the old farming system.

Table 1**.**

Main characteristics of farms in selected countries

Specification		Germany	Estonia	Lithuania	Latvia	Poland
Total labour input (AWU)	2004	2.13	2.86	1.75	2.87	1.76
Total Utilised Agricultural Area (HA)		71.98	106.42	31.66	61.1	15.73
Farm Net Income (EUR)		28,557	15,722	7,087	9,626	6,110
Total labour input (AWU)	2012	2.13	2.01	1.77	2.02	1.73
Total Utilised Agricultural Area (HA)		82.03	125.87	48.49	68.93	18.84
Farm Net Income (EUR)		45.381	25.903	17.131	13.161	10.681

Source: Own study based on FADN data

For Baltic States, accession to the EU was a stepping stone to further reforms of the agricultural sector. The changes that the sector had undergone following the transformation in the late 1980s included restoring farmland to its former owners, removing price controls and subsidies and privatising agricultural processing and distribution (Maddock N., 1995). Since 2004, farms have been operating on the new EU conditions which also caused considerable change in the agricultural sector. The most visible aspect was the rapid growth of agricultural income. The rate of family farm income in selected New Member States increased from 37 to 142 % in the years 2004-2012. The dynamics of growth was relatively faster than in the old EU-15 countries, yet farmer income in NMS is still at a much lower level.

One of the reasons behind income growth was the transfer of EU funds, especially in the form of direct payments. Improvements in income and the availability of EU funds have translated into numerous agricultural investments in New Member States. According to FADN data, the annual average value of investments per farm in new Member States was relatively high compared to the conditions obtaining before 2004 and amounted from EUR 38,000 in Poland to EUR 184,000 in Estonia. However, in comparison to Germany these figures are relatively low, also when investment intensiveness (per hectare) is considered. Even though Poland was characterized by the lowest level of investments per farm among the surveyed countries, investment intensiveness there was higher than in Latvia, Lithuania and Estonia –graph 1.

The investments made were to a large extent the outcome of implementation of aid payment programmes which followed accession to the EU by the surveyed countries. The value of aid transferred to each country form the RDP budget has been given in the table below.

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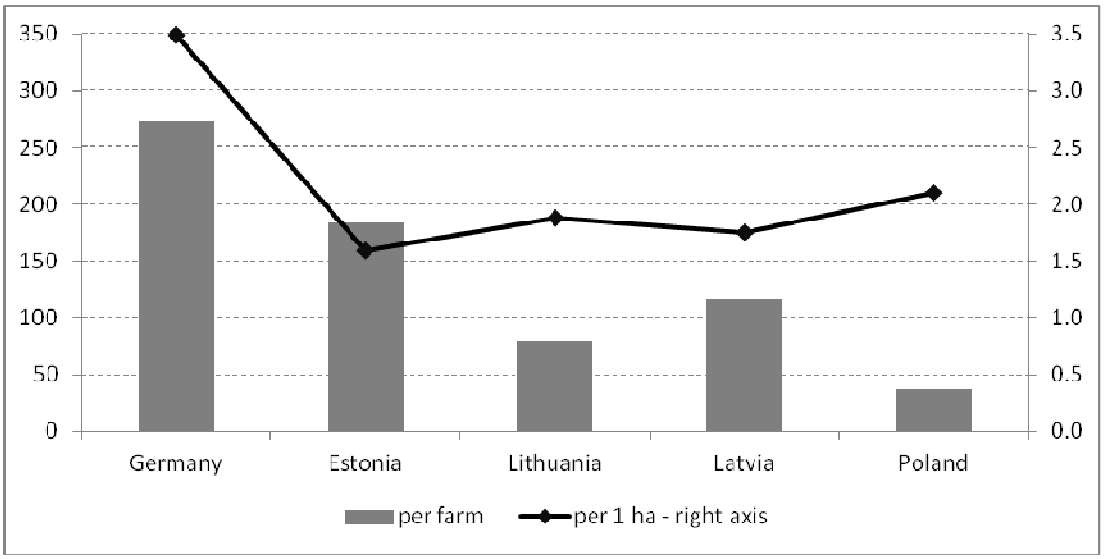

Source: Own study based on FADN data

Graph 1. **Annual average investments value per farm and per hectare total in 2004-2012 (EUR 1 000)**

Table 2.

