ECONOMIC SCIENCE FOR RURAL DEVELOPMENT

Proceedings of the
International Scientific Conference

Production and Taxes

№ 24
Jelgava
2011

TIME SCHEDULE OF THE CONFERENCE

Preparation: October 2010 – April 2011
Process: 28-29 April 2011

ISSN 1691-3078
ISBN 978-9984-9997-5-3

Abstracted / Indexed: ISI Web of Knowledge,AGRIS, EBSCO
http://thomsonreuters.com/products_services/science/science_products/a-z/conf_proceedings_citation_index/
http://www.llu.lv/ef/konferences.htm
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ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Reviewers

Every article included into the Proceedings was subjected to a scientific, including international review.

All reviewers were anonymous for the authors of the articles.

The following **85** reviewers from scientific and academic institutions of **8** countries (Estonia, Finland, Germany, Latvia, Lithuania, Poland, Romania, and Slovenia) have written **176** reviews.

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Foreword

Every year the Faculty of Economics, Latvia University of Agriculture holds the international scientific conference "Economic Science for Rural Development" and publishes internationally reviewed papers of scientific researches, which are presented at the conference. **This year the conference is organised for the 12th year running and all the papers are published in English.** Selected papers from the Proceedings are included into *ISI Web of Knowledge* database and the Faculty of Economics has applied also to Scopus database for including the Proceedings into this database.

Researchers from various European countries representing not only the science of economics in the diversity of its sub-branches have contributed to the conference this year; they have expanded their studies engaging colleagues from social and other sciences, thus confirming inter-disciplinary and multi-dimensional development of the contemporary science. The conference is dedicated to topical themes of rural development; hence, the research results are published in three successive volumes (No. 24, 25, and 26). The first volume of scientific conference proceedings was published in 2000.

Professors, doctors of science, associate professors, assistant professors, PhD students, and other researchers from the following higher education, research institutions, and professional organisations participate at the International Scientific Conference held on April 28-29, 2011 and present their results of scientific researches:

Latvia University of Agriculture
Academy of Management in Lodz
Balvi District Partnership
Daugavpils University
Estonian Agricultural Registers and Information Board
Estonian University of Life Sciences
Fulda University of Applied Sciences
Latvian Academy of Agricultural and Forestry Sciences
Latvian State Forest Research Institute "Silava"
Latvian State Institute of Agrarian Economics
Latvijas Mobilais Telefons
Lithuanian University of Agriculture
Ministry of Education and Science of the Republic of Latvia
Research Institute of Agriculture Machinery, Latvia University of Agriculture
Research Institute of Biotechnology and Veterinary Medicine "Sigra"
Riga International School of Economics and Business Administration
Riga Technical University
Rural Support Service
School of Business Administration Turība
Seinäjoki University of Applied Sciences
University College of Economics and Culture
University of Helsinki
University of Latvia
University of Life Sciences in Lublin
University of Ljubljana
Vidzeme University of Applied Sciences
Vytautas Magnus University
Warsaw University of Life Sciences
West Pomeranian University of Technology in Szczecin
West University of Timişoara

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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The following topical themes have been chosen for the conference:

- Primary and secondary agricultural production and cooperation;
- Integrated and sustainable development;
- Finance and taxes;
- Education and rural science;
- Resources and sustainable consumption;
- Home economics.

The comprehensive reviewing of submitted scientific articles has been performed on international and inter-university level to ensure that only high-level scientific and methodological research results, meeting the requirements of international standards, are presented at the conference.
Every submitted manuscript has been reviewed by one reviewer from the author's native country or university, while the other reviewer came from another country or university. The third reviewer was chosen in the case of conflicting reviews. All reviewers were anonymous for the authors of the articles. Every author received the reviewers' objections or recommendations. After receiving the improved (final) version of the manuscript and the author's comments, the Editorial Board of the conference evaluated each article.
All the papers of the international scientific conference "Economic Science for Rural Development" are arranged into the three following thematic volumes:

No. 24 Production and Taxes
Primary and Secondary Production and Cooperation
Finance and Taxes

No. 25 Resources and Education
Resources and sustainable consumption
Education and rural science

No. 26 Sustainability
Integrated and Sustainable Development

The publishing of the Proceedings before the conference will promote exchange of opinions, discussions, and collaboration of economic scientists on the international level. The research results included into the Proceedings are available worldwide to any stakeholder.

The abstracts of the conference proceedings provided in English are submitted to the international databases:

Web of Knowledge, which is a unified platform, that integrates all data and search terms. It provides access to the world's leading citation databases, including powerful cited reference searching, the Analyse Tool, over 100 years of comprehensive backfile and citation data. *Web of Knowledge* also delivers access to conference proceedings, patents, websites, and chemical structures, compounds and reactions. While other databases simply aggregate data, *Web of Science* information is carefully evaluated and selected. This time-tested approach helps conserve an institution's resources and researchers' time by delivering access to the most relevant resources. *Web of Science* offers a true cited reference index, which is still the best tool for discovery and the only method of retrieving accurate citation counts.

AGRIS - International Information System for the Agricultural Sciences and Technology set up by the Food and Agriculture Organisation of the United Nations (FAO UN), and especially to the databases containing full research texts set up by the academic higher education institutions.

EBSCO Academic Search Complete is the world's most valuable and comprehensive scholarly, multi-disciplinary full-text database with more than 8,500 full-text periodicals, including more than 7,300 peer-reviewed journals.

CABI PUBLISHING CAB ABSTRACTS database. *CAB Abstracts* gives researchers instant access to over 6.3 million records from 1973 onwards, with over 300,000 abstracts added each year. Its coverage of the applied life sciences includes agriculture, environment, veterinary sciences, applied economics, food science, and nutrition. **CAB Abstracts** is a comprehensive bibliographic database that covers worldwide literature from all areas of agriculture and related applied and life sciences. Published by CAB International, a division of CAB International, CABA is the world's most comprehensive database in its field containing 5 million entries of which 95% are supported by abstracts. Starting from 2009, part of entries is available as full-text periodicals.

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
Gunita Mazūre
Associate professor of Faculty of Economics
Latvia University of Agriculture

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Economic Evaluation of Technical Support for the Technologies of Growing Agricultural Crops

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Nikolajs Kopiks, Dainis Viesturs, *Research Institute of Agriculture Machinery, Latvia University of Agriculture*

Abstract. The article deals with the economic evaluation of technical support for the technologies of growing agricultural crops characterised by the indicators of efficiency and cost of technical means. Impact of the amount of work is shown upon the level of technical support using the technological operations of pre-sowing soil preparation and sowing by means of a combined aggregate for cereal cultivation as an example. Estimation is shown for the application of a high level of technical support at the expense of increasing the yields. Economic-mathematical models were applied for the solution of this task which took into account the impact upon saving labour resources (employment of machine operators), environment protection (consumption of fuel), and the economic aspects (lowering the reduced costs).
The results obtained during the process of optimisation indicate that each level of technical support for the technologies of growing agricultural crops has an economically expedient limit of its application. It is a corresponding amount of the performed work, the time of its execution connected with the costs, and the degree of the necessary capital investments. Estimation of the enumerated factors presents a possibility to determine the forms of application of the machinery - its acquisition as individual property, for collective use, or its leasing.

The presented approach to the evaluation of the level of technical support of technologies allows also obtaining information in order to make a motivated decision when purchasing machine and tractor aggregates, selecting technologies, and shaping the structure of tractor aggregates on the farm.
Key words: tractor aggregate, level of technical support, economic-mathematical simulation, reduced costs.

Introduction

The development of agricultural production depends in many ways on a motivated level of technical support of the production processes. Diversity of the market and production factors, the development of technical means, and their interrelation create a multitude of possible variants for the formation of technical support. Great importance in the solution of this problem is attached to the optimisation of the structure of technical support using the methods of economic-mathematical simulation.
The aim of the research is to provide a motivated level of technical support for the technologies of growing agricultural crops depending on the production conditions, the amount of the performed work and fixed agro-technical terms. An instrument for the solution of this task is economic-mathematical simulation which takes into account the following factors: saving labour resources (employment of machine operators), improvement of the ecological indicators (reduced consumption of fuel), and the economic aspects (lowering the reduced costs). Economic-mathematical models were applied for parametric optimisation of functional dependencies reflecting the character of the investigated process (Франс Дж., Торили Х. М., 1987; Хемди А. Т., 2005). Theoretical foundations used in publications (Asejeva A., Kopiks N., Viesturs D., 2006; Kopiks N., Viesturs D., 2010) on completing machine and tractor aggregates were applied to establish functional dependencies.
The obtained information allows the manufacturer of agricultural products make a motivated decision for the choice of an optimal variant of a tractor aggregate depending on the above-mentioned conditions and taking into account the requirements of a farm when modifying and adapting new technologies of growing agricultural crops.

Results and discussion

Let us discuss the motivation of the level of technical support using as an example the technological operations of pre-sowing soil preparation and sowing cereal crops. The level of technical support is characterised by the indicators of efficiency and price of the machinery. Agricultural machines of the "Spirit" type used for soil preparation without ploughing and which ensure the required structure of soil and sowing were selected for the research purpose. The data about the agricultural machines, obtained from VÄDERSTAD, the distributor of this machinery, are presented in Table 1.

Table 1

Basic initial data about agricultural machines

Aggregate	Price of the tractor, LVL	Price of the agricultural machine, LVL	Operating width, m	Required efficiency, hp
McCORMICK MTX150+ST - 400	46132.1	43000	4	150
McCORMICK ZTX230+ST - 600	78470.0	54000	6	210
McCORMICK ZTX260+ST - 800	81774.0	64000	8	250
Fendt 930+ST-900	173430.0	71500	9	300

Source: VÄDERSTAD, the distributor of agricultural machinery

The basic initial data include: the technological speed of aggregates - 12 km/h; depreciation cost -17%; annual loading of the tractor -1350 h; the hourly wage rate of the operator – 1.34 LVL; the price of fuel – 0.45 LVL/kg (after the return of the excise tax); duration of the working day –10 h (duration of the operation of the aggregate during a day).

In order to estimate the level of technical support, a mathematical model was used for the choice of a tractor aggregate. The model is based on the criterion of reduced costs when performing a definite amount of work and it is expressed as follows:

$$Z = F(T, P)$$

where: Z – reduced costs; T – vector of technical parameters {B, V, Q}; B – operating width of an agricultural machine, V – technological speed of the aggregate; Q – consumption of fuel; P – vector of cost parameters { C_T, C_M, α_1, α_2, a }; C_T – price of the tractor; C_M – price of the agricultural machine; α_1, α_2 – renovation costs of the tractor; a – hourly wage rate.

Components of the minimisation function of the specific variable costs:

- specific deprecation costs related to an agricultural machine where:

$\mathbf{C_{M\alpha} = f(c_M, b, \alpha_1, \Omega}$

c_M - price of a part of the operating width of the agricultural machine;
b - operating width;
$\boldsymbol{\alpha_1}$- depreciation coefficient;
Ω - amount of work.

$A = \mathbf{f}(\mathbf{a}, v, b, \tau)$- specific wages where:

a - hourly wage rate;
v - speed of the aggregate;
b - operating width;
τ - the coefficient of the consumed time of work.

$Q = \mathbf{f}(\theta, v, b, \tau)$ - specific consumption of fuel where:

θ - hourly consumption of fuel;

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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v - speed of the aggregate;
b - operating width;
τ - coefficient of the consumed time of work.

$C_{T\alpha} = f(c_T, \alpha_2, \omega, v, b, \tau)$ - specific depreciation deductions where:

c_T - price of the tractor;
α_2 - depreciation coefficient;
ω - annual loading of a tractor in hours;
v - speed of the aggregate;
b - operating width;
τ - coefficient of the consumed time of work.

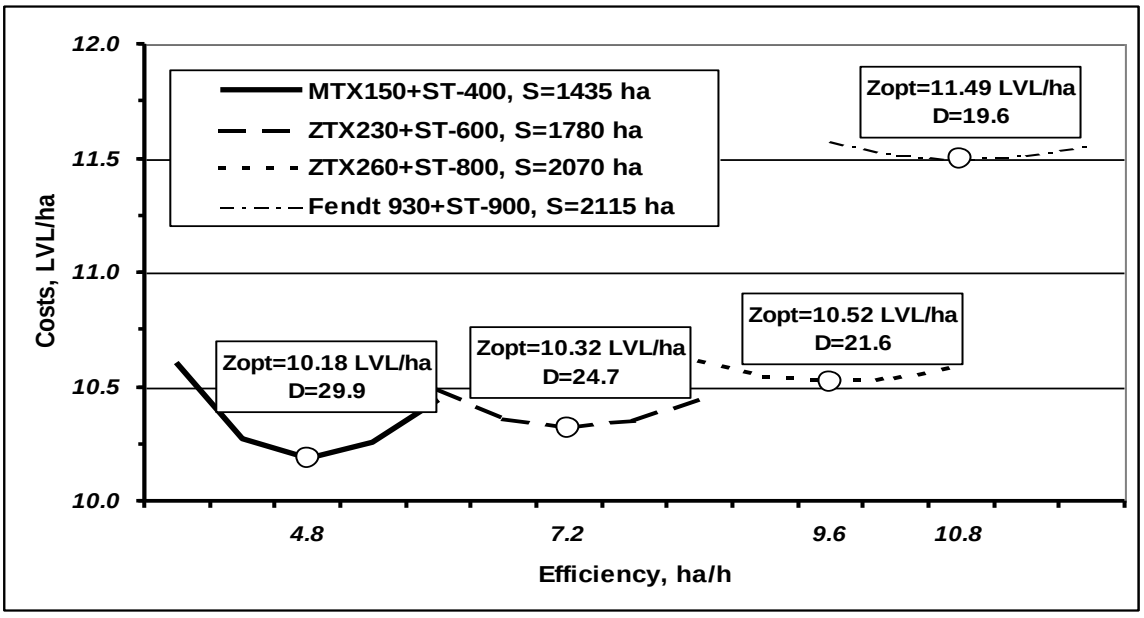
This mathematical model is solved as an optimisation task of non-linear programming.

The repair and maintenance costs are calculated in proportion to the performed work. Therefore they are not included into the considered function of specific variable costs.

An optimal value of variable costs is obtained and a corresponding amount of the performed work without fixing the completion terms of the work are attained as a result of the calculation of this mathematical model.

Figure 1 shows the dependence of the optimal reduced costs and the duration (k – working days, D) of a particular amount of work on the level of technical support.

It is obvious from Figure 1 that the dependence of the reduced costs on efficiency is of a non-linear character. Besides, each aggregate has its own limit of efficient use. For instance, for the aggregate MTX150+ST – 400 it is S = 1435 ha, the duration of a particular amount of work D = 29.9 days, the optimal value of specific reduced costs **Z**opt – 10.18 LVL/ha. For the aggregate Fendt 930+ST-900 S = 2115 ha, D = 19.6 days and **Z**opt – 11. 49 LVL/ha. When its efficiency increased 2.25 times, the increase in the reduced costs was by 13%, the limit of its efficient use – by 44%, but the price of the aggregate - more than 2.75 times.



Source: authors' graph based on the data of VÄDERSTAD, the distributor of agricultural machinery

Fig. 1. **Variations in the optimal reduced costs depending on the aggregate efficiency**

This occurs on condition when the completion terms of the operation are not fixed. It is evident from the character of the changing variables which reflect the reduced costs depending on efficiency that there exists a certain limit to their efficient application expressed by the amount of the performed work. A more apparent change in the reduced costs takes place with the tractor aggregates of lower efficiency. This is caused by an increase in the costs for wages, fuel, and depreciation. When efficiency is high, the change

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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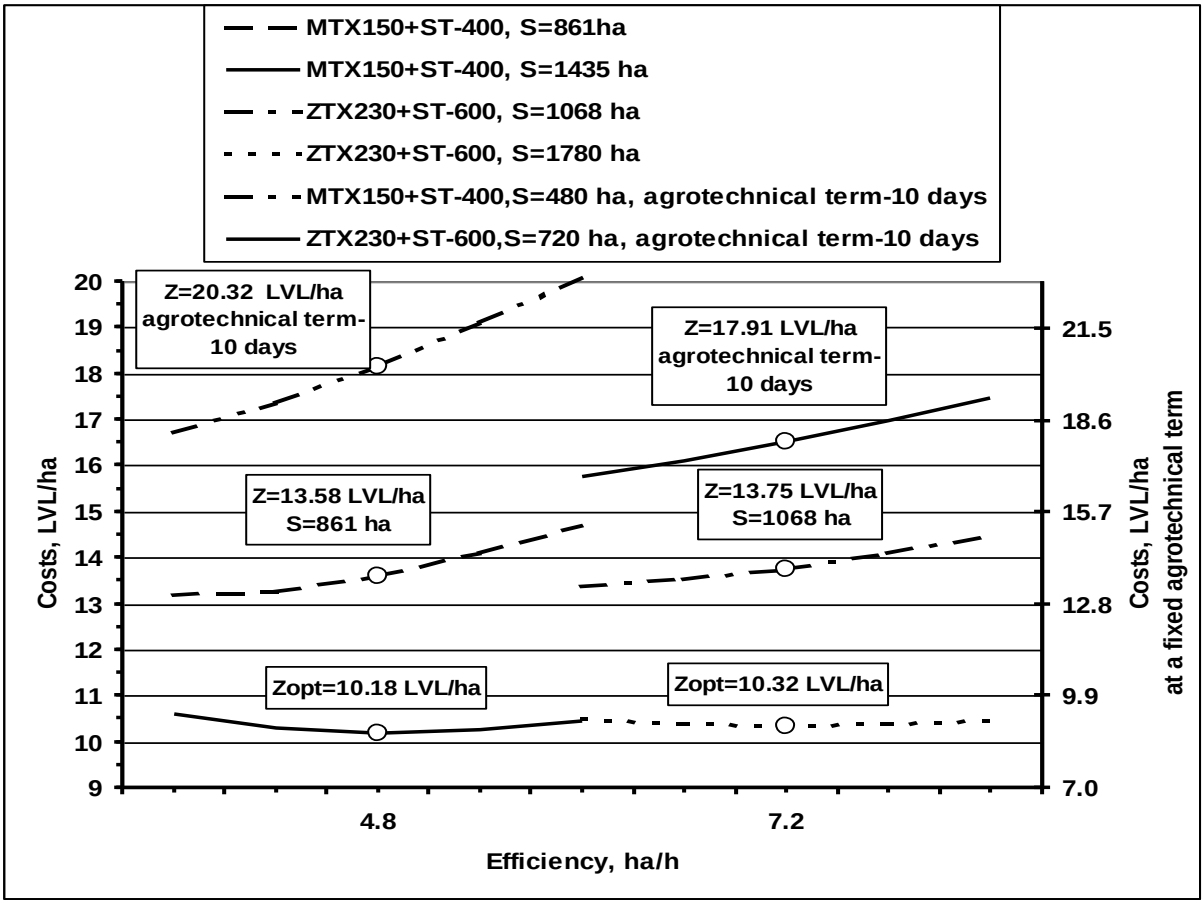
in the reduced costs occurs slower in relation to their optimal value. This allows, when choosing the level of technical support, to accept the deviations from the optimum value within the limits of insignificant variation in the costs.

It also results from the graph that the duration of the work is shorter when the reduced costs are optimal for the more efficient aggregates. Thus, for the aggregate MTX150+ST – 400 it is D=29.9 days if the amount of the performed work is S=1435 ha, but for the aggregate Fendt 930+ST-900, D=19.6 days if S=2115 ha. This points to the impact of highly efficient aggregates and the yields since they depend on the duration of the performed work (Riekstiņš A., 2008).

However, on real conditions, the amount of the performed work may also have fixed agro-technical terms. Figure 2 reflects variations in the reduced costs at an imposed limitation on the agro-technical terms T≤ 10 and a limitation on the performed amount Ω=b, where b – the assumed amount of work which constitutes 60% of the amount when the aggregate has optimal variable costs.



Source: authors' graph based on the data of VÄDERSTAD, the distributor of agricultural machinery

Fig. 2. **Variations in the reduced costs at an imposed limitation on the agro-technical terms and limitation on the performed amount of work depending on the aggregate efficiency**

As it is obvious from Figure 2, variable costs have increased by 33.4% when the fixed amount of the work performed by the aggregate MTX150+ST – 400 is 60% of the amount of the work performed at an optimal value of these costs. The increase is 2 times at a fixed 10-day agro-technical term. For the aggregate MTX150+ST – 600 the variable costs have increased by 33.24% and 1.74 times. For the aggregate ZTX260+ST – 800 they have increased by 33% and 58%, and for the aggregate Fendt 930+ST – 900 their increase was by 33% and 48% respectively. The data indicate that for the aggregates with the amount of the

performed work changing up to 60% in relation to the limit of their efficient use the change in the variable costs differs insignificantly. But when the agro-technical terms are fixed for the aggregates of lower efficiency, these changes are more essential in the direction of their increase. They are significantly lower for the aggregates of higher efficiency.

It is also evident from the graphs in Figure 2 that the imposed limitations – the amount of the performed work and the agro-technical term – change the limits of efficient use of the aggregate in the direction towards its decreasing with increased significance of the variable costs. Therefore, when the level of technical support is determined, the imposed limitations should correspond to a strictly allowed value which is in agreement with the discussed process (efficient implementation of the technology).

The obtained data indicate that the value of the costs at a low efficiency of the aggregate increases due to their increased share in the wages, fuel, and depreciation. At increased efficiency the price of the aggregate rises, simultaneously increasing the deductions for renovation. Also other researchers (Olt J., Traat U., Kuut A., 2010) have come to similar conclusions. It is clear from the graphs presented in Figures 1 and 2 that each value of the efficiency and price of the aggregate which determine the level of technical support has a definite limit of its efficient application. Its expansion can be achieved at the expense of higher yields. The level of technical support should provide for higher quality of the performed work, and high efficiency provides a possibility to reduce the terms of the work which, in its turn, promotes higher yields. This is confirmed by other investigations as well.

However, ensuring high efficiency of the aggregate requires additional costs (capital investments). In this case the economic expediency of raising the level of technical support is estimated on condition when it complies with the inequality $\boldsymbol{D/Z \geq 1}$, where D – additionally gained income from one hectare at the expense of the reduced duration and improved quality of the performed work; Z – additional capital investments per hectare. It shows that, in case the condition of this correlation is observed, the efficiency of a high-capacity aggregate can be achieved also with small amounts of the performed work when the factors of the reduced duration and improved quality of the work promote higher yields and, consequently, additional income.

A comparison was made of the work performed by the aggregates MTZ–952, EN M85-165, KVU-3.6-4s, and Nordsten CKF. The difference lies in the technical level of soil preparation and sowing using the conventional method when these operations are carried out separately by means of these machines. Using the aggregate MTX150+ST – 400, the reduced costs per hectare (deprecation costs, costs of maintenance and repairs, wages and fuel) are 3.2 times lower than in case these operations are performed separately. The costs in terms of man-hours/ha are 12 times lower and the fuel consumption per hectare is 2.8 times less. Data show that the use of combined aggregates allows to save labour resources (employment of machine operators), to protect environment (reduced consumption of fuel, a lesser number of passes per unit of the area), and to lower the reduced costs at increased specific capital investments. The results for the other aggregates discussed above show the efficiency of their application as well in contrast to the variant when each technological operation is carried out separately (on condition that the amount of the performed work corresponds to the limit of their efficient use). When the amount of work does not comply with the optimal value of costs and the value of capital investments, it is necessary to find organisational forms of collective application of the machinery or its leasing.

Conclusions, proposals, recommendations

1. The proposed evaluation of the level of technical support allows determining the optimal amount of work for each level as well as appraising the impact of the fixed limit of agro-technical terms on the optimal amount of work.
2. The performed analysis indicates that each level of technical support has a concrete limit of efficient application depending on particular conditions; it influences the duration of the performed work as well.

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3. The presented approach to the evaluation of the level of technical support for the technologies of growing agricultural crops allows obtaining information in order to make a motivated decision when purchasing machine and tractor aggregates, selecting technologies, and shaping the structure of tractor aggregates on the farm.

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Economic Evaluation of Rape Production on the Member Farms of the Cooperative LATRAPS

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Abstract. There were three periods of producing rape in Latvia: the first period was in the 1980s when this crop was not widely used in processing, the second one was from 1999 to 2003 when the importance of rape for farms was understood, and the third one has begun in 2004 when Latvia joined the European Union (EU), and the area sown with rape significantly increased. The proportion of area sown with rape in Latvia, compared with other EU Member States, is low – only 1.3% in 2008. In 2008, the average yield in Latvia was lower than in the EU on average, i.e. 2.40 t ha^{-1}; while it was 3.05 t ha^{-1} in the European Union. A part of Latvian rape producers have joined the cooperative of agricultural services LATRAPS whose number of members has increased 48 times and its net turnover rose 357 times over 10 years. Since 2008, the cooperative LATRAPS organises a competition called "Zelta rapsis" (Golden Rape) to determine the possibilities of farms to grow rape as much efficiently as possible. The average yield in the group of analysed member farms of the cooperative LATRAPS significantly exceeds the average indicators in the country and the EU, reaching 4.28 t ha^{-1} in 2008. The data on the analysed farms show that the highest proportion of variable costs in rape production consists of expenditures on fertilisers and plant protection. By applying statistical analysis methods, it was proved in the present research that the amount of variable costs does not significantly influence yields, since there is a weak correlation between the yield and the items of variable costs. Therefore, the high yield is affected by membership in the cooperative.
Key words: rape production, gross margin, variable costs.

Introduction

Rape is a crop having a long history of production in the world, yet, its presence in Latvia's agriculture and economy is relatively recent. Rape is used for three main purposes: oil, feed, and biofuel. Florica MORAR (2011) emphasises that "the role, function, and particular economic importance of the rape cultures in the process of an intensifying agriculture as well as the ever growing demands of the national economy for the products of this culture have determined in the past few years a considerable growth of the cultivated areas and at the same time, an intensification of the efforts to increase profitability and the economic efficiency of the resulted productions". In Estonia, too, V.Loko, E.Koik, and K.Tamm (2005) state that "rape growing has been more profitable in recent years, which is the reason for a rapid increase of the growth area". Over the recent years, the production of biofuels has become increasingly important. Yuri Kochetkov and Tatyana Yurkovskaya (2010) point that **"**in Europe biodiesel is usually produced from oil seed rape and sunflower, in the USA - from soya. As a technical crop, oil seed rape has many advantages. It is unpretentious and grows well in the whole Europe**"**.

In Latvia, the production of rape for biofuel is affected by the EU Directive 2003/30/EC "On the Promotion of the Use of Biofuels and Other Renewable Fuels for Transport". As result of its implementation, the economic efficiency of rape production, the energy balance and other indicators, including fiscal ones, in Latvia have to increase significantly, which can be achieved by developing rural areas. The production and processing of raw materials for biofuels take place in rural areas; and a reduction in hazardous emissions produced by vehicle engines consuming biofuels is observed in densely populated areas and cities. The socio-economic and environmental situation significantly improves in Latvia thanks to the development of this industry. By elaborating the programme "Production and Use of Biofuels in Latvia" eight years ago, the Cabinet found that the best solution for Latvia is to produce biofuels from the raw

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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materials produced in Latvia (including rape), to use these biofuels in the territory of Latvia, and to export the biofuels after satisfying the demand of its domestic market. Prerequisites are created for the rape producers so that they have a market niche, which is formed from the demand of processing enterprises for this crop. Yet, still there is an urgent problem for the producers – how to increase income and reduce cost so that the production of rape becomes economically efficient, ensuring profit for the producers.

The research **hypothesis** – the output of rape in Latvia increases at a fast rate and becomes economically efficient by using cooperation advantages.

The research **aim** is to make an economic evaluation of rape production on the farms of the cooperative LATRAPS.

The following research **tasks** are set forth to achieve the aim:

1) to investigate the trends of rape production in Latvia;
2) to characterise the economic performance of the cooperative LATRAPS;
3) to analyse the gross margin for rape production on the farms of the cooperative LATRAPS.

Methods used in the research: the monographic method for investigating the components of rape production, the graphic method for interpreting the research results, and statistical analysis methods for determining correlations between factors. Legal and regulatory enactments of the EU and Latvia, data of Eurostat and the Central Statistical Bureau of Latvia on the trends in rape production, and information provided by the cooperative LATRAPS for calculating economic indicators were used to obtain the research results and to justify the urgency of the present research.

Results and discussion

1. Trends in rape production in Latvia

There was an attempt to force Latvia to produce rape already in the Soviet times, but neither appropriate technologies nor sale possibilities were available then. A real need to produce rape in Latvia emerged in the 1990s. A problem of soil depletion emerged after the change of the economic system and setting up of specialised grain farms. Since rape is one of the best sanitary crops and soil improvers owing to its relatively deep taproot, more and more farms decided to introduce this crop in their crop rotation to ameliorate the field. (Ruža E., 2000). The large organic mass that is gained from rape and left in soil after it is harvested increases grain yields by 20% or even more during the next years (Ruža E., 2000, Augkopības rokasgrāmata, 2001). A similar opinion is expressed by foreign scientists, for instance, Klaus Sieling and Henning Kage (2010) believe that "oilseed rape is indispensable because of its beneficial effects on yield levels and nitrogen-use efficiency of following cereals, especially wheat, since alternative crops are often not realistic alternatives".

Latvian scientists J.Vanags and I. Turka (2009) point that in Latvia „due to the favourable market conjuncture, the country support, and the constant increase of purchase price, the area of rape sowings rapidly increases. This increase is stipulated by widening of the rape usage-in food as well as for renewable energy in biofuel and utilisation of rape shoots in fodder".

Two indicators were used: quantitative – area sown with rape and qualitative – yield per hectare to evaluate the trends in rape production in Latvia. After analysing the areas sown with rape in Latvia (Figure 1), three periods can be distinguished:

- *the first period* – the 1980s when many agronomists learned to grow this crop and the processing of rapeseeds also began, thus getting a valuable supplement for feed as well as rapeseed oil that has many applications;
- *the second period* – from 1999 to 2003 when the positive environmental and economic role of rape on farms was understood, and the Latvian Association of Rape Producers and Processors "Latvijas rapsis", which tackled problems related to the production and sale of rape products, strengthened this role;
- *the third period* – Latvia's accession to the EU in 2004 when the area sown with rape significantly increased, which was determined by the fast growing rapeseed market with relatively high prices and good export possibilities.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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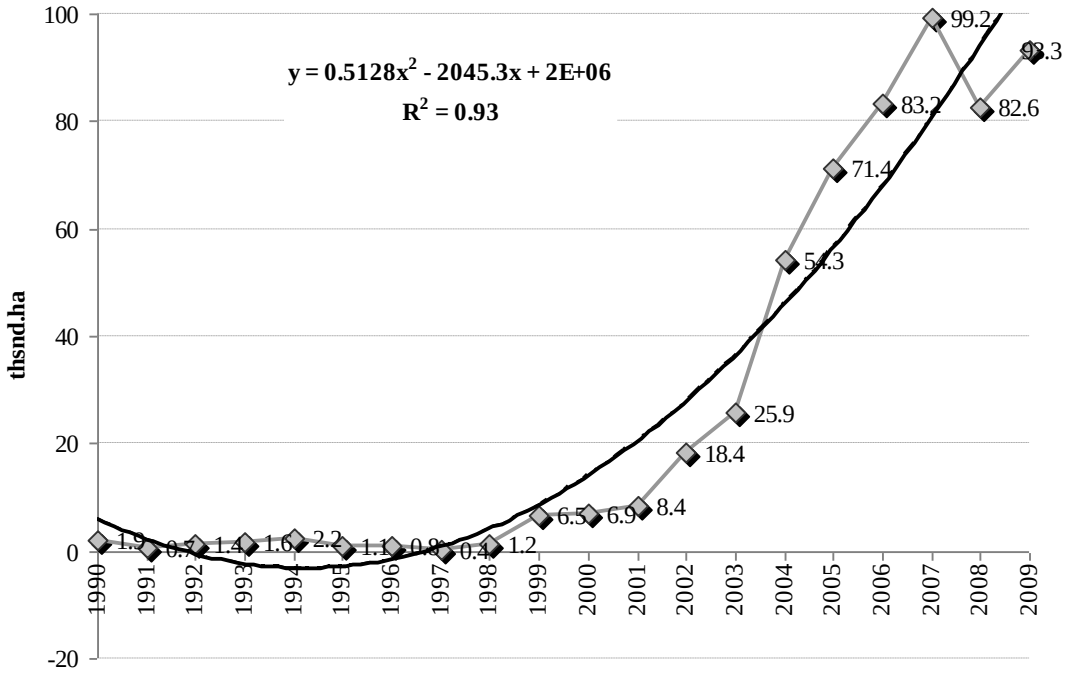

Source: authors' construction based on the CSB data

Fig. 1. **Areas sown with rape in Latvia in 1990-2009, thou. ha**

To identify the trends in the areas sown with rape, a regression analysis – the polynomial regression model – was applied, in which the determination coefficient was the highest - R^2=0.93. An analysis of nonlinear regression showed that the areas sown with rape have steadily increased over the researched period, justifying the above-mentioned periods of rape production in Latvia. Yet, at the same time, it has to be recognised that the proportion of area sown with rape in Latvia in the total EU area is insignificant, accounting for 1.3% in 2008. The largest countries producing rape in the EU are France (23.6%), Germany (22.1%), and Poland (12.4%). (Rape, Area, Eurostat) In the neighbouring countries – Lithuania (2.6%) and Estonia (1.3%), too, the proportions of area sown with rape are insignificant. Therefore, a problem of cooperation arises not only in Latvia, but also in all the three Baltic States.

Along with the quantitative indicators (areas sown with crops), qualitative indicators (yield) are also important. A yield of crop is an indicator that characterises the development level of any farm and directly affects the economic efficiency of resources used in production. The indicators showing yields of rape are presented in Figure 2.

The data of Figure 2 show that the average yield in Latvia is very volatile (from 0.81 t ha^{-1} in 1995 to 2.40 t ha^{-1} in 2008), and no particular trend is observed. Professor Antons Ruža points that a yield exceeding 2 t ha-1 can be regarded as normal (Augkopības rokasgrāmata, 2001). The highest average yield of 2.40 ha^{-1} was achieved in Latvia in 2008, while in Lithuania (2.04 ha^{-1}) and Estonia (1.43 ha^{-1}) the yields were lower. These indicators affirm that a better experience in growing rapeseeds is gained in Latvia. However, the average yield of rapeseeds in Latvia is significantly lower than in the EU. In 2008, the average yield of rapeseeds in the EU was 3.05 t ha^{-1}, in Germany – 3.75 t ha^{-1}, in France – 3.22 t ha^{-1}, in the United Kingdom - 3.26 t ha^{-1}, and in Poland - 2.73 t ha^{-1} (Rape Production, Eurostat).

To ascertain a trend in rape production, a regression analysis using the polynomial regression model was done, which in this case characterises the dispersion of values in the best way. The determination coefficient (R^2) was 0.5303, which explains only 53% of changes in yields.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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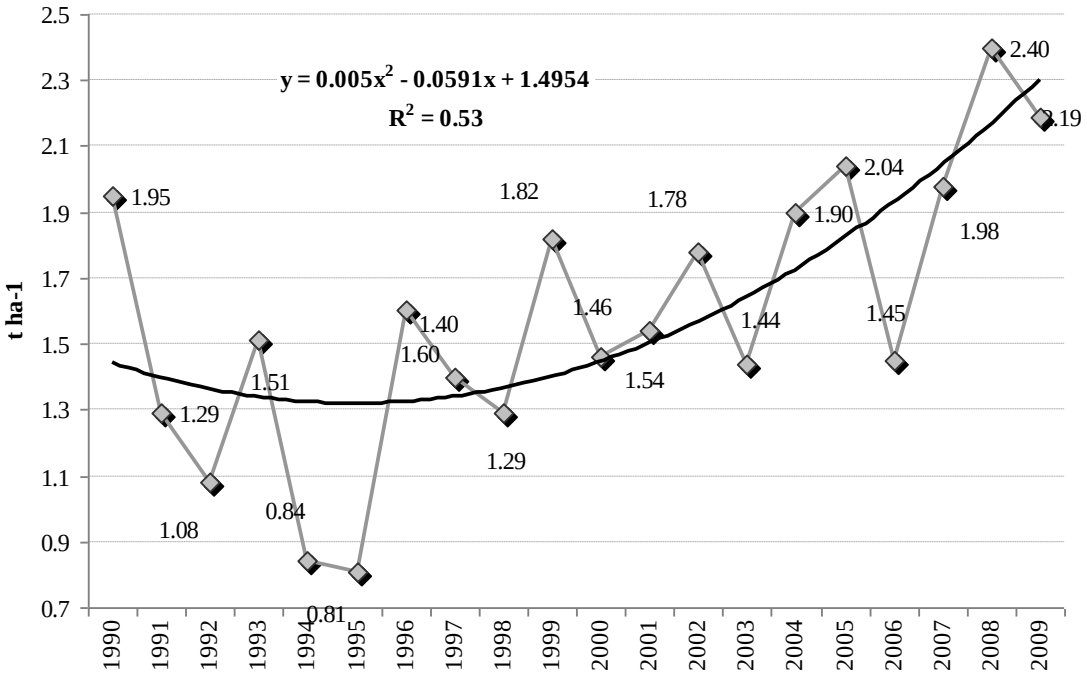

Source: authors' construction based on the CSB data

Fig. 2. **Yields of rapeseeds in Latvia in 1990-2009, t ha^{-1}**

In general, one can conclude that the average yield of rapeseed in Latvia is not sufficiently high, and many factors might affect it (environmental, economic, and subjective). Various forms and types of management may be used to reduce the impacts of these factors. Therefore, more attention is paid to production indicators of the cooperative LATRAPS in the further research.

2. Performance characteristics of the cooperative LATRAPS

The cooperative of agricultural services LATRAPS is an enterprise founded on 22 April 2000 by means of the association "Latvijas rapsis". The founders of the cooperative and its first members were 12 farmers from the districts of Jelgava and Dobele.

Since the year 2000, the number of its members has significantly increased (Figure 3), and in the beginning of 2010, their number was 48 times larger than when it was set up, uniting 585 members. The cooperative's activity is directly oriented towards facilitating the operations of farmers related to the production and sale of rape products. Presently, the cooperative's members come not only from Zemgale, which is the most appropriate region in the country for growing crops, but also from all the regions of Latvia. Any its member is not only its customer, but also its owner, as the cooperative is owned by neither the government nor investors from outside, which could influence the cooperative's performance.

The cooperative of agricultural services LATRAPS is administered by general meetings of its members and its board. The functions of its board are separated from the executive functions, thus, its employees cannot be its members.

By means of SAPARD[1] funding, specialists of LATRAPS built a new and modern facility for pre-processing and storing grain. The year 2004 was a year of changes not only for Latvia, but also for LATRAPS, as Latvia's accession to the EU changed the cooperative's performance as well. Contracts were made between several grain-processing complexes in Latvia, thus promoting regional development and facilitating work for the cooperative's members.

[1] Special pre-accession programme for agriculture and rural development

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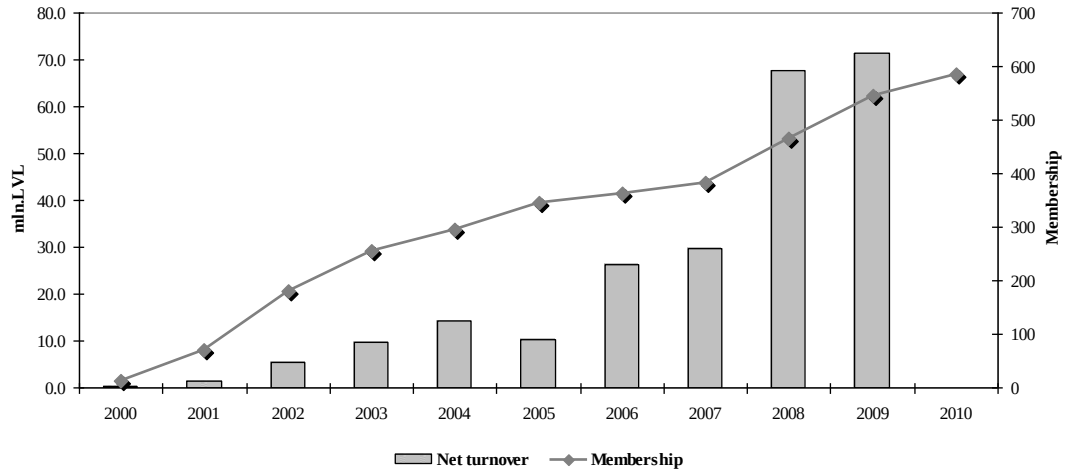
The enterprise started producing oil and biofuel in 2009 to extend the sale possibilities for the rapeseed products produced by its members. Its biodiesel plant is located in Staļģene, the municipality of Jelgava, and it processes up to 30000 tons of rapeseed a year.

The organisational structure of the cooperative LATRAPS consists of three departments – the department of agriculture, grain, and machinery, the complex of grain and rapeseed pre-processing, as well as the department of accounting and administration. The main functions of the Department of Agriculture is to supply its members with and to trade seeds, fertilisers, and plant protection means; to buy and sell seeds of grain and rape, and to provide consultancy services. The priorities of the Department of Grain are to buy and sell rapeseed, to make grain purchase contracts, and to organise and control places for delivering grain and rapeseeds. The Department of Machinery, in its turn, deals with agricultural machinery by selling new and used machinery and spare parts to the cooperative's members and by repairing this machinery. During the period of operation of the cooperative LATRAPS, not only its membership has increased, but also its net turnover has sharply grown – 357 times (Figure 3).



Source: authors' construction based on the cooperative LATRAPS data

Fig. 3. **Net turnover of the cooperative LATRAPS (mln.LVL) and its membership in 2000-2010**

The main fields of activity of the cooperative LATRAPS are supply of raw materials and consultancy services, purchase and sale of grain and rapeseed, supply and maintenance of machinery, and pre-processing of grain and rapeseed at its complex.

The main goal in the field of activities related to supplying raw materials and consultancy services is to organise centralised supply of seeds of wheat and rape, plant protection means as well as other materials so that the cooperative's members save their time, energy, and funds as much as possible. If any farmer buys these goods individually, it costs much more, as the cooperative buys these goods in large quantities directly from their producers. The large number of its members makes the cooperative an important player in the market, and the producers are forced to take into consideration it (Kļavis A., 2007). The cooperative's members are also offered consultancy services and field demonstrations to extent their competencies and to increase the yields of crops, thus providing a possibility to gain a maximum profit from each crop.

The function of the Department of Purchase and Sale of Grain and Rapeseed is to coordinate the supply of products produced by the members to the cooperative. Owing to planning the circulation of products, which allows collection of grain and rapeseed in large quantities, the cooperative has a possibility to sell the products without mediators on the domestic or world markets as well as to get the best price for the framers.

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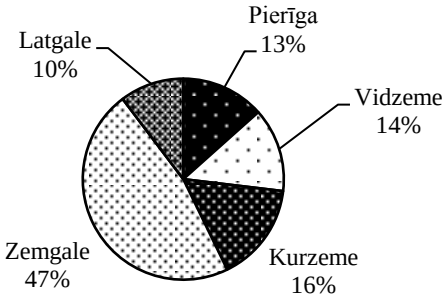
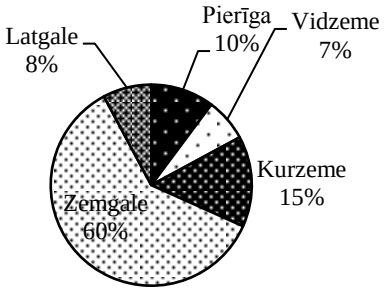
The cooperative also orders agricultural machinery and equipment on request of its customers as well as supplies spare parts and provides its members with consultations of specialists.



Source: authors' construction based on the CSB data, 2008

Fig. 4. **Structure of area sown with rape in Latvia's regions in 2007, %**



Source: authors' construction based on LATRAPS data, 2010

Fig. 5. **Structure of area sown with rape on the farms of LATRAPS in Latvia's regions in 2010, %**

The cooperative operates in the whole territory of Latvia. Of the total area sown with rape in Latvia, more than 40% belongs to the member farms of the cooperative. According to the CSB data (2008), the areas of rape are distributed unevenly among the regions in Latvia (Figure 4). Almost a half (47%) of the areas sown with rape is located in Zemgale region, while the proportions of rape areas in the other regions of Latvia range from 16% (Vidzeme region) to 10% (Latgale region). A similar trend is observed in the regional distribution of rape areas for the cooperative LATRAPS, yet the largest part (60%) of these areas is concentrated in Zemgale region (Figure 5).

3. Economic efficiency evaluation of rape production on the member farms of the cooperative LATRAPS

Initially, growing rape in Latvia was regarded as economically inefficient; however, specialists of crop farming admitted over the recent years that rape is an economically efficient crop and there are good possibilities both to sell it on the domestic market and to export it.

In June 2008, the cooperative LATRAPS started holding the competition "Zelta rapsis" with the purpose of identifying Latvian rape growers who produce the best quality rape and gain the highest yields of this crop, thus making the production of rape economically efficient. Any competitor has to be a farm registered in Latvia, which grows rape in the territory of Latvia, and its area sown with rape has to be at least 5 hectares. The competition's participants provide information on using fertilisers and plant protection means in their fields in the season when the competition is held as well as information on the history of field works performed in their fields.

Gross margin was chosen to be an indicator for calculating economic efficiency; it is calculated according to the following equation:

$$BS = (IE - MI), \text{ where} \quad (1)$$

IE- income from selling rapeseed;

MI- variable costs in rapeseed production.

The data for the period of 2008-2010 are used and the average indicators of 67 farms are analysed in this research.

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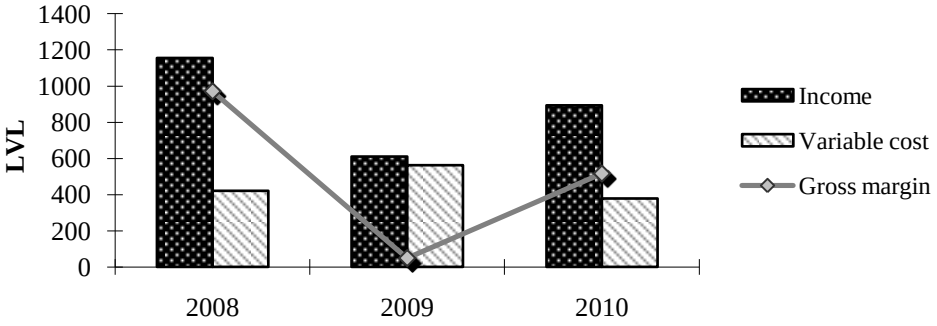

Source: authors' construction based on LATRAPS data

Fig. 6. **Incomes from sales, variable costs, and gross margins for the member farms of the cooperative LATRAPS in 2008-2010, LVL ha^{-1}**

The result of calculations in Figure 6 shows that the annual economic indicators of rape production are very volatile. The lowest gross margin was in 2009 due to a significant decrease of **incomes**. The incomes were impacted by changes in the yield and the sale price. A correlation analysis showed that the incomes gained from sales in the analysed farms (a group of 67 farms) were equally significantly affected both by the yield (*r= 0.835*) and by the sale price (*r=0.839*), as there is a strong positive correlation between these indicators.

The average yield of rapeseed in the group of analysed farms in 2008-2010 is volatile (4.28 t ha^{-1} in 2008, 3.59 t ha^{-1} in 2009, and 3.72 t ha^{-1} in 2010); the lowest yield was in 2009, but the highest in 2008. Taking into consideration the strong correlation between these factors, one can make a conclusion that the yield of rapeseed significantly influenced the gross margin per hectare.

Yet, the average yield of rapeseed is high in the group of analysed member farms of the cooperative LATRAPS and significantly exceeds the average yields of this crop in Latvia and the EU. One may conclude from these indicators that the chosen type of cooperation is successful and increases the quantitative indicators of rape production and makes the production of rape profitable.

After analysing the sale prices, one may conclude that the prices were volatile: 270 LVL t^{-1} in 2008, 170 LVL t^{-1} in 2009, and 240 LVL t^{-1} in 2010. The price of rapeseed decreased by almost 37% in 2009; it was impacted by a decrease in the purchase price on the world market. It means that the rape producers have to take into account also the global market risks, which may be insignificantly influenced by the producers themselves.

Due to both these factors, the production of rape became almost economically inefficient on the farms in 2009, as the gross margin per hectare decreased to LVL 48.4.

The **variable costs** faced not so extensive fluctuations, which are the second component in calculating a gross margin. The costs of seeds, fertilisers, plant protection means, and agricultural works are included in the analysis of costs.

Table 1

Variable costs per hectare and their structure on the member farms of the cooperative LATRAPS in 2008-2010

Year		Seeds	Fertilisers	Plant protection means	Agricultural works	Total
2008	LVL	27.24	146.60	70.67	175.93	420.44
	%	*6.6*	*34.8*	*16.6*	*42.0*	*100.0*
2009	LVL	26.78	215.00	68.89	250.59	561.26
	%	*4.8*	*37.9*	*12.2*	*45.1*	*100.0*
2010	LVL	29.93	139.21	84.67	123.41	377.22
	%	*8.1*	*36.4*	*22.6*	*32.8*	*100.0*

Source: authors' calculations based on the data of LATRAPS farms

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After analysing the data in Table 1, one may conclude that the largest proportion in the structure of variable costs belongs to the costs of fertilisers and agricultural works, accounting for more than 70% of the total variable cost. The analysis of annual variable costs leads to a conclusion that in 2009, the costs of fertilisers (+47.3%) and agricultural works (+42.4%) significantly increased compared with 2008. The sharp increase in the purchase price of grain and rapeseeds in 2008 promoted a tremendous increase in the price of fertilisers. During the period of sowing winter rape in 2009, the farms were forced to buy fertilisers that were 50% more expensive than in the previous period of sowing winter crops. The second most expensive item in the structure of variable costs for rape production is the cost of agricultural works. As regards this item, the costs increased due to natural factors – several operations of spraying were performed to control pest invasion and there were unfavourable weather conditions during the period of harvest. The cost of drying the crop significantly increased due to harvesting higher moisture rapeseed. In the analysed period, the lowest costs were in 2010, and it decreased 32.8% compared with 2009. A decrease in the costs was achieved by supplying cheaper inputs to the cooperative's members. By cooperating and buying large quantities from the direct producers of fertilisers, the costs of fertilisers in the structure of variable costs are the lowest during the 3-year period – 139.21 LVL ha^{-1}.

The amount of resources invested might affect the crop yield and differentiate the production levels in various farms. Therefore, a correlation analysis of these factors was done in the research.

Table 2

Correlation between the rapeseed yield and the variable cost on the member farms of the cooperative LATRAPS in 2008-2010

	Yield, t ha^{-1}	*Seeds*	*Fertilisers*	*Plant protection means*	*Agricultural works*
Yield, t ha^{-1}	1				
Seeds	0.24955	1			
Fertilisers	0.16144	0.12036	1		
Plant protection means	0.38002	0.27973	0.19192	1	
Agricultural works	0.09105	-0.13086	0.54272	-0.08649	1

Source: authors' calculations based on the data of LATRAPS farms

The results summarised in Table 2 show that the yield in the analysed farms is not significantly affected by the variable costs, as there are weak correlations between the yield and the costs of seeds (*r=0.24955*), the cost of fertilisers (*r=0.16144*), the costs of plant protection (*r=0.38002*), and the cost of agricultural works (*r=0.09105*). It means that the standards of management on the farms producing rape are quite even which is ensured by their participation in cooperation and proves the economic importance of cooperation.

Conclusions

1. The production of rape in Latvia is promoted by the EU directive on biofuels and the related national programmes.
2. The area sown with rape sharply increased in Latvia in the period of 1990-2009, but its largest increase occurred after Latvia's accession to the EU, since greater market possibilities for rapeseed emerged. In 2009, the area sown with rape in Latvia was 98.3 thousand hectares or 8.4% of the total area sown with crops.
3. The average yield in Latvia did not exceed 2 t ha^{-1} over the recent years (2008, 2009), but it is significantly lower than in the EU on average – 3.05 t ha^{-1}. The average yield on the best member farms of the cooperative LATRAPS is considerably higher (3.59 t ha^{-1} in 2009, 4.28 t ha^{-1} in 2008 on average) and exceeds the average indicators in the EU.

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4. LATRAPS is the largest cooperative producing rape in Latvia; it united 585 cooperative members and its net turnover exceeded LVL 70 million in 2010. The rape areas belonging to the cooperative (just like in Latvia) are mostly located in Zemgale region.
5. The gross margins for rape production on the member farms of the cooperative LATRAPS are volatile over the years, and they are significantly impacted by changes in incomes that mostly depend on fluctuations in rapeseed prices in the world market.
6. In rape production, the largest proportions in the structure of variable costs are constituted by the costs of fertilisers and agricultural works, yet, there is no strong correlation between the resources used and the yield gained. It means that a high standard of production exists in the analysed farms, which is achieved by their membership in the cooperative.
7. With agricultural cooperation emerging and developing, the indicators of rape production are high, thus ensuring its production economically efficient. It proves the research hypothesis.

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Vegetable Production in Poland and Selected Countries of the European Union

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Abstract. The paper aims to analyse the state of the art and the conditions for development of vegetable production in Poland and selected countries of the European Union. The research is based on the analysis of the data from the official statistical sources for the period of 2002-2007. It argues that the vegetable sector is developing significantly, which results from market cyclical factors and strong competitive advantages as well as the EU funds available for the sector development. The further development of the sector will depend on the dynamics of increasing competitive positions on the EU Common Market as well as taking advantages of the EU funds and the level of cooperation between sector's stakeholders.
Key words: vegetable sector, conditions of development, sector's organisation.

Introduction

In 2008, the total production of fresh vegetables in the world amounted to 893.4 million tons, with the total crop area of 52.44 million ha. In comparison, one year earlier that production amounted correspondingly to 889.7 million tons and the crop area 52.04 million ha. The biggest harvest of vegetables took place last year in Asia – approximately 658.6 million tons, then in Europe – over 94.5 million tons, less than 41.0 million tons in the North America, over 22.0 million tons in the South America, and over 55.75 million tons in Africa. In comparison, just at the beginning of the 1980s, the total production of vegetables and fruit in the world amounted to 630.0 million tons, in the 1990s, it was 820.0 million tons, and the beginning of the 21st century, i.e. the years 2000–2001 brought the production volume growth up to 1.20 billion tons (Długokęcka M., 2008). China is for a few years the biggest vegetables producer in the world, producing approximately 50% of global production. Two European Union countries: Italy (13.6 million tons) and Spain (12.7 million tons) are among the first ten of the vegetable producers in the world.

Poland takes the 4th place in the global vegetable production, after Italy, Spain, and France. In the years 2004–2007, the vegetable production in Poland amounted to approximately 5.5 million tons, which was approximately 9% of total vegetables crop in the EU-27. Poland is the biggest producer of garden beet, cabbage, and carrot in the EU, with the following proportions of crops: 46%, 23%, and 15%. In production of cucumber and onion, Poland takes the 2nd place in the EU. Poland is the second producer, after Belgium, of refrigerated vegetables in the EU, and the biggest producer of sour vegetables and dried carrot. Supplies from Poland are very important in covering the EU demand for onion, cauliflower, and refrigerated, sour and dried vegetables.

The vegetable growing is one of the most important parts of Polish gardening. The vegetables production in Poland amounted over PLN 4.8 billion in 2007, which was approximately 6% of global agricultural production and approximately 10% of global vegetable production. The agricultural production of vegetables amounted over PLN 3.3 billion, which was over 6% and 14% in the agricultural and vegetable production, accordingly. The export value of vegetables and their preserves amounted to EUR 463 million, which was approximately 5% of total agricultural and food export.

The paper aims to analyse the state of the art and the conditions for the development of vegetable production in Poland and selected countries of the European Union. The tasks of the research are 1) to analyse the production of vegetables; 2) to analyse the consumption of vegetables; and 3) to analyse the EU support to vegetable sector. Additionally, a case study of Poland was performed with regard to the latter task.

Methodology and data sources

This paper presents the conditions of vegetables production growth in Poland, as one of the biggest vegetable producers in the EU, and in selected EU countries. It aims to analyse the state of the art and the conditions for the development of vegetable production in Poland and

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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selected countries of the European Union. The analysis includes the production and consumption of vegetables as well as the organisational and legal solutions for the sector, especially in the context of the EU support. The time range of performed analysis has been selected for purpose, due to Poland's accession to the EU in 2004, and included the years 2002–2007. The performed analysis has been based upon the materials and source data from the institutions engaged in the organisation, supervision, and monitoring of the sector, using the source documents analysis tools as well as descriptive statistics methods and heuristic methods.

1. Production of vegetables in Poland and selected EU countries

The vegetable production in the EU-27[1] in the years 2002–2007 amounted to 69 million tons on average, including approximately 55.1 million tons in the EU-15 countries, approximately 13.9 million tons in the EU-12 countries, and almost 5.5 million tons in Poland (Table 1). Calculating production per capita, the vegetable production level in the EU-27 amounted approximately to 140 kg. The vegetable production in the EU-27 has dropped from 69.1 million tons in 2002 to 64.9 million tons in 2007 (drop by 6.1%). In the studied period there was the production drop in the EU-15 countries, from 56 million tons to 51.4 million tons (drop by 8.2%), and it was the biggest in 2006 (drop by 6.6%). The vegetable production in the EU-12 countries in the analysed years maintained the similar level, approximately 13 million tons, only in the years 2003–2004 it amounted to 15 million tons. In the years 2002–2007, the vegetable production in Poland has increased from 4.9 to 5.9 million tons (raise by 1 million tons, i.e. 20.4%). The average annual raise amounted to 3.4% in the analysed period, but there were fluctuations in the vegetable production. In the years 2005–2006, there was the production drop by 3.4 and 5.4% respectively and in the years 2003–2004, the production increased by 8.2%, 9.4%, and 11.3% respectively.

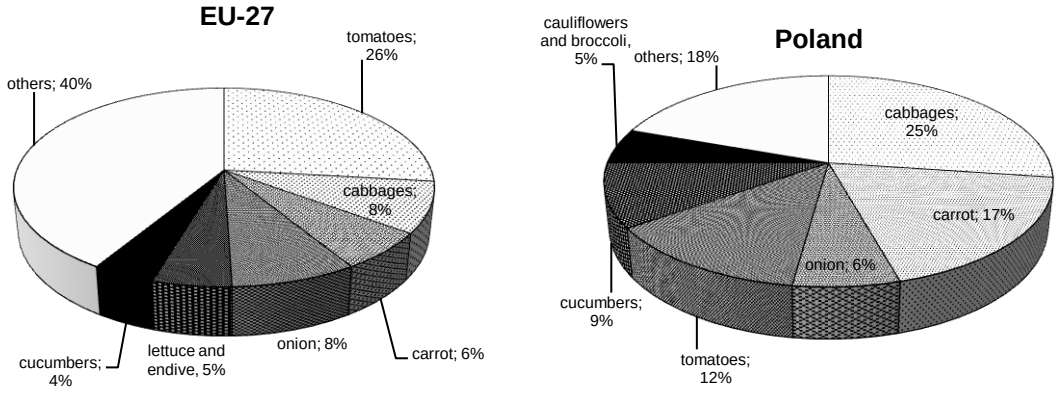
Table 1

Vegetable production in the European Union (million t)

Item	2002	2003	2004	2005	2006	2007
EU-27	69.1	71.1	71.7	70.9	66.2	64.9
EU-15	56.0	56.0	56.7	57.7	52.5	51.4
EU-12	13.1	15.1	15.0	13.2	13.7	13.5
Poland	**4.9**	**5.3**	**5.8**	**5.6**	**5.3**	**5.9**

Source: Analizy rynkowe: Rynek owoców i warzyw nr 33/2008, IERiGŻ–PIB

In the individual EU countries, the production change rate in the years 1995–2006 was diversified, in either amount or direction.



Source: Źródło: Nosecka B., Stryjewska I., Mierwiński (2008): Perspektywy polskiego rynku warzyw i ich przetworów, Skierniewicki Portal Ogrodniczy

Fig. 1. **Structure of total vegetable production in Poland and the EU-27 in the years 2004-2006**

[1] The calculations were done for the period of 2002-2007. The authors used data for the present 27 Member States. However, some countries joined the EU in 2004 and some in 2007. Thus, corresponding data for some potential EU-27 Member States were calculated until the year 2007

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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The EU-27 countries with the constant vegetable production growth include Italy, Spain, the Netherlands, and Austria. In Poland, there was a small drop trend noticeable in the years 1995–2006 (revision of the statistical data after 2002, performed by the Central Statistical Office after the General National Census). Especially visible drop trends have been noticed in those "new" European countries, where there were problems with ownership transformations (Bulgaria, the Czech Republic, Lithuania, Slovakia, and Hungary). There is a high geographical production concentration in the EU. The countries with the highest vegetable production (Italy, Spain, France, and Poland) produce almost 60% of the EU-27 production (Table 2).

Table 2

Changes in vegetable production in the EU in the years 1995-2006

Country	Vegetable harvests (1000 t)		Share in the harvest in the EU-27 (in %)
	1995-1997	2004-2006	
EU-27	**64 473**	**69 207**	**100.0**
Italy	14 442	15 826	22.9
Spain	11 014	13 084	18.9
France	6 400	6 069	8.8
Poland	**5 700**	**5 550**	**8.0**
Romania	4 214	4 248	6.1
Netherlands	3 616	4 235	6.1
Germany	3 211	3 195	4.6
United Kingdom	2 942	2 726	3.9
Hungary	1 597	1 679	2.4
Bulgaria	1 440	767	1.1

Source: Nosecka B., Stryjewska I., Mierwiński J. (2008). Perspektywy polskiego rynku warzyw i ich przetworów. Skierniewicki Portal Ogrodniczy

The variety structure of produced vegetables in the EU-27 and in Poland is characterised by differences, but also similarities (Figure 1). The clearly dominating varieties in the production structure of the EU-27 include tomatoes (26%), while in Poland – cabbage (25%). Four varieties of vegetables: cabbage, carrot, onion, and tomatoes in Poland amounted to 69%, and in the EU-27 countries – 51%. The share of six most often cultivated vegetables in Poland in turn amounted to 80%, and in the EU-27 – almost to 60%.

Table 3

Vegetable production in Poland in the years 2002-2007 (in 1000 t)

Item	2002	2003	2004	2005	2006	2007
Vegetables in total	**4701.2**	**5090.8**	**5590.0**	**5458.3**	**5120.0**	**5710.0**
Ground vegetables	**3947.2**	**4419.6**	**4916.2**	**4785.3**	**4408.0**	**4987.0**
Cabbage	1188.2	1236.7	1371.0	1320.0	1189.4	1325.0
Cauliflower	176.4	188.8	205.7	204.3	211.8	228.0
Onion	584.9	678.3	865.7	714.1	590.2	725.0
Carrot	692.1	834.6	927.9	929.0	833.2	938.0
Red beet	311.2	333.5	356.9	356.0	340.6	375.0
Cucumbers	259.7	289.7	255.9	257.5	271.9	293.0
Tomatoes	221.4	234.1	212.7	232.4	246.7	277.0
Others	513.0	623.9	720.4	772.0	724.2	797.0
Greenhouse vegetables	**754.0**	**671.2**	**673.8**	**673.0**	**712.0**	**723.0**
Tomato	393.0	372.3	369.6	369.0	405.0	412.0
Cucumbers	223.0	198.7	208	211.0	220.0	218.0
Others	138.0	100.2	96.2	93.0	87.0	92.0

Source: IERiGŻ (2005). Analizy rynkowe: Rynek owoców i warzyw. nr 23, IERiGŻ (2008). Analizy rynkowe: Rynek owoców i warzyw. Nr. 33

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The share of other vegetables in Poland amounted only to 18%, but in the EU-27 – to 40%. This shows that Poland has quite low diversified and modest structure of cultivated vegetables in comparison with other EU-27 countries.

Total vegetable production in Poland in the years 2002–2007 has fluctuated from 4.7 to 5.7 million tons, and the share of cabbage, carrot, and onion has amounted to over 60% (Table 3). In Poland, vegetables are produced mostly on the fields. The ground vegetable production level in the analysed years amounted to 3.9–4.9 million tons. The greenhouse vegetable production ranged between 671 thousand tons in 2003 and almost 723 thousand tons in 2007. In 2007, the greenhouse vegetables accounted for 12.6% of total crops.

2. Consumption of vegetables and their products

The consumption of vegetables and their products in the years 2002–2007 amounted to 111 kg per capita on average (according to the balance data: production, export, and import). The vegetable consumption in the years 2002–2006 in turn varied from 109 to 111 kg, and in 2007 increased to 115 kg (Table 4).

Table 4

Consumption of selected ford products in Poland in the years 2002-2007 (kg/capita)[2]

Item	2002	2003	2004	2005	2006	2007
Grain	120	120	119	119	117	115
Potatoes	131	130	129	126	121	121
Vegetables	**111**	**110**	**111**	**110**	**109**	**115**
Fruit	56.7	54.5	55.0	54.1	54.4	41.0
Meat	69.5	72.1	71.8	71.2	74.3	77.0
Milk	182	181	174	173	176	178

Source: Kowalski A. [ed.] (2008). Analiza produkcyjno-ekonomicznej sytuacji rolnictwa i gospodarki żywnościowej w 2007. IERiGŻ-PIB. Warszawa

The consumption of fresh, chilled, and refrigerated vegetables and their products in Poland, according to the research of family budgets carried out by the Central Statistical Office (excluding consumption in the public catering institutions, i.e. hospitals, bars, restaurants etc.) amounted to 63.8 kg per capita on average in the years 2002–2007. In the analysed period, consumption of vegetables and their product dropped from 64.5 kg to 60.5 kg in 2007 (drop by 6.3%). The highest consumption of vegetables has been noticed in 2005, while the lowest - in 2007, and it amounted to 67.1 and 60.5 kg per capita, respectively. In the studied period, the highest vegetable consumption growth was noticed in 2005 (6.1%), and the highest drop - in 2006 (7%).

Table 5

Average annual consumption of vegetables and their products in Polish households (kg /capita)

Products	2002	2003	2004	2005	2006	2007
Vegetables, mushrooms and their products	64.56	64.92	63.24	67.08	62.40	60.48
Fresh vegetables and mushrooms	60.72	61.08	59.64	59.16	54.12	52.2
Cabbage	8.76	8.76	8.88	8.16	7.44	7.44
Cauliflower	2.04	1.8	2.04	1.92	1.80	1.80
Tomato	10.08	10.56	10.44	10.68	10.20	9.84
Cucumber	8.40	8.16	6.96	8.18	7.92	7.08
Red beets	4.44	4.44	4.32	4.08	3.48	3.36
Carrot	8.04	8.16	8.04	8.04	6.96	6.72
Onion	6.96	6.84	6.72	6.60	6.00	5.76
Other	12.00	12.36	12.24	11.40	10.32	10.20

Source: Statistical Yearbook of Poland, different years, GUS

[2] Data from the country statistical product balance

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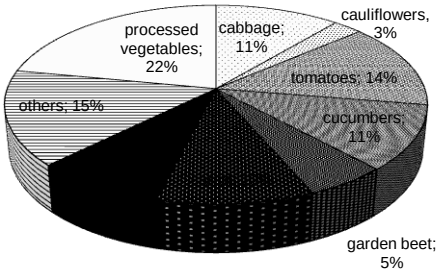
In the years 2002–2007, there was a drop in the fresh vegetable consumption, from 60.7 kg to 52.2 kg per capita (drop by 14%). The share of fresh vegetables in the vegetable consumption dropped from 94.1% to 86.3%. The consumption of almost all fresh vegetables has dropped in the analysed period. The highest decline was noticed in relation to the following varieties: garden beet (drop by 24.3%), onion (17.2%), and carrot (16.4%). The tomatoes consumption did not changed, and in the whole period, it amounted approximately to 10 kg per capita. The structure the share of cabbage, tomatoes, cucumbers, carrot, and onion dropped from 69.6% in 2002 to 60.7% in 2007 in the fresh vegetable consumption.



Source: authors' calculations based on the data from GUS

Fig. 2. **Structure of vegetable consumption in Poland in the years 2002-2007**

In the years 2002–2007, other vegetables represented 15% (paprika, zucchini, lettuce, endive, spinach, leek etc.), tomatoes - 14%, cabbage - 11%, cucumbers - 11%, carrot - 10%, onion - 9%, beet - 5%, vegetable products - 22%, and cauliflower and broccoli - 3% in the consumption structure (Figure 2). In the years 2002–2007, the consumption drop of cabbage, beet, and carrot was observed in comparison with the previous period. There were no changes in the consumption of cucumbers, onion, and products. The share of broccoli, cauliflower, and other vegetables grew. It proves the small widening of the assortment of the vegetables consumed in Poland.

Table 6

Average annual consumption of vegetable processed products[3] and vegetable juices in Poland (kg per capita)

Products	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Processed products from vegetables	**14.9**	**14.7**	**15.0**	**16.5**	**18.0**	**18.5**
Frozen	2.5	2.7	2.5	3.7	5.2	6.0
Tin	3.0	3.3	3.8	4.0	3.7	3.7
Pickle	2.1	1.9	2.1	2.0	2.2	1.6
Sauerkraut	3.8	3.8	3.6	3.5	3.2	3.0
Tomato concentrate	0.4	0.4	0.4	0.6	0.7	0.7
Ketchup	1.7	1.7	1.6	1.7	2.1	2.5
Vegetable juices	**0.9**	**1.1**	**1.3**	**1.3**	**1.7**	**1.5**

Source: Statistical Yearbook of Poland, different years, GUS

The vegetable products consumption in Poland grew from 14.9 to 18.5 kg per capita in the years 2002–2007 (growth by 24%) (Table 6). The highest consumption in the vegetable products consumption was noticed for the refrigerated products (growth from 2.5 to 6 kg per capita), canned vegetables (growth from 3.0 to 3.7 kg per capita), and sauerkraut (consumption drop from 3.8 to 3.0 kg per capita). In the years 2002–2007, in Poland the consumption of drinkable juices, fruit drinks, and fruit – vegetable drinks has grown from 27.1

[3] Balance consumption: production, import, export

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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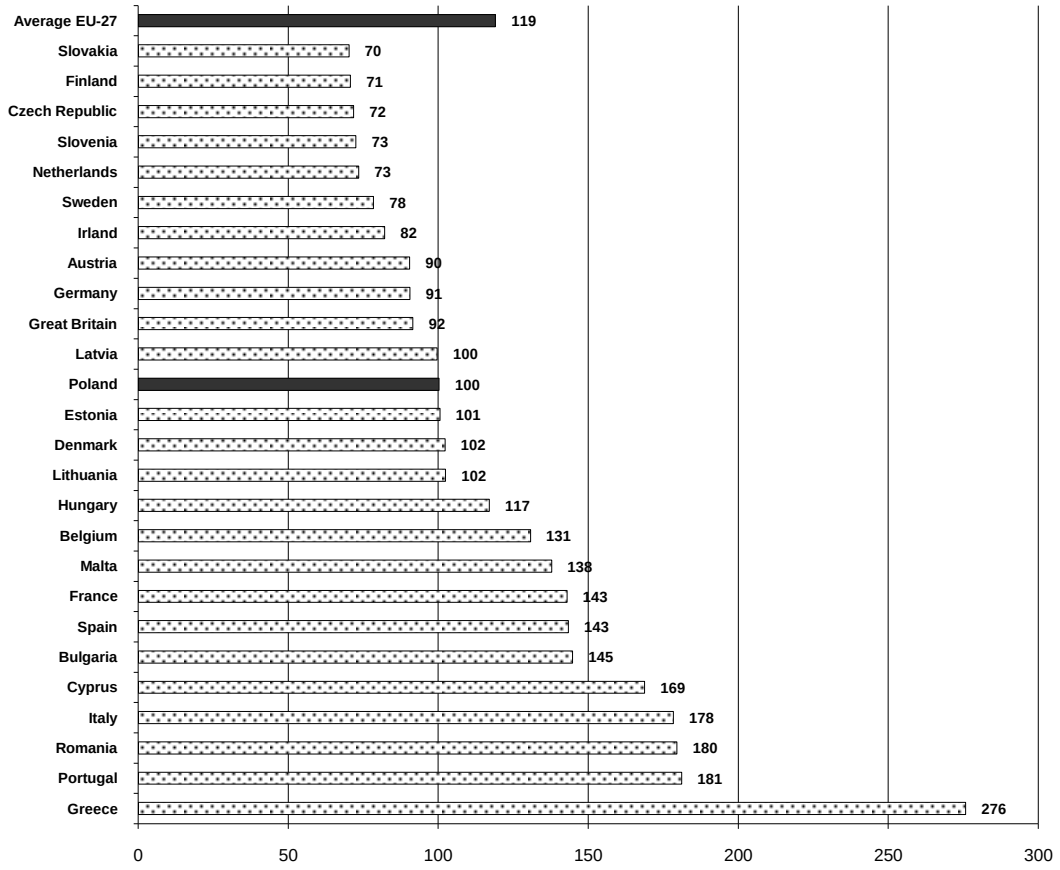
to 38.1 kg per capita (growth by almost 41%). The consumption of vegetable juices increased almost twice, and reached 1.8 kg per capita in 2007.

The vegetable consumption in the EU countries shows great diversification (Kwasek M., 2008). The highest consumption level in 2003[4] has been noticed in Greece – 275.5 kg per capita, and the lowest in Slovakia – 70.2 kg per capita. The difference between the highest and the lowest consumption amounted as much as 205.5 kg per capita (Figure 3). High consumption level has been also noticed in Portugal (181.1 kg), Romania (179.5 kg), Italy (178.3), and Cyprus (168.7 kg). More than 100 kg of vegetables were consumed in Poland, Estonia, Denmark, Lithuania, Hungary, Belgium, Malta, France, Spain, and Bulgaria (from 100.3 kg in Poland to 144.7 kg in Bulgaria). In other countries, the vegetable consumption was below 100 kg per capita, and below 80 kg in the following countries: Slovakia (the lowest consumption in the whole EU-27), Finland, the Czech Republic, Slovenia, the Netherlands, and Sweden.



Source: Kwasek M., (2008). Typologia krajów UE wg. wzorców konsumpcji żywności. Wyd. IERiGŻ-PIB, Warszawa

Fig. 3. **Consumption of vegetables and their products in the EU 27 in 2003 (in kg per capita)**

The vegetable consumption level in Poland accounts for 90% of the average consumption in the EU-27 countries. According to the FAO data, in Poland the total vegetable consumption in 2003 amounted over 100 kg per capita, and Poland took the 12th place among the EU countries. The consumption of cabbage and root vegetables, tomatoes, and cucumbers prevails in Poland. The consumption of cabbage, cauliflower, tomatoes, cucumbers, carrot, onion, and their products (in calculation into fresh products) in Poland approximately accounted for 118% of the average consumption in the EU-27 in the years 2000–2005. These products are more consumed only in Greece, Romania, Italy, and Belgium. Polish consumption of cabbage (31.6 kg in comparison with 12.8 kg in EU-27), carrot (21.4 kg – 10.1 kg), onion (14.4 kg – 10.2 kg), and cauliflower (3.8 kg – 3.0 kg) is definitely higher than in other European countries. On

[4] The latest data of the FAO and Eurostat for the consumption in the EU are for 2003

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the contrary, the consumption of tomatoes and their products is lower (9.6 kg per capita in comparison with 31.1 kg in the EU-27 on average) as well as most of other vegetables. The consumption of vegetable pickles is not significantly different from the EU, and the consumption of sour vegetables is higher in Poland.

3. Support for vegetable sector in the EU

After observations of fruit and vegetable markets functioning in the past years, the European Commission decided that the system regarding fruit and vegetables sector, which was valid until 2007, and legislated with the previously issued and the recent regulations (EC No. 2201/96 of 28 October 1996 regarding the common organisation of fruit and vegetable products market, and the EC No. 2202/96 of 28 October 1996, introduces the community support programme for the producers of selected citrus fruit) requires changes in order to increase the competitiveness and market orientation of that sector (Walczak J., 2008). In connection with the abovementioned, the decision regarding the transformation of common organisation of fruit and vegetable market was made since 2008. The main goals and assumptions of the transformation are as follows:

- better market orientation and higher sector competitiveness;
- limiting the fluctuations of farmers incomes;
- activities aiming at balancing improvement in the fruit and vegetable selling chain (better market organisation level);
- better consideration of sector diversification;
- strengthening of producers abilities in crisis management;
- decreasing of negative influence on the natural environment;
- increasing of fruit and vegetable consumption;
- assuring of coherence with the WTO principles and development policy;
- increasing of predictability and control of public expenses;
- simplification of management (minimisation of administrative duties) and control rationalisation.

There are many detailed solutions provided in order to achieve the assumed goals. The most fundamental one is to remove support for the production addressed for processing (including the financial support system for delivering tomatoes for the processing) and covering fruit and vegetables with the regional payments systems (decoupling). For the countries using the uniform regional payment system (SAPS), the fruit and vegetables are currently covered with the direct additional payments. The financial means, provided for the support of production for processing will be transferred to the Member States as the national envelopes. In case of financial support for tomatoes, the Member States will be able to use the direct payments for the tomato crops during the 4-year period of transition (2008–2011), on the condition that the part of payments, connected with the production amount, will not exceed 50% of the national ceiling.