Funds for rural development from RDP 2004-2006 and RDP 2007-2013 in selected Baltic States

Country	EUR/farm		EUR/UAA		EUR/AWU	
	RDP 2004-2006	RDP 2007-2013	RDP 2004-2006	RDP 2007-2013	RDP 2004-2006	RDP 2007-2013
Estonia	5.105	31.008	237	798	5.376	22.567
Lithuania	2.249	7.668	246	667	2.327	9.802
Latvia	3.239	9.785	275	594	2.951	10.062
Poland	1.640	5.604	218	866	1.547	5.920

Source: Financial transfers between Poland and the European Union (Czyzewski et al., 2011)

The RDP 2007-2013 funds for Poland amounted to EUR 867 per hectare, an average of EUR 124 per year. This figure was the highest among those surveyed countries that joined the EU in 2004. In the previous financial perspective (RDP 2004-2006), the value of funds per hectare for Poland was the smallest and amounted to EUR 218, i.e. EUR 72.5 per year. Nevertheless, taking into account the size of country (the UAA), and scale of agriculture, Poland was the biggest beneficiary of the CAP funds among selected New Member States (Czyzewski et al., 2011). In the RDP financial perspective for 2007-2013, Poland was, however, notable for the highest value of funds per hectare of UAA. Nevertheless, the highest value of funds per farm and per worker was observed in Estonia as a result of the size of holdings in that country.

Surveys showed that, in the eight year period surveyed, investment dynamics in NMS countries was higher in first four years immediately following accession. After 2008, due among others to the agricultural crisis that took place in 2009 and resulted in lower income of farmers, the value of gross investments declined in all the surveyed countries. The deceleration of investment activity was also observed in Germany; however, the rate of investments in that country was significantly higher than in the others.

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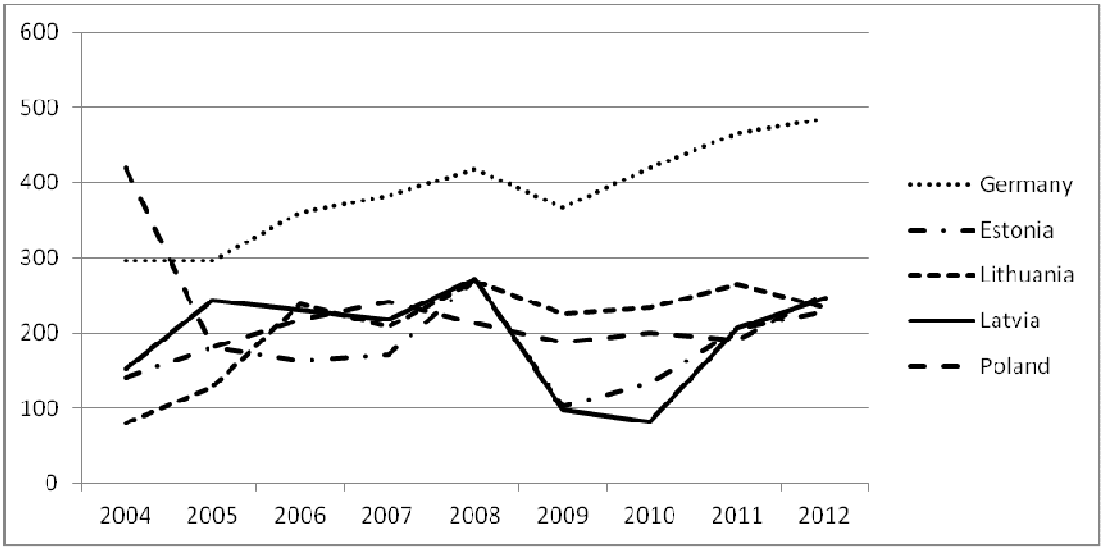

Source: Own study based on FADN data

Graph 2. **Value of investments per hectare in 2004-2012 (EUR)**

The investment activity of the surveyed countries led to an increase of land infrastructure development in agricultural holdings. According to the FADN data, the growth of assets (machines, technical equipment and buildings) per hectare of UAA from 2004 to 2012 was highest in Lithuania and lowest in Germany. The high investment value in German agriculture combined with a slight increase of asset value may indicate that investments there are rather of a modernizing nature, while in countries such as Lithuania or Poland their purpose is mainly reconstruction-oriented. Especially in the first four years following accession, investments helped reduce to some extent the gap between new and old EU countries.

Although the dynamics of investments in Latvia, Lithuania, Estonia and Poland was higher in 2008-2012 simultaneously the gap between farmers in these countries and German farmers (measured by the value of assets per hectare) increased, while in Poland the value of fixed assets even decreased. Surveys show that the 2012 value of fixed assets per hectare in Germany amounted to EUR 2.367, i.e. 65 % more than the average in the four countries used for comparison, while in 2008 the difference was only 50 %. The dynamics of land infrastructure growth in Germany was relatively slower than in other countries, even though the value of growth was the largest – table 3.

Zemeckis and Drozdz (2009) claim that the accession of Baltic States to EU was usually connected with a radical reduction in the number of workers employed on farms, the gradual development of a market-oriented approach and the introduction of modern machinery and methods of production. The investments conducted accelerated the substitution of labour by capital process in the surveyed countries. Many authors pay attention to the fact that the three Baltic States (Lithuania, Latvia and Estonia) together with Poland were the poorest among the EU New Member States (Vanags A., 2003). They were characterized by a relatively high share of workforce employed in the agricultural sector. Therefore, the value of fixed assets per worker in the surveyed New Member States has increased faster than was the case for equipment. Surveys showed that the growth of fixed assets per AWU (Average Work Unit) value was the highest in Latvia at 242 %, while in Germany and in Poland it was the lowest at 29 and 36 % respectively. Substitution of work by capital in Poland was lower in comparison to other NMS in the Baltic area.

Analyzing the gross investment level in the surveyed countries, the important aspect is the ability of farmers to replace their property (assets). Previous surveys conducted in Poland (Jozwiak et al., 2008) show that holdings with small economic size (<8 ESU) are not able to conduct investments whose value would be higher than the cost of depreciation. The ability to replace property in the surveyed countries, could be measured as the rate of investment ratio, calculated as a relation of gross investment value to the cost of depreciation. Surveys show that Poland, due to the high share of small farms, is characterized by the lowest rate of investments. Regardless, in Estonia and Latvia, where the average size of holdings is the largest, the observed rate of investment was the highest – Figure 3.

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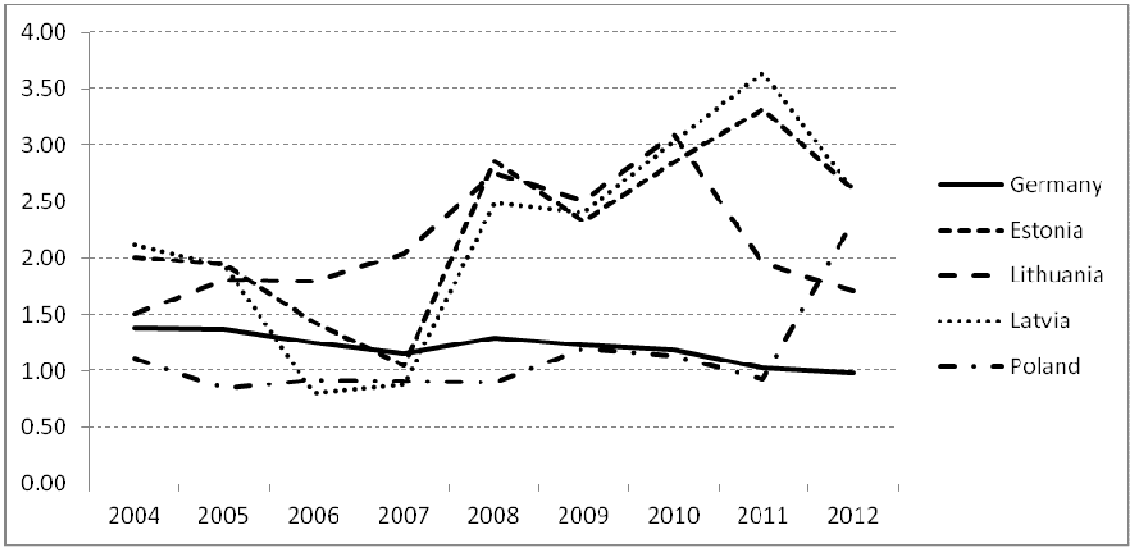
Table 3.

Value of fixed assets per hectare and per AWU in selected countries (EUR)

	Year	Germany	Estonia	Lithuania	Latvia	Poland
EUR/ha	2004	2.083	602	477	356	2.673
	2008	2.173	952	984	691	3.167
	2012	2.367	940	1.033	759	2.993
EUR/AWU	2004	70.407	22.387	8.625	7.584	23.892
	2008	77.746	47.768	23.139	20.254	34.714
	2012	91.140	58.894	28.299	25.912	32.591

Source: own study based on FADN data



Source: own study based on FADN data

Graph 3. **The rate of investment in selected countries in 2004-2012 (in %)**

Conclusions

The conducted surveys show that the annual average value of investments per farm in New Member States was quite diversified after 2004 and amounted to from EUR 38,000 in Poland to EUR 184,000 in Estonia. A high value of investment per farm was observed in countries with relatively high average farm area and more extensive production. Nevertheless, such countries are characterized by low investment value per one hectare of UAA. Despite the high investment activity of farmers in NMS, its level was still lower than in, for example, Germany. Due to investments made in Poland, Lithuania, Latvia and Estonia, the value of fixed assets per hectare has increased especially during the first four years following accession. However, the investment activity in agricultural sectors of these countries decelerated after 2008 and the gap between farmers in these countries and German farmers in terms of land infrastructure (measured by asset value per hectare) increased. The investments conducted had accelerated the substitution of labour by capital process in the surveyed countries. The highest rate of substitution was observed in Latvia. Notwithstanding, substitution of work by capital in Poland was the lowest among Baltic NMS.