The stimulation of process of establishing the renowned producers' organisations is another mechanism of vegetables producers support. It will consist in increasing of community support share (from 50% to 60%) in the operational funds of producers organisations in the specified cases (therewith, among others, for the new Member States and countries with low market organisation level, i.e. below 20% of producers organisations sale in the total production of fruit and vegetables). Moreover, it is foreseen that there will be the support limit growth for the operational fund from 4.1% to 4.6% of sold products value, on the condition of using the excess only for preventing and managing the crises. In the Member States, where the producers' organisations sell less than 15% of fruit and vegetables production, and where the fruit and vegetables production is at least 15% of their total agricultural production, it is possible to provide the national financial help for the producers up to 80% of the producers' contribution. This help is additional with reference to the operational fund, and may be returned by the EU at the request of the Member State. At the same time, the increase of support for the initially accepted fruit and vegetables producers groups is provided for covering the costs, connected with the group establishment and administrative activities: up to 10% of sold products value in the first year of the implementation of the project for obtaining the acceptance, 10% - in the second year, 8% - in the third year, 6% - in the fourth year, and 4% - in the fifth year.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Because the transformation includes the natural environment protection aspects, the producers' organisations shall allocate at least 10% of the expenses foreseen in each operational programme for that purpose. Moreover, the operational programme must include at least two activities connected with the environment protection. In range of the operational programme of the producers' organisation, the EU will co-finance the ecological production up to 60%.

At the same time, other support mechanisms have been provided, among others the promotion of fruit and vegetables consumption, especially among children and youth as well as the introduction of crisis management for the producers' organisations. Among others, the following tools are provided for counteracting or preventing the crises on the market: removing fruit and vegetables from the market, reaping of green fruit and vegetables or reaping cancellation, informing and training activities in the crises, crops insurance, and support for securing the bank loans or administrative costs of creating the mutual insurance funds. The crisis management means shall not be more than one third of the expenses in range of operational programme. In order to finance the crisis management, the producers' organisation will be authorised to incur the loans on the commercial conditions. The loans capital and interest payment may be the part of the operational programme, not exceeding the limit of 20% of operational programme total expenses in the particular year. The expenses, incurred by the producers' organisation for the loan payment, will be possible to be included in range of the operational programme financial support.

4. Support for vegetable sector in Poland – case study

The fruit and vegetables sector differs significantly from other agricultural sectors in range and national intervention techniques within the framework allowed in the EU. Thus, intervention comes down to supporting the producers organisations, compensations for not introducing the fresh fruit and vegetables on the market, maintaining the common quality requirements, additional payments for some fruits and vegetables for processing, export refunds and import certificates, and promotion subventions. However, it is required to note that the support mechanisms in the individual EU countries are the same as the matter of principle. Only the amounts of national support, accompanying the EC support, are different. This document presents the main support mechanisms for the vegetable sector in Poland, before and just after the EU accession. It should be considered that the vegetable sector is always subject to the support with the fruit sector. Therefore, the characteristics below refer to these both sectors. The support was granted either for the producers or for the processors of fruit and vegetables.

The Activity 7 "Groups of Agricultural Producers" has been provided within the Rural Development Plan for the years 2004–2006. Its goal is to increase the incomes of farmers by the costs reduction; improvement of production quality on the market by using the common production technologies and common product preparation for the market; concentration of deliveries; better production planning; and adaptation to the market needs. As the result of such activities, 119 producers groups have been supported, including 27 fruit and vegetables producers groups. At the same time, wide support was offered in range of Activity 8 "Technical Support". With the use of means from that activity, the trainings and workshops took place, study travels were organised, and studies were published in order to increase the level of knowledge of the producers and processors.

The activity "Improvement of Processing and Marketing of Agricultural Products" was implemented within the Sector Operational Programme "Restructuring and Modernisation of Food Sector and Development of Rural Regions 2004–2006". Totally, 1643 applications were submitted for the co-financing of the implementation of projects for PLN 2.92 billion, and 1092 contracts were signed in the amount of PLN 1.82 billion, which reached the limit of the budget. Until the end of 2006 the implementation of 433 projects has been finished – most of them referred to meat and milk processing sectors (approximately 24% of projects each), and approximately 20% - to fruit and vegetables processing. Implemented projects are mostly connected with improvement and control of health conditions (26% of projects), improvement and control of quality (24%), use of new technologies (18%), and improvement and rationalisation of processing procedures (15%).

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The best-documented effects of support programme influence on the fruit and vegetable sector in Poland took place in the range of SAPARD programme. That programme preparation was based upon two identified priority axes in range of agriculture and country regions needs in the pre-accession time. It was also reflected in the division of means in range of the first axis "Improvement of Agricultural and Food Sector Efficiency". In range of this axis, the considerable part of means was assigned to the investments connected with the adaptation of dairy, meat, fish, and fruit and vegetable sectors to the acquis communitaire requirements.

In range of Activity, totally 1 1778 applications were submitted, therein 1429 applications in range of Scheme 1 and 349 applications in range of Scheme 2. Until 31 December 2006, in total 1268 projects have been implemented (they received the final payment) for PLN 1,525,052.9 thousand. Most applications, in respect of the number of finished projects (649) and the amount of paid means, were implemented in the meat sector (PLN 781,718.4 thousand), followed by the dairy sector (315 applications and PLN 387,711.1 thousand), fruit and vegetables sector (223 applications and PLN 243,199.1 thousand), and in the fish sector (81 applications and PLN 112,424.2 thousand).

Most investments carried out in the range of projects in Activity 1 were connected with the adaptation to the sanitary and veterinary requirements, or only sanitary in fruit and vegetables processing sector. The fruit and vegetable sector plants mostly undertook the investments connected with the increase in value added, improvement of products quality, implementing new technologies and innovations, and production costs reduction. The share of such investments in case of fruit and vegetable sector amounted to 47% in comparison with 25% in dairy sector, 18% in fish sector, and 11% in meat sector. The share of investments closely connected with limiting of negative influence on environment was low in the SAPARD programme, and varied from 0.4% (fruit and vegetable sector) to 2.0% (meat sector).

In the range of fruit and vegetable sector, 102 plants implemented projects, where the HACCP system was implemented, and 130 implemented programmes of adaptation to the sanitary and veterinary standards in the EU. The quantity of production from plants, which received support in the range of SAPARD, having the authorisation for export to the EU, amounted to 740,339 tons. In range of fruit and vegetable sector companies, who implemented the investments financed from the SAPARD programme, the lowest increase of emitted pollutants has been noticed among other sectors, i.e. 0.3%.

In the range of allowed the EU national support, the Agriculture Restructuring and Modernisation Agency has also offered the producers and processors help in range of credits and other financial support (ARiMR, 2009). The following mechanisms were implemented in the analysed period:

- preferential investment credits;
- preferential disaster credits;
- credit warranties and securities of preferential credits payment;
- financial support for agricultural producers groups, registered before 30 April 2004.

Another programme with different character than the above was the project implemented by the Trade Quality Inspection of Agricultural and Food Products, co-financed by the EU – Strengthening of Market Quality Control of Fruit and Vegetables in Poland – being the element of multi-sector programme Transition Means 2005/017-488.01.02 "Strengthening of Administrative Possibilities". The project was implemented in cooperation with the Federal Ministry of Food, Agriculture and Consumer Protection, and the Environment and Consumer Protection Agency in the North Rhine-Westphalia in Germany. The goal of that project was to improve the trade quality control of fresh fruit and vegetables in range of consistency with the valid regulations. In range of its implementation, a number of trainings were planned, including two seminars and four workshops.

Other important programmes of supporting the fruit and vegetable sector are the promotional programmes, co-financed by the EU. From May 2004 to the end of 2007, Poland achieved the acceptance of six promotional programmes with the total budged of over EUR 8 million (ARR, 2009). Two of them applied directly to the fruit and vegetable sector.

Conclusions

The importance of Poland in the vegetable production in the EU is getting more significant due to increasing crops of most vegetables. There is production growth of vegetables, having until now lower importance in the production structure: broccoli, paprika, leaf and leguminous vegetables and sweet corn. The growth trends are not observed only for cabbage and garden beet, but it results from the stable demand for these vegetables.

In the EU countries, the systematic growth of vegetable production could have been observed in Italy, Spain, the Netherlands, and Austria. The production in the new Member States, mostly in Bulgaria, the Czech Republic, Slovakia, Hungary, and Lithuania has not grown due to the ownership transformations.

The vegetable consumption in the EU-27 countries shows great diversification. The highest consumption level in 2003 has been noticed in Greece, and the lowest in Slovakia (the difference between the highest and the lowest consumption amounted as much as 205.5 kg per capita). In Poland and most of the EU-27 countries, the total consumption of fresh vegetables shows no growth trends. In Poland, there is small growth of consumption of tomatoes, paprika, broccoli, cauliflower, cucumbers or Savoy and Chinese cabbage, and the consumption drop of white cabbage and root vegetables. In Poland, likewise in the old and new EU countries, there is the consumption growth of vegetable products, mostly refrigerated vegetables.

To sum up, it can be stated that the vegetable sector in Poland and in other EU countries develops significantly, which results mostly from the cyclic factors on the supply and demand sides as well as from its strong competitive position. The sector support mechanisms are also important, mostly the EU funds. Further development of the sector will be connected with the dynamics of competitive positions changes in range of the EU Common Market as well as with changes on the global market of vegetables and their products. The basic extra-market factors, which will influence the vegetable sector in Poland and other EU countries, include the knowledge of using the sector support funds, which sine qua non condition is the ability of cooperation in the range of producers groups and other forms of collective competitive advantage building.

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Significance of Connections with the Environment of Agricultural Farms in Poland for their Production and Economic Situation

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Abstract. The economic goal of the activity of an agricultural farm is to achieve the greatest revenues. Agricultural farms in Poland are much diversified. Each of them is characterised by a different pace of development conditioned by many factors. In addition, the yield is diversified which results in the different revenues of farms. High revenues depend on the farmers' adjustment to the requirements of the market economy, on their entrepreneurship, and social and economic policy. Changes in the environment of farms require systematic research and deliberations on the economic situation of agricultural farms. The revenues of people employed in agriculture are the main goal of the agricultural policy. Therefore, this is an important and still valid issue.

The aim of the study is to determine the level of production and revenues in the agricultural farms in Poland, which are characterised by different connections with their environments. The author has used the data from Eurostat, the Statistical Yearbook of the Republic of Poland, Institute of Agriculture and Food Economics – PIB, and author's own research conducted in 225 randomly selected farms for the purpose of the research.
Key words: agricultural farms, income, production.

Introduction

"No organisation can be today understood on the grounds of analysis that comprises its inner structures only; very often the basic explaining elements are of outer character …" (Nizard G., 1998). The formulated idea allows saying that everything that occurs in the enterprise environment is currently more important for its functioning than that occurring inside. All inner activities have to be formed (adapted) in connection with widely understood environment. Environment alterations are often of higher importance for entities than their inner operation rules. It is of course connected with the environment character, or possible to be defined as stable or stormy. Currently, in the period of market economy, organisations have more and more rare possibility to function in a stable environment. It concerns also, and maybe particularly, farmsteads in Poland and the states where centrally planned economy was replaced by the market economy. Process of alterations in agriculture did not occur so quickly as in its environment.

Agriculture to environment relations is changing in the process of economic development. Agricultural production was initially exclusively used to satisfy needs of the household members. It was the only industrial development, which contributed to creation of more and more complex environment. Agriculture, being hitherto self-sufficient branch of economy in respect of production media resources, became strongly contingent upon deliverers of industrial origin production means as well as agricultural products buyers (Runowski H., 2003).

A concept of organisation is currently understood very widely. Its meaning contains the whole set of conditions and impact of various organisations (institutions) having influence on behaviour of particular enterprises. It imposes limitations upon the enterprise as well as creates chances and influences its development (Marek S., 2008). This influence is very often so strong that affects the enterprise complicating situations, and rendering decision-taking and efficient management more difficult. It can be even stated that contemporary environment can "force" enterprises to the defined behaviours. Not each environment has the same impact on the enterprise. Companies that seem to function in the same surrounding may react in various ways. It also concerns agricultural enterprises (farmsteads). Each of them, constituting unrepeatable economic entity, possesses different conditions in which it functions.

Production and economic results depend on conditions in which the production proceeds as well as on the grade the farmer is able to take advantage of it. Such conditions may include

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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dependent-on-farmer elements such as, among others, crops structure, production intensity, production technology etc. In addition, the farm manager knowledge and skills are of high impact on the farm results obtained. A large group of independent-of-manufacturer's conditions occurs to which a farmer has to adapt. These are natural and economic conditions, such as soils quality, capital resources as well as conditions of the farm environment origin, like institutions and organisations that function in direct agricultural surrounding. Manufacturer is "forced" or s/he wishes to cooperate with them. The income level of agricultural population results from many factors, which relate not only to the production, but depend on, among others, general country's development, its economic condition, and conducted agricultural policy (e.g. ruling of prices of agricultural products or production resources).

The research aim is an attempt to determine and evaluate production and economic situation of farmsteads in Poland having differentiated relations with the environment. A general characteristic of income situation of Polish agriculture with the application of mass statistical data and accessible literature on subject is presented at the beginning. Income differentiation of all farms, which keep accountancy for FADN needs, is also presented in the paper. On the contrary, farms from the group under FADN observation are purposefully selected for empirical investigations.

High differentiation of farms taking into account criteria of economic size, agricultural type, or region occurs within the FADN observation field. Farms are thus selected in a way to provide representation of groups of the economic size from 4 to 40 ESU as well as five, the most often occurring, production types. Very small (below 4 ESU) and also large farms are neglected, since their number was too low to perform the analysis. Farms of the following agricultural types were selected for investigations: arable farming, dairy farms, pasturing farms (including fattening cattle, sheep, goats, and other animals fed in pasturing system), farms of granivorous animals (fed with concentrated feeding stuff) as well as mixed farms (including various crops jointly with animals). Investigations were conducted among 225 farms within the region of Mazowsze and Podlasie. This region was acknowledged as representing significant differentiation in respect of conducted agricultural production (covering four administrative provinces - Mazowieckie, Podlaskie, Lubelskie, and Łódzkie).

A group of the so-selected farms was divided according to the relations-to-environment index. This index was constructed with application of system approach taking into account elements of relations at "*inlet*" to farm and "*outlet*" (Steffen G., Born D., 1987). Current assets expenditures, taking advantage by farmer of production services, hired labour, production materials purchase from regular suppliers, taking advantage of foreign financial means (e.g. credits) are classified among others as "*inlet"* factors. In addition, such elements as participation in training, ODR consultancy, land leasing, cooperation with science, and usage of computer were also classified as the *inlet* factors group. Marketable production yield, sales to permanent buyers, rendering services, activity in organisations, or producers' groups, work outside farm, land lease out, and natural environment protection activities are regarded as *outlet* factors. Weighted prices were introduced, since the importance of inlet and outlet factors is differentiated in relation to the evaluation of connection with environment. Maximum index value can be 1. Inlet and outlet elements could maximally reach 0.5 points each.

Farms were grouped according to the index size during the next investigations stage. In this respect, farms were classified according to the sequence from the lowest to the highest value and divided into groups with application of quartiles for this purpose. A group of 25% population units of index value below first quartile (Q_1) was separated as Group I, 75% population of index value above Q_1 and below third quartile (Q_3) as Group II, and 25% above third quartile (Q_3) as Group III. The analysis of the production and agricultural income in the years 2005-2007 was done for the separated groups.

Income situation in farmsteads of Poland

In respect of their specifics (among others high size-reduction, lower efficiency), agricultural enterprises in Poland have no possibility, as it is possible for large industrial companies, to influence fixing sales prices of their products as well as of purchased production means and services (Zegar J., 2002). On the contrary, incomes in farms can originate not only

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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from agricultural production but also from family-members work outside agriculture. The farmstead may acquire incomes from rendered services, budget transfers as well as from social benefits.

The average area in Poland was 7.8 hectares of arable land in 2007. The largest amount among almost 1.804 million farms was occupied by units with area from 2 to 5 ha (34%) (Statistical Yearbook GUS, 2008). In Poland, the number of farmsteads that are not engaged in agricultural production has increased in the past years. They constituted 6.2% of all farmsteads in 1996 and already 17.1%[1] in 2002. Chmielewska (2002) determined such farmsteads as self-supplying. The author informs that self-supplying process in Polish agriculture is universal, since a part of farmstead market-production is assigned for inside-farm consumption. Sikorska (2003) also separated social farms whose function is supplying household with food. It seems that such process of usage of own products consumption is related to independence feeling and protection against higher products prices on the market.

As already mentioned hereinabove, farmsteads in Poland are characterised with high percentage of social units. Common Agricultural Inventory of 2002 indicated that about 46% of functioning-in-Poland individual farmsteads do not conduct market activity, 6% of them do not conduct agricultural activity at all, and only about 48% of farmsteads produce mainly for the market (PSR, 2002). Assignment of produced products for sales significantly affects the formation of farmsteads money incomes and expenditures. Market relations are thus of high importance for the development and functioning of farmsteads.

The level of production and efficiency of resources utilisation form the basis for agricultural incomes. Incomes in peasant farmsteads are of certain specifics in comparison with other social and professional groups. It concerns particularly the so-called family farmsteads, where a farmer is both the owner of production means and a worker. He should thus earn not only pension and capital interests but also work remuneration (Zegar J., 2008). In addition, other factors cause differentiation in measurement of farmers and hired workers (e.g. employed in industrial enterprises) incomes. Even the afore-mentioned natural consumption can be included here (a part of incomes occurs in the form of consumption of the produced-in-farmstead products). Relation of a farmstead with household is important. It is often difficult to separate farmers and their family household from the production farmstead. The next effect that differentiates incomes of the mentioned social and professional groups relates to few income sources in farmers families, like, occurrence of natural form of income or income distribution specific character.

Zegar (2008) classifies, on macroeconomic level, gross value added as well as gross disposable income at disposal as basic income categories. In contrast, agricultural income (farmstead income) is on microeconomic level. Income from farmstead in investigations of households' budgets is fixed as a difference between production value and current expenditures for production as well as taxes and payments related to farmstead management. Income from family farmstead includes payment for engagement of (own) production factors as well as payment for risk the farmer undertakes. Income from family farmstead according to the FADN systems is calculated by subtracting general indirect consumption (correcting possibly by the balance of additional payments and taxes related to operational activity), thus obtaining category of gross value added. After subtracting depreciation one gets net value added which, lowered by cost of outside factors (remunerations, rents, interests) as well as balance of additional payments and taxes related to investments, makes possible to define income from family farmstead (Standard Results…2008).

Level of gross disposable income in farmers' households in Poland before 2004 was lower than in the whole households sectors. Only direct payments brought improvement of income situation in farmers households (Zegar J., 2008). Income level in current and fixed prices as well as the dynamics of disposable incomes in individual farmsteads in Poland in the years of 2000-2008 is shown in Table 1.

[1] Data from Common Agricultural Inventory 1996 and 2002

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Distinct improvement of income situation in Polish agriculture could have been observed only since 2004. The increase of agricultural income in 2004 compared with 2003 may be explained by fixed prices (according to indexes of sold-by-farmers prices dynamics) in gross disposable incomes. Agricultural incomes are still lower than incomes gained by non-agricultural sectors.

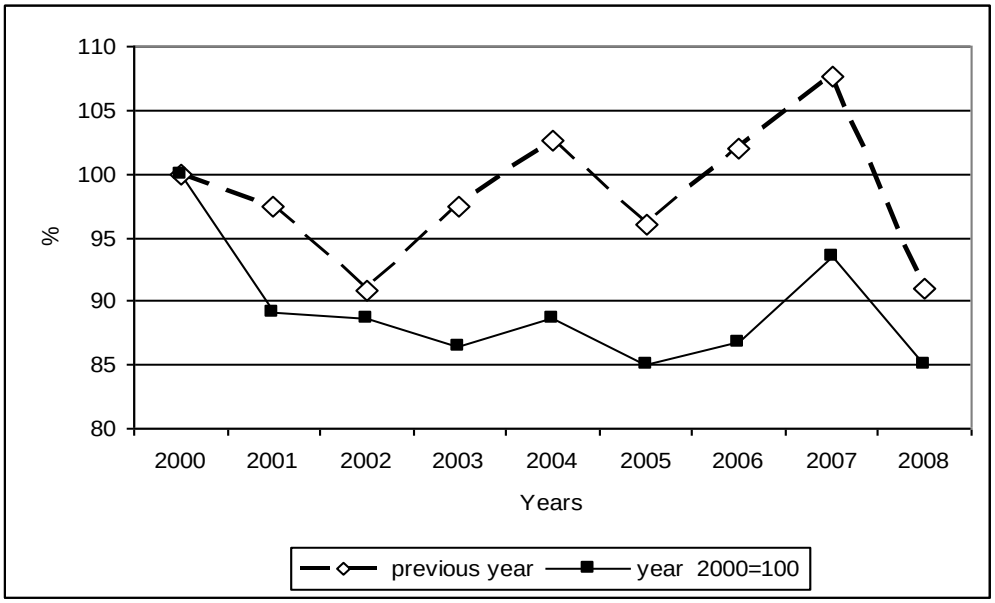
Table 1

Size and dynamics of gross disposable incomes in Polish individual farmsteads (indices of gross disposable income (nominal and real) of private farms in agriculture

Years	Disposable incomes						
	in million PLN (current prices)	in percent	in million PLN (fixed prices year 2000)	indices nominal income		indices real income	
				previous year = 100	2000 =100	previous year = 100	2000 =100
2000	24351.9	4.6	24351.9		100.0		
2001	25907.1	4.6	26891.6	108.0	106.4	103.3	105.7
2002	25182.7	4.4	24205.3	95.6	103.4	94.5	96.9
2003	25191.3	4.3	24092.5	100.0	103.4	99.7	95.7
2004	30376.2	4.9	32363.1	120.7	124.7	106.3	101.5
2005	32438.3	5.0	33834.3	106.7	133.2	104.7	107.2
2006	34817.8	5.1	37260.4	107.3	143.0	107.4	114.8
2007	36962.0	5.2	45290.6	109.5	158.3	107.2	124.7
2008	40604.0	5.1	50350.2	127.3	166.7	97.2	118.8

Source: author's calculations based on Statistical Yearbook GUS 2001-2008

One of the reasons for lower incomes of agricultural population are the economic conditions (Wiatrak A., 1998, 2002, Zegar J., 2008). The reports of prices on goods purchased and sold by farmers are shown in Figure 1.



Source: Statistical Yearbook of the Republic of Poland 2001-2009

Fig 1. **Index of price relations ("price gap") sold agricultural products to purchased goods and services**

Price alterations in 2000 were advantageous for agriculture (index 103%). The situation worsened in the subsequent years. The price increase rate of products bought by farmers was higher than of products they were selling. The year 2002 was exceptionally disadvantageous (index 90.9%). Only Poland's accession to the European Union in 2004 and introduction of

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area payments and support under PROW or SPOR[2] improved the situation and provided higher possibilities for the development of agriculture and rural areas.

Level of incomes in FADN farmsteads in Poland

Alterations of agricultural incomes in farmsteads that keep agricultural accountancy (FADN) are presented in breakdown of farms by production types as well as economic strength of farmsteads (ESU) and arable lands area. Values of gained income are accepted in fixed prices of 2008 in order to prepare vertical analysis. The dynamics of price indexes for sold-by-farmers products were used for calculations. Values of received agricultural incomes in farmsteads of different economic size (ESU) are presented in Table 2 in fixed prices.

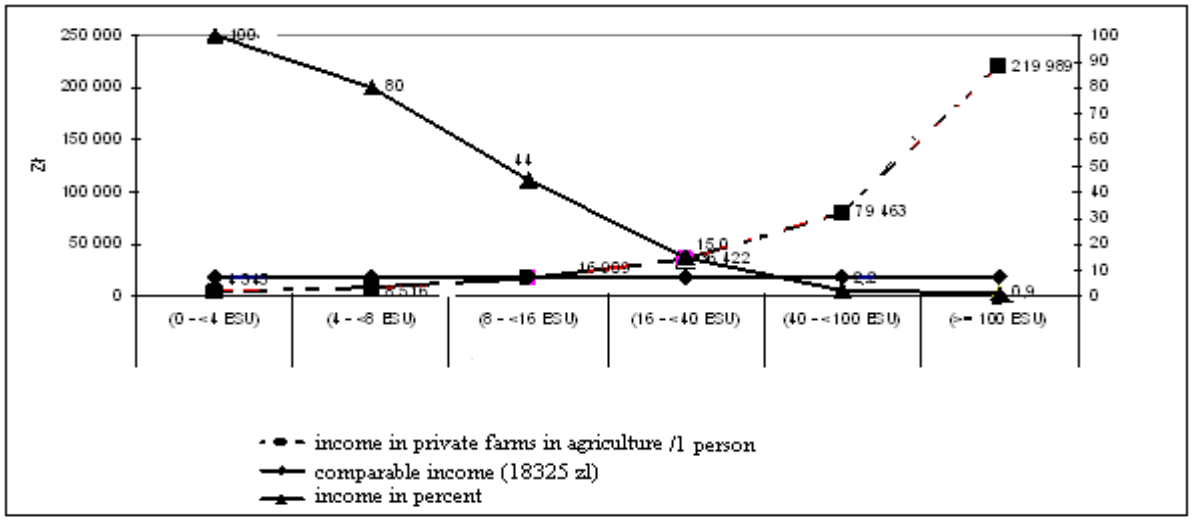
Table 2

Agricultural income per farmstead according to economic size in fixed prices of 2008

Years	Total	Income (PLN) in farmsteads of economic size					
		< 4	4-8	8-16	16-40	40-100	> 100
2004	25574	4974	13811	32157	76195	188023	519324
2005	25684	7379	14420	32652	69671	159165	473624
2006	34085	11513	20376	41594	83029	175161	818149
2007	34871	16189	22732	41479	86791	222248	621607
2008	24596	10271	17313	31427	67999	154536	223262

Source: author's calculations based on the Polish FADN 2004-2008

Dependencies between the economic size and gained income of a farmstead were very high (R^2 = 0.98), which is evident. Based on the evaluation of yearly changes, it is possible to state that incomes have risen by over 36% in the period from 2004 to 2007. The highest rise occurred in farmsteads of the lowest ESU size – over three times. In the year 2008, they got smaller by about 30%.



Source: Goraj L., Struktura i dochody gospodarstw rolnych w Polsce

Fig. 2. **Distribution of farmsteads in FADN observation field according to income from family farmstead per fully employed person and economic size classes in 2004**

[2] PROW – Programme of Rural Districts, SPOR - Sector Operational Programme. Food sector restructuring and modernising as well as rural districts development

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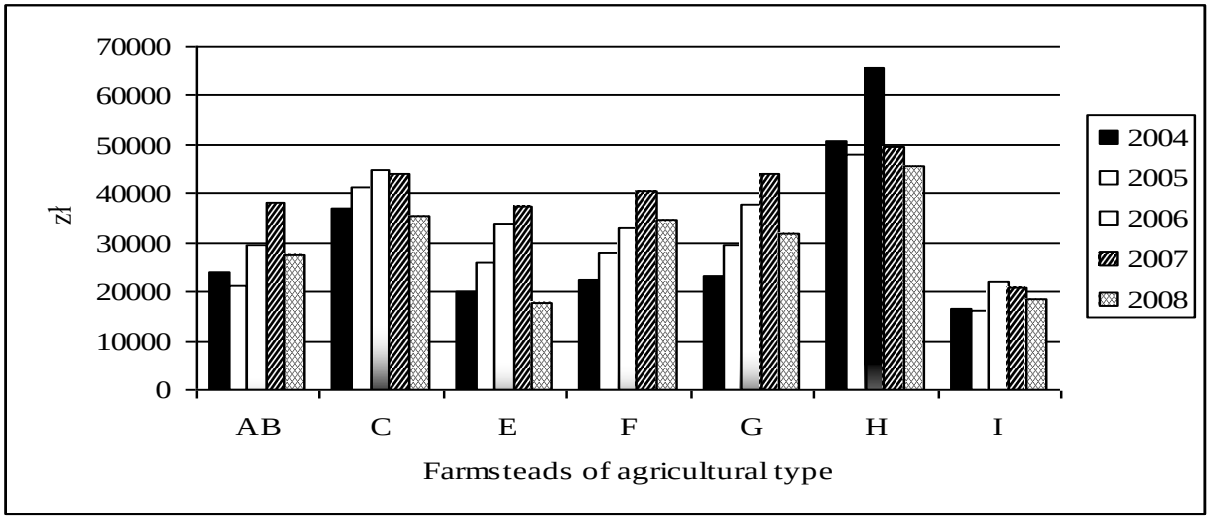
The increase of agricultural income was lowering simultaneously with the increase of the economic size of farmsteads if comparing the years 2004 and 2008. Farmsteads of over 16 ESU size gained lower incomes in 2005 than in 2004. On the contrary, those farmsteads possessing the highest ESU value (over 100) were characterised with high incomes differentiation by the years (increase and drop alternatively).

The data of 2004 regarding farmstead incomes according to their economic size indicated that 96.5% of them have not gained parity work payment for average net wages in the national economy in terms of fully employed person (Goraj L., 2004). Income obtained in individual farmsteads of various economic sizes in terms of fully employed person is presented in Figure 2.

Parity income amounting to PLN 18.325 in 2004 was reached by farmsteads of not less than over 16 ESU economic size. The group of these farmsteads in Poland makes however very high proportion among all individual farmsteads (3.5%). The highest proportion of farmsteads in Poland is units with the economic size of up to 2 ESU (over 65%) (PSR, 2002).

Significant differentiation of the reached income has also occurred in farmsteads of various agricultural types. Agricultural income gained in farmsteads depending on their agricultural type is presented in Figure 3.



Source: author's calculations based on the Polish FADN 2004-2008

Fig. 3**. Agricultural income per farmstead according to agricultural type in the years 2004-2008 – fixed prices of 2008**

*AB – arable farming, C – gardening, E – permanent cultivation, F – milk cows, G –pasturing system feed animals, H - granivorous animals, I – mixed

Farmsteads keeping granivorous animals were characterised with the highest agricultural income level, followed by garden cultivation farmsteads. The lowest income level was reached by farmsteads of mixed production type in each year under investigation. Alteration tendencies trend was similar in the case of income calculation in terms per single fully employed person (Table 4). Multi-lateral farmsteads were also evaluated to be the least advantageous in respect of gained income in terms per 1 fully employed person.

Incomes in farms of mixed type and those keeping granivorous animals were characterised with high differentiation. Income drop in terms per 1 person occurred generally in the group of farmsteads keeping granivorous animals. Exclusively the year 2006 proved to be very advantageous for farms of agricultural type.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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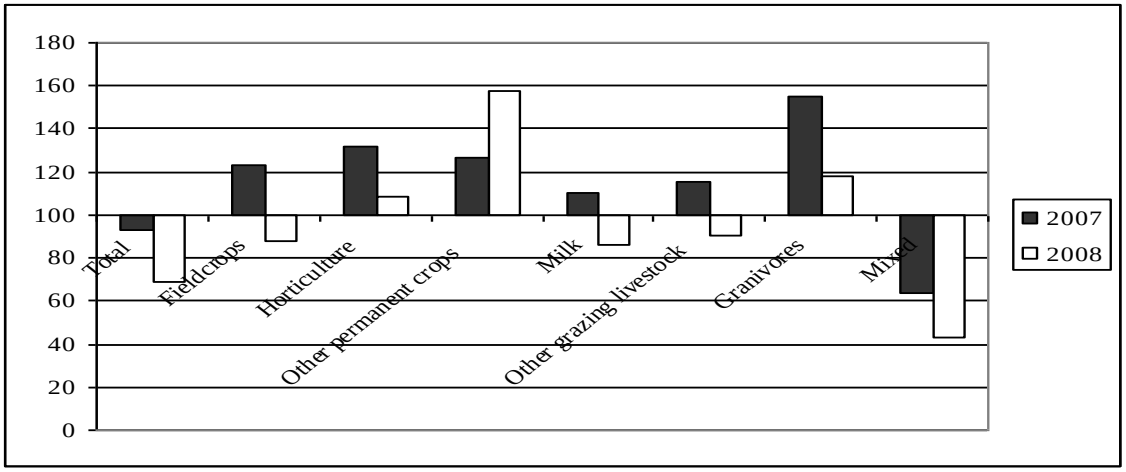
Table 4

Income per fully employed person in farmsteads according to agricultural type in fixed prices of 2008

Year	Agricultural income per single person [PLN/AWU] in farms of agricultural type						
	AB	C	E	F	G	H	I
2004	16143	22183	13968	13463	13749	33962	10462
2005	14300	24747	18046	16776	17491	31610	10377
2006	20261	28196	24288	19493	22642	43556	14194
2007	25817	28563	27830	23816	26271	30766	13669
2008	18926	22386	13211	20174	20330	30267	12160

Source: author's calculations based on the Polish FADN 2004-2008

The rise of income in terms per 1 fully employed person can be observed in the years for the majority of agricultural types. However, it was not sufficient to get comparability with incomes in other sectors of the national economy. When comparing agricultural incomes with the average net remuneration in the national economy, it can be stated that income in three agricultural types in terms of per single fully employed person got the level above the average net remuneration in the national economy (Figure 4).



Source: Goraj L., 2008: Szacunek dochodów gospodarstw rolnych w 2008 roku

Fig. 4. **Relation indexes of income from family farmstead to the average net remuneration in the national economy in the years of 2007-2008 according to farmstead types TF8, situated in observation field of Polish FADN**

The most advantageous relation was noted by farms of durable plantations (157.5% rise), following farms keeping granivorous animals as well as garden cultivations (Goraj L., 2008). The least advantageous situation again occurred in mixed production type.

Production and economic results in farmsteads of differentiated relations with the environment

Income level is directly influenced by the generated production amount and its assigned-for-sales part. It is of particular importance in farmsteads, where not always the whole generated production is assigned for sales. The size of assigned-for-market production (mainly its share in the total agricultural production in the farmstead) makes also one of the elements creating farmsteads connections with the environment. Value of the generated production in

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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farmsteads of differentiated connections with environment expressed on the grounds of connections index value is presented in Table 5.

Table 5

Level of agricultural production in terms per 1 farmstead as well as per 1 ha of arable land (UR) in farmsteads of differentiated relations with environment – fixed prices of 2005

Farmsteads from group	Agricultural output (PLN) in years			Agricultural output per 1 ha (PLN) in years		
	2005	2006	2007	2005	2006	2007
I*	67513	60927	82743	3709	3545	4311
II**	99519	112987	114334	4736	4989	5223
III***	189392	166688	225009	8524	7020	8483

* group I - 25% of farms of the index value below the value of the first quartile (Q_1)
** group II - 75% of farms of the index value above Q_1 and below Q_3
*** group III - 25% of farms above the third quartile
Source: author's studies

The presented results indicate an increase of production value simultaneously with the rise of farmstead contacts with the environment. The analysis of production changes in the years allows to state that the year 2006 was the least advantageous in respect of obtained production value in farmsteads of the lowest connections index with the environment. Farmsteads from the middle group were characterised with a stabilised situation in respect of generated production both in the terms per farmstead as well as per 1 ha of arable land.

Value of production assigned for market in terms per farmstead and per 1 ha of arable land is presented in Table 6. Similarly as in the case of general production value, the higher is the index of contacts with the environment, the higher the sales value. Differences between farmsteads of the lowest and the highest index were between about 15% and over 20%. Commodity production in terms of per farmstead as well as per 1 ha of arable land in farmsteads of the lowest connections with the environment was at similar level. Value of sold production exceeded generated production in the farmsteads of the highest connections index in 2006. It may give evidence of stock sales in more difficult period for farmsteads and of limitation of products assignment for self-supply.

Table 6

Commodity production in terms of per farmstead and per 1 ha of arable land of differentiated connections with the environment - fixed prices of 2004

Farmsteads from group	**Market agricultural output per farmstead**			**Market agricultural output per 1 ha**		
	2005	2006	2007	2005	2006	2007
I	40515	39933	40427	2226	2215	2234
II	80609	102357	95963	3674	4519	4384
III	170727	170063	210587	7584	7362	7939

Source: author's studies

Similar relations as in the case of yielded production occurred in the farmsteads under investigations when determining agricultural income (Table 7). Both gained incomes, calculated in terms per farmstead and per 1 ha of arable land, were higher in farmsteads with higher index of connections with the environment. Incomes expressed in fixed prices were rising in the subsequent years in the first two farmsteads groups.

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Table 7

Agricultural income in farmsteads of differentiated connections with the environment - fixed prices of 2004

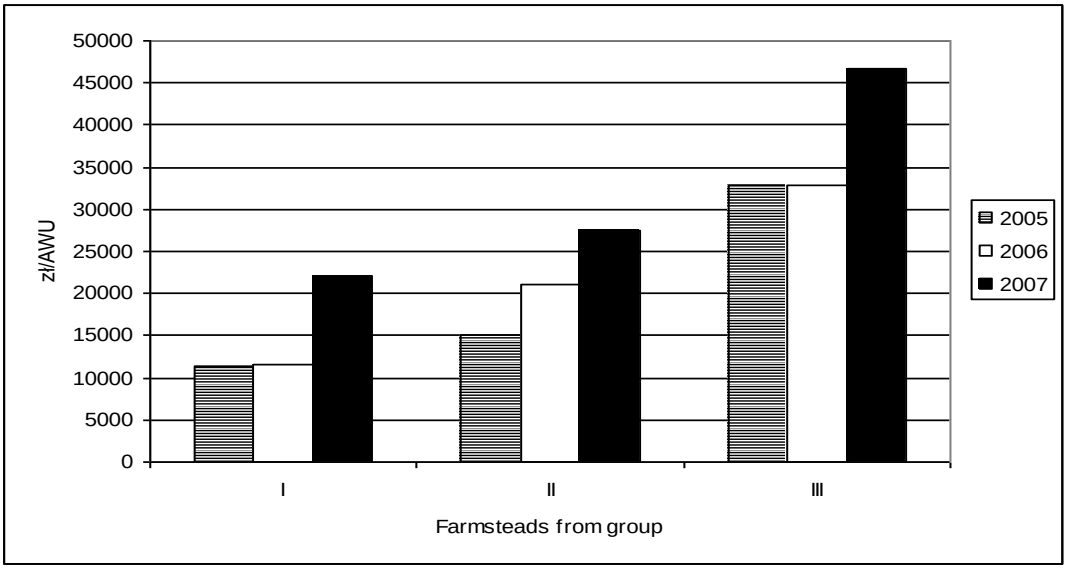
Farmsteads from group	Agricultural income per farmstead (PLN) in years			Agricultural income per 1 ha of arable land (PLN) in years		
	2004	2005	2006	2004	2005	2006
I	19587	21790	38213	1076	1125	1921
II	27725	37995	52858	1264	1678	2415
III	57635	56145	81483	2594	2407	3072

Source: author's studies

Farmsteads of the highest index of connections with the environment obtained lower incomes both in terms per farmstead and in terms per 1 ha of arable land despite higher commodity production.

Situation was different in respect of gained incomes in terms per 1 fully employed person in the subsequent years (Figure 5).

Farmsteads of the first group reached similar income level per 1 fully employed person in the years 2005 and 2006. Situation was similar in the third group farmsteads. Distinct income "jump" was possible to be noticed not earlier than in 2007. It rose almost two times in farmsteads of the lowest connections index and over 40% in the group of the highest contacts with the environment.



Source: author's studies

Fig. 5. **Agricultural income in terms per 1 fully employed person – fixed prices of 2005**

Systematic income rise occurred in 75% of farmsteads of the medium group in the subsequent years.

Conclusions

The performed analyses allow to state that income level in Poland's farmsteads before 2004 was lower than in the all households sector. Such situation resulted mainly from disadvantageous changes of relation between the purchased-by-farmers goods, and services prices and prices of products farmers were selling. Agricultural situation was improved not

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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earlier than after starting getting direct payments in result of Poland's access to the European Union in 2004.

Farmsteads that keep accountancy belong to the group of farmsteads of higher economic strength and better results than average in the country. Despite that, only the group of over 16 ESU economic size gained incomes comparable with incomes in non-agricultural sectors.

A very different situation in respect of agricultural incomes occurred in farmsteads according to the agricultural type. The most advantageous situation in the period under investigation occurred in the granivorous animals maintaining farms or in garden cultivation farms. Comparing agricultural incomes with the average net remuneration in the national economy, income in terms of fully employed person in three agricultural types was found to be above the average net wages in the national economy.

The completed investigations allow to state that there is a strict relation between farmsteads connections with the environment, reached production and economic results. Stronger connections with the environment as measured by the connection index favoured also obtaining higher production and income level in terms per area unit.

According to Woś (2004), a peasant farmstead is not only a producer of material goods and market partner but also a historically fixed form for the existence of peasant families. Therefore, these units very often do not bankrupt in spite of getting low incomes; however, a significant part has stopped market production after 2004. Unlike enterprises, which would long ago have announced bankruptcy in such situation, farmsteads are still existing enlarging only the group of self-supplying units.

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ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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Product Market Competition and Productivity: Evidence from the Polish Food Marketing System

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Abstract. The aim of the study was to determine the changes in the efficiency of the Polish food market. The study contains an assessment of the competitiveness of structure of the basic food market segments and the operating efficiency of main links of the marketing chain. An important aspect of the research involved the analysis of relations between changes of the competition and changes of the operating efficiency in the food market. The study shows a positive relation between the bargaining power of enterprises and the labour productivity in the Polish market for food products.
Key words: productivity, food marketing system.

Introduction

Food chain forms a complex marketing system. It includes a chain of related economic entities and markets coordinating their conduct that participate in the satisfaction of the society's eating needs. The efficiency of the mentioned system depends on the operation of markets that coordinate the purchase and sale relationships between farmers, business owners in the food industry, wholesale and retail trade as well as consumers. Competition plays the essential role in the market efficiency improvement. Competition favours the production development, not only in terms of quantity, but also in terms of quality and assortment. On the contrary, the competitive market structure affects the operating efficiency of food production and trade sectors.

The aim of the study was to assess the changes in the efficiency of the Polish food market. Particular attention was paid to the assessment of competitiveness of the structure of basic food markets and measurement of their operating efficiency. The study also analyses the relation between the competitiveness of market structure and labour productivity in the main food processing and food trading segments.

The following research tasks were to be carried out in order to attain the main aim of the research:

- determination of changes in the efficiency of the Polish food market using the sellers' bargaining power indices;
- assessment of the level and changes of the operating efficiency in individual links of the food chain using labour productivity measures;
- analysis of the relation between the bargaining power of enterprises and the labour productivity in the Polish market for food products.

Research methods

The aggregate statistical data showing results for 52 sectors of the economy (marked with 4-digit PKD codes) in the area of food industry, wholesale and retail trade in the period of 1996–2007 were used in order to assess the efficiency of the food chain in Poland. The data were acquired from the database available in the Eurostat's statistical system including structural business statistics.

The sellers' bargaining power index (Price-Cost Margin – PCM) was used as the measure of the market competitiveness. The PCM index is one of the basic measures of the sellers' bargaining power on the market. It is based on the Lerner market power index[1] (Church J., Ware R., 2000). The market power of a company is defined as its ability to increase a price

[1] $L = \left(\frac{P^m - MC(Q^m)}{P^m} \right) = \frac{1}{|\varepsilon|}$ where: P^m – price, $MC(Q^m)$ – marginal costs, ε – price elasticity of demand

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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above the marginal cost. The market power index is inversely proportional to the price elasticity of demand ε. In accordance with the Lerner index, the increase in the price elasticity of demand adversely affects the market power of an enterprise. In the research carried out, the PCM index for individual enterprises was estimated as follows:

$$PCM_{Pi} = \frac{PS - K_Z}{PS}$$

where:
PCM_{Pi} – bargaining power index of an enterprise;
PS – sales revenues;
K_Z – variable costs (costs of materials and energy, outsourced services, value of the goods purchased, other costs by types and operating costs, labour costs).

The index determines the bargaining power of an enterprise on the market. The calculation of the PCM for a group of enterprises operating in a particular branch of the industry based on the formula presented below enables to determine the competitiveness of a particular branch.

$$PCM_P = \sum_i s_i PCM_{Pi}$$

where:
PCM_p – price-cost margin index for a group of enterprises operating in a particular branch of the economy;
s_i – market share of company *i.*

When assessing the operating efficiency, the labour productivity indices were used: gross value added per employee (*apparent labour productivity*) and relation between the gross value added per employee and the average labour costs (*wage adjusted labour productivity*)[2].

The correlation analysis was used when analysing the relation between different aspects of the efficiency of marketing systems. The non-parametric correlation measure between two variables – Spearman's rank correlation coefficient was used in the research. (Aczel A. D., 2000).

Competitiveness of the Polish food market

The competition in the market for food products was measured using the PCM index. The increase in the PCM index in time is interpreted as an increase in the sellers' bargaining power on a particular market, and at the same time, it signifies a reduction in the competition in a particular branch of the economy. Simultaneously, the decrease in the PCM index signifies the development of competition. The research covered the main branches of the Polish food industry. The data concerning changes in the competition in sectors of the wholesale market for food products are presented in Figure 1.

The data presented above show that the average PCM index in the Polish food industry has increased from 13.3% in the period of 1996-1999 to 17.1% in the period of 2000-2003. After Poland's accession to the EU, the bargaining power index in the food industry decreased to 13.6%. Vegetable product processing and secondary processing sectors (bakery and confectionery industry) were characterised by a relatively higher PCM index. Poultry, meat, and dairy industries, which process perishable agricultural resources, showed a significantly lower PCM index. Furthermore, the data presented in Figure 1 show considerable differences in the PCM index in individual branches of the food industry. A permanent upward trend was observed in the fruit and vegetable industry, sugar industry, dairy industry, juice production, meat, and poultry industry. The mentioned branches were systematically improving their positions in the food chain. The greatest increase in the PCM index was observed in the sugar industry, meat industry, fruit and vegetable industry, and juice production. In the period of

[2] The indices were determined based on: Structural business statistics – Productivity and profitability Retrieved: http://epp.eurostat.ec.europa.eu/portal/page/portal/european_business/introduction/ productivity_profitability. Access: 15 January 2010.

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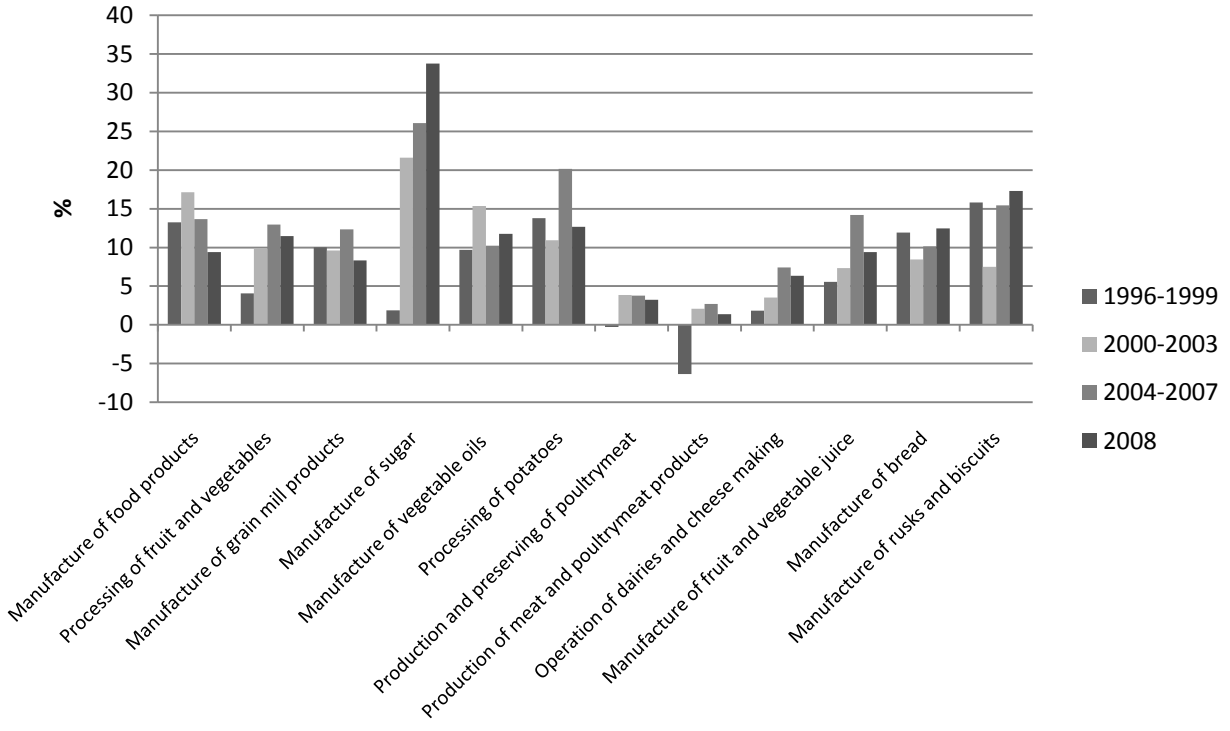
2004-2007, the PMC index was higher in the mentioned branches by more than 8 percentage points in comparison with the period of 1996-1999.



Source: author's calculations based on Annual Detailed Enterprise Statistics on Manufacturing Subsections (NACE D)

Fig. 1. **PCM index in the Polish food industry in the period of 1996-2007**

Some branches observed a considerable reduction in the PCM index in the period preceding Poland's integration with the EU and an increase in the period of 2004-2007. This situation occurred in the milling, potato, bakery, and sugar industries. In the period of 2000-2003, the oil industry observed a considerable increase in the enterprises' bargaining power in the market, and the PCM index decreased in the period of 2004-2007. The foregoing shows an improvement in the competitiveness of the market for vegetable fats.

The situation of the Polish food market in 2007 and the following years was determined, among others, by the effects of the global financial crisis. It resulted, in particular, in considerable fluctuations of prices of agricultural resources (cereals) and food products (sugar). Particularly high prices were observed in the period of July 2007 – May 2008, and in the second half of 2010. The reason for such fluctuations included not only the demand-supply situation, but also speculative activities in international markets for agricultural and food products, and creation of the so-called speculative bubble. The data presented in Figure 1 show that the mentioned situation resulted in a decrease in the PCM index in the entire food industry in 2008. This means that the increase in the costs of raw materials could not be fully compensated by an increase in the final products of the industry. The structure of the wholesale market for food products rendered it impossible to transfer the increase on the food recipients and resulted in a decrease in the profits generated in the food industry.

Figure 2 presents changes in the PCM index for the fundamental areas of the wholesale and retail trade in food products.

The data presented above show that the changes in the competitiveness of individual food product distribution segments were similar. Both, the wholesale and retail trade in food products observed an increase in the competitiveness prior to Poland's accession to the EU. At that time, the average PCM index decreased by 0.9 percentage points, and by 3.4 percentage points in the retail trade in comparison with the period of 1996–1999.

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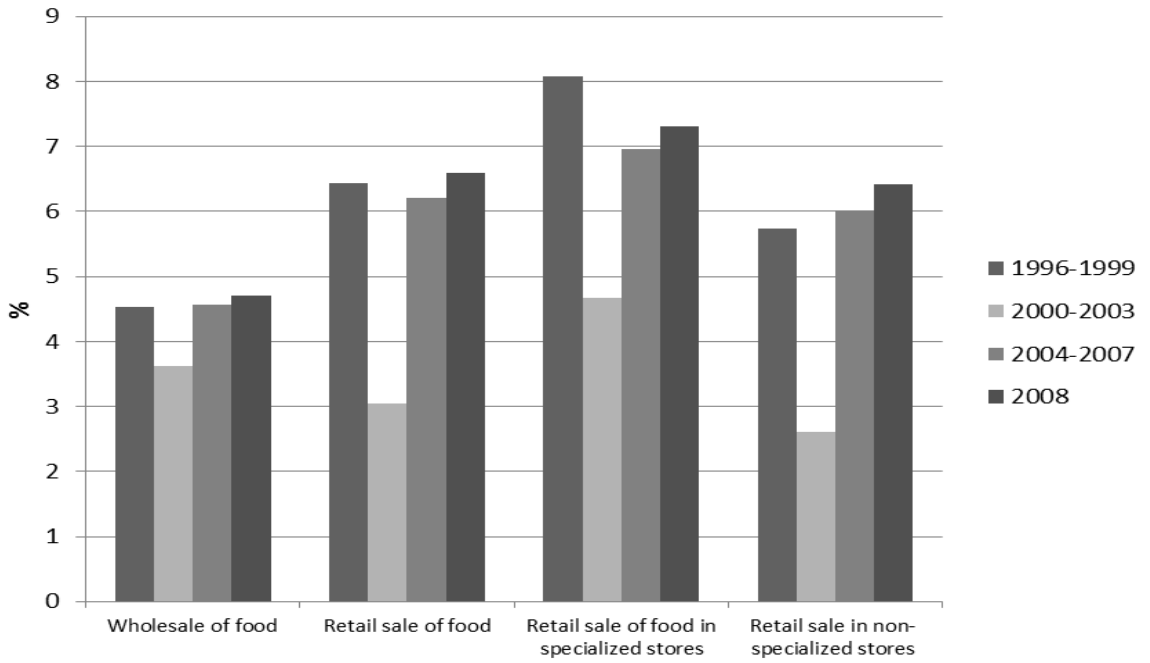

Source: author's calculations based on Annual Detailed Enterprise Statistics on Trade (NACE G)

Fig. 2**. The PCM index in the food product distribution sectors in Poland in the period of 1996-2007**

After Poland's accession to the EU, all segments of the food distribution sector observed an increase in the bargaining power. The scale of changes was different in individual segments. The greatest changes took place in the non-specialised retail trade operating, mainly, large chain forms of food retail sale. The PCM index grew by 3.4 percentage points. In the period of 2004-2007, the PCM index rose almost twice in comparison with the period of 2000-2003. At the same time, the bargaining power of the non-specialised retail trade rose merely by 2.6 percentage points. As regards the wholesale trade, the PCM index was characterised by considerably lower dynamics. Figure 2 shows that in 2008 the PCM index in the distribution sectors grew slightly. The crisis thus resulted in the increase in the bargaining power of the wholesale trade and retail trade in the food market.

Operating efficiency of the market for food products

The basic aspect of assessment of the food marketing system involves the analysis of the economic efficiency of production and trade processes, with the operating efficiency being the main measure. The improvement in efficiency is the goal of farmers operating in the agricultural product marketing system, enterprises of the food industry operating in food marketing systems as well as entities operating in the wholesale and retail market for food products. The labour productivity is the basic measure of the operating efficiency.

The level and changes of labour productivity in the food industry, trade, and agriculture in Poland in the period of 1996–2008 are presented in figure 3. In the agricultural product marketing system, the labour productivity was determined as the share of the gross value added in base prices per employee based on the statistical data derived from the economic accounts for agriculture (EAA).

As regards other food chain links, the gross added value was expressed in producer's prices and the data were derived from the GUS (Polish Central Statistical Office) and Eurostat. The productivity measured as aforesaid was very different in individual food chain links.

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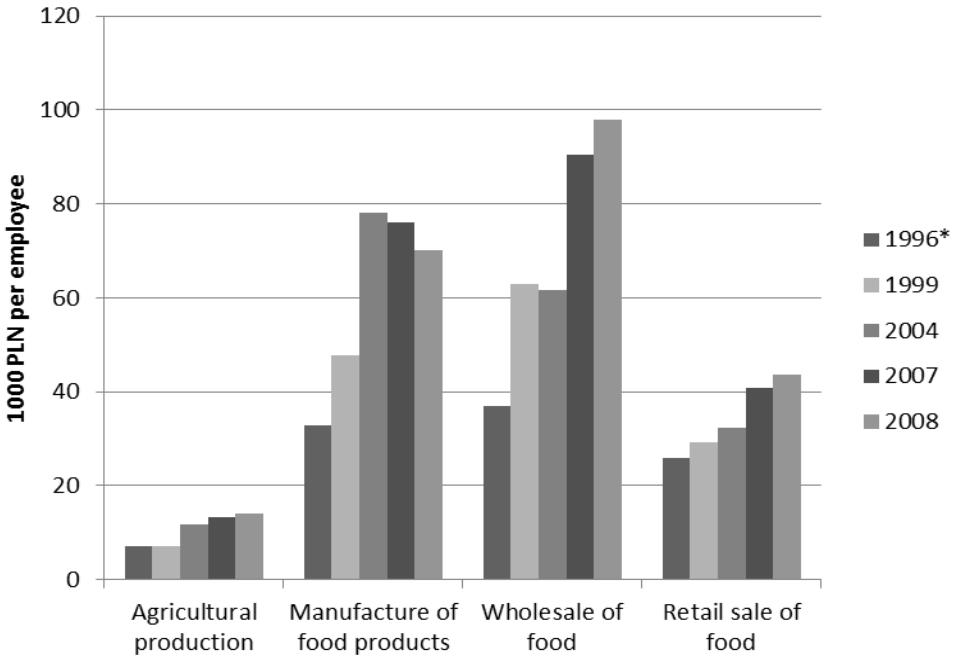

* for agriculture, data for 1998

Source: author's calculations based on Annual Detailed Enterprise Statistics on Manufacturing Subsections (NACE D) and Annual Detailed Enterprise Statistics on Trade (NACE G)

Fig. 3. **Labour productivity in the Polish food marketing chain in the period of 1996-2007**

The presented data show that the labour productivity in agriculture was much lower than in non-agricultural food chain links, i.e. food industry, wholesale and retail trade. The gross value added per employee in the industry and wholesale trade in food products was by approximately 6 times higher on average than in agriculture. The labour productivity in the retail trade was by more than 3 times higher than the labour productivity in agriculture. The differences in labour productivity of individual marketing systems in the food chain result from differences in the production technologies, physical capital resources, and human capital quality and use.

The analysis of the main branches of food industry shows considerable differences in the labour productivity in this sector of the economy. Chechelski and Morkis mention the following factors affecting the work output in food industry: factors related to fixed assets, factors related to the employment, and factors related to the production. The work output factors related to fixed assets include technical devices, productivity and value of fixed assets, investment rate, and electric energy consumption rate per one employee. The employment-related labour productivity factors include the average employment and gross salaries. At the same time, the production-related factors include production sold, share in total costs, and the number of economic entities (Chechelski P., Morkis G., 2002). At the same time, Herath and others emphasise the positive relation between the intensity of the implementation of food quality and safety assurance systems and the labour productivity (Herath D., Hassan Z., Henson S., 2008). Simultaneously, positive effects of merging and concentrating enterprises in the US food industry are underlined by Ollinger and others (2006).

The labour productivity is also an important measure of the development of marketing systems in the distribution sectors. The enterprise management style contributes to the improvement in labour productivity in trade. In large commercial companies, the increase in the labour productivity is largely affected by the organisational structure and the use of modern technologies, machines and devices (Park T., 2008). Typical instruments of that kind include, among others, computer systems to record sales, standardisation of displaying devices, barcodes, canons of displaying goods, and promotions. Also the scope of the services offered (full-service stores and self-service stores) is significant (Szulce H., Chwałek J.,

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Ciechomski W., 2008). When analysing the operation of international retail chains, Lafontaine and Sivadasan emphasise that the volume of single orders affects the labour productivity measured by turnover per 1 employee. At the same time, the service quality negatively affects the productivity (Lafontaine F., Sivadasan J., 2008).

Table 1 presents the average pace of changes of the gross value added per employee in the period of 1996-2008 in food production and distribution sectors. The highest annual growth rate was observed in juice production and meat industry. It was the highest in these branches throughout the analysed period of 1996-2007; although in the period of 2003-2007, the annual growth rate in meat industry was negative. The labour productivity was systematically growing in all food chain segments analysed. The economic crisis resulted in a collapse of the positive trends and deterioration in the labour productivity indices. In the entire food industry, the labour productivity in 2008 decreased by 7.9% in comparison with 2007. It seems that although many sectors of the industry increased the labour productivity considerably reducing the employment in the past, the reserves remaining in that area are lower. The medium- and long-term challenge will be to increase the efficiency of the Polish companies without reducing the number of employees.

Table 1

Annual growth rate of the gross value added per employee in the food marketing chain

Specification	Average annual percentage change				
	1996-1999	1999-2003	2003-2007	2007-2008	1996-2008
Manufacture of food products	20.7	9.6	0.3	-7.9	6.5
Processing and preserving of fruit and vegetables	45.6	11.4	8.4	0.4	17.0
Manufacture of grain mill products	4.8	16.0	4.7	11.3	8.9
Manufacture of sugar	33.7	24.2	25.3	31.3	27.5
Manufacture of vegetable oils	1.6	10.0	5.9	62.1	10.0
Processing of potatoes	43.5	2.1	15.9	-9.6	14.8
Production and preserving of poultry meat	18.1	12.3	2.8	-1.9	9.2
Production of meat and poultry meat products	115.7	25.2	-2.0	2.8	30.1
Operation of dairies and cheese making	30.9	13.5	12.1	-11.8	14.7
Manufacture of fruit and vegetable juice	129.7	6.5	9.0	-7.8	28.5
Manufacture of bread	19.2	-0.6	5.0	16.5	7.3
Manufacture of rusks and biscuits	22.7	-0.1	10.0	3.2	8.9
Wholesale of food	19.4	0.3	9.2	8.2	7.7
Retail sale of food	4.2	4.3	4.2	7.2	3.9
Retail sale of food in specialised stores	5.6	11.2	1.3	10.3	5.47
Retail sale in non-specialised stores	12.2	2.5	5.0	6.7	5.5

*1998-1999

Source: author's calculations based on Annual Detailed Enterprise Statistics on Manufacturing Subsections (NACE D) and Annual Detailed Enterprise Statistics on Trade (NACE G)

The relation between the gross value added per employee and the average labour costs shows the extent to which the gross added value covers the average labour costs. The relation answers the question whether the value added per employee grows faster than the labour costs. In the period OF 1996-1999, the labour efficiency calculated as the relation between the value added per employee and average labour costs was the highest in the specialised retail trade (Figure 4).

In the period of 2000-2003, the highest productivity was observed in the wholesale trade, and in the period of 2004-2007 in the sugar industry. The data presented above show that there were considerable differences in the efficiency measures analysed among the food marketing system links.

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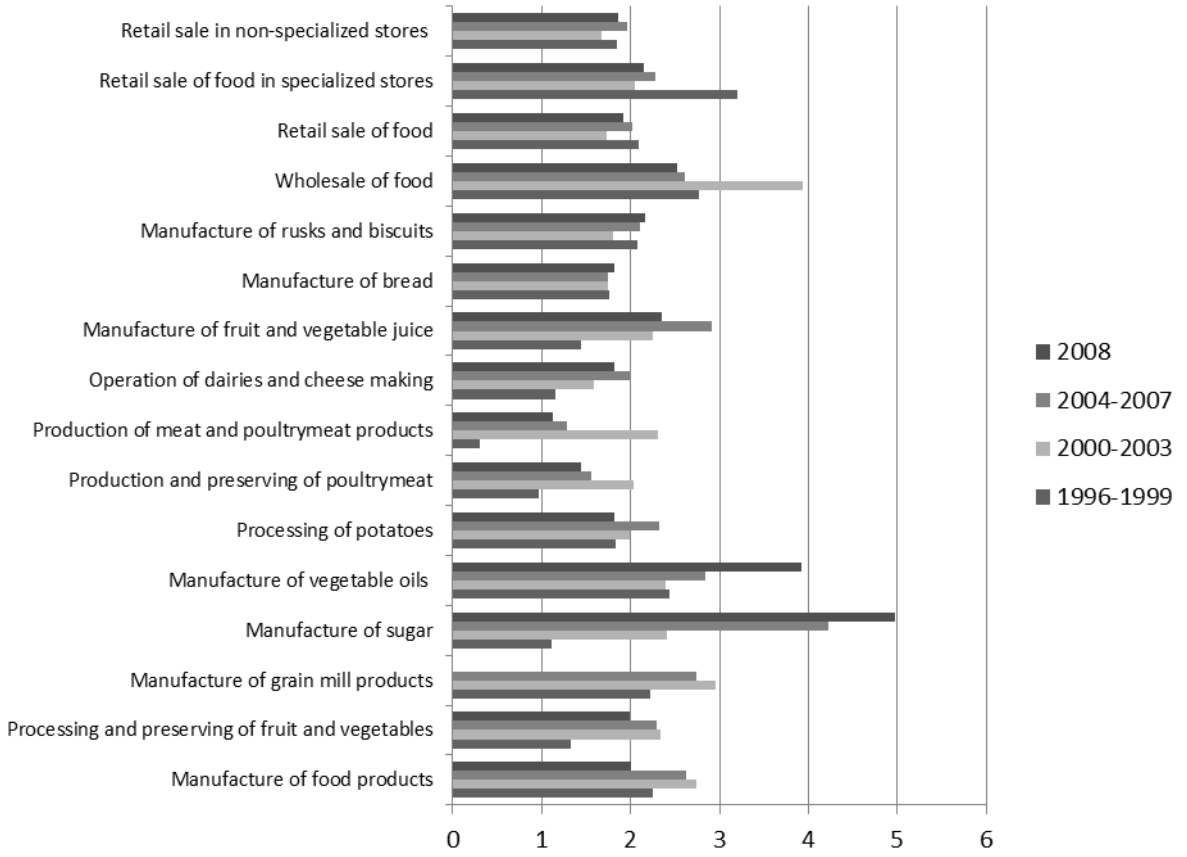

Source: author's calculations based on Annual Detailed Enterprise Statistics on Manufacturing Subsections (NACE D) and Annual Detailed Enterprise Statistics on Trade (NACE G)

Fig. 4. **Relation between the gross value added per employee and the average labour costs in the food industry and retail trade in the period of 1996-2007**

Relations between the market power and labour productivity in the food marketing system

Relations between different measures thereof have to be determined in order to assess the statistical efficiency. Thus, it was checked whether a considerable relation existed between variables: the PCM index, gross value added per employee and the relation between the value added per employee and average labour costs. The aforementioned check was carried out based on the analysis of the Spearman's rank correlation. Table 2 presents the results of the analysis. The analysis showed a positive relation between the variables analysed. The relations between the PCM index and the labour efficiency per employee and the relation of labour efficiency per employee/average labour costs turned out to be moderate. The results show that an increase in the value of one index is accompanied by an increase in the other index. This means that the enterprises' bargaining power (PCM) is positively correlated to the labour efficiency measured by value added per employee. The Sperman's rank correlation coefficient between the analysed variables accounted for 0.462. The foregoing means that the enterprises' bargaining power is positively correlated with the labour efficiency indices.

Competition plays an essential role in the improvement of operating efficiency in the marketing systems. It makes companies reduce costs and increase the labour productivity. At the same time, they are under pressure to increase the usefulness delivered to the consumers and the market share. The results of correlation analysis presented herein show that the improvement in the market position of enterprises measured by the PCM index is accompanied by an increase in the labour productivity.

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Table 2

Spearman's rank correlation coefficients between PCM, BPI, value added per employee, and value added per employee/average labour costs

Variables	PCM index (%)	Added value per employee (PLN thousand)	Added value per employee/average labour costs
PCM index (%)	1.000	0.462*	0.451*
Added value per employee in PLN thousand		1.000	0.545*
Added value per employee/average labour costs			1.000

* $p < 0.01$ (on both sides)

Source: author's calculations based on Annual Detailed Enterprise Statistics on Manufacturing Subsections (NACE D) and Annual Detailed Enterprise Statistics on Trade (NACE G)

The correlation coefficient between the gross value added per average labour costs and the PCM index accounted for 0.451. The foregoing also shows a positive relation between the analysed variables.

Conclusions

Food marketing systems are created by different branches of the food industry. They fulfil not only production-related functions, but they also perform marketing activities oriented at final consumers and agents participating in the distribution process. The analysis of the competition in individual food industry segments showed that the restructuring contributed to the reinforcement of food industry in the food chain. The estimated PCM indices enabled to determine the competitiveness of structure of the market for individual food products. The fluctuation of the PCM indices shows that the position of food industry in the wholesale market for food products changes. The research carried out shows that the average PCM index for the food industry grew from 13.3% in the period of 1996-1999 to 17.1% in the period of 2000-2003. After Poland's accession to the EU, the bargaining power index of the food industry decreased to 13.6%. Vegetable product processing and secondary processing sectors (bakery and confectionery industry) were characterised by a relatively higher PCM index. Poultry, meat, and dairy industries, which process perishable agricultural resources, showed a significantly lower PCM index. A permanent upward trend was observed in fruit and vegetable industry, sugar industry, dairy industry, juice production, meat, and poultry industries. A considerable reduction in the PCM index in the period preceding Poland's integration with the EU and an increase in the period of 2004-2007 was observed in the milling, potato, bakery, and sugar industries.

The transformations in the institutional structure and conditions also resulted in the changes in competitiveness of distribution sectors. The PCM index in the retail and wholesale trade decreased in the period preceding Poland's accession to the EU and significantly grew after 2004. The foregoing means that distribution sectors strengthen their bargaining position in the food chain. The greatest increase in the bargaining power was observed in the non-specialised retail trade, including large chain forms of retail sale. The situation of the Polish food market in 2007 and the following years was determined, among others, by the effects of the global financial crisis. It resulted, in particular, in considerable fluctuations of prices of agricultural resources (cereals) and food products (sugar). Particularly high prices were observed in the period of July 2007 – May 2008, and in the second half of 2010. The reason for such fluctuations included not only the demand-supply situation, but also speculative activities on international markets for agricultural and food products, and creation of the so-called speculative bubble.

Considerable differences in the operating efficiency of marketing systems were shown when assessing the level and changes of the operating efficiency of food marketing systems. In addition, a positive correlation between the bargaining power measured by the PCM index

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and the labour productivity was revealed. The relation between the market power and the labour productivity index corrected by average labour costs was also positive. The relation shows that in the case of an increase in the enterprises' bargaining power, the gross value added per employee tends to cover the average labour costs to an increasingly greater extent. The economic crisis resulted in a collapse of the positive trends and deterioration in the labour productivity indices. In the entire food industry, the labour productivity in 2008 decreased by 7.9% in comparison with 2007.

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Effect of Demographic and Market Related Variables on Farmers' Investment Behaviour – Econometric Study

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Abstract. The size of agricultural investment has been increasing during the previous decade in Finland due to the powerful structural change in agriculture. This article studies empirically the role of factors related to demographics and operation environment of agriculture on the investment behaviour of farmers. This article applies econometric methods in the setting of panel data. Basic linear models are estimated in order to explain magnitude of farm investments. The available FADN structural and economic variables are included as explanatory variables to the models. The aim of the study is to find out the effects of several explanatory variables on the magnitude of cumulative investments over the period of 1998-2008.

Key words: investment, panel data, econometric model.

Introduction

During the recent decade there has been a substantial structural change going on in Finnish agriculture. Several small farms have ended production. On the contrary farms, which have stayed in the business, have usually expanded their size by large-scale investments (Development Fund of..., 2006).

This article is the first stage of the author's econometric study on Finnish agricultural investments. The aim of this study is to explain the magnitude of cumulative investments over the period of 1998-2008. Econometric models are applied to empirical data in order to find out the effects of several variables on investments. Variable to be explained is cumulative investments over the period. Linear econometric models are used in this article. The aim of this study is to find out whether different explanatory variable coefficients have the sign predicted by the theory in these models. In addition, the levels of the estimated coefficients are also of interest.

The Dataset consists of Finnish Farm Accountancy Data Network (FADN) farm data[1] managed by MTT Agrifood Research Finland. The period covers years starting from 1998 to 2008. At the moment the year 2008 is the last available data point. Only farms with positive investments are considered here, because of the type of models used. Variables included in FADN statistics refer to:

1) physical and structural data, such as location, crop areas, livestock numbers, labour force, etc.
2) economic and financial data, such as the value of production of different crops, stocks, sales and purchases, production costs, assets, liabilities, production quotas, and subsidies, including those connected with the application of CAP measures (European Commission, 2011).

A more complete report of the dataset is presented after this introduction. First, the study describes a dependent variable - investments. Second, the dataset report provides a definition of explanatory variables, some of their distribution statistics and lays background for their inclusion into the models. Finally, the study presents actual econometric models used. Results from these models are reported compactly in the following chapter. Conclusion section closes the article.

[1] The author would like to thank MTT for providing the data. In particular, Arto Latukka and Jukka Taurianen provided invaluable help.

The data

The dataset consists of Finnish FADN farm data for the period from 1998 to 2008, which is now the most recent year available. Data include observations from 1495 different farms. The dataset is in panel[2] form, though the panel is highly unbalanced (i.e. not all farms have observations for every year). Since some of the estimation methods used in the study require observations for at least two successive periods, the farms with only one observation were dropped from the analysis. Likewise, horticulture farms were dropped from the analysis because they generally differ significantly from other farms and there were not too many of them in the dataset.

There is a pile up of observations with zero investments for the whole period. Linear models are not suitable for such setup, and thus only farms with positive investments were included in the analysis. There were 1003 of such farms in the data.

Dependent variable

The dependent variables in this study are investments on individual farm during the period of 1998-2008. Investments include purchases and major improvement costs of land, and machinery as well as building or acquisition costs and repair costs of buildings. Building draining or other systems to enhance land productivity are considered as investments. Investment statistics used in this study includes all agricultural investments in a particular farm, not just those directed to the main production line. In contrast, investments for private economy are not included in the study.

Annual investments vary strongly even if the farm is in a rapid growth stage. Large investments may be executed during some years; while break for investments is taken in others. As a result, some other dependent variable should be used. Cumulative investments were chosen as a dependent variable so that the panel features of the data (the time dimension) could be used in the study. Cumulative investments for farm *i* are defined as:

$$Y_{it} = \sum_{t=j}^{T} y_{it} \qquad (1.1)$$

Where, *j* denotes the year when farm *i* enters the sample and *T,* respectively, the year when farm *i* leaves the sample. Cumulative investments on the period are calculated annually so that a dependent variable refers to investments cumulated from the beginning of the period to the year under examination.

Descriptive analysis of the data on investments

The share of farms uptaking large investments do not vary very much between different years. Approximately 50% of the farms included in the sample annually invest more than 10% of their total assets.

It can be seen that large-scale investments, if they were made in a particular farm, were often made in several years within the period. This tells that investments are concentrated on those farms that have decided to continue and even enlarge production.

The average annual investment tends to grow in time. This is true especially in dairy production. In addition, the freezing of investment aid for piggery investments during December 2002-2007 is clearly observable. After that, no new applications for investment aid were processed; only already

[2] Panel data is "pooled" cross-sectional and time-series data. It contains variables for the same farms over several periods.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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accepted applications were financed. The freezing occurred because of temporary overproduction (Development Fund of..., 2007).

Explanatory variables

These variables are chosen based on the economic theory. This chapter presents a short description of the variables as well as some justification on why they should be reasonable predictors of investments. Abbreviated expressions of the variables used in econometric models are presented in parenthesis.
The use of lagged explanatory variables is not happening in the sense they are conventionally used; rather this is because of the data structure: most of the variables represent the value at the end of the year. Consequently, lagged value represents the information more correctly at the moment investment decision is being made.

According to the investment theory, risk and irreversibility of investment are also the major determinants of willingness to invest (Dixit, A.K., Pindyck, R.S. 1994). The available variables relating these factors to investments on farm level are yet to be found for the author's quantitative research purposes.

Continuous explanatory variables

Interest rate (int_r) is one of the most common factors affecting the investments. According to the theory, a decrease in interest rate boosts investments as the cost of finance goes down (Dixit, A. K., Pindyck, R. S. 1994). In this study, interest rate is defined as actualised costs of finance divided by the amount of foreign capital. Cost of finance includes not only interest payments but other expenses, such as bank charges, as well. If farms in the data differ with respect to the risk induced to lender, these risks should be reflected in actualised financing costs.

The cost of foreign capital has been quite low and steady during the euro period[3] (2002 -). Furthermore, the interest subsidies for investments are likely to decrease the level and reduce the variation in the cost of foreign capital.

Equity ratio (eq) is defined as:

$$Equity\ ratio\ = \frac{(Total\ assets\ -\ Liabilities)}{Total\ assets} * 100 = \frac{Equity}{Total\ assets} * 100 \qquad (1.2)$$

It is assumed that the equity ratio could affect the availability of foreign liabilities as farm owners with higher equity ratio could provide better collateral to the borrower. However, the new Basel II and Basel III regulations for the banks give higher weight to the profitability estimates of the investments instead of collateral (Financial Supervisory Authority, 2010).

The early descriptive analysis of the data suggests that farmers who decided to continue production invested heavily and continued to do so in the subsequent years. Significant investments in the developing stage of the farm will presumable drive Equity Ratio downwards. Therefore, one could expect that Equity Ratio will act as an instrument variable of the farmer's lifecycle. These two effects have opposite impact, so that the dominating one can be found out by applying the models to data.
There are many potential candidate variables for describing the *farm size*. Only one of such variable should be chosen into the econometric model, since multicollinearity problems will

3 The euro was introduced to the world financial markets as an accounting currency on 1 January 1999. Euro coins and banknotes entered circulation on 1 January 2002 (Bank of Finland, 2011).

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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arise otherwise. Possible candidates include the number of animals, arable area, and total assets. *Total assets* (tot_as) were chosen in this study, as they are present in every production line and every type of farm. Assets are converted to thousands of euros.