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ECONOMIC ANALYSIS OF PESTICIDE USE IN WHEAT PRODUCTION FOR SUSTAINABLE RURAL DEVELOPMENT

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Abstract. The objective of this research is to do the economic analysis of pesticide application practices and level of pesticides used by the farmers in wheat production for sustainable rural development in Turkey. The primary data were collected from 84 wheat producers. Results of this research show that the average area of wheat production was 3.91 ha with 3 461.90 kg ha^{-1}. The average cost of wheat production was EUR 549.94 ha^{-1}. It was calculated that the average usage of pesticides was 1 103.50 g per hectare as an active ingredient in the wheat production. The average usages per hectare of active ingredient of insecticides, fungicides and herbicides were determined to be 48.00 g, 146.60 g and 908.90 g, respectively. Herbicides are the biggest pesticide group used in wheat production. They accounted for 82.37 % of total weight of active ingredients, followed by fungicides (13.28 %) and insecticides (4.35 %). The study revealed that the farmers were using herbicides more than the recommended, fungicides and insecticides less than the recommended dosages. It was calculated that the average plant protection costs was EUR 50.25 ha^{-1} which was 9.14 % of wheat production costs. The percentages of average plant protection costs were 85.03 %, 9.24 % and 5.73 % herbicides, insecticides and fungicides, respectively. The gain threshold was calculated to be 228.39 kg ha^{-1}. As a result, government should be promoting research into application technologies that mitigate risk and cost and maximize gain from pesticide used. Also, pest management and farmer training programmes in all crops should be developed to ensure sustainable food security, food safety, farmers' income, and rural development.

Key words: wheat, pesticide use, economic analysis, environmental, sustainable rural development, Turkey.
JEL code: R1, Q5, Q180, Q160, Q120

Introduction

Pesticides have been a major contributor to the growth of crop productivity and food supply. Crops yields strongly depend on crop protection measures. The main purpose of pesticide use is to increase food security, with a secondary goal being increased standard of living (Delcour et al., 2015). Food productivity soared due to new technologies, mechanization, increased chemical use, specialization and government policies that favoured maximizing production. Sustainable agriculture integrates three main goals; environmental health, economic profitability, and social and economic equity. Most specialists agree upon the fact that organic, biological, or ecological agriculture is a component of the sustainable agriculture system, as well as an alternative to intensive, industrial, and conventional farming, which increasingly proves its limits and drawbacks with regard to the quality of the obtained products and the negative impact upon the environment, through the use of significant amounts of chemicals for the control of pests, weed and diseases (Sima, 2009). Sustainable approaches are least toxic and least energy intensive, and yet maintain productivity and profitability (Dimitri et al., 2005).

Sustainable rural development implies improving the quality of life for the rural poor by developing capacities that promote community participation, health and education, food security, environmental protection and sustainable economic growth, thereby, enabling community members to leave the cycle of poverty and achieve their full potential (Martin and Gertrud, 2007). Pesticides used in agriculture to protect crops and pest control have been accompanied with environmental pollution, human health issues and reduced agricultural sustainability around the world (Pimentel and Greiner, 1997). Excessive uses of chemical pesticides have many consequences on agriculture and environment, such as increased production costs, pest resistance to pesticides, and dangerous diseases to human. For reducing disease and pests and increase income from crop activities, farmers resorted using more pesticides (Wilson and Tisdell, 2001; Nazarian et al., 2013).

Insects, pests, diseases and weeds are the major source of crop damage, yield and quality reduction in Turkey and elsewhere in the world. Also insect infestation problem has become quite serious in

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cereals, badly affecting the production and the quality of the produce. Consequently, the use of pesticide in agriculture has become extremely essential. Pesticides are used to overcome the pest problem in various crops. When the pest problem is managed at the proper time it improves the crop productivity. Therefore, pesticide use definitely helps in improving the crop productivity and quality if right type of pesticide is used at right time with the right dose (Khan et al., 2010).

Pesticide use in Turkey increased substantially over the years. Although the overall intensity of pesticide use is low by comparison with many developed and developing countries and the European Union countries, there are concerns over adverse impacts on human health and the environment in some regions (OECD, 2008). Pesticides will continue to play an important role in food security in Turkey due to the limited arable land resources and the increase of future population. Therefore, the only way to improve food security is to increase crop yields through the scientific use of pesticides with an emphasis on protecting the environment (Yilmaz, 2015). Pesticides used are the most important elements in determining productivity and the level of cereal production.

Wheat is an important basic food consumed mostly as bread in Turkey. It provides a substantial component of the human diet. Wheat is also consumed as animal food and used to make various processed foods in the industry (Mutlu et al., 2014). Nutritional problem is a rapidly increasing issue more and more all around the world. The most plausible solution is to increase the crop and livestock production. Wheat is grown on about 7.9 million ha area annually with the production of approximately 19 million tons in Turkey for wheat; it occupies the prime position both in area and production among the cereal crops in Turkey. In Turkey, total cereal production was 32.7 million tons produced on 11.7 million ha, which was 58.08% of total cereal production was wheat (TURKSTAT, 2014). In some years, Turkey has been able to make small wheat exports, balanced in other years by small imports. In other words, it would appear that supply and demand are currently in rough balance (TUSAF, 2014).

The aim of this research was to evaluate the economics of pesticide use in wheat production for sustainable rural development. Furthermore, this study also attempts to determine the farm-level economic cost and amount of pesticides used in wheat production. Also, farmers' attitudes toward their use of pesticides, their pesticide used practices and problems were determined. There is limited available information about the economic evaluation of pesticide use in wheat production in Turkey. In order to fill this information gap, there is a need for this study.

Methodology

Data collection

The total wheat production in 2014 was 96 030 tons in Isparta province. Total cereals production was 212 986 tons produced on 99 512 ha. About 45.09 % of total cereals produced was wheat (TURKSTAT, 2014). Wheat, occupies the prime position in area and the second in production among the cereal crops in the Isparta Province.

Data for the study were obtained from primary sources. The primary data were collected using a set of structured and pre-tested questionnaires, which were administered to the wheat farmers of the study area. This study was conducted using a face to face interview with 84 wheat farmers from Egirdir, Gelendost and Yalvac districts of the Isparta province in West Mediterranean region of Turkey and their villages were chosen as the study area where there is intensive wheat production. Wheat is the most important crop grown in farms in these villages. The farms were chosen by simple random sampling method (Yamane, 2001).

Data Analysis

All data were analyzed using SPSS software and procedures. Descriptive and inferential statistics were used to analyze the data collected. Demographic characteristics of farmers were analyzed using percentages and frequencies. For the economic cost of pesticide the formula below was used (Eq. 1):

$$EC = APAIU * PPUPT, \quad (1)$$

where:

EC: Economic cost (EUR ha^{-1});

APAIU: Amount of pesticide active ingredient used (g ha^{-1});

PPUPT: Price of pesticide used by pesticides type (l/EUR).

Additionally, the gain threshold can be calculated with the following formula (Eq. 2);

$$\text{Gain threshold } (\text{kg ha}^{-1}) = \frac{\text{pesticide and pesticide application costs (EUR ha}^{-1})}{\text{average wheat price (EUR kg}^{-1})} \quad (2)$$

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Furthermore, pesticides were grouped by their toxicity classification and their chemical family in based on the WHO criteria (WHO, 2010).

Research results and discussion

1. General characteristics of the farms

The average age of the farmers was 51.1 years and the average experience of farmers in wheat was 27.6 years. The average household size was 4.7 people. Farmers' average years of education was 7.6 (Table 1). The percentage of farmers who used agricultural credit for wheat production was 36.9 %. The percentage of farmers who are members in agricultural cooperative was calculated as 77.4 %. The average farm size and cultivated area were 12.11 ha and 10.50 ha, respectively. It was found that farms who were under irrigation were 14.5 % of farm size and fallow land 13.3 %. The average cultivated area of the farms was 10.50 ha of which 32.3 % was devoted to wheat (3.91 ha) production (Table 1). In the study area, 63.1 % farmers rely only on wheat production as they do not have any other occupation, while the rest of the farmers were engaged in some other professions.

Table 1.