One period lagged value shall be used, since the data have a value of total assets at the end of the year, i.e. to get starting value of assets at the beginning of the year when investments are not yet made. Use of assets at the end of the year explain investments during the same year resulting without a doubt to more significant estimates and better fitting in the model. This is due to the connection:

$$Total\ assets_{End} = Investments - Depreciations + Total\ assets_{Begin} - Sales\ of\ capital \qquad (1.3)$$

Therefore, such model lacks economically meaningful interpretation for predictive purposes.

Investment decisions are forward looking. Therefore, future *expectations* play a key role here (Dixit, A.K., Pindyck, R.S. 1994). In particular, estimates about profitability of the investments are based on expectations. Profitability depends on the other things than just the output price. Input prices and agricultural subsidies are important factors as well. The statistic *profitability ratio* (prr) is used to represent current as well as expected profitability in order to get a comprehensive measure of profitability.

The profitability ratio is calculated as:

$$\text{Profitability } Ratio = \frac{Farm\ Net\ Income}{Interest\ claim + Wage\ claim} \qquad (1.4)$$

Moreover, large investments also tend to mix up the production process temporarily. Farmer's resources are directed to the management of investment process and there is generally some delay in starting the production after investment has been completed. Therefore, the farm specific profitability ratio of investment year would not be a good predictor as it has a tendency to be exceptionally low due to the disturbed production process.

Annual averages calculated by production line were used as the variable expressing the profitability expectations. The effect of coincidental annual farm level variation can be avoided by using these averages. Furthermore, one period lagged value was used in the models, because that presumably correctly represents the information available now, when investment decision has to be made. Profitability ratio was calculated as the annual average:

$$\overline{prr}_{jt} = \left(\sum_{j} prr_{jt} \Big/ J \right), \text{ where} \qquad (1.5)$$

j had seven different values (those production lines of euts8 of FADN definition excluding horticulture).

Capital to labour ratio (cap_labour) reflects differences in production line. However, it reflects a result of endogenous decision of capital-intensive farming in case the effect of different production lines is accounted for.

The share of machinery capital of total assets (KON_os) is used to explain machinery resources of the farm. It is assumed that farms with readily available machinery resources are more likely to expand production. In this case expanding refers mainly to obtaining more arable land. Moreover, these farmers may act as machinery contractors in addition being farmers.

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Qualitative explanatory variables

Support region (TA1-TA3)

Finland was divided into different support areas after the accession to the European Union. Those areas were receiving different amounts of agricultural subsidies.

The Southern support areas of the country (A- & B-areas) were meant to adapt to common markets mainly via structural development in farming (MTT, 2007). Roughly, the unit costs of production were meant to be pushed to a competitive level by enlarging farm size.

National subsidy payments based on the arable area or the number of animals in the Southern regions, were agreed only for a temporary period. The purpose of these payments was to ease the adjustment process. In contrast, it was considered that the Northern support areas (C1-C4-areas) will need permanent subsidies due to the less favourable natural conditions. Consequently, less investment aids were available in C-areas. In the period starting from 2003, investment aid levels were made equal in the whole country. However, some differences in other subsidies are still present in different support regions (MTT, 2007). Three different categories: (TA1) for A&B, (TA2) for C1-C2P, and (TA3) for C3-C4 were used in the econometric analysis.

Main production line is defining character of a farm. Farms in the data are classified according to their main *production line* (TS1-TS4) (euts8 classification). Farms in the data are divided into Dairy (TS3), Pig (TS4), and Cereal farms (TS2). Furthermore, the smaller production lines (=few observations) were combined into heterogeneous "Unclassified" group (TS1).
Different *policy regimes* (Ohj_K1-Ohj_K3) (affecting mainly via subsidy levels) were coded as dummy variables: 0 for the years 1998-1999, 1 for the years 2000-2003, and 2 for the years 2004-2008. Actually, there was still another change in regime in the year 2008. The policy in 2008 was still quite in line with the policy in earlier regime (Development Fund of..., 2008).

Linear panel models

Linear models were used to explain the magnitude of investments. Basic linear panel model can be written as:

$$y_{it} = \alpha_{it} + x_{it}^T \beta_{it} + u_{it} \quad (1.6)$$

Variable to be explained is $\boldsymbol{y_{it}}$ denoting cumulative investments and $\boldsymbol{x_{it}}$ mean covariate variables. Index ***i=1,…,n*** refers to the farm *i* and index ***t=1998,…,2008*** to the year.

However, the model above is not estimable as there are more parameters to be estimated than there are observations. Therefore, some further restrictions are needed. Pooling the data is the simplest (and the most restrictive) model. It specifies constant coefficients:

$$\alpha_{it} = \alpha \ \wedge \ \beta_{it} = \beta, \ \forall \ i,t$$

$$\Rightarrow y_{it} = \alpha + x_{it}^T \beta + u_{it} \quad (1.7)$$

The error term is likely to be correlated over time for a certain individual. Panel-corrected standard errors shall be used for inference. White estimator is suitable for the task (Wooldridge, 2002).

Thus, the following pooled model was estimated:

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$$Y_{iT} = \sum_{t=1998}^{T} y_{it} = \alpha + \beta_1 \text{int}\_r_{iT} + \beta_2 eq_{iT-1} + \beta_3 tot\_as_{iT-1} + \beta_4 \overline{prr}_{jT-1}$$
$$+\beta_5 cap\_labor_{jT-1} + \beta_6 ta1_i + \beta_7 ta2_i + \beta_8 ts1_i + \beta_9 ts2_i + \beta_{10} ts3_i + u_{iT}, \quad (1.8)$$

where α is the constant term, *int_r* is the interest rate, *eq* is the equity ratio, *tot_as* is the amount of total assets, and *cap_labour* is the capital to labour ratio. Categorical variables *ta1-ta2* refer to the support region and *ts1-ts3* - to the production line. One class of categorical variables is left out from the estimation equation as a reference category in order to avoid a perfect collinearity. Variable *prr* refers to profitability ratio (note that it is indexed with *j* denoting farms having the same main production line). The same model was estimated in RE setting and FE model departs only due to the dropped categorical regressors.

Unobserved effects models

$$y_{it} = c_i + x_{it}^T \beta_{it} + u_{it} \quad (1.9)$$

where $\boldsymbol{c_i}$ is unobserved effect viewed as a random variable. Now $\boldsymbol{u_{it}}$ is called idiosyncratic disturbance term.

Assumption: unobserved effect is not correlated with regressors, i.e. $Cov(x_{it}, c_i) = 0$

→ *Random effects model (RE)*

If one allows correlation, i.e. $Cov(x_{it}, c_i) \neq 0$

→ *Fixed effects model (FE)*

The same model as in Pooled regression was used for the random effects. The RE model is inconsistent if in fact $Cov(x_{it}, c_i) \neq 0$. Then error terms in these models would be correlated with the regressors (Wooldridge, 2002).

Therefore, this crucial assumption shall be tested, and Hausman test is used for this purpose. Only time-variant regressors can be identified in the FE model (Wooldridge, 2002). Thus, support region and main production line are not used as explanatory variables in the FE model.

Results from linear models

In Pooled and RE models the significance of categorical variables was tested jointly for all coefficients by using F-test. That is, coefficients of TA1-TA2 were jointly tested and likewise for TS1-TS3. Both of them were found to have significant coefficients.

The effect of support area show that larger investments are made in the Northern C-areas compared with the Southern (A & B) regions. This result is surprising in the sense that structural adjustment to the common markets was announced to be the main objective specifically in the Southern support regions. Perhaps the more certain continuation of price subsidies in the Northern support areas is the reason behind this finding.

Among different production lines, dairy farms tend to make the largest investments. Average investments in cereal and unclassified farms are roughly equally large. The smallest average investments are surprisingly observed in pig farms. This could mean that pig production is concentrating on even fewer active farms; while many others are just cooling down. Those few enlarging piggery farms are surely investing heavily.

Variables indicating later policy regimes get significant and large coefficients. That is the size of investments grows considerably when moving forward in the observation period. This fact is

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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not likely to be entirely connected with the policy regime per se, but indicates that average investments grow in time.

Linear models show that farm size is a significant determinant of the size of investments. This is hardly surprising i.e. that larger farms tend to make larger investments. The effect of Equity Ratio remains ambiguous. In pooled and RE models, the Equity Ratio gets a significant and negative coefficient. This would indicate the relevance of farmer's lifecycle. However, in the FE model the corresponding coefficient is positive (but only nearly statistically significant). This would point toward the limited access of foreign capital if a farm's equity ratio is poor.

Error terms certainly are heteroscedastic. Thus, White estimator was used for obtaining robust standard errors. Possible collinearity of the regressors was "tested" by counting variance inflation statistic (VIF). As a rule of the thumb, values below 10 indicate that collinearity problems are not noteworthy (Wooldridge, 2002). In these models VIF are well below the threshold value.

Table 1

Summary of fixed effects regression

Fixed-effects (within) regression — Number of obs = 5287
Group variable: **maat_num** — Number of groups = 1003

R-sq: within = 0.7363
between = 0.5758
overall = 0.6629

Obs per group: min = 1
avg = 5.3
max = 10

F(8,1002) = 373.81
corr(u_i, Xb) = -0.4783 — Prob > F = 0.0000

(Std. Err. adjusted for 1003 clusters in maat_num)

inv_sum	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
int_r	-141.3043	56.30738	-2.51	0.012	-251.7982	-30.81036
lag_eq	379.2229	205.9836	1.84	0.066	-24.98585	783.4316
lag_tot_as	1130.79	40.80465	27.71	0.000	1050.718	1210.863
lag_prr	60894.24	11791.78	5.16	0.000	37754.82	84033.65
lag_cap_la~r	.0721276	.0325109	2.22	0.027	.0083305	.1359248
lag_KON_os	1406.014	352.7082	3.99	0.000	713.8822	2098.145
Ohj_K2	32186.33	3794.429	8.48	0.000	24740.39	39632.27
Ohj_K3	120274.8	7044.41	17.07	0.000	106451.4	134098.3
_cons	-311671.7	24020.67	-12.98	0.000	-358808.3	-264535.1
sigma_u	181235.01					
sigma_e	96189.094					
rho	.78022142	(fraction of variance due to u_i)				

After both FE and RE models were estimated, the validity of RE model was tested by Hausman test (Baum, 2006). The test firmly rejects the hypothesis that RE estimator is consistent. That is to say, there exists a notable farm specific effect, which is correlated to regressors. This result tells also that Pooled and RE estimates are not consistent. Thus, the FE model is preferred in the analysis.

Conclusions

Larger farms tend to invest more than smaller ones (hardly surprising). The effect of Equity Ratio remains ambiguous. There are two opposite effects: the relevance of farmers' lifecycle and availability of foreign finance. Relative importance of these effects is not clarified as in the FE model it has a positive coefficient; whereas in other models the coefficient is negative. Suggested improvement for this issue is quite simple: adding farmer's age into the model to take care of lifecycle effect. The role of occupational choice is likely to be very important in explaining investments. This conclusion is given by descriptive analysis.

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Interest rate is not a very important explanatory factor despite the strong theoretical background for it being important factor affecting investments. This indicates that the price of foreign capital has not been a critical issue for agricultural investments during the previous decade. Debt has been accessible on relatively low and steady interest. In addition, interest subsidies of investment aid have made the price of foreign capital even lower.

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Modelling of Major Crop Plants Yield Variability in Poland

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Abstract. The paper presents an analysis of major crop plants yields variability in each voivodeship of Poland. The main aim of the study was to find out the statistical relationships between crop plants yield variability and the following factors: arable area, size of wheat production area, share of arable lands used for wheat production, land quality, and average yield. For that purpose two basic models were applied, i.e. a standard linear model of multiple regression and one of the models specific to spatial data analysis, namely simultaneous autoregressive model. While it was found out that the relationship between mentioned above factors and yield variability is different for each of considered crop plants, there are some similarities: the increase of production area share of total arable area and the increase of average yields enlarge yields variability, and by the same token they increase production risk; better land quality lowers yields variability only in case of more demanding crop plants.
Key words: crop plants yield, variability, production risk, spatial autocorrelation.

Introduction

Production risk is one of the dominant risks in the agricultural sector, particularly in plant cultivation. The most important factors influencing yields level are weather conditions, pests, and diseases. Although Poland is a country of a relatively moderate size, the weather and soil conditions are quite diverse. The same can be said about interaction of the weather and soil conditions and hence, aggregation should be avoided when assessing production risk in plant cultivation. Unfortunately voivodeships are the smallest administrative units for which yields time series of reasonable length are available.

The previous author's (Kobus P., 2009) study showed that the standard deviation for wheat yield (after eliminating the influence of the trend) took values from 2 decitons (dt) per hectare in Podkarpackie to 5.4 dt/ha in Lubuskie. It means that even on NUTS 2 level there exists a considerable unevenness of plant production risk, which is worth of analysing.

Such irregularity of yield variability may be a result of many factors. It was found that 19% of wheat yield variability in Norway (farm level) could be explained by 15 significant predictors (Grønlund A. et al, 2006). The highest ranking predictors were the following: irrigation, percent winter wheat, pH, and natural logarithm of the farm area.

Other authors (Górski T. and Górska K., 2006) investigated the influence of the level of data aggregation, from plot data to national yields, and found a negative relation between the scale and crop variability.

The reason for relationship between production area and yield variability can be explained on the ground of probability: assuming that yield from each hectare is a random variable, the average of such variables is also a random variable but with the variance equal to the average variance of individual variables only in the case of full linear dependency. As such perfect linear dependency is rarely observed in practice, the variance of the average from a bigger number of hectares should be smaller.

On the contrary increasing production area moves the marginal field to the area with less favourable conditions and it could result not only in lower yields but also in a higher variability. This could conceal or even negate the effect of enlarging the production area. Consequently, both effects shall be studied jointly to find out the effects of production area size and incorporating less favourable area.

Another factor explaining the above mentioned unevenness of plant production risk is an average yield level. P. Kobus (2010a) study showed that an average yield level displayed a positive relation with wheat yields variability on the country level. However, literature of the subject provides opposite results; researches carried out in the Czech Republic on a district level (Haberle J. and Mikysková J., 2006), where 77 administrative units were analysed and a fairly strong (r=-0.58) negative relation between the average wheat yield and its variability measured by variation coefficient was found.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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Another researches carried out by the author confirmed once again that, in the case of wheat yields in Polish voivodeships, the increase of average yield results in higher yield variability. The land quality showed reducing effect on wheat yield variability (Kobus P., 2010b). Also an increase of wheat production area results in lower yield variability. But to have such a result this increase must be done by expanding total arable area. The increase of production area achieved by simply increasing the share of wheat production area will result in the increase of yield variability, which is supposedly a result of moving production to area with less favourable conditions.

The main aim of this study is to find out the relationships between crop plants variability and the following factors: size of arable area, size of crop plant production area, share of arable lands used for crop plant production, land quality and average yield, and to find out wherever the results concerning wheat are valid for other crop plants in Poland.

The author would also like to investigate the possibility of spatial correlation between yields variability in particular voivodeships.

Data

The statistical data used in this analysis include the average yields of the following crop plants: rye, barley, potatoes and rape (with turnip rape) in Polish voivodeships in the years 1995 – 2007, and the data are available mainly from Eurostat (Eurostat, 2010). The Central Statistical Office of Poland (GUS, 2010) and Global Administrative Areas (GADM, 2010) were another data sources.

The following variables were used in the analysis:
AA – arable area, '000 ha;
PA – crop plant production area, '000 ha;
SPA – share of crop plant production area, %;
LQ – land quality;
AY – average yield of crop plant, dt/ha;
SD – standard deviation of crop plant yield after detrending, dt/ha.

Table 1

Values of the analysed data for rye in Poland's voivodeships (1995-2007)

Voivodeship	AA, '000 ha	LQ	PA, '000 ha	SPA, %	AY, dt/ha	SD, dt/ha
Dolnośląskie	958.9	0.664	55.7	6.4	27.7	3.4
Kujawsko-Pomorskie	972.6	0.868	118.4	12.2	25.0	2.9
Lubelskie	553.4	0.847	138.7	10.9	22.7	2.3
Lubuskie	1641.9	0.665	57.6	14.7	23.2	3.8
Łódzkie	392.3	0.674	236.7	24.7	22.3	2.7
Małopolskie	1275.3	0.923	17.8	3.2	25.0	1.8
Mazowieckie	491.8	0.939	392.6	23.9	21.4	2.1
Opolskie	587.9	0.845	23.2	4.7	30.9	3.6
Podkarpackie	515.4	0.820	41.3	7.0	23.1	2.0
Podlaskie	759.5	0.605	126.1	16.6	21.3	2.5
Pomorskie	689.0	0.786	100.9	14.6	23.4	2.8
Śląskie	415.2	0.740	43.2	10.4	25.2	3.0
Świętokrzyskie	835.9	0.811	61.3	11.9	21.3	2.2
Warmińsko-Mazurskie	1542.5	0.702	76.8	9.2	23.3	2.1
Wielkopolskie	864.8	0.933	283.9	18.4	25.5	3.3
Zachodniopomorskie	856.0	0.799	108.2	12.6	26.2	3.2

Source: author's calculations based on Eurostat, 2010 and GUS 2010

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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Variables: PA, SPA, AY and SD were observed separately for each plant. Apart from the data for arable area and crop plants production area, which were directly available from Eurostat, all the other variables were calculated by the author on the basis of Eurostat and GUS data. The description given above is sufficient for almost all variables except LQ. This is an artificial variable created for describing the agricultural quality of land. It is a compromise between the available data and the required accuracy.

The Statistical Yearbook of Agriculture (GUS, 2010) on page 75 presents a table entitled "Agricultural land by soil valuation classes and by voivodeships in 2000" with the area of land classified in particular classes, with subclasses class a and b pooled together. The LQ variable calculation was based on that table and coefficients for calculation of countable hectares for tax purposes from Region 2 (I - 1.8, II - 1.65, IIIa - 1.5, IIIb - 1.25, IVa - 1, IVb - 0.75, V - 0.3, VI - 0.15), while averages from appropriate subclasses were used as coefficients for land classes III and IV.

Table 1 presents values of investigated variables for rye. The first two columns include values of arable area and land quality in each Polish voivodeships. Since these variables are common for all considered models this information is not repeated in Table 2.

Table 2

Values of the analysed data for barley, rape and potatoes in Poland's voivodeships (1995-2007)

Voivodeship	Barley			Rape (with turnip rape)			Potatoes		
	PA, '000 ha	AY, dt/ha	SD, dt/ha	PA, '000 ha	AY, dt/ha	SD, dt/ha	PA, '000 ha	AY, dt/ha	SD, dt/ha
Dolnośląskie	81.6	33.8	3.7	75.9	24.0	4.2	43.4	201.3	26.1
Kujawsko-Pomorskie	127.1	31.6	3.8	50.3	24.7	4.3	44.3	191.0	28.8
Lubelskie	125.0	28.8	2.4	21.1	22.4	4.3	104.6	179.7	21.1
Lubuskie	34.6	27.1	5.2	17.5	21.1	4.1	14.1	187.3	32.4
Łódzkie	44.9	27.6	2.9	6.8	21.7	3.7	119.7	175.0	32.0
Małopolskie	46.6	30.2	2.1	2.5	23.8	3.6	75.3	163.9	20.2
Mazowieckie	68.5	27.4	2.1	14.2	22.2	5.0	173.0	173.1	23.9
Opolskie	65.1	37.9	3.7	53.5	25.6	4.3	20.6	202.4	26.1
Podkarpackie	27.0	28.2	2.3	8.7	19.3	2.4	75.4	176.6	19.3
Podlaskie	27.0	24.9	3.8	1.8	20.4	4.6	66.9	179.3	18.6
Pomorskie	59.7	29.5	3.2	39.3	21.7	2.9	39.1	195.2	25.8
Śląskie	37.6	30.4	3.1	13.1	23.3	3.7	35.5	187.3	23.3
Świętokrzyskie	59.6	26.8	2.7	3.2	21.6	3.7	57.0	163.3	15.9
Warmińsko-Mazurskie	64.8	26.5	2.6	51.4	19.4	2.3	28.1	185.2	21.8
Wielkopolskie	155.8	34.5	4.4	64.0	25.0	4.9	87.7	193.9	24.6
Zachodniopomorskie	88.7	30.8	4.0	74.4	21.9	3.4	30.4	199.2	22.7

Source: author's calculations based on Eurostat 2010

Research methods

For the analysis of the data two models were considered, that is the standard linear model of multiple regression and one of the models specific to spatial data analysis, namely

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simultaneous autoregressive model (Bivand R.S., et al 2008). The model of first choice was the linear model given by:

$$\mathbf{Y} = \mathbf{X\beta} + \boldsymbol{\varepsilon} \quad (1)$$

where: $\mathbf{Y}$ - dependent variable (standard deviation of yield SD), $\mathbf{X}$ - matrix of independent variables (log(AA)[1], WPA, SPA, LQ, AY), $\boldsymbol{\beta}$ - vector of regression coefficients, $\boldsymbol{\varepsilon}$ - vector of normal independent identically distributed random errors.

The problem with the application of the above model to the data analysed is the independence of random errors. As the observations come from administrative units it is possible that they are spatially autocorrelated. In such case, it is inappropriate to use model (1), which assumes independence of random errors. The proper model would be the following simultaneous autoregressive model:

$$\mathbf{Y} = \mathbf{X\beta} + \mathbf{B}(\mathbf{Y} - \mathbf{X\beta}) + \boldsymbol{\varepsilon} \quad (2)$$

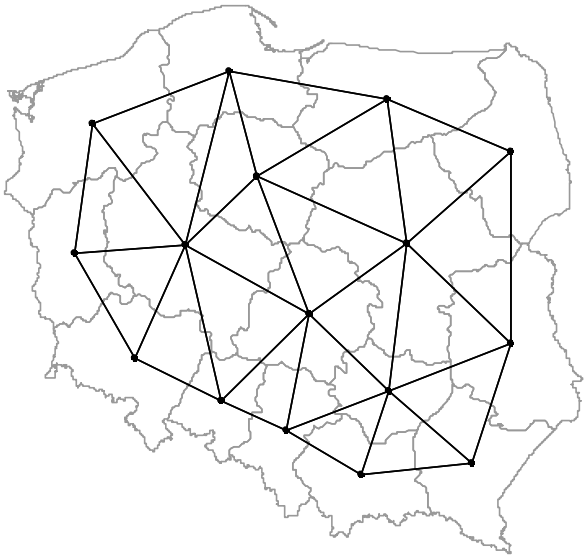
where: $\mathbf{Y}$ - dependent variable (standard deviation of yield SD), $\mathbf{X}$ - matrix of independent variables (AA, SPA, LQ, AY), $\boldsymbol{\beta}$ - vector of regression coefficients, $\mathbf{B}$ - matrix with values representing spatial dependence between areas, $\boldsymbol{\varepsilon}$ - vector of independent random errors.

One of the most popular tests for detecting spatial autocorrelation is Moran I test (Bivand R.S., et al 2008):

$$I = \frac{n}{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}} \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}\left(y_i - \bar{y}\right)\left(y_j - \bar{y}\right)}{\sum_{i=1}^{n}\left(y_i - \bar{y}\right)^2} \quad (3)$$

where: w_{ij} is the spatial weight of the link between areas i and j.

The matrix of spatial weights **B** is constructed on basis of the neighbourhood object presented in Figure 1. It has 16 rows and 16 columns, one for every voivodeship; each cell contains value 1 if the corresponding row and column voivodeships have a common border and value 0 otherwise.



Source: author's calculations based on GADM, 2010

Fig. 1. **Neighbourhood structure of Poland voivodeships**

All the statistical calculations were performed in R, an environment for statistical computing (R Development …, 2009) with the help of the following packages: sp, rgdal, maptools, RcolorBrewer, classInt, and spdep.

[1] The function log(x) is natural logarithm of x.

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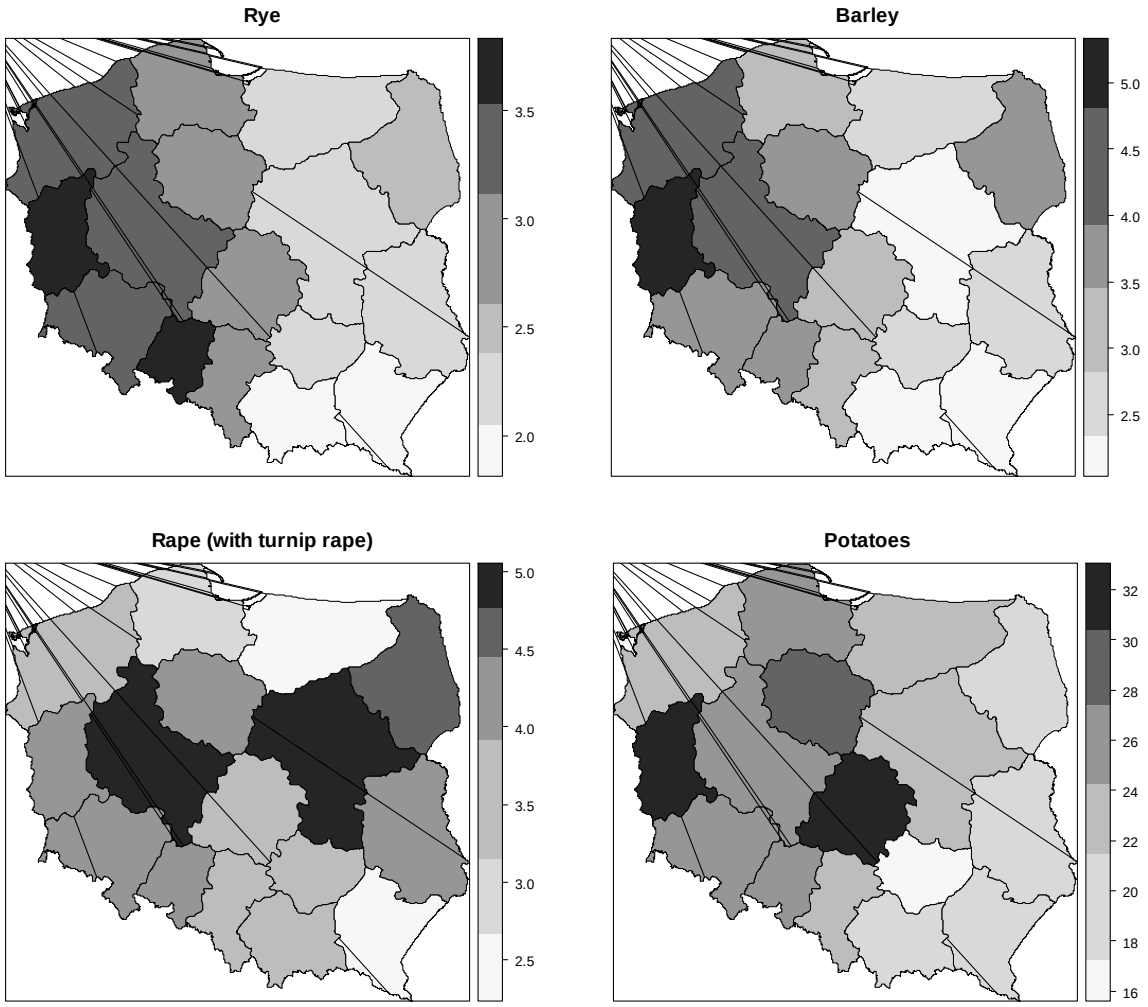
Results

The spatial distribution of standard deviation of particular crop plants yield after eliminating the influence of the trend, as shown in Figure 2, suggests that there exists a spatial autocorrelation of yield variability. It is clear that in the case of cereals all the Western voivodeships exhibit comparatively high values of wheat yield standard deviation, while the Eastern voivodeships show low variability, contrary in the case of rape it is the Eastern and Central voivodeships which have the highest variability. This kind of clustering is typical for spatially correlated objects. In the case of potatoes there is no evident clustering; it suggests that potatoes variability is not spatially correlated.



Source: author's calculations

Fig. 2. **Standard deviation of detrended crop plants yield, dt/ha (1995-2007)**

Moran I test was applied to confirm the visual impression and to quantify spatial autocorrelation.

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Table 3

Results from Moran I test for standard deviations of yields in Polish voivodeships

Plant	Moran's I	Moran's I SD.	p-value	Signif.
Rye	0.5697	4.3791	<0.001	***
Barley	0.4390	3.5858	<0.001	***
Rape	-0.0217	0.0319	0.3748	
Potatoes	0.2427	2.1925	0.0142	*

*Signif. codes: '***' - 0.001, '**' - 0.01, '*' - 0.05, '.' - 0.1*
Source: author's calculations

The results from Table 3 confirm the first notion about spatial autocorrelation for cereals, i.e. the values of Moran I statistic were relatively high and significant, which proves that the variability of cereals yield expressed in standard deviations is positively spatially correlated, i.e. a voivodeship with high yield variability is likely to have neighbours with similarly high variability. In the case of rape and potatoes the calculated results are opposite to the first impression, there is a spatial autocorrelation for potatoes but there is no such correlation for rape.

Although the existence of spatial autocorrelation of yield variability was confirmed in three cases, it does not mean that the standard linear model cannot be applied here. The assumption in the model concerned random errors rather than the dependent variable itself. It is possible that a large part or even the whole spatial autocorrelation can be attributed to the analysed factors.

The results of multiple linear[2] regression model estimation are presented in Table 4, where t-test was used for testing the significance of particular parameters. In all cases, except potatoes, there was a significant relationship between considered variables and crop plants yield variability, with determination coefficients above 70%. Contrary to the results from researches concerning wheat (Kobus P., 2010b) there were only one or two significant variables.

2 The name linear model does not imply that conditional expected value of dependent variable is a linear function of independent variable. It means that it is a linear function of model parameters.

Table 4

Results from multiple linear regression

	Rye			Barley		
Variable	**Estimate**	**p-value**	**Signif.**	**Estimate**	**p-value**	**Signif.**
(Intercept)	-4.584	0.198		15.373	0.131	
log (AA)	0.075	0.889		-1.663	0.259	
LQ	-0.319	0.863		-6.503	0.021	*
SPA	0.131	0.014	*	0.006	0.977	
PA	-0.005	0.127		0.019	0.332	
AY	0.250	<0.001	***	0.090	0.259	
R^2	0.777			0.715		
	Rape (with turnip rape)			**Potatoes**		
(Intercept)	-6.730	0.111		42.250	0.417	
log (AA)	0.874	0.128		-7.962	0.232	
LQ	-3.160	0.064	·	-7.276	0.562	
SPA	0.095	0.484		-0.816	0.352	
PA	-0.018	0.312		0.118	0.203	
AY	0.332	0.002	**	0.211	0.246	
R^2	0.717			0.402		

*Signif. codes: '***' - 0.001, '**' - 0.01, '*' - 0.05, '.' - 0.1*
Source: author's calculations

The results of the used tests are substantial only if the model assumptions hold, especially the assumption of random errors independence. Moran I test for linear models was applied to verify that assumption of random errors independence.

Table 5

Results from Moran I test for linear models

Plant	Moran's I	Moran's I SD.	p-value	Signif.
Rye	0.1070	1.8637	0.0312	*
Barley	0.2536	2.7960	0.0026	**
Rape	0.1088	2.3776	0.0087	**
Potatoes	-0.0762	0.3493	0.3634	

*Signif. codes: '***' - 0.001, '**' - 0.01, '*' - 0.05, '.' - 0.1*
Source: author's calculations

In the case of cereals the values of Moran's I statistic for linear models are lower compared with the values calculated simply for the dependent variables, but still significant. For the rape and potatoes the results of tests are reversed, i.e. in the case of potatoes there is no significant spatial autocorrelation and for rape there is a significant positive spatial autocorrelation.

Consequently the estimated linear models presented in Table 4 are reliable only in the case of potatoes. A model given by Equation 2, i.e. the simultaneous autoregressive model should be applied for all the other considered plants. The results of such application for all crop plants, except potatoes, are presented in Table 6.

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Table 6

Results from simultaneous autoregressive model

	Rye			Barley		
Variable	**Estimate**	**p-value**	**Signif.**	**Estimate**	**p-value**	**Signif.**
(Intercept)	-1.966	0.440		13.232	0.007	**
log (AA)	-0.237	0.526		-1.027	0.213	
LQ	0.335	0.796		-5.215	0.001	**
SPA	0.113	0.001	**	0.088	0.420	
PA	-0.003	0.130		0.010	0.308	
AY	0.207	<0.001	***	0.004	0.941	
Nagelkerke R^2	0.791			0.735		
	Rape (with turnip rape)					
(Intercept)	-5.622	0.043	*			
log (AA)	0.578	0.154				
LQ	-3.538	0.004	**			
SPA	0.061	0.498				
PA	-0.013	0.290				
AY	0.385	<0.001	***			
Nagelkerke R^2	0.735					

*Signif. codes: '***' - 0.001, '**' - 0.01, '*' - 0.05, '.' - 0.1*
Source: author's calculations

Comparing the results from linear and autoregressive models it is clear that although the values of parameters estimators changed it is not a big change and these variables, which were significant remained so.

A stepwise procedure was applied since every model also contains non-significant variables. In each step the least significant variable, i.e. the variable with the highest p-value was removed from the model. The procedure was assessed finished when all remaining variables were significant at 10% significance level. Final models are presented in Table 7.

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Table 7

Results from simultaneous autoregressive model and multiple linear model, without non-significant variables

	Rye[3]			Barley[3]		
Variable	**Estimate**	**p-value**	**Signif.**	**Estimate**	**p-value**	**Signif.**
(Intercept)	-3.673	0.002	**	16.764	<0.001	***
log (AA)	-	-		-1.636	<0.001	***
LQ	-	-		-4.306	<0.001	***
SPA	0.124	<0.001	***	-	-	
PA	-0.005	<0.001	***	0.017	<0.001	***
AY	0.224	<0.001	***	-	-	
Nagelkerke R^2	0.787			0.724		
	Rape (with turnip rape)[3]			**Potatoes[4]**		
(Intercept)	-2.211	0.066		-7.160	0.668	
log (AA)	-	-		-	-	
LQ	-4.227	<0.001	***	-	-	
SPA	-	-		-	-	
PA	-	-		-	-	
AY	0.421	<0.001	***	0.168	0.078	.
Nagelkerke R^2	0.703			0.205[5]		

*Signif. codes: '***' - 0.001, '**' - 0.01, '*' - 0.05, '.' - 0.1*
Source: author's calculations

Removing all non-significant variables did not greatly reduce value of Nagelkerke R^2, it still remained over 0.7. Although in the case of potatoes there was reduction of multiple R-squared from 0.4 to 0.2 and the overall performance of linear model for potatoes was unsatisfactory. Very low value of multiple R-squared and lack of significance of all variables except one, and even for that one it was on the significance level equal to 0.1. The reason for such behaviour could be the degree of change in potatoes production area during the years 1995-2007. It was reduction by over 60%.

Despite the fact that each model had a different set of significant variables there are some similarities. In all cases, except barley, the positive values of parameter estimates for the average yield confirm that the increase of yields cause higher variability in terms of standard deviations.

As to other variables the picture is more complicated. Let start with the signs of estimates, they inform of the relation character. The minus shows a negative relationship while the plus - positive. But before drawing conclusions like "the bigger barley production area the bigger average yield variability" one thing shall be made clear: the estimates presented in Tables 4, 6 and 7 come from multiple regression and their proper interpretation is that if for example the average yield for a voivodeship increases by one unit (dt/ha), **and all other variables remain on the same level**, the yield standard deviation for that voivodeship would increase

[3] Simultaneous autoregressive model
[4] Classical multiple linear model
[5] In the case of potatoes it is a standard determination coefficient from linear model

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by 0.224 unit (dt/ha) in the case of rye and by 0.421 units in the case of rape. Bearing that in mind the conclusion "the bigger barley production area the bigger average yield variability" is an oversimplification, the bigger barley production area without increasing total arable area means higher share of barley production area and consequently expanding barley production to less favourable area. On the contrary the minus before estimate of the log (AA) coefficient means that increasing total arable area lowers yield variability, but it could also be an effect of relatively decreasing share of barley production area.

The log transformation of arable area (AA) must be taken into account to assess the combined effect of increasing both arable area and barley production area. The increase of arable area by 1 thousand hectares gives higher increase of log (AA) for a lower reference point than for a higher one. The log transformation simply results in constant reaction of dependent variable to the increase of arable area (AA) expressed in percents while not transformed barley production area causes constant reaction of depended variable to the increase of production area expressed in thousands of hectares.

In the case of rye there is no arable area in the model and it may be observed that while the increase of production area lowers yield variability the increase of share in arable area results in higher variability.

Contrary to cereals there was no evidence of influence of arable area, production area or its share on yields variability of rape and potatoes. Land quality showed stabilising effect on yields of barley and rape, but for less demanding crop plants, like rye and potatoes such an effect was not observed.

Discussion

The analysis of yield variability showed significant influence of all considered factors, namely: land quality, natural logarithm of arable area, average yield and size of production area and its share in total arable land, although not all components for every crop plants.

The size of arable area and land quality showed a negative relationship with the yield variability while wheat production area and average wheat yield in a voivodeship showed a positive relationship. Considered variables together explain over 70% of yield standard deviations unevenness among voivodeships, which is a very high value. A research carried out in the Czech Republic (Haberle J. and Mikysková J., 2006) it was 35% and in Norway only 19%. The reason for such a high value of determination coefficient as the one observed could be the level of data aggregation. In the present study it was a voivodeship with the average size of arable area of 834.5 thousand ha; while in the Czech Republic it was a district with the average size of arable area of 37.8 thousand ha and in Norway it was a farm level. On the contrary for potatoes it was only 20% despite the same large voivodeships entities.

The negative influence of arable area size on yield variability showed in this study agrees with results presented in T. Górski and K. Górska (2006). Also, the negative influence of land quality agrees with the results of J. Haberle and J. Mikysková (2006) which shows a positive influence of high proportion of fertile soils on the average yield and negative on variability.

The previous paper of the author (Kobus P., 2010a) showed that an average yield level displayed a positive relation with wheat yields variability on the country level. Another paper of the author (Kobus P., 2010b) showed to be true also on the level of provinces, at least for wheat. This study confirms that it so also for rye, rape and potatoes but not for barley. In the Czech Republic (Haberle J. and Mikysková J., 2006) it was found out that the relationship between average yield and its variability was also significant but a negative one.

Those results are not necessarily contradictive. In the present study and those published in previous papers of the author (Kobus P., 2010a, 2010b) variability was measured by standard deviations while Haberle and Mikysková used variation coefficient. Although variation coefficient is a well established and widely used measure of variability it should not be used (in the author's opinion) when investigating the possible relation of average level of yield and yield variability. The variation coefficient is a ratio of standard deviation, and average and consequently variation coefficients tend to be negatively correlated with averages even if standard deviations are not.

Conclusions

The results of analysis confirm that an increase of cereals production area results in a lower yield variability. But this increase shall be achieved by expanding total arable area to have

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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such a result. The increase of production area achieved by simply increasing the share of cereals production area will result in the increase of yield variability, which could be a result of moving production to less favourable area. The production area size was not significant for rape and potatoes.
The increase of average yield results in higher yield variability for all the considered crop plants except barley. The land quality showed reducing effect on yields variability.
The spatial autocorrelation was significant in 3 out of 4 cases; consequently it suggests that using classical linear models for describing crop plants behaviour should be avoided, without a thorough examination of model assumptions.
Although variability of the investigated crop plants shows some similarities in reaction to production area and land quality it cannot be generalised for other plants.

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Development of Fruit Industry and Fruit Supply Chains in Poland

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Abstract. The development of consumer-driven, efficient, responsive, and innovative supply chains is crucial for the growth of fruit consumption in Europe and for a competitive and sustainable fruit sector. Currently, fruit supply chains are characterised by a relatively low level of consumer orientation and consumer-driven innovations.
The awareness of the functioning of supply chains in the European fruit sector should be increased to be able to increase the level of consumer-drivenness, efficiency, and responsiveness of fruit supply chains.
The paper aims at presenting the results of a review of fruit supply chains from the fruit industry in Poland. The analysis of supply chains is preceded by a review of fruit consumption, fruit production, trade characteristics, and trends. Moreover, the role of different actors in the functioning of fruit supply chains is presented as well as their quantitative characteristics.
A desk research was carried out to present the characteristics of fruit industry in Poland with particular attention to the functioning of supply chains in Poland,. This type of research includes use of general access sources of information. The following sources were used: literature on functioning of supply chains and role of particular actors in a chain, analyses considering the characteristics of fruit industry conducted by various research institutes as well as reports on the current state and development perspectives of the fruit market in Poland. In addition, statistical data from the national statistical office were used for the research purpose.
Key words: fruit production, fruit consumption, fruit industry, fruit supply chains, horticulture.

Introduction

Increase in fruit production in a situation of declining demand is the basic reason for large economic problems in the world horticulture. Fruit overproduction is mostly noticeable in countries with well-developed horticulture. A group of these countries consists of many Western European countries including Poland. Based on forecasts, it can be supposed that the economic situation of horticulture will worsen in the future and this applies also to Poland. Quality requirements as well as production costs are growing; whereas fruit prices are decreasing. There is also a growth of fruit production in the countries, which had not played a significant role in this field before (China, India, Turkey, and Iran). Large trade entities use various methods of encouraging costumers in larger purchases, mainly by price decreases, done at a cost of fruit producers. In order to counteract these processes, the attention should be focused on building commonly managed supply chains.

In the era of globalisation, companies shall quickly react to market needs and offer product of high quality with competitive prices if they want to get a position on the market and keep a competitive advantage over rivals. All these things contribute to creating value for a costumer. Nowadays, firms continually look for ways, methods, and techniques of management, which allow one to achieve these goals. One such concept is the implementation of supply chain management, which means the management of relations with suppliers and customers as well as clients in order to provide the highest possible value for a client with lower costs in a whole chain. It is a situation where the narrowly understood interests of one link shall be confronted with advantages for the whole chain. It is a great challenge for the Polish fruit sector where nowadays it is difficult to talk about supply chain management. Many companies creating supply chains operate currently near each other and do not perceive their customers as partners who should be involved in the determination of a common strategy of operation and agreeing on prices (Lemanowicz, 2009). The development of consumer-driven, efficient,

responsive, and innovative supply chains is crucial for the growth of fruit consumption in Europe and for a competitive and sustainable fruit sector.

The aim of the research was to review fruit supply chains from the fruit industry in Poland and provide an independent analysis of some of the key issues that have emerged in both theory and practice. For this purpose, the detailed research tasks were determined as the review of fruit consumption, fruit production, trade characteristics and trends, and presentation of the role of different actors in the functioning of fruit supply chains as well as their quantitative characteristics.

A desk research was carried out in order to present the characteristics of the fruit industry in Poland with particular attention to the functioning of supply chains. This type of research includes the use of general access sources of information as literature on functioning of supply chains and the role of particular actors in supply chains, analyses considering characteristics of the fruit industry conducted by various research institutes as well as reports on the current state and developments in the fruit market in Poland. Additionally, statistical data from the national statistical offices were used for the research purpose.

Characteristics of the Polish fruit industry

Poland is the biggest apple producer in Europe and one of the greatest all over the world. Apart from apples, there is a significant contribution of cherries, pears, currants, and strawberries. Global fruit production in Poland has not been characterised by increasing tendencies and it has been significantly changeable in particular years. In 2006, the total production of fruit in Poland was over 3.2 million tons. As far as apple production is concerned, it amounted to about 2.3 million tons, which meant 72% of the total fruit production. In 2007, as result of strong spring ground frost, crops had the lowest level for 20 years and they were by 47% lower than in 2006. Total fruit production in 2007 was at the level of 1.7 million tons. A decrease in the production in orchards was at the level of 53%, 55% - in the case of apples, 48% - for pears, 47% - for sweet cherries, and 45% - for cherries. In 2008, crops were more than twice higher than in the previous year and they were at the level of 3.85 million tons. Compared with the previous year, prices of dessert apples rose by 75% whereas apples for industry went up by 300%, and strawberries, redcurrants and plums by 80% (Nosecka, 2008). The year 2010 was not advantageous for fruit crops. They were on the level of 2.7 million tons, so 25% lower than in 2009. Apple production decreased by 30%, cherries - by 23%, and plums - by 24%. The basic causes of low production were disadvantageous weather conditions in the whole period of growth – cold and wet spring, hot summer, and slight frost in October. However, it was not a bad year for fruit producers because production decrease was compensated by price rise and production of all kinds of apples was profitable (IERiGŻ, 2010).

Table 1

Production of fruit in Poland (in thousand tons)

Specification	2002	2003	2004	2005	2006	2007	2008	2010[1]
Total fruit	**3018.0**	**3308.8**	**3520.9**	**2921.6**	**3210.8**	**1695.4**	**3840.9**	**2738.0**
Tree fruit	2 605.1	2 877.8	3 021.3	2 424.8	2 708.0	1266.8	3291.0	2212.1
Apples	2 167.5	2 427.8	2 521.5	2 075.0	2 304.9	1040.0	2830.0	1850.0
Pears	92.1	77.2	87.3	59.3	59.3	30.7	72.8	61.0
Plums	102.9	109.6	132.6	91.4	93.6	53.5	113.6	92.1
Cherries	173.1	191.1	201.7	139.9	194.9	107.7	201.7	145.0
Sweet cherries	40.8	44.1	48.4	37.5	38.4	20.2	41.0	37.1

[1] *Estimation*

Source: Horticultural crops output, Central Statistical Office Warszawa, successive years

Poland is one of the biggest producers of soft fruit in Europe. In 2008, production of strawberries surpassed for the first time 200 thousand tons and currants exceeded 190

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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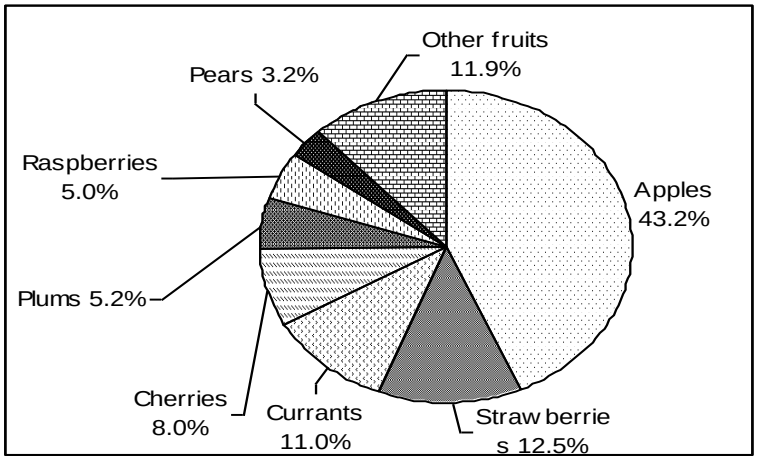
thousand tons. A significant share in soft fruit production was also found for raspberries and chokeberries.
Fruit in Poland is grown on the area of 405 000 hectares. Apple orchards have the biggest share in the fruit cultivating area, which occupies an area of 175 000 ha (43% of total fruit-growing area). Strawberries (12.5%), followed by currants (11%), and cherries (8%), also cover a significant area of horticultural production (Figure 1).



Source: authors' construction

Fig. 1. **Structure of fruit area in Poland in 2010**

As far as apple production is concerned, based on the balance data (IERiGŻ) and experts' estimations, it is possible to indicate the main directions of apple use. For example, in 2006, the production of apples achieved a level of above 2.3 million tons, from which above half (1.1–1.2 million tons) was destined for the processing industry, mainly for concentrated apple juice production. Nearly 35% of total apple production (0.7-0.8 million tons) was destined for direct consumption. Part of the production (0.3-0.4 million tons), mainly dessert apples, is exported. Concentrated juice is mainly produced from apples, which is a half-finished product for juice, nectars, and fruit beverage production. Above 90% of concentrated apple juice is exported. Poland is among the European countries where a significant part of apple production is destined for processing. In 2007, there was a significant decrease in production of fruit preserves as result of a decline in fruit production caused by spring ground frosts. The most considerable was a decrease in concentrated apple juice (by 40%). However, the decline in apple concentrate production was lower than the decrease in apple production and supply to the processing industry as result of the import of apples for processing. The season 2010/2011 may bring a decrease in concentrated apple juice production to the level of 130 thousand tons compared with 215 thousand tons in the season 2009/2010. Generally, experts assume that production of all fruit preserves and drinking juices will be lower in the season 2010/2011. The cause of this state is of course lower fruit supply.

The structure of fruit supply chains

This chapter presents the structure of fruit supply chains in Poland. As apple production has the greatest significance in Polish horticulture, this reflects the direction of apple distribution; however, what should be stressed is that these structures are also typical for other fruit. Figure 2 presents the main actors taking part in fruit supply chains in Poland.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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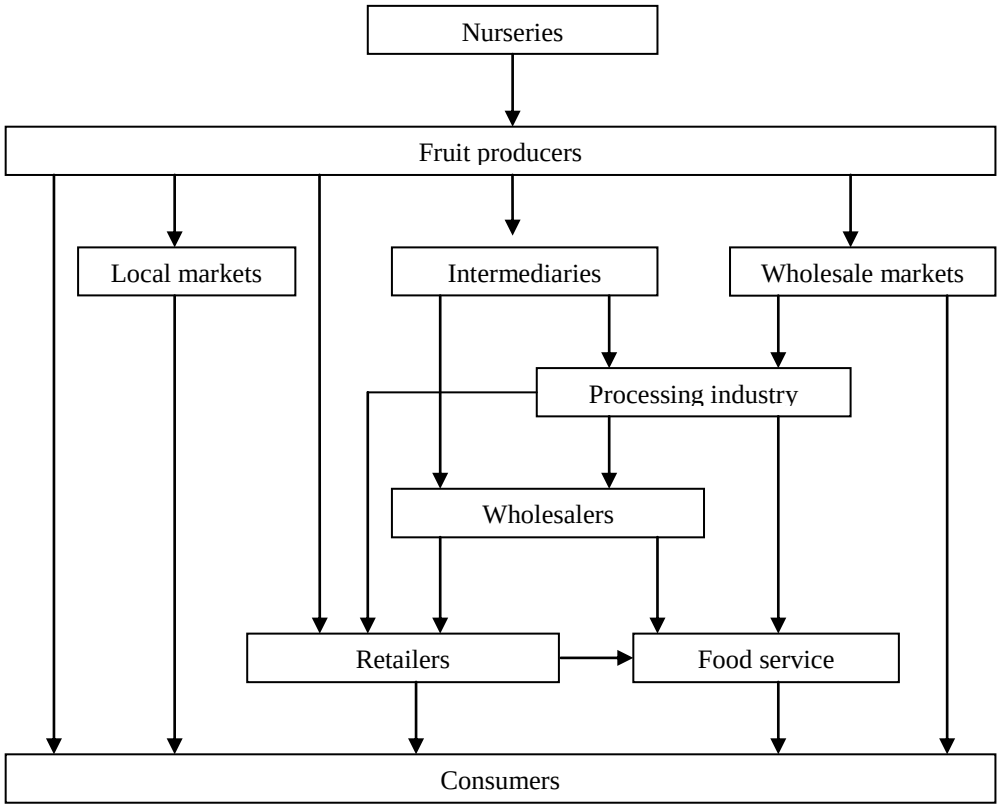

Source: authors' construction

Fig. 2. **Fruit supply chains in Poland**

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Nurseries. In Poland, nursery material is produced by about 1150 nursery gardens on the area of 1100 ha. Fruit trees produce on an area of about 500 ha. Polish fruit-tree nurseries have a fragmented structure. The majority of fruit- nurseries have about 0.5 ha. There are about 20% of farms with an area ranging from l to 3 ha and the same percentage applies to farms over 3 ha.

The production of fruit trees is about 10 million annually. Apple-trees account for 50%, cherry trees - for 20%, plum trees - for 9%, and pear trees and sweet cherry trees - both for 7% of total nursery material.

Fruit producers. In the period of 1998-2009, the total area of orchards in Poland rose from 265.2 thousand ha to 282 ha. In Poland, small orchards are still in the majority – those with no more than 1 ha constitute 77% of total number of farms representing only about 18% of the orchard area. Next 17% of fruit-growing farms have from 1 to 5 ha and they constitute nearly 33% of total area of orchards in the country. Only 0.25% of the total fruit-growing farms have orchards with an area of 20 ha or more, and they constitute nearly 10% of total area of orchards in Poland (Table 2).

Table 2

Structure of number and area of orchards in particular area groups of orchards

Specification	Area groups of orchards in ha						
	total	to 1 ha	1.01-4.99 ha	5.0-9.99 ha	10-19.99 ha	20-49.99 ha	>50 ha
	in % of the total number and area						
Number of fruit-growing farms	100	76.9	16.7	4.6	1.3	0.2	0.05
Area of orchards	100	18.1	32.8	25.3	14.1	5.4	4.3

Source: Badanie produkcji roślinnej, 2008, Central Statistical Office

The sector of fruit producers in Poland is very fragmented. This situation results in difficulties in creating efficient exchange relations between farms and other actors in the chain.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Transaction costs are high, information is scattered, and the quality of product is difficult to control.

From the data presented, it turns out that in Poland there is a low level of concentration of horticultural production. Despite this fragmented horticultural farm structure, the process of producer group creation is going slowly; although, there has been significant acceleration in this field recently. Currently, only about 65 producer groups in the horticultural sector are functioning. The supply of horticultural producer groups does not exceed 3% of total fruit production. In the EU-15 countries, concentration of production is considerably higher, and the share of producer groups (cooperatives) in the market supply exceeds 40% on average, in Belgium and the Netherlands it is as high as 80%.

Wholesale markets . The creation of a wholesale distribution system in Poland, similar to the one in the EU, was introduced under the governmental programme "For the Organisation of Wholesale Markets and Commodity Exchanges" in 1994. Currently, 7 supraregional, 6 regional, and many local markets are participating as part of this programme.

Processing industry (juices, nectars, fruit beverages)

In 2008, there was the highest annual increase in the value of sales of juices and nectars for the decade - at the level of 7.9%. It should be added that this value has been rising at the lowest pace compared with other categories of alcohol-free beverages. It results, among others, from the higher prices of these beverages. A leader of juice and nectar production in Poland is Maspex. In 2008, its participation in sales value was 28.1%. The position of the Agros Nova company has weakened from 17.8% in 2006 to 13.2% in 2008; whereas Hortex has been gaining a stronger position – with an increase from 12% in 2006 to 15.7% in 2008. In the years 2007 and 2008, there was also an increase of the Coca-Cola Company in its value of juice and nectar sales. A reason for such a rise is the launching of one line of juices, nectars, and fruit beverages within the Cappy brand on the market. The proportion of own brands of chain stores was at the level of 33.9% in the sales volume and 19.2% in the sales value in 2008. Table 5 presents changes in juices and fruit as well as fruit and vegetable nectars, and beverages in the period of 2001-2008. An analysis of this data displays that production of drinking juices has been continuously declining; whereas there has been an increase in nectar production, which was unpopular in Poland at the beginning of the present decade but its production reached the level of 320 million litres. The decrease in the role of drinking juices is caused by the adjusting process of entities in this sector to high prices of concentrated fruit juices on the world market. In 2008, there were about 110 enterprises functioning in the beverage sector. The contribution of 4 market leaders: Maspex Wadowice, Agros Nova, Hortex Holding, and Coca Cola Company (Cappy juice) in the market of juices, nectars, and fruit and fruit-vegetable beverages reached 60%. Apart from big firms, there are numerous groups of small plants producing for the local markets.

Concentrated juices produced in Poland are used as raw material to produce juices, nectars, and beverages. The leaders in this sector cover part of the demand for concentrated apple juice with their own production. As far as the juice-producing branch is concerned, there are tendencies to separate the sector of concentrated juices from the drinking juice sector. Factories producing juices and beverages reduce own production and purchase in enterprises producing concentrated juices. The contribution of juices produced directly from fruit and vegetables amounts to about 5%.

Wholesalers. Wholesale in Poland is run in closed storehouses (free-standing buildings), shelters, silos, and storage yards – the majority of them are storehouses. In 2008, about 29 000 closed storehouses with storage areas were functioning in Poland. In 2007, total resources of modern storage areas were at the level of 3,818,000 square metres (compared to 2,722,000 square metres in 2006). The number of new investments has been rising dynamically, especially in the regions. In 2007, only 16% of new built storage areas were located in the region of Warsaw. The majority of storehouses were built in Poznań (22.5%), Upper Silesia (20%), central Poland (more than 19%), and in Wroclaw (14%).

Wholesale hypermarkets (self-service wholesaling) functioning in Poland belong to two companies with foreign capital: Makro Cash and Carry Poland Ltd (part of Metro AG Concern),

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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and Selgros (the main shareholder is Rewe Group). In 2008, Makro had a network composed of 29 outlets, while Selgros had 11 outlets.

Distribution centres are considered the most modern forms of capital-area concentration established by wholesale enterprises to service their own or cooperating storehouse networks as well as logistics centres organised by specialised firms (logistic service operators). Regarding the fragmented structure of both production and trade, there are difficulties in establishing distribution and logistics centres faster, so consequently, there are differences between Poland and developed countries concerning the abovementioned. However, a process of building professional distribution centres is nowadays very dynamic in Poland.

Retailers. In Poland, the majority of food shops are still traditional small ones with an area up to 500 m^2. Their share in the food trade is over 60%. The significance of hypermarkets, supermarkets, and discount shops in Fast Moving Consumer Goods (FMCG) sector turnover grows dynamically.

From the data of the Nielsen research company, it may be concluded that the number of all food shops in Poland declined in 2008. There has been a decrease in a number of small entities, community shops, and food kiosks; whereas there has been an increase in the number of super- and hypermarkets.

In 2008, there were 59 827 small food shops and the number was less by 10% than in the previous year. Compared with the year 2004, there was a decline in the number of small shops by 13.3 thousand trading entities. In the period of 2007-2008, an average number of food shops increased by 2%, i.e. from 31 951 entities to 32 547. For the comparison, the number of hypermarkets rose from 245 to 267, which means an increase by 9%; whereas in the case of supermarkets it increased from 3567 to 3916 – by 10%. In total, in the traditional trade in 2008, there were 102 153 food shops; whereas in modern trade there were 4183 entities.

Discount shops are very popular among Polish consumers. In 2006, the total number of discount shops exceeded 1500. Discount "Biedronka" has the dominating position in a group of discount shops. In 2006, it had 800 shops; whereas in 2010 it opened its 1600^{th} shop. This chain is located in 600 Polish towns. The owner of Biedronka shops, Jeromino Martens company, has plans of a dynamic development and wants to open 500 new shops during the next two years.

Consumers. Nowadays, consumers do not have to be persuaded that fruit plays an important role in their diet. Fruit provides the necessary nutritional elements, and diversifies human diet. Discovering vitamins and their role for the organism, people have shifted fruit from a group of foodstuff with additional tastes to a group of basic and necessary foodstuff in a rational nutrition (Kubiak, 1999). Fruit consumption in Poland has significantly changed from 33 kg per person in 1970 to 55 kg per person in 2009.

The recent increase in fruit consumption has been irregular and has fluctuated in Poland. However, in a long period one can observe a considerable rise in its levels. Despite significant increase in fruit consumption in Poland, it has still been very low compared with other countries of the EU. Fruit consumption in Poland is more than 20 kg lower than the recommendations of the National Food and Nutrition Institute.

As some research shows, only 2% of Poles eat 5 recommended portions of fruit a day. Fruit and vegetable are eaten 1.8 times a day on average. A proportion of people who eat 3 and more portions of fruit and vegetable per day is 18%.

The research also shows that there is a low level of fruit consumption in a group of children. Only 8% of children eat fruit 5 times a day. Children aged 4-15 years eat fruit not more than 2 times a day. Only 4% of children eat fruit at school; whereas 5% - drink juice at school. Fruit consumption in a group of children takes place usually at home (SMG/KRC, 2007).

Taking the fact of the low level of fruit consumption in Poland into account, there have been more promoting activities in order to encourage consumers to consume fruit. An example of such activities was the 5-a-day campaign as well as product innovations continuously launched on the market.

Conclusions

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Continuous changes take place in fruit farming, both in fruit production and distribution. They are getting more and more difficult for fruit producers. New problems are complex and require long-standing solutions. An analysis or solution of one problem often needs thinking commonly on a few different factors, closely related with each other. Such problem solving is described as system or complex activities. A group of basic activities, which should be implemented in the Polish fruit farming consists of an increase in the yield per area unit and improvement of fruit quality; and the building of efficient and managed supply chains. Therefore, processing plants should take up system activities in order to provide themselves with the necessary material. The most important operations in this field are contract agreements with a particular producer group, which will take into account minimum purchase prices. Another important task for plants is to establish own producer organisations, which can be closely cooperated with. It is a necessity to treat a partner seriously, a producer of fruit for processing, especially in the case of fruit purchase and prices. Many companies look for improvement of their profitability at a cost to the companies they cooperate with. However, such an operation, which consists of throwing costs on other partners in a chain, does not contribute to the improvement of competitiveness. As a result, all costs generated by the chain's participants are displayed in a product price paid by a consumer at the moment of providing a product on the market. It should be stressed that contemporary smaller plants operating based on Polish capital are characterised by better cooperation and treatment of producers.

Another very important activity is fruit promotion, to ensure an increase in consumption. The programme "Fruit at school" is a very good example and it was planned to start in the EU countries from the school year 2009/2010.

Moreover, a lack of a strong trade organisation is a weak side of the Polish fruit farming, especially in the situation of fruit export. There has been "Polish-Polish" competition on the foreign markets of fresh and processed fruit. As a result, prices of fresh and processed fruit are considerably lower. It is a loss for fruit and processed fruit producers.

The development of fruit farming is strongly connected with a level of national nurseries. It has been at a good level for a few years. National production of nursery material covers the needs of Poland's fruit farming. However, there is the necessity for the improvement of tree quality.

Activities specified above do not exhaust of course all operations, which should be taken up in order to improve the situation of the Polish fruit industry. It is especially important to build supply chains, since the development of consumer-driven, efficient, responsive, and innovative supply chains is crucial for the growth of fruit consumption in Europe and for a competitive and sustainable fruit sector.

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Production Cost Estimates for Silage from Energy Crops

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Abstract. The cost of silage produced from seven potential energy crops in Latvia according to the technologies advised by scientists in the prices of 2009 was calculated in the present paper. It was stated that the average cost of growing, harvesting, and ensilaging crops is approximately LVL 490 ha^{-1} in year 1 and ranges within 8% depending on the chosen technology map for growing crops and the biotechnological properties of crops. The cost of producing maize silage was LVL 608 ha^{-1} or LVL 12.15 t^{-1}. However, it is necessary to define more precisely the outcomes of production technology and biogas in order to make general conclusions on the use of energy crops for energy production.
Key words: renewable energy, silage for biogas, energy crops, production costs.

Introduction

Latvia has undertaken to increase significantly the amount of using renewable energy sources, reaching a proportion of 40% for renewable energy in its total energy consumption in the year 2020. The output of electrical energy from renewable energy sources (RES) has to increase from 3030 GWh in 2010 to 5191 GWh in 2020, i.e. by 71%. It is planned that in 2020 hydro energy will account for 57% (97% in 2008), but the output of electricity from biomass and wind will account for 24% and 18%, respectively, of the total electric energy generated from RES. Besides, the output of electricity from biomass will increase from 70 GWh in 2010 to 584 GWh in 2020 (Ministry of Economics, 2010). A possibility of producing new products that feature a stable demand would positively affect the development of farms. Farmers want to use such a possibility. The administrative decisions made in 2010 concerning biogas facilities composed the entire amount of 467959 MWh set by the public seller (Latvenergo), reaching the total number of decisions of 60; this means that 60 businessmen have the right to sell the electricity produced by them according to the purchase obligation (Ministry of Economics, 2010). The area sown with maize, which is the main crop for biogas production, also increases. In 2009, the sown area has increased by 66.9% compared with to 2008; thus, reaching 9.8 thousand ha; an average yield has also increased from 213 to 230 cnt ha^{1} (CSB of Latvia, 2009). Yet, the yields significantly lag behind the experiments conducted by Latvian scientists where the yields exceed 650 cnt ha^{-1} (seminar "Maize for Biogas and Feed Production" at the Research and Training Farm "Vecauce", Latvia University of Agriculture, 20 August 2010). Even if taking into consideration the fact that real and experimental yields cannot be compared directly, a three times lower yield is impressive. A question arises whether maize is an optimal crop for silage production to produce energy in all the regions of Latvia. Latvian scientists have not given an unambiguous answer to it and possibly will not do it ever. The production of silage is determined by not only soil specifics and climatic conditions, but also by farm specialisation and product logistics. Therefore, new varieties of crops, which are suitable for biogas production, are searched for in Latvia. The present paper analyses plants of various species that are viewed by specialists in crop farming as potential for biogas production in Latvia include grasses: alfalfa, galega, tall fescue, and red canary grass; oil crops: winter rape, sunflower; and a biomass crop: maize. The research aim is to ascertain the costs of producing silage from the above-mentioned crops and to make their mutual comparisons per 1 ha and 1 t of output. The crops and their production technologies – land tillage, fertiliser doses, harvesting etc. – were chosen according to the recommendations of A. Adamovičs, a crop farming specialist at Latvia University of Agriculture as well as interviewing agricultural practitioners.

Data and methods

The methodology of the Latvian Rural Advisory and Training Centre (LLKC) "Calculations of Gross Margin for Farms" was used for calculations. The LLKC report "Calculations of Gross Margin for Farms" is issued every year by means of co-funding of the Ministry of Agriculture of

the Republic of Latvia. A table, which includes incomes and expenditures of production is used for calculating gross margins. The main items in the table include incomes from products sold, raw material costs (seed, fertiliser, plant protection etc.), costs of operations performed manually and by machines, and the result part – gross margin 1 (income minus raw material costs), gross margin 2 (income minus raw material costs minus costs of operations performed manually and by machines), gross margin 3 (gross margin 2 plus national and the EU support). The methodology was not used completely, since biomass for energy production is an intermediate product. Therefore, a potential gain from biomass sales was not calculated, but only the costs per 1 ha of land utilised and per 1 t of biomass produced were calculated in the research.

The prices of seed of crops were taken from a price list of "Latvijas šķirnes sēklas" Ltd for 2009, and the prices of fertilisers and plant protection means were taken from a price list of "Latagra" Ltd for 2009.

The costs of manual and machine operations compose the costs of special machinery, product transportation, and biomass preparation machinery. The necessary data for calculating the costs of manual and machine operations were obtained from the annual LLKC survey "The Pricelist of Machinery Services in Latvia in 2009", agricultural producers of Zemgale as well as specialists in special machinery (tunnel technology). The costs include the value added tax (21% rate). Trench technology is used for ensilaging biomass, except the cost calculation for maize biomass, which includes the cost of ensilaging biomass using tunnel technology.

The biomass and all the resources used for its production are transported at a distance of 10-15 km and 10-12 t are delivered per one transportation – such an assumption is based on the recommendations of specialists in crop farming.

The surface area of polythene film used for ensilaging biomass is assumed 0.84 m^2 per 1 t of biomass. The assumption is based on the LLKC specialists' recommendation that 70 metres of a film of 6 m width are needed for covering 500 t of biomass. Compacting biomass in a trench requires 3.6 minutes per 1 t of biomass, since a compacting of 500 t of biomass takes 30 hours on average.

Plants of various species that are viewed by specialists in crop farming as potential for biogas production in Latvia include grasses: alfalfa, galega, tall fescue, and red canary grass; oil crops: winter rape, sunflower; and a biomass crop: maize were researched. Within the present research, these plants are regarded as biomass plants, as the output is calculated in total tons per hectare of biomass.

A general description of plants used in the calculation is given in the publication "Production and Use of Energy Crops" by A.Adamovičs and his colleagues.

The alfalfa genus (Medicago L.) is rich in juice. Only two species of it may be grown for biomass production in Latvia. Yellow or crescent-shaped alfalfa (M. falcata L.) is perennial grass. This species is rich in form and very valuable owing to its drought and cold resistance. In Latvia, it grows in wild hilly permeable to water places.

Hydride alfalfa or bastard alfalfa (M. media Pers. syn. M. varia Martin.) is a natural crossbreed of yellow alfalfa and the cultivated one; it is often classified as a separate species. Hydride alfalfa is more popular on Latvia's conditions, as it is more productive than yellow alfalfa. This species is plastic and adapts well to growing on various conditions.

Galegas are the grasses of the pea genus (Leguminosae), and this genus comprises 8 species, of which only two – Eastern galega (Galega orientalis Lam.) and herbal galega (Galega officianalis Lam.) is widely used. Eastern galega is grown for biomass.

Tall fescue (Phalaris arundinacea (L.) Raush.) is a twining grass having long and strong roots. The grass is up to 2 m high and very leafy. The grass's lifespan reaches 10 years if it is sown, yet, in the wild its lifespan is unlimited. In the wild, it usually grows in meadows and on banks of rivers and lakes.

Red canary grass (Festuca arundinacea Schreb.) is a perennial twining grass. It grows up to 1.5 m high, its stalks are rougher, its leaves are wider compared with meadow fescue; it can be productive for 8-10 years.

Rape (Brassica napus ssp. oleifera Metzg) belongs to the mustard genus (Cruciferae), cabbage family (Brassicaceae). This plant has well-developed taproots and strong 1.1-1.9 m high stalks.

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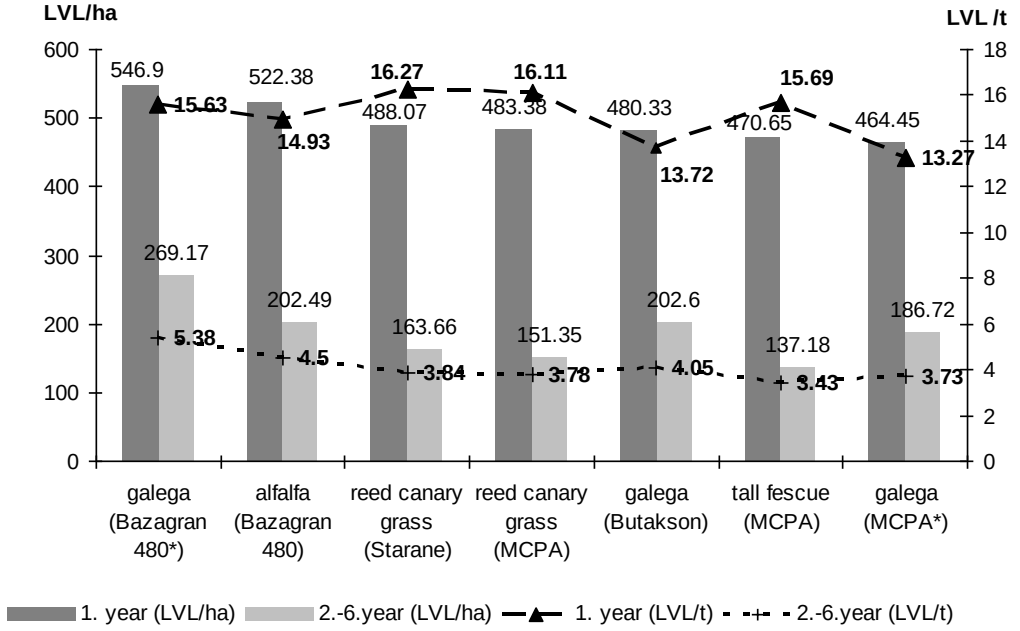
Common sunflower (Helianthus annuus L.) is an annual plant of the aster family (Asteraceae). The domestic sunflower's (H. cultus Wenzl.) subspecies (ssp. sativus Wenzl.) is used for biomass production.

Maize (Zea mays L.) is an annual cross-pollination caulescent plant belonging to the grass genus and having a well-developed but shallow root system. Its stalks are broad and lodge resistant with a diameter of 1.5-3.5 cm and 0.6-6 m high.

The content of dry matter of biomass is of great importance to produce biogas. It is different for the biomass plants that are researched: 15-23% for grasses, maize has also a high content of dry matter of approximately 19%, while oil plants have a relatively low content of dry matter or 12-14% (Adamovičs A, et. al., 2007).

Results and discussion

According to agronomy specialists, Latvia's climatic conditions are suitable for growing grasses for biomass production. The wide choice of grass species and their various agricultural and biological properties allow any farm to find an appropriate grass for it. Growing perennial grasses is related to lower intensity of field works during Years 2-6, which significantly reduces the cost of biomass. Latvia has the highest proportion of agricultural land per capita in the EU or 1.08 hectares per resident compared with the average 0.41 hectares per resident in the EU, which is regarded as an important factor for successful development of biogas production (Nielsen J.B.H., Oleskowicz-Popiel P., Al Seadi T., 2007). Presently, Latvia does not lack agricultural lands, which allows the country to increase agricultural output extensively (by increasing the area of agricultural land). It is seen in Figure 1 presenting a summary of production costs for grasses, using various technologies and means for growing plants.



Source: authors' calculations

Fig. 1. **Costs of growing grasses in Year 1 and Years 2-6, LVL/ha, LVL/t**

In total, the average variable costs of cultivation, harvesting, and ensilaging grasses in Year 1 is approximately LVL 490 ha^{-1} and does not exceed 8% depending on the chosen technology map for growing crops and the biotechnological properties of crops. In the technology maps, a special attention was paid to choosing plant protection means and their impact on the cost. Bazagran 480, which is an expensive herbicide (its price was LVL 28.75 per litre in 2009), has the greatest impact on the cost. It has to be noted that Bazagran 480 and MCPA are not recorded in the Latvian Plant Protection Register as usable for growing galega. Therefore, these scenarios of growing plants may be regarded as theoretical and are marked with the asterisk sign (*). If calculated per hectare, the highest costs are obtained for growing alfalfa, yet its production is justified owing to the high yield of this plant, thus keeping the costs of

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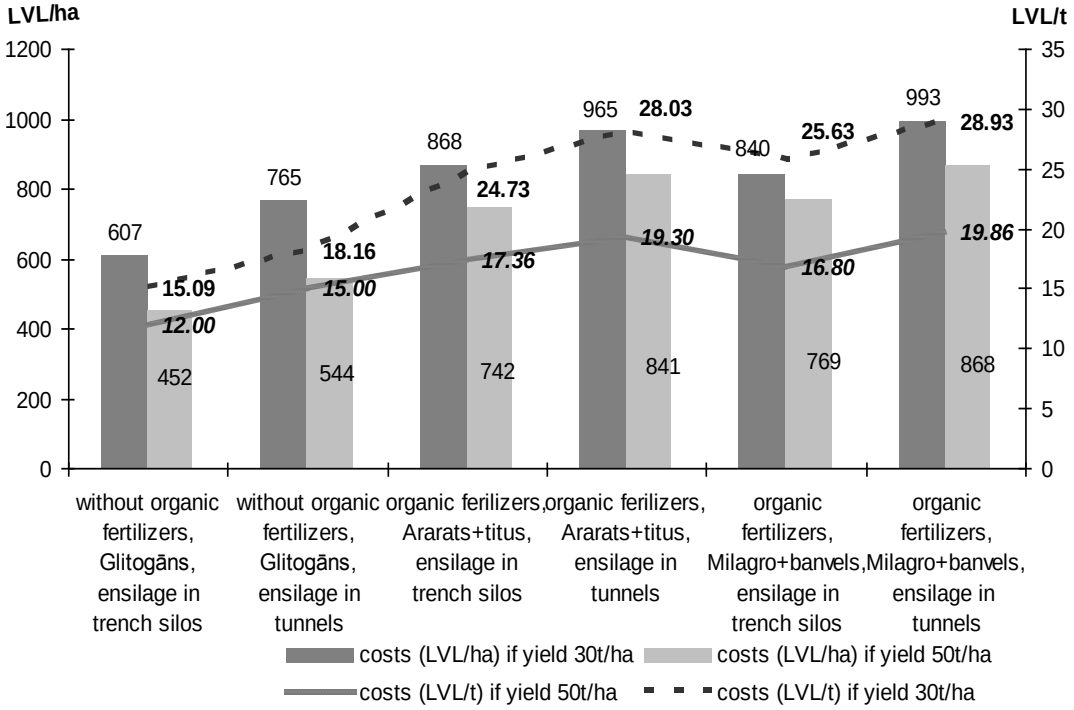
biomass slightly below LVL 15 t^{-1}; a better result is provided only by galega, using the herbicide Butakson. By intensively growing red canary grass, the costs per hectare are below the average value, yet its costs per ton are relatively high: 16.11 LVL t^{-1} in the year of introduction; yet its production costs decrease during Years 2-6, amounting to 3.78. It has to be concluded that the choice of herbicide may significantly affect the cost of biomass (Bazagran 480), yet in general, it depends on the structure of costs (Figure 4). A greater investment in Year 1 for red canary grass and tall fescue is paid back by smaller investments in Years 2-6.

Among the producers of biogas, maize is very popular. This may be explained by its high yield of biomass, high content of dry matter, and popularity in Germany. The experience taken over from this country had the largest effect on the development of biogas production from crops in Latvia. Maize is a crop to be grown intensively; it requires a lot of warmth, light, and moisture.