Farmers' socio-economic characteristics, environmental attitudes and extension practices

Variable	Mean	SD*	%
Personal characteristics			
Farmer's age (years)	51.1	12.89	-
Farmer's education(years)	7.6	3.04	-
Farmer's experience (years)	27.6	13.09	-
Number of people in family	4.7	2.38	-
The rate of the farmer membership of agricultural cooperative (%)	-	-	77.4
The number of the people working on crop production in family	2.9	1.57	-
The number of farmer dealing with non-agricultural activity	-	-	36.9
The rate of farmer use agricultural credit	-	-	41.7
Farm characteristics			
Average farm size (hectare)	12.11	13.27	100.0
Cultivated area (ha)	10.50	12.85	86.7
Fallowing area(ha)	1.61	3.25	13.3
Irrigated area(ha)	1.75	2.58	14.5
Non-irrigated area(ha)	10.36	12.54	85.5
Owned land(ha)	8.68	7.20	71.7
Rented land(ha)	3.43	11.08	28.3
Wheat area(ha)	3.91	5.90	32.3
Other crops production area(ha)	6.59	7.96	54.4
Farmers' environmental attitudes and extension practices			
The rate of farmers wants to produce by using the techniques environmentally friendly	-	-	85.7
The rate of farmers watches TV programmes related agriculture	-	-	95.2
The rate of farmers use internet for agricultural purposes	-	-	26.2
The rate of farmers subscribe for a farming magazine	-	-	3.6
The rate of farmers participated any meeting about wheat production	-	-	51.2
The rate of farmers participated any extension programmes related with plant protection	-	-	38.1
The rate of farmers knows about biological control in agricultural combat	-	-	22.6
The rate of farmers knows useful insects	-	-	36.9
The rate of farmers use protector pesticide against pests and diseases	-	-	69.1

**Standard Deviation*

Source: author's calculations based on farmer survey data.

The rate of farmers who watched the agricultural related programmes on television was calculated as 95.20 % and used the internet for agricultural purposes was 26.20 %. Farmers' that used modern information sources as mainly information sources for deciding to pesticide application time were 55.95 %, deciding to pesticide choice 90.48 % and deciding on pesticide application dosage 75.00 %. This means that farmers

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used more information from extension agents, farmer cooperatives, input dealers, pesticide label and mass media. Most of the farmers had contact with the public and private extension agents with 33.33 %, while 23.81 % indicated non-contact with extension agent. The rate of farmers who read pesticide labels was 96.43 %. Information on the label about when and how to use the pesticide was the most important source of information that affected farmer's knowledge, safety in pesticides and particularly training to improve the application of pesticides (Waichman et al., 2007). The rate of farmers who want to produce by using the environmentally friendly techniques was 85.70 %. It was determined that 51.20 % of the farmers participated in related with wheat production extension programme. The percentage of farmers who participated in related with plant protection extension programme was 38.1 %. It was determined that 69.10 % of the farmers used protector pesticide against pests and diseases. The rate of farmers who know about biological control in agricultural combat and known useful insects were 22.6 % and 36.9 %, respectively (Table 1).

2. Pests and diseases encountered by farmers in wheat production

Plant protection problems such as pests, weeds and diseases are the major factors decreasing wheat production. Table 2 shows the major pests and diseases encountered by farmers in wheat production in the study area. The research results showed that the majority of these farmers faced with pests, weeds and diseases include; weed seeds, sunn pest (*Eurygaster integriceps Put*), covered and semi loose smut of wheat, orthoptera, *zabrus sp.*, and *pactytyclus hordei*, respectively. These pests, weeds and diseases, cause economical losses in some wheat fields in the study area. The most important applications in controlling pests, weeds and diseases of wheat are cultural and mechanical controls. Chemical control is the other method used to suppress wheat pests, weeds and diseases, due to its rapid effect.

Table 2.

The major pests, weeds and diseases encountered by farmers in wheat production in research area

Pests, Diseases and Weeds	N*	%	Rank
Weed seed control	62	73.81	I
Sunn pest (Eurygaster integriceps Put)	23	27.38	II
Covered and semi loose smut of wheat	41	48.81	III
Orthoptera	8	9.52	IV
Zabrus sp.	6	7.14	V
Pactytyclus hordei	5	5.95	VI

Source: author's calculations based on farmer survey data. *Multiple responses

3. Classification and types of the pesticides used by the farmers in wheat production

Pesticides have been a major contributor to the growth of crop productivity and food supply. Yet, they are a source of concern because of human and environmental health side effects (Sexton et al., 2007). Table 3 shows an overview of all types of pesticides used by the farmers in wheat production in the research area. Pesticides were grouped by their toxicity classification and their chemical family (WHO, 2010). Among the 84 wheat farmers, 6 different types of pesticides were used. Among the 84 wheat farmers, 3 different types of insecticides were used. The insecticides commonly used by the farmers were identified as Deltamethrin (5.95 %), Chlorpyrifos ethyl (1.19 %) and Lambda-cyhalothrin used by 2.38 % of the farmers.

Among the 84 wheat farmers, single types of fungicides were used. The fungicide commonly used by the farmers was identified as Tebuconazole used by 27.38 % of the farmers as protection from fungal diseases in wheat production.

The most common herbicides in wheat production are 2.4-D Isooctylester (52.38 %) and Tribenuron-methyl (19.05 %). The study revealed that, the most common pesticides used by the farmers in wheat production were moderately hazardous categories (class II).

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Table 3.

Type of pesticides used in wheat production in the research area, classified using the WHO hazard classifications*

Trade Name	Chemical family	Toxicity class a	Number of farmersc	%
Insecticides				
Decis ulv 1,5	Deltamethrın	II	5	5.95
Fulrik 4	Chlorpyrifos ethyl	Not listed	1	1.19
Karate zeon	Lambda-cyhalothrın	II	2	2.38
Fungicides				
Izolexıl 2 DS	Tebuconazole	II	23	27.38
Raxil 2 DS	Tebuconazole			
Herbicides				
Ester EXT	2,4-D Isooctylester	Not listed	44	52.38
Ester H	2,4-D Isooctylester	Not listed		
Granstar	Trıbenuron-methyl	Not listed	16	19.05

Source: author's calculations based on farmer survey data. ª WHO 2010 *The WHO recommended classification of pesticides by hazard. Index. Classification of active pesticide ingredients (Ia = Extremely hazardous; Ib = Highly hazardous; II = Moderately hazardous; III = slightly hazardous; U = Unlikely to present acute hazard in normal use; FM = Fumigant, not classified; O = Obsolete as pesticide, not classified). ᶜ Multiple responses were possible as there were no limitations set up for farmers' choices

The economic costs of pesticide and amounts of pesticides used on wheat production

According to literature weather is the most important factor in pesticide use for crop production, which has a major influence on the spread of plant diseases, fungi and insects. Other significant factors have been the prices, biological factors, damage per pest, pesticide effectiveness, and other random variables affect pesticide productivity and profits. When deciding whether to treat his crop, a farmer will weigh up the cost of the potential crop loss against the cost of applying pesticides; thus, pesticide prices are also influence sales. Another significant factor has been the introduction of new, highly active, lower dose pesticides in recent years (Tisdell 1986; Lucas and Vall, 1999; Sexton et al., 2007).

There exist today options damage control tools at the farmer's disposal. These include biological control, which makes use of natural predators of pests and other natural phenomena like the weather; mechanical control, which includes the use of specific tilling and cultivation techniques; and chemical control-the application of pesticides, herbicides, and fungicides (Sexton et al., 2007). Results of this research show that, the average usage of pesticides are 1 103.50 g per hectare as an active ingredient in the wheat production. The average usages per hectare of active ingredient of insecticides, fungicides and herbicides were determined to be 48.00 g, 146.60 g and 908.90 g, respectively. In a similar study done by TEAE (2001) founds that the average usage per hectare as active ingredient of herbicides were 762 g (in Tekirdag, Turkey), 520 g (in Adıyaman, Turkey), 595.90 g (in Polatlı, Ankara, Turkey) and 887.30 g (in Konya, Turkey). In the same study done by TEAE (2001) found that the average usage per hectare as active ingredients of fungicides were 78.30 g (in Polatlı, Ankara, Turkey) and 40.60 g (in Konya, Turkey). Care should be taken in making comparisons as the scope of the dose might vary from one province to another. A number of factors could affect figures from one year to the next: the weather and the seasons, pest pressure, pesticide prices, land set-aside and policy changes (Lucas and Wall, 1999). Herbicides are the biggest pesticide group used in wheat production. They accounted for 82.37 % of total weight of active ingredients, followed by fungicides (13.28 %) and insecticides (4.35 %). It was determined that farmers use herbicides more than the recommended, fungicides and insecticides less than the recommended dosages of private pesticide dealers and extension staff and pesticide labels. Increased or decreased use of pesticides can lead to inefficient, crop and economic losses and environmental hazards. It was calculated that economic cost was EUR 50.25 per hectare. The percentages of these costs are 85.03 %, 9.24 % and 5.73 % for herbicides, insecticides and fungicides, respectively.

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Table 4.

Economic costs of pesticide and amounts of pesticides used on wheat production

Type of Pesticides	Used amount		Recommended Amount	Pesticides+ Pesticide application costs	
	(g-ml-cc)/ha	%	(g-ml-cc)/ha	(€ /ha)	%
Insecticides	48.00	4.35	53.48	4.64	9.24
Fungicides	146.60	13.28	168.80	2.88	5.73
Herbicides	908.90	82.37	831.88	42.73	85.03
Total pesticides	1 103.50	100.00	1 054.16	50.25	100.00

Source: author's calculations based on farmer survey data.