Source: authors' calculations

Fig. 2. **Production costs of silage from maize**

Six technology maps for growing maize were used in the present research. Four of them, which are based on scientific research, were developed by a professor A. Adamovičs, the other two were developed by farmers and based on their experience in farming. The technology maps of the practitioners feature less fertilisers, and no manure is used at all. The costs of maize biomass produced in such a way are lower, but a special attention has to be paid on the threat of depleting agricultural land, which endangers the sustainable production of biogas. The technology of ensilaging biomass significantly affects the production of it. After comparing the traditional technology of ensilaging biomass in trenches in Latvia with ensilaging biomass using tunnel technology, one has to conclude that the costs increase by one fifth in case of tunnel technology. It has to be noted that the cost of ensilaging biomass in trenches does not include the expenditure on constructing a trench, which is not included in variable costs and which is not necessary if using tunnel technology for ensilaging biomass. By intensifying production and saving funds on technical infrastructure, the impact of technology of ensilaging biomass on the cost of production loses its significance. In general, the technology maps of the agricultural practitioners are much cheaper if comparing the best technology map of the practitioners (ensilaging biomass in trenches) with the best one recommended by the scientists (Milagro + Banvels, ensilaging biomass in trenches). Both technology maps consider a yield of

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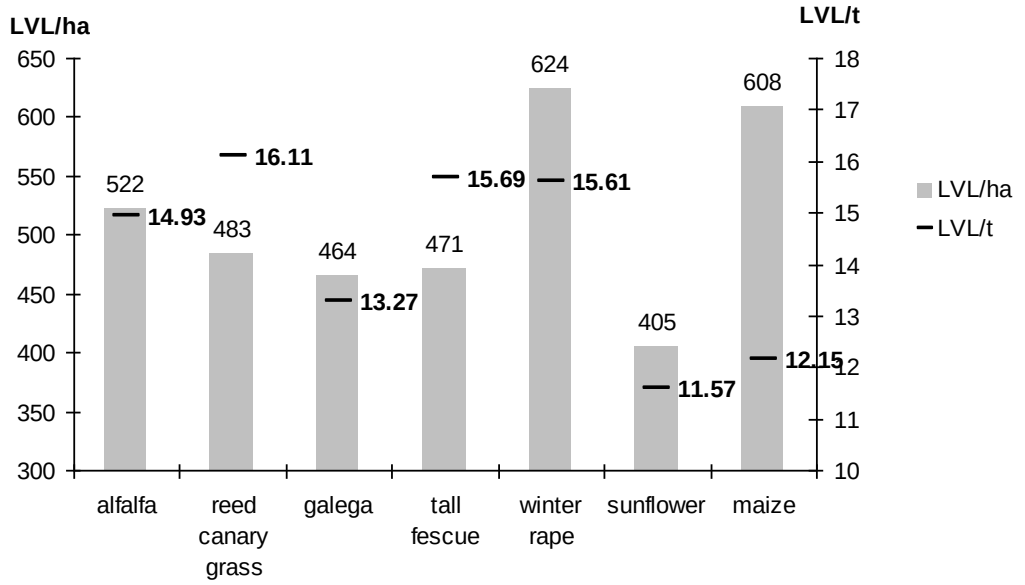
50 t ha^{-1}: the technology map of the scientists is 40% more expensive, respectively, LVL 12.00 t^{-1} and LVL 16.80 t^{-1} or 70% costlier at a yield of 30 t ha^{-1}. According to the technology maps developed by the scientists, the cost of silage produced does not significantly change depending on the plant protection means. The impact of one weight unit on the costs of silage increase significantly considering the total variable costs. Respectively, with a decrease in the yield of maize by a ton, its cost increases by LVL 0.41 – in case of the practitioners a decrease was only LVL 0.16.

In producing silage for biogas production, the choice of particular crops will be determined by not only the cost of silage, but also soil properties, the location of agricultural land, farm management specifics etc. Nevertheless, it is possible to compare the costs of silage within the present research.



Source: authors' calculations

Fig. 3. **Costs of silage from energy crops in Year 1 (year of introduction)**

The popularity of growing maize corresponds to the gained results that show a low cost for intensive production or LVL 12.15 t^{-1}. However, when analysing the data, the period of reproduction of grasses up to 6 years, theoretically even 10 years, has to be taken into account, which significantly reduces the costs of silage over the next years after fields are sown with this crop. Silage made from winter rape is expensive both in terms of cost per 1 hectare and per 1 ton. Using rape for silage is also inefficient due to its low content of dry matter. Yet, it has to be remembered that rape is a valuable oil crop, which is used for biofuel production. Opposite results are shown by another oil crop – sunflower; the cost of silage produced from equal to LVL 11.57 t^{-1}. Although the gained results are optimistic, the practical use of sunflower is affected by the very low content of dry matter – less than 10%, while at the beginning of blooming, the content reaches 12-14%.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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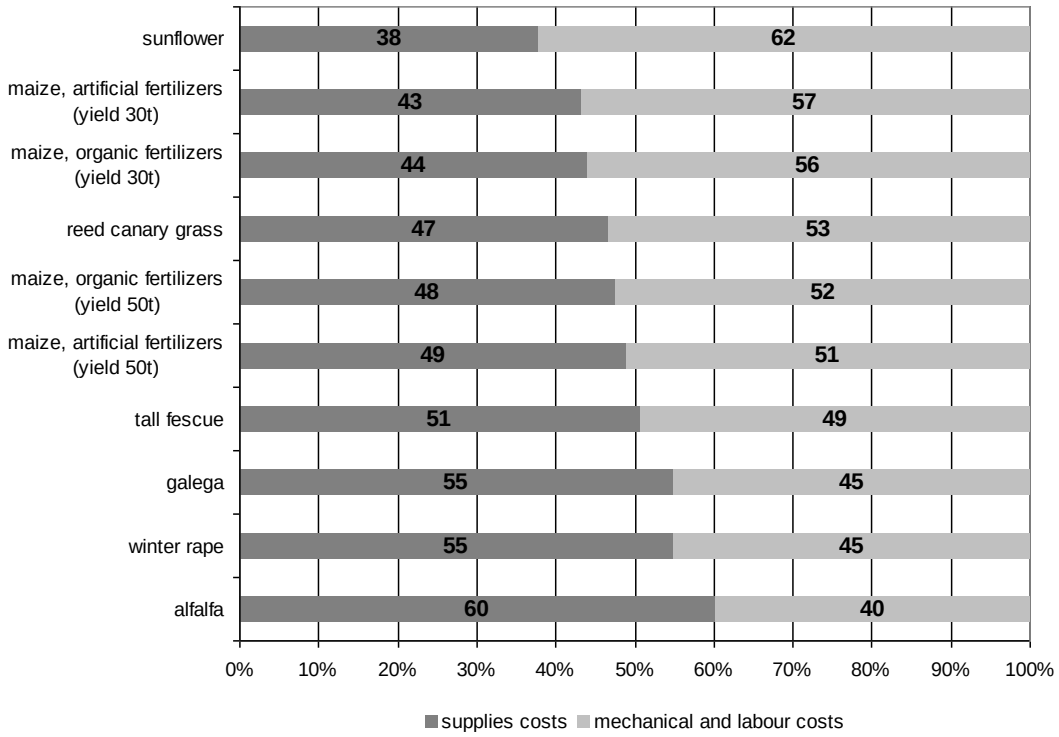

Source: authors' calculations

Fig. 4. **Structure of variable costs in growing energy crops, percentage**

In growing energy crops, the structure of costs may be itemised as follows: raw material costs, and costs of manual and machine operations. The ratios of these costs might change in case farmers exploit their own machinery. In the present research, the costs are calculated as if these were services that are purchased, or in case operations are performed according to another technology map, or whether digestate from biogas production or manure is used as a fertiliser. After analysing the exogenous factors constituting the cost, one can state that the raw material costs area affected by the availability and price of financial capital (loans for operational capital), whereas the costs of machinery and labour are impacted by the price of fuel.

Karina Ēriksone and her colleagues compared the costs of energy crops in the EU countries, and found that the costs were relatively lower in the East European countries, respectively, 41.3 % of unit cost for services of producing energy crops in the North Europe (Ericsson K., Rosenquist H., Nilsson L.J. 2009). On the one hand, the differences in price levels and the relatively large areas of agricultural land per capita establish prerequisites for efficient production of biogas and electric energy. On the other hand, there are significant differences in the yields of energy crops that are lower in the North-Eastern Europe. The yield can be affected not only by climatic conditions, but also by the technology of growing crops (Gaile Z., 2010; Kopmanis J., Gaile Z., 2010). The output of biogas produced from the silage of energy crops is also important, which significantly influences the costs of electric energy per one hectare of land utilised or per one unit of money invested, as, for instance, the average output of biogas produced from red canary grass is 263l kg $_{vsd}^{-1}$, but from maize it is 553l kg $_{vsd}^{-1}$ (Dubrovskis V., Adamovičs A., Plūme I., 2009). Therefore, it is necessary to develop optimal technologies of growing energy crops that could be used for the production of silage in practise, and to measure the output of biogas and the content of methane. It is needed to have a possibility to identify the necessary cost per unit of energy and to make a generalisation on the efficiency of consumed resources.

Conclusions

- The production of biogas from silage has a stabilising role in energy production, thus making it less dependent on the availability of remnants in livestock farming.
- The average costs of growing, harvesting, and ensilaging crops are approximately LVL 490 ha^{-1} in Year 1 and ranges within 8% depending on the chosen technology map for growing crops and the biotechnological properties of crops.
- The costs of silage produced from maize is significantly affected by the amount and type of fertiliser used. The technology maps of the farmers feature less fertilisers, and no manure is used at all. The cost of maize biomass produced in such a way is 40% lower, but a special attention has to be paid on the threat of depleting agricultural land, which endangers the sustainable production of biogas.
- The use of oil crops for producing silage cannot be justified neither economically nor from the point of view of energy gains, since their content of dry matter, which is important in biogas production, is low – up to 12% of total weight, which is twice as less as in grasses.

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The research has been supported within the ESF project "Support for the Implementation of Doctoral Studies at Latvia University of Agriculture", Agreement No. 2009/0225/1DP/1.1.1.2.0/09/APIA/VIAA/129

Economic Effect of Latvian Dairy Sector Secondary-level Integration

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Abstract. Dairy sector is an important part of Latvian agriculture. Dairy sector structural aspects are crucial for its development as fragmentation is characteristic both for dairy farming and dairy processing in the country. Insufficient research exists on the secondary level in this respect. Integration may help partially or fully decrease the sector's fragmentation. The author analyses the economic effect of integration in the Latvian dairy processing within the period of 1996-2009. Gross value added at factor cost is used as a key indicator of the economic effect.

The majority of Latvian dairy processing turnover is produced in horizontally integrated dairy processing companies' groups and merged companies. Most sizable observed integration arrangement series has increased consolidated turnover of the involved group by approximately one-fourth. Almost always integration arrangements have taken place within Latvia. In the period of 2003-2009 no previously non-integrated companies have joined the integration arrangements. Non-integrated companies' contribution to the GDP relative to their turnover has been higher than that of integrated companies. However, most gross value added is generated in integrated companies as they are among the largest. The author discovers that integrated dairy processing companies at times of financial shock are more financially susceptible than non-integrated companies.
Key words: Latvian dairy, integration, economic effect.

Introduction

Dairy sector, including dairy farming and processing, is an important part of Latvian economy as in 2006 it used approximately 5.5% of the country's total labour units in full time equivalents. The relation of Latvian dairy sector gross value added at factor cost to its GDP in current prices indicates that the indicator is approximately 2% of GDP (Ozoliņš J., Vēveris A., 2009). Appropriate natural resources, availability of existing infrastructure, and long-term world food market forecasts will determine the rationale for retention and development of the dairy sector in the Baltic States (Ozoliņš J., 2009). Dairy sector in Latvia is faced by significant economic problems; inter alia, fragmented milk processing. Milk processing is dominated by mass products such as milk, cultured products, and cheese and butter, the price of which cannot be influenced by the producers (Leimane I. et al., 2006).

The major identified dairy sector problems can be directly (such as fragmented secondary production) or indirectly (such as low productivity) attributed to the industry structure problems and one way to solve them is integration. For purposes of this paper the author has updated and uses a broad integration definition developed by another author (Zvirbule-Bērziņa A., 2003): a process of economic, legal collaboration and hierarchy of subjects with a determined degree of connection, which shows to what degree the integrated subjects lose or retain their own economic or legal independence enforcing achievement of concrete objectives, both the achievement of common objectives and achievement of the objectives of every collaboration partner.

Mostly neglected data set on Latvian dairy processing companies for the period of 1995-2009 is available for researchers. Several theories exist that may be applied in dairy sector integration analysis from different viewpoints. They include widely acknowledged transaction cost economics (Williamson O., 1985), property rights approach (Grossmann S., 1986), competence perspective (Dosi G., 1988), and strategic behaviour approach (Kogut B., 1988).

Integration patterns and related economic effect have not been researched enough. The existing research includes studies of Leimane I. et al., 2006; Jasjko D. et al., 2007; Krieviņa A., 2009; and Jansik C., 2009. Several scientists have devoted fragments of their papers,

except for fully devoted but not recent work of Kedaitiene, to dairy sector integration problems in the other Baltic States (Girgzdiene V. et al., 1999; Hartmann M. et al., 1999; Kedaitiene A. et al., 2002; Vaznonis V. et al., 2006). Therefore the research problem of this paper is the need to evaluate integration patterns and related effect on the economic performance of dairy processing companies.

The author has set the following research hypothesis: dairy processing companies which are characterised by a higher level of integration produce higher gross value added at factor cost relative to their turnover. The aim of this paper is to explore integration patterns in the dairy processing industry and evaluate the economic effects of integration. The following tasks have been set to achieve the aim: 1) evaluation of dairy processing integration along integration dimensions of a theoretical model; 2) assessment of gross value added at factor cost characteristic to companies with varying levels of integration; and 3) calculation of several widely used financial analysis criteria and examining their characteristics for differences related to integration.

The author has used data of all dairy processing companies approved by the Food and Veterinary Service of Latvia as of 1 October 2010. Companies which process goats' milk, specialise in milk candy production, whose turnover from dairy processing is less than 30%, newly established companies with no publicly available data yet and those that do not submit annual reports due to their small turnover were excluded from the sample. Annual reports' data of 30 companies for time period of 1995-2009 were used in the research. The paper is based on data of 366 Latvian dairy processing companies' annual reports.

Descriptive statistics, time series analysis, non-parametric statistical analysis methods, abstract-logical, and monographic methods were used for the research purpose. Exclusively integration via ownership connections is analysed due to data availability considerations. Other integration arrangements such as contractual ones are not examined due to the unavailability of data. Integration strategy dimension is not analysed due to data limitations. Time period of certain statistics differs due to data limitations: some ratios require data from the preceding period; whereas collected time series starts with the year 1995.

The paper has been supported by the European Social Fund within the project "Support for the Implementation of Doctoral Studies at Latvia University of Agriculture" (Sub-activity 1.1.2.1.2. Support for the Implementation of Doctoral Studies), Agreement No. 2009/0180/1DP/1.1.2.1.2/ 09/IPIA/VIAA/017, Contract No. 04.4-08/EF2.D2.19.

Results and discussion

1. Dimensional characteristics of Latvian dairy sector secondary level integration

A model adapted and improved by the author is applied in this section to analyse integration characteristics. The model includes seven dimensions of integration and four groups of structural conditions (Ozoliņš J., 2010). The dimensions of integration employed in the model are: initiator, level, direction, territory, temporal, strategy, and form.

Integration initiator dimension. During the period of 1995-2009 in 22% of the examined cases dairy processing companies were competitor-owned or owned competitors, thus creating 58% of net sample turnover. Over the same period in 14% of cases the companies were owned by dairy farmers or their organisations, producing approximately 3% of total turnover and 64% of companies were independent, responsible for 39% of turnover. The proportion of farmer-owned dairy companies has not changed significantly during the examined period; whereas the proportion of companies owned by competitors has grown by 22 percentage points. Over the whole analysed period 3 to 4 companies were owned by dairy farmers or their organisations. Except for Jaunpils pienotava in the years 2008-2009, the rest have stayed in the Quartile 1 and Quartile 2 by net turnover. In 70% of cases companies owned by or owning competitors were in the highest Quartile 4; while all others in Quartile 3 by net turnover. Although the majority of dairy processing companies are independent, most of turnover is produced by integrated companies with insignificant interest representation of dairy farmers.

Integration level. In 66% of the examined cases integration level can be characterised as low with the share ownership of less than 20%, or none at all, of other dairy processing, dairy farming or dairy intermediary organisations. Approximately 33% of cases were in the

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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high integration level category as companies owned more than 50% or were owned by other dairy processing companies, dairy farmers' organisations or intermediary organisations to the same extent. Only 1% of cases were in the medium integration level category. During the period of 2002-2009 compared with the period of 1995-2001 the proportion of companies with high integration level has increased by 12 percentage points equally contributed by decreases in the number of low and medium-level integration companies. Medium level integration relationships have been decreasingly popular as they may be costly and do not usually provide adequate level of control. The largest integration arrangement series observed in Latvia has increased consolidated turnover of the created company group by approximately 24%.

Integration direction. Dairy companies were found to be horizontally integrated in 22%, vertically integrated in 14% of cases and laterally integrated in 6% of cases. During the period of 2002-2009 horizontal integration was observed in 27% of cases, increasing by 11 percentage points over the same indicator for the period of 1995-2001. Vertically integrated companies were observed in 5 percentage points fewer cases; whereas the small weight of laterally integrated companies observed remained practically constant.

Integration territory. Up to 2001 all cases of observed integration arrangements were local – processing companies owned shares of other companies within Latvia. In the period of 2002-2009 in 87% of cases integration arrangements were local; while the other 13% of cases were regional, involving integration within the Baltic States and, in case of Rīgas piena kombināts, ownership of a Russian dairy plant.

Temporal dimension. Over the whole observation period in 16% of cases dairy companies were in an integration arrangement for up to 3 years, in 26% of cases for a period of 3 to 6 years, whereas in 58% of cases the integration arrangement had existed for over 6 years. In the period of 1995-2001 companies with medium period of integration dominated with 76%; while in the period of 2002-2009 dairy processing companies with long period of integration were in majority with 73%. A notable observation drawing attention was a complete lack of short-term integration cases after the year 2003. While existing arrangements continued to mature, several involved companies changed owners.

Form of integration. Integration cases involving no more than 2 integrating parties constituted approximately 44% of the total. During the period of 1995-2001 multilateral integration cases involving more than 2 parties dominated with the share of about 70%; while in the period of 2002-2009 bilateral and multilateral integration cases observed were practically equal in proportion.

2. Integration effect on gross value added

Gross value added is an important indicator of a company's economic effect. The available data set contains sufficient information to calculate gross value added at factor cost in accordance with methodology used by the Central Statistical Bureau of Latvia in 62% of cases over the period of 1995-2009 and 83% of cases during a shorter period of 2000-2009.

The author used as an indicator gross value added share in the sum of net turnover and other operational income to identify differences in the economic effect possibly attributable to integration patterns. Over the period of 1996-2009 the mean value of the indicator was 18% for non-integrated companies, 16% for cooperatives; while the value for company groups/merged companies was 15%. However, the indicator value of DK Daugava, engaged both in dairy farming and processing, showed a considerably higher indicator mean value, i.e. 35%. It can be asserted at the 95% confidence level that mean value of non-integrated companies is different than the mean gross value for company groups and merged companies. The lowest indicator values were observed for the companies Smiltenes piens, Tukuma piens, Siera nams, Limbažu piens, and Krāslavas piens; companies with the highest indicator values were Braslas, Saltums-2, Rīgas piensaimnieks, Latoniks, and DK Daugava. The indicator is the most direct approximation possible of the contribution of each company to GDP of the country that can be calculated from the available data at company level. It is, however, subject to companies' policies towards disclosing profit in their annual results as it is subject to the company income tax.

Chi-square testing indicated that the analysed indicator values do not conform to normal distribution. Eta measure of 0.424 allowed concluding that there is a medium-to-low

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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association between levels of integration and the gross value added indicator used. It can be concluded that no significant effect of integration on the gross value added can been observed in Latvian dairy processing.

3. Integration effect on company financial indicators

The EU pre-structural and subsequently Structural Funds support has been available to dairy processing companies since the year 2001. With some modifications the same set of three financial criteria has been used to determine companies' eligibility for the support. It has been necessary to meet at least 2 out of 3 criteria to qualify for support or maximum project eligible expenditures amount: 1) equity ratio (common equity over total assets) shall be equal or greater than 1; 2) current ratio (current assets over current liabilities) shall be equal or greater than 1; and 3) sum of net profit or loss and one-half of year's depreciation shall be equal or greater than 0 (Noteikumi…, 2008). Taking into account the available support rate of up to 50%, this set of criteria has been an important precondition for dairy processing industry investment activities.

Over the period of 1995-2009 in 52% of cases companies with low integration level and in 45% of cases companies with high integration level fulfilled the financial criteria for the support. During a shorter period of 2001-2009 the mean proportion was not significantly different. However, in the year 2003 almost 75% of low-integration companies qualified; while only 50% of high integration level companies fulfilled the criteria. Another year showing superior compliance on the part of low integration companies was 2008, when 56% of those fulfilled the criteria while only 27% of highly integrated companies qualified for the support. Since 2001 there have been no years when high integration level companies have shown significantly better results. It can be concluded that while the overall eligibility difference between high and low-level integration companies to access the EU support is not significant, in some periods it becomes notably lower for high-integration level companies. Therefore, negative outside factors affecting the EU support criteria performance to a larger extent affect high integration level companies' ability to carry out investment projects.

Detailed analysis of separate support eligibility criteria indicates that companies have been best at meeting Criterion 1 and Criterion 3 and less so with respect to Criterion 2. High and low-integration level companies have been equally successful in meeting the equity ratio in 83-84% of cases on average. High integration level companies have produced systematically better results with respect to Criterion 3 (compliance in 92% of cases on average) than those with low integration level (compliance in 82% of cases on average). During the period of 1996-2009, except for an insignificantly better compliance ratio value in 2009 of low-integration level companies, highly integrated companies have shown higher compliance rate with Criterion 3 during all other years.

Analysis of the current ratio (Criterion 2) compliance of dairy processing plants show mixed results for the period of 1996-1999. Within the period of 2000-2009, companies with low integration level have demonstrated higher compliance with the current ratio criterion requirements during all the years except 2009. The average compliance rate over the period of 1996-2009 of low integration level companies was in 67% of the cases and of high integration level companies in 52% of the cases. Current ratio performance of low integration level companies has been significantly higher than that of the high integration level companies in 1996-1997 and in 2007-2008 when the difference was 24-36 percentage points.

As there is the highest difference in the current ratio statistics among the three financial criteria for the state support in Latvia, this ratio was analysed in more detail (Figure 1). Mean current ratio value in the industry in the period of 1996-2009 was 1.83. Non-integrated companies mean current ratio was 2.04 times, for cooperatives the mean ratio was lower, 1.62 times; while it was the lowest - 1.52 times for company groups/merged companies. Liquidity measured by the current ratio has demonstrated a decreasing trend for all types of companies.

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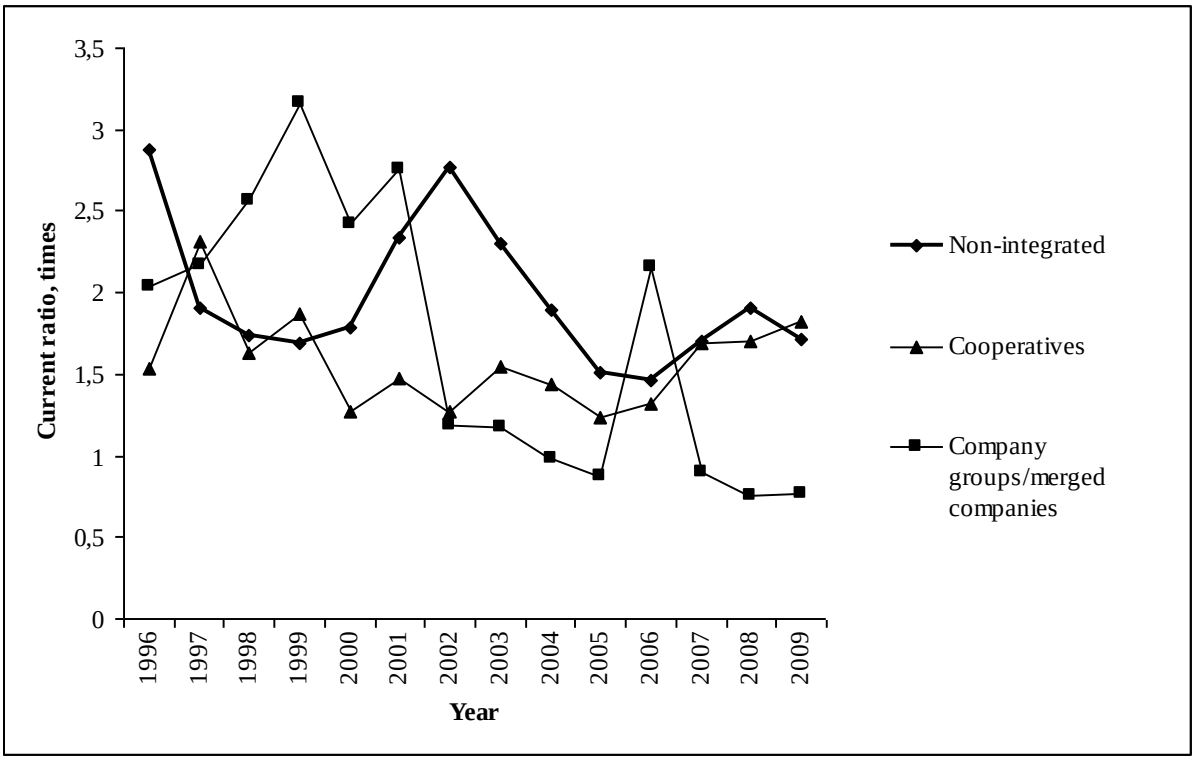

Source: author's calculations based on the data of company annual reports

Fig. 1. **Latvian dairy processing company current ratio dynamics**

Mean profit margin on sales (calculated as net profit or loss of the year over the sum of net turnover and other company operational income, in percentage) in the period of 1996-2009 was close to zero at 0.05%. Mean profit margins on sales for separate categories do not differ significantly: -1% for non-integrated companies; 2% for company groups and merged companies; 1% for cooperatives (Table 1). Mean profit margin on sales has been comparatively stable, varying in the range between 0 and 3% over the whole observation period for company groups and merged companies. The margin was initially negative for non-integrated companies until the year 2000; subsequently it has been positive in almost all years and comparable with that of company groups. Profit margin of cooperatives has been fluctuating significantly since the year 2002, ranging between -4% in the year 2004 and 3% in the year 2007.

Mean return on total assets (ROA; calculated as net profit or loss of the year over the average value of total assets at the beginning and end of the period, in percentage) in the period of 1996-2009 was 3%. The highest mean ROA was 6% for cooperatives, for company groups and merged companies this indicator was lower at 4%; while it was the lowest for non-integrated companies - 2%. The annual mean ROA has been more even in company groups and merged companies, positive in all years and ranging between 1 and 8%. Highest fluctuations during the whole period were observed in the ROA mean values of cooperatives, 5 times exceeding 10%; while being approximately -10% in 2004 and 2009. ROA of non-integrated companies until the year 2000 was fluctuating but subsequently it has been positive in most years and shown less volatility with similar but not identical change patterns as the indicator of company groups and merged companies. Cooperatives have been more successful at using their assets.

Return on common equity (ROE; net profit or loss of the year over the average value of total equity at the beginning and end of the period, in percentage) mean value in the period of 1996-2009 was 2%. Mean ROE for non-integrated companies was the lowest at -1%; for cooperatives it was positive at 2% on average; while the respective value for company groups and merged companies was significantly higher - 10%. On average company groups and merged companies have in almost all years produced positive returns ranging up to 24%. Non-integrated companies have not produced satisfactory results from the viewpoint of an investor

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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– there have only been 2 two-year periods in which ROE has stayed positive and a few single-year positive results.

Table 1

Mean values of Latvian dairy processing companies' financial indicators, 1996-2009

Indicator	Non-integrated companies	Cooperatives	Company groups/merged companies	Sector mean
Current ratio, times	2.0	1.6	1.5	1.8
Profit margin on sales, %	-1	1	2	0
ROA, %	2	6	4	3
ROE, %	1	2	10	2
Total assets turnover, times	2.6	4.2	2.5	2.7
Inventory turnover, times	16.8	25.8	16.9	18
Days of sales outstanding, days	31	22	28	28

Source: author's calculations based on the data of company annual reports

Mean total assets turnover ratio (calculated as net turnover over the average value of total assets at the beginning and end of the period, in times) in the period of 1996-2009 was 2.7 times. Mean values for cooperatives were higher than the average - 4.2 times; while mean ratio values for other types of companies were 2.4-2.6 times. The analysis always reveals higher annual values for cooperatives. While the ratio values for non-integrated companies exceed those of company groups and merged companies until the year 2002, subsequently the indicators produced by the other group became slightly higher and further changed closely together.

Mean inventory turnover ratio (calculated as costs of sold products (production, sales and administration) over the average value of inventories at the beginning and end of the period, in times) was 18 times on average for all companies in the years 1996-2009. Mean value of the indicator was higher for cooperatives - 26 times and 17 times both for non-integrated companies and company groups and merged companies. Until the year 2002 inventory turnover ratios of non-integrated companies were higher than those of company groups and merged companies; an opposite pattern was observed in the period of 2003-2009. Mean inventory turnover of cooperatives was higher than for other categories of companies in all years except 2004 and 2005, when it was slightly surpassed by company groups' indicator.

Days of sales outstanding indicator (calculated as receivables over sum of net turnover and other operating income that has been divided by 365, in days) has on average been 28 during the years 1996-2009. Mean value of indicator was lower for cooperatives at 22 days, while it was 28 days for company groups and merged companies, and 31 days for non-integrated companies. Cooperatives had shorter periods of days of sales outstanding until the year 2006, but afterwards they have lost their leading position. Non-integrated companies have in almost all years demonstrated the longest days of sales outstanding periods.

Conclusions, proposals, recommendations

1. Most of the dairy sector secondary level company sample turnover in the period of 2002-2009 has been generated in horizontally integrated companies. All horizontally integrated companies were relatively large. In the respective period the share of net turnover produced by vertically integrated companies has decreased by 3 percentage points to merely 2.6% compared with the period of 1996-2001. Almost all vertically integrated companies were small or medium small. In all examined cases vertical integration initiators were dairy farmers' organisations and not dairy processing companies.
2. In 65% of the examined cases over the period of 1996-2009 integration level of companies was low, mostly with no sector-related ownership ties at all, in 33% of cases integration level was high. Medium level integration relations have not been common as they are more

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expensive and by themselves do not provide adequate level of control. There have been no large-scale integration arrangements. The largest observed integration arrangement series has increased consolidated turnover of the created group by approximately one-fourth.

3. All integration arrangements observed until 2001 were localised within Latvia. In the period of 2002-2009 in 13% of cases integration arrangements were regional, involving ownership ties with dairy industry entities within other Baltic States or Russian Federation.
4. In the period of 2003-2009 the existing integration relationships continued to mature, several of the previously integrated companies changed owners. None of the non-integrated companies joined integration arrangements, which means that integration process had stopped in this respect.
5. The author's hypothesis that highly integrated companies' gross value added would be higher relative to turnover was rejected. Non-integrated companies contribution to the GDP relative to their turnover has been higher than that of integrated companies. However, most gross value added is created in integrated companies as they are comparatively larger.
6. Mean current ratio has been higher for non-integrated companies than for company groups and merged companies. Profit margin on sales has been higher for company groups and merged dairy processing companies than for other types of companies. ROA has been the highest for dairy processing cooperatives. ROE was significantly higher for company groups and merged dairy companies. Mean total assets turnover ratio and mean inventory turnover ratio were the highest for dairy processing cooperatives. Dairy processing cooperatives have produced superior days of sales outstanding indicator performance during most of the examined period but since 2006 advantage has been lost and in 2009 it was the longest in the industry.
7. Conformance of a company previous year's financial reports to a set of financial criteria has been a precondition for receiving the EU investment support or receiving larger amount of support. High and low integration companies have been overall equally successful in meeting the set of criteria for programmes available for dairy processing investment projects. It was observed though that in two specific years conformance to financial support criteria of integrated, larger companies became significantly lower than that of non-integrated companies. They may be more susceptible to outside factors fluctuations influencing their financial standing. Moreover, even though the situation in the market and for a company may significantly improve, non-conformity to financial support criteria of the preceding year's reports has a time lag precluding access to the EU support during the subsequent year. Therefore, the author suggests a review of financial eligibility criteria application, allowing exceptions in case financial standing has materially changed.

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Economic Efficiency of Rapeseed Oil Production By-product Use in Farmed Red Deer Ration

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Abstract. The research study was targeted at efficiency evaluation of feeding the rapeseed oil cake to farmed red deer (*Cervus elaphus*) over the winter season thus replacing the traditional ration of rolled grain of equivalent feed value. The deer lose up to 20% of their body weight in the winter season. Hence, a well-balanced feeding programme should be provided to retain their body-weight over the winter season.

The efficiency of the rapeseed oil cake in farmed red deer feeding was assessed at the end of the trial based on the feed consumption and costs, the meat outcome and utilisation of crude protein.

The feeding trial was performed over the winter of 2010 with farmed red deer (*Cervus elaphus*). The trial included two groups of animals of identical age: the control (1) group (n_1=10) and the trial (2) group (n_2=10). Both groups of deer received identical value feed. The trial group received 0.200 kg of rapeseed oil cake replacing 0.450 kg of rolled grain per deer in comparison with the control group. The research data were analysed by a non-parametric statistical methods at the essentiality level α=0.01 for data comparison.

The rapeseed oil cake ration of 0.200 kg per day for one deer over the winter season increased the acquired carcass meat outcome by 4.43% and reduced the amount of consumed feed and expenses correspondingly by 3.2% and 8.13% in comparison with the control group. By feeding rapeseed oil cake crude protein content in the excreted manure decreased by 15.02%, i.e. feed crude protein utilisation in deer organism increased by 6.18% in comparison with the control group.

Key words: rapeseed oil cake, farmed deer, economic efficiency.

Introduction

In deer farming the conditions for animal keeping are similar to wild conditions. Deer are kept in deer farms outside throughout the year; animals are kept in small herds in fenced territories or enclosures. Over the summer season red deer intake the necessary feed ration by pasturage without additional fodder. However, over the winter season red deer are exposed to the climatic conditions. Over the winter of 2010 the average snow depth was 53 cm; while the average air temperature was -5.6ºC, which is actually 0.7 degrees below the norm (Meteoroloģijas centrs, 2010). Adult animals lose up to 20% of their body weight over the winter season (Fletcher J., 1989; Tuckwell C., 2003; Paeglītis D., et.al, 2006). Therefore to maintain red deer body weight over the winter season dietary requirements include red deer feeding by full value feed ensuring that according to the norms an animal weighting 150 – 200 kg intakes feed containing 2.6 – 2.7 kg of dry matter, 320.0-330.0 g of protein, and 25.0-39.0 MJ exchange energy amount on average per day (Adam C.L., 1994).

In Latvia's farms the necessary daily feed value is ensured feeding a red deer by 7 kg of haylage and 1 kg of rolled grain (oats etc.) on average (Paeglītis D., et. al, 2006). Literature suggests that foreign deer breeders enrich winter feed by protein containing fishmeal (Adam C.L., 1994; Tuckwell C., 2003). In Latvia it is also possible to enrich red deer feed ration by protein containing feeding stuff, i.e. using rapeseed oil production by-product – rapeseed oil cake during the winter season. Rapeseed oil cake has a high nutritional value, since an average natural sample contains 35.0 – 45.0% of crude protein, 14.0-15.0% of total fat, 7.27 MJ/kg exchange energy and other nutrients. Consequently, rapeseed oil cake in red deer feed ration may successfully replace the respective amount of grain and provide animals with the necessary amount of crude protein.

No researches and comprehensive efficiency evaluation of feeding the rapeseed oil cake to farmed red deer have been done to date in Latvia. It is vitally essential to study digestibility and utilisation of crude protein containing rapeseed oil cake in an organism of red deer. It is substantially characterised by the amount of undigested and unused crude protein in excreted

manure (Osītis U., 2004). The excreted amount of undigested crude protein chemically and bacteriologically decomposes in manure and creates environmental pollution, simultaneously causing economic losses due to defective use of feed (Patterson P.H., 1998). Hence, it becomes significant to evaluate the use of rapeseed oil cake in red deer feeding compared with the use of traditional content feeding stuff. Therefore the **research aim** was to assess the economic efficiency in feeding the rapeseed oil cake to farmed red deer over the winter season. The following research **tasks** were set:

1) to estimate expenses of feed ration necessary for red deer;
2) to identify expenses of taken up and utilised crude protein per feed ration;
3) to compare the proportion of red deer carcasses in the control group and the trial group.

Publications of Latvian and foreign scientists and conference proceedings as well as researches done at the Research Institute of Biotechnology and Veterinary Medicine "Sigra" of Latvia University of Agriculture have been used for the research purpose.

Materials and methods

The feeding trial with rapeseed oil cake was performed with red deer (*Cervus elaphus*) farmed in captivity and enclosed territories between January and April, 2010. Feeding trial scheme is specified in Table 1. The trial included two groups of red deer of identical age: Group 1- the control group and Group 2 - the trial group. Each group consisted of 10 animals.

Both groups (control and trial) of red deer received feed of equivalent value. The content of feed ration was balanced corresponding to the season and norms of physiological needs for red deer organism, so every animal could daily intake 2.6 kg of dry matter, containing 320.7g of crude protein (Fletcher J., 1989; Adam C.L., 1994). The trial group of red deer received 0.2 kg of rapeseed oil cake.

The feed ration for the trial group of red deer contained 0.450 kg of rolled grain less compared with the control group to ensure that feed rations of the control group and the trial group of red deer contain equal amount of dry matter, crude protein, and other nutrients.

Table 1

Ration composition for one red deer per day

Group	Number of deer	Feed stuff	kg	Dry matter (DM), kg	Crude protein (CP), g
1 – control group	10	haylage	7.0	1.697	188.50
		rolled grain	1.0	0.903	132.20
		total	8.0	2.6	320.70
2 – trial group	10	haylage	7.0	1.697	188.50
		rolled grain	0.550	0.497	72.71
		rapeseed oil cake	0.2	0.406	59.49
		total	7.750	2.6	320.70

The economic efficiency assessment of rapeseed oil cake containing feed ration included the determination of feed consumption by one deer per day and calculation of costs for the consumed feed; the analysis of crude protein content in taken up feed of red deer; and the calculation of undigested and excreted in manure crude protein amount and expenses per day. The weight of muscle tissue, bone tissue and adipose tissue was checked in the carcass of the control and the trial group red deer at the end of the trial period.

Biochemical analyses of feed and manure were carried at the accredited biochemistry research laboratory of the Research Institute of Biotechnology and Veterinary Medicine "Sigra", Latvia University of Agriculture (LATAK Registration No. LATAK-T-038-06-99-A) according to the standard LVS EN ISOIIEC 17025-2005, all the analyses were carried in compliance with the corresponding accredited ISO standards. The obtained data were processed using *Microsoft Excel* methods for data mathematical processing. Research data were analysed by a non-parametric method (Mann-Whitney U test) for data comparison. Two independent variables –

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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deer of control group (n_1=10) and deer of trial group (n_2=10) were compared at the essentiality level α=0.01.

Results and discussion

Feeding red deer with rapeseed oil cake allowed reducing the amount of consumed feed. Daily feed consumption of one red deer from the trial group equalled to 7.750 kg, i.e. by 0.250 kg or 3.2% less compared with a daily consumption of a red deer from the control group. Thus, decreasing also the costs of consumed feed (Table 2).

Utilised feed costs in the trial group were by 8.13% lower compared with the feed consumption costs in the control group. The difference in crude protein amount and costs between rolled grain and rapeseed oil cake led to such difference in costs (Table 2).

Table 2

Feed and protein consumption and costs per red deer per day

Parameters	Group 1 - control		Group 2 - trial	
	amount	LVL*	amount	LVL*
In feed ration:				
haylage, kg	7.00	0.126	7.00	0.126
rolled grain, kg	1.00	0.120	0.550	0.066
rapeseed oil cake, kg	-	-	0.200	0.034
Total	8.00	0.246	7.750	0.226
% to control	100	100	96.87	91.87
Protein content to fed out feed ration, g	320.7	0.148	320.7	0.136
% to control	100	100	100	91.89

- *feed costs are calculated according to the Central Statistical Bureau of the Republic of Latvia and Latvian Agricultural Consultation Centre Price Survey of 2009*

Costs of protein in rapeseed oil cake are lower compared with rolled grain, i.e. utilisation of rapeseed oil cake in red deer feed ration is economically more profitable. One kilogram of protein in rolled grain costs LVL 0.82, while in rapeseed oil cake - LVL 0.57. Cost difference on one kilogram protein is LVL 0.25. The trial group of red deer received 0.200 kg of rapeseed oil cake (LVL 0.034) replacing 0.450 kg of rolled grain per deer (LVL 0.054) in comparison with the control group. Savings on feed ration costs per one deer equalled to LVL 0.02 per day.

Undigested and unutilised crude protein amount in excreted manure essentially characterises the digestibility and utilisability level of fed out crude protein in the digestive system of animals (Osītis U., 2004).

Feeding rapeseed oil cake, the organism of trial group red deer over the winter season consumed 75.23% of feed crude protein amount, i.e. 4.38% more than the consumed crude protein amount of the control group feed content (Table 3).

These data show that feeding of red deer by rapeseed oil cake, digestibility and utilisability of crude protein and total nitrogen was relatively higher compared with the control group. The trial group red deer excreted by 15.02% less undigested crude protein in manure compared with the control group red deer, i.e. environmental pollution decreased.

On the one hand the undigested and excreted crude protein in manure chemically and bacteriologically decomposes and causes environmental pollution; yet on the other hand it causes economic losses due to defective feed utilisation. The expenses of taken up crude protein decrease by LVL 0.012 with the increase of feed digestibility level in the trial group, while the expenses of excreted crude protein decrease by LVL 0.009 per one deer per day.

In general, feeding the trial group red deer by rapeseed oil cake, expenses of undigested and excreted crude protein decreased by 20.30% compared with the control group (Table 3).

Table 3

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Crude protein amount and costs in red deer feed and manure (per one deer per day)

Parameters	Group 1 - control	Group 2 - trial	+/- to control
Crude protein taken up by dry matter, g	320.7	320.7	-
Excreted amount of manure per day, dry matter g	650.0	650.0	-
Crude protein content in the excreted manure, g	93.47	79.43	- 14.04
% to control group	100	84.98	- 15.02
Utilised crude protein in organism, g	227.23	241.27	+ 14.04
% vs. the control group / % to control group	100	106.18	+ 6.18
Utilised crude protein from taken up in organism, %	70.85	75.23	+ 4.38
Expenses of taken up crude protein, LVL	0.148	0.136	- 0.012
Expenses of excreted crude protein, LVL	0.043	0.034	- 0.009
Expenses of excreted crude protein to control, %	100	79.07	- 20.30

Feeding red deer by rapeseed oil cake, total feed consumption costs declined by 8.13% (Table 4) and the utilisation of crude protein contained by feed, including rapeseed oil cake, was more economically efficient.

Table 4

Deer undigested crude protein expenses (on average for 100 deer per day)

Parameters	Group 1 - control	Group 2 - trial	+/- to control
Utilised feed costs, LVL	24.60	22.60	-2.00
Utilised feed costs, %	100	91.87	-8.13
Undigested crude protein costs, LVL	4.30	3.40	- 0.90
Undigested crude protein expenses of total utilised feed expenses, %	17.48	15.04	- 2.44

In the trial group expenses of undigested and excreted crude protein were by LVL 0.90 lower compared with the control group, i.e. losses of feed crude protein deceased by 2.44% calculated of total consumed feed costs (Table 4), simultaneously also reducing environmental pollution.

The impact of feeding up red deer by rapeseed oil cake on red deer productivity was assessed according to the proportion of muscle tissue, adipose tissue and bone tissue in an animal carcass. The proportion of carcasses components differed between the groups (Table 5).

Table 5

Average components percentage and ratio of deer carcasses

Group	Muscle tissue, %	Adipose tissue, %	Bone tissue, %	Ratio mass of muscle and bone tissues
Group 1 - control	62.80	3.34	33.86	1.85
Group 2 - trial	67.23	5.66	27.11	2.48
+/- to control	+4.43	+2.32	-6.75	+0.63

Feeding up red deer by rapeseed oil cake containing feed, the proportion of muscle tissue and adipose tissue in the trial group red deer carcass outcome was significantly higher - by 4.43% and 2.32% respectively, but the ratio of bone tissue was by 6.75% smaller compared with the control group. Thus the trial group red deer carcass showed better proportion (2.48) of the muscle tissue and bone tissue ratio – by 0.63 higher in comparison with the control group.

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It means that utilisation of rapeseed oil cake in the content of red deer feed contributed to the red deer productivity and increased the share suited for food – amount of muscle tissue and adipose tissue in the carcass (Table 5).

Conclusions

The economic efficiency of feeding the rapeseed oil cake to farmed red deer (*Cervus elaphus*) over the winter season was assessed on trial conditions, ensuring 0.2 kg rapeseed oil cake ration per one deer per day. Feeding of the trial group red deer by rapeseed oil cake shows the following results compared with the control group:

1) the amount of consumed feed and feed costs decreased by 3.2% and 8.13% respectively;
2) crude protein amount utilised in an organism increased by 6.18%, while the expenses of excreted and undigested crude protein decreased by 20.30%; losses of feed crude protein deceased by 2.44% calculating of total consumed feed costs;
3) animal productivity increased thanks to the increase of muscle tissue and adipose tissue proportion by 4.43% and 2.32% respectively.

Acknowledgements

Academic study and publication were financed by the project "Support for Doctoral Studies at Latvia University of Agriculture" / 2009/0180/1DP/1.1.2.1.2/09/IPIA/VIAA/017/, Agreement No. 04.4-08/EF2.D1.03

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Productivity Growth in Finnish Dairy Farming for 1989 – 2008

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Abstract. The aim of the paper is to examine productivity/profitability growth in Finnish dairy farming for 1989 – 2008. Profitability of production is the basis for economic survival in the long run. Profitability as well as profit consists of two components: productivity of inputs and input-output prices. On the competitive market, the firms face equal prices. Thus, their success is to a large extent based on their productivity and its development over time. However, being also allocatively efficient is important, i.e. the farms should use their inputs and produce their outputs in correct proportions with respect to the prices.
Milk quotas set restrictions for milk production. Therefore, dairy farmers are likely to have cost minimisation, i.e. producing their output at minimum cost, as their main target. The duality between input distance and cost functions allows applying the input distance function approach when estimating the components of productivity/profitability growth. The input distance function is also able to capture several inputs and outputs.
Finnish bookkeeping data of dairy farms are applied in the analysis. The period from 1989 to 2008 is of interest since Finland joined the EU in 1995. The period after the accession was characterised by decreasing output prices, and increasing land and animal based subsidies.
Key words: input distance function, efficiency, scale effect, technical change.

Introduction

Productivity growth is an important source of keeping and improving competiveness. There are many sources of productivity growth. At first, productivity growth was seen equal to productivity change (the Solow residual), i.e. the shift of production function. Later, more detailed decompositions have been presented. Probably the most widely used source is the decomposition into technological change, technical efficiency change, and scale effect (Kumbhakar & Lovell, 2000) which has been applied, for example, in production/output distance function related studies. Balk (2001) has presented a decomposition which divides productivity growth into technological change, technical efficiency and scale efficiency change, and mix effect. These components can be recovered either from input or output orientation. The latter decomposition defines scale effect in a different manner: it relies on the concept of scale efficiency change when the former starts from elasticity shares and scale elasticities, and the changes in outputs.

For example, Rasmussen (2010) has applied input distance function based approach to Danish farms using Balk's decomposition. Although this decomposition is fairly newly presented, the distance function approach is not new. It was introduced by Shephard (1970) and has been applied in several studies. Output distance functions have been applied by Morrison-Paul et al. (2000) to the analysis of New Zealand's agricultural reform, and Newman and Matthews (2006) to the decomposition of productivity growth on Irish dairy farms. Stochastic input distance functions were also applied by Sipiläinen (2007) in the decomposition of productivity growth in Finnish dairy farming for 1989 – 2000. In this case the sample was relatively small covering only 72 dairy farms.

The aim of this article is to estimate a stochastic frontier input distance function for the Finnish dairy farms for 1989 - 2008. Technological change, technical efficiency change, and scale effect are also determined in the research. It is also examined whether the effects of the EU-accession can be observed in the analysis.

Model and estimation

The author applies a parametric input distance function in the estimation of the relationship between two outputs and five inputs. The input distance function approach with its orientation

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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of input reduction is consistent with the target of cost minimisation. This also coincides with the actual situation where milk quotas restrict the milk output. Therefore, it is reasonable to assume that milk producers aim at cost minimisation when producing a certain output quantity.

A flexible translog equation serves as starting point for the input distance function. It is flexible since it allows interactions between all inputs and outputs, and often also between those and time trend indicator. In this case function can be written as (e.g. Coelli and Perelman, 1999; Fuentes *et al.,* 2001):

$$\ln D_I^t(x_i^t, y_i^t) = \alpha_0 + \sum_{k=1}^{h} \beta_k \ln x_{ki}^t + \frac{1}{2}\sum_{k\leq}^{h}\sum_{j=1}^{h} \beta_{kj} \ln x_{ki}^t \ln x_{ji}^t + \sum_{m=1}^{p} \alpha_m \ln y_{mi}^t$$
$$+ \frac{1}{2}\sum_{m\leq}^{p}\sum_{n=1}^{p} \alpha_{mn} \ln y_{mi}^t \ln y_{ni}^t + \sum_{k=1}^{h}\sum_{m=1}^{p} \varphi_{km} \ln x_{ki}^t \ln y_{mi}^t + \beta_t t + \frac{1}{2}\beta_{tt} t^2 + \sum_{k=1}^{h} \gamma_{kt} \ln x_{ki}^t t \qquad (1)$$
$$+ \sum_{m=1}^{p} \theta_{mt} \ln y_{mi}^t t + \sum_{k=1}^{h} \beta_{kR} D_R \ln x_{ki}^t + \sum_{m=1}^{p} \alpha_{mR} D_R \ln y_{mi}^t$$

where, there are h inputs x and p outputs y; t is a time trend; D_R is a dummy for the EU membership; $\alpha, \beta, \varphi, \rho, \gamma$ and θ :s are coefficients to be estimated; and D_I is the input distance function. Subscript i denotes the observed units. The symmetry of coefficients is also assumed ($\beta_{jk} = \beta_{kj}$ and $\alpha_{mn} = \alpha_{nm}$). The input distance function is by the definition linearly homogenous in inputs. Dividing the inputs by one of the inputs imposes the linear homogeneity in inputs. This actually imposes the following constraints:

$$\sum_{k=1}^{h} \beta_k = 1; \sum_{k=1}^{h} \beta_{kj} = 0; \sum_{k=1}^{h} \varphi_{km} = 0 \ \ and \ \ \sum_{k=1}^{h} \gamma_{kt} = 0 \qquad (2)$$

Homogeneity in inputs implies that:

$$D_I^t(x_i^t / x_{ki}, y_i^t) = D_I^t(x_i^t, y_i^t) / x_{ki}^t \qquad (3)$$

Transforming the variables in logarithms and rearranging the equation gives the translog functional form (TL is an abbreviation):

$$-\ln x_{ki}^t = TL(x_i^t / x_{ki}^t, y_i^t, t; \alpha, \beta, \varphi, \rho, \gamma, \theta) - \ln D_I^t(x_i^t, y_i^t) . \qquad (4)$$

Setting $u_i^t = \ln D_I^t(x_i^t, y_i^t)$ and adding a stochastic error term (v_i^t), the presentation is similar to that of a parametric stochastic frontier with a decomposed error term:

$$-\ln x_{ki}^t = TL(x_i^t / x_{ki}^t, y_i^t, t; \alpha, \beta, \varphi, \rho, \gamma, \theta) - u_i^t + v_i^t , \qquad (5)$$

where u_i^t are time-varying inefficiency effects.

From the stochastic translog input distance function it is possible to derive several further measures: technical efficiency (which is discussed later), technological change, and elasticities of the input distance function in relation to inputs and outputs. The elasticity with respect to output equals to the elasticity of cost of this specific output at the cost minimising level of inputs. The elasticity with respect to input equals to the cost share of this specific input at the cost minimising input levels. These elasticities thus reflect the relative importance of inputs and outputs in the production.

The elasticities can be used to calculate some additional estimates for the local elasticity of scale $e_t(x, y) = -\left[\sum_{m=1}^{p} \partial \ln D_I^t(x, y) / \partial \ln y_m\right]^{-1}$ (Färe et al. 1986) which is the inverse of the scale measure telling how much the input use changes when the output increases by one per cent.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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At the cost minimising input levels this equals to relative cost change. The scale effect can then be determined between two points of time as follows:

$$\ln SE = \frac{1}{2}\sum_{m=1}^{p}\left[\left(e_t(t+1)-1\right)\cdot e_m(t+1)+\left(e_t(t)-1\right)\cdot e_m(t)\right]\cdot \ln\left(\frac{y_m^{t+1}}{y_m^t}\right), \quad (6)$$

where

$$e_m(t) = \frac{\partial \ln D_I(x^t, y^t, t)/\partial \ln y_m}{\sum_{m=1}^{p}\partial \ln D_I(x^t, y^t, t)/\partial \ln y_m}.$$

The scale effect is determined by scale elasticities, elasticity shares, and changes in output quantities.[1] The effect vanishes under constant returns to scale and/or constant values of inputs. In this case, the scale effect is defined without the concept of scale efficiency which is central, for example, to Balk's (2001) method of decomposition.

Local technical change is determined as the first derivative of input distance function with respect to time t ($TC_{local} = \partial \ln D_I(x^t, y^t, t)/\partial t$). Technical change from year t to t+1 has been calculated as a geometric mean of these first derivatives at these sequential data points for each farm.

The first error term component, v_i^t, in equation 5 is a standard random variable capturing the effects of unexpected stochastic changes in production conditions, measurement errors in land input, or the effects of left-out explanatory variables. It is assumed to be independent and identically distributed with N(0, σ_v^2). The second component, u_i^t, is a non-negative random variable associated with technical inefficiency in production, particular the level of outputs.

Several authors have addressed the problem of separating heterogeneity and technical inefficiency (e.g., Wang, 2002; Wang and Schmidt, 2002; Karagiannis and Tzouvelekas, 2005). Several specifications are possible. The heterogeneity can be taken into account in the production or distance function part or in the technical (in)efficiency part. One may also place the heterogeneity in efficiency either on the mean or heteroscedasticity on the variance of efficiency term as well as on the variance of noise term, or even in two or all three of them simultaneously. A mixture is chosen in the present case. Part of the heterogeneity is placed on the means or variances of the efficiency term, but the regional heterogeneity is incorporated in modelling of the technical relationship between inputs and outputs[2]. For this purpose regional dummy variables are applied. The region refers to the geographic location, the Southern part being the reference group.

The u_i values are independently distributed with a truncation at zero of N(μ_i, σ_u^2), where μ_i is modelled in terms of determinants or heterogeneity in mean causing factors of inefficiency as:

$$\mu_i = \delta_0 + \sum_{sc=1}^{2}\delta_{sc}D_{sc}, \quad (7)$$

where D_{sc} refers to the size class dummy variables. Farms were classified as small if they belonged, according to the number of cows, to the lower quartile in a specific year. Respectively, farms were classified as large (denoted by Lar) if they belonged to the upper quartile in a specific year. Middle sized farms (denoted by Med) were those whose size was between lower and upper quartiles. The size classification of a farm is revised for every year. The δ:s are regression coefficients of efficiency effects.

[1] If scale economies (the sum of output elasticities in the input distance function) are less than one, input use increases less than proportionately when output increases. Thus, elasticity of scale can be expressed as an inverse of this figure.

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Given the translog stochastic frontier specification of the input distance function, technical efficiency of production can be obtained from the conditional expectation of $TE_i = \exp(-U_i)$, given the random variable ε_i ($\varepsilon_i = v_i - u_i$; Battese and Coelli, 1988). The applied model (Battese and Coelli, 1995) does not use the panel properties of the data. The level of technical efficiency lies between 0 and 1, and it may vary across farms and over time. Technical efficiency change between years is calculated as ratio of estimated technical efficiencies between sequential years.

The empirical data are obtained from the Finnish Farm Accountancy Data Network data set. Specialised dairy farms were included in the sample from 1989 to 2008. The selection of the sample was following the definition of milk farms on the basis of standard gross margins. The total number of observations is 6765 (966 different farms), the annual number of farms varying from 300 to 400. The author applies two outputs and five inputs in the input distance function analysis. The outputs are milk output (M) and the aggregate of other outputs (O). Subsidies are excluded in the current version. The input categories are land (A, ha), labour (L, own and hired in hours), purchased feed (F, in euros), crop inputs (OM, fertilisers, seed, crop protection in euros), and capital as a flow of services (C, depreciation, interest and maintenance of machinery and buildings, interest on animal capital as well as energy). The monetary values of inputs and outputs are converted to constant values by respective price indices published by the Statistics Finland. Thus, it is assumed that the farmers face equal prices in specific product groups. If the prices at the farm level differ because of the quality, this difference ends up to implicit quantities. Table 1 shows the per farms descriptive statistics of the data. As the data indicates, the average farm size in the data set has more than doubled during the period. The milk yield per farm has even tripled. However, the labour input in hours (does no include contract work) has remained on average at the same level.

Table 1

Descriptive (per farm) statistics for 1989, 1993, 1998, 2003 and 2008

Variable	1989	1993	1998	2003	2008
Milk yield (ltr)	108282	112982	139115	221042	322943
Cow (n)	17	17	19	26	37
Land (ha)	28	29	36	49	65
Labour (h)	4882	4775	5013	5091	5086
Feed (euro)	14078	10784	13332	22141	30519

In the present application of the input distance function, all inputs have been divided by land input in order to impose linear homogeneity on inputs. Time trend variables are used to capture year-to-year neutral technical change. Non-neutral technical change is defined as a cross term of inputs or outputs and the time trend. In addition, a dummy variable indicating the EU membership is used to take into account possible changes in input-output relations (elasticities) during these two different time periods. In addition, the levels of input use are allowed to vary between the Southern and Northern Finland.

The parameters of the model are estimated by the method of maximum likelihood, applying the computer program Nlogit 4.0 (Limdep9.0).

Results and discussion

The full translog model with inefficiency effect performed best according to the log likelihood tests. In addition, the indicator allowing different elasticities for inputs and outputs during the EU membership were significant for the outputs and for one input. There were also significant differences in input need for given output between the Southern and Northern Finland. Therefore, the author included a regional indicator variable into the final model. Inefficiency was also significant and varied according to the size class of farms. A list of estimated parameters is presented in Appendix A.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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According to the assumptions of the input distance function should be non-decreasing and concave in **x** and non-increasing and quasi-concave in **y**. The basic condition is monotonicity which was tested for the whole sample. Monotonicity is violated when input elasticities are negative and output elasticities are positive. In the current case the number of violations is small.

The average technical efficiency is 0.879 indicating that input use could be reduced by close to fourteen per cent if inefficiency could be removed. The minimum and maximum values are also quite far from each other – 0.576 and 0.979 – showing considerable variation between farms. There is also variation between years on the same farms but the patterns of variation seem not to be similar: there is a slight although not significant indication that the inefficiency decreases over time when the farm is participating in the bookkeeping system. In spite of this, the average technical efficiency in the sample is almost equal at the beginning and end of the research period.

According to the results, the average technical efficiency is highest among the small dairy farms. Thus, they are operating closer to their production frontier than medium sized and large farms. Technical efficiency is the lowest among the largest farms. This may be related to the difficulties and different stages in the growth of farms.

Table 2

Annual averages of elasticities of scale (EOS), technical efficiency (TE) and technical change (TC)

	n	EOS	EOS Std	TE	TC
1989	316	1.270	0.055	0.876	0.010
1990	317	1.302	0.060	0.889	0.008
1991	300	1.320	0.067	0.877	0.008
1992	302	1.307	0.060	0.882	0.009
1993	322	1.313	0.060	0.888	0.008
1994	329	1.316	0.059	0.887	0.009
1995	347	1.387	0.104	0.877	0.006
1996	326	1.378	0.087	0.890	0.006
1997	341	1.393	0.099	0.888	0.006
1998	407	1.360	0.085	0.880	0.008
1999	357	1.345	0.085	0.874	0.010
2000	348	1.360	0.113	0.874	0.010
2001	324	1.355	0.078	0.873	0.010
2002	325	1.369	0.092	0.876	0.010
2003	316	1.372	0.087	0.871	0.010
2004	332	1.379	0.091	0.872	0.011
2005	362	1.371	0.094	0.873	0.011
2006	364	1.372	0.093	0.876	0.012
2007	361	1.379	0.097	0.884	0.012
2008	361	1.400	0.097	0.876	0.012

The local measures of elasticity of scale show that inputs increase less than by one (approximately by 0.7 per cent and even more) per cent when output increases by one per cent. The results also indicate that elasticity of scale is increasing over time. Thus, at the cost minimising input levels the utility of increasing the farm size has been increasing during the past twenty years in spite of the fact that the average farm size has increased considerably.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Thus, the most productive scale size and actual scale size deviates even more at the end of the period than at the beginning of it.

The local measure of technical change is a combination of neutral and non-neutral elements. A large part of technical change is caused by non-neutral changes. The significance of coefficients of neutral technical change is fairly low. Technical change improves input output relation approximately by one per cent per year. The results show clearly that before the EU accession technical change slows down considerably but it starts to speed up after a few years in the EU membership. Annual technical change achieves a level of 1.2 per cent at the end of the period.

Productivity growth can be decomposed into technical efficiency change (EffCh), technical change (TechCh), and scale effect (ScaleEff) (e.g. Kumbhakar & Lovell 2000) so that the total factor productivity change is equal to their product, i.e. TFPh = EffCh * TechCh * ScaleEff. These results have been presented in Table 3. It shows that during the whole research period technical change is dominating the TFP growth being on average one per cent per year. The increase is approximately 20% over the whole period. Efficiency change (a small increase) and scale effects (no effect) are minor if one looks at the whole period.

Table 3

Components of productivity growth

	n	EffCh	TechCh	ScaleEff	TFPCh
1989					
1990	250	1.020	1.010	0.920	0.947
1991	247	0.994	1.009	0.966	0.968
1992	238	1.008	1.010	0.998	1.016
1993	230	1.004	1.009	0.983	0.997
1994	244	1.005	1.010	0.990	1.004
1995	249	0.984	1.008	1.003	0.995
1996	271	1.019	1.007	0.985	1.011
1997	268	0.996	1.007	1.010	1.013
1998	287	1.000	1.009	1.018	1.027
1999	338	0.990	1.010	1.012	1.012
2000	320	1.001	1.010	1.012	1.024
2001	309	1.001	1.011	1.015	1.027
2002	289	1.006	1.010	1.020	1.036
2003	286	0.993	1.010	0.997	1.000
2004	290	1.002	1.011	1.011	1.025
2005	311	1.004	1.011	1.007	1.022
2006	335	1.008	1.012	1.012	1.032
2007	334	1.006	1.012	1.007	1.025
2008	331	0.995	1.012	1.001	1.008
Mean		1.002	1.010	1.000	1.011
Cumulative		1.037	1.205	0.963	1.203

However, when investigating the growth patterns over time the changes are more interesting. At the time before the EU accession the scale effect was negative - especially during the first years. After the EU accession the role of scale effect increased and at the end of the period it has in many years been equally large as the effect of technical change. The annual productivity growth was close to two per cent since 1995. This is related to how the scale effect has been measured: when the output increases and elasticity of scale is larger than one, the scale effect contributes to productivity growth.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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Conclusions

Technological development has been the most important source of productivity growth. The importance of the scale effect has increased during the research period. All Finnish dairy farms operate at the area of increasing returns to scale indicating that they would benefit from increasing the scale of production. Since the growth of farms was very limited during the period before the EU accession, the scale effect on productivity growth was even negative. It is interesting to notice that the average elasticity of scale increases over the study period. This suggests that the gap between the average and technically optimal scale has been even increasing. The result also indicates that agricultural policy with its restrictions affects productivity change. In addition to scale effect, technical change also slows down before the EU accession but starts to grow again during the EU membership.

Technical efficiency has remained relatively stable over time despite considerable changes in the policy regime, i.e. the EU accession in the beginning of 1995. In general, larger farms tend to be less efficient than smaller farms – the average technical efficiency differs significantly. This suggests that there may be difficulties in utilising the production potential on large and growing farms.

The results are fairly similar compared with Denmark (Rasmussen 2010). However, in Denmark productivity growth has been faster and some of the dairy farms had reached their optimal scale which was not the case in Finland. In addition, in Denmark elasticity of scale has remained relatively stable over time but in Finland it has been increasing, especially after the EU accession.

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ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Appendix A1

Parameter estimates

Parameter	Variable	Coefficient	St. Error	t-value	Probability
α_0	Constant	-2.27283	0.67255	-3.38	0.0007
α_M	Milk	-0.87021	0.07581	-11.48	0
α_{MR}	M*EU dummy	-0.09575	0.01954	-4.90	0
α_O	Other output	-0.16422	0.02641	-6.22	0
α_{OR}	O*EU dummy	0.02597	0.00604	4.30	0
α_{MM}	M*M	-0.04258	0.01214	-3.51	0.0005
α_{OO}	O*O	-0.02041	0.00074	-27.74	0
α_{MO}	M*O	0.00813	0.00215	3.78	0.0002
β_F	Feed	-0.03491	0.05516	-0.63	0.5269
β_{FR}	F*EU dummy	-0.01276	0.01433	-0.89	0.3734
β_C	Capital	0.57554	0.12932	4.45	0
β_{CR}	C*EU dummy	0.04789	0.02351	2.04	0.0417
β_L	Labour	0.61341	0.12718	4.82	0
β_{LR}	L*EU dummy	-0.01497	0.01276	-1.17	0.2409
β_{OM}	Other material	0.02738	0.01665	1.64	0.1
β_{OMR}	OM*EU dummy	-0.01997	0.01463	-1.37	0.1721
β_{LL}	L*L	0.02598	0.01520	1.71	0.0875
β_{LF}	L*F	-0.0402	0.00706	-5.69	0
β_{LC}	L*C	-0.05225	0.01521	-3.44	0.0006
β_{LOM}	L*OM	-0.01164	0.00519	-2.24	0.025
β_{FF}	F*F	0.10077	0.00387	26.03	0
β_{FC}	F*C	0.01447	0.01143	1.27	0.2055
β_{FOM}	F*OM	0.00345	0.00591	0.58	0.5592
β_{CC}	C*C	0.00465	0.02626	0.18	0.8594
β_{COM}	C*OM	0.01668	0.0093	1.79	0.0729
β_{OMOM}	OM*OM	0.00865	0.00342	2.53	0.0114
φ_{ML}	M*L	0.03437	0.00966	3.56	0.0004
φ_{MF}	M*F	-0.03098	0.00768	-4.04	0.0001
φ_{MC}	M*C	0.03182	0.01338	2.38	0.0174
φ_{MOM}	M*OM	-0.02581	0.00624	-4.13	0
φ_{OL}	O*L	0.00167	0.00304	0.55	0.5822
φ_{OF}	O*F	-0.00754	0.00234	-3.22	0.0013
φ_{OC}	O*C	0.00955	0.00342	2.79	0.0052
φ_{OOM}	O*OM	0.00108	0.00203	0.53	0.5948
θ_{MT}	M*time trend	0.00527	0.00150	3.52	0.0004
θ_{OT}	O*time trend	0.00057	0.00037	1.55	0.1217
γ_{LT}	L*time trend	0.00022	0.00141	0.16	0.8753
γ_{FT}	F*time trend	0.00766	0.00118	6.48	0
γ_{CT}	C*time trend	-0.00492	0.00186	-2.64	0.0084
γ_{OMT}	OM*time trend	.71394D-04	0.00087	0.08	0.9345
α_R	EU dummy	-0.07066	0.00386	-18.32	0
β_T	time trend	-0.00173	0.01203	-0.14	0.8859
β_{TT}	T*T	-0.00011	0.00022	-0.52	0.6044

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Appendix A2

Parameter estimates

	Offset [mean=mu(i)] parameters in one sided error			
MED	0.03593	0.01429	2.51	0.0119
LAR	0.04961	0.01660	2.99	0.0028
	Variance parameters for compound error			
Lambda	1.28086	0.07762	16.50	0
Sigma	0.18983	0.00361	52.57	0

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Some Entrepreneurial Characteristics and Resource Use on Dairy Farms in South Ostrobothnia, Finland in 2003 and 2009

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Abstract. The aim of this paper was to examine entrepreneurial characteristics and resource use, and their changes on the family-owned dairy farms between the years of 2003 and 2009 on the region of South Ostrobothnia, Finland, which traditionally is recognised as an area of strong entrepreneurship. A postal survey was used to gather information on entrepreneurs' work-related values, goal-orientation, entrepreneurial motivation, and resources. The final data consisted of 191 (2003) and 258 (2009) farms. The results indicate that farm and herd sizes as well as the average milk yield grew between 2003 and 2009. The share of young entrepreneurs slightly increased and, with that, educational level and professional qualities. Entrepreneurial characters were examined with factor and cluster analysis. It was notable that the life cycle of the enterprise had a more clear influence on the clustering in 2009 than in 2003. The dairy farms could be divided into five clusters: Successors I, Successors II, Developers, Continuers, and Retirees each of these having a distinct combination of resources, entrepreneurial activity, and entrepreneurship. The results indicate that these combinations have developed between the years 2003 and 2009 to more balanced characterisations. However, less than half of the entrepreneurs are actively developing their enterprises.
Key words: entrepreneurship, resource use, dairy farm, factor analysis, cluster analysis.

Introduction

Agricultural production is heavily regulated with complex support schemes and market systems. Farmers have been conceived more as producers than entrepreneurs (Burton & Wilson 2006). The EU's Eastern enlargement in the beginning of 2006 has forced a remarkable renewal of the agricultural policy (Niemi & Ahlstedt, 2008). Although subsidies coupled to production are being given up and they are partly compensated with direct income support according to the EU's agricultural policy, entrepreneurship is still an important characteristic of agricultural entrepreneurs. They have to think constantly over productivity of resources and financial goals, enterprise development and continuity of entrepreneurship.

Values and attitudes towards being an agricultural entrepreneur are changing as well. There is a risk that motivation for entrepreneurship, especially in labour-intensive livestock farms, will decrease because the amount of agricultural subsidies is largely based on land area used in production and no longer depends on an entrepreneur's own work input and capital use. On the contrary, changes in the operating environment also force an entrepreneur to improve and search for new production operations as well as new operational strategies. In these kinds of change situations, an agricultural entrepreneur has to evaluate his entrepreneurial activities, his entrepreneurial motivation, and the goals of his enterprise, and possibly search for new meanings and grounds for his work.

Entrepreneurship can be studied from various points of view (Davidson 2004). The different definitions of entrepreneurship always include a person, an entrepreneur, who is responsible for entrepreneurial activities. According to Peltonen (1986), entrepreneurship is an attitude and a way of thinking and doing represented by the person's beliefs, actions, and

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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expressions of feelings. It relates to goal-oriented activities. Bygrave and Zacharakis (2010) define an entrepreneur as a person who perceives an opportunity and creates an organisation to pursue it. In this definition, the entrepreneurial process includes all the functions, activities, and actions associated with perceiving opportunities and creating organisations to pursue them. Kuratko (2008) makes a clear distinction between entrepreneurs and small-business owners; two concepts that are commonly used interchangeably. He states that small businesses are characterised by being independently owned and operated, being not dominant in their fields and typically not engaging many new or innovative practices. Furthermore, they do not necessarily grow large and their operators typically prefer a more stable and a non-aggressive way of running their business. Entrepreneurial ventures are those where the owner's main goals are innovation, profitability, and growth. In the development of their businesses, entrepreneurs are thus seen to have a different perspective compared with small business owners.

Koiranen and Peltonen (1995) see that close concepts for entrepreneurship are initiative, positive work attitude, desire to work, purposefulness, desire for success, responsibility, desire to take risks, creativity, inventiveness, and activeness. Many elements have an effect on entrepreneurship and becoming an entrepreneur. Huuskonen (1995) divides these into three groups: general background, personal elements, and situational elements. Central to entrepreneurship are personal elements, which include view of life, values, attitudes, and motivation.

Entrepreneurship is an important characteristic of farmers, agricultural entrepreneurs - even though following Kuratko's definitions presented above, they might in many cases be considered more as small-business owners. Their operating environment is, however, constantly changing due to changes in agricultural policy, changes in market conditions, and technological development. Agricultural entrepreneurs have to continuously consider financial targets, enterprise development and continuity of their business. They have to adjust their entrepreneurial activities to new requirements set by the operating environment. This can lead to changes in the intensity of production or the allocation of resources. Therefore, constant change demands agricultural entrepreneurs to re-assess their entrepreneurship and elements affecting it. It is also necessary to notice that the opportunity, which the entrepreneur perceives and then pursues does not need to be anything remarkable or ground-shaking: it may simply be the possibility to gain reasonable living for the family at the desired region by combining several minor resources and skills to utilise small varying sources of work and income.

In Finland, most farms are family-owned and family-operated units (Tike, 2010). Generally, for a family firm it is very important to recognise and to react to the changes that happen in the external environment. This ability can be a source of competitive advantage, which facilitates success and survival. According to Zahra et al. (2008), there are research findings; however, showing that family firms may be conservative and often have not got the ability to adapt to the changing environment. In their study among 248 family firms of the food processing industry, Zahra et al. (2008) found a positive association between a family firm's culture of commitment to the business and its strategic flexibility, the ability to follow new opportunities and respond to threats in the environment. Stewardship-oriented organisational culture moderated this association positively. These findings must naturally be interpreted cautiously in the context of Finnish agricultural enterprises, but it is interesting to notice that Vihtonen (2007) got somewhat corresponding results in her study among Finnish farmers: financial performance was the best in the group of dynamic and customer-oriented enterprises, where the history of the enterprise was perceived as a supporting resource. Financial performance was the weakest in the tradition-bound enterprises, where goal-orientation as regards to cost-efficiency was relatively poor. In these farms, the commitment to the history of the enterprise appeared to constitute a barrier to its development.

In Finland, South-Ostrobothnia is a region where relatively close-knit communities and small-scale entrepreneurship have even centuries-old traditions especially on the agricultural and food sectors. In the dairy industry, this tradition goes back to the late 19th century (Katajamäki, 2009; Koski, 2002.) Especially during Finland's EU membership the increased

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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role of the international agribusiness has questioned this tradition, and great changes have been going on in the structure of agriculture, in the resource use on individual farms, and on the attitudes concerning entrepreneurship.

This paper is descriptive in nature. With development of entrepreneurship and entrepreneurial activities over time as a research problem, the authors set two aims for the study. The first aim is to analyse and describe how entrepreneurship and entrepreneurial activities are corresponding to each other on dairy farms of South Ostrobothnia. The second aim is to find out whether any changes have occurred in this relationship between the years of 2003 and 2009. Entrepreneurship is examined from the viewpoints of entrepreneurial motivation, appreciation of work, and goal-orientation. It is necessary to notice that these are just few features, entrepreneurial characters, belonging to the multitude of dimensions relating to entrepreneurship (Davidsson, 2004). An exhaustive analysis of entrepreneurship on these farms is beyond the scope. The analytical frame of the study is presented in Figure 1.

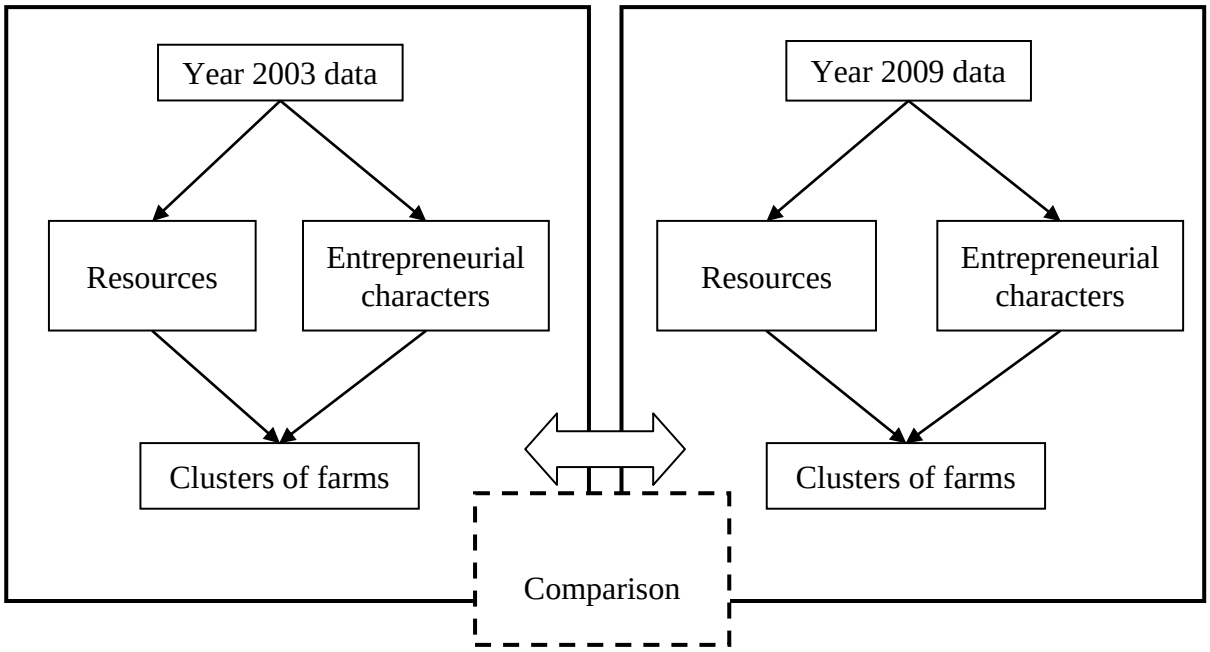

Fig 1. **Analytical frame of the study**

Materials and methods

The target group of this study was dairy farms in the region of South Ostrobothnia in Finland. The quantitative data were acquired by postal questionnaires. The questionnaire contained items that related to farmers' opinions and attitudes concerning their goals, entrepreneurial motivation, and appreciation of work. There were also questions concerning farmers' biography, their stage in the farm life cycle, continuity of farming, resource use in agriculture, and general background. The farms were chosen randomly from the Finnish Farm Registry, maintained by the Ministry of Agriculture and Forestry. All municipalities of the region were represented in the sample.