Production and plant protection costs in wheat production

Table 5 shows plant protection costs in wheat production in the study area. Plant protection costs of items such as wages, uniforms, equipment of personnel engaged in plant protection and pesticides. In this study, the average costs of wheat production were determined to be EUR 549.94 ha^{-1}. According to this study, the cost of plant protection (pesticide and pesticide application costs) per hectare was determined as EUR 50.25 having the portion of 9.14 % of average production cost. In this study, the average yield for wheat was determined to be 3 461.90 kg ha^{-1}. It was calculated that pesticide and pesticide application costs and production costs were determined to be EUR 0.01 kg^{-1} and EUR 0.16 kg^{-1}, respectively.

Table 5.

Cost of plant protection applications and production cost in wheat production

Indicators	Mean	SD*
A. Average yield (Kg/hectare)	3 461.90	1 025.45
B. Average Pesticides+ Pesticide application costs (€ /ha)	50.25	28.59
C. Average Pesticides+ Pesticide application costs (€/kg) (C= B/A)	0.01	0.01
D. Average production costs (€ /ha)	549.94	138.90
E. Average wheat production costs(€/kg) (E= D/A)	0.16	0.04
F. The proportion of plant protection costs in average production costs (%) (F=(B/D)*100))	9.14	-

Source: author's calculations based on farmer survey data. *Standard Deviation

Gain threshold of pesticide use on wheat production

Gain thresholds levels of pest population that, if left untreated, would result in reductions in revenue that exceed treatment costs. Gain thresholds are used to decide if pesticide treatments or other pest management practices are economically justified. The decision generally requires information on pest infestation levels from scouting or monitoring (Pedigo and Higley, 1996). In this study, the gain threshold was also estimated for wheat production. Gain thresholds are a simple way to determine the relationship between the pesticide and pesticide application costs and the value of the harvested crop. Gain thresholds are simply the pesticide and pesticide costs per area divided by the value per unit of harvested wheat.

Average pesticide and pesticide application costs and average wheat price were EUR 50.25 ha^{-1} and EUR 0.22 kg^{-1}, respectively. The gain threshold was calculated to be 228.39 kg ha^{-1} and it was 6.60 % of wheat production per hectare. This means that the increase in yield, or gain, has to be 228.39 kg ha^{-1} (6.60 % of wheat production ha^{-1}) for this pesticide use to be economic.

Conclusions, proposals and recommendations

This study was aimed to analyse the farm level of economic analysis of pesticide use in wheat production in West Mediterranean Region of Turkey. Results of this research show that average area of wheat production was 3.91 ha with 3 461.90 kg ha^{-1}. The average cost of wheat production was EUR 549.94 ha^{-1}. Results of this research show that the average usage of pesticides was 1 103.50 g per hectare as an active ingredient in wheat production. Herbicides are the biggest pesticide group used in wheat production. It was calculated that the average plant protection cost was EUR 50.25 ha^{-1} and

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this represents 9.14 % of wheat production costs. According to this research's findings, there are some problems related to the use of pesticides in the study area.

6) The farmers' desire to grow wheat has to be cost effective, sustainable and environment-friendly.

7) Most of farmers use modern information sources (extension agents, farmer cooperatives, input dealers, pesticide label and mass media) as mainly information sources for deciding to pesticide application time, pesticide choice and pesticide application dosage.

8) The study revealed that the farmers were using herbicides more than the recommended, fungicides and insecticides less than the recommended dosages. Using herbicides more than the recommended dosages and using less than the recommended rate of fungicides and insecticides will aggravate the efficacy problems. This leads to crop losses, cost increase, economic loss and undesirable environmental effects.

The results of this research suggest that:

1) Agricultural policy makers should design and implement training interventions to promote knowledge, attitude and safety behaviour of wheat farmers in application of pesticides.

2) The effective training and extension activities which provide farmers research results related to pesticide application should be performed.

3) To decrease unnecessary pesticide use, training programmes should be implemented to increase information and consciousness level of farmer.

4) Extension and training programmes about production techniques environmentally friendly and Integrated Pest Management (IPM) should be developed in order to follow the new approaches.

5) To maximize the benefits of pesticide use at minimum human, environmental and economic cost, pesticides must be strictly regulated and used judiciously by properly trained and appropriately equipped personnel, ideally in tight integration with other complementary technologies.

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