The datasets were initially analysed by Aro (2005) and Latva-Kyyny (2010) in their master theses. The 2003 survey was also analysed by Vehkamäki et al. (2008). The authors received 191 responses from 382 farms (50%) in the 2003 sample and 278 responses from 526 farms (53%) six years later. The questionnaires had mainly the same contents and the same target group, which enabled comparison between the results of 2003 and 2009 (e.g. Madsen 2007). However, when interpreting the results it is necessary to notice that less than half of the respondents were represented in both of the data sets. The changes that seem to

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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have happened in entrepreneurial characters and resource use are thus not exact but more suggestive in nature.

The questionnaire items relating to entrepreneurship were first analysed with a factor analysis to reduce the information of the questions into a few variables and to find features that would characterise the dimensions of entrepreneurship. Factor analysis is commonly used for such purposes. It is a multivariate method where several interdependent variables are combined (e.g. Hair et. al., 2006). It is assumed that there are some latent features that cannot be measured directly, but which affect the way the respondents answer each item in the survey. The common variance of the questionnaire items causes a correlation between the items. These correlations are condensed in factor analysis to reveal the underlying latent features as factors. Factor scores are the normalised weighted sums of the variables on each factor. They can be used in further analyses as values of the factor variables associated with each respondent.

Entrepreneurial activities of farmers were studied by means of cluster analysis, in which variables examined were the factor scores of entrepreneurial features obtained in the factor analysis, and variables describing the entrepreneurs and their resources: entrepreneur's age, vocational education and experience in independent farming, arable area, number of cows and average milk yield, intention to continue the enterprise, the spouse's participation in farm work, use of external employees, and plans of transferring the farm to a descendant.

Some general figures were calculated to characterise the sample farms (year 2009). The average age of the farmers was 45.8 years. Younger farmers had a higher education than the older ones. All the farmers under 35 years of age had at least a vocational education. The average experience in independent farming was 20 years on average. Most of the farmers (59%) were in the growth or establishment phase of the business, while six per cent of the respondents had had the farm in their possession for less than five years and were thus clearly operating at the founding phase. Retirement was an actual question for 25% of the respondents. Among those who would face this decision within five years there was a sure successor for 28%, a possible successor for 51% and unknown successor for 21%. The total arable land of the farms was 57 hectares on average. On average, 22 hectares of this was rented from another land owner. The average number of cows was 31, giving an average milk yield of 8 500 kilograms. The smaller farms typically had a lower average milk yield per cow than the bigger ones.

Results and discussion

In a changing operating environment, dairy farmers have to adjust their entrepreneurial activities to meet the new situation. There are many alternatives. It may be possible to diversify or reduce production, to continue as before, to change the line of production, to develop secondary occupations, to search for extra income outside agriculture, or to cease production totally. However, it is unrealistic to assume that all entrepreneurs would be flexible "opportunists" and eager to alter their behaviour drastically. It is probably more typical that the resources tied into agricultural production are extremely tedious to transfer into other types of business. In addition, farmers' professional skills outside agriculture may be a clearly limiting factor.

Factor structures among the variables measuring values, goals, and entrepreneurial orientation in the questionnaire were mostly similar in both of the datasets (years 2003 and 2009). Ten factors were extracted. Together they explained 65% of the total variance of the original variables. Factors five to ten had eigenvalues lower than one and explained only few per cents of the total variance each. They could have been omitted because of this statistical insignificance but were, nevertheless, extracted and retained in future analysis. They were thought to bring some, although weak, features into the analysis, which were not covered by the four "most evident" factors.

After a Varimax rotation, the factors describing entrepreneurship in the analysis of the year 2009 data could be interpreted as follows:

Growth of the enterprise: Entrepreneurs scoring highly on this factor tended to have goals like "increase the amount of arable land", "growth of the farm", and

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"increase the number of cattle" important to them. They also tended to see "availability of arable land" as an important motivational factor. Further, they were "willing to take risks" and saw "increased co-operation with other farmers" as an important goal.

Entrepreneur's knowhow: Entrepreneurs who scored highly on this factor were typically motivated by "strong belief on their own possibilities in farming" and their "own ability to organise the production". They also rated their "education and professional skills" as high.

Leisure time: Entrepreneurs scoring highly on this factor typically gave high priority to "increasing the amount of leisure time" and "more money for private consumption" as their goals. They valued highly such things as "low mental stress" and "flexible working times" as important aspects of work.

Continuity: Entrepreneurs having high scores on this factor were typically motivated by "continuing the family estate", "having a successor" and stressed "continuity of farming" as an important goal.

Social esteem: This factor was associated with "getting recognition", "feeling oneself necessary" and "the possibility to affect the society" as highly valued propositions relating to work.

Developing livestock: Entrepreneurs who scored highly on this factor typically aspired to "increase the average crop and milk yields" and the "breeding value of the cattle".

Challenging work: Entrepreneurs who scored highly on this factor valued highly such work-related propositions as "the possibility to self-development" and "facing new challenges".

Intensification of production: This factor had typically high scores among entrepreneurs who gave high priority to "decreasing the physical stress of work" and also aspired to "decrease unit costs of production".

Foresee ability: High scores on this factor were typical among entrepreneurs who valued highly "good foresee ability of future" relating to work. They were typically motivated by the "prevailing support policy".

L*arge-scale production:* Entrepreneurs who scored highly on this factor typically aspired to "increase the amount of cattle" and to "own a big dairy farm".

Next step in the analysis was to categorise the entrepreneurs into different types to reveal the connections between entrepreneurial activities, resource use and some biographic variables (upper part of Table 1) with entrepreneurial features, depicted as factor scores obtained in the analysis above. In a k-means clustering, the authors ended up with a solution of five clusters. From the alternative solutions tested, this was the clearest one to interpret.

Following this clustering, dairy farm entrepreneurs were designated in the following way: *Successors I, Successors II, Developers, Continuers, and Retirees*. Table 1 shows the direction and strength of variables within each cluster in relation to the average of all farms.

- *Successors I* were the most educated and youngest entrepreneurs. On average, they had smallest cattles and lowest milk yields. Spouses were mostly working outside the farm and external workers were not hired. Growth of the enterprise was an important goal and continuity was an important motivational factor. They were not interested in developing their livestock and making it bigger.
- *Successors II* were also young and educated. They had smallest farms measured by acreage and, respectively, their spouses' participation in farming was lowest of all groups. None of the factors of entrepreneurship gets high values among these entrepreneurs.
- *Developers* are younger than average and relatively highly educated. They have the biggest farms, highest yields, and highest use of employees and strongest intention of continuity. Their spouses are participating in the farm work more than on average. Table 1

Cluster analysis of the 2009 data: direction and strength of variables within each cluster in relation to the mean (the number in parentheses after the cluster name reports the relative share of entrepreneurs in the cluster in question)

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Variables of cluster analysis	Successors I (5%)	Successors II (23%)	Developers (20%)	Continuers (16%)	Retirees (35%)
Entrepreneur and resources related					
Age	**- - -**	**- - -**	- -	+	**+ + +**
Vocational education	**+ + +**	+ +	+ +	-	**- -**
Total arable area	+	**-**	**+ + +**	-	**- -**
Number of cows	**- -**	-	**+ + +**	+	-
Average yield	**- - -**	-	**+ +**	+	+
Spouse's participation in farm work	- -	**- - -**	**+ +**	+ +	+
Use of external employees	-	+	**+ + +**	+	**- -**
Experience in independent farming	**- - -**	- - -	- -	-	**+ + +**
Plans of transferring farm to descendant	**- - -**	- - -	-	- -	**+ +**
Intention of continuing	+ +	-	**+ + +**	- -	**- -**
Entrepreneurship factors					
Growth of the enterprise	+ +	+	**+ + +**	**- - -**	- -
Entrepreneur's knowhow	**- -**	+	**+ +**	+	-
Leisure time	**- -**	+	- -	**+ +**	+
Continuity	**+ +**	- -	-	**- - -**	+ +
Social esteem	+	**-**	+	-	**+**
Developing livestock	**- - -**	+	+	**+**	-
Challenging work	- -	+	**+**	**- -**	+
Intensification of production	-	+	**+ +**	**-**	+
Foresee ability	+	**-**	-	**+ +**	-
Large-scale production	**- -**	-	**+ + +**	+	-

Their entrepreneurship is characterised by a strong growth orientation, knowhow, and intensification of production. They appreciate leisure time as a motivational factor less than others do.

- *Continuers* are a little older than the average level. Their cattle and yields are little higher than on average and the spouse's participation is relatively high. They are not willing to grow their enterprise, they value leisure time and foresee ability related to farming highly, and are not motivated by continuity and challenging work.
- *Retirees* are the oldest and least educated entrepreneurs having thus most experience in farming and a low intention to continue. Instead, they typically have plans to leave the farm to the next generation. They are not growth oriented and are motivated highly by continuity of the family estate.

The results reveal the connections between entrepreneurship, entrepreneurial activities and resource use as well as the life cycle of the enterprise especially among the D*evelopers* and R*etirees*. The D*evelopers* have a high level of entrepreneurship and largest resources, which

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apparently feed each other creating a dynamically developing farm. The C*ontinuers* exhibit these features accordingly without, however, further intention to grow. Their growth and development phases of the life cycle were most probably in the past years and now, as they are approaching the time of change of generation they are operating on a stable phase. They are not motivated by continuity and it seems that the question concerning a potential successor is largely open. They value relatively highly leisure time and their entrepreneurial activities will probably start to fade in the future.

This fading of entrepreneurial activity is clearly visible among the R*etirees*, soon facing the actual decision. Since they are highly motivated by continuity and have typically plans to transfer the farm to the next generation they most probably just operate to maintain the farm in such a condition, that the successor will be able to make the next big decisions. There is probably one in most cases, since continuity is an important motivational factor to them.

Successors I and S*uccessors II* can be seen to be like on a road crossing. They should decide how to continue, and how to develop their enterprise. Their plans to invest into agriculture in the near future are low on average. Among S*uccessors II*, there is a little higher level of entrepreneurship relating to milk production, but spouse's inactivity in farming and continuity not being a motivational factor makes the decision a difficult one. This challenge is augmented by their somewhat conflicting motivation structure: at the same time they are keen on growth, intensification, and developing the livestock, but on the other hand, they appreciate leisure time more than most others. Among S*uccessors I* the situation can be seen differently. Since they are growth oriented, continuity motivated, and being not interested in developing their cattle, they will most probably continue farming but, instead of milk, choose another line of production.

The large share of R*etirees* (35%) in the sample is notable. When the authors also add the share of *Continuers* (16%), the share of entrepreneurs willing to develop farming remains relatively low: only half of the entrepreneurs will develop their farms to a direction or another, and only one out of five of the entrepreneurs belong to the most active, dairy farm development cluster.

Since the second aim of this study was to analyse possible changes in entrepreneurship and resource use that have happened between the years 2003 and 2009, a short presentation of the year 2003 clustering analysis follows repeating results of Aro (2005). The most clearly interpretable clustering of the 2003 data led to three clusters as follows:

- *Traditionalists* (63% of entrepreneurs) had small farms and cattle. They were aging and least educated having no high scores on any of the factors of entrepreneurship. They had not developed their farms actively and had no strong intentions to do so in the future. The features of this group portray the interconnections of resources and entrepreneurship: if one is weak then the other cannot prosper either.
- *Inconsistents (9%)* were the oldest, most experienced of all groups and had the smallest farms. On the entrepreneurship factors they, however, showed the highest growth orientation and will to develop livestock. They were motivated for their own knowhow and valued social esteem and leisure time more than other value. The contradiction between their resources and entrepreneurship was thus apparent. In the development of their enterprises, the time had probably already passed. A good question here is why they did not act earlier. Were there not resources available or did they not, after all, had the required courage to take the necessary steps.
- *Doers* (28%) were the youngest and most educated farmers possessing also the largest farms. Their growth orientation was low and they appreciated highly social esteem, continuity, and good benefits and leisure time. It can be concluded that these entrepreneurs had already taken the most important steps – or the previous generation had taken those – on the way to a successful business. Now it was time to concentrate on the core business and utilise the good resources. On the contrary, it may be concluded that these farmers were, due to their short career, just facing the big decision: how to continue from this point forward, having good resources but not so high level of entrepreneurial motivation, work appreciation, or clear goals.

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In addition to the features presented above, the results indicated that the number of dairy farmers has decreased during the examination period, and the average farm-specific arable area and herd size have increased. Furthermore, more investments were made in the past five years than had been planned in 2003. Farmers also sought extra income outside the farm, because there was a slight relative increase both in the number of spouses working outside the farm and in that of entrepreneurs having secondary occupations.

Conclusions, proposals, recommendations

Entrepreneurs' response to changes in the operating environment could be detected in the results of the study. When comparing the cluster analyses of 2003 and 2009, it seems that, over the period, the entrepreneurs' activities and resources converged with the variables describing entrepreneurship. The entrepreneurial activities have developed during the examination period, because entrepreneurship and resources had realised more distinctly than earlier in the operation of dairy farmers. The entrepreneurs in the clusters of 2009 had developed their operations according to the factors describing their entrepreneurship. This was visible also in the finding that entrepreneurs appreciating growth had invested and had plans to invest in the future; whereas those appreciating leisure time had minor investment intentions.

It seems that dairy farms in South Ostrobothnia are becoming more and more enterprise-like. This is reflected also in the entrepreneurs' replies concerning whether they would name themselves entrepreneurs or producers, or something else. Vesala and Peura (2002, p. 38) see that identifying oneself as an entrepreneur reveals the strength of entrepreneurial identity. According to the theory on social identity, self-categorisation relates to commitment. If a person wants to be and sees himself an entrepreneur, he accepts entrepreneurship as his attribute and orients himself according to it. In the 2009 survey, dairy farmers more often than earlier identified themselves as entrepreneurs from various vocational alternatives given.

Competition over arable land is already hard in the active areas and it will hardly become any less so. The increased price of farmland limits investing on other production facilities and deteriorates the liquidity of the enterprises (Pyykkönen, 2006). The availability of land is also aggravated by the fact that the demand for and supply of land are unbalanced. There are more *Developers* than *Retirees* in the most active sub-regions of the studied area; whereas the situation is the opposite in some other sub-regions. In active regions, this intensifies the competition over land, which further increases its price. In other regions, it is reasonable to question what will happen to the resources of those entrepreneurs who cease production. If the resources are left unused, there may be considerable adverse effects on regional economy. It is a challenge to develop farms in the active regions if no land is available. In this regard, the crucial distinction between development and non-development, viability and non-viability in the long run, may be determined by the conservativeness versus strategic agility of the enterprise and the farming family running it. Values associated with tradition and continuity as sources of entrepreneurial motivation may function as a good leverage to a positive direction. On the contrary, lack of that motivation as well as a too traditional thinking may lead to a crippled development.

According to the results, the share of entrepreneurs developing their farms had decreased in the examination period more than the total number of dairy farmers. This direction of development is worrying, because the study area is one of the top areas of dairy production in Finland. The same problem is also closely related to the low investment intentions of entrepreneurs continuing dairy production in 2009. Neither of the successor groups examined had plans for large investments although their farms were relatively small. They still belong to the generation, which should develop dairy production for vital dairy production to be able to continue in Finland. In contrast, the journey of these people as entrepreneurs was still short. Perhaps they were not totally aware of what they had taken on and, thus, their future plans were not yet clear. The strength of the traditions of the family estate most probably plays a crucial role when these farmers select their way forward, especially in the area concerned in this study, where entrepreneurship, traditions, and

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agriculture are generally highly valued. As noted earlier, *Successors I* were mostly motivated by continuity and social esteem, while *Successors II* were motivated more clearly by challenges relating to entrepreneurship, intensification, and cattle development. With many comparable current resources, the typical tracks of the entrepreneurs belonging to these clusters may thus be very different ones and worth of a future investigation.

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Changes in Efficiency of Fertilisers Use in Poland in the Years 1992-2009

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Abstract. This article aims to present the changes in efficiency of fertilisers' inputs in Poland in the period of 1992-2009. The tasks were threefold: 1) to evaluate total crop production in Poland in cereal units (c.u.); 2) to determine the amount of use of mineral fertilisers; and 3) to define the productivity of fertilisers. The data for the years 1992–2009 from the Central Statistical Office of Poland were used in the research. Production outputs in cereal units per 1 kg NPK in mineral fertilisers and changes in the efficiency of fertiliser use in time were determined from the data obtained. The study uses one- and multi-dimensional regression analysis. Also, the method of division of the aggregate determination coefficient in the multiple regression method was used in order to determine the relative impact of individual independent variables.
The research shows that the significant increase of fertiliser use in Poland has taken since 1992, but it was not significantly correlated to increasing the amount of total crop production. Consumption of mineral fertiliser in Polish agriculture has increased by 50% within the researched period, but at the same time the total amount of crop production has increased only by 4%. Crop production, counted in cereal units, from 1 kg of NPK-fertiliser has decreased by nearly 40%. The use of 1 kg of NPK-fertiliser has resulted in production of 0.35 c.u. in the first half of the 1990s and only 0.23 c.u. in the years 2006-2009. Productivity of inputs of N-fertiliser individually has also decreased, form 0.64 to 0.42 c.u. per 1 kg of N-fertiliser.
The higher inputs of fertilisers in Polish agriculture do not result in increased crop yields and production due to mistakes in production technology, for example, too small scope of pesticide use, and imbalanced nutrient supply. The other reasons can also be indicated, for example, very high share of soils with very high acidity in Poland (51%) and high acreage of light and very light soils with low capacity of sorption complex.
Key words: fertiliser, production efficiency, efficiency of fertilisers use, crop management.

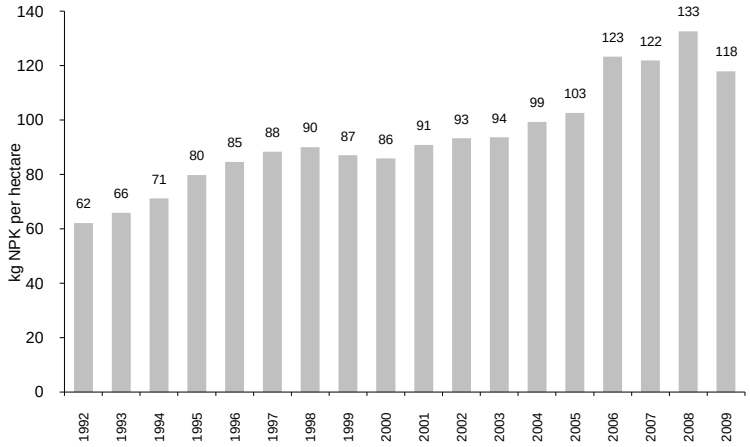
Introduction

Nowadays, agricultural production requires high outlays from outside the agriculture. Without them, it would not be able to achieve high crops and it would be thus difficult to provide food to people in a certain country, and the world. One of the most important crop-supporting outlays includes mineral fertilisers. The use of mineral fertilisers is very high; although some highly developed countries have reduced the use of fertilisers.

In Poland, the use of mineral fertilisers at the end of the 1980s accounted for approximately 180 kg NPK per 1 hectare of arable land. After the economic transformation, the use of fertilisers in the Polish agriculture abruptly decreased, and in 1992, it accounted for only 62 kg NPK/ha. In the subsequent years, the use of fertilisers rose to approximately 100 kg NPK/ha in 2004, and after Poland's accession to the EU, to approximately 120 kg NPK/ha (Figure 1). In comparison with the "old" EU Member States with a similar character of agriculture, the figures are very much similar (Figure 2). It is notable that the use of fertilisers in the EU-15 countries has decreased. The foregoing resulted from the implementation of environmental programmes oriented at a reduction in the environmental impact of agriculture. In the period of 1997-2007, it has decreased by as much as 20-30% in some countries. At the same time, the use of fertilisers in Poland rose by more than 30%. It means that in the future, if the production technology improves, it will be possible to achieve a higher production without increasing the use of fertilisers also in Poland.

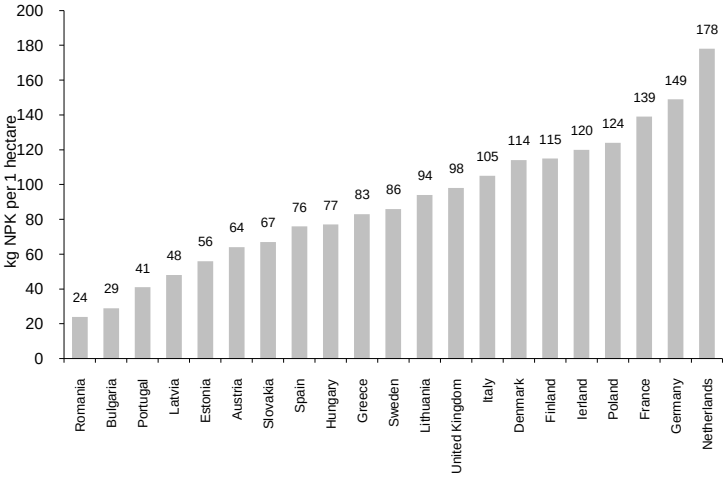
Different amounts of fertiliser use among different countries result not only from different production intensities of the basic agricultural plants, but also from the fact that in many countries there are significant areas that are extensively used for pasturage or semi-natural agricultural production.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
No. 24, 2011



Source: data of the Central Statistical Office of Poland

Fig.1. **Mineral fertiliser use per 1 hectare in Poland in the period of 1992-2009**



Source: author's calculations based on the data from Eurostat for 2007 (fertiliser use/agr land use)

Fig. 2. **Mineral fertiliser use per 1 hectare in selected countries of the European Union**

The increase in the fertiliser use enables to increase not only the production output. It results also from the fact that the new varieties are often adjusted to higher intensity and yield poor crops if fertiliser use is low (White E., Wilson F., 2006). Wheat varieties grown in the 1950s yielded 45 kg grain per one kilogram of nitrogen used in the production, with fertiliser use of 75 kg N/ha, and varieties grown in the 1980s yielded as much as 70/kg grain per kg N (CGIAR, 1997). It also depends on the place of production, so varieties should be tested at specific locations in order to find the ones that are best adjusted to production at a particular place (CGIAR, 2010).

The use of artificial fertilisers involves high-energy consumption. Fertilisers constitute as much as 32% of energy used in the wheat production (Jankowiak J., Miedziejko E. 2009), and the increase in the use of fertilisers by plants is the most important factor increasing the energy efficiency of crop production (Rathke G.W., et al. 2007). Therefore, the higher the production efficiency of fertilisers, the cheaper is the agricultural production. High opportunities in that respect result from the application of precise agricultural methods (Meyer-Aurych A., et. al. 2010, Schumann A., 2010) and division of one fertiliser portion into several parts (Chen D., et al. 2008) as well as adjustment of outlays to the crops planned (Andreas T., et al., 2010), since otherwise it results in high losses of nutrient components (Cui Z. et. al., 2010). Also, the balance of nutrient components (Jate M., 2010), and soil quality and acidity (Shafran S., et. al., 2010) are very important for the use of nutrient components from fertilisers.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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It is common knowledge that using mineral fertilisers contribute to higher yields, in particular in comparison with results of agriculture where no fertilisers are used. The average natural soil productivity in Poland is estimated at 15 dt cereal per 1 ha. The percentage of the nutrient components derived from fertilisers used by plants has decreased together with an increase in the use of fertilisers. The use of fertilisers may be higher and still effective since many new varieties better use higher portions of fertilisers (White E., Wilson F., 2006) and there is progress in the production technology. On the example of highly developed EU countries, it may be concluded that it is possible to reduce the average use of mineral fertilisers in agriculture without considerably reducing crops. In Poland, mineral fertiliser use is still the most important factor deciding on the crop yield (Wicki L., Dudek H., 2009).

The aforementioned factors show that a higher use of mineral fertilisers does not always contribute to a higher crop yield. It depends, largely, on the technologies used and whether the use of fertilisers is adjusted to the expected crops.

This article aims to present changes in efficiency of fertilisers' inputs in Poland in the period 1992-2009. The tasks were threefold: 1) to evaluate total crop production in Poland in cereal units (c.u.); 2) to determine the amount of use of mineral fertilisers; and 3) to define the productivity of fertilisers.

Data and methods

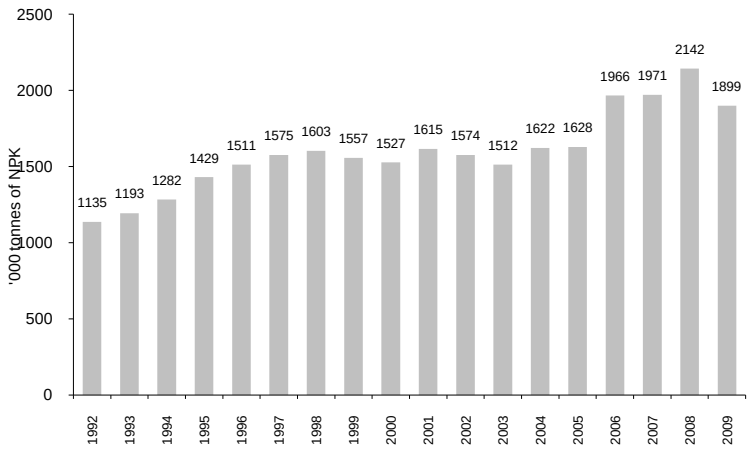
The analyses use the statistical data of the Polish Central Statistical Office concerning the amounts of mineral fertilisers used in Poland in the period of 1992–2009, and the crop yield of the basic agricultural plants. The agricultural production output was established in cereal units (c.u.) determined by Woermann (1944). The production of cereals, industrial plants, fodder plants, production on permanent grasslands, and production of vegetables and fruits were taken into account.

Production outputs in cereal units per 1 kg NPK in mineral fertilisers and changes in the efficiency of fertiliser use in time were determined from the data obtained. The study uses one- and multi-dimensional regression analysis. The OLS method was used to estimate coefficients of the regression equation. The study lacks the description of the method used, since it is a well-known and described method (Seber G., Lee A. 2003, Allison P. 1991). In addition, the method of division of the aggregate determination coefficient in the multiple regression method was used in order to determine the relative impact of individual independent variables (amount of N, P, and K used). The strength of the individual impact of individual independent variables used in the models was determined according to the characteristics $d_{yxj} = b_j \times \frac{S_{yxi}}{S^2_y}$, the sum of which for all j is equal to the determination index specified for the model. Characteristics d_{yxj} shows the division of impact of single explanatory variables on the determination index (Ostasiewicz W., 1999). In order to determine the average annual change dynamics, the following equation was used: $(\ln(Y_n/Y_0))/n$, where 0 refers to 1992, and n = 17 to 2009. The analyses do not use methods as TFP or Cobb-Douglas function, since not all production factors in agriculture (land, labour, and capital) were taken into account jointly, but one of the outlays only.

Results

In the period of 2006–2009, the use of mineral fertilisers in Poland accounted for 1995 thousand tons of pure NPK component, out of which 54% was constituted by nitric fertilisers. The figure was much higher than that observed earlier. In the period directly following the political transformation (1992-1994), an average of nearly 1200 thousand pure NPK component were used, 64% of which was constituted by nitrogen. Thus, the use of fertilisers grew by nearly 800 thousand tons NPK, i.e. by 65%. The use of fertilisers in the period analysed is presented in Figure 3. In the whole period analysed, the average annual pace of changes in the use of fertilisers accounted for 3.0%. Subsequent years observed different dynamics of the use of fertilisers. It abruptly increased after Poland's accession to the EU, which was due to the direct payments obtained by Polish farmers.

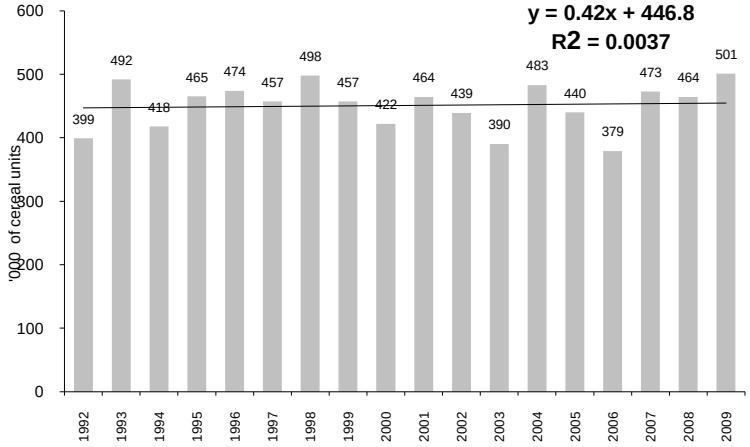
ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
No. 24, 2011



Source: data from the Central Statistical Office of Poland

Fig. 3. **Mineral fertiliser use in Polish agriculture in 1992-2009**

In the period analysed, the agricultural production output in Poland changed rather due to variable weather conditions in subsequent years than changes in the use of fertilisers. The total production output in cereal units and the production trend is presented in Figure 4. The effect of higher use of fertilisers in the form of higher production output is not observed. The average annual increase in the production output accounted for 1.3% in the period of 1992-2009. The production growth dynamics were thus more than twice as low as those observed for the use of fertilisers were.



Source: author's calculations

Fig. 4. **Total crop production in Poland in '000 of cereal units (100 thousand of c.u. is equivalent to 10 million tonnes of cereals)**

The greatest percentage of the production structure was constituted by cereals, fodder plants, and industrial plants (Figure 5). In subsequent years, the percentage of cereals and industrial plants in the production structure was growing; while the percentage of fodder plants decreased. In the period of 2006-2009, the percentage of cereals in the crop production accounted for 58.5%, and it was by 8.8 percentage points higher than the average in the period of 1992-1994. In the same period, the percentage of industrial plants increased by 4.7 percentage points, and that of potatoes was by as much as 10.6 percentage points lower.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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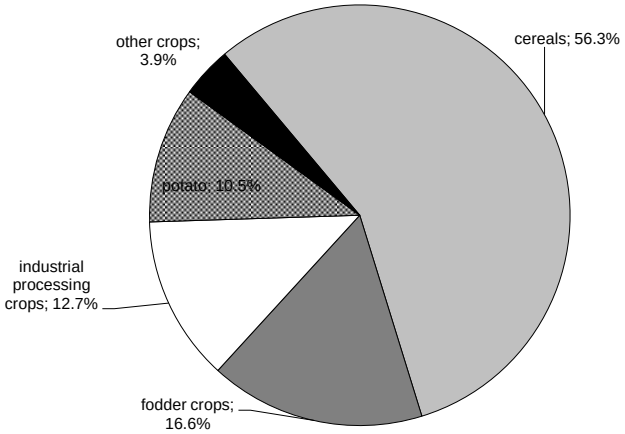
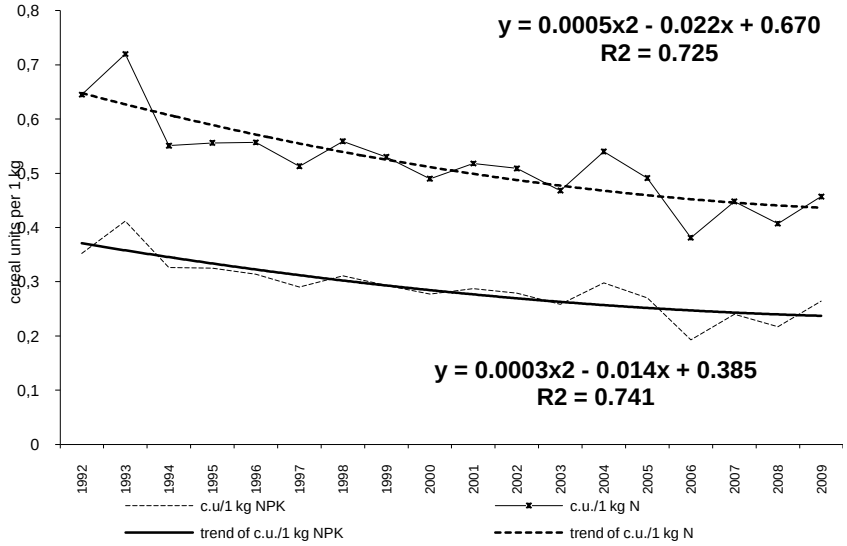
No. 24, 2011



Source: author's calculations

Fig. 5. **Structure of crop production in Poland (calculated on base of production in cereal units, average for the period of 1992-2009)**

Crop production output in cereal units per 1 kg NPK used in fertilisers has decreased. Analogically, the periods 1992-1994 and 2006-2009 were compared to each other. In the former period, the productivity of 1 kg NPK accounted for 0.363 c.u. gross; while in the latter period - only for 0.228 c.u. The foregoing means that between the analysed periods the production output obtained from 1 kg NPK has decreased by 37% in comparison with the reference level. The reduction in the efficiency is not justified by the crop yield and the production output. With the increase in the average crop yield, it could be expected that the use of nutrient components from fertilisers would decrease. Figure 6 presents the efficiency of total NPK outlays in mineral fertilisers and also separately for N outlays in the period analysed. Both, production in c.u. on 1 kg NPK as well as on 1 kg N decreased. The efficiency of NPK outlays decreased by an average of 0.73% per annum, and that of N outlays by an average of 0.88% per annum. The decrease in the efficiency of fertiliser use was not stopped in the period analysed, and no stabilisation is observed. The non-lineal regression models estimated for the observed changes enabled to adjust slightly better the trend line measured by the determination coefficient for the regression model. However, the minimum of those functions was not achieved.



Source: author's calculations

Fig. 6. **Changes of productivity of NPK and N inputs in Polish agriculture in the period of 1992-2009 (in c.u. per 1 kg of NPK and N respectively)**

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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In addition, the relation between the production output and the use of fertilisers was analysed based on the regression analysis. The results are presented in Table 1. For the model with one independent variable, the regression coefficient for NPK outlays is equal to 0.022, which means that in the period analysed, a very poor though positive relation between total mineral fertiliser use and the production output was observed (ca. 2.2 kg of cereals per one additional kg of NPK used). The relation is insignificant from the statistical point of view, and the regression coefficient value shows a zero relation between the figures analysed.

In the other model, three basic components N, P, K were adopted as independent variables. The model obtained is significant from the statistical point of view with p-value of 0.083. Individual independent variables have differently affected the production output. Nitrogen and potassium outlays enabled to increase the production output, and phosphorus outlays were negatively correlated to the production. With the significance value of 0.05, only the impact of nitrogen fertilisers was significant from the statistical point of view. The determination index of 42% was obtained for the estimated multiple regression model. The index was decomposed into parts that may be assigned to individual independent variables and determine the extent to which a given variable individually affects the dependent variable. The following values of partial determination were obtained: for N outlays – 48.6%, for P outlays – 9.0%, and for K outlays – 0.4%. The foregoing shows that in the period analysed the crop production output in Poland was affected, mainly, by the use of nitric fertilisers, and also potassium fertilisers. Nitrogen contributes the most to the crop yield; while phosphorous fertilisers contribute to the crop yield depending on the saturation of soil with phosphor, and the fertiliser used is available for plants even several years after the use. Even lack of phosphorous fertilisers in a particular year does not usually result in a considerable decrease in the crop yield.

Table 1

Results of regression analysis for dependence of crop production on fertiliser input

Variable	Regression coefficient	Model R^2	P-value for regression coefficient	F statistics	P-value for model
Simple linear regression model					
Intercept	416180	2.4%	0.0000	0.402	0.5352
NPK	0.022		0.5352		
Multiple linear regression model					
Intercept	289032	42.0%	0.0006	3.422	0.0829
N	0.516		0.0077		
P	-1.051		0.1818		
K	0.109		0.8365		

Inputs are in tones of nutrient component and production is in thousands of c.u.. It means that if inputs of N fertiliser increase by 1 tonne, the production increases by 0.516 thousand c.u. (approximately 51.6 kg of cereals per one kg of N).
Source: author's calculations

Conclusions

The study has analysed the changes in the efficiency of use of mineral fertilisers in Poland in the period of 1992-2009. It was concluded that there was a considerable increase in the use of fertilisers, which was particularly vivid in the period following Poland's accession to the EU. However, the increase in the use of fertilisers did not translate into an increase in the crop production output. In the period analysed, the fertiliser use increased by more than 50%; while the crop production output did not change more than 4%. The production obtained from 1 kg of NPK component decreased by nearly 40%. With 1 kg NPK, it was obtained from 0.35 c.u. in the first half of the 1990s to only 0.23 c.u. in the period of 2006-2009. The productivity of N outlays in the same period have also decreased from 0.64 to 0.42 c.u./kg N.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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The considerable increase in the fertiliser use resulted from an improvement in the economic situation of agricultural farms in connection with direct payments obtained from 2004. It may be supposed that higher use of fertilisers did not contribute to the crop yield due to mistakes made in the production technology, e.g. poor protection of plants against pathogens, and due to limitations arising from deficiency of other components. The factor limiting the increase in the efficiency of fertiliser use may also involve high soil acidity in Poland, and cultivation of light soils with small sorption complex. The percentage of acid and very acid soils in Poland is more than 51% (Kopiński J., Krasowicz S., 2010:11). The increase in the efficiency of the use of fertilisers will require farmers to adjust the outlays to the conditions of a specific farm and the expected production output as well as to improve the production technology to affect, first, factors that most limit the yield.

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2. Finance and Taxes

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
No. 24, 2011

Comparable Analysis of Financial Ratios of Farms and Impact of Subsidies on them in the European Union Countries

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Abstract. Financial ratios of the EU countries' farms, their comparative analysis and interpretation from the financial management point of view, the impact of subsidies on financial situation of farms are presented in the article. The research was carried out for the first time. The novelty is both in the methodology (due to the specific methodology of financial ratios calculation and limitations of the FADN data), and in the empirical research. The research aim is to evaluate and compare financial ratios in the EU countries' farms and to estimate the impact of subsidies on them. Research results showed a very large spread of the values of financial ratios. The authors presented maximum and minimum values of financial ratios, compared financial ratios of Lithuanian farms with the average ratios in the EU farms and the Baltic States farms, and presented possible reasons of financial ratios values. The sensitivity analysis of financial ratios to subsidies was done to estimate the impact of subsidies on financial ratios of farms in the EU countries. Research results are valuable for farms of different EU countries in the managing of finance, and the EU institutions when forming the policy of the EU support for agriculture and assessing the efficiency of this support.
Key words: financial ratios, subsidies, the EU, farms.

Introduction

Global financial crisis affected not only macroeconomics, financial markets, but also business entities, including agricultural. In addition to financial crisis hitting all over the world, the deteriorating financial situation of farms was also caused by inconsiderate liberalisation of financial support for farms. There are usually established some kind of marginal values for financial ratios, as indicators of financial situation. If financial ratios of farms match marginal values or are close to it, it is considered that a manager or other decision-making personnel stands for moderate financial management approach. Deviation from marginal values of ratios in one or the other way reflects conservative or aggressive financial management approach. Comparative analysis of the European Union (the EU) countries' farms financial situation enables to identify financial situation of different countries farms among other countries. Such questions like good or bad solvency, high or low profitability are not very easy to answer and it is argued if the financial ratios are not compared with the average ratios in the same industry.

Financial support for farms in every EU country differs in total and has different impact on financial situation of farms in the EU countries. What is the impact of subsidies on financial ratios of farms in the EU countries? This question is important not only for farms, but also for the EU institutions when forming the EU agricultural policy and assessing the effectiveness of support.

This study was carried out for the first time. Its scientific novelty asserts both the methodology (because of the specification of methodology used for calculating financial ratios in agriculture and the limitations of the FADN data) and empirical studies.

The object of the research is financial ratios and subsidies of the EU countries' farms.

The research aim is to evaluate and compare financial ratios in the EU countries' farms and to estimate the impact of subsidies on them. The aim is implied by the following tasks: 1) to review the previous research according to financial ratios and their interpretation; 2) to develop the methodology for calculation and comparison of financial ratios in the EU countries' farms and estimation of impact of subsidies on them; 3) to make a comparative analysis of

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
No. 24, 2011

financial ratios in the EU countries' farms; and 4) to estimate the impact of subsidies on financial ratios in the EU countries' farms.

The methods of the research: analysis and synthesis of scientific literature, comparison method and statistical analysis (sorting, averages, ratios, and sensitivity).

Research methodology

Financial ratios are particularly meaningful when compared with: 1) financial ratios of previous periods in the same farm; 2) provided parametric ratios; 3) financial ratios of the same branches farms; 4) financial ratios of the main competitors; and 5) modular economic ratios of the country (Mackevičius J., 2006). Comparative analysis was carried out by partly using the third point of mentioned: average financial ratios of farms were compared in different EU countries.

All financial ratios are usually divided into five groups: liquidity or short-term solvency, profitability, long-term solvency (capital structure, stability), assets turnover or efficiency and market value (Mackevičius J., 2006; Valladares E. V., Flores J. L. D., 2005). In agriculture, as specific economic activity, the methodology for calculating some of the ratios is different due to a specific recognition of income, biological assets, and subsidies.

Short-term solvency ratios are related with current assets and short-term liabilities, by treating the concept "current" as cash inflow in one year and the concept "short-term" as carrying out the obligations in one year. Traditionally assets in the balance sheet are grouped into fixed and current assets. There are three groups of assets in the balance sheet of farms: fixed, current, and biological. According to the 17th Business Accounting Standard "Biological Assets", these assets include plants and animals. It is grouped into crops, perennial plantations, and animals. According to the main current and fixed assets differences (usage in one production cycle or not; changing the form or not, comparable high or low value), the perennial plantations and productive livestock should be included into fixed assets, while crop and other livestock – into current assets (Aleknevičienė V., 2008). Under Farm Accountancy Data Network (FADN) only breeding livestock is included in the fixed assets. Other biological assets are included in the current assets.

Assessment of short-term solvency is usually done by using current ratio, quick ratio, cash ratio, and net working capital ratio. There is no opportunity to calculate cash ratio due to the lack of data in the FADN.

Profitability ratios are calculated by dividing profit by sales revenue, assets, and equity. J. Mackevičius, O. Molienė and D. Poškaitė (2008) indicate the following sales profitability ratios: gross, typical activities, financial and investment activities, ordinary activities and net profitability. E. V. Valladares and J. L. D. Flores (2005) offer such profitability ratios as: net profit margin, return on assets, and return on equity. There is no possibility to find information on sales revenue in the FADN, so it is purposeful to use gross farm income (total output minus intermediate consumption plus subsidies) instead. Gross production profit is calculated by subtracting variable costs (all costs, except intermediate consumption, depreciation and interest) from gross farm income, and net profit from ordinary activities – by subtracting depreciation and interest from gross production profit. In this way, profitability of farms is measured by using the ratios: gross production profit margin, net ordinary activities' profit margin, return on assets, and return on equity.

Long-term solvency or stability is also evaluated by using various financial ratios. E. V. Valladares and J. L. D. Flores (2005) indicate the following long-term solvency ratios: gross debt ratio, debt to equity ratio, capital multiplier, long-term debt ratio, and times interest earned ratio. R. H. Fosberg and A. Ghosh (2006) define capital structure by using gross debt ratio and debt to equity ratio. N. Eriotis, D. Vasiliou and Z. Ventoura-Neokosmidi (2007) evaluate capital structure by using debt ratio and interest coverage ratio. Stability may also be evaluated by using financial leverage which is calculated as financial debt to equity ratio in assessment of financial leverage effect, i.e. influence of financial risk on return on equity (Aleknevičienė V., 2008). I. Jakušonoka (2007) when analysing capital structure of agricultural companies in Latvia, has calculated financial leverage and financial leverage effect. The authors of this article evaluated stability of the EU countries' farms by using debt ratio,

financial leverage, interest coverage ratio, and financial leverage effect. Data about financial debts (debts for which interest is paid) are not presented in the FADN, so it was assumed that all short-term debts are not financial, thus only mid-term and long-term debts were used when calculating financial leverage. For evaluation of financial leverage effect the average interest rate was calculated dividing interest expense by long-term and medium-term debt.

E. V. Valladares and J. L. D. Flores (2005) indicate the following assets efficiency ratios: stock turnover, debt receivable turnover, payables turnover, and assets (total, current, fixed) turnover. The efficiency of the EU countries' farms was evaluated by using total assets, current assets and fixed assets turnover ratios due to the limitation of the FADN data.

The methodology of financial ratios' calculation is shown in Table 1.

Table 1

Methodology for calculation of financial ratios of the EU countries' farms

Group of financial ratios	Name of financial ratio	Methodology of financial ratios' calculation
Short-term solvency ratios	Current Ratio	Current Assets/Short-term Liabilities
	Quick Ratio	Accounts Receivable and Cash/Short-term Liabilities
	Net Working Capital Ratio	(Current assets–Short-term Liabilities)/Current Assets
Profitability ratios	Gross Production Profit Margin	Gross Profit from Production/Gross Farm Income
	Net Ordinary Activities' Profit Margin	Net Profit from Ordinary Activities/Gross Farm Income
	Return on Assets (ROA)	Profit from Ordinary Activities /Assets
	Return on Equity (ROE)	Profit from Ordinary Activities /Equity
Stability (Long-term solvency) ratios	Debt Ratio	Liabilities/Assets
	Financial Leverage	Long-term and Medium-term Liabilities/Equity
	Interest Coverage Ratio (ICR)	Earnings before Interest (EBI)/Interest paid
	Financial Leverage Effect	(Return on Capital employed–Interest rate) x Financial Leverage
Efficiency ratios	Assets Turnover	Gross Farm Income/Assets
	Current Assets Turnover	Gross Farm Income/Current Assets
	Fixed Assets Turnover	Gross Farm Income/Fixed Assets

Source: authors' construction

The longer the period, the more exact is the evaluation of financial situation of farms. It may be achieved since the impact of one year data on the average of financial ratios is eliminated better. All variables, necessary for calculating financial ratios, and financial ratios were calculated as arithmetic means of the FADN data of 2004–2008. This research period was selected due to two reasons: 1) Lithuania, Latvia and Estonia joined the EU in 2004; 2) there are no more recent FADN data as for 2008.

Assumptions and limitations of the research. The main assumptions are as follows:

- it was assumed that seasonal or temporary current assets as part of total current assets were equal to the ratio of crops output to total output;
- all costs of the farms, except fixed assets' depreciation and interest expense, were considered as variable;
- all medium-term and long-term debts were considered as financial debts (bank loans, leasing, bonds), and all short-term debts were considered as non-financial.

The impact of subsidies on farms' financial situation in the EU was assessed using the sensitivity analysis. Balance current subsidies and taxes influenced both numerator and denominator of gross production profit margin and net ordinary activities' profit margin. ROA and ROE were influenced by balance current subsidies and taxes only through the numerator.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Limitation of the research: all data of the EU countries' farms were presented only in 2007. There were no data about farms in Bulgaria, Romania, and Malta in 2004; Bulgaria and Romania in 2005; and Greece, Italy and Spain in 2008.

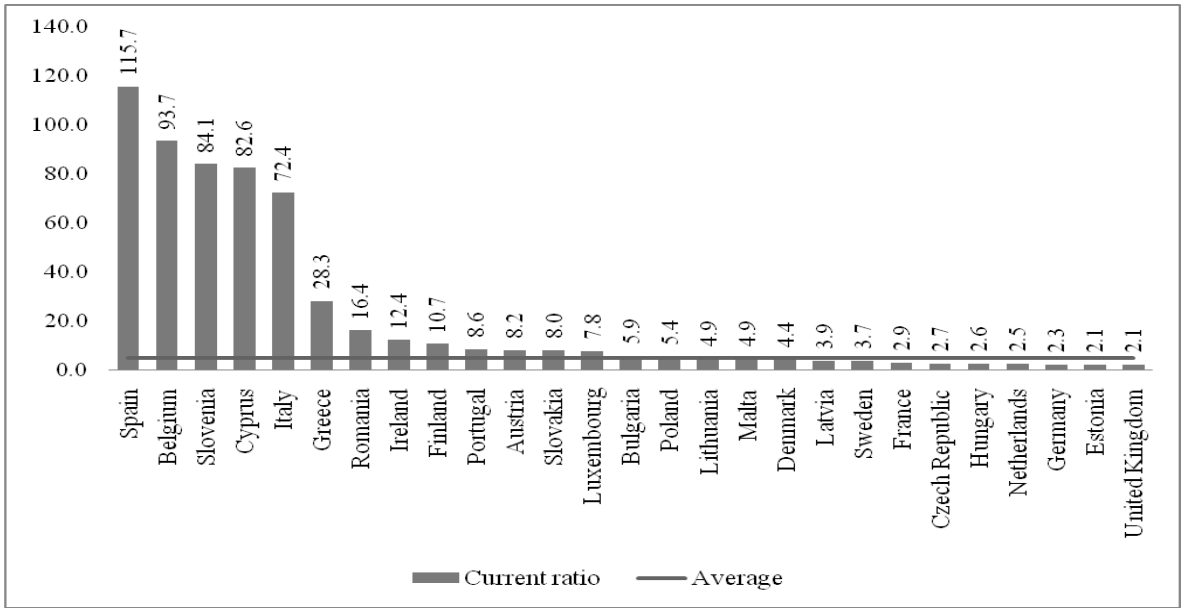
Research results

Empirical research started from the calculation of short-term solvency ratios. It was found out that the average current ratio of the EU countries' farms was 4.5 (Figure 1). Current ratios in the EU countries' farms varied from 115.7 in Spain to 2.1 in the UK. Large current ratios also appeared in Belgium (93.7), Slovenia (84.1), Cyprus (82.6), and Italy (72.4). These ratios showed radically conservative approach of farmers towards the management of liquidity. The lowest ratios were observed in the farms of the UK (2.1), Estonia (2.1), Germany (2.3), and the Netherlands (2.5).

Quick ratio shows how much of short-term liabilities can be covered by using only the most liquid assets – accounts receivable and cash. Big gap between current ratio and quick ratio signifies about freezing of money in stocks. This freezing is common in agriculture due to a relatively long production cycle. In countries where, according to the climatic conditions, many crops are harvested at the end of the year, the gap mentioned was huge and this was not caused by wrong management decisions on short-term solvency. The average quick ratio in the EU countries' farms was 3.1, while in Lithuania's – 3.4. This ratio has varied from 110.1 in Spain to 1.0 in Estonia during the research period. Regarding Spain, it can be seen that management of accounts receivable and cash was inefficient, since current ratio and quick ratio were quite the same.

Net working capital shows the assets financing policy: conservative, moderate, or aggressive. According to moderate approach only seasonal and temporary current assets should be financed by short-term liabilities. In agriculture these are current assets used for crop production. Moderate financing policy was carried out in the farms of Estonia, the UK, Germany, Ireland, and Denmark. Close to the moderate financing policy were the farms of Sweden, the Netherlands, the Czech Republic, and Luxembourg. All the other EU countries' farms implemented conservative financing policy. The most conservative financing policy was implemented in the farms of Greece and Italy. This practice of financing policy was concerned with large business risk in agriculture in order to maintain sufficient solvency under high cash flow fluctuations. However, it is needed to keep in mind that lower net working capital ratios provide an opportunity to earn a higher profitability: profit increases due to lower amount of interest paid for short-term debts than for long-term debts.

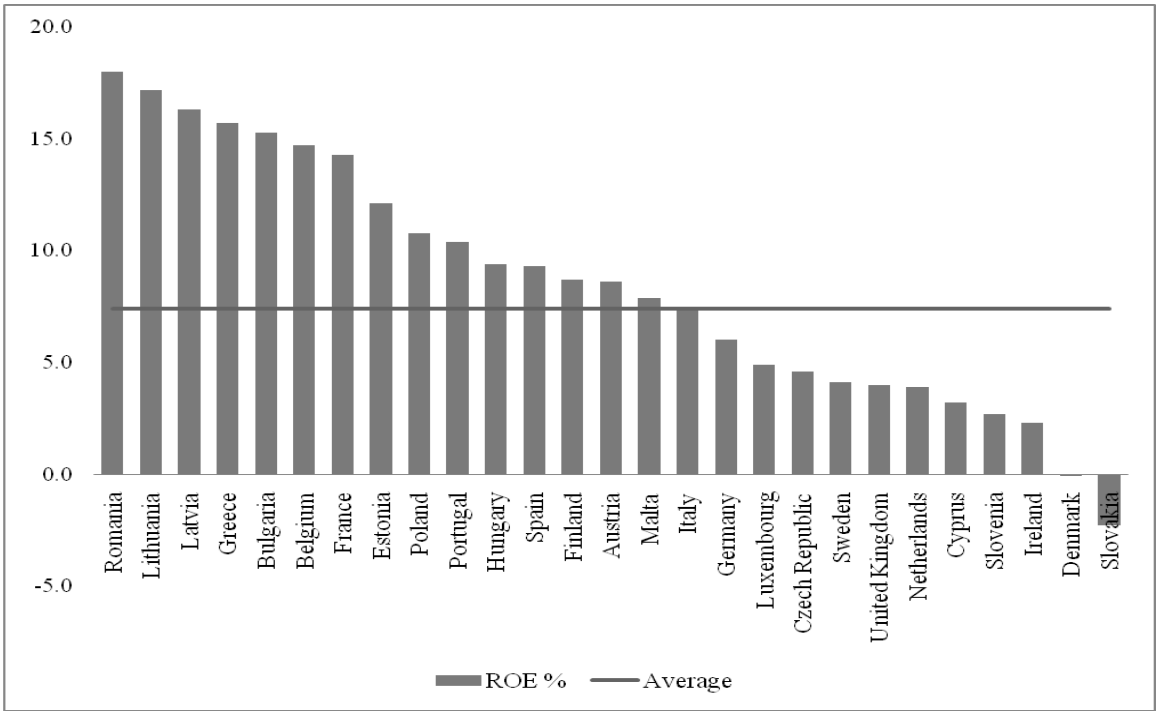
Results of the research showed that gross production profit margin varied from 94.7% in Slovenia's farms to 41.9% in Slovakia's farms. This huge gap among gross production profit margins in the EU countries' farms indicates variant management of variable and part of fixed (except depreciation and interest) costs. Excluding Slovenia's and Slovakia's farms, the highest gross production profit margins were in Austria (92.9%) and Poland (90.6%), while the lowest margins were in the Czech Republic (45.3%). The average gross production profit margin in the EU countries' farms was 78.2 %. The average net ordinary activities profit margin in the EU countries' farms was 48.7%. This ratio varied from the highest point in Spain's farms (75.9%) to the lowest in Slovakia's farms (-13.5%). High ratios also had farms in Malta (73.5%) and Greece (72.9%). (Figure 1)



Source: authors' construction based on the FADN data

Fig. 1. **Average current ratios in the EU countries' farms in 2004–2008**

Return on assets ratios (ROA) varied from 17.4% to -2.2%. The average ROA in the EU farms was 6.2%. The highest returns on equity (ROE) were in the farms of Romania (18%), Lithuania (17.2%), Latvia (16.3%) and Greece (15.7%), while the smallest – in the farms of Slovakia (-2.2%), Denmark (0.0%) and Ireland (2.3%) (Figure 2). On average a farmer in the EU countries earned 7.4%. Estonian farms took the 8th place according to ROE. The bigger the ratio compared with ROA, the more efficient is the management of farm's capital structure.



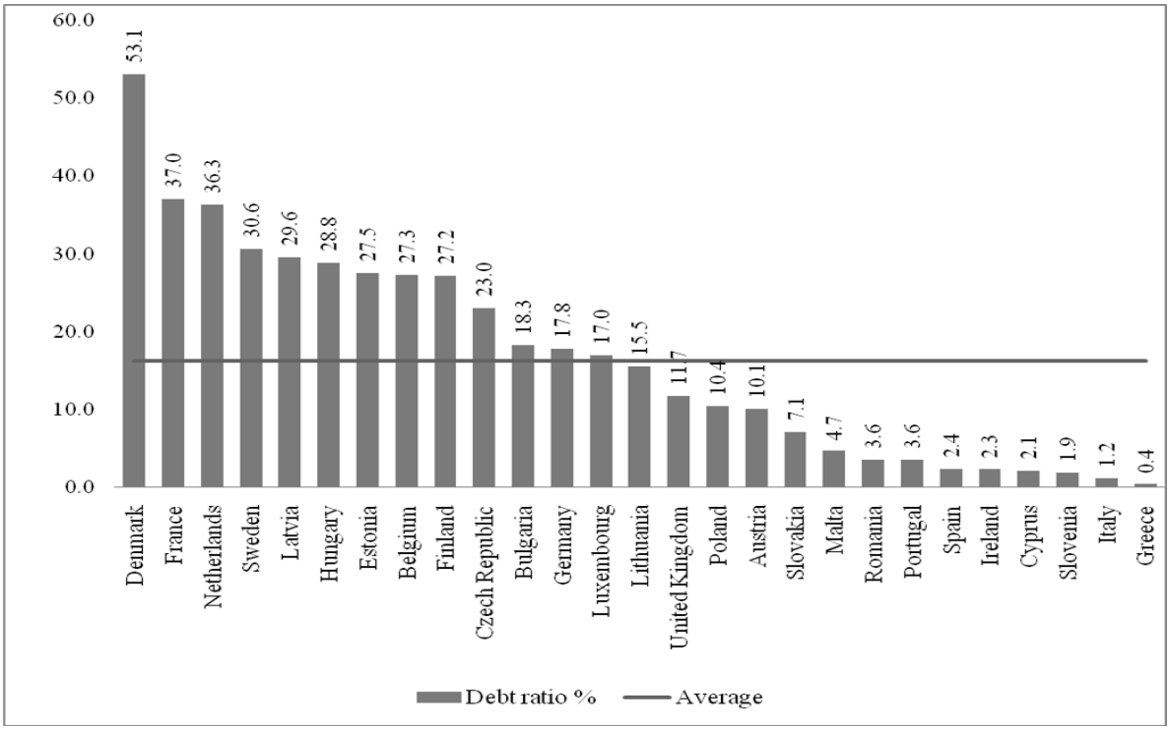
Source: authors' construction based on the FADN data

Fig. 2. **Average return on equity in the EU countries' farms in 2004–2008**

ROE is closely related with stability ratios. When stability decreases, return on equity increases, and vice versa. However, this requires one important condition: the return on

invested capital shall be higher than the interest rate on debt capital. The highest financial risk was taken by farms in Denmark (53.1%), France (37.0%), the Netherlands (36.3%), and Sweden (30.6%) (Figure3). The lowest financial risk was taken by farms in Greece (0.4%), Italy (1.2%), Slovenia (1.9%), Cyprus (2.1%), Ireland (2.3%), and Spain (2.4%). The average debt ratio in the EU farms was 16.3%. Farms in Lithuania were close to the EU average (15.5%), while farms in Latvia and Estonia financed 29.6% and 27.5% respectively of assets by debts.

Financial leverage in the EU farms ranged from EUR 1.06 (Denmark) to EUR 0.002 (Greece). The average financial leverage in the EU countries' farms was 0.14. Lithuanian farms had higher stability compared with the EU farms' average (0.10), while Latvian and Estonian farms had lower stability (0.28 and 0.23). Interest coverage ratio (ICR) shows the ability of farm to cover the interest by EBI. When ranking credit by Standard & Poor's quality indicators, this ratio should be no less than six times if the credit has A rating (A rating is the last high-quality rating). According to the study, during the research period the average ICR in the EU countries' farms was 9.9 times. ICR increases with the decrease of financial debts. It is not surprising that this ratio was the largest in Greece (333.3) and Italy (148.8), and the lowest in farms of Denmark (1.0), the Netherlands, and Sweden (2.6). ICR was negative in Slovakian farms due to the lack of profit necessary to cover fixed costs. Our neighbours, Estonian and Latvian farms had 9.1 and 9.7 ICR, while Lithuanian farms – 29.6.



Source: authors' construction based on the FADN data

Fig. 3. **Average debt ratios in the EU countries' farms in 2004–2008**

Financial leverage effect shows the increase of ROE when using debt capital for financing. Effective borrowing in the capital market has increased ROE in 14 EU countries' farms and conversely – has reduced ROE in 13 EU countries (Figure 4). The average ROE in the EU countries' farms has increased by 0.21 ppt. because of capital structure decision-making. The average ratios for Lithuania, Latvia, and Estonia have been bigger – 1.06, 2.21 and 1.07 ppt. respectively. The most efficient borrowing in the capital markets was in the farms of Belgium, France, and Latvia. Their financial leverage effects were 2.51, 2.41 and 2.21 ppt. respectively. Most inefficiently have borrowed farms in Denmark (-2.90 ppt.).

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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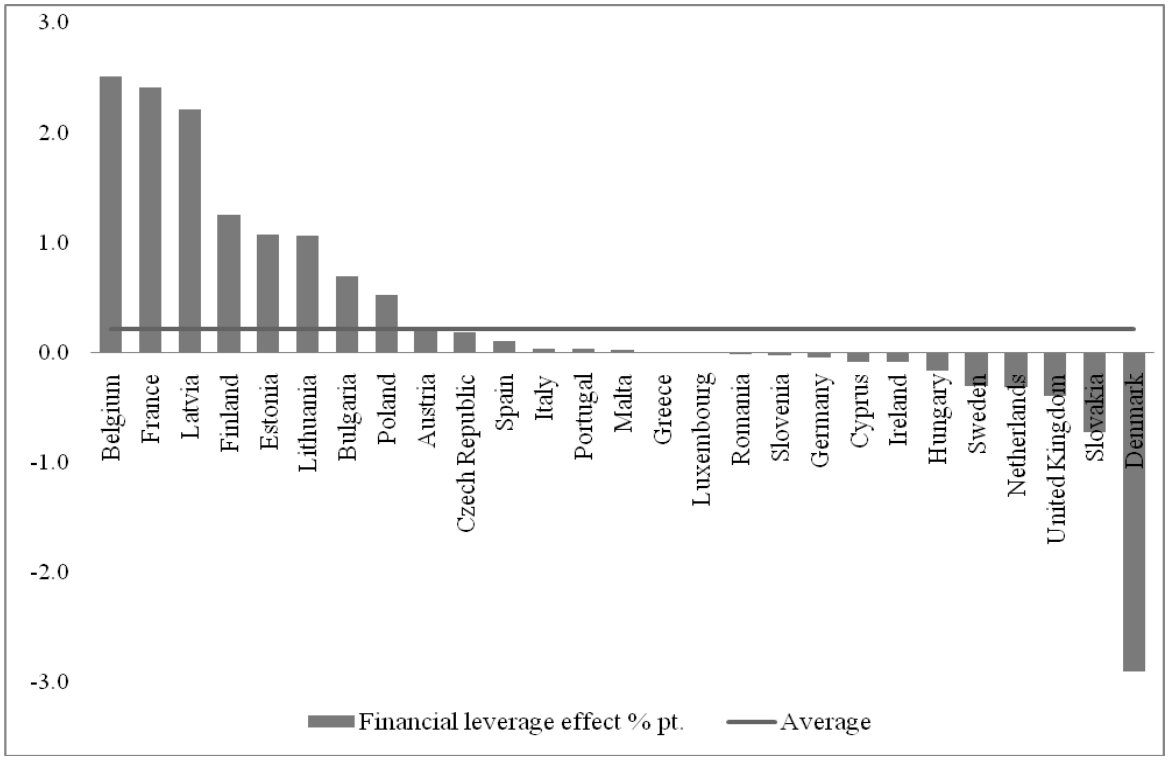
ROE is caused not even by net profit and capital structure, but by asset efficiency as well. Assets turnover in the EU countries' farms varied from EUR 0.29 in Bulgaria to EUR 0.04 in Ireland. The average EU countries' farms have earned EUR 0.13 gross farm income for 1 euro of assets. Ratios in the farms of Latvia, Lithuania, and Estonia were accordingly EUR 0.24, EUR 0.22 and EUR 0.20, and took up positions in the top seven. The lowest fixed assets turnover ratio was in Ireland's farms (EUR 0.04), but according to the current assets turnover took up 12th place between all EU countries. This suggests that Ireland's farms have relatively much invested in fixed assets during the period of 2004–2008, and capital intensive business during the period of investment is always less efficient. The average fixed assets turnover in the EU countries' farms was EUR 0.14. The most efficiently current assets were managed in the farms of Greece (4.34), Belgium, and Slovenia (1.36), while the lowest ratios were in the farms of Spain (0.32), Denmark (0.47), and Sweden (0.55). The average ratio in the EU countries' farms was 0.68.



Source: authors' construction based on the FADN data

Fig. 4. **Average financial leverage effect in the EU countries' farms in 2004-2008**

The impact of subsidies on financial ratios was determined using sensitivity analysis. This analysis was accomplished by calculating four profitability ratios: gross production profit margin, net ordinary activities profit margin, ROA, and ROE. The sensitivity analysis was done under assumption that balance current subsidies and taxes decrease by 1 per cent. When the assumption was made, gross production profit margin, net ordinary activities' profit margin and gross farm income were reduced by 1 per cent of balance current subsidies and taxes.

Comparative analysis of gross production profit margins before and after assumption showed that all changes in this ratio were negative, but none of them exceeded 0.30 ppt. The biggest change was observed in the farms of Slovakia and the Czech Republic: reduction of gross production profit and gross farm income by 1% of balance current subsidies and taxes caused reduction of gross production profit margin by 0.30 ppt. and 0.24 ppt. respectively. The lowest influence of subsidies on gross production profit margin was in the farms of the Netherland, Slovenia, Poland (0.02 ppt.) and Belgium, Spain, Italy, and Romania (0.03 ppt.). Gross production profit margins in the farms of Estonia and Latvia were more sensitive to the changes of balance current subsidies and taxes than the EU average (0.06 ppt.) –0.13 ppt.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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and 0.11 ppt. respectively. In the farms of Lithuania this ratio was less sensitive (0.05 ppt.) than the EU average.

Comparative analysis of net ordinary activities' profit margins before and after assumption showed that these ratios are the most sensitive in the farms of Slovakia (0.59 ppt.), Finland (0.51 ppt.), Sweden (0.37 ppt.), and the Czech Republic (0.35 ppt.). The least sensitivity of net ordinary activities' profit margins to the change of subsidies was observed in Spain, Italy, and Romania (0.05 ppt.). This ratio in the farms of Lithuania was least sensitive among the Baltic countries (0.13 ppt.) while in the farms of Estonia and Latvia this ratio decreased by 0.26 ppt. and 0.27 ppt. respectively (the EU average is 0.15 ppt.).

The impact of balance current subsidies and taxes on ROA and ROE is the same, because the reduction of subsidies influences only the numerator of these ratios. ROA ad ROE in the farms of Finland (0.13 ppt.) and Latvia (0.12 ppt.) were the most sensitive to the reduction of balance current subsidies and taxes. The least sensitive were the ratios in the farms of the Netherlands (0.01 ppt.), Cyprus, Denmark, Ireland, and Italy (0.02 ppt.). The average sensitivity of ROA and ROE in the EU countries' farms was 0.04 ppt. These ratios in the farms of Lithuania were least sensitive among the Baltic countries again (0.08 ppt.). The sensitivity of ROA and ROE to the balance current subsidies and taxes in the farms of Estonia was very similar (0.09 ppt.).

Conclusions

The research results showed a very large spread of the values of financial ratios of farms in different EU countries. Current ratio in the EU countries' farms differed up to 55 times: from the highest in the farms of Spain to the lowest in the UK. The average current ratio in the EU countries was 4.5. Moderate financing policy was found in the farms of Estonia, the UK, Germany, Ireland, and Denmark. Close to the moderate financing policy were the farms of Sweden, the Netherlands, the Czech Republic, and Luxembourg. All the other EU countries' farms implemented a conservative financing policy. The most conservative financing policy was implemented in the farms of Greece and Italy. This practice of financing policy is concerned with large business risk in agriculture in order to maintain sufficient solvency under high cash flow fluctuations.

ROE is one of the most important financial ratios, aggregating all financial management decisions made in the farm. The highest ROE was in the farms of Romania, Lithuania, Latvia, and Greece, while the smallest – in the farms of Slovakia, Denmark, and Ireland. A farmer in the EU countries earned 7.4% ROE on average.

ROE is closely related with stability ratios. When stability decreases, return on equity increases, and vice versa. However, this requires one important condition: the return on invested capital shall be higher than the interest rate on debt capital. The highest financial risk was taken by farms in Denmark, France, the Netherlands, and Sweden. The lowest financial risk was taken by farms in Greece, Italy, Slovenia, Cyprus, Ireland, and Spain. The average debt ratio in the EU farms was 16.3%. Farms in Lithuania were close to the EU average (15.5%). Farms in Latvia and Estonia financed 29.6% and 27.5% of assets by debts. Effective borrowing in the capital markets increased ROE in 14 EU countries' farms and conversely – reduced ROE in 13 EU countries. The most efficient borrowing in the capital market was in the farms of Belgium, France and Latvia. The most inefficiently have borrowed farms in Denmark.

The greatest impact of balance current subsidies and taxes on profitability ratios are determined in the farms of Slovakia and the Czech Republic, considering ROA and ROE – in the farms of Finland and Latvia. The least sensitivity of profitability ratios is observed in the farms of Spain, Italy, and Romania, considering ROA and ROE – in the farms of the Netherlands, Cyprus, Denmark, Ireland, and Italy. The impact of subsidies on profitability ratios in the farms of Lithuania is the weakest among the Baltic States.

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Capital Structure, Characteristics and Features of Chemical Substances Manufacturing Enterprises: Case of Latvia

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Mg.oec.

Abstract. Business financing is one of the most studied subjects in corporate finance. Capital structure is an important factor in the determination of an enterprise's value, and an accurately stated and selected equity and debt ratio can maximise an enterprise's value and minimise the cost of capital. Therefore, this subject is also especially important at different stages of the business cycle. Different industries have different capital structure features; hence, one industry in particular has been selected for the research - the chemical substances manufacturing industry.

The aim of this study is to define and analyse the factors, which influence capital structure and its changes, as well as to determine whether the capital structure strategy of Latvian enterprises conforms to any known capital structure theory.

The research also involved use of the following quantitative and qualitative methods applied in the science of economics: monographic, selection, a time series analysis, and the graphic method.

Research results show that most of the factors, which have influenced capital structure in the last ten years, caused an increase in debt in capital structure. Factors causing the debt increase are macroeconomics and market conjuncture, investor and creditor protection increase, and the development of financial instruments. Factors, which should result in a debt decrease, are the size of an enterprise and a corporate income tax decrease from 25% to 15%. The market timing theory was stated for eight enterprises (out of ten).
Key words: capital structure, debt, equity, capital structure theories.

Introduction

Business financing represents one of the most studied issues in corporate finance. Capital structure is of particular importance in estimating the value of an enterprise; an accurately estimated and selected equity and debt ratio can maximise the value of an enterprise and minimise the cost of capital, so this issue is especially significant in the changing conditions of the economic development.

Although several capital structure theories have been put forward, compliance tests have been carried out in various countries and various industries, and the factors influencing the capital structure have been analysed in recent decades, there are still many unanswered questions and problems. For example, it is not always possible to evaluate the market value of security, and there are regular discussions about whether the cost of convertible bonds should be considered a debt or equity. So far, a united model, which would envelop all theories, is missing. The results of empirical research are contradictory; no theory breaks out of the pack as a good means of interpreting corporate decisions.

The issue is also topical in Latvia thanks to several reasons. Firstly, in Latvia virtually there have been no deeper studies of capital structure. Secondly, no empirical research has been made that would prove (or deny) the choice of Latvia in favour of one or another theory. Thirdly, in Latvia the calculation of financial indicators and their analysis, including the determination of the weighted average cost of capital (*WACC*), is not common. The research and analysis of capital structure in Latvia is also linked to several problems. Both sufficient time and a sufficient volume of samples are required in order to perform a qualitative analysis and the development of a model. However, in Latvia, a sufficient amount of qualitative data is missing, and not enough enterprises within the industry could be included in the sample. Business cycles also ought to be taken into consideration, namely, since Latvia declared independence several crisis and growth phases have occurred, which makes it difficult to perform the research.

The aim of the study is to list and analyse the capital structure of enterprises, which manufacture chemical substances in Latvia and the factors affecting it as well as to define any

compliance to capital structure theories based on the empirical results from applying the theories. The following tasks have been set forth to achieve the aim: to define factors which affect capital structure, to perform an analysis of the affecting factors, to analyse capital structure changes in ten enterprises over a ten year period, and to draw conclusions on the compliance to capital structure theories of Latvian enterprises which manufacture chemical substances.

The study used qualitative and quantitative methods applied in the science of economics: monographic, selection, a time series analysis, and the graphic method.

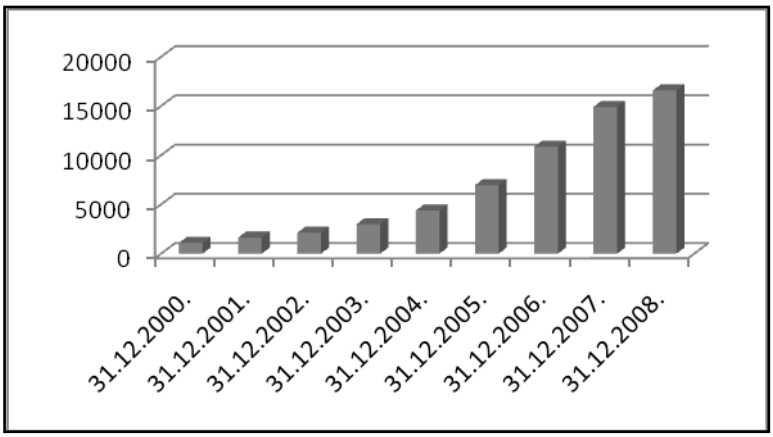
Results and discussion

The study defined and analysed several factors, which might influence the capital structure of Latvian enterprises manufacturing chemical substances. The factors include - macroeconomics (GDP per capita, inflation), the development of the lending market (the number of disbursed loans, interest rates, the sorting-out of legal property rights, and pledge registration), the development of other capital markets (the development of the Riga Stock Exchange, and Financial Instruments Market law), legislation (business income tax changes, and the tax imposition on dividends) etc.

GDP per capita (using the figures of 2000 as comparable prices) from 1995 up to 2007 has increased significantly (Central Statistical Bureau, 2010). During the growth, when the GDP increase can be observed, optimism dominates in the economy and entrepreneurship, turnover increases, as does the number of customers, and with that, profit; enterprises are expanding, opening branches in other cities and countries. At the same time several sources of capital became more available, for example, bonds (investors have positive forecasts, and thus they are more investing), and it is comparatively easier to get a loan from credit institutions. When such economic conditions emerge (increased GDP, improved financial data for the business, an optimistic view about the future), it is more likely that a business will increase its debt ratio in terms of capital structure – it is cheaper and when such conditions become apparent it is also easier to achieve the growth.

In 2008, inflation in Latvia reached its peak together with the GDP per capita increase (Central Statistical Bureau, 2010). Besides inflation "increases" the price of goods and services, it also increases the cost of capital, because investors demand a higher premium to cover inflation.

Loan disbursement conditions became lax in Latvia's credit market; in the last decade it became easier to recieve loans from credit institutions. Between 2004 and 2008 the volume of disbursed loans increased rapidly (Figure 1) and it is only logical that the capital structure of businesses showed an increased debt ratio.



Source: Central Statistical Bureau, 2010

Fig. 1. **Disbursed loans (at the end of the period) in Latvia, per million LVL, 2000-2008**

Another factor is interest rates. Changes in the last decade were in favour of debt increase in the capital structure of enterprises. The weighted average interest rate of disbursed

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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long-term loans up to 2003 (inclusive) was stably decreasing, but EUR and USD interest rates between 2004 and 2008 varied at relatively low levels between 6% and 8% respectively (Central Statistical Bureau, 2010). The share of debt increases in the capital structure with the decrease of the cost of debt.

Development of the Riga Stock Exchange. The NASDAQ OMX Nordic Exchange includes the markets for securities in the Nordic and Baltic countries, and consists of the stock exchanges of Copenhagen, Stockholm, Helsinki, Iceland, Tallinn, Riga and Vilnius. Therefore, the NASDAQ OMX provides access to approximately 80% of all the securities markets in the Nordic and Baltic countries, and members of the stock exchanges, listed enterprises, investors and other market participants get an opportunity to use a service with an increased value added. The Riga Stock Exchange was established on 7 December 1993; from 1997 sessions were organised daily; in 1998, private joint stock companies, which were not privatised were listed on the stock exchange (JSC Balta shares, and bonds of Latvia Investment Bank). In 1999, the first mortgage bonds were listed, these being issued by the Mortgage and Land Bank of Latvia. In 2000, the stock exchange offered its members a new service: i-broker, which allowed clients to trade directly via the Internet. In 2001 investment fund units were first listed. Notably important is the fact that in the year 2007 the stock exchange launched the alternative market, First North, which allowed small and medium-sized enterprises the chance to develop rapidly, using the potential of shares market, by which they could raise capital and increase their visibility (Riga Stock Exchange, 2010).

Development of the credit market. Even though the biggest Swedish banks, Swedbank and SEB, entered Latvia in the last decade of the previous century, active lending only began several years later. The increase of lending was influenced by the previously mentioned general economic conditions (GDP increase, low interest rates, optimism about the future, etc.), and also by Latvia's accession to the EU and NATO in 2004, which gave Latvia wider access to foreign capital and inspired a greater level of confidence in investors.

The author of this research also emphasises legal property rights and pledge registration in areas such as the development of the State Unified Computerised Land Register, which was an important information source to credit institutions and investors. The Register makes possible to check quickly whether mortgages are registered by other banks or there exist other burdens, which could reflect on a bank's ability to execute this property in the future. In 1993, the Land Register registered 340 properties; already in 2003 totally 74,828 properties were entered, while in 2007 the total number reached 1,066,111 properties (State Unified Computerised Land Register, 2010). However, commercial pledge registration, renewal and termination in the Enterprise Register started in February 1998 (Enterprise Register, 2010). As a result, creditors and investors are more protected.

Company size. In 2008 there were 69,863 economically active individual entrepreneurs and companies (excluding farms, fishery farms and self-employed individuals) in Latvia, out of which 99.3% qualified in the SME category (small and medium enterprises). The following structure of SMEs exists in Latvia: micro enterprises - 78.6%, small enterprises - 17.3%, medium enterprises - 3.5%, and large enterprises - 0.6% (Ministry of Economics of the Republic of Latvia, 2010). In accordance with theoretical research, large enterprises characteristically possess a large debt ratio; while small enterprises have a small ratio. The author of this research places strong emphasis on the fact that researches do not provide the definition for large and small debt ratio. It is also not made clear according to which parameters the company size is estimated, either taking into consideration the scope of business activities, net turnover, the number of employees or some other factors. According to the European Commission Regulation No. 364/2004 and the European Commission recommendation No. 361, dated 6 May 2003 medium enterprises have between 50-249 employees, their net annual turnover does not reach fifty million euros and the annual balance volume is less than 43 million euros. In research, the enterprises included do not match the characteristics of large enterprises. Yet the comparison of the enterprises with the largest and smallest volume of actives shows that no significant differences are being stated in the capital structure. For example, in 2008, the largest volume of actives was stated for Dzintars JSC, but the smallest was claimed for Bioefekts Ltd, comparing an average debt ratio for a ten-year

period, and significant differences in capital structure were not stated - the average debt ratio for Bioefekts Ltd was 41.80%, but for Dzintars JSC it was 39.52%.

Corporate income tax rate. Interest payments decrease taxable income. Therefore, in accordance with the accepted theory, if the income tax rate of an enterprise decreases, its debt ratio should also decrease due to the decrease of the tax shield. In Latvia, the tax rate was 25% until the end of 2001, but from 1 January 2002 the rate was decreased to 15% (Law "On Corporate Income Tax", 1995). When comparing the industry debt ratio between 2001 and 2002, it can be concluded that the debt ratio has decreased by 3.36 percentage points, but already in 2003, the ratio has increased by 1.56 percentage points. Consequently, it can be concluded that the tax rate decrease had only a short-term impact on the capital structure of businesses.

Dividend taxation at 10% (Law "On Personal Income Tax", 1993). The rate (which was valid from 1 January 2010) could have reflected even more in favour of debt over the next few years (if not in the present current financial crisis). On the one hand, an enterprise can decrease its taxable income (15%) by the interest amounts it pays, but on the other hand, dividends paid out to the shareholders of enterprises are taxable at the personal income tax rate of 10%. The author of this research also forecasts that in the future there is a possibility that the cost of equity would increase, because investors may request additional premiums in order to cover tax expenses.

What must also be noted is that on 20 November 2003 Latvia adopted the Financial Instruments Market Law (effective from 1 January 2004, compared with the US Securities Law, which was effective from 1933). The purpose of this law is to ensure the functioning of financial instrument market by facilitating the protection of the interest of investors, the stability and reliability of the financial instrument markets, and the accessibility of information and equal opportunities for all participants on the financial instrument market. Legal requirements, which are in place also regulate the procedures for making a public offer of financial instruments, the public circulation of financial instruments, the provision of investment services and non-core investment services, the licensing and supervision of participants on the financial instruments market, and determining the rights and duties of participants in the financial instruments market as well as the liability for any failure to comply with the requirements laid down in this law (Law "On Financial Instruments Market", 2003).

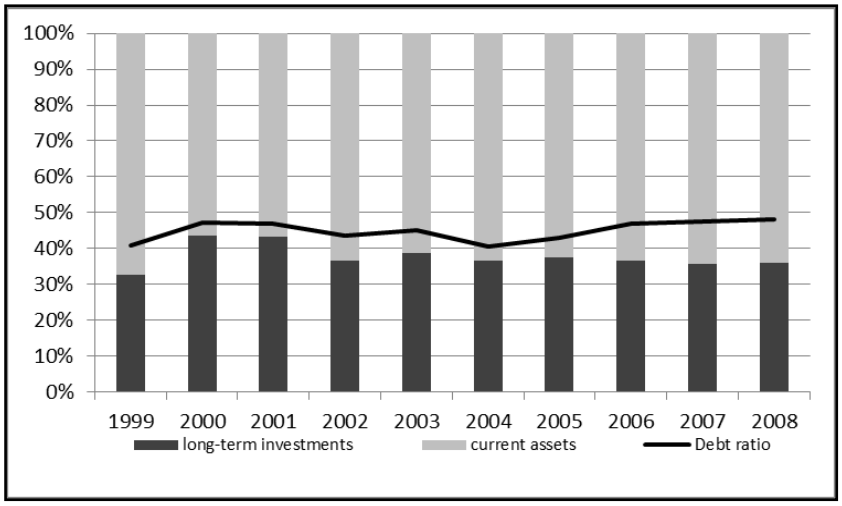
Over the recent decade, the majority of the factors influencing capital structure have caused an increase of the debt ratio in the capital structure of enterprises. The factors accounting for this growth were macroeconomic and market factors (GDP growth and the decrease of interest rates as a result of which the availability of loans grew), and the enhancement of investor and creditor protection (the registration of property and mortgages in the Land Register, the registration of commercial pledges). In their turn, the factor that supposedly should have caused and provided for a decrease of the debt ratio was the size of the enterprise (the majority of Latvian enterprises fit into the category of small and medium enterprises). However, the debt ratio was relatively similar for both large and small enterprises. The changes in Latvia's tax policy in the period between 1999 and 2008 had a small influence on capital structure compared with that of macroeconomic and market situation indicators. The 2010 changes in tax legislation (the imposition of taxes on dividends, and microenterprise tax) will have little influence on the equity and debt ratio. Both in the period examined as well as in forecasting the situation for the next couple of years, a bigger role belongs to the enhancement of investor and creditor protection and measures for market improvement (Financial Instrument Market Law, 2003).

Within the research, ten industry enterprises were analysed in order to establish the compliance of their capital structure to a particular capital structure theory. The analysis of each enterprise was made according to the following terminology:

- general information about the enterprise;
- the structure of its assets (the percentage ratio between fixed and current assets) and the debt ratio;
- an analysis of the return on current assets, the total liquidity ratio and cash flow to debt ratio, and their comparison with the average industry indicators (the aforementioned indicators were chosen because, in the author's opinion, they reflect several important

aspects of enterprise performance – return on current assets, enterprise solvency, and ability to adapt to the changing financial situation);
- an analysis of the changes in the capital structure of enterprises.

The debt ratio in the period being analysed is greater than long-term investment (Figure 2). It is also important that until 2005 the increase of long-term investments was followed by the increase of the debt ratio. However, starting from 2005, long-term investments remain relatively unchanged (or slightly decrease); while the debt ratio in 2006 has increased by four percentage points compared with the previous year. The turning point could be the accession to the European Union, which offered both a bigger sales market and access to the sources of finance.



Source: Central Statistical Bureau, 2010

Fig. 2. **The active structure and debt ratio of enterprises in Latvia manufacturing chemical substances and products between 1999 and 2008**

Table 1 includes a summary of ten chemical enterprises, which were analysed in Latvia using capital structure theories.

Table 1

The likely compliance of ten chemical enterprises, which were analysed in Latvia using capital structure theories

No.	Enterprise	Capital structure theory
1	ELME MESSER METALURGS LSEZ Ltd	Market timing theory/capital structure pecking order theory
2	Neomat JSC	No conclusions can be made due to the lack of
3	Bioefekts Ltd	Capital structure pecking order theory
4	Olaines ķīmiskā rūpnīca BIOLARS	Market timing theory
5	Rīgas laku un krāsu rūpnīca Ltd	Market timing theory/trade-off theory
6	Dzintars JSC	Market timing theory/trade-off theory
7	PPE Serviss Ltd	Market timing theory
8	L.Ē.V. /Ekstraktu rūpnīca/ Ltd	Market timing theory
9	DEFREO Ltd	Market timing theory
10	Grāts Ltd	Market timing theory

Source: author's summary

As result of the analysis, it was found that 80% of enterprises comply with the market timing theory; while for 10% of remaining enterprises it was not possible to establish an accurate benchmark for compliance due to the lack of data. The remaining 10% of enterprises showed the traits of the pecking order theory.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Overall, it can be concluded that the result acquired – eight out of ten cases possessing the traits of the market timing theory – is reasonable. Accession to the European Union, the rapid increase of the use of credit, comparatively low interest rates, a favourable macroeconomic situation, optimistic forecasts about the future, including future solvency, and the enhancement of investor/creditor protection – all these factors facilitated the growth of the debt ratio in the capital structure of enterprises. The key factors are connected mainly with the issuing of credit by commercial banks – the loan market became overheated and business management used the favourable market situation to raise cheaper capital.

The capital structure trade-off and pecking order theories are more likely to be observed in the larger chemical enterprises in Latvia. The key idea of the trade-off theory is the trade-off between the tax advantage and financial distress costs, and the tax advantage effect will be felt more in larger enterprises, which have large interest payments. There is a similar situation with the pecking order theory, which main concept is based on information asymmetry (which could be expressed to a greater extent in large enterprises) and the cost of various kinds of capital – large enterprises have more opportunities and a wider choice in rising funding when compared with small enterprises and microenterprises.

The author of the research would also like to stress the behavioural psychology aspects in the decision-making process regarding capital structure. Not all decisions are understandable and logical; one should also take into account the human factor, and knowledge and competence in financing issues.

Conclusions, proposals, recommendations

1. Over the last decade, the majority of the factors, which have influenced capital structure, caused an increase of the debt ratio in the capital structure of enterprises. The factors accounting for this growth were as follows: macroeconomic and market situation factors (GDP growth and the decrease of interest rates, resulting in the growth of the availability of loans), the enhancement of investor and creditor protection (the registration of property and mortgages in the Land Register, and the registration of commercial pledges), the development of the financial instruments market (the Financial Instruments Market Law, and the development of the Riga Stock Exchange). In their turn, the factors that supposedly should have caused and provided for the decrease of the debt ratio were the size of the enterprise (the majority of Latvian enterprises fit into the category of small or medium-sized enterprises. However, the debt ratio was relatively similar both for large and small enterprises), and the decrease in the income tax rate for enterprises from 25% to 15% (when the law came into force the debt ratio decreased by more than three percentage points).
2. Based on the research data, the traits of the market timing theory have been found in eight out of ten enterprises. The accession to the European Union, the rapid increase in the availability of credit, comparatively low interest rates, a favourable macroeconomic situation, optimistic forecasts about the future, including future solvency as well as the enhancement of investor/ creditor protection, all helped facilitate the growth of the debt ratio in the capital structure of enterprises. The key factors are connected mainly with the availability of credit from commercial banks – the loan market became overheated and business management used the favourable market situation to raise cheaper capital.
3. The capital structure trade-off and pecking order theories are more likely to be observed in the large chemical enterprises in Latvia. The key idea of the trade-off theory is the trade-off between the tax advantage and financial distress costs, and the tax advantage effect will be felt more in large enterprises with large interest payments. There is a similar situation with the pecking order theory, which main concept is based on information asymmetry (that could be better expressed in large enterprises) and the cost of various kinds of capital – large enterprises have more opportunities and a wider choice in rising funding when compared with small enterprises and microenterprises.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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Scale of Bankruptcies of Enterprises in Poland

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Abstract. The aim of the article was to present the scale of bankruptcies of enterprises in Poland, with a particular focus on the agribusiness sector. The analysis results were presented according to the following criteria: type of bankruptcy proceedings, enterprise legal form, and division by provinces and branches. In 2010, almost 85% of total number of bankruptcies of enterprises accounted bankruptcies for liquidation of assets. Findings show that the greatest number of bankruptcies in the period analysed relates to limited liability companies (in 2010 it accounted for as much as 69% of all bankruptcies). Regarding branches, the greatest number of bankruptcies relates to industry, trade, and transport. A particular attention was paid to the scale and reasons for bankruptcies in the agribusiness. Factors preventing and accelerating bankruptcies of agribusiness enterprises were discussed in the article. It is worth mentioning that the percentage of bankruptcies of agribusiness enterprises in the total number of bankruptcies was low (approximately 10% in 2007-2008).
Key words: bankruptcy, liquidations of enterprises, recovery procedures.

Introduction

More bankruptcies of banks and enterprises are observed due to the global financial crisis. Bankruptcies during the crisis result, in particular, from two groups of factors. One of them involves a more difficult access to funds, which may not be obtained by companies with a worse financial condition, characterised by low financial liquidity. The other one involves bad market situation resulting in lower sales revenues. From the viewpoint of the economy, a bankrupt company is an enterprise, which is not able to settle its liabilities on time, and the value of its property is not sufficient to cover them. Therefore, in economic terms, the bankruptcy means that an enterprise is not able to continue independently its activity without external financial contribution.

The aim of the article is to present the scale of bankruptcies in Poland in the period of 2007-2010 with a particular focus on the agribusiness sector. In the case of some issues, the analysis covered the period of 2002-2009 or 2006-2010. The following tasks of the research were formulated:

- to examine determinants of changes affecting the number of bankruptcies of enterprises in Poland;
- to point out the structure of bankruptcies of enterprises by legal form, branches and provinces;
- to indicate the scale and reasons for bankruptcies of agribusiness enterprises in Poland.

The phenomenon in question was analysed and synthesised. The research results were processed using the descriptive analysis. In addition, graphical and tabular methods were used in the research. Source materials included the literature on the subject and reports of Coface.

Results and discussion

Figure 1 presents the number of bankruptcies of enterprises in the selected countries of the Central and Eastern Europe. In most of the countries analysed, the number of bankruptcies has grown since 2008. In 2009, the number of bankruptcies grew the fastest in the Czech Republic and Hungary in comparison with the previous year. After six years' decrease, the year 2009 marked a considerable increase in the insolvencies of Polish companies. In 2009, courts declared bankrupt 691 economic entities in Poland. It was by 68% more than in 2008 (Figure 1).

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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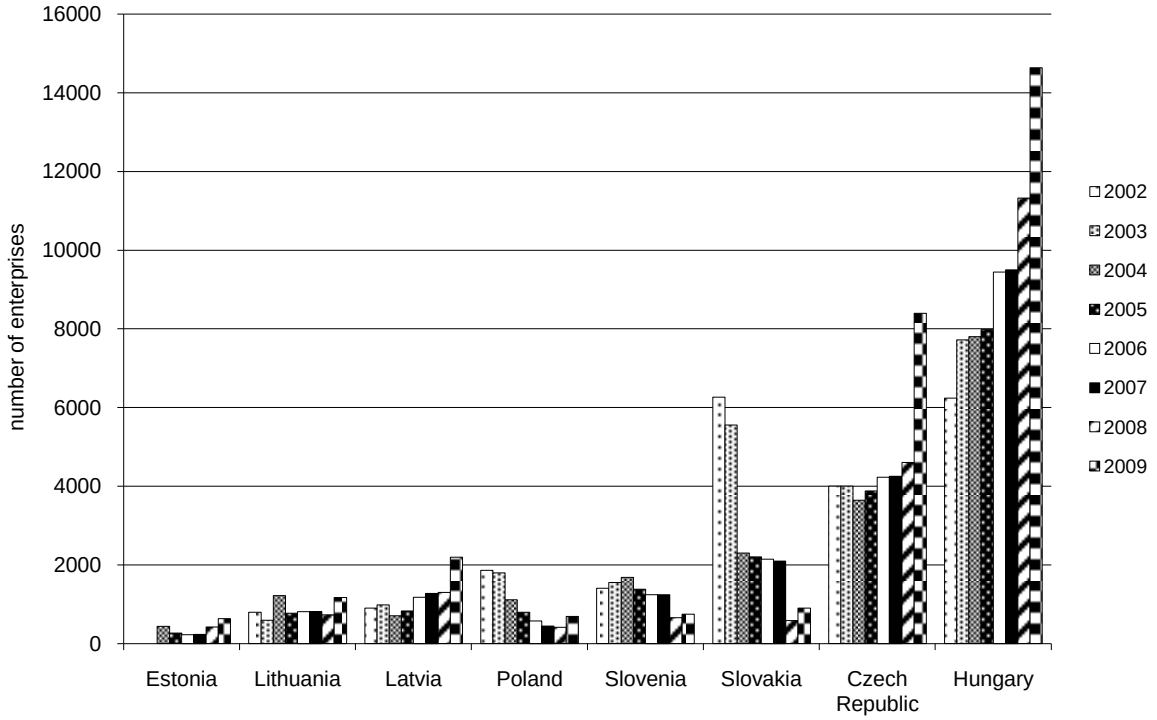

Source: study based on reports Insolvencies in Europe for 2002-2009

Fig. 1. **Number of bankruptcies of enterprises in the selected countries of the Central and Eastern Europe in the period of 2002-2009**

In 2010, Polish courts declared 655 enterprises bankrupt. In the following months of the second half of the year, the increase in the number of bankruptcies slowed down; hence, the whole year result was by 5.2% better than the previous year result. However, the result was by nearly 60% higher than that in the pre-crisis year 2008 (Figure 2).

It is notable that many bankruptcies were declared in order to liquidate assets, e.g. in 2010, they constituted as many as 85% of bankruptcies (Figure 2). In 2010, the percentage of bankruptcy proceedings with a possibility for a bankrupt company to come to an agreement with its creditors within a recovery procedure rose to nearly 18 %. The mentioned figure accounted for 15% during two years prior to the crisis. In the opinion of Prof. E. Mączyńska, liquidation by bankruptcy should be the last option, since bankruptcy involves particularly high costs, including externalities, mainly social ones. One of the results of bankruptcies and liquidations of enterprises relates to an increase in the unemployment rate, i.e. also expenses on unemployment benefits (Mączyńska E., Pietraszkiewicz K. et al., 2010). It is notable that the percentage of recovery procedures is low in Poland. It is beyond any doubt that an increase in the number of positively finished enterprise recovery or reorganisation procedures could result in a reduction of social costs.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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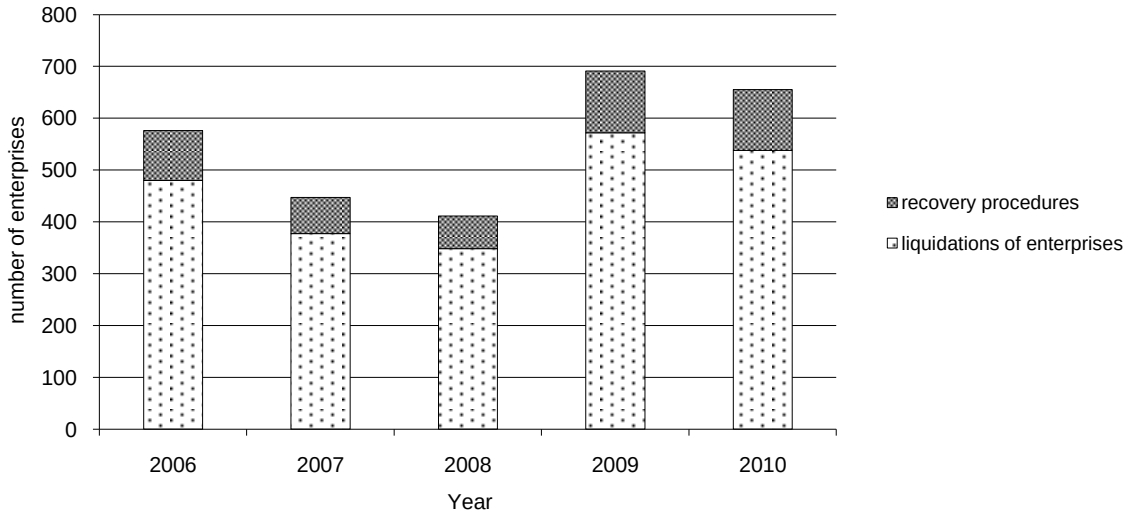

Source: study based on Coface, 2008 and Coface, 2010
Fig. 2. **Types of bankruptcy proceedings in Poland**

Recovery procedure has been present in the Polish legal system since 2003. It was governed by Articles 492-521 of the Act of 28 February 2003 (Dz. U. Journal of Laws, No 60, Item 535, as amended) Bankruptcy and Recovery Law. Despite correct legislative assumptions, it is rarely used in practice. It should be borne in mind that among 1381 bankruptcy petitions in the first half of 2007, there were only 21 petitions for a recovery procedure (approximately 1.5%). The foregoing fact may result, among others, from the difficulty to distinguish between the condition of insolvency justifying the declaration of an enterprise bankrupt from the condition of a danger of insolvency, which forms a basis for the initiation of a recovery procedure. The managers of enterprises are not willing to inform their contracting parties about financial problems, and they often wait too long before taking rehabilitation activities, because of which they are prevented from the possibility to submit an effective declaration on initiation of a recovery procedure. In accordance with Article 492 and the following ones of the Bankruptcy and Recovery Law, the regulations of a recovery procedure are aimed at recovery of the condition of an indebted enterprise to restore its long-term ability to compete on the market. A recovery procedure may be conducted solely by enterprises that settle their liabilities on the on-going basis, and their financial situation is not unfavourable enough to signify a near bankruptcy according to a reasonable assessment (Grenda Ł., 2010). According to the author, enterprise managers should use early warning systems to monitor the danger of insolvency.

The data contained in Figure 3 show that the greatest number of bankruptcies in the period analysed affected limited liability companies. Their percentage in the total number of bankrupt companies in 2010 accounted for as much as 69% and increased by 4 percentage points in comparison with 2007. Another legal form that observed a great number of bankruptcies relates to entrepreneurs pursuing non-agricultural economic activity. It is notable that the percentage of joint-stock companies in the total number of bankruptcies is relatively low in comparison with that of limited liability companies. Legal forms of business used by bankrupt entities included general partnerships, co-operatives, and state-owned enterprises (Figure 3).

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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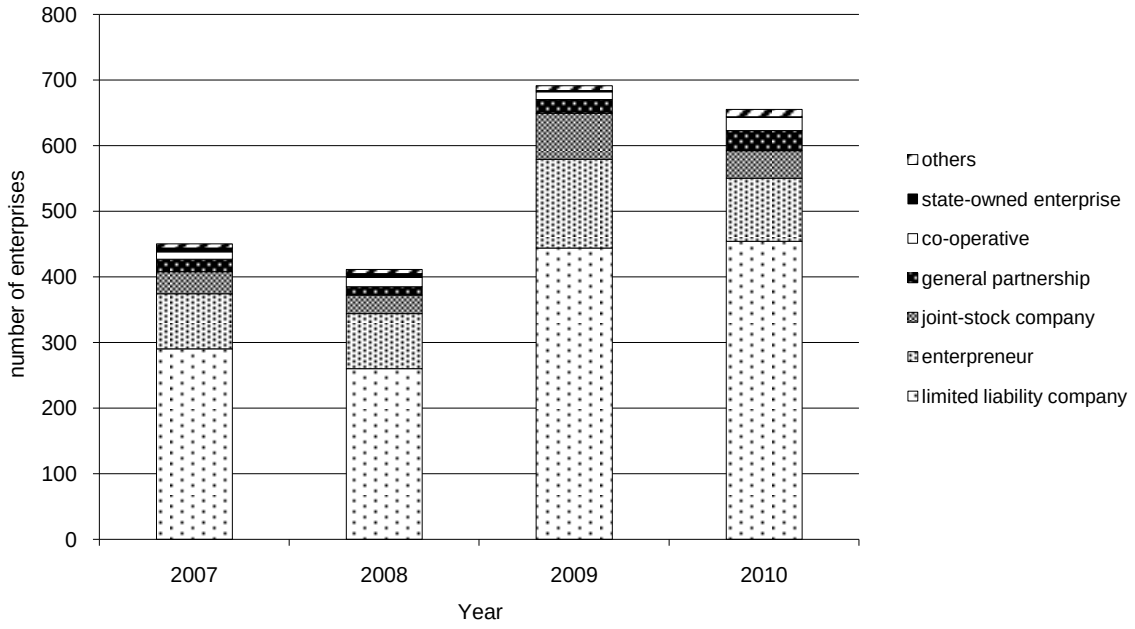

Source: study based on Coface, 2008 and Coface, 2010

Fig. 3. **Bankruptcies by legal form of enterprises in Poland**

Table 1 shows the number and dynamics of bankruptcies of enterprises by provinces. In the period analysed, the greatest number of bankruptcies has occurred in the following provinces: Mazowieckie, Śląskie, Dolnośląskie, and Zachodniopomorskie. The said geographical structure of bankruptcies has a statistical effect. The greatest number of bankruptcies is observed in provinces with the greatest number of operating entities. The smallest number of bankruptcies is observed in Podlaskie and Lubuskie provinces. These regions are characterised by a relatively weak social and economic development and a relatively small number of economic entities. The greatest dynamics of the increase in the number of bankruptcies was observed in the following provinces: Wielkopolskie, Małopolskie, and Zachodniopomorskie.

Table 1

Number and dynamics of bankruptcies of enterprises by provinces in Poland

Province	Year				Dynamics, %
	2007	2008	2009	2010	
Mazowieckie	96	91	118	134	140
Śląskie	67	63	104	93	139
Dolnośląskie	42	44	86	77	183
Zachodniopomorskie	27	34	59	58	215
Wielkopolskie	19	15	45	54	284
Małopolskie	21	20	53	52	248
Kujawsko-pomorskie	28	20	47	42	150
Łódzkie	16	14	34	26	163
Warmińsko-mazurskie	25	24	23	25	100
Podkarpackie	21	18	30	23	110
Pomorskie	18	12	18	21	117
Lubelskie	32	29	34	17	53
Opolskie	9	6	3	11	122
Świętokrzyskie	11	10	11	8	73
Lubuskie	9	7	20	7	78
Podlaskie	6	4	6	7	117
Total	447	411	691	655	147

Source: study based on Coface, 2008 and Coface, 2010

In 2010, the payment discipline slightly improved, thus decreasing the scale of payment delays. The number of bankruptcies ceased to grow, but the problems of enterprises, in particular in some branches, are still present, an example being an increase in the number of

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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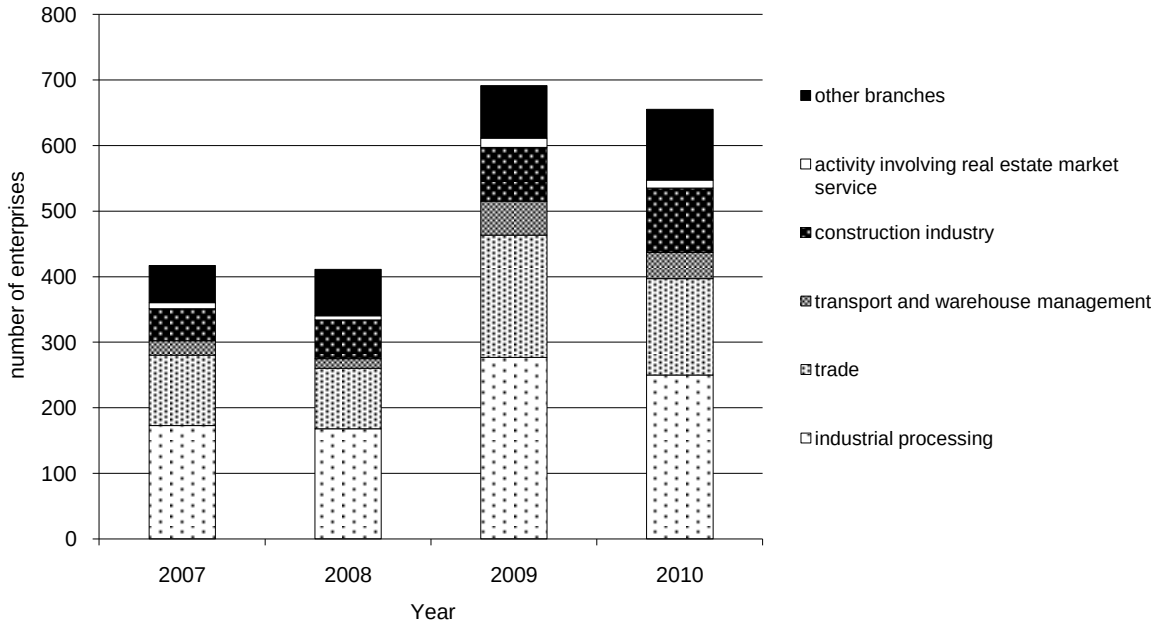
bankruptcies in the construction industry. In 2010, the courts declared bankruptcies of 98 construction companies, which is by 20% more than in the previous year and by 100% more than in 2007. In 2010, the greatest dynamics of the increase in the number of bankruptcies in comparison with 2007 was observed among construction companies, other branches, and transport companies. In the period of 2007-2010, the greatest percentage in the number of all bankruptcies was constituted by industrial processing enterprises (Figure 4).



Source: study based on Coface, 2008 and Coface, 2010
Fig. 4. **Number of bankruptcies by branches in Poland**

According to Dun&Bradstreet report, the financial situation of half of the Polish companies was unfavourable. The reason for such development refers to increasingly greater problems with recovery of receivables. In March 2010, the value of unpaid invoices at 40 largest construction companies in the Polish market accounted for nearly PLN 129 million, at 25 companies of the food industry - for more than PLN 171 million, and at 15 leading companies of the cosmetic industry - for PLN 99 million. Payment problems affect also chemical companies producing for agriculture (Woźniak A., 2010).

As regards industrial companies[1], the most important reason for bankruptcies relates to excessive debts. Loss of financial liquidity was ranked fourth. Two reasons were characteristic for the mentioned group of companies: inadequate asset financing structure and excessive production base in comparison with the sales volume. As regards production companies, most of the reasons were endogenous (Czeszejko-Sochacki M., 2007).

Scale and reasons for bankruptcies of agribusiness enterprises in Poland

According to Kowalczyk (Kowalczyk S., 2009), agribusiness has features characteristic of this subsystem of the economy only, which determine not only its specificity, but also the tendency of development and bankruptcy of economic entities involved in it. A considerable number of features typical to the agribusiness results from the specificity and difference of agriculture from other agribusiness links and from sectors outside the agribusiness. It is notable that these features may accelerate, initiate, or prevent a bankruptcy (Figure 5). There are also ambivalent features depending on the situation (they may constitute either stimuli or destimuli).

[1] Located in Warmińsko-Mazurskie province

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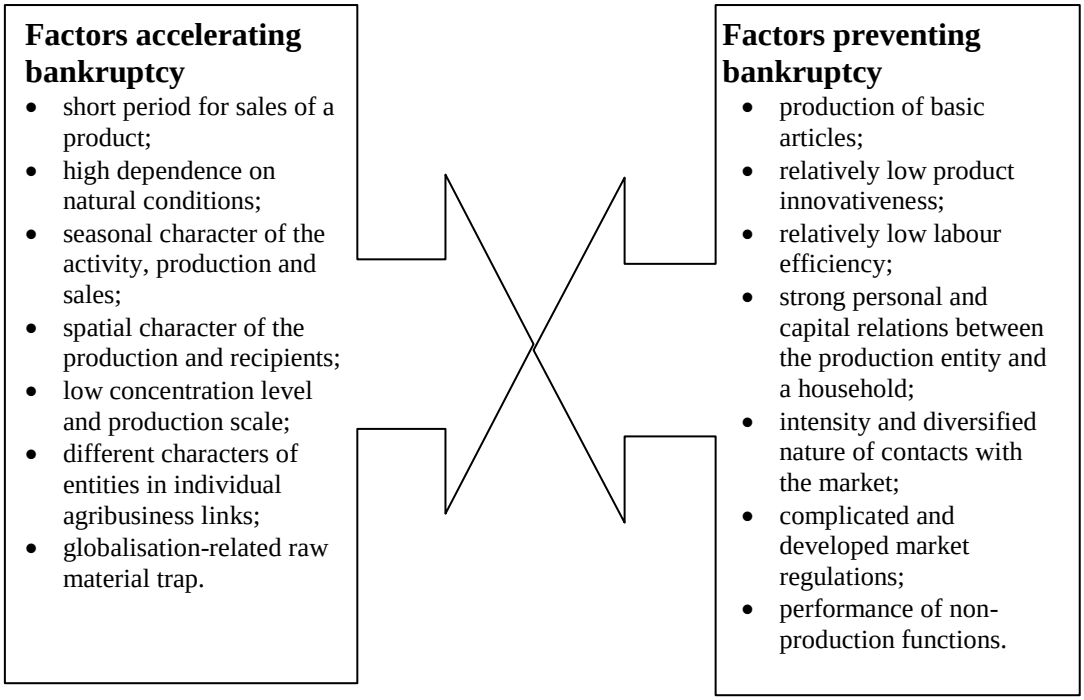

Source: Kowalczyk S., 2009

Fig. 5. **Agribusiness features accelerating and preventing bankruptcies of enterprises**

Table 2 presents the number of bankrupt agribusiness enterprises against bankruptcies of enterprises in Poland. In the period of 2003-2008, the percentage of bankruptcies of the companies representing food industry in the number of all bankruptcies was low and did not exceed 10%. However, it has been systematically growing. The percentage of food enterprises in all bankruptcies in the industry in the period analysed has increased from 17.9% in 2003 to 24.4% in 2008. The percentage of agribusiness enterprises in all bankruptcies was growing until 2007, and in 2008, it slightly decreased (Table 2).

Table 2

Number of bankruptcies in the agribusiness against the background of bankruptcies of enterprises in Poland

Specification	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Total number of bankruptcies	1798	1116	793	576	447	411
Dynamics (in %)[a]	-	62.1	71.1	72.6	77.6	98.7
Total industry	487	271	218	168	166	131
Dynamics (in %)	-	55.6	80.4	77.1	98.8	78.9
Food industry	87	44	48	34	40	32
Dynamics (in %)	-	50.6	109.1	70.8	117.6	80.0
Percentage of the food industry in:						
- all bankruptcies (in %)	4.8	3.9	6.1	5.9	8.9	7.8
- bankruptcies in the industry (in %)	17.9	16.2	21.9	20.9	24.1	24.4
Agriculture	51	36	18	13	7	6
[b] Total agribusiness	138	80	66	47	47	38
Percentage of agribusiness in all bankruptcies (in %)	7.7	7.2	8.3	8.2	10.5	9.2

[a] Previous year equals 100%

[b] Food industry and agriculture, excluding individual farms

Source: Kowalczyk S., 2009

The analysis of bankruptcies of agribusiness enterprises should consider the diversified nature of the entities composing the system. The available statistics contain data on companies forming a part of the agribusiness, i.e. food industry and agriculture, excluding individual farms. In the literature on the subject, there are only few studies concerning bankruptcies of individual farms. The significance of the aforementioned issues grows in the case of lower profitability in that sector in comparison with non-agricultural sectors. The abrupt

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acceleration of the number of liquidations of farms in the future was emphasised by Prof. Franciszek Tomczak during his lecture entitled "*Development Problems of the Polish Agriculture in the Light of the Global Experience*" during the 30th anniversary of the Inter-University Professor Club "*For the Agriculture and Rural Areas*", which took place on 26 May 26 2010 at the Warsaw University of Life Sciences in Warsaw. Regression processes in agriculture are much deeper; they may be even referred to as a multi-dimensional deagrarisation (Musiał W., 2009). According to Prof. Wiesław Musiał, there is insufficiency of capital in agriculture (and even in the agribusiness); hence, there are no significant investments. The main symptoms of a farm bankruptcy include:

- large areas of fallow land in sub-regions;
- reduction in the headage of livestock and operation of many farms without stock;
- low and even negative income gained in agricultural production and reduction in its percentage in the income structure of rural population and in house budgets of families in rural areas;
- reduced reproduction of the production assets, both in respect of buildings and structures as well as tractors, machines, and agricultural tools;
- reduction in the interest in agricultural production, including its improvement, optimisation, and modernisation of the production technologies;
- traditional management of a farm, including production capital;
- poor identification of young people in rural areas with the work on a farm and in agriculture (Musiał W., 2009).

It is also notable that a bankruptcy of an agricultural farm may take place in terms of economy, but it terms of law a natural person operating an agricultural farm may not be declared bankrupt in accordance with Article 6 (5) of the Bankruptcy and Recovery Law. The mentioned group of farmers may not use the consumer bankruptcy, either. Therefore, from the viewpoint of law, bankruptcy may affect agricultural farms that have a status of an enterprise (commercial-law companies, and co-operatives).

Conclusions

The number of bankruptcies of enterprises in Poland in 2009 grew in comparison with 2008 due to the financial crisis. A positive development in the period analysed involved a slower increase in the number of bankruptcies of enterprises.

It is notable that the greatest percentage of the total number of bankruptcies of enterprises was constituted by bankruptcies with liquidation of assets. Most of enterprises were choosing bankruptcy by liquidation, because it was often too late to implement recovery measures. The greatest number of enterprises going bankrupt was operating in the form of limited liability companies.

As regards branches, the greatest number of bankruptcies took place in the industry, trade, and transport. The dynamics of the increase in the number of bankruptcies was very high in construction industry. One of the reasons for bankruptcies in this branch may involve prolongation of payment periods. In addition, general contractors often use their subcontractors as an additional source for financing their activities by delaying payments for the finished works.

The agribusiness sector is characterised by features, which, among others, determine the tendency for development and bankruptcy of the economic entities. The percentage of bankruptcies of agribusiness enterprises in the total number of bankruptcies was low, yet it was slightly growing between 2003 and 2007.

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Debt of Local Governments on the Rural Areas in Poland

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Abstract. The aim of the paper is to analyse the issue of indebtedness of local government in rural areas of Poland in the context of public sector debt. The analysis showed that the level of rural gminas' debt increased distinctly during the examined period as well the debt of other local governments. The extremely high increase was observed in 2009. It stemmed from the implementation infrastructural investments partly co financed by the EU funds. Banks are the main creditors of rural gminas. The repayment and the service of debt was not a problem for rural gminas in the examined years.
Key words: local government, debt, budget deficit, credit, infrastructural investment.

Introduction

The local governments undergo constant pressure to improve conditions of inhabitants' life as well as conducting economic activity. To meet expectations, the local governments have to create, develop, or improve the different kind of infrastructure: social, cultural, educational, and technical. The investments are necessary to achieve this goal. The infrastructural investments are expensive and they cannot be financed only by current revenues from the local governments' budgets, so the problem of financing arises. Credits and loans (bank and non-bank) help sort out this problem; however, they create a problem of debt.

The aim of the paper is to analyse the issue of indebtedness of local government entities in rural areas of Poland in the context of the public sector debt. The answer for the following questions can help show the different aspects of the problem: i) what is the level, dynamics and structure of debt of local governments in rural areas; ii) what sources of credits/loans are typically used by local governments; iii) what are the credits taken for; and iv) what kind of problems the debt can generate for the future.

In Poland, the basic unit of territorial division of the country is a local community called gmina. Gminas located in rural areas are the object of the analyses carried out in the paper. They are named rural gminas in contrast to urban or urban-rural gminas. As of 1 January 2010, there were 2479 gminas in Poland, of which 1576 had the status of a rural gmina (The list..., 2010). In the paper, the analyses are carried for the period of 2005-2009. The data on finances of rural gminas before 2005 are not available.

The Ministry of Finance was the main source of data on the level and structure of debt. Additional information was obtained from the Central Statistical Office.

The mix of descriptive and comparative methods supported by the statistical tools was used in the paper.

The paper starts with the presentation of issues connected with the public debt problem, like estimation of debt, law regulations, debt level, its structure, and reasons. It is followed by the analyses of the level and dynamics of rural gminas' debt on the background of the public debt and the debt of other kinds of local government entities. Next part of the paper is devoted to the structure of debt according to different criteria. The last part of article discusses the reasons of creation of debt and its effects on rural gminas budgets. The paper ends with some conclusions.

Results and discussion

1. Methodological and theoretical aspects of public debt

Debt called in literature as the public debt usually refers to the debt of general government sector[1], which includes four sub-sectors: a) central government; b) state government[2]; c) local

[1] This sector is defined in ESA95 as all institutional units that are non-market producers whose output is intended for individual and collective consumption, and mainly financed by compulsory payments made by units belonging to other sectors, and/or all institutional units principally engaged in the redistribution of national income and wealth
[2] There is no state sector in Poland

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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government; and d) social security funds. It is worth to mention that the public sector is usually defined as general government plus public corporations, which are government-owned trading businesses that obtain most of their income from the sale of goods and services (Manual…, 2010).

General government debt is defined as consolidated gross debt at end-year nominal value. Data for the general government sector are consolidated between sub-sectors on the national level. The simple manuals' definitions characterise debt as accumulated deficits minus accumulated surpluses (Colander D., 2010). This definition indicates budget deficit as the main reason of the debt, although the deficits are the main source of debt, it may include financial obligations due to, for example, state compensations. The budget deficit is a shortfall of incoming revenues under payments.

The level of debt as well as the deficit on the national level is measured and presented as a percentage of GDP. In the EU countries, the level of deficit and debt is regulated by the Maastricht Treaty. It obliges the Member States to comply with budgetary discipline by respecting two criteria: a deficit to GDP ratio and a debt to GDP ratio. The first ration cannot exceed the reference value of 3%, the latter - 60% (Manual…, 2010). In the case of excess of the deficit over the reference, the excessive deficit procedure (EDP) is triggered on the EU level.

The level of local governments' debt is mainly evaluated by comparing it with the revenues. However, there are different rules for its maximum level across Europe. For example, in the Czech Republic, Hungary, and Slovakia there are no any limits of debt and thus there are no any sanctions for the excess of the burden. In Russia and Spain the limit is high - 100% and 110% respectively; whereas, in Romania, the limit is very low – 20%. In Denmark and the United Kingdom, there are individual limits. In Poland, the limit of debt as well as the limit of repayment exists: the first limit is at 60% of incomes, the latter one - 15%[3]. Although the penalties for excess the limits are not given in the case of threat of worsening of the financial situation, the external managing body can be established (Informacja…, 2004).

In Poland, the level of public debt imposes limitations on the local government deficit. Till 2009 in case public debt exceeded 50% of GDP, the planned deficit of each local government unit could not be higher than the planned deficit of the State budget. According to the new law, when public debt is higher than 55%, every local unit is allowed to plan deficit only for projects financed from the EU funds. No public deficit may be planned if public debt exceeds 60%. It is worth mentioning that in 2009 the government debt in Poland rose noticeably and reached 50.9% of GDP. The data for three quarters of 2010 indicate the increase of this ratio.

Debt is a result of deficits from the past. The deficits and the debt in effect are caused by very different reasons. Colander (2010) distinguishes a deficit caused by the recessionary fall in incomes and deficit brought about by government policy (for example, tax cut). Barro (1997) mentions and shows the data supporting the view that during the wars the deficit is especially high. A very interesting explanation of the deficit is given by the New Political Economy. This stream of economics raises the problem of importance of political forces for traditional economic issues. It can be useful to develop its concept regarding public deficit and debt, since it can be useful to explain the creation of deficit and debt on local level.

"New Political Economy" views politicians not as benevolent social planners but as individuals who maximise their objective functions given the constraints they face and information they have. Voters are viewed as neither the idealised citizens of high school of civics classes nor the mechanical actors of much of political science but as rational economic agents. One potential source of inefficient policies is that politicians and voters may not know the essence of the optimal policies. Individuals have the heterogeneous understanding of economics and the impacts of alternative policies. Some individuals are less informed and support inefficient policies. Incomplete knowledge of voters and politicians may be a second source of inefficient policy. It is an important source for deficit bias. The benefits of high purchases (consumption) and low taxes are direct and evident; while the cost – the lower future purchases and higher future taxes that are needed to satisfy the governments' budget

[3] These limits are valid till 2014

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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constrain are indirect and less obvious. If individuals do not recognise the extent of the cost, there may be a tendency towards excessive deficits (Romer D., 2006).

2. The characteristics of the local government debt in Poland

In Poland, during 2000-2009 the total debt of local governments of different kind was rising gradually. The rate of dynamics was generally high; however, it has varied year to year noticeably. It was especially high at the beginning of the examined period and in the last year. The changes have stemmed from the changes in financial situation due to the economic cycle, changes in legislation (for example, in 2004, the share of local governments in the state income taxes was increased), and the pressure on infrastructural investment strengthened by the possibility of receiving financial support from the EU funds. The significance of these factors is illustrated by the data. In 2000-2002, the Polish economy slumped, which has negatively influenced the revenues of local government The lowest dynamics was observed in 2007, when the rate of economic growth was at pick – 6.8%, the highest one was observed in 2009, when about 20 000 of investment agreements with the support of the EU funds were undersigned. Nevertheless, the worsening of economic situation occurred (Cieślak A., 2010).

Table 1

Debt of local governments in Poland in 2000-2009

Year	Dynamics (previous year = 100)	Local government debt/public debt	Local government's debt / local government's revenues (%)	The share of particular group of local governments in the total debt of local governments (%)			
				Gminas	Poviats	Towns on poviat status	Voivodships
2000	151.6	3.3	12.9	54.74	4.03	40.12	1.11
2001	130.8	4.1	15.4	50.94	4.33	42.47	2.26
2002	125.2	4.3	19.2	39.32	5.80	52.06	2.82
2003	112.5	4.2	21.8	38.31	7.09	50.88	3.72
2004	110.6	4.4	20.9	39.52	7.75	49.79	2.94
2005	110.9	5.7	20.6	38.09	8.57	49.17	4.17
2006	117.8	6.0	21.3	38.42	9.99	45.28	6.31
2007	103.7	5.8	19.7	38.49	10.20	43.51	7.80
2008	111.2	5.6	20.2	37.61	10.04	44.40	7.95
2009	140	6.5	26.0	36.26	9.70	46.48	7.56

Source: author's calculations based on "Information on realisation of budgets of self-local entities" (Informacja o wykonaniu budżetów jednostek samorządu terytorialnego). Rada Ministrów, Warsaw 2000-2010

The relative measure of the debt level – the relation of debt to incoming revenues indicates the growing role of external financing in the budgets of local governments. The level of debt evaluated from the perspective of this measure is rather low and it is certainly a safe level. The value of this indicator has doubled in the course of 10 years. Especially high increase was observed in 2009. It stemmed from the rapid (40%) increase in debt; whereas the increase in incomes was one digital. This "safe" level does not mean that some local government has not crossed the maximum level 60%, but the scope of this negative phenomenon was very small and concerns only 0.6 % of local governments (Information..., 2010). It is worth to mention that the relation of expenditures for the repayments and interests to incomes was less than 5% what is a low level compared with the maximum level of 15% (Information..., 2010).

During the examined period, the share of local governments' debt in public debt was small – one digital; however, it was rising gradually and thus in 2009 it was two times higher compared with 2000.

The analysis of the structure of debt by the kind of local government shows that towns on poviat status have the highest share in the total debt of local governments. The share has changed from 40% to 52%. It can indicate on investment activity. At the second place, there

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were gminas with nearly 10-percentage points lower share. The share of the each other group were one digital.

3. The level, dynamics and structure of rural gminas' debt

The analyses of the relation of rural gminas' debt to incomes show that the level of debt has been low in the examined period. This level is lower by some percentage points compared with the average level of local government debt. Moreover, it is far from the maximum level of 60% allowed by the law. The nearly constant value of this indicator is the second distinct feature. It has been at about 15%, except for 2009. It is worth to underline that during the same time the value of debt was rising, and the rate of its dynamics differed year to year. Nevertheless, the rural gminas were able to keep the relation nearly unchanged until 2009. In 2009, like in the case of other kind of local governments, the absolute and relative level of debt increased noticeably due to high growth of debt. It stemmed from higher dynamics of expenditures compared with income dynamics. The budget deficit in this year was very big – 6.0% of income (Information..., 2010).

Table 2

Characteristics of rural gminas' debt

Year	Total debt (mln PLN)	Debt dynamics (previous year = 100)	Debt / income (%)	Dynamics of income (previous year = 100)	Dynamics of expenditures (previous year = 100)	Budget result (mln PLN)	Non rural gminas' debt dynamics (previous year = 100)	Rural gminas' debt/ local governments'debt (%)	Rural gminas' debt/public debt (%)
2005	2 910 .5	100.9	14.6	-	-	+197.7	110.5	15.1	0.62
2006	3 485. 3	119.7	15.4	113.5	117.5	-565.01	118.3	13.7	0.69
2007	3 626 .2	104.0	14.7	108.8	104.6	+350.6	103.8	13.9	0.69
2008	3 919 .4	108.1	14.5	109.7	111.6	-64.4	109.0	14.0	0.66
2009	5 197.8	132.6	18.3	105.3	111.4	-1719.0.	136.4	13.6	0.78

Source: author's calculations based on "Information on realisation of budgets of self-local entities" (Informacja o wykonaniu budżetów jednostek samorządu terytorialnego), Rada Ministrów, Warsaw 2000-2010

Although the share of a number of rural gminas in a number of all gminas in Poland was 64%, their share in debt of all gminas is much lower and amounted to 36%. It is a result of higher budgets of non-rural gminas, the value of their investment and better access to sources of financing, like municipal bonds. The relation of rural gminas' debt to the total debt of local governments was low; though constant, and it was lower than 1% of the public debt. The latter share indicates that the changes in rural gminas budgets did not affect the situation of public finance significantly and the way of reduction, the public debt is not connected with the improvements in rural gminas or in other kind of local governments' financial situation.

Table 3

Structure of rural gminas' debt (%)

Year	Structure by maturity		Structure by kind of financial instrument			Structure by creditors	
	Long term debt	Short term	Securities	Credit and Loans	Executable obligations	Bank	Others
2005	92.24	7.76	2.3	95.4	2.3	44.1	55.9
2006	93.17	6.83	3.6	94.8	1.6	50.3	49.7
2007	94.87	5.13	4.6	94.4	1.0	53.9	46.1
2008	98.31	1.69	5.1	94.1	0.8	61.6	38.4
2009	93.77	6.33	5.3	93.9	0.8	70.1	29.9

Source: author's calculations based on "Information on realisation of budgets of self-local entities" (Informacja o wykonaniu budżetów jednostek samorządu terytorialnego), Rada Ministrów, Warsaw 2000-2010

The data on the structure of debt by maturity indicates its long-term character (Table 3). The share of long-term debt exceeded 90%. It shows that the debt could be a result of investment activity. Rural gminas have raised the value of investment distinctly in the examined period. Data show that during the examined five years, the value of investment

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expenditures has nearly doubled. Their dynamics was very high except for 2007 (the first year of financial perspective 2007-2013). The nearly 30% rate was related in 2006 (the last year of former financial perspective 2004-2006[4]) and 2009. The share of investment expenditures in total expenditures was constant during 2005-2008 and was about 20%. In 2009, it increased noticeably by some percentage points. It was partly the result of investments co-financed by the EU funds in the frame of new financial perspectives 2007-2013.

Table 4

Characteristics of rural gminas' investment activity

Year	Investment expenditures (mln PLN)	Investment expenditures rate of growth (%)	Investment expenditures/total expenditures (%)
2005	3764.05	-	19.05
2006	4789.88	27.3	20.63
2007	4595.60	-4.1	18.92
2008	5403.60	17.6	19.99
2009	6956.81	28.7	24.43

Source: author's calculations based on "Information on realisation of budgets of self-local entities" (Informacja o wykonaniu budżetów jednostek samorządu terytorialnego), Rada Ministrów, Warsaw 2000-2010

The infrastructural investments are long-term and costly. Generally, many local governments cannot afford them relying only on the current budget revenues. They have to finance them by taking credits and loans or issue municipal bonds, which is a form of taking a loan. The credits and loans were the main part of debt like in the case of other local government entities but their share in debt was much higher comparing with them. It is a result of a rather easy access of the local governments to bank credits (Ankieta..., 2009). The share of securities (mainly municipal bonds) in rural gminas' debt was very low but during the examined period, it was rising quickly, and has nearly doubled. In the case of other kind of local governments the role of this financial instrument in financing was much higher and as the data show, the local governments have noticed the advantages of this tool (Danilowska A., 2010). Unfortunately, this instrument is suitable for bigger units. In the case of rural gminas, the closer cooperation between them in the form of common bond issue can resolve the problem.

Banks have been the main creditors for the local governments. Their role has increased gradually. Local governments are very valuable clients for banks. They are credible debtors and, the risk of default is very low. Moreover, in the case of difficulties with service of debt, they can expect the state support.

4. Reasons and effects of the debt

The local governments are expected to resolve many problems on local level. They are responsible for the access of inhabitants to many services, which influence the life conditions. Besides, they have to create basic conditions for conducting the economic activity to attract the enterprises, which would generate the jobs and be valuable taxpayers. The level of development of the basic infrastructure in rural areas was very low at the beginning of economic transformation. Huge efforts were made to improve the situation. Due to low incomes in rural areas, the state engaged in the co-financing of the infrastructural investment carried out by local governments. The improvement of the situation was great. The accession to the European Union gave the possibility for faster changes thanks to the co-financing from the EU funds.

The data in Table 5 show a very quick progress in infrastructure. During the 1990s, a noticeable progress in the area of water distribution and telecommunication was made - the improvement in distribution of gas and sewerage network took place during last decade.

[4] For new EU members

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Table 5

Changes in technical infrastructure of rural areas

Specification	1995	2000	2005	2006	2007	2008	2009
Network of line distribution (thous. km):							
- water	x	161.8	190.7	195.5	200.3	204.2	207.4
- sewerage	x	16.2	36.8	40.3	45.3	46.9	50.5
- gas	x	52.2	71.5	73.2	74.8	75.98	77.2
Connection leading to residential (thousands) :							
-water	1 621.8	2 297.3	2 752.1	2 763.1	2 830.3	2 931.7	2 978.8
- sewerage system	73.4	259.4	598.0	654.6	716.9	781.0	832.3
- gas from gas line system[1]	575.2	765.9	896.3	917.1	928.4	956.6	976.9
Households consuming electricity (thousands)	x[2]	x[2]	4 651	4 646	4 682	4 688	4 740

[1] *and non residential buildings*
[2] *x - data not available*

Source: Statistical Yearbook of the Republic of Poland 1998, 2006-2010, Central Statistical Office, Warsaw

The massive infrastructural investment undertaken by local governments are a very positive phenomenon, but the problem of indebtedness can occur soon. As it was shown in the previous part of the paper, the debt has increased very quickly. Of course, the analyses indicate that the relative level of debt was not big, but doubtlessly, it charges future budgets with the service of debt.

Table 6

Rural gminas' debt service and repayment

Year	Dynamics of credits and loans (previous year=100)	Debt service/ budget expenditures (%)	Value of repayment of credits and loans (thou. PLN)	Dynamics of the value of repayment of credits and loans (previous year=100)	Repayment of credits and loans/ new taken credits and loans (%)	Value of redemption of municipal bond/revenue from municipal bond issues (%)
2005		0.61	1 098 285		88.9	85.4
2006	135.2	0.46	1 081 944	98.5	64.8	17.6
2007	79.8	0.52	1 122 034	103.7	84.2	27.3
2008	99.7	0.62	1 009 202	89.9	75.9	16.1
2009	167.8	0.57	1 006 761	99.8	45.1	14.6

Source: author's calculations based on "Information on realisation of budgets of self-local entities" (Informacja o wykonaniu budżetów jednostek samorządu terytorialnego), Rada Ministrów, Warsaw 2000-2010

The data in Table 6 show the debt charges in the finance of rural gminas. The high dynamics of new credits and loans in two years of the examined period and very low one in two others is a very characteristic phenomenon. It can be related to the fluctuations in investment activity. On the contrary, the expenditures for repayments of credits and loans have been constant. The relation of repayment of credits to new credits and loans is quite high - in two years, it has amounted to more than 80%. It may be concluded that in these two years the credits were taken mainly for repayment "old" credits and loans. In other years, the credits were of much higher values and they can finance not only repayment but investment activity as well. The data on the relation of value of redemption of municipal bond to the revenues from municipal bond issues suggests that rural gminas have noticed the advantages of municipal bond as a source of financing the investments. The level of using the municipal bond is very low, but it may change in the future.

The service of debt has amounted to less than 1% of budget expenditures. It is a low level and service of debt has not been a problem for rural gminas in the examined years. There is

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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no clear tendency in this ratio, yet it may be expected that it can rise in case of increase in debt or interest rates[5].

Conclusions

1. During five examined years, the level of nominal and relative debt of rural gminas has increased noticeably, but it has remained on safe level taking into consideration the maximum 60% line of debt. Especially high-rise was observed in 2009 that stemmed from massive investments partly co-financed from the EU funds.
2. The rural gminas' debt is of the long-term character, thus indicating on the relation to the investment expenditures and repayment of "old" debt.
3. Banks have been the main creditors of rural gminas. The local governments generally are very creditworthy clients. Moreover, they are often very valuable source of income for the banks, which serve the current gminas' accounts.
4. The issue of municipal bonds have not been an important source of financing for rural gminas, yet, in the future; it may change as it is suggested by positive dynamics of using this instrument.
5. Using of external sources of financing has allowed the local governments to carry out massive infrastructural investments. The progress in this area is very remarkable, yet the needs are still big, so local governments will be under the pressure of inhabitants to continue the investment activity. In such circumstances, the debt can be expected to rise.
6. The repayment and the service of debt has not been a problem for rural gminas in the examined years; though the debt charge in the future budgets can restrict the uptaking of new investments.

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[5] It of course refers to only floating rates

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
No. 24, 2011

Land in the System of Real Estate Objects and Features of Tax Application in Latvia

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Abstract. Since the economic recession in Latvia, the national debt in September 2010 amounted to LVL 4.717 billion. The study confirms significant impact of downward trends of the economy of Latvia on the national budget performance indicators in 2009. One of the most commonly mentioned and controversial indicator is the real estate tax that has to be imposed also on the land.

The aim of this study is to analyse and assess the system of the Land Fund of Latvia and features of tax application. The following three key objectives will be addressed in this research to achieve the determined aim: clarifying the concept of the land, types of property rights and ownership status; assessment and evaluation of allocation of national land-use according to targeted groups and the types of land use; and gathering information on taxes imposed on land and assessing property tax revenues from the land to provide the development assessment of the land fund system in Latvia. Recommendations for the improvement of the system of factors influencing the Land Fund of Latvia were developed as result of the study. The key recommendation is to develop a new monitoring and control system for the complete inspection of real estate objects classifying them according to the regions as well as the creation of integrated database based on administrable taxes according to the categories of real estate.

The results of the study may be applied for identification of the impact of fiscal policy on the assessment of the development trends of real estate tax in Latvia.

Key words: Land Fund of the Republic of Latvia, purpose of real estate usage, real estate tax, value added tax, personal income tax.

Introduction

Taking into account that the economy of Latvia continues to undergo substantial changes, the macro-economic development situation and still its trends remain a crucial issue for economy of the country. From the rapid growth phase, which lasted until the mid-2007, the economy fell into recession period. In 2010, a majority of macroeconomic indicators characterising the economic situation improved, and economic stabilisation continued. The state budget and national social insurance budget as well as the consolidated budget balances of local governments were negative. In accordance with the information published by the Bank of Latvia as of September 2010, tax revenues increased by only 3.4%, due to the increased revenue in income tax, value added tax, and real estate tax. In September, the total debt of both central government and local governments fell to LVL 4.717 billion, decreasing the sum of domestic debt but at the same time increasing the amount of external debt.

As of 2010, property tax on residential areas - apartments and private houses has to be paid. Until 1 January 2010, property tax of 1% had to be paid only by owners of land and commercial areas. From 1 January 2010, property tax for land and commercial areas was increased to 1.5% and the tax for the raw agricultural land - up to 3% of the cadastral value of the property.

Based on the above mentioned, the aim of the study is to assess the system of the Land Fund of Latvia and the application of tax features to the land.

The following tasks are determined to achieve the set aim:

1) to clarify the concept of the land, types of property rights, and ownership status;
2) to analyse and evaluate the breakdown of land in the Republic of Latvia according to targeted groups of real estate use;
3) to explore the taxes levied on land, analyse property tax revenue from the land, thus developing proposals for the improvement of real estate tax policy within the framework of the fiscal function.

Theoretical and methodological basis of this study is the published information on real estate tax administration and tax application in Latvia, information provided by the State Land Service of the Republic of Latvia, the Ministry of Finance and the Ministry of Economics of the Republic of Latvia as well as publications in the media and the World Wide Web, the authors' background and experience acquired carrying out job duties referring to the property tax administration in Riga City Council.

The following methods were used developing the study: economic analysis, survey of legal and regulatory enactments, summary of the statistical material, data grouping, etc. The authors compare, analyse, and propose their assessment of the particular items of the research using the above-mentioned methods.

Within the framework of the development of this study, the following restriction was defined: the study period is from 2007 to 2010, this included information taken and applied from the Land Fund of Latvia from 2009 to 1 January 2010. The analysis on property tax revenue for the land and the assessment of the real estate tax debts are not reflected in the present research due to the limited scope of the article.

Results and discussion

1. Concept of the land, types of property rights and ownership status

Pursuant to the "Immovable Property State Cadastre Law" of the Republic of Latvia of 1 December 2005 in Latvia, the uniform land records, as an integral part of real estate, shall be performed by the State Land Service. These records shall be subject to the whole territory of Latvia, regardless of its ownership.

Land - is an inseparable part of our life and existence, an eternal value, and the key component of all real estate. In any benefit brought about by real estate ownership, it has not only a land component but also an investment component. Unlike buildings, land does not diminish in value, quite the contrary - its value increases over time (Baltruma D., Freibergs J., 1999).

In the legislation of the most countries the term *land* is interpreted as an area, cone limited, penetrating the land borders of the land surface at the centre of the earth. *Land* is a key component of real estate, because, over time, buildings, structures, etc. that are built on this land lose their value, but the land is not subject to depreciation, it remains physically stable and, thus, it is an everlasting value. Although there are certain restrictions (in Latvia), oil and gold that is found on the land owned by the landowner belongs to this owner. In other countries, there are restrictions on the ownership of the earth and sky (Baltruma D., Freibergs J., 1999).

Table 1

Breakdown of land by ownership status (as of 1 January 2010)

Land ownership status	Number of land units	Area, ha
Personal property	661 930	3 355 761.3
Legal entities	66 037	615 279.9
Local government	22 582	96 291.0
State or state institutions	10 986	551 248.1
Co-ownership of mixed status	17511	13 465.3
Land ownership in total	779 046	4 632 045.6

***Source**: Review of the Administrative Territories and Territorial Units of the Republic of Latvia*

Land ownership - all real estate upon which property rights have been established and have been according to the law entered into the Land Register, or real estate over which there is a legal tenure, if:

- the land ownership rights are restored by the decisions made by the Land Commission, local government and state institutions;
- in accordance with the decisions made by the Land Commission, local government and state institutions, the land ownership is conferred in return for payment and agreement on the land redemption is signed with the Mortgage bank;
- acquired as a result of transactions.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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In 2009, according to the land ownership status (Table 1), the land owned by individuals takes the leadership position, leaving the second place for the land owned by legal entities.

In its turn, the land according to its ownership status in the country (Table 2) is classified as:

1) Land in use. This is the land, which according to the decisions made by local governments, the Land Commission, or government bodies shall be granted to individuals and legal entities for permanent use or the land for which only conclusions of the Land Commissions on restoration of property rights on land ownership in cities and the land for which a final decision on the restoration of property rights has not been taken yet;
2) Land within the jurisdiction of the State. In accordance with the law of the Republic of Latvia "On the State and Local Government Land Ownership Rights and Recording of Such Rights in the Land Register" of 29 March 1995, the State, through the Court, is awarded the ownership of land referred to in Articles 2 and 5 of this law, i.e. land upon which during the period of land reform, the property rights have not been renewed, or ownership by recompense has not been accorded, or the land has not been assigned for permanent use or long-term lease to private or legal persons. Such land shall be entered in the Land Register in the name of the State;
3) Land within the jurisdiction of local governments. Pursuant to Articles 3, 4, and 5 of the law of the Republic of Latvia "On the State and Local Government Land Ownership Rights and Recording of Such Rights in the Land Register" of 29 March 1995, local governments, through the Court, are awarded the ownership of land upon which during the period of land reform, the property rights have not been renewed, or ownership by recompense has not been accorded, or the land has not been assigned for permanent use or long-term lease to private or legal persons. Such land shall be recorded in the Land Register in the name of the respective local government;
4) the land for completion of the land reform. According to Article 6 of the Amendments of the Law of the Republic of Latvia "On the State and Local Government Land Ownership Rights and Recording of Such Rights in the Land Register" of 21 June 2007, this is the land upon which during the period of land reform, the property rights have not been renewed, or ownership by recompense has not been accorded, or the land has not been assigned for permanent use or long-term lease to private or legal persons, local governments, or state institutions.

Table 2

Breakdown of the land by ownership status in the country in total

Land ownership status	As of 1 January 2009		As of 1 January 2010	
	Number of properties	Area, ha	Number of land units	Area, ha
Land ownership	557 093	4409892.2	779 046	4 632 045.6
Land usage	93 677	1758714.8	53 079	186 693.5
Land for completion of land reform and the land awarded ownership by the Court to the State or local government	56 390	279003.3	-	-
Land awarded ownership by the Court to local government	-	-	113 238	199 508.2
Land awarded ownership by the Court to the State	-	-	30 777	1 405 726.1
Land for completion of the land reform	-	-	10 053	27 052.8
Total for the country	707 160	6447610.3	986 193	6 451 026.2

Source: Review of the Administrative Territories and Territorial Units of the Republic of Latvia

According to the data reflected in Table 2 on the land breakdown by ownership status in the country, it is seen that the leadership position as of both 1 January 2009 and 1 January 2010 is taken by land ownership. Whereas, the number of land usage on 1 January 2010 has decreased approximately 1.7 times. The aforementioned can be explained by the fact that in

2009, as the privatisation process of the land granted for the use has continued, the changes in the land breakdown by ownership status have taken place - previously ratified use of land allotments has changed the real estate classification of use to property status. The increase has been observed in the amount of land in the jurisdiction of the state and local governments and areas of the lands needed for completion of the land reform (meaning that local and state authorities have assessed the land and land allotments that are at their disposal), which are not needed for carrying out functions performed by local governments or state authorities, and which further shall be used for completion of the land reform. It can be concluded that there are still many people, who have not passed their ownership documents for land. Consequently, the property tax is not levied on such lands.

2. Structure of the land as a real estate object

The real estate classifications of use have been defined for calculating applicable real estate tax, and for the purpose of land valuation and for the local government administration, which defines and ratifies the categories of land use. The newly created real estate allotments or those, which do not have a defined category of use, are initially defined in accordance with the local government's territorial plan that identifies the approved land use categories and gives approval for building regulations. Land use is being systematised and each category is given a code in accordance with the classification system for land use to ensure a uniform categorisation of land use, its registration, and identification procedures.

Table 3

The breakdown of land use into targeted classifications (as of 1 January 2010)

Code	Real estate use classifications	Area, ha	% of total area registered in IS of the SREC
01	Agricultural land	3 876 363.1	60.1
02	Forestry land and specially protected nature territories in which economic activity is prohibited by the laws and regulations	2 152 822.4	33.4
03	Land of privatised waterways, including lakes, rivers, ponds etc.,	126 466.6	2.0
04	Mining areas	29 002.0	0.4
05	National park and recreational use of the land	29 185.4	0.4
06	Land for individual residential dwellings	43 886.4	0.7
07	Land for apartment house building	10 932.4	0.2
08	Commercial building land sites	6 316.2	0.1
09	Land for community based structures	32 433.1	0.5
10	Land for industrial use	23 731.8	0.4
11	Land for traffic management systems	106 461.1	1,6
12	Land for engineering and utilities construction	12 049.7	0.2
13	Land use not specified	1 376.0	0.0
	Total for the country	6 451 026.2	100.0

Source: Review of the Administrative Territories and Territorial Units of the Republic of Latvia

In Latvia, according to the purpose of the real estate use, the land is classified into the following groups:

01 agricultural land
02 forestry land and specially protected nature territories in which economic activity is prohibited by the laws and regulations
03 land of privatised waterways, including lakes, rivers, ponds etc.
04 mining areas
05 National park and recreational use of the land
06 land for individual residential dwellings
07 land for apartment house building
08 commercial building land sites
09 land for community based structures
10 land for industrial use
11 land for traffic management systems

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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12 land for engineering and utilities construction (Review of the Administrative Territories and Territorial Units of the Republic of Latvia).
The breakdown of the land into targeted classifications changes is constantly updated.

In accordance with information to be found in Table 3, the classification with the largest percentage of land use is the classification "agricultural land". In 2009, totally 60.1% of land area was registered in this category within the State Real Estate Cadastre Information System (SRECIS). The second largest classification group of land use "forestry land and specially protected nature territories in which economic activity is prohibited by the laws and regulations" had reached 2 152 822.40 ha of land area. At the same time, the Land Report comprises 978 units of land for which the purpose of land use is not specified and the area of such land equals to 1 376.0 ha.

3. Taxes imposed on land

Characteristics of the real estate tax on land

Until 31 December 2007, the real estate tax rate for the land was 1.5% (Law on Immovable Property Tax, 2007) of the cadastral value of the land allotment, while from 1 January 2008 to 31 December 2009 it was 1% (Law on Immovable Property Tax, 2009), but starting from 1 January 2010 the tax rate of the real estate on land is 1.5% (Law on Immovable Property Tax, 2010) of the cadastral value of the land allotment. In turn, if property tax has already been calculated since 2007, then for the following years the tax is applied and calculated with an increase of up to and not being greater than 25%. This is based on Transition Clause 22 of the law "On Immovable Property Tax" (as was effective until 31 December 2009 and as amended and effective from 1 January 2010).

In 2007, the State Land Service approved newly developed base of cadastral values. Therefore, in 2008, with entering into force of the up-dated base of the cadastral value of land, an increase of the cadastral value of the land and, consequently, also increase in the real estate tax on land in several times was predicted to all real estate groups in the whole territory of the country. For example, an increase for agricultural land allotments will be two times on average, for the land for building individual residential dwellings – 5.6 times, for commercial building land sites it will reach an increase of 5.5 times, and the increase of 5.1 times will be for the land for industrial use (Review of the Administrative Territories and Territorial Units of the Republic of Latvia; the Cabinet Issues for the Government Raised by the Free Trade Union Confederation of Latvia, 2010)).

In order to prevent numerous and substantial real estate tax increases, amendments to the Law "On Immovable Property Tax" were adopted on 29 November 2007, and on 18 December 2007 the Cabinet Regulations No. 495 "Application of Provision of the Law On Immovable Property Tax", which entered into force on 1 January 2008 and according to which, the amount of the real estate tax for each separate allotment of land and each building in the years 2008, 2009, and 2010, shall not exceed the estimated tax amount for the previous fiscal year (not taking into account any rebates) by no more than 25%. Hence, the calculation and administration of the real estate tax applying the actual State land valuation (if the land use has not been changed) shall be compared and aligned to the previous tax calculations.

According to the aforementioned, the authors point that since 2007 the property tax revenue for the land has dramatically increased that, in accordance to the data published by the State Treasury, in 2008 drew up to LVL 35.2 million (State Treasury, 2010) (Table 4), which is about 3.5 times more than in 2007. In 2010, tax revenue on land is LVL 47.4 million (State Treasury, 2010), which is LVL 7.5 million or 18.7% more than in 2009. As shown in Table 4, the real estate tax revenue for land is increasing each year. This is explained by the application of the mentioned limit of a maximum increase of the tax amount not exceeding 25% and changes in tax rates in 2010.

Table 4

Real estate tax revenue in the country in total, million LVL

Indicators	2007	2008	2009	2010
Property taxes, including	40.25	70.6	72.9	89.6

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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real estate tax (land)	10.01	35.4	39.9	47.4
real estate tax (buildings, structures)	30.17	35.2	33.0	42.2

Source: State Treasury, 2010

In Riga City municipality, the real estate tax is administered by the Revenue Board of Riga City Council, and often there are situations when a real estate taxpayer and tax management authorities have different opinions regarding the amount applied for the real estate tax for the land in cases when the land allotment is newly created or the purpose of the real estate use has been changed recently.

If the owner of a property has been registered for the years 2008, 2009, and 2010, or the land was being leased and no real estate tax was paid to the local government, this indicates that the land in question had been awarded ownership by the Court to the local government and had not been reassigned for use or leased and the real estate tax was not applicable. The local government calculates the real estate tax owed applying the rate of 1% of the land valuation for the years 2008 and 2009 and the rate of 1.5% for 2010. Thus, there are situations when the taxpayer does not agree to the calculated amount of real estate tax owed either using the rate of 1% or 1.5%, where the limit of the increase exceeds that of the limit of a maximum increase not exceeding 25%. The taxpayer disputes the calculation. Such situations arise from the considerable increase in property cadastral values in 2008 and 2009 compared with 2007.

In its turn, the municipality explains the particular situation by the fact that the real estate tax for the previous years has not been calculated on this type of land allotments, and it becomes the land allotment on which the real estate tax is imposed on in the years 2008, 2009, and 2010 when the ownership rights of the individual are restored or transferred to this person. Simultaneously, it is unambiguously stated in Transition Clause 22 of the law "On Immovable Property Tax", that the real estate tax to be calculated for the years 2008, 2009, and 2010 cannot exceed the tax levied in the previous year by more than 25%, but does not limit the amount of tax to be calculated and levied for the first time. Next, but not less important aspect is the prerequisite in the aforementioned law, which states that the previous years' tax calculation is to be used as the starting point for the new calculation and that any increase shall be within the legislated limits.

In Paragraph 60.1 of the Cabinet Regulations No. 495 "Application of provisions of the Law On Immovable Property Tax" of 20 June 2006, the legislature has enumerated the cases in which, exceptionally, however, the limit of the tax increase is applicable; even though the legal conditions do not exactly comply with Paragraph 22 of the Transitional Provisions of the afore mentioned law. When evaluating this section, Riga City Council adhere to the principle that within this clause there is no provision for exceptions to the rule to apply a limit when calculating tax owed on properties where the property rights/ownership were only restored in 2009, and prior to this, no tax was calculated in the previous fiscal year.

In addition, it should be noted that Cabinet Regulations No. 301 of 7 April 2009 to the Amendments of the Cabinet Regulations No. 495 of 20 June 2006 to the law "On Immovable Property Tax" (effective from 16 April 2009) were amendments to the Cabinet Regulations No. 495 as of 20 June 2006 to the law "On Immovable Property Tax" outlining the applicable rates. These amendments are a supplement to the second sentence of Sub clause 60.1 (2) "under other circumstances, when the real estate/property tax, based on the regulations in the second section of Clause 1 of the law, regarding a specific property on which no tax was calculated in the previous tax period, the nominated limit for any tax increase is not applicable. The aforementioned amendments to the Cabinet Regulations No. 495 of 20 June 2006 "Application of Tax Rates According to the Law On Immovable Property Tax" give an additional explanation of the will of the lawmakers, not to apply the nominated limit for a tax increase, if tax was not calculated the property in question in the previous tax period. Hence, the application of the regulations is explained, thereby alleviating any possible differences in the interpretation of the regulations.

This kind of situation is a common practice when there is a dispute regarding determination of the amount of real estate tax on land.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Returning to changes in the classifications of the real estate use, there are situations when the taxpayer led by variety of reasons (cadastral value, the use of land unit etc.) submits an application to the municipality asking to change the classification of the real estate use, and after the assessment of all documents, the local government shall define a new purpose of real estate use and determine the targeted group for the land allotment, issuing an administrative act or decision. For instance, if in 2002 in the classification of the land use the targeted group of 08 "Commercial building land sites " with code 0801 "business object construction" of the real estate use for the particular land allotment has been set, but in 2007, the tax payer proposes to determine a new purpose of the real estate use according to group 12 "Land for engineering and utilities construction", the new purpose of the real estate use shall take effect from 2008. Therefore, changing the purpose of the real estate use during tax administration period, it is applicable only starting with the next fiscal year in case of updating the cadastral value for the real estate tax calculation.

As regards the real estate tax calculation on land in 2011, an increase in the limit on real estate tax in the amount of 25% will be applied also in 2011.

Value added tax (VAT) on land

At present, VAT is not payable for the sale of land, except for the first sale of unused real estate (Law on Value Added Tax, 2010). The aforementioned exemption is not applicable in those cases, when disused buildings are sold together with the land allotment on which they stand.

The following constructions are considered as disused real estate:

a) newly built constructions or structures (including also permanently fixed equipment in those constructions), if these buildings are not used, rented, or leased after putting them into operation;

b) newly built constructions or structures, if they are sold within a year after the entry into service, regardless of the way of their use until the moment of sale;

c) buildings or structures, if they are sold within a year after acceptance of the renovation, reconstruction or restoration;

d) unfinished construction objects

It is to be noted that from 1 January 2011 value added tax (VAT) will be applied to land allotments sold for building construction, when the Parliament, in its second reading will adopt the amendments to the law "On Value Added Tax". The intention of the draft law is to supplement the law and to define, that land identified for construction is an allotment of land, for which it is intended to carry out construction for any utilities for road-building or other engineering for which there has been issued a building permit. The allotment of land will be considered as land for construction works, if the building permit for the aforementioned construction works is issued after 31 December 2010 (Finance net, 2010).

Personal income tax (PIT) on real estate

Pursuant to the Law "On Personal Income Tax", the tax is not imposed on the income if the individual sells real estate, receives real estate as an inheritance or gift, receives compensation for the termination of rental agreements, and the freeing of dwelling space in denationalised houses or houses returned to lawful owners to tenants who have lived in the relevant house up to the restoration of property rights to the lawful owner (his or her heirs), or receives other income on that personal income tax is not imposed on (Law on Personal Income Tax, 2010). However, the State Revenue Service informs on the following:

- if transactions with the real estate are officially registered economic activity of the individual, then starting from 1 January 2010, the income tax of 26% is imposed on the income;
- if a house or apartment is sold by a person who has not registered property sale as a commercial activity, then commencing from 1 January 2010, a tax of the capital increase with the rate of 15% that is applied on this transaction;
- if the property has been owned by a natural person less than 5 years, then from 1 January 2010 in case of selling this property, the tax of 15% is imposed on the transaction;
- if the property has been owned by a private person for more than 5 years, counting from the date of conclusion of the contract of sale, it is considered whether this property has been a declared place of residence of that person for at least one of the previous years. Selling such

property, the tax is not subject to payment of a fee. If the property has not been declared as a place of residence for at least one of the previous years, then, in case, of selling such property, in 2010 the tax of 15% is applied on that transaction, and personal income tax is calculated from the difference between the selling price and value of the property (Latvian Real Estate Association, 2010). For instance, value of the residential building together with land is LVL 100 000. Selling the land for LVL 130 000, the tax will be charged from the difference – LVL 30 000. If the transaction is a subject to the application of a 15% rate, then in this case, the tax payable is LVL 30 000 x 15% = LVL 4500.

It is interesting that for the year 2009, if received inheritance, donations, income from real estate sales, or other non-taxable income exceeds LVL 3000, the annual income declaration should be handed in at the Branch of the State Revenue Service at the declared place of residence by April 1, 2010.

Conclusions, proposals, recommendations

Local governments and state institutions, assessing land and land allotments within their jurisdiction, strengthen property rights on this land in the Land Register what results in an increased area of land within the state and local government jurisdiction.

The breakdown of land into targeted classifications of the real estate changes and it is constantly updated following the changes in cadastral value of the particular land allotment, classifications of land use, and other purposes.

Summarising the features of the real estate tax on land it can be concluded that the real estate tax rate actually is changing from year to year due to the government decisions. Previously analysed real estate tax increase on the land of 25% is not applicable for newly created land allotments, although, in practice, it is possible from the State Land Service to request historical cadastral value of a real estate object. Consequently, the authors propose to optimise the real estate tax administration by amending the Law "On Immovable Property Tax" incorporating the provision that in order to apply the limit of tax increase of 25% in the tax calculation automatically, the tax payer, in case of newly created land allotment, is obliged to provide the local government with the information on the historical cadastral value of a real estate object.

The limit of tax increase of 25% will be allotted also in 2011. Although, taking into consideration the current economic situation in the country, where there is a high level of unemployment and low population solvency, the government should carefully evaluate the application of the tax for some categories of the population. In fact, ever since 2008, the real estate tax on land (if a new real estate is not created and the purpose of its use has not been changed) increases annually by 25%. It should be noted that tax revenue for the land would not increase annually by 25%, since a large proportion of this revenue is made by outstanding tax payments. The view expressed in the media that the real estate tax policy should identify also the experience of other countries should be supported, where the real estate tax policy is based on household income, namely, the calculated tax amount should not exceed 5% of the average household income per year. Consequently, in calculating the tax and if it is above the 5% threshold of personal income per year, residents should be able to contact the local authority with a request to revise the estimated tax.

In its turn, the fact that the limit of real estate tax increase of 25% is not entitled to those taxpayers who had changed classification category of the real estate use should be supported.

As regards the application of VAT on the transactions with land allotments sold for building construction, it is positive that it is intended to reconsider definition of an object subjected to the tax payment. Only such land allotment is supposed to be the land for construction works to which the building permit for the aforementioned construction works is issued or which will has a permit for construction of utilities or road extensions. As a result, it will reduce the number of VAT taxable objects; otherwise, those land allotments, which are actually intended to be covered with buildings, are considered the land for construction works.

The public should be more informed on payment personal income tax when selling real estate, otherwise the conditions on which the tax is payable are not really understandable.

Finally, the authors conclude that in the current economic situation in the country, it is difficult to observe stability and predictability in the laws and regulations regarding taxes.

Consequently, the government should adopt such legislative amendments to the tax rules that would serve as a tool to stimulate the economy. Otherwise, generally speaking, inadequate tax burden on the fiscal function leads to the "underground/shadow economy" and to the reduction of economic potential of the country.

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Regulation and Institutional System for the Introduction of the EU Funds

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Abstract. Over the last ten years, significant amount of the resources of the EU funds has been invested in EU Member States, which has improved the social and economic indicators of the regions of the Member States. From 1997 to 2010, Latvia has access to different EU funds for development. There are two periods marked in Latvia when it was possible to receive the support of the funds: the pre-accession period when the country was getting ready for accessing the EU and the post-accession period. This research clarifies the regulation of the EU funds as well as the related legislation and institutional system in Latvia.

Key words: funds, regulation, enactments, institutional system.

Introduction

Facilitating the development of the territories of the region has been a topical issue in most of the Member States of the European Union (EU) since the 1950s when the development of the territories was determined by the EU regional policy. The implementation instrument of the EU regional policy is the EU funds, with the help of which, the economic growth of the state and its regions and of separate industries is provided applying facilitating investment introduction methods.

The impact of EU funds on different development indicators of the Member States has been studied by EU theoreticians and practitioners, evaluating the financing of the funds as well as revealing different problems in the acquisition of the funds. S.Rynck and P.McAleavey (2001) emphasise the ignorance of the solidarity principle in the fund distribution. The Member States that have invested significant amounts of money in the common EU budget, wish to receive as possible larger financing through the support of the EU funds, not taking into consideration the convergence principle. When analysing the gains of Poland accessing the EU and attracting the EU funds, A.Mickiewich and B.Mickiewich (2010) conclude that along with attracting the EU funds to agricultural industry, farmers' revenues have increased, a positive impact on the labour market can be observed, new workplaces have been created, thus creating a multiplier effect in other industries. Introduction of the funds has caused a significant inflow of investment that fastened the modernisation of agricultural farms. The distribution of the financing of the EU Structural Funds between the Member States and their impact on different industries has been studied by I.Vaidere (2010) who has assessed the perspective of the Common Agricultural Policy in Latvia and the Member States. I.Haite (2010) has clarified the opportunities for sustainable development in Rēzekne city of Latgale region by attracting financing of the EU funds. V. Tetere (2010) has analysed the impact of the EU Structural and Cohesion Funds on the economy of Latvia, S.Čingule and I.Latviete (2010) have compared the EU offered possibilities in using Structural Funds in Latvia and Ireland. An important factor is the priorities for allocating financing as defined by each country and the choice of the support measure following the EU regulation, developing a corresponding regulatory and institutional system in the Member States.

The above-mentioned aspects also determined the **aim** of this research – to assess the normative regulation of the EU funds in the EU and the corresponding legislation and institutional system in Latvia.

The **hypothesis** of the research: Latvia has developed an adequate regulatory and institutional system to introduce the EU Structural Funds.

The following **tasks** were set to achieve the aim:

1) to get acquainted with the system of regulatory enactments in the EU for introducing funds;

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
No. 24, 2011

2) to evaluate the main regulatory enactments and the institutional basis for introducing the EU funds in Latvia before and after accessing the EU.

Research subject – EU funds and programmes.

Research object – regulatory enactments and the institutional system for the introduction of the EU funds.

The analysis and synthesis, monographic and graphical methods, logically constructive, deduction and induction methods, analysis of documents, information grouping, and structuring were applied as the research **methods**.

The EU regulatory enactments as well as the ones of the Republic of Latvia for introducing the EU funds were analysed during the research.

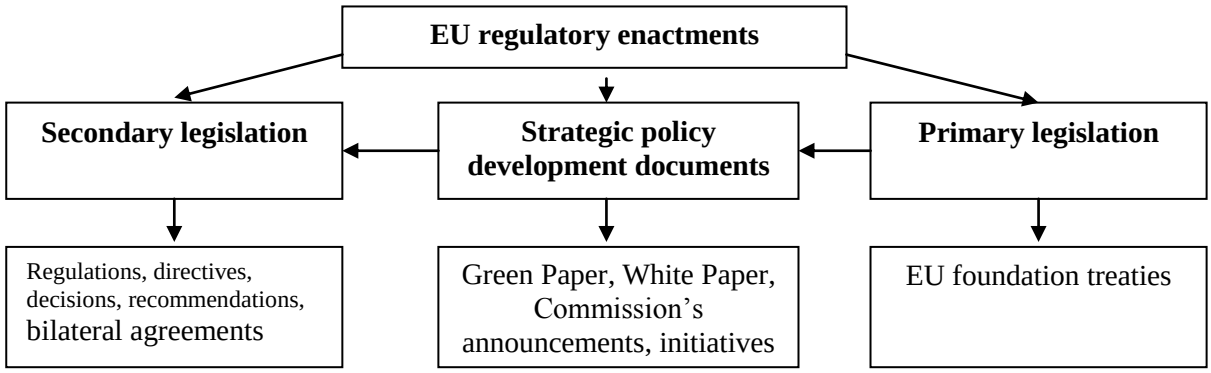
Results and discussion

1. The system of the EU regulatory enactments for introducing the EU funds

The rule of law is based on the EU. This means that the main regulatory enactments in the EU are treaties that the Member States have deliberately and democratically approved. The treaties signed in the past have been amended and renewed based on the changes in the society. In Figure 1 the authors have schematically presented the system of the EU regulatory enactments, in which it is possible to separate primary and secondary legislation as well as strategic policy documents which provide regulation and the institutional system for the introduction of the EU funds.

Primary legislation (Figure 1). The Treaty of Rome (1957) belongs to the primary legislation for the use of the EU funds. In the 1957 edition, the Treaty provided for the foundation of the European Social Fund (ESF). In addition, the European Agricultural Guidance and Guarantee Fund (EAGGF) was created to implement a Common Agrarian policy. This political decision was made in 1962 (Romas..., 1957). During the course of time the provisions of the Treaty of Rome were supplemented and amended according to the environmental, regional, social, and industrial policy. At the meeting of the EU Member States in December 1974 important political decisions were made on the necessity to establish the European Regional Development Fund (ERDF). It began operating in 1975. The Treaty of Maastricht (1992) indicates to the necessity to develop a new – Cohesion Fund (CF). This idea was implemented in 1994, which has to be considered the time when the Cohesion Fund was established, while the Treaty of Maastricht shall be considered its legal basis (Treaty..., 1992).

Strategic policy development documents (Figure 1) (Rokasgrāmata..., 2010). When preparing secondary legal enactments, the Commission bases its decisions on previously developed and discussed strategic policy development documents. These documents analyse and assess the legal regulation that is in force, its effectiveness, the situation in every specific industry as well as offer solutions to the identified problems. The task of the **Green Paper** is to enhance discussions and to start the consultation process on the European level about a specific topic within the EU competence. The **White Paper** is a document that comprises practical recommendations for the EU activities in specific fields.



Source: authors' construction based on Rokasgrāmata, 2010

Fig. 1. **The system of the EU regulatory enactments**

The **Commission's announcements** are prepared based on the practical recommendations of the White Paper and on the results of the discussions and consultations summarised in the Green Paper. The announcement is the final stage before preparing the draft EU legislative document.

It usually contains the basic provisions of the draft. A political decision is made based on the **initiatives**. If compared with the practical recommendations of the White Paper, initiatives are a horizontal document and their aim is to eliminate the common problems identified in several industries. Initiatives present the targets set and the action plan to attain the targets.

Secondary legislation (Figure 1). It should be developed as provided by the primary legislation. When adopting secondary legislation acts, their legal basis shall be indicated – the article of the Agreement on the EU Operation or the EU Treaty that provides competence in the respective issue. To attain the targets set in the EU policy, the EU Parliament together with the Council and the Commission adopt regulations, directives and decisions (Rokasgrāmata..., 2010).

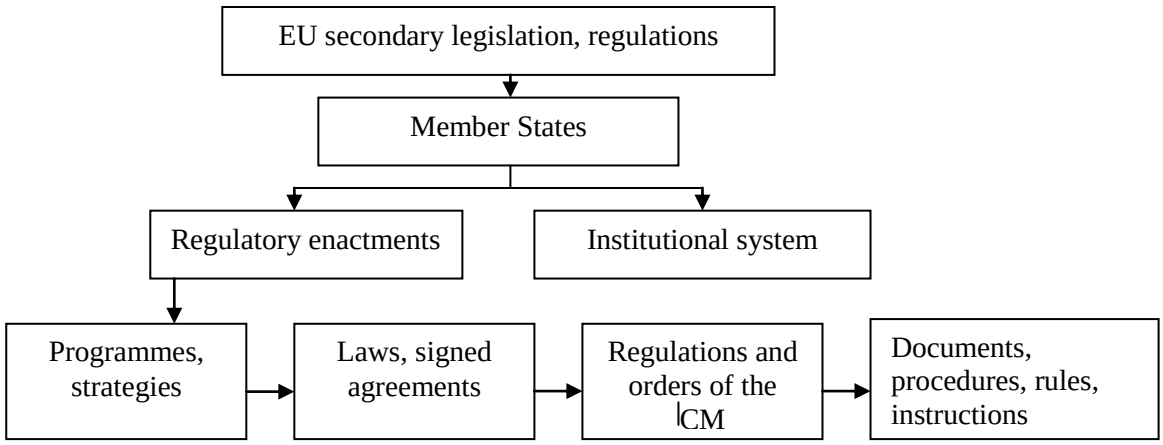
A ***Regulation*** is issued either by the EU Council together with the Parliament or the EU Commission (EC). It is a general legislative document and it shall be applied in all its provisions. According to the Treaty of Rome (1957), regulations are generally applicable; they impose liabilities and are directly applicable in all Member States (Rokasgrāmata..., 2010). **Directives** shall not be directly applicable in the Member States and according to the Treaty of Rome, they impose liabilities concerning the attainable result but they allow countries to choose the forms and methods of attaining them (Rokasgrāmata..., 2010). ***Decisions*** impose liabilities on those who are addressed by the decision and a decision sets in force with the moment the addressee is notified about it. ***Recommendations*** are meant for encouragement and persuasion. They are used as indications to the desirable direction for the Member States or as a reflection of the opinion of the EU institutions. ***Bilateral agreements*** are secondary legal documents that have been of very big importance during the pre-accession period (Rokasgrāmata..., 2010).

2. The regulatory enactments and institutional system of Latvia for introducing the EU funds

Several funds and programmes have been introduced in Latvia from 1997 to 2010. The introduction of the EU funds can be divided into two periods, with corresponding regulation and institutional system:

- pre-accession period from 1997 to April 30, 2004;
- post-accession period from May 1, 2004 until present.

Based on the above division, the authors evaluated the peculiarities of both periods.



Source: authors' construction based on Rokasgrāmata, 2010, VSID, 2007

Fig. 2. **Normative regulation in Latvia for the introduction of the EU funds, 1997-2010**

The regulatory system is similar in both periods and it is based on the EU regulations issued as provided by the Treaties (Figure 2):

1) a Member State develops a strategy for introducing the EU funds and an action programme approved by the EC;
2) a Member State adopts a law on the management of the EU funds or signs a bilateral agreement with the EC;
3) the regulations of the Cabinet of Ministers (CM) on introducing the EU funds are adopted based on the approved law;
4) the Cabinet of Ministers regulates the development of documents that provide the procedures, order, instructions, etc. for the implementation of the EU funds.

The institutional system for introducing the EU funds in the Republic of Latvia is formed by all state administrative institutions that, according to the regulatory enactments, are stipulated to perform the functions of the EU funds administration. The authors of the paper will assess the institutional systems according to the periods of EU funds introduction: pre-accession and post-accession periods, dividing the post-accession period according to the planning periods of the funds.

Pre-accession period

On 12 July 1995 the Agreement on developing an association between the Republic of Latvia on the one hand and the European Community and its Member States on the other hand (Europe Agreement) was signed. Thus, Latvia was granted access to pre-accession funds to prepare to the EU accession.

Starting from 2000, the EU used three financial instruments to offer assistance to the Candidate Countries: PHARE, ISPA, and SAPARD. With the help of these programmes, Candidate Countries had the opportunity to attain the targets set in the EU pre-accession strategy (Pirmsiestāšanās..., 2009). In Table 1 the authors have summarised the regulatory enactments and institutional system of the pre-accession period for PHARE, ISPA, and SAPARD programmes. The operation of every programme was stipulated by an EU secondary legislation act – a regulation. Latvia had to undertake several activities to be able to start using the financing of the funds: implementation programmes had to be developed for the introduction of every fund, the necessary laws had to be developed and adopted, financial memoranda between the EU and Latvia had to be signed for both a specific period of time (SAPARD, PHARE) and every project measure separately (ISPA) (Pilvere, 2003, SAPARD, 2007).

Table 1

Legal basis and institutional system for attracting the EU funds in the pre-accession period in Latvia

EU regulations	Programmes in Latvia	Regulatory enactments in Latvia	Funds	Responsible institutions
3906/89 (PHARE)	Strategy of the Republic of Latvia for the Integration to the European Union (Stratēģija, 2000), Phare programme and the transition programme	The signed Memorandum between the EC and the Republic of Latvia on allocating financing, Law on EU financial instrument PHARE programme and Transition Programme, Regulations of the Cabinet of Ministers (CM)	ERDF	Ministry of Finance, industry ministries, State Treasury, 2nd level intermediary institutions
1267/1999 (ISPA)	ISPA national strategy in the environment sector (2000)	Financial memoranda between the EU and Latvia on every measure	CF	VARAM (Ministry of Environmental Protection and Regional Development)
2222/2000 (SAPARD)	Rural Development Plan	Law of the Republic of Latvia on "Long-term Financial Agreement between the Republic of Latvia and the EC on behalf of the Community"	EAGGF	Ministry of Finance, Ministry of Agriculture, Rural Support Service (RSS)

Source: authors' construction based on Pirmsiestāšanās..., 2009, Pilvere, 2003, SAPARD, 2007

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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There are differences of the institutional system between the three pre-accession funds. The differences are related to the readiness of the institutions of Latvia to administer independently the pre-accession funds. The readiness was determined based on the results of the accreditation performed by the EC in Latvia. The institutional systems of PHARE and SAPARD were similar in Latvia. The Ministry of Finance was the leading institution and the industry ministries provided the correspondence of the measures implemented within the framework of the funds, the agency of the industry ministry was responsible for monitoring the projects implemented within the framework of the fund. ISPA fund had a different institutional system in Latvia. The EC signed a separate agreement with Latvia for every ISPA project and the Ministry of State Regional Development was the coordinating ministry in Latvia (Pirmsiestāšanās..., 2009, Pilvere, 2003, SAPARD, 2007).

Post-accession period

The requirements for introducing funds in Latvia after the EU accession are developed based on the provisions of the EU regulatory enactments. For Latvia as EU Member State they are the EU agreements. The authors of the research considered the corresponding regulation and institutional system for attracting the EU funds within two periods: 2004-2006 and 2007-2013.

In 2004-2006 (Table 2) the introduction of the EU funds in Latvia was regulated by two groups of regulatory enactments: the EU regulatory enactments and regulatory enactments of Latvia. The EU regulatory enactments are regulations that determined the introduction of structural funds and funds; while regulatory enactments of Latvia comprise laws, the Cabinet Regulations, and programmes.

Regulations (Table 2) that determined the introduction of the EU funds can be divided into two big groups: attributable to all Structural Funds and attributable to a specific fund. Regulations that are attributable to all funds provide for different procedures and rules that have to be followed introducing all EU funds, e.g. about the information and publicity measures, about the rules for using euro in Structural Funds budget administration, a.o.. Regulations that determine operation of specific funds provide measures and areas that are to be supported with the help of the respective fund (Kohēzijas..., 2011, Saistošie..., 2007).

The main laws of Latvia for introducing the EU funds:

- Law on Agricultural and Rural Development (2004) which provides that state and the EU support is granted to facilitate agricultural, rural, and fishery development (Lauksaimniecības..., 2004);
- Law on EU Structural Funds Management (2005), the goal of which is to facilitate the introduction of transparent and corresponding to financial management principles Structural Funds in Latvia in the overall management of Structural Funds (Eiropas..., 2005);
- Law on EU Cohesion Fund Management (2005) provides establishing an effective and transparent EU CF project management in Latvia (Kohēzijas..., 2005).

The Cabinet Regulations (Table 2) are issued in concordance with the Law on Regional Development, Law and the Rule of the CM, Law on Budget and Financial Management, and Law on the EU Structural Funds Management. The Cabinet Regulations prescribing the introduction of the EU Structural Funds can be divided into two groups: regulations attributable to all the funds and regulations attributable to the operation of a specific fund (Ministru..., 2010, MK Kohēzijas..., 2010).

Programmes. The *Single Programming Document* (Vienotais..., 2004) was developed for implementing Target 1 of the EU Structural Funds in Latvia from 2004 to 2006. The *Framework Document of the Cohesion Fund* (Kohēzijas..., 2005) stipulates how the Republic of Latvia uses the CF funding for financing projects in the environment and transport sectors. *Programme Supplement* (PP...,2004) has been developed as a supplement to the Single Programming Document as provided by Item 4 of Article 9 of the Council Regulation (EC) No.1260/1999 of 21 June 1999. According to the SPD, the Programme Supplement provides five strategic

priorities. Particular areas of investment or measures that facilitate attaining the targets of the SPD are determined for every priority (Saistošie...,2007) .

Table 2

Legal basis for introducing the EU funds in Latvia from 2004 to 2006

EU regulatory enactments	Funds	Programmes	Regulatory enactments in Latvia
Structural Funds and funds			
Regulations (EC): No.1260/1999, No.1685/2000, No.643/2000, No.438/2001, No.1105/2003, 1145/2003, No.448/2004	ERDF, ESF, EAGGF, FIFG*	Single Programming Document (SPD) or the Development Plan of Latvia (2004) *Supplement to Latvia Target 1 Programme of the Single Programming Document 2004-2006 (2004)*	Law on Regional Development (2002) Law on Agricultural and Rural Development (2004) Law on European Structural Funds Management (2005) Cabinet Regulations: No.200 (30.03.2004.), No.727 (16.12.2003.), No.782 (07.09.2004.), No.543 (17.12.2002.), No.124 (02.3.2004.), No.88 (01.02.2005.), No.601 (16.08.2005.), No.385 (16.05.2006.), No.494 (20.06.2006.), No. 501 (20.06.2006.), No.502 (20.06.2006.), No.538 (27.06.2006.), No.546 (27.06.2006.), No.607 (25.07.2006.)
Regulations (EC)No.1783/1999, No.1685/2000	ERDF	Single Programming Document	Cabinet Regulations No.604 (25.07.2006)
Regulation (EC) No.1784/1999	ESF	Single Programming Document	Cabinet Regulations No.608 (25.07.2006.)
Regulation (EC) No.1257/99	EAGGF	Single Programming Document	Cabinet Regulations No.606 (25.07.2006.)
Regulation (EC) No.1263/1999o	FIFG	Single Programming Document	Cabinet Regulations No.605 (25.07.2006.)
Regulation (EC) No.1164/94, Regulation (EC) No.1831/94 , Regulation (EC) No.1386/2002, Regulation (EC) No.16/2003, Regulation (EC) No.621/2004	CF	Framework Document of the Cohesion Fund *for the planning period of 2004-2006 (2006)*	Law on EU Cohesion Fund Project Management (2005) Cabinet Regulations: No.120 (14.02.2006.), No.487 (01.06.2006.), No.270 (04.04.2006.), No.537 (27.06.2006.), No.554 (04.07.2006.) No.555 (04.07.2006.), No.704 (29.08.2006.), No.809 (03.10.2006.), No.845 (10.10.2006.), Order of the CM No.686 (07.11.2008.), Instructions of the CM: No.14 (02.12.2008.), No.5 (04.04.2006.)

*Financial Instrument for Fisheries Guidance,
Source: authors' construction based on www.essfondi.lv (2010), VPD..., 2004

2007-2013. Both new amounts of the financing of Structural Funds and CF and the legal regulation of their use are determined and the corresponding planning documents for the supported territories are prepared with the beginning of the new long-term EU financial framework in 2007 (Table 3).

Regulations are the EU regulatory enactments for the introduction of the EU funds in Latvia. Similar to the period of 2004-2006, regulations can be divided into two groups: the ones attributable to all Structural Funds and the ones attributable to a particular fund (Regulas..., 2011, Zivsaimniecības..., 2011, Eiropas..., 2011).

The National Development Plan of Latvia (NDP) is one of the main regulatory enactments in Latvia (Table 3). The state level EU funds planning documents have been developed for the introduction of EU funds based on its provided strategic priorities, laws, and the Cabinet Regulations.

Laws

- A new law was not adopted to ensure the agricultural and rural development; the introduction of the EU funds was provided by the Law on Agricultural and Rural Development adopted by the Saeima on April 7, 2004 (Lauksaimniecības...,2004).
- The Law on European Union Structural Funds and Cohesion Fund Management (2007) provides the rights and responsibilities of the institutions involved in the EU funds management and the rights and responsibilities of the beneficiary of the EU financing as well as the procedure for adopting, challenging and appealing the decisions made by the institutions involved in the EU funds administration (Eiropas..., 2007).

The Cabinet Regulations, like it was in the previous period, regulate the introduction of funds, starting with the project evaluation criteria, provisions for the approval procedure, terms of signing the agreement as well as offer project application forms and standard agreements for the project implementation (Saistošie..., 2011, Horizontālie..., 2011).

According to the provisions of the Council Regulation No.1083/2006 of 11 July 2006 that provides general terms about the ERDF, ESF and CF and withdraws the Regulation (EC) No.1260/1999, VSID is prepared by Latvia and submitted to the EC. VSID is prepared taking into consideration the conceptual document "The Growth Model of Latvia: People in the First Place", the National Development Plan, and the National Lisbon Programme of Latvia.

In compliance with the decision of the Cabinet of Ministers of 18 October 2005 on the Conception of the SF and CF Introduction Model, Latvia has designed three VSID action programmes (Saistošie..., 2010).

The *State Strategic Rural Development Plan of Latvia* has been developed and updated according to the National Development Plan for 2007-2013 (Latvijas..., 2006). The strategy is implemented with the Rural Development Programme for 2007-2013, which is planned to be introduced in the entire geographical territory of the country (Latvijas..., 2010).

The Ministry of Agriculture has developed a mid-term policy planning document *"Strategic Plan of Fishery Industry for 2007-2013" (*Zivsaimniecības..., 2006) and the Action Programme for the introduction of the European Fisheries Fund support in Latvia from 2007 to 2013 (Rīcības..., 2007), which offers detailed terms for the respective measures and activity implementation in a certain period of time.

The *Action Programme for the Introduction of European Fisheries Fund Support in Latvia for 2007-2013 (Rīcības.., 2007)* has been developed to implement the principles of the Council Regulation (EC) No.1198/2006 on European Fisheries Fund and its priorities, the National Development Plan of Latvia for 2007-2013, and the Fisheries Industry Strategic Plan of Latvia for 2007-2013.

Institutional system in 2004-2006

On 2 September 2003, the Cabinet of Ministers determined the institutional system of the management, monitoring, control, and evaluation of the EU Structural Funds (Regulations No. 500 of the Cabinet of Ministers of September 2, 2003 "On the Institutional System of the Management, Monitoring, Control and Evaluation of EU Structural Funds") to ensure the management of the EU Structural Funds, as provided by the Council Regulation No. 1260/1999 of 21 June 1999.

According to these regulations, the institutional system of the management, monitoring, control, and evaluation of the EU Structural Funds consists of the Leading Institution, the Paying Institution, Steering and Management Committees, the 1st level intermediary institutions (industry ministries) and the 2nd level intermediary institutions and beneficiaries of the financing of Structural Funds (public authorities, municipalities, legal entities or natural entities registered in the Republic of Latvia, administrators of grant schemes).

In 2007-2013 the Law on EU Structural Funds and Cohesion Fund Management regulates the EU fund management in Latvia. The law provides the rights and responsibilities of the institutions involved in the EU funds management and beneficiaries of the financing of the EU

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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funds, the procedure for making, challenging and appealing the decisions of the institutions involved in the management of EU funds.

Table 3

Legal basis of Latvia for attracting the EU funds from 2007 to 2013

EU regulatory enactments	Funds	Programmes	Regulatory enactments in Latvia
Structural Funds and funds			
Regulations (EC): No.1083/2006, No.1828/2006, No.832/2010, No.8467/2009, No.1084/2006, No.284/2009, No.1341/2008, No.1082/2006.	ERDF, ESF, CF	State Strategic Framework Document (VSID) 2007-2013 (2007) Action programmes, supplements	Law on European Union Structural Funds and Cohesion Fund Management (2007) Cabinet Regulations: No.140 (16.02.2010.), No.1238 (27.10.2009.), No. 1155 (06.10.2009.), No. 210 (03.03.2009.), No. 952 (01.09.2009.), No. 464 (18.05.2010.), No. 455 (17.06.2008.), No. 65 (05.02.2008.), No. 918 (18.12.2007.), No. 524 (31.07.2007.), No. 740 (10.08.2010.), No. 484 (10.07.2007.), No. 441 (26.06.2007.), No. 419 (26.06.2007.), No.418 (26.06.2007.).
Regulations (EC): No.437/2010, No.397/2009, No.1080/2006.	ERDF	(VSID) 2007-2013 (2007) Action programme	The respective institution developed the Cabinet Regulations for every activity implemented by ERDF
Regulations (EC): No.396/2009 No.1081/2009	ESF	(VSID) 2007-2013 (2007) Action programme	The respective institution developed the Cabinet Regulations for every activity implemented by ESF
Regulations (EC): No.1290/2005, No.1320/2006, No.1975/2006, No.1698/2005. No.1974/2006, No.1290/2005.	ELFLA EAGF	*State Strategic Rural Development Plan of Latvia.* Rural Development Programme of Latvia for 2007-2013 (2010)	Law on Agricultural and Rural Development (2004) Cabinet Regulations: No.783 (14.07.2009.) No. 573 (17.06.2009.) No.644 (20.07.2010.)
Regulation (EC) No.1198/2006	EFF	*Fisheries Industry Strategic Plan for 2007-2013.* Action programme for the introduction of European Fisheries Fund support in Latvia for 2007-2013 (2009)	The Cabinet Regulations are developed for every measure implemented through EFF

Source: authors' construction based on Saistošie..., 2011,Horizontālie..,2011, VSID.., 2007, Eiropas.., 2007, Lauksaimniecības...,2004, Regulas..., 2011, Zivsaimniecības..., 2011, Eiropas...,2011.

The Ministry of Finance is the EU funds leading institution that is responsible for the EU funds management in Latvia. In 2007-2013 the EU funds management is ensured by the following institutions: the leading institution, responsible institutions, cooperation institutions, the paying institution, the audit institution, the certification institution, the steering committee, and the purchase-monitoring bureau.

Management of agricultural funds is ensured by the Ministry of Agriculture (MoA) as the leading and competent institution, the functions of the payment agency are performed by RSS, the certifying institution is chosen by the leading institution MoA in a form of a public tender attracting an independent auditor's company.

The institutions involved in the introduction of Fisheries fund are the leading, certifying and audit institution is the MoA, whose functions include establishing a steering committee. RSS is responsible for transferring payments.

Conclusions

1. The main documents of the system of regulatory enactments for the introduction of the EU funds are treaties signed by the Member States that significantly affect the legal system and the policy development directions of these countries.
2. Two periods are marked in Latvia when it is possible to receive the EU funds – pre-accession and post-accession periods. Each period has a similar regulation and institutional system which operation is provided by the EU regulations.
3. The institutional system of the EU funds in the Republic of Latvia consists of state administrative authorities that, according to the regulatory enactments, possess regulated administrative functions of the EU funds.
4. In the pre-accession period, the regulatory enactments of the EU funds are based on the Agreement of the Member State and European Community on establishing an association, because of which Latvia had access to the EU funds programmes PHARE, ISPA, SAPARD. The normative regulation introduced according to the EU regulations and the amount of financing was provided by the signed financial memoranda between the EU and Latvia. Programmes, laws of the Republic of Latvia and the Cabinet Regulations have been adopted and the institutional system has been developed in Latvia.
6. During the pre-accession period, the institutional system for the introduction of the EU funds is of two kinds: centralised and decentralised. PHARE and SAPARD programmes were introduced applying the decentralised model, the introduction of ISPA programme was centrally coordinated by the EU Commission. In the decentralised model, the programme administrating institutions were accredited by EC, determining their correspondence to the programme introduction. The administrating institutions performed programme development, monitoring, and administration.
7. In the post-accession period, the introduction of the EU funds in Latvia is provided by the agreements of the European Community. In both post-accession periods (from 2004 to 2006 and from 2007 to 2013) their introduction has been regulated by two groups of regulatory enactments: the EU regulatory enactments and regulatory enactments of Latvia. EU normative documents are regulations that are changed every financing period.
9. In 2004-2006, the necessity for introducing the EU funds in Latvia was determined by the Basic Statement of Regional Policy. The introduction of the EU funds is regulated by the laws of the Republic of Latvia, the Cabinet Regulations, and state level planning documents of the EU funds.
10. In 2007-2013, new Structural Funds and amounts of financing have been determined in the EU funds, new legal regulation for the EU funds has been developed, and the Member States have prepared new strategic and planning documents.
11. In the post-accession period, the institutional system for the introduction of the EU funds in Latvia is developed based on the EU regulations, laws of the Republic of Latvia, and Cabinet Regulations.

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Problematic Aspects of Taxes of Farmers' Enterprises

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Abstract. In Latvia, the type and amount of tax payments are determined by the legal status of an agriculture enterprise. The recent changes in the legislation of the Republic of Latvia (RL) resulted in significant increase of tax burden for small farmers' enterprises neglecting the taxation's principle of fairness. The aim of the study is to examine taxes payable by farmers, their structure, dynamics, and tax burden in relation to the type of a tax: personal income tax (PIT), corporate income tax (CIT), or micro-enterprise tax (MET). The study serves as the basis for recommendations to simplify tax calculations and to even out tax burden for different types of taxpayers. There is a lack of a complex long-term vision regarding the income tax legislation in the agricultural sector; since PIT regulations are changed regularly and significantly; as concerns CIT, regulations remain unchanged here. Taking into account that farms in Latvia's rural areas are and will be of different sizes and different legal statuses, it is necessary to secure the principle of fairness, single terms for taxes on subsidies and tax reliefs. It is necessary to simplify tax calculations for small farms, introducing micro-enterprise tax acceptable for farmers, i.e. outlining the object of the tax and decreasing the tax rate imposed on incomes from agriculture and rural tourism.
Key words: farmers' taxation, personal income tax, corporate income tax, micro-enterprise tax.

Introduction

The agricultural production in Latvia is implemented within various legal statuses. In addition, a legal status of the business determines the type of income taxes and the amount of tax payments. In recent years, the changes in the legislation of the Republic of Latvia resulted in the growth of farms' tax burden neglecting the principle of fairness of the tax system. The hypothesis of the study is the following: the income tax legislation in the agricultural sector lacks a complex long-term vision.

The aim is to examine the problematic aspects of taxation in relation to farmers' enterprises (FE) and to provide recommendations for aligning tax burden for different types of taxpayers.

The tasks of the research:

1) to examine the legal forms the agricultural sector agents and their dynamics;
2) to examine the taxes of FE payable and payment dynamics in Latvia;
3) to examine the differences in tax burden depending on the taxpayers' status and a tax: personal income tax, corporate income tax, or micro-enterprise tax;
4) to analyse the relevance of micro-enterprise tax for agricultural enterprises.

Methods: monographic, abstract – logical, the analysis and synthesis, and descriptive statistics.

The object of the study is the taxes for agricultural enterprises of the Republic of Latvia, the time period of the study is the years 2002 – 2010.

Results of research

1. Legal forms of the agricultural sector agents and their dynamics

The agricultural production can be implemented within several legal forms. For the purpose of the characteristics of types of legal forms and their dynamics, the statistical data of the CSB of Latvia have been used for economically active units in agriculture, i.e. agents that manufacture products for the market or employ at least one employee. Such data have been compiled since 2006. In order to perform agricultural production, there are several options to choose from to register a commercial society (Ltd or JSC), or to register as an individual merchant. Besides, the agricultural production activities can be performed without registering a business in the Register of Enterprises. The procedure of registration in the Register of Enterprises (RE) will be done until 31 December 2011. In fact, the amount of registered farms

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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has been decreasing year by year. According to the *Lursoft* data, 38.0 thousand FEs were registered in the RE by January 1, 2011, and 6.5 thousand have been liquidated. Thus, the Register contains 31.5 thousand FE. However, according to the data of the CSB, the number of economically active FE is remarkably smaller: it was 12.3 thousand Fes in 2008 (Table 1). In addition, the number has been decreasing year by year due to the anticipated re-registration of FEs in the Commercial Register that will take place from 1 January 2012 to 30 June 2013. Nevertheless, household plots hold a big share in agricultural production – in 2008, they accounted for 53.6% of all economically active business units in the agricultural sector. The CSB data show that the number and share of entrepreneurs in the agricultural sector is small: in 2008, they accounted for 2.2 thousand or 7.1%. However, the number has an increasing tendency.

Table 1

Breakdown of the agricultural sector agents according to their legal status in Latvia, economically active units (2006 – 2008)

Legal status	2006		2007		2008	
Farmers' enterprises	13067	*41.5*	13100	*38.1*	12325	*39.3*
Household plot owners	17358	*55.1*	19175	*55.7*	16809	*53.6*
Commercial societies (Ltd, JSC)	924	*2.9*	1616	*4.7*	1739	*5.5*
Individual merchants	144	*0.5*	513	*1.5*	508	*1.6*
Total	31493	*100.0*	34404	*100.0*	31381	*100.0*

Source: CSB data

According to the Law on Farmers' and Fisheries Enterprises, after 2013 it will be possible to perform agricultural activities in the status of an entrepreneur, Ltd, JSC, individual merchant, or household plot owner without the registration in the Commercial Register. However, it will still be necessary to register in the State Revenue Service (SRS) in the status of an entrepreneur. Consequently, two types of legal forms will be in force in the agricultural sector that has the status of a legal entity: Ltd and JSC. The property and liability of the company and owners will be separated. It will be possible to undertake business activities in the status of a natural entity: in the form of individual merchant or household plot owner. In this case, complete liability will be retained and an owner's property will not be separated from the company's wealth. Since the legal status of FE will change, their owners are required to choose a relevant option. Not only the aspects of liability and the separation of property are important, but also the taxation and accounting regulations that vary significantly with regard to a chosen legal form.

2. Taxation in the agricultural sector and its dynamics in Latvia

Tax payments are reflected in the statistical data of Fes, which are registered in the SRS as taxpayers and of enterprises involved in the agricultural sector (Tables 2 and 3). Unfortunately, data on taxes paid by household plot owners are not available. However, the results of the research were not influenced by the lack of these data, since the amount of taxes paid by household plot owners is negligible. The data show that, even though 31.5 thousand FEs are registered in the Register of Enterprises, only 26.6 thousand FEs were registered as taxpayers at the end of 2009, and their number has been gradually decreasing since 2004.

Comparing the year 2009 with the year 2002, the number of FE taxpayers has decreased by 6%; comparing the year 2009 with the year 2006, the number of FE taxpayers has decreased by 3%. However, the amount of taxes paid has been increasing; the largest amount was recorded in 2008, when it was LVL 8846.7 thousand. The decline in 2009 was caused by the economic crisis in Latvia and a significant reduction of prices for agricultural products. The average calculations per one FE show that the amount of taxes was small; however, it has increased from LVL 94.3 (2002) to LVL 259.4 (2009).

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Table 2

Dynamics of taxes paid by farmers' enterprises* (2002-2009)

Indicator	2002	2003	2004	2005	2006	2007	2008	2009	2009 / 2002, %	2009/ 2006, %
FE – the number of taxpayers	28385	28458	28527	27727	27442	27198	26905	26636	*94*	*97*
Tax payments, thousand LVL										
PIT	969.0	1287.1	1528.1	1456.6	1842.4	2370.7	2738.7	2180.7	*225*	*118*
CIT	433.1	459.8	389.8	441.2	795.1	731.3	1391.1	564.2	*130*	*71*
MSSIC	2459.3	2963.2	3136.6	3322.1	4350.3	5960.6	7799.6	6524.2	*265*	*150*
VAT	-1266.0	-1098.8	-1443.9	-4133.8	-4175.8	-3991.4	-3255.3	-2521.8	*199*	*60*
NRT	31.5	48.3	47.2	51.7	56.3	74.3	133.3	107.4	*341*	*191*
Excise	8.8	x	x	4.4	1.2	1.1	1.4	30.4	*346*	*2533*
Customs	40.8	13.5	13.4	10.5	15.4	21.1	37.9	25.6	*63*	*166*
Total	**2676.5**	**3673.1**	**3671.2**	**1152.7**	**2884.9**	**5167.7**	**8846.7**	**6910.7**	***258***	***240***
Average per 1 FE, LVL	***94.3***	***129.1***	***128.7***	***41.6***	***105.1***	***190.0***	***328.8***	***259.4***	***275***	***274***

** excluding real estate tax*
Source: Latvijas lauksaimniecība un lauki

Excise tax and natural resource tax (NRT) had the biggest increase; however, the overall amount of taxes was comparatively small. The largest payments account for mandatory state social insurance contributions (MSSIC), personal income tax, and corporate income tax.

Table 3

Dynamics of taxes paid by enterprises in the agricultural sector* (2002-2009)

Indicator	2006	2007	2008	2009	2009/2006, %
Number of enterprises	1182	1196	1498	1571	*133*
Tax payments, thousand LVL					
PIT	5237.0	6050.4	6924.2	6725.5	*128*
CIT	406.5	636.7	800.4	1021.0	*251*
MSSIC	8921.4	10635.0	13152.9	15739.6	*176*
VAT	2544.7	2089.7	-575.5	-2008.2	*-79*
NRT	75.1	86.0	104.6	160.2	*213*
Excise	238.6	245.0	212	238.7	*100*
Customs	18.0	16.9	5.4	4.3	*24*
Total	**17441.3**	**19759.7**	**20624.0**	**21881.1**	***126***
Average amount of taxes per 1 enterprise, LVL	***14755.8***	***16521.5***	***13767.7***	***13928.1***	***94***
Average amount of CIT per 1 enterprise, LVL	***343.9***	***532.4***	***534.3***	***649.9***	***189***

** excluding real estate tax*
Source: Latvijas lauksaimniecība un lauki

The data reflecting tax payments of enterprises in the agricultural sector are available starting from 2006. The number of enterprises in the agricultural sector paying taxes has increased by 33%, while the amount of taxes paid have increased by 26% between 2006 and 2009. The biggest share of taxes paid by enterprises refers to MSSIC payments, which are similar to FEs data (71.9% of total tax amount in 2009). The largest tax increase refers to CIT (151%) and NRT (113%). As regards the tax payments per 1 enterprise, the calculations show that they are much bigger than tax payments by FEs (53.7 times in 2009); however, they have decreased by 6% in comparison with 2006. It is estimated that CIT payments per 1 enterprise have increased significantly: the figures have increased by 89% between 2006 and 2009. It means that profit of enterprises in the agricultural sector has a yearly rise in such an amount that, after the CIT relief (LVL 10/ ha), it is necessary to pay taxes.

As regards value added tax (VAT), a FE in general and, recently, the agricultural sector is not supposed to pay it. The largest overpayment of VAT happened in 2005, more than LVL 4

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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million, due to the growth of the EU funding that caused big investments in agriculture. In recent years, the amount of VAT overpayment has been reducing gradually, since large investments have started to pay off. According to the significantly altered VAT overpayment system (2010), VAT payments of farmers might increase starting from 2011, in spite of the increase of the threshold level of VAT registration from LVL 10000 (till 2010) to LVL 35000 (2011).

Table 4

Distribution of taxes paid by farmers' enterprises* (2002-2009), %

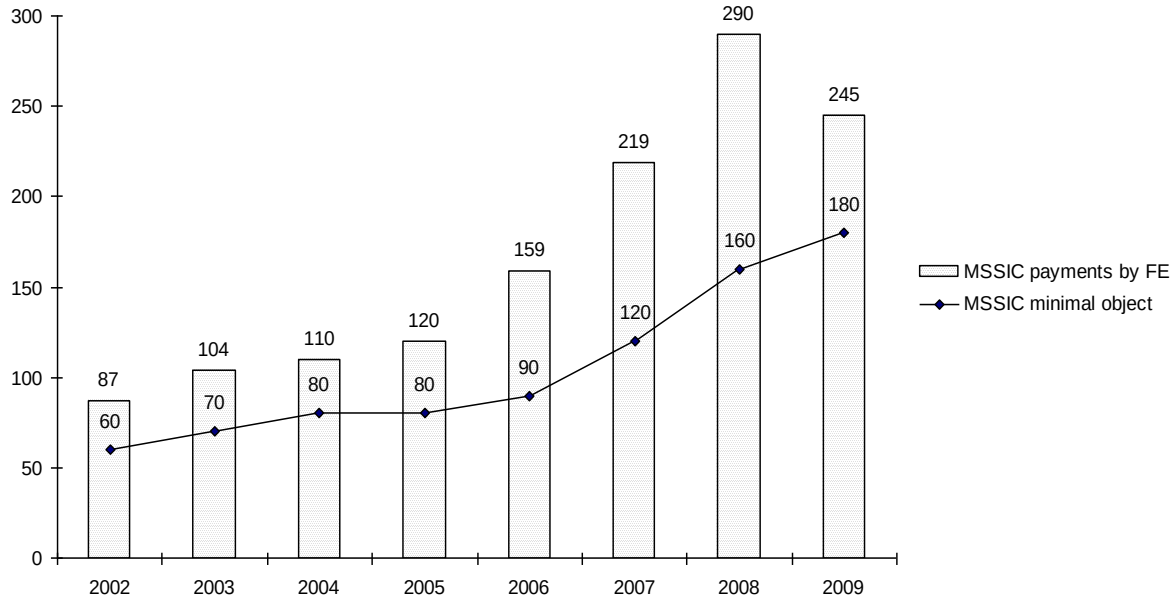
Type of tax	2002	2003	2004	2005	2006	2007	2008	2009
PIT	*24.6*	*27.0*	*29.9*	*27.6*	*26.1*	*25.9*	*22.6*	*23.1*
CIT	*11.0*	*9.6*	*7.6*	*8.3*	*11.3*	*8.0*	*11.5*	*6.0*
MSSIC	*62.4*	*62.1*	*61.3*	*62.8*	*61.6*	*65.1*	*64.4*	*69.2*
NRT	*0.8*	*1.0*	*0.9*	*1.0*	*0.8*	*0.8*	*1.1*	*1.1*
Excise	*0.2*	*0.0*	*0.0*	*0.1*	*0.0*	*0.0*	*0.0*	*0.3*
Customs	*1.0*	*0.3*	*0.3*	*0.2*	*0.2*	*0.2*	*0.3*	*0.3*
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

** excluding real estate tax and VAT*
Source: Latvijas lauksaimniecība un lauki

As regards FE tax payments (Table 4), MSSIC account for the largest share (more than 60%), and it has increased year by year. As regards income taxes, their share has a decreasing tendency. The amount and share of CIT have been decreasing mainly because large FEs were reorganised into enterprises.

PIT payments include payroll tax that is levied on employees' salaries and tax imposed on income from business activities. The rise of the amount of PIT paid until 2008 was mainly caused by the overall salary level increase. The decrease of PIT in 2009 could be explained by the decline of average salary in the country and due to the regulation that entitles the increase of the sum of income exempted from tax payments from LVL 3 000 (in the period to 2008) to LVL 4 000 (2009). It is possible that in the future years the amount and share of PIT will increase significantly due to the amendments in PIT regulations in 2010.

FE owners pay MSSIC both for themselves as for self-employed persons and for their employees. The growth of the amount of MSSIC is caused by gradual increase of a minimal object of the self-employed (Figure 1) and minimum salary.



Source: Latvijas lauksaimniecība un lauki

Fig. 1. MSSIC payments by FEs and MSSIC minimal object for the self-employed (2002-2009), LVL

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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Despite the fact, that MSSIC account for the largest share of FEs payments, calculating per 1 FE (Figure 1), their amounts are negligible: LVL 290 in 2008 and LVL 245 in 2009. The amount paid has increased gradually until 2008. The reduction of taxes paid in 2009 was caused by the fall in farmers' incomes; besides, the minimal object of MSSIC was increased and the majority of farmers did not perform MSSIC payments.

The reasons for small sums are as follows:

1) the majority of FE owners did not pay MSSIC or paid it for some months a year;
2) a large number of FE owners were at the age of retirement and MSSIC of the self-employed is not paid then.

The number of farmers who wish to register as VAT payers has increased gradually as their production volumes exceeded VAT registration threshold. There are no data available on the VAT payers in agriculture; however, the reduction of VAT compensation payments starting from 2008 (Table 5) points indirectly to the increase of the amount of VAT payers and FE production volumes per 1 enterprise on average.

Table 5

VAT compensation payments and excise tax repayments to farmers in Latvia

Indicator	2002	2003	2004	2005	2006	2007	2008	2009
VAT compensation payments, million LVL	x	3.27	4.36	4.84	4.76	5.41	4.63	2.91
Excise tax repayments, million LVL	5.40	5.50	8.93	11.50	10.69	12.52	14.47	18.65
Area of AL, for which excise tax repayments have been received, thousand ha	480	480	580	710	652	720	766	852

X – N/A

Source: Latvijas lauksaimniecība un lauki

The amount of compensation payments might increase in 2011 due to the significant increase of VAT registration threshold. However, farmers' enterprises that have decided to develop and expand agricultural production should not quit VAT register in order to receive VAT compensation payments. A FE in the status of a VAT payer has an opportunity to decrease costs of pre-tax payments that still are a considerable amount of money for farmers' enterprises.

The sums of excise tax repayments grow year by year: in 2009, the increase was LVL 13.25 or 3.5 times in comparison with 2002. It was caused by a significant excise tax increase after the accession of Latvia to the EU as well as the increase of agriculture land (AL) by 1.8 times for which excise tax is being repaid.

In 2009, farmers have received LVL 21.56 million as VAT compensation payments and excise tax repayments, but FEs tax payments have amounted to LVL 6.91 million, i.e. 32% from the amount of tax relief. As regards 2003, tax relief accounted for LVL 8.77 million and taxes accounted for LVL 3.67 million or 42% of the amount of tax relief. The calculations point to the tendency of a rapid increase of farmers' tax relief in comparison with tax payments. It should be noted that data on taxes paid refer to farmers' enterprises, while tax relief refers to all agents involved in agriculture; however, the overall tendency is stable.

3. Differences in tax burden in agriculture concerning taxpayer's status

Farmers pay one of the two taxes: either corporate income tax or personal income tax. The type of the tax depends on the status of a farm. Enterprises are supposed to pay corporate income tax, and individual merchants and household plot owners are supposed to pay personal income tax. As regards a FE, it can be either CIT or PIT payer. Even though, there is no statistics available, it is clear that the majority of FEs is registered in SRS as PIT payers. The data of the area of AL stated by the Ministry of Agriculture indirectly indicate on the small amount of CIT. The area of AL has received CIT relief – LVL 10 per 1 ha. Comparing with the area subject to excise tax repayments, it accounts for only 9% in 2002, 6% in 2003, 12% in 2008, and 4% in 2009 (Table 6). Thus, despite the fact that one CIT payer cultivates much bigger AL area than PIT payer on average does, CIT relief is received for a comparatively small area. The rapid decline in 2009 could be explained by a significant fall in FEs incomes, thus not all possible CIT reliefs for the land were used then.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Table 6

Area of agricultural land, for which excise tax and CIT reliefs have been received

Indicator	2002	2003	2008	2009
CIT relief used, thousand LVL	438.6	308.0	943.4	342.3
Area of AL, for which CIT relief has been received, thousand ha	44	31	94	34
Area of AL, for which excise tax repayments have been received, thousand ha	480	480	766	852
Area of AL for CIT relief from the area of AL for excise tax repayments, %	*9.1*	*6.4*	*12.3*	*4.0*

Source: Latvijas lauksaimniecība un lauki

Until 2004, the owners of FEs could choose the status of a taxpayer. From 2004 only those FEs, income or turnover of which in the previous year did not exceed LVL 45 thousand, could register as CIT payers, starting from 2007 – LVL 200 thousand were the figure. Thus, only comparatively large FE could choose the status of a CIT payer.

The status of a taxpayer significantly influences amounts of income taxes payable (Table 7). The calculations permit to conclude that, as regards tax costs, PIT payer status is more convenient for FEs with a small area of AL. The area of the respective AL fluctuates from 30 to 50 ha depending on a year due to the changes of PIC regulations: the rate, the sum of income from agriculture that is exempted from tax payments etc.

Table 7

Differences in agricultural tax payments depending on the legal status of an enterprise

Indicator	JSC, Ltd	FE (CIT)	FE (PIT), individual merchant, household plot
Income tax and rate	CIT 15%, + for dividends PIT 10%	CIT 15%	PIT until 31.12.2007. 25%; 2008-2009 15%; 2010 - 26%; 2011 – 25%
Tax relief	Tax is reduced by area of AL– LVL 10 per ha		Income from agriculture and rural tourism is exempted until 31 December 2008 - LVL 3000; 2009 - LVL 4000; 2010 - LVL 2000
Tax for subsidies	None		Subsidies are added to the levied income from 2010
Prepayment of income tax	Is not paid if at least 90% is from agriculture		½ tax payments of the previous year

In order to increase the budget income, in 2010 significant amendments were made in the law "On Personal Income Tax"; the amendments referred to the majority of farmers' enterprises:

1) PIT rate was increased from 15% in 2009 to 26% in 2010;
2) the EU and state support payments (further: subsidies) were included in the income levied with tax;
3) the sum of the income from agricultural production and rural tourism services exempted from PIT payments was reduced from LVL 4000 in 2009 to LVL 2000 in 2010.

The calculations show that PIT increase in 2010 was significant (Table 8). For example, if FE income was LVL 5000 and subsidies were LVL 1000, the tax increased by LVL 890 (1040 – 150) or almost 7 times.

Table 8

Example of FE personal income tax calculations in 2009 and 2010, LVL

Indicator	2009	2010
Income from agricultural production (income – expenses), excluding subsidies	5000	5000
Income exempted from tax payments	4000	2000
Subsidies	1000	1000
Income levied with tax	1000 (5000 – 4000)	4000 (5000 – 2000 + 1000)
PIT rate	15%	26%
PIT payable	150	1040

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Besides, PIT relief without tax calculation for the sum of LVL 2000 serves as an encouragement to divide an enterprise into several parts, for the purpose of the use of tax relief determined by the law.

As regards the law "On Corporate Income Tax", there are no significant changes. Calculations for a crop farm have been carried out as an example for differences in tax payments. Two cases are analysed: in one case, the area of AL is 100 ha; and in the other case, it is 200 ha (Table 9). In addition, each group of areas is divided according to the possible profit from 1 ha. It is accepted that profit from 1 ha is LVL 50 or LVL 100. The result shows that PIT payers have to pay noticeably bigger tax payments: from LVL 780 to LVL 4680 per year. CIT payers have to pay from LVL 0 to 1000 per year, respectively. Thus, the bigger the area of AL, the bigger the differences in taxes.

Table 9

Example of PIT and CIT calculations in 2010

Indicator	PIT		CIT		PIT		CIT	
Area of AL, ha	100				200			
Income (profit), LVL/ha	50	100	50	100	50	100	50	100
Total of income (profit)	5000	10000	5000	10000	10000	20000	10000	20000
Income, exempted from PIT	2000	2000	x	x	2000	2000	x	x
Income levied with PIT	3000	8000	x	x	8000	18000	x	x
PIT 26%	780	2080	x	x	2080	4680	x	x
CIT 15%	x	x	750	1500	x	x	1500	3000
CIT relief	x	x	750	1000	x	x	1500	2000
Income tax payable	780	2080	0	500	2080	4680	0	1000

Source: Leibus, 2010a

Taking into account significant tax differences with regard to the status of a taxpayer, in 2010 farmers' non-governmental organisations succeeded in cancelling the threshold for the registration as CIT payer. Consequently, an owner of any FE, irrespective of the turnover (income), who is willing to pay CIT, is allowed to register in the SRS. However, the change of the status is not appropriate for all farmers' enterprises. Before the amendments of respective laws, the Ministry of Agriculture carried out a survey among owners of farmers' enterprises. Totally 800 farmers participated in the survey and only 97 or 12% expressed the wish to reregister. The reasons for not willing to register were as follows:

1) it is necessary to start double-entry book-keeping system, which might increase costs due to the salary for an accountant;
2) book-keeping should be transformed from the cash payments to the accumulation principle that could cause tax burden, since taxes should be paid from the calculated income even if the payments from buyers are not received.

It is advisable for crop growing enterprises to change taxpayers' status since they cultivate sufficiently large areas of AL, to reduce tax payments. Yet, a PIT payer status is more convenient for farms with small areas, for example, for vegetable and fruit growers. The calculations show that in 2010 and 2011 PIT rates were gainful for farms with profit (including subsidies) not more than LVL 2000 and with the area of AL less than 30 ha.

4. Estimation of micro-enterprise tax suitability for agricultural enterprises

On September 1, 2010, micro-enterprise tax was introduced in order to simplify tax calculations and to decrease the tax burden for labour force. As a result, several tax payments have been replaced by one tax payment, thus simplifying tax calculations and decreasing the amount of tax declarations. MET provides an opportunity to combine the following in one payment:

1) taxes and duties for employees: MSSIC, PIT, and entrepreneurship risk state duty;
2) MSSIC of the self-employed;
3) tax imposed on income or profit of an enterprise: CIT or PIT depending on which tax has to be paid.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Micro-enterprise tax payments can be chosen by agricultural enterprises: LTD, FE, individual merchant as well as household plot owners, if they correspond to the criteria of a micro-enterprise (the Law on Micro-enterprise Tax):

1) turnover or income from business activities in a calendar year does not exceed LVL 70000;
2) the number of staff at any time does not exceed five;
3) income of employed by a micro-enterprise does not exceed LVL 500 per month.

Micro-enterprise tax is 9% of turnover of an enterprise, besides VAT. As regards incomes from farming business activities, they also include the EU and the state's support payments for agriculture as well as sums exempted from PIT and CIT, for example, assistance in the case of natural disaster or other unexpected damage.

Hence, 65% of the paid MET is transferred to social insurance of an owner and employees of an enterprise. Therefore, allowances of social insurance depend on the amount of turnover.

The analysis of MET permits to conclude that it has the following main advantages:

1) simplified tax calculation procedure and decreased tax payments;
2) tax payments decrease significantly if a farm has high labour force costs;
3) tax payments can decrease for enterprises, which have comparatively small costs, but income exceeds the sum of money exempted from PIT.

The main disadvantages of MET are as follows:

micro-enterprise tax does not include VAT; this means that VAT payers have to pay VAT in addition to micro-enterprise tax;

farms with big share of costs or farms working with losses can have higher tax payments;

the amount of MSSIC can fluctuate from month to month; it influences significantly the amounts of social insurance of an owner and employees;

the requirements for micro-enterprise accounting have not been simplified; it is necessary to have the income statement, book-keeping entries: micro-enterprises should have a register of business activities, CIT payers should have a register and prepare annual reports.

Micro-enterprise tax is not gainful for the majority of farmers who are in the status of PIT and CIT payers (Table 8), since MET is calculated from the income of business activities, irrespective of costs that are typically quite large for farmers. Besides, there is no tax relief for those farmers who pay MET.

Table 10

Comparison of FE income taxes and micro-enterprise tax, 2011 (LVL)

Indicator	PIT	CIT	MET
Income from agricultural production	70000	70000	70000
Costs	66000	66000	66000
Revenues from agricultural production	4000	4000	4000
Exempted revenues	2000	-	-
Support payments (subsidies)	6000	6000	6000
Tax imposed on	8000 (4000 – 2000 + 6000)	4000	70000
Tax rate	25%	15%	9%
Tax	2000	600	6300
Maximum CIT relief for AL	-	1000	-
Tax after CIT relief	-	0	-

Source: Leibus, 2010b

However, a new tax is suitable for farmers who have comparatively high labour force costs, because choosing MET, the tax is not calculated for labour costs. Calculating labour costs, in 2011 the amount of labour taxes per 1 employee with the wage of LVL 500 amounted to LVL 275.45 per month (MSSIC is LVL 175.45, PIT is LVL 100) and LVL 3305.40 per year. If an enterprise employs 5 people staff with wages of LVL 500, the tax payments for labour force per year is LVL 16 527. The tax savings exceed noticeably the amount of micro-enterprise tax LVL 6 300 that is calculated from maximum micro-enterprise turnover. Thus, choosing to pay MET, the costs are decreased by the amount of the taxes payable for labour force. Consequently, those enterprises face a significant tax reduction, which have maximum labour costs permitted by the Law on Micro-credit Tax.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
No. 24, 2011

The aim of MET was the simplification of calculation and payment of taxes, simultaneously decreasing or not increasing seriously tax costs for small enterprises. It should be noted that this aim was not achieved in relation to the agricultural sector. The tax burden increases significantly by paying MET, except farms with large labour costs. To make MET suitable for agricultural enterprises, it is necessary to introduce tax relief to incomes from agriculture that would be equivalent to PIT and CIT relief:

1) do not impose micro-enterprise tax on the assistance in case of natural disaster and other emergency situations;
2) decrease tax rate by a half on incomes from agriculture and rural tourism.

Conclusions and recommendations

1. There is a lack of a complex long-term vision regarding the income tax legislation in the agriculture sector; since PIT regulations are changed regularly and significantly; as concerns CIT, regulations remain unchanged here.
2. Taking into account that farms in Latvia's rural areas are and will be of different sizes and of different legal statuses (Ltd, individual merchant, household plots), it is necessary to secure the principle of fairness, unifying terms for taxes on subsidies and tax reliefs.
3. It is necessary to improve PIT relief to avoid the artificial division of farms, stating tax-exempt income for each adult family member and giving an opportunity to choose tax relief for a hectare of AL.
4. It is necessary to simplify tax calculations for small farms, introducing MET acceptable for farmers, i.e. outlining the object of the tax and decreasing the tax rate imposed on incomes from agriculture and rural tourism.

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Synergy of Recipients of State Social Security Benefits and Economic Development in Latvia

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Abstract. The research showed that with the beginning of economic crisis and owing to the amendments made in legislative enactments, the numbers of recipients of unemployment and sickness benefits have increased in Latvia's regions, while the number of recipients of paternity and maternity benefits has decreased. The majority of recipients of social security benefits is concentrated in the regions of Riga and Pierīga, while the smallest one in Vidzeme region. A cluster analysis showed that monocentric economic development trends were specific to Latvia, as result of which there were significant differences between the country's capital city of Riga and the rest of Latvia's regions. The economic development level in many border districts of Latvia is low; hence, the socio-economic differences increase and differences in the number of recipients of social security benefits increase in the regions of Latvia. According to the research results, there is interaction – synergy – among the number of recipients of unemployment benefits per 1000 employed individuals, the number of recipients of maternity and parental benefits per 1000 employed individuals, the economic development level of districts, as well as the distance of districts to the country's capital city. There is also a strong interaction between the number of recipients of sickness benefits per 1000 employed individuals and the number of recipients of maternity and parental benefits per 1000 employed individuals, while there is no interaction between the number of recipients of sickness benefits per 1000 employed individuals and economic activities.
Key words: state social security benefits, economic development, synergy.

Introduction

The capacity of social security system and sustainable development, which protects individuals in case of social risk and provide disabled individuals with means of existence, plays an important role in avoiding social tension and ensuring the wellbeing of the society. To provide a sustainable social security system in Latvia, maintaining its financial stability and fostering its development as well as achieving the society's better understanding on the role of social insurance system were set as the key tasks to be solved in the "National Development Plan 2007-2013". After analysing the amounts of state social security benefits in Latvia and its regions during 2005-2009, Mistre B. and Dobele A. emphasise that there are significant differences among the amounts of these benefits in different Latvia's regions (Mistre B, Dobele A., 2010). Social insurance problems, including changes in the amount and number of social security benefits, were revealed in several studies conducted by the Ministry of Welfare (Optimāla, nodarbinātību veicinoša .., 2007; Cunska Z., Muravska T, 2008; National Strategy Report… , 2008).

However, few studies on the synergy of recipients of social security benefits and economic development, which is a complementary precondition for sustainable development in its regions, have been done presently in Latvia. Therefore, the synergy between economic development and recipients of social security benefits, which is revealed in this paper, can be regarded as the paper's novelty.

Hypothesis: a synergy exists in Latvia between the number of recipients of state social security benefits and the economic development level of its districts. The **research aim** is to identify interaction between the number of recipients of state social security benefits and the economic development level in Latvia. The following **tasks** were set forth to achieve the research aim:

1) to investigate the economic and legal aspects of the country's state social security benefits;
2) to examine the economic development in Latvia's districts;
3) to compare the number of recipients of state social security benefits with the results of cluster analysis.

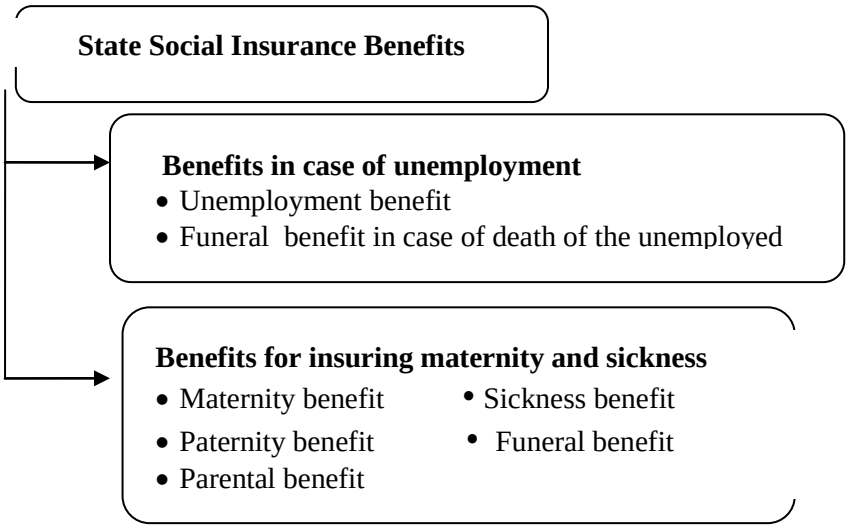
The present research is based on the monographic method, analysis and synthesis, deduction and induction, factor analysis as well as the economic and statistical method. Mostly legal enactments of the Republic of Latvia, data of the Central Statistical Bureau (CSB) and the State Social Insurance Agency (SSIA), and pieces of research done in Latvia in the field of social insurance were used in the present research. The research covers the period of 2006-2009, analysing the data by statistical regions and districts (a unit of administrative and territorial division in Latvia until the middle of 2009). Planning and statistical regions are the largest territorial units, for which the statistical information is collected and analysed in Latvia. Planning regions (Riga, Vidzeme, Kurzeme, Zemgale, and Latgale) have been established in Latvia for regional development planning and ensuring the cooperation between local governments. Six statistical regions have been established for the purposes of registration. In the system of statistical regions, Riga planning region has been divided into 2 statistical regions – Riga and Pierīga (Development of regions…, 2009).

Results

1. Economic and legal aspects of state social insurance benefits

A social safety system is established in any country, which largely depends on the social and economic situation as well as on the social policy implemented in it. Latvia's social safety system includes state social insurance, state social benefits, social services, and social assistance that are financed both from the central government's basic budget and special budget, and the budget of local governments. The goal of social insurance system is to insure individuals and their dependent individuals against the risk of losing their earned income due to sickness, disability, maternity, unemployment, old age, accidents at work or occupational disease as well as against additional expenses related to childcare and the death of insured persons or their dependents.

Latvia's social insurance includes state pensions and state social security benefits. In accordance with the law "On Insurance in Case of Unemployment" (1999) and the law "On State Social Insurance" (1997), state social insurance benefits are classified into two groups: benefits in case of unemployment and benefits of maternity and sickness (Figure 1).



Source: authors' construction based on the law "On Insurance in Case of Unemployment" (1999) and the law "On State Social Insurance" (1997)

Fig. 1**. Classification of state social insurance benefits in Latvia**

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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Due to the limitation set for the paper, only the trends in the number of recipients of state social security benefits were analysed using the unpublished data of the SSIA.

Table 1

Changes in the number of recipients of state social security benefits in Latvia's regions in 2006-2009

Type of benefit	Region	Average number of recipients				Annual increase rate, %		
		2006	2007	2008	2009	2007	2008	2009
Unemployment benefit	Riga	9676	9171	9216	21007	-5.22	0.49	127.94
	Pierīga	5772	5929	5531	11531	2.72	-6.71	108.48
	Vidzeme	3545	3457	3119	6791	-2.48	-9.78	117.73
	Kurzeme	4888	4922	4727	9450	0.70	-3.96	99.92
	Zemgale	4524	4245	3922	8511	-6.17	-7.61	117.01
	Latgale	6351	6130	5390	9741	-3.48	-12.07	80.72
Sickness benefit	Riga	6904	7087	7572	8497	2.65	6.84	12.22
	Pierīga	3789	3960	4253	4897	4.51	7.40	15.14
	Vidzeme	2447	2540	2800	3258	3.80	10.24	16.36
	Kurzeme	3109	3067	3135	3331	-1.35	2.22	6.25
	Zemgale	2640	2713	2820	2920	2.77	3.94	3.55
	Latgale	2983	3142	3201	3361	5.33	1.88	5.00
Maternity benefit	Riga	880	956	946	829	8.64	-1.05	-12.37
	Pierīga	435	481	494	468	10.57	2.70	-5.26
	Vidzeme	209	228	232	206	9.09	1.75	-11.21
	Kurzeme	296	321	308	277	8.45	-4.05	-10.06
	Zemgale	261	296	302	264	13.41	2.03	-12.58
	Latgale	257	273	273	254	6.23	0.00	-6.96
Paternity benefit	Riga	164	211	254	225	28.66	20.38	-11.42
	Pierīga	107	136	165	152	27.10	21.32	-7.88
	Vidzeme	57	72	85	72	26.32	18.06	-15.29
	Kurzeme	83	94	114	95	13.25	21.28	-16.67
	Zemgale	74	84	112	92	13.51	33.33	-17.86
	Latgale	65	81	87	85	24.62	7.41	-2.30

Source: authors' calculations based on the SSIA data

Table 1 does not include changes in the number of recipients of parental benefits, since such a benefit was introduced in 2008.

Table 1 shows that the number of recipients of unemployment benefits in the whole country as well as in all its regions, except Riga region, has decreased in 2008. A similar trend was also observed in the previous years, as the economic boom positively affected the situation in Latvia's labour market, causing almost full employment. The publication "Social Policy Implementation in Latvia after Joining the European Union" (2009) states that "the average number of recipients of unemployment benefits slightly decreased every year since Latvia's accession to the EU..."

The procedure of granting and paying **unemployment benefits** is regulated by the law "On Insurance in Case of Unemployment" (1999). A person being granted the status of unemployed and having a period of insurance not less than 1 year is entitled to unemployment benefit, if obligatory social insurance contributions for unemployment have been paid or had to be paid in the Republic of Latvia for at least nine months during the recent 12 month period prior to the date of gaining the status of unemployed.

After the years of strong economic growth, in 2009, Latvia's national economy faced an economic crisis that was caused both by structural and cyclical, and exogenous factors. The economic recession significantly affected the labour market – the registered unemployment rate increased, the rate of employment decreased, the economic activity

indicators sharply fell, and the wages were significantly cut (Koncepcija par sociālās..., 2010). In 2009, the increase in the rate of unemployment affected also changes in the number of recipients of unemployment benefits. Table 1 shows that the number of recipients of unemployment benefits increased – it doubled in all Latvia's regions. The fastest annual increase was observed in Riga region and Vidzeme region, i.e. in the regions with the largest concentration of residents and the lowest unemployment rate in the period until 2008 as well as in Zemgale region (Development of Regions..., 2010.). The smallest annual increase was observed in Latgale region – in the region having the highest unemployment rate during the entire period since Latvia restored its independence.

An analysis of the percentage distribution of recipients of unemployment benefits showed that on average 28.8% of benefit recipients are concentrated in Riga region, in Pierīga region - 17.2%, Vidzeme region - 10.1%, Kurzeme - 14.4%, Zemgale - 12.6%, and Latgale - 17.0% over the researched period.

A **sickness benefit** is granted if a person does not go to work and thus loses job income or if a self-employed person loses income: disability due to sickness or trauma, medical care or prevention is needed, isolation due to quarantine is necessary, treatment at a medical institution during the period of recovery after sickness or trauma if such treatment is needed to restore working capabilities, care, prosthesis, or orthesis for a child under 14 years of age at hospital.

Since 2009, a sickness benefit is granted and paid for a period from the 11th day of incapacity for work till the day of restoring working capabilities, but for not more than 26 weeks from the first day of incapacity for work if the incapacity is continuous, or for not more than 52 weeks within a three year period if the incapacity returns interruptedly. Until 2009, any sickness benefit was granted and paid for a period starting with the 15th day of incapacity for work till the day of restoring working capabilities, but for not more than 52 weeks from the first day of incapacity for work if the incapacity is continuous or for not more than 78 weeks within a three year period if the incapacity returns interruptedly.

A sickness benefit in the event of taking care of a sick child under 14 years of age is granted and paid for a period from the first day of incapacity for work until the 21st day of incapacity for work (On Maternity and ..., 1995).

Table 1 shows that the number of recipients of sickness benefit tended to increase in all the regions of Latvia during 2006-2009. After analysing the percentage distribution of benefit recipients, one can conclude that the largest share of recipients of sickness benefit is in Riga region or on average 31.8% of the total number of recipients of sickness benefit in Latvia, followed by Pierīga region with 17.9% on average, and Kurzeme and Latgale regions with 13.4% on average. The increase in the number of recipients of sickness benefit is related to almost full employment in Latvia's labour market in the period until 2008 as well as to the legalisation of employment, i.e. social insurance payments were made from all incomes, thus gradually reducing the phenomenon of under-the-table wages.

In accordance with the law "On Maternity and Sickness Insurance" (1995), a **maternity benefit** is granted and paid during the entire period of pregnancy leave (56 days) and postnatal leave (56 days) if a woman does not go to work and, thus, looses job income or if a self-employed woman looses income.

A woman who has initiated pregnancy-related medical care till the 12th pregnancy week at a preventive medical institution and continued it for the entire period of pregnancy, is granted a 14 day extra leave that is added to her pregnancy leave.

A **paternity benefit** is granted and paid to the child's father for *ten calendar days* of the leave granted in relation to childbirth.

To adjust the state social insurance system to economic possibilities, in 2009, the law "On State Pensions and Benefits Paid in the Period of 2009-2012" (2009) was passed. It provides that during the period from 3 November 2010 to 31 December 2012, maternity and paternity benefits, which are stipulated in the law "On Maternity and Sickness

Insurance", are paid 80% of their recipients' average wage subject to insurance contributions.

Table 1 shows that the number of recipients of maternity benefit in the whole country as well as in Latgale did not change in 2008. In the regions of Pierīga, Vidzeme, and Zemgale, the number of recipients of maternity benefit increased, while a decrease was observed in the regions of Riga and Kurzeme. In 2007, an increase in the number of recipients of benefits was observed in all the regions and the whole country, whereas in 2009 it tended to decrease.

After analysing the number of recipients of paternity benefit over the researched period, one can see that this number has gradually increased in the whole country and all its regions in 2007 and 2008; while in 2009 there was an opposite trend – the number of benefit recipients decreased.

The authors of the paper believe that maternity and paternity benefits are short-term benefits and, thus, the changes in their number have to be viewed along with the legislation concerning parental benefits. The authors believe that the birth rate has to be stimulated mostly by parental benefits and their duration. Since 2005, a parental benefit depends on incomes and only partially, it can be viewed as a social benefit; it also features an instrument for family planning. The change in legal enactments, i.e. the introduction of the so-called "mothers' wage" encouraged families to afford one more child, especially during 2006-2007. Therefore, the number of recipients of parental benefits gradually decreased in Latvia until 2007, but their number increased by 4525 in 2007 if compared with the previous year. In 2008, it again sharply fell, as this support increased mostly owing to an increase in childbirths and during the first year of life of children; after the second year of their life this support decreases. It means that support for children in Latvia is intended only for a relatively short period (2 years), hence, it does not provide a real support for families and does not promote an increase in child births (Cunska Z., Muravska T., 2008).

A **parental benefit** is granted and paid to a socially insured person that *nurses his/her child aged less than one year* if this person is employed on the day of granting the benefit and is on leave for child care or does not gain income from self-employment due to child care.

Half of the recipients of maternity and paternity benefits are concentrated in the regions of Riga and Pierīga, whereas the smallest share of them is in Vidzeme region.

The numbers of recipients of state social insurance benefits significantly diverge among the districts of Latvia. Therefore, the authors computed the indicator "number of benefit recipients per 1000 employed individuals" (Table 2). The indicator was calculated per 1000 employed individuals, as state social insurance benefits may be received only by employed individuals. The year 2008 was selected for analysis, as a cluster analysis of the economic development was also done for this year and there was a lack of statistical data for 2009.

After analysing the numbers of recipients of state social security benefits by type of security benefits in Latvia's districts, one can conclude that these numbers are different, except the numbers of recipients of paternity benefits.

The calculation showed that explicitly the smallest number of recipients of state social security benefits per total number of employed individuals dominates in Riga City. Per 1000 employed individuals. Totally, 19 individuals received a sickness benefit, 2 individuals were granted a maternity benefit, 1 - benefited from a paternity benefit, and 15 had a parental benefit.

In terms of the smallest number of recipients of sickness benefit, Riga city was followed by the districts of Gulbene, Ludza, Liepāja, Ventspils, Saldus, Daugavpils, Preiļi, Krāslava, Alūksne, and Jēkabpils in which this indicator ranged within 27-32 per 1000 employed individuals.

The largest number of recipients of maternity benefit per 1000 employed individuals was in the districts of Ogre, Bauska, Limbaži, Riga, Jelgava, Tukums, and Dobele where it was within a range of 4-6. However, per 1000 employed individuals, 3 individuals

received a maternity benefit in the districts of Krāslava, Daugavpils, Gulbene, Ludza, Preiļi, Ventspils, Madona, Rēzekne, Liepāja, Jēkabpils, Valmiera, and Kuldīga, which is the lowest indicator after Riga City.

Table 2

Average number of recipients of state social insurance benefits per 1000 employed individuals in Latvia's districts in 2008

District	Unemployment benefit	Sickness benefit	Maternity benefit	Paternity benefit	Parental benefit
Riga City	23	19	2	1	15
Riga	44	35	4	1	29
Liepāja	49	31	3	1	22
Daugavpils	37	31	3	1	18
Rēzekne	66	37	3	1	19
Jelgava	41	38	4	1	29
Ogre	69	51	6	2	39
Bauska	77	39	5	2	36
Tukums	51	41	4	2	29
Cēsis	46	48	4	1	25
Preiļi	79	31	3	1	21
Jēkabpils	46	32	3	1	22
Ventspils	34	30	3	1	22
Valmiera	34	41	3	1	22
Talsi	50	43	4	1	24
Dobele	73	49	4	1	29
Kuldīga	78	37	3	1	26
Limbaži	79	50	5	2	30
Madona	58	45	3	1	22
Ludza	86	29	3	1	20
Saldus	57	30	4	1	24
Aizkraukle	58	37	4	2	27
Krāslava	74	32	3	1	17
Valka	52	42	4	1	25
Balvi	71	41	4	1	22
Gulbene	48	27	3	1	19
Alūksne	53	32	4	1	24

Source: authors' calculations based on the SSIA and CSB data

The calculations showed that per 1000 employed individuals, 2 individuals received a paternity benefit in the districts of Ogre, Bauska, Tukums, Limbaži, and Aizkraukle, which is the highest indicator among the districts.

The largest number of recipients of parental benefit per 1000 employed individuals was observed in the districts of Ogre, Bauska, Limbaži, Jelgava, Tukums, Riga, and Dobele, ranging within 29-39.

In terms of the smallest number of recipients of parental benefit per 1000 employed individuals (within 17-20), Riga City was followed by the districts of Krāslava, Daugavpils, Rēzekne, Gulbene, and Ludza.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
No. 24, 2011

It is necessary to evaluate the economic development of the districts to make a deeper analysis of differences regarding the numbers of recipients of state social security benefits.

2. Evaluation of economic development in Latvia's districts

A cluster analysis was performed to compare the economic development levels by various indicators in Latvia's districts. Sixteen statistical indicators were selected for the cluster analysis: the number of residents at the beginning of 2009; the change in the number of residents (from the beginning of 2005 to that of 2009, %); the population density at the beginning of 2009 (people per 1 km^2 of territory); the number of employees at their basic work in 2008 (thou.); demographic burden per 1000 residents as of the beginning of 2009; net wage in the private sector in 2008 (LVL); net wage in the public sector in 2008 (LVL); the number of economically active legal entities or entrepreneurs and businessmen per 1000 residents in 2008; the number of businessmen per 1000 residents in 2008; total revenues of the basic and special budget in 2008 (LVL); revenues of the basic budget in 2008 (LVL); revenues of the basic budget per capita in 2008 (LVL); Gross Domestic Product budget in 2006 (thou. LVL); Gross Domestic Product budget per capita in 2006 (LVL); and non-financial investments in 2006 (mill. LVL); non-financial investments per capita in 2006 (LVL) (Table 3).

These statistical indicators were summarised for all the 26 districts of Latvia. Riga City or the country's capital was excluded from Riga district.

The analysis of variance (ANOVA), which is included in the module Cluster Analysis of SPSS for Windows, showed that all the selected indicators, except five: change in the number of residents, demographic burden per 1000 residents, net wage in the private sector, the number of economically active legal entities or entrepreneurs and businessmen per 1000 residents, and non-financial investments per capita are statistically significant for grouping the districts into clusters. Their significance did not exceed a level of 0.05. The statistically insignificant indicators were omitted by the authors.

The cluster-to-cluster distances obtained in the analysis prove that there is a relationship among the clusters. The clusters being closer to each other can move to another level if a new distribution of them is performed, and they can create new clusters or cluster groups.

In clustering the statistical data, several numbers of clusters were considered: from 2 to 10 clusters. Latvia's territorial division by the economic development into 7 clusters was the most appropriate option, as the number of Latvia's districts was more equable with such a distribution into clusters.

In addition to the clustering results, the clusters were ranged for all the statistically significant indicators to determine the overall development level of each cluster in relation to the other clusters (Table 3).

The ranging showed that the most positive situation regarding economic development was in Cluster 1 that included only the capital city of Riga; the values of all the statistically significant indicators were placed in the first position.

Table 3

Average values and ranks of clusters in the cluster analysis of the economic development in Latvia

Indicator	Cluster 1		Cluster 2		Cluster 3		Cluster 4		Cluster 5		Cluster 6		Cluster 7	
	Average value	Rank	Average value	Rank	Average value	Rank	Average value	Rank	Average value	Rank	Average value	Rank	Average value	Rank
Number of residents	713016	**1**	185863	**2**	115260	**3**	65803	**4**	55215	**5**	47026	**6**	31196	**7**
Population density, people per 1km^2	2353.2	**1**	62.8	**2**	48.4	**3**	24.55	**4**	20.5	**5**	19.87	**6**	14.47	**7**
Number of employees, thou.	400.1	**1**	58.8	**2**	36.75	**3**	21.45	**4**	15.05	**5**	12.46	**6**	7.39	**7**
Net annual wage in the public sector, LVL	5737	**1**	4110	**2**	4036	**5**	4037	**4**	4024	**6**	4085	**3**	3820	**7**
Number of businessmen per 1000 residents	56	**1**	24	**2**	24	**2**	21	**4**	22	**3**	20	**5**	15	**6**
Total revenues of the basic and special budget, mill. LVL	606.80	**1**	72.65	**2**	60.55	**3**	36.65	**4**	21.35	**5**	13.79	**6**	9.04	**7**
Revenues of the basic budget, mill. LVL	554.77	**1**	63.36	**2**	55.41	**3**	32.78	**4**	19.35	**5**	11.93	**6**	7.81	**7**
Revenues of the basic budget per capita, LVL	778	**1**	358	**4**	485	**3**	513	**2**	351	**5**	261	**6**	254	**7**
GDP, thou. LVL	6722327	**1**	624151	**2**	378723	**3**	237340	**4**	136374	**5**	122971	**6**	64249	**7**
GDP per capita, LVL	9272	**1**	3299	**3**	3213	**4**	3702	**2**	2435	**6**	2573	**5**	1980	**7**
Non-financial investments, mill. LVL	2034.90	**1**	338.15	**2**	142.35	**3**	121.75	**4**	69.15	**5**	57.33	**6**	26.19	**7**
Total rank	**-**	**11**	**-**	**25**	**-**	**35**	**-**	**40**	**-**	**55**	**-**	**61**	**-**	**76**
Districts included into clusters	Riga		Daugavpils Riga		Jelgava Liepāja		Rēzekne Ventspils		Cēsis Tukums		Aizkraukle Bauska Jekabpils Kuldīga Madona Ogre Saldus Talsu Valmiera		Alūksne Balvi Dobele Gulbene Krāslava Limbaži Ludza Preiļi Valka	

Source: authors' construction based on the CSB data

Cluster 2 included the districts of Riga and Daugavpils. The values of all the mentioned indicators were placed in the second position, except the indicators: revenues of the basic budget per capita and Gross Domestic Product budget per capita. The values of these indicators are reduced by the large number of residents in the districts included into Cluster 2.

After comparing the average values of Clusters 2 and 1, one can conclude that there is a significant difference pointing that the economic development level in the capital city is much higher than in the districts included into Cluster 2.

Cluster 3 includes 2 districts – Jelgava and Liepāja. The indicator "number of businessmen per 1000 residents" was placed in the second position, the indicator "GDP per capita" had the fourth position, and the indicator "net wage in the public sector" took the fifth position; all the values of the other indicators were placed in the third position.

Cluster 4 also includes 2 districts – Rēzekne and Ventspils. The indicators "revenues of the basic budget per capita" and "GDP per capita" were placed in the second position. The values of the other indicators had taken the fourth position.

The average value of the indicator "number of residents" in Cluster 4 is smaller than that in Clusters 2 and 3. Therefore, the value of the indicator "revenues of the basic budget per capita" is higher, although the indicators "total revenues of the basic and special budget", "revenues of the basic budget" as well as "GDP" are almost twice as high.

Cluster 5 includes the districts of Cēsis and Tukums. The highest indicator of this cluster is "number of businessmen per 1000 residents", which was placed in the third position in the ranging, but if the average values of this indicator are compared among Clusters 2, 3, 4, 5, and even 6, one can see that there are no significant differences among the values. A similar conclusion can be made for the indicator "net annual wage in the public sector", which was ranked in a low sixth position. However, after comparing the average values among Clusters 3, 4, and 5, one has to conclude that there are no large differences among them. The indicator "GDP per capita" is also ranked in the low sixth position. The values of the other indicators are ranked in the fifth position.

Cluster 6 includes 9 districts of Latvia: Aizkraukle, Bauska, Jēkabpils, Kuldīga, Madona, Ogre, Saldus, Talsi, and Valmiera. The average values of the indicators were ranked mostly in the sixth position for this cluster, meaning that the economic development level in this cluster is lower than in the previous five ones.

Cluster 7 also includes 9 districts: Alūksne, Balvi, Dobele, Gulbene, Krāslava, Limbaži, Ludza, Preiļi, and Valka. The values of the all selected indicators characterising their economic development level are ranked only in the lowest positions, meaning that districts of this cluster feature the lowest economic development level in the country.

Discussion

If comparing the clustering results with the number of recipients of unemployment benefits per 1000 employees, one can see that the number of benefit recipients in the clusters of higher economic development level is smaller than that in the clusters of lower economic development level. In Riga, which is the country's capital city and is included into Cluster 1, the number of recipients of unemployment benefits is the smallest, i.e. 23 benefit recipients per 1000 employed individuals.

In the districts included into Cluster 2, there are 37 benefit recipients in Daugavpils district, but in Riga district – 44 benefit recipients per 1000 employees.

In Jelgava district, which is included into Cluster 3, there are 41 benefit recipients, but in Liepāja district – 49 such individuals per 1000 employees.

There are only 34 recipients of unemployment benefit per 1000 employees in Ventspils district, which is included into Cluster 4. It is the second lowest rate in the country after Riga city.

An exception has to be noted: the number of recipients of unemployment benefit per 1000 employees is 34 in Valmiera district from Cluster 6. The authors of the paper explain this fact by the relatively small distance of this district to the capital city. Therefore, a part of Valmiera district's population is employed in Riga or its vicinity having one of the lowest unemployment rates. The National Strategy Report on Social Protection and Social Inclusion 2008-2010 also states that the low registered unemployment rate in the regions of Riga and Pierīga has

promoted regional mobility, respectively, a part of businessmen have attracted their employees from more distant planning regions of Latvia as well.

Cluster 4, except Ventspils district, includes also Rēzekne district that has a large number of recipients of unemployment benefit or 66 per 1000 employees. This large number of recipients of unemployment benefit can be explained by the high unemployment rate in this district and by the large distance from it to the capital city. The authors believe that a large distance to Riga determines the relatively large number of recipients of unemployment benefit (49) in Liepāja district.

In Clusters 5, 6, and 7 where a lower economic development level is observed if compared with the previous clusters, the number of recipients of unemployment benefit ranges from 50 to 86. The largest number of benefit recipients (86) is in Ludza district that has a low economic development level and there is a large distance from it to the capital city.

It means there is interaction – synergy – among the number of recipients of unemployment benefits, the economic development level of districts as well as the distance of districts to the country's capital city.

After comparing the clustering results with the number of recipients of maternity, paternity, and parental benefits per 1000 employees, one can conclude that a larger number of benefit recipients per 1000 employees is observed in the districts that are located next to the capital city or quite close to it, i.e. Ogre, Bauska, Limbaži, Riga, Jelgava, Tukums, Dobele, Cēsis, and Aizkraukle as well as in the districts of Cluster 6 – Aizkraukle, Bauska, Ogre, and Valmiera.

The gained results can be explained by the fact that Cluster 6 includes the indicator "net annual wage in the public sector, LVL" that is one of the highest value indicators ranked in the high third position. The authors of the paper believe that the rise in wages promoted an increase in the birth rate in the country, which also affected the indicator "number of benefit recipients per 1000 residents". It is also stated in the National Strategy Report on Social Protection and Social Inclusion 2008-2010 that an expenditure increase in the sphere of social insurance was impacted by the significant rise of wages in the national economy, as a result of which the amount of benefits increased, pensions were annually indexed, and birth indicators improved in the country, which in their turn were affected by an increase in the number of maternity benefits.

After analysing the statistically insignificant indicator "net annual wage in the private sector, LVL", the authors found that this indicator would not affect the results of cluster analysis and it would be placed in the fifth position with an average value of LVL 3512.56 for Cluster 6.

In the districts closely located to Riga City – Riga, Jelgava, and Cēsis – the average wages in the public and private sectors do not significantly differ from the average values of respective indicator in Cluster 6. A large part of residents living in the districts closely located to Riga city work in the country's capital, and thus the authors believe that in 2008, the residents of these districts regarded their future prospects as much more optimistic than the residents of more distant districts (for instance, the districts of Krāslava, Gulbene, Ludza, and Preiļi), meaning that their uncertainty about tomorrow – their job and income – was lower; it explains the gained results.

According to a household budget survey conducted by the CSB (Household Budget Survey..., 2009), the self-assessments of wellbeing in various planning regions of Latvia are different. The largest share of households who choose a response "we are not rich, but we live well" come from the regions of Riga, Pierīga, and Kurzeme. Whereas the response "we are on the brink of poverty or we are poor" was mostly expressed in Latgale. In 2008, the self-assessment of wellbeing of households living in Latgale has improved compared with the previous years.

To prove the thesis set in the paper, the authors developed dispersion diagrams for the indicators "net wage in the public sector", "number of recipients of maternity benefits per 1000 employees", "net wage in the public sector", and "number of recipients of parental benefits per 1000 employees", finding that there is a medium strong relationship between the variables.

The largest number of recipients of maternity and parental benefits per 1000 employees is in Ogre district, 6 and 39 respectively. In the districts of Bauska and Limbaži, there are 5 recipients of maternity benefit and respectively 36 and 30 recipients of parental benefit per

1000 employees. There are 4 recipients of maternity benefit and 29 recipients of parental benefit per 1000 employees in the districts of Tukums, Jelgava, Dobele, and Riga. Irrespective of the high economic development level in the country's capital city of Riga (Cluster 1), the numbers of recipients of maternity and parental benefits per 1000 employees in Riga are the lowest compared with the whole country or only 2 recipients of maternity and 15 recipients of parental benefits per 1000 employees. This result gained by the authors may be explained by the large number of individuals employed in the capital city or 400.1 thousand people, which is almost 7 times more than the number of employees included into Cluster 2, and 54 times more than those in Cluster 7.

In the more economically developed districts located in the border area of Latvia – Daugavpils, Liepāja, Ventspils, and Rēzekne – the number of recipients of maternity and parental benefits is smaller if compared with the districts of Riga, Jelgava, Cēsis, and Tukums.

If the indicator "number of newborns per 1000 residents" is analysed, a similar trend may be observed – the birth indicator is higher in the districts closely located to the capital city, but lower in more distant districts (Demography 2009, 2009).

Thus, there is interaction – synergy – among the number of recipients of maternity and parental benefits, the economic development level of districts as well as the distance of districts to the country's capital city.

After comparing the number of recipients of sickness benefit per 1000 employees with the results of cluster analysis, the authors did not find any interaction, but after comparing the number of recipients of sickness benefit per 1000 employees with the number of recipients of maternity and parental benefits per 1000 employees, one can find a medium strong relationship: in the districts, where the number of recipients of maternity and parental benefits per 1000 employees is larger, the number of recipients of sickness benefit is also larger. For instance, the largest number of recipients of maternity and parental benefits per 1000 employees is in Ogre district, and the largest number of recipients of sickness benefit in the country or 51 is also observed there. Limbaži district features the second largest number of recipients of sickness benefit per 1000 employees, and the number of recipients of maternity and parental benefits is large as well. The smallest number of recipients of sickness benefit per 1000 employees is in the capital city (19), and the number of recipients of maternity and parental benefits is also the smallest there. The results gained by the authors can be explained by means of the country's present legal acts: part of recipients of sickness benefit (according to the SSIA data – approximately 20%) are parents of children. According to the authors, it explains the medium strong relationship between the numbers of benefit recipients.

Thus, there is a medium strong relationship between the number of recipients of sickness benefit and the number of recipients of maternity and parental benefits; whereas no relationship was identified between the number of recipients of sickness benefit and the economic activities.

Conclusions

1. With the beginning of economic crisis and owing to the amendments made in legislative enactments, the numbers of recipients of unemployment and sickness benefits increased, while the number of recipients of paternity and maternity benefits decreased in the regions of Latvia. The majority of recipients of social security benefits is concentrated in the regions of Riga and Pierīga, but the smallest one in Vidzeme region.
2. Monocentric economic development trends are specific to Latvia, as result of which there are significant differences between the country's capital city of Riga and the rest of Latvia's regions.
3. The economic development level in many Latvian border districts is low, thus the socio-economic differences increase and differences in the number of recipients of social security benefits in also increase in the regions of Latvia.
4. There is interaction – synergy – among the number of recipients of unemployment benefit per 1000 employees, the number of recipients of maternity and parental benefits per 1000 employees, the economic development level of districts as well as the distance of districts to the country's capital city.

5. There is a medium strong relationship between the number of recipients of sickness benefit per 1000 employees and the number of recipients of maternity and parental benefits per 1000 employees, whereas no relationship was identified between the number of recipients of sickness benefit per 1000 employees and the economic activities.

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Problematic Aspects of Accounting for Biological Assets

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Abstract. The key production elements of an agricultural company are its biological assets, and the company profit depends on the efficiency of the management of these assets. Accurately organised stocktaking in accounting may provide control over biological assets and create favourable preconditions for the development of a company.
During the research, the author carried out an analysis of the International Accounting Standards (IAS) and expert publications regarding assessment aspects of biological assets. Theoretical concepts concerning the contents quality of IAS 41, benefits and disadvantages of fair value application have been explored in the study; and this may serve as a basis for elaboration of Latvian Accounting Standards (LAS) for "Biological Assets" or "Agriculture".
Key words: agricultural sector enterprises, biological assets, accounting, financial statement, fair value.

Introduction

Although the share of agriculture in Latvia's Gross Domestic Product is not large, it is an important sector of the economy. Agriculture provides the population with livelihood; and it promotes commercial activity and sustainable employment in rural areas, thus improving the living quality and retaining density of rural population.

The agricultural sector enterprises can implement a successful business with relevant help of accounting.

The annual report is accounting information provided for the public use. Anybody who is cooperating with the enterprise or is planning to do so accepts decisions based on this information. Consequently, the information in this report should be truthful, comparable, timely, significant, comprehensible, and complete. The information in the annual report shall be presented based on the same principles to ensure its usability from year to year (Dziļuma V., 2000).

The aid "Biological Assets" is an important tool for accounting in agricultural activity; it distinguishes accounting in agriculture from that in other sectors of economy (Ore M., 2010). However, very little attention is paid to issues of biological asset stocktaking in accounting in Latvia. Neither regulatory enactments determine the order of accounting for biological assets nor has any research exploring the problems of biological asset accounting been carried out up to now (Jesemčika J., 2010a).

The aim of the research is to systematise and analyse accounting methodology of biological assets based on the existing theories and international experience to develop proposals for the improvement of accounting policy and its implementation in agricultural enterprises.

The following tasks were set to achieve the aim: to identify and compare requirements of IAS 41 and the Annual Accounts Law of the Republic of Latvia (LR), related to the assessment of biological assets, and to analyse the existing theoretical concepts and the international experience in assessment methods of biological assets.

The justification for the research is the problem that the existing legal and regulatory enactments of the Republic of Latvia do not provide explicit and unambiguous norms for biological asset accounting in agricultural companies. Unless, there exists a single assessment system defined by the national standards, it makes the annual reports of enterprises of the same type of economic activity incomparable. It creates problems both for external and internal users of the financial statements.

Further research provides the analysis of IAS 41, former research and expert publications regarding aspects of biological asset assessment within the period from 1 January 2000 to December 2010 for precise identification of problems in the sphere. Qualitative methods of scientific research in the science of economics were applied: monographic (to test the content relevance between documents of different levels) and content analysis (to explore

the problem elements and synthesise interconnections between legal and regulatory enactments, and other researchers' articles, and further interpret the obtained information according to the object and aim of the research). The research covers the period from 1 January 2000 to December 2010.

Results and discussion

The annual report is the most important document of an enterprise, and the very first document studied by investors, financial analysts, and consultants analysing the company. It reflects how the enterprise acts financially, and often explains the management philosophy and the key aim of business.

An important tool for accounting in agricultural activity is the aid "Biological Assets", which distinguishes accounting in agriculture from other sectors of economy (Ore M., 2010). Biological assets are animals or plants the company grows to obtain agricultural produce for sale or as additional biological assets (Gada pārskatu likums, 1992). When preparing the annual report, it is essential for an agricultural enterprise to present objective values of biological assets on the balance sheet and accurately reflect value changes in the profit and loss account.

Assessment issues are paid special attention in the International Accounting Standards. Assessment is the process of estimation in monetary units, where elements of financial statements are recognised and assessed on the enterprise balance sheet and in the profit and loss account. Therefore, it is necessary to select a specific method. (Jesemčika J., 2010b)

The accounting method, presentation of financial statements, and disclosure of information concerning agricultural activity – these are issues, which have not been dealt with by other accounting standards as well as the accounting method for biological assets in the respective periods of their growth, degeneration, food-production and reproduction, and the initial assessment of agricultural produce at harvest – is determined by the International Accounting Standards 41 "Agriculture" (Lauksaimniecība, 2000).

Despite the importance of the primary sector in the global economy, accounting for agricultural activities had seldom been a focus of attention for accounting researchers, practitioners, and regulators until the approval of International Accounting Standard 41 "Agriculture" in December 2000 by the International Accounting Standards Council (IASC). IAS 41 marked both a radical departure from the traditional accounting for biological assets and an early test of fair value accounting (FVA). The standard has been controversial, with the IASC facing strong opposition from industry, practitioners, and many national professional accounting bodies. While IAS 41 has been acknowledged as providing "a good conceptual framework", its detractors suggest that the IASC's project has "portrayed a dubious triumph of theory over pragmatism" (Fisher R., Mortensen T., Webber D., 2010).

IAS 41 requires biological assets be measured at fair value less estimated point-of-sale costs from initial recognition of the biological assets to the point of harvest, other than when fair value cannot be measured reliably on initial recognition.

The fair value is the amount for which an asset could be exchanged, or a liability settled, between knowledgeable and willing parties in an arm's length transaction (Lauksaimniecība, 2000).

An enterprise should recognise a biological asset or agricultural produce only when the enterprise controls the asset because of past events, or it is probable that future economic benefits will flow to the enterprise, and the fair value or cost of the asset can be measured reliably (Lauksaimniecība, 2000).

IAS 41 requires changes in the fair value of a biological asset less estimated point-of-sale costs to be included in the profit and loss account for the period in which they arise. In agricultural activity, a change in physical attributes of a living animal or plant directly enhances or diminishes economic benefits to the entity (Lauksaimniecība, 2000).

IAS 41 requires that an unconditional government grant related to a biological asset measured at its fair value less estimated point-of-sale costs be recognised as income when, and only when, the government grant becomes receivable. If a government grant is conditional, including where a government grant requires an entity not to engage in a specified agricultural activity, an entity should recognise the government grant as income when, and

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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only when, the conditions attaching to the government grant are met. If a government grant relates to a biological asset measured at its cost less any accumulated depreciation and any accumulated impairment losses, IAS 20 **Accounting for Government Grants and Disclosure of Government Assistance** is applied instead (Lauksaimniecība, 2000).

The preference for fair-value-based measurement in IAS 41 is consistent with a systematic shift in the dominant measurement paradigm away from the traditional historical cost accounting (HCA) model - a shift being jointly championed by the US Financial Accounting Standards Board and the International Accounting Standards Board. FVA proponents point to the enhanced decision usefulness and transparency of fair value information attributable to its timely reflection of current market conditions. Opponents, however, believe that FVA comes at the expense of reliability and understandability, referring to the need sometimes to use somewhat arbitrary market based values that rely on subjective means of establishment. Concerns have also been raised about the costs of ascertaining such values, particularly for reporting entities in developing countries; the undesirable effects of increased volatility of reported earnings; and the failure of fair value to capture always the true economics of business. Further, the extension of FVA to a range of assets, industries and countries has raised concerns about the ability of one measurement system to be all things to all stakeholders, with many of the key requirements being tailored to assets where active markets are prevalent (e.g., financial instruments) (Fisher R., Mortensen T., Webber D., 2010).

According to economists' opinion, the problems in assessment of biological assets are related to the fact that agriculture largely depends on agro climatic conditions and territorial remoteness of the enterprise from the sales markets. This is especially acute when estimating long-term biological assets, the fair value of which has been created in a longer period of time in changeable market conditions. The value of perennial plants and food-producing animals considerably changes depending on their location zone. This is closely related to the changes in risk degree and production costs. It should be noted that with time the initial plant and animal values differ from the values of similar physically young and more productive biological assets (Jesemčika J., 2010b).

The Latvian Accounting Standards, which along general lines are in accordance with accounting regulatory enactments, the European Community Law and the International Accounting Standards, are generally applicable directions for recognition of items in financial statements, their assessment and explanations. Currently 11 LAS items have been developed and approved.

However, none of the existing standards explicitly explains specific issues of accounting policy of agricultural enterprises. Contrary to Estonia and Lithuania, Latvia has not developed and approved the accounting standards for biological assets.

Currently in Latvia, accounting for biological assets and agricultural produce at harvesting is regulated only by the Annual Accounts Law (Ore M., 2010). As no national standards have been developed regarding accounting for biological assets, the accountants of agricultural enterprises can follow only the aforementioned law and requirements of the IAS 41 "Agriculture".

Analysing the information from the internet forum discussion of agricultural enterprise accountants, the author was reassured in correctness of the concepts expressed by international and Latvian researchers that the formulation of the norms of IAS 41 were expressed in a sophisticated way and were theoretically oriented, thus making the accountants' everyday work complicated.

As the accounting of any country will always have its own peculiarities and differences, one should abstain from generalisation. The majority of opinions in Latvia support the translation of IAS with addition of some amendments in it. However, how large and how substantial should these amendments be to claim that the presence of these amendments in the Latvian financial accounting standards testify of establishing a system of national accounting, and not just a translation of IAS and adding it a new title? Evidently, no one can give a clear answer to this question, and the improvement and development of the Latvian accounting system should be continued in this context (Prauliņš A., 2003).

A.Prauliņš in his scientific monograph *Theory and Practice of Accounting Standardisation* concludes that the most essential arguments in favour of the Latvian National Accounting Standards are their adaption possibilities to the specifics and needs of the economy of Latvia,

sophisticated contents of the international standards, and contradictory and ambiguous assessment of some standard items worldwide as well as potential difficulties for small and medium enterprises in the application of the international standards in practice (Prauliņš A., 2007).

In the European Accountants and Auditors' Forum of 2006, Hans Georg Bruns, Board Member of the International Accounting Standards Council, named elaboration of standards for small and medium enterprises to be the main task for the development of IAS. Although, it has never been indicated that IAS are provided only for enterprises quoted in international stock exchanges, however, in practice they are mainly applied by these enterprises. The requirements set for enterprises quoted in internal stock exchanges, and possibilities and resources of small and medium enterprises are not comparable. Therefore, H.G.Bruns considers that small and medium enterprises need separate standards (Zariņa V., 2006).

The Accounting Council should elaborate LAS "Agriculture" or "Biological Assets" to improve accounting in the agricultural enterprises of Latvia, simultaneously paying attention to unsophisticated content language of the standards and their unequivocal practical application. As the majority of agricultural enterprises fall into the category of small and medium enterprises, this aspect should be taken into consideration in the elaboration process of the standards.

In the further process of analysis, the author will systematise the main concepts of theoreticians regarding assessment of biological assets based on the four key principles of preparing financial reports (relevance, reliability, comparability, and understandability).

Relevance

The principle of relevance means that all items fundamentally affecting assessment of users of the annual report and decision-making should be mentioned without making the annual report overly detailed (Apsīte I., 2003).

Information is considered essential if its undisclosure may affect decisions taken by the users of the financial report (Finanšu pārskata sagatavošanas pamatnostādnes, 2004).

Accounting information and systems have previously been demonstrated to improve decision making in the farming context. However, the usefulness of accounting data appears limited by the measurement base used in the traditional accounting framework, that of historical cost. Therefore, the possibility of replacing the historical cost model for agricultural accounting with the one based on current values is not a new issue (Fisher R., Mortensen T., Webber D., 2010).

In support of the relevance of FVA, Herbohn notes that including unrealised gains or losses in reported profits provides users with more timely information that is relevant to assess their investment and the efforts of management over the period.

Further, it can be argued that the volatility that is introduced into income merely reflects the inherent risk of an investment in the agricultural sector (Fisher R., Mortensen T., Webber D., 2010).

However, opponents are concerned that there is frequently too much uncertainty regarding the ultimate realisation of many agricultural revenues. They believe that allowing recognition of estimates in income statements could result in significant adjustments in subsequent periods and may create pressure on entities to declare and pay dividends for which no funds are available. Herbohn suggests that this "allows greater opportunities (and motivation) for companies to massage their accounts in any financial year, depending on whether they wish to show higher or lower earnings." Therefore, the scope for earnings management is clearly increased when subjective valuation methods are required to be used (Fisher R., Mortensen T., Webber D., 2010).

Reliability

Reliability means that the information presented is reliable, neutral, essential, and prudent.

Reliability provides truthfulness of information, neutrality, the essence, and prudence.

The principal concern is when markets for biological assets do not exist. In such instances, reporting entities may have to estimate fair values by determining the net present values of future cash flows, yielding inherently subjective valuations. As Dowling and Godfrey note "unlike an objective value from an external market, net present value is highly dependent

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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on the discount rate and growth projections used in the calculation" (Fisher R., Mortensen T., Webber D., 2010).

IAS 41 provides "a good conceptual framework" for meeting the information needs of different stakeholders but note some practical difficulties in operationalising the standard (Fisher R., Mortensen T., Webber D., 2010).

FVA application to certain non-severable biological assets, such as grapevines, may result in "false or misleading statements and a reduction in the presentation of relevant financial information". The annual revaluation requirements imposed by IAS 41 "might prove onerous and expensive, particularly in less developed countries" (Fisher R., Mortensen T., Webber D., 2010).

The accountants face the problem of defining the market value – what exactly is it? Defining of the market value is subjective to a certain extent. (Dziļuma V., 2000)

Comparability

Comparability implies the ability to compare an entity's financial performance and position through time and across different entities (Fisher R., Mortensen T., Webber D., 2010).

The principle of comparability means that annual reports are prepared based on consistent accountancy policy and assessment methods from year to year. This mainly refers to assessment of balance sheet asset items and assessment methods, which are defined not by external documents, but by definite internal considerations: stock assessment methods, and long-term investment depreciation assessment methods. It is essential that cost price elements should be the same from year to year. For instance, how overheads are included (if they are included at all) into the cost price and how they are distributed among the remaining stocks and the disposed stocks, which is also part of an assessment method (Dziļuma V., 2000).

IAS 41 may further impair comparability through the introduction of volatility into the income statement. Herbohn's empirical analysis indicates a significant increase in the coefficient of variation associated with the reported earnings of sampled companies after the introduction of FVA for biological assets in Australia (Fisher R., Mortensen T., Webber D., 2010).

Amendments to the Annual Accounts Law, adopted on 26 May 2005, allow enterprises a choice in estimation of biological assets – to continue assessing these assets at purchase expenses or at their fair values (Kalniņa G., 2006).

In the situation, when a single assessment system defined by a national standard, does not exist, the financial reports of enterprises of the same type of economic activity become incomparable if each of them applies a different method. This creates problems both for external users and for internal users of financial reports (Jesemčika J., 2010b).

There is a discrepancy between the IAS 41 "Agriculture" and Annual Accounts Law of the Republic of Latvia. According to the Law in Sections 30, 31, and 32 regarding stock assessment procedures, the harvested product from biological assets in the process of detachment of produce, or animal breeding, or cessation of a biological asset's life processes, should be registered at manufacturing cost. IAS also requires that the harvested agricultural produce obtained from biological assets be assessed at fair value, which in further records is treated as cost of production. Thus, external financial statement users on the international level may be misled by the information reported in the financial statement of Latvia's company (Ore M., 2010).

The principle of comparability is referred not only to assessment methods and accounting policy, but also to classification of inventory objects. To a certain extent, it is connected with parts and elements of cost price. An important issue is that it should be strictly stated, which profit or loss calculation item should be indicated and where in the profit and loss account, so that the results are comparable from year to year. This will make it possible to draw conclusions on the enterprise development and partially to forecast it. The assessment criteria set by the Annual Accounts Law do not provide all possible situations. Therefore, the accountant should understand them and take appropriate decisions on the assessment, taking into consideration principles of prudence and comparability (Dziļuma V., 2000).

Understandability

Understandability means that the information is understandable to users of financial reports with preliminary knowledge in entrepreneurship, economics, and accounting.

The understandability of accounts prepared according to IAS 41 may also be affected in a number of ways. Firstly, shareholders' expectations regarding the distribution of unrealised profits, despite the entity not having the cash to distribute. Secondly, both users and practitioners "are likely to find the rationale behind the "marking-to-market" approach in IAS 41 more difficult to comprehend or appreciate than the more pragmatic historic cost model". Elad, quoting a practitioner's response, suggests that the proposal for IAS 41 "whilst well intentioned is far too academic and will not be understood by the UK farmers and will be totally incomprehensible to many in developing countries". Thirdly, confusion may be caused by virtue of the prescribed accounting practices in IAS 41 being inconsistent with other accounting standards. Herbohn noted some farmers' concerns at having to value biological assets separately from the land they are attached to. An example provided is that of vineyards where there is never an intention to sell the vines separately from the land (Fisher R., Mortensen T., Webber D., 2010).

In practice, in economically ever-changing and unpredictable situation, it is quite problematic to state the fair value of an object. The fair value may lead to errors in the financial reports due to voluntary selection of information while preparing the most significant assessments for the profit and loss account and the balance sheet (Jesemčika J., 2010b). Agriculture is a subsidised sector of economy; quite often, the manufacturing cost of a product is higher than its sales price. Consequently, reliable assessment of a fair value of a biological asset depends on the national or the European Union policy in the agricultural sector, which creates a certain risk. (Ore M., 2010)

Assessment of fair value of a biological asset or agricultural produce may be facilitated by grouping them according to important features, for instance, age or quality. An enterprise may choose features relevant to properties, which are used as the basis for price setting on the market (Lauksaimniecība, 2000). The existing edition of the Annual Accounts Law concerning reflection of biological assets on the balance sheet contains several inconsistencies.

Conclusions, proposals, recommendations

1. IAS 41 (approved in December 2000) marked both a radical departure from the traditional accounting for biological assets and an early test of fair value accounting (FVA).
2. The preference for fair-value-based measurement in IAS 41 is consistent with a systematic shift in the dominant measurement paradigm away from the traditional historical cost accounting (HCA) model.
3. The problems in assessment of biological assets are related to the fact that agriculture largely depends on agro climatic conditions and territorial remoteness of the enterprise from the sales markets. While assessing biological assets in the cost price, it is essential that the cost price elements should be the same from year to year and they should be comparable. This will make it possible to draw conclusions on the enterprise development and partially to forecast it.
4. Agriculture is a subsidised sector of economy; quite often, the manufacturing cost of a product is higher than its sales price. Consequently, reliable assessment of a fair value of a biological asset depends on the national or the European Union policy in the agricultural sector.
5. Analysing statements of theoreticians, the following disadvantages of the HCA model were identified: it fails to account adequately for the unique reproductive and natural transformational nature of biological assets; and it ignores the realities of rapidly changing market values of farming assets.
6. FVA proponent' points: it enhances decision usefulness and transparency of fair value information attributable to its timely reflection of current market conditions; and including unrealised gains or losses in reported profits, it provides users with more timely information that is relevant to assess their investment and the efforts of management over the period. Further, it can be argued that the volatility that is

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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introduced into income merely reflects the inherent risk of an investment in the agricultural sector.

7. FVA opponents' points: this method cannot be used for assessment of all biological assets: the taking of unrealised gains and losses to the income statement; country-specific issues are not included; it uses somewhat arbitrary market based values that rely on subjective means of establishment; the approach taken in IAS 41 is too academic and not focused on the practicalities of reporting on biological assets; the undesirable effects of increased volatility of reported earnings; and the failure of assessment of fair value does not always capture the true economics of business, affecting the four principles of preparing financial reports (relevance, reliability, comparability, and understandability).
8. Analysing the contents of the accountants' discussion forum on the internet, the author was reassured in the concept expressed by researchers that the contents of IAS was overly complicated and theoretically oriented, thus creating ambiguousness in everyday accounting work.
9. Currently the assessment of biological assets and agricultural produce at harvesting is regulated only by the Annual Accounts Law, which allows assessing of biological assets using either the HCA model or the FVA model, thus financial reports of enterprises of agricultural sector are not intercomparable.
10. There is a discrepancy between IAS 41 "Agriculture" and the Annual Accounts Law of the Republic of Latvia, regarding stock assessment procedures; consequently, external financial report users on the international level may be misled by the information reported in the financial statement of Latvia's company.
11. The assessment criteria set by the Annual Accounts Law do not provide all possible situations. Therefore, the accountant should understand them and take appropriate decisions on the assessment, taking into consideration principles of prudence and comparability.
12. To improve stocktaking in accounting in the Latvian agricultural enterprises, the Accounting Council should elaborate LAS for agriculture and for biological assets taking into consideration IAS requirements and paying due attention to their adaption to the needs and specifics of the economy of Latvia as well as potential difficulties in practical application of international standards for small and medium enterprises.

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Factors Associated with the Violation of Requirements of Area Based Subsidies in Estonia

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Abstract. Area based agricultural subsidies are tied with fulfilling several requirements that are related to policy objectives, e.g. cross-compliance or administrative requirements. Each Member State is obliged to check certain proportion of payment applications at the farms. The selection of farms to be checked is based on risk analysis and random selection. Violation of requirements is often associated with the concepts of moral hazard and adverse selection. Therefore, this paper studies the factors that affect the probability of violation of requirements. Knowledge about the relevant factors helps improve the risk analysis and thus improves the effectiveness of the checks and use of public funds. The administrative data of 2009 and the results of on the spot controls from Estonian Paying Agency were used in the research. The logistic regression was used to estimate the effects of several criteria (e.g. farm size, production type, business type, age etc.) on the probability that a farm violates the requirements.
Key words: compliance monitoring, infringements, cross-compliance, direct payments, logistic regression.

Introduction

Direct payments constitute an important part of farmers' income. In 2009 various subsidies comprised 39.9% of farm gross value added and 63.9% of farm net value added in Estonia. At the same time, direct payments comprised 64.2%, and payments from Rural Development Programme 35.7% of the subsidies received by farmers (Rural Economy Research Centre, 2009). Also, direct payments constitute a significant part of the CAP budget. In 2009 direct payments comprised 68.8% of the CAP EUR 54.9 billion budget. The share of CAP expenditure in the EU budget was 40.4%, thus direct payments added up to 28.8% of the EU total budget (European Commission, 2009a; European Commission, 2009b).

Considering the significant proportion that direct payments make in both farmers and the EU budget, it is clear that farmers want to maximise the amount of direct payment, and at the same time minimise the costs and effort that come with application procedures and fulfilment of the payment criteria. At the same time, in order to guarantee the effective use of public funds, the EU and Member States (via Paying Agencies) are putting much effort in compliance monitoring, i.e. they are monitoring if the payments are allocated to eligible persons and for the eligible farmland. However, due to the fact that there are so many farmers, it is too costly to check all the farms on the spot.

The compliance with the rules of subsidy payments has been researched from several perspectives. Various authors (Ozanne A *et al.*, 2001; Hart R and Latacz-Lohmann U, 2005; Yano Y and Blandford D, 2008; Viaggi D, 2008; Arguedas C *et al.*, 2008; Raggi M *et al.*, 2008) have based their studies on the concepts of moral hazard, adverse selection, and information asymmetry. Several studies focus on the analysis of private (Nitsch H and Osterburg B, 2008; Raggi M *et al*., 2008; Ridier A *et al.*, 2008; Viaggi D, 2008; Agruedas C *et al.*, 2008) and public (Mettepenningen E *et al.*, 2008) transaction costs related to complying with cross compliance rules. Most of the time the studies have been focused on voluntary agri-environmental payments (Ozanne A *et al.*, 2001; Choe C and Fraser I, 1998; Choe C and Fraser I, 1999; Yano Y and Blandford D, 2008; Viaggi D, 2008; Lankoski J *et al.*, 2008; Mettepenningen E *et al.*, 2008). Lankoski J *et al*. (2008) reason that in optimal policy design and assignment of

subsidy levels also the compliance monitoring costs should be taken into account. Since the resources for compliance monitoring are scarce, Fraser I and Fraser R (2005) suggest targeting monitoring resources to selected sub-groups in order to improve the effectiveness of monitoring resources.

The data

Every year at least 5% of the applicants for direct payments have to be checked on the spot (on the farms). During the farm visits inspectors of the Paying Agency[1] measure the applicant's farmland area that is eligible for the subsidies and check the applicant's compliance with the eligibility criteria of the subsidies. During eligible area checks the inspectors measure the area of farm fields and check the compliance of the area measured with the information in the field parcels register and farmer's payment application. The mismatch between the area verified on the farm, the area marked on the payment application, and information in the registry may occur due to several reasons, e.g. outdated information in the registry, inaccuracy while filling in the application or intentional misinformation given by the farmer in order to apply for larger subsidy than he or she is actually eligible for. The aim of the farmer's eligibility check is to verify that he or she fulfils the requirements of the respective payment. Without any compliance monitoring the farmers would apply for the subsidy even if they do not comply with subsidy requirements (moral hazard problem).

In addition, cross-compliance checks have to be carried out on the spot for at least 1% of the applicants. The purpose of the cross-compliance checks is to ensure that farmers fulfil several agri-environmental criteria, i.e. provide public goods that constitute criteria for subsidy eligibility. The control sample for on the spot checks of cross-compliance is also based on risk analysis and random selection.

In this study the authors focus on the problems of area mismatch and subsidy ineligibility in case of single area payment scheme (SAPS) that constitutes two thirds of the total budget of direct payments in Estonia; and the results of cross-compliance checks, i.e. infringements of the cross-compliance rules. The authors use the administrative data from ARIB's registers and the results of on the spot inspections from 2009.

In 2009 in case of SAPS area mismatch and SAPS eligibility checks 79.5% of the applicants to be checked were included into the control sample based on risk analysis and 20.5% as a result of random selection. In case of cross-compliance checks 78.7% of the applicants were selected via risk analysis and 21.3% randomly. Risk analysis is carried out so that risk scores are assigned to applicants based on various criteria and applicants with higher risk scores are preferred in the control sample. The criteria for the risk analysis are modified every year according to the results of the farm visits of the previous year (Tedrema K, 2010).

In 2009 there were 15858 SAPS applications of which 986 applicants (6.2% of applications) were checked on the spot. The total area covered by SAPS applications was 865 thousand hectares. The area covered by applicants who were checked on the spot was 37.8 thousand ha (4.4% of the total area of applications) with 38.4 ha average area per farm. The number of on the spot cross-compliance checks was 169. These applications covered 34.5 thousand ha and the average farm size was 204 ha (Tedrema, 2010).

Therefore, the aim of the paper is to control the effects of various factors on: 1) the probability of farmer's farmland area mismatch in case of SAPS; 2) the probability of farmer's ineligibility for SAPS; and 3) the probability that a farmer infringes cross-compliance rules.

The models

Three models were developed and logistic regression was applied, to estimate the effects of the factors. In the first model the authors used *area mismatch* as a dependent variable. In the logistic regression *area mismatch* had value 1 if during on the spot visit the differences were found between the actual eligible farmland area and the area declared on the payment application. The dependent variable was 0 when the area measured on the spot was in compliance with payment application. The underlying generalised model was as follows:

$$area\ mismatch^* = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_{23} x_{23} + e \quad (1)$$

[1] Estonian Agricultural Registers and Information Board (ARIB) is the Paying Agency in Estonia

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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Where *area mismatch* is a function of continuous unmeasured latent variable *area mismatch**, whose values determine the value of observed binary variable *area mismatch*.

area mismatch = 0, [*area mismatch*≤0*]

area mismatch = 1, [*area mismatch*>0*]

In the second model the dependent variable was *farmer's ineligibility* which was valued as 1 when during the farm visit it was asserted that the farmer was not eligible for the payment and 0 - otherwise. The underlying generalised model was as follows:

$$farmer's\ ineligibility^* = \delta_0 + \delta_1 z_1 + \delta_2 z_2 + \ldots + \delta_{23} z_{23} + e \quad (2)$$

Where *farmer's ineligibility* is a function of continuous unmeasured latent variable *farmer's ineligibility**, whose values determine the value of observed binary variable *farmer's ineligibility*.

farmer's ineligibility = 0, [*farmer's ineligibility*≤0*]

farmer's ineligibility = 1, [*farmer's ineligibility*>0*]

In the third model the dependent variable was *cross-compliance infringement* which was 1 if on the spot check confirmed that the farmer had infringed the cross-compliance requirements and 0 - otherwise. The underlying generalised model was:

$$cross\text{-}compliance\ infringements^* = \gamma_0 + \gamma_1 q_1 + \gamma_2 q_2 + \ldots + \gamma_{20} q_{20} + e \quad (3)$$

Where *cross-compliance infringements* is a function of continuous unmeasured latent *cross-compliance infringements**, whose values determine the value of observed binary variable *cross-compliance infringements*.

cross-compliance infringements = 0, [*cross-compliance infringements*≤0*]

cross-compliance infringements = 1, [*cross-compliance infringements*>0*]

The expected signs of regression coefficients are discussed together with regression estimates in the next section.

Results and discussion

The first model

The first model estimates the effects of various factors on the probability of mismatch between the area declared on the SAPS application and eligible area measured on the farm by inspector. The results are given in Table 1. The first group of variables (x_1-x_7) contains regional information. The regions are classified according to regional offices of the ARIB. The base region is Harju-Lääne-Hiiu (Northwest Estonia). The research results indicate that in Järva-Rapla region (Central Estonia) the probability of mismatch between the area declared and actual eligible area is significantly lower than in the base region, while in Viru region (Northeast Estonia) the probability of area mismatch is significantly larger than in the base region. The estimates for the other regions are statistically insignificant.

The next group of variables (x_7-x_9) control farm specialisation. The *crops only* variable indicates that the farmer has in addition to SAPS also applied for the crop premium (additional direct payment). This can be considered as a proxy for specialisation on crop production. *Crops and animals* indicate that the farmer has applied for SAPS, crop premium, and keeps agricultural animals. This could be considered as a proxy for mixed farms. *Animals only* refers to farmers that have applied for SAPS and own agricultural animals. The authors consider this as a proxy for specialisation on livestock. The base group consists of farmers who have applied only for SAPS. Most of those farmers presumably just keep land in good agricultural and environmental conditions (GAEC). The results indicate that in crop farms the probability of area mismatch is significantly lower than in the base group. For mixed and livestock farms the regression coefficients are statistically insignificant.

The third group of variables (x_{10}-x_{12}) indicates whether the farm is participating in agri-environmental programme, is organic producer, and is situated in LFA or Natura2000 areas. The research results demonstrate that in organic farms the probability of area mismatch is significantly higher than in conventional farms. This may be associated with higher payment levels for organic production that motivates the farmers to declare larger organic farmland area than they actually have.

The fourth group of variables (x_{13}-x_{14}) is related to legal form of farm. The base group is private persons who can also apply for SAPS. The variable *self-employed* refers to self-employed entrepreneurs (mostly family farms) and *commercial company* refers to farms that

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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are registered as companies (mostly limited liability companies). The results indicate that self-employed entrepreneurs have lower probability of area mismatch than private persons. For commercial companies the estimates are statistically insignificant.

The authors could not confirm that the probability of area mismatch is related to age group (x_{15}-x_{16}) of the farmer or size class of the farm (x_{17}-x_{19}). However, the larger the average field size (x_{20}), the lower the probability of area mismatches. This confirms the authors' expectation that in case of scattered fields the probability of area mismatch is higher.

Table 1

Coefficients of logistic regressions in case of area mismatch and farmer's ineligibility

Area mismatch		Estimation	Farmer's ineligibility		Estimation
Variable	*intercept*	0.312 (0.289)	*Variable*	*intercept*	-2.468 (0.578)***
x_1	*region2 (tartu-jõgeva)*	-0.101 (0.244)	z_1	*region2 (tartu-jõgeva)*	-0.114 (0.458)
x_2	*region3 (võru-põlva)*	0.354 (0.261)	z_2	*region3 (võru-põlva)*	-0.050 (0.452)
x_3	*region4 (saare-pärnu)*	-0.235 (0.256)	z_3	*region4 (saare-pärnu)*	-0.045 (0.476)
x_4	*region5 (järva-rapla)*	-0.616 (0.276)**	z_4	*region5 (järva-rapla)*	-0.118 (0.511)
x_5	*region6 (viru)*	0.793 (0.306)***	z_5	*region6 (viru)*	0.429 (0.491)
x_6	*region7 (valga-viljandi)*	0.204 (0.273)	z_6	*region7 (valga-viljandi)*	0.328 (0.474)
x_7	*crops only*	-0.378 (0.195)*	z_7	*crops only*	-0.841 (0.395)**
x_8	*crops and animals*	-0.343 (0.211)	z_8	*crops and animals*	-0.201 (0.366)
x_9	*animals only*	-0.256 (0.211)	z_9	*animals only*	0.125 (0.358)
x_{10}	*agri-environment*	-0.148 (0.199)	z_{10}	*agri-environment*	-0.364 (0.398)
x_{11}	*organic*	0.588 (0.239)**	z_{11}	*organic*	0.145 (0.397)
x_{12}	*lfa and natura*	0.169 (0.168)	z_{12}	*lfa and natura*	-0.053 (0.293)
x_{13}	*self-employed*	-0.394 (0.165)**	z_{13}	*self-employed*	-0.241 (0.316)
x_{14}	*commercial company*	-0.199 (0.314)	z_{14}	*commercial company*	0.522 (0.530)
x_{15}	*≤40 years*	-0.036 (0.227)	z_{15}	*≤40 years*	0.113 (0.400)
x_{16}	*>60 years*	0.166 (0.154)	z_{16}	*>60 years*	-0.211 (0.282)
x_{17}	*area >50…≤100 ha*	0.369 (0.329)	z_{17}	*area >50…≤100 ha*	0.918 (0.598)
x_{18}	*area >100…≤300 ha*	-0.085 (0.376)	z_{18}	*area >100…≤300 ha*	1.524 (0.703)**
x_{19}	*area >300 ha*	-0.495 (0.608)	z_{19}	*area >300 ha*	2.277 (0.949)**
x_{20}	*average field size (ha)*	-0.053 (0.022)**	z_{20}	*average field size (ha)*	-0.141 (0.060)**
x_{21}	*farmer's ineligibility*	1.467 (0.314)***	z_{21}	*area mismatch*	1.475 (0.317)***
x_{22}	*e-application*	-0.114 (0.324)	z_{22}	*e-application*	-1.565 (1.045)
x_{23}	*risk analysis*	0.154 (0.171)	z_{23}	*risk analysis*	-0.474 (0.279)*
Pseudo R^2 = 0.102 Loglikelihood = -626.9 Correct predictions = 62.8% n = 986			Pseudo R^2 = 0.072 Loglikelihood = -250.7 Correct predictions = 91.8% n = 986		

**Significant at 0.1 level.*
***Significant at 0.05 level.*
****Significant at 0.01 level.*

The authors also wanted to verify if the infringements are combined, i.e. if the same applicant has problems with area mismatch and eligibility for the SAPS. The coefficient of the

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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variable *farmer's ineligibility* (x_{21}) implies that if the applicant has problems with SAPS eligibility the probability that he or she has problems with area mismatch increases.

In the research sample 4.7% of the applications were submitted electronically (*e-application*). In case of e-application some of the application data is not filled in by the farmer but is retrieved from the official registers[2]. As e-applications are used by more active internet users who tend to be better informed about various requirements the authors expected that in case of e-applications (x_{22}) the probability of area mismatch was lower. However, the research results do not confirm this as the estimate is statistically insignificant.

As the selection of almost 80% of the sample farms is based on risk analysis the authors tested the effectiveness of the risk analysis. The regression coefficient of *risk analysis* (x_{23}) is statistically insignificant. Therefore, the authors cannot assert that farms that were included in the sample via risk analysis have higher probabilities of area mismatch than randomly selected farms.

The second model

The aim of the second model was to estimate the effects of various factors on the probability that the farmer has problems with the eligibility for the SAPS. The research results indicate that regional characteristics do not have significant effect on the probability of infringements of eligibility criteria. As in case of area mismatch, crop farms have significantly lower probability of violating eligibility criteria.

The results indicate that larger farms (*area >100…≤300 ha* and *area >300 ha*) have higher probability for violating the requirements. However, the larger the average field sizes, the smaller the probability of eligibility problems. The estimates of the second model also confirm that if the farm has problems with area mismatch the farm is likely to have problems with complying with SAPS eligibility criteria.

Unexpectedly it appears that in case of eligibility infringements the farms that were included into the sample via risk analysis had smaller probability of breaching the SAPS conditions. This implies that there is a room for improvements in risk analysis.

The third model

The estimations of the third model are given in Table 2. The results indicate that in Võru-Põlva (Southeast Estonia), Järva Rapla (Central Estonia), and Valga-Viljandi (South Estonia) regions the probability of infringements of cross-compliance requirements is higher than in Harju-Lääne-Hiiu region (Northwest Estonia) that was the base region.

Also, it appears that livestock farms have significantly higher probability of not fulfilling the cross compliance requirements. The research results indicate that self-employed entrepreneurs and commercial companies have lower probability of cross-compliance infringements than private persons. Also, younger farmers (*≤40 years*) have lower probability of breaching cross-compliance rules than farmers between 41 and 60 years. This may be due to their better access to information via internet.

The results indicate that in larger farms (>100 ha) the problems with cross-compliance criteria are more likely than in small farms (≤10 ha).

[2] The applications submitted on paper are pre-printed by ARIB and contain also some information retrieved from ARIBs registers

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Table 2

Coefficients of logistic regression in case of cross-compliance infringements

Cross-compliance infringements		Estimation
Variable	*intercept*	-1.778 (0.940)*
q_1	*region2 (tartu-jõgeva)*	1.195 (0.794)
q_2	*region3 (võru-põlva)*	1.484 (0.721)**
q_3	*region4 (saare-pärnu)*	-0.317 (0.730)
q_4	*region5 (järva-rapla)*	2.421 (0.860)***
q_5	*region6 (viru)*	0.958 (0.824)
q_6	*region7 (valga-viljandi)*	1.989 (0.755)***
q_7	*crops only*	-0.199 (0.717)
q_8	*crops and animals*	0.519 (0.698)
q_9	*animals only*	1.351 (0.557)**
q_{10}	*agri-environment*	0.579 (0.642)
q_{11}	*organic*	0.103 (0.539)
q_{12}	*lfa and natura*	-0.032 (0.494)
q_{13}	*self-employed*	-1.134 (0.560)**
q_{14}	*commercial company*	-1.482 (0.795)*
q_{15}	*≤40 years*	-1.020 (0.604)*
q_{16}	*>60 years*	-0.545 (0.527)
q_{17}	*area >10…≤100 ha*	0.449 (0.635)
q_{18}	*area >100 ha*	1.536 (0.737)*
q_{19}	*average field size (ha)*	-0.056 (0.072)
q_{20}	*risk analysis*	0.247 (0.554)
Pseudo R^2 0.201 Loglikelihood -90.3 Correct predictions 74.6% n 986		

*Significant at 0.1 level
**Significant at 0.05 level
***Significant at 0.01 level

Conclusions

The aim of the paper was to study the effects of various factors on the probability of area mismatch and farmer's ineligibility in case of SAPS applications, and the effects of various factors on the probability that a farmer infringed cross-compliance requirements. The research results indicate that regional characteristics may be associated to area mismatches. In one region the probability of area mismatch was larger than in the base region and in one region it was smaller than in the base region. At the same time the research results do not confirm a significant relationship between regional factors and probability of farmer's ineligibility. In case of cross compliance infringements in three regions the probability of infringements was higher than in the base region.

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The results suggest that in farms that are specialised on crop production the probability of infringements and area mismatch is lower and in livestock farms it is higher. Also, in organic farms the probability of area mismatch is higher than in conventional farms. This may be related to higher payment levels for organic production that in some cases may work as an incentive for farmer to apply for larger area than he or she is actually farming on.

Self-employed persons (family farms) and commercial farms tend to have lower probability compared with regular persons, for area mismatch, farmer's ineligibility and cross-compliance infringements. This may stem from the fact that farms that belong to those two legal business forms are more market oriented and, thus more aware of different requirements they have to fulfil.

The farmer's age should not be considered as a significant determinant of area mismatches or requirements infringement. Only in case of cross-compliance the results suggest that younger farmers (≤40 years) tend to have smaller probability of infringements.

The research results indicate that managing more fragmented fields increases the probability of violations of various requirements. At the same time in larger farms the probability of farmer's ineligibility and non-compliance with cross-compliance rules are larger than in small farms.

The authors also tested if the current risk analysis is having an effect on probabilities of area mismatch, ineligibility or infringements. In all three cases the authors cannot confirm that in those farms that were added to the sample via risk analysis the probability of area mismatch or infringements was higher than in those farms that were selected randomly.

Therefore, this study could be additional source of information for modifying the risk analysis in the coming years. However, the risk analysis would benefit even more if such study could cover longer period than just one year as the factors that affect area mismatches or infringements are likely to change over time. Naturally, the number of significant factors is larger than covered in this paper. Several socio-economic characteristics should be added to the analysis. Nevertheless, the authors attempt showed that administrative databases also contain valuable information that can shed some light on the probability of violation of several payment eligibility criteria and help improve the effectiveness of compliance monitoring and use of public funds.

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Shadow Economy and its Relation to the Tax System of Latvia

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Abstract. The shadow economy has a tendency to increase during the economic slowdown; this tendency was fully experienced in Latvia. Although the exact size of the shadow economy is difficult to ascertain, in Europe it is believed to be about EUR 1.8 trillion. The shadow economy leaves an unfavourable effect not only on the present state budget, but it also affects the state development in the future. It facilitates unequal competition, increases risk and thus raises the price of capital, leading to improper statistics and concepts on the economic processes in the state and causing the adoption of non-qualitative decisions on issues affecting the state development. Consequently, the shadow economy in the long-term may enhance social inequality and segregation. The research aim is to study the shadow economy and its relation to the tax system and budget revenues of Latvia. The paper focuses on some causes of the shadow economy and its relation to the state budget revenues and tax system of Latvia. The study concludes that combating of the shadow economy requires not only punitive measures, which increase control and administrative burden, but also complex and innovative solutions to change the attitude of the society towards engagement in the shadow economy and enhance willingness to perform legal activities. The research is mainly based on the monographic descriptive method as well as the methods of analysis and synthesis.
Key words: shadow, economy, taxes, tax system, budget.

Introduction

Researches on various aspects of the shadow economy have a more than three decades long history; though still there are disputable questions related to the causes of the shadow economy and possible policies for combating it. One of the reasons for seldom researches on the shadow economy effects (Feige E., 1994, 1997; Frey B.S., Weck-Hanneman B., 1984; Lemieux,T., Fortin, B., Fréchette P., 1994) is the lack of systematic information collected according to a single methodology. In addition, theoretical conclusions on causes of the shadow economy are not unequivocal. On the one hand, the shadow economy destroys the principles of social equality by redistributing income in favour of a particular narrow group of population; thus distorting the market competition. On the other hand, the shadow economy sector may serve as way out in the situations when the state excessively intervenes in an individual's activities. Several researchers have done studies on the shadow economy in particular countries (Bajada Ch., 1999; Bovi M., 2002; Brēķis E., 2007; Eilat Y., Zinnes C., 2002; Isachsen A. J., 1985; Isachsen A. J., Klovland J. T., Strøm S., 1983; Kaufmann D., Kaliberda A., 1996; Lackó M., 2000; Mirus R., Smith R.S., 1970; Rădulescu I. G., 2007; Smith R.S. 2002; Tanzi V., 1980). Feige E., (1989, 1997), and Schneider F. and Enste, D. (2000, 2002, 2004) have done continuous researches on different aspects of shadow and underground economies. However, there are quite few studies on the shadow economy in Latvia; hence, the research **hypothesis**: the shadow economy is difficult to measure and it leaves a negative impact on the tax system and budget revenues. The research **aim** is to study the shadow economy and its relation to the tax system and budget revenues of Latvia. The following **tasks** are advanced to achieve the set aim:

1) to discuss the concept of the shadow economy;
2) to study the measuring and causes of the shadow economy;
3) to assess the size of the shadow economy and its relation to the tax system.

The precise analysis of the size of shadow economy is almost impossible due to insufficient and sometimes controversial statistical data. The information compiled by the Ministry of Economics of Latvia, the Ministry of Finance of Latvia and the research data of local and foreign authors, different working papers, scientific publications, and other materials have been used for the purpose of the study. The research is mainly based on the monographic descriptive method, the methods of analysis and synthesis which are used to study the

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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problem elements and synthesise coherencies or formulate regularities as well as graphical methods.

Results and discussion

1. Concept of the shadow economy

Nevertheless, the research on shadow economy has more than 30 years long history, the topic is still controversial, since there are disagreements about the definition of shadow economy and literature lacks a single term to denote the mentioned phenomenon. Various concepts like *underground* economy, *unofficial* economy, *hidden* economy, *grey* economy, *black* economy, *parallel* economy, or *offshore* economy are used to denote the phenomenon "shadow economy". The notions are used depending on the context a particular researcher is willing to emphasise and in many cases without a proper explanation of the content attributed by these terms. Such terminological and conceptual disarray leads to huge cognitive losses – confusion of discussion on terms or names of the concept with discussion on the substance or the contents of the concepts.

One of the most frequently used definitions presents underground economy as the totality of economic activities that are not recorded as such and contribute to the Gross National Product (GDP) that is calculated officially (Feige, E., 1994). Roger S. Smith (1994) defines underground economy as production of goods and services, legal or illegal, which escape control in official estimates for the Gross Domestic Product (GDP). An online Economic Glossary defines underground economy as *illegal and unreported market transactions and productive activity that escape the watchful eyes of official record keepers* (Economic Glossary ..., s.y.).

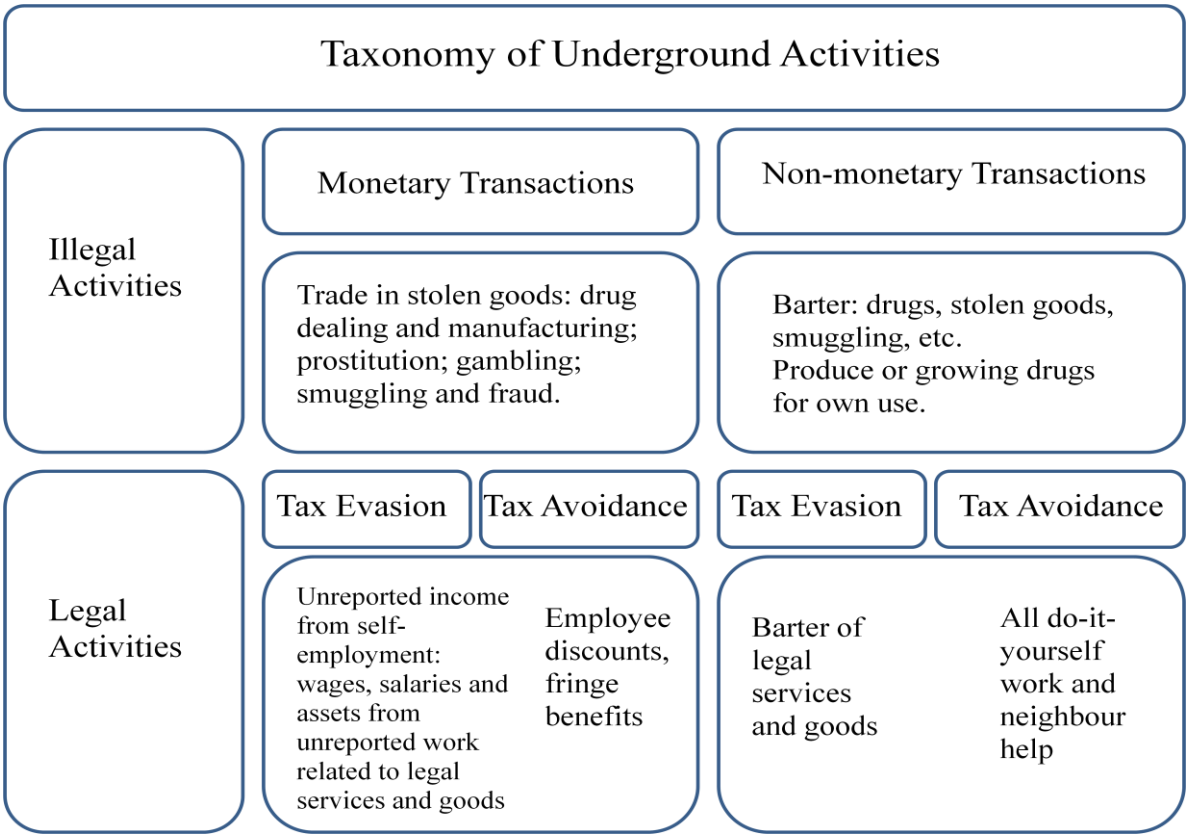
It is a well-known fact that there are many underground activities that are included in planned economy as well as in market economy, no matter if they are developed or developing. The agents, who are involved in underground activities escape, avoid or are excluded from the institutional system of rules, rights, regulations that officially govern those economic actors who are involved in production and exchange (Rădulescu, I. G., 2007). The different types of underground activities may be distinguished by means of specific institutional rules that are broken. According to this criterion, Edgar Feige identified four specific types of underground economic activities: illegal, unreported, unrecorded, and informal (Feige, E., 1997):

- *illegal economy* refers to the "totality of the revenues that are generated by those economic activities that violate the legal status of legitimate forms of trade". This category includes activities such as production and distribution of drugs, black market of currency exchange, prostitution and pornography;
- *unreported economy* refers to the "totality of economic activities that escape or avoid fiscal rules as they are defined in fiscal codes". This includes both legal sources and illegal sources of the unreported revenue;
- *unrecorded economy* refers to "those activities that avoid institutional conventions that define the necessary requirements for the report to the governmental agencies for statistics";
- *informal economy* includes the "economic activities that avoid costs and are excluded from the rights and benefits that come along with leasing, work contracts, loans and social securities". It includes that revenue which is generated by economic agents that operate informally.

Alongside with the previous classification the shadow economy may be divided into two large groups: first - by the lawfulness of activities: legal (not forbidden by the legislation; though a person is interested not to declare them) or illegal (those economic activities and transactions which are in conflict with the legal enactments); and second - whether money is used in transactions as means of exchange (Figure 1).

Illegal activities are not part of the GDP concept, although there are opinions (Mirus R., Smith R.S., 1997) that resulting income is nevertheless taxable. Some illegal income is actually reflected in GDP, since expenditures based on such income are included there. Legal activities, whether money- or barter-based, should be included in GDP but may go unreported. The latter group involves the production of goods and services but may be structured as barter to leave no record and so succeed in evading taxes. Thus, the underground economy would

include unreported rental incomes, skimming by owners of businesses, barter activities, off-the-books employment, and unreported income from home-produced goods (Mirus R., Smith R.S., 1997).



Source: Mirus R., Smith R.S., 1997

Fig. 1. **Taxonomy of underground economic activities**

Economic activities in relation to the official sector may be subdivided into the following three groups (Brēķis, E., 2007): 1) parallel economy or "white collar" economy; 2) grey economy or informal; and 3) black economy or underground (Table 1).

Table 1

Taxonomy of underground economy in relation to the official sector

	Types of underground economy		
	parallel economy	**grey economy**	**black economy**
Subjects	Employees and workers belonging to the official economic sector	Illegally employed	Professional criminals
Objects	Redistribution of income without production	Production of legal goods and services	Production of illicit and deficit goods and services
Relation to the official sector	Does not exist without the official economy	Relatively independent	Independent

Source: Brēķis, E., 2007

Parallel economy means an illicit hidden economic activity undertaken by persons employed in the official sector at their jobs resulting in a hidden redistribution of generated Gross National Product. Administrative staff employees (white collars) are engaged in these activities; hence comes the concept "white collar shadow economy". Publically parallel economy enhances the production of neither new goods nor services; thus as a result of parallel economy persons undertaking the mentioned activities increase their wealth level on the account of losses incurred by other people.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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Grey economy means those economic activities that relate to trade with officially unregistered legal goods or services. Unlike parallel economy which is closely tied with the official economy and lives it off; grey economy functions more independently. Independent producers of this sector deliberately evade official accounting to reduce expenditure, or even such economic activity does not require accounting.

Black economy (organised criminal economy) means unlawful economic activities connected with production and sales of illicit and deficit goods. Black economy compared with grey economy is more independent. This economic activity may be related not only to a violent redistribution of wealth (thefts, robberies, blackmailing), but also to production of goods and services destroying the society (production and sales of drugs, racketing, prostitution).

Grey and black economies benefit only a narrow group of individuals, simultaneously causing losses to other individuals. However, grey economy might benefit the society in general acting as alternative, for example, in an economic system with high level of bureaucracy and different restrictions. From the point of view of the society and state administration factors, promoting transfer of individuals from the grey economy to the official economy, may rouse a particular interest. Sectors of parallel and black economy shall not be integrated, but exterminated, hence the mentioned sectors are usually analysed separated from the grey sector (Brēķis, E., 2007).

2. Measuring and causes of the shadow economy

Estimates of the size of the shadow economy vary widely, partly because underground economic activity is, by its nature, difficult to observe, and partly because of divergent points on the definition of the shadow economy. Since measuring the shadow economy is a complex science, the following table provides a brief overview of the methods used to measure the size of shadow economy (Table 2).

Table 2

Measuring of the shadow economy: different methods

No.	Method	Main Features
1.	**DIRECT APPROACHES**	
	Sample survey	Estimates size of shadow economy from survey data.
	Tax audit	Estimates size of shadow economy from audit measurements of undeclared taxable income.
2.	**INDIRECT APPROACHES**	
	National accoun ting statistics	Estimates size of shadow economy on basis of the discrepancy between income and expenditure statistics in national accounting or in individual data.
	Labour force statistics	Estimates growth in shadow economy on basis of decline in labour participation in the official economy, assuming the labour force has a constant participation rate overall.
	Transactions	Uses data on the overall volume of monetary transactions in the economy to calculate total nominal (unofficial plus official) GDP, then estimates size of shadow economy by subtracting official GDP from total nominal GDP.
	Currency demand	Estimates size of shadow economy from the demand for cash, assuming shadow transactions are undertaken in cash and that an increase in the shadow economy will raise demand for cash.
	Physical inputs (electricity consumption)	Estimates growth of shadow economy from electricity consumption, assuming that electricity consumption is the single best physical indicator of overall economic activity. Subtracts the growth rate of official GDP from the growth rate of total electricity consumption and attributes the difference to the growth of the shadow economy.
3.	**MODELS**	
	Latent variable approach	Estimates the size of the shadow economy as a function of observed variables that are assumed to influence the shadow economy, for example, the burden of taxation, the burden of government regulation, and of variables where shadow economic activities leave traces, like cash, official working time, unemployment, etc. Advantageous method because it considers multiple causes and effects simultaneously.

Source: Schneider F., Enste D., 2000

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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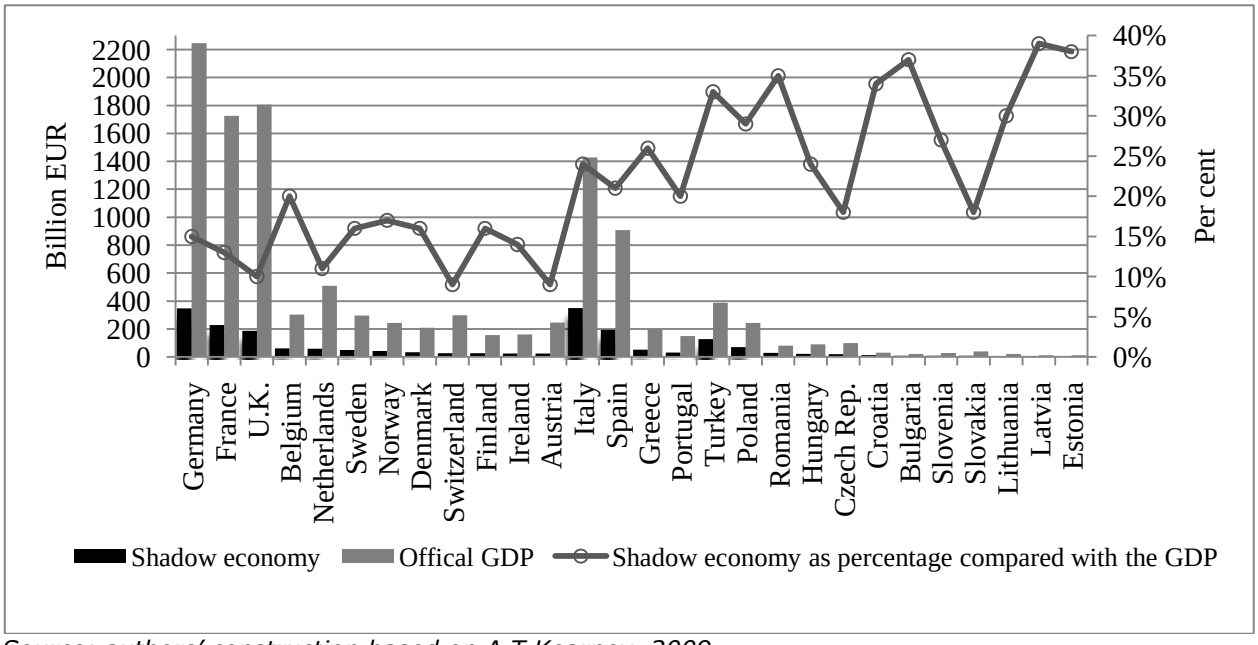
There is no "best" estimation method; each approach has strengths and weaknesses, and yields its own insights and results. The comparisons emphasise that for a particular country in a certain period, different methods may give very different impressions of size and growth. They imply that decision makers should be careful if using estimates based only on a single method. They also stress the need for caution in making cross-country comparisons or comparisons over time within a country, where the estimates are derived using different methods (Schneider F., Enste D., 2002). Usually two basic methods are applied: direct and indirect ones. Direct method involves publicly available information about the shadow economy, such as information from anonymous surveys; while indirect method covers macroeconomic indicators of the real economy that are used to discern the shadow's economy impact.

Economic theory suggests that taxation, excessive regulations, efficiency of the bureaucracy and corruption are the main causes of the underground economy (Schneider F., Enste D., 2000). The bigger is the tax wedge (the difference between the total cost of labour and after tax earnings from work) the greater should be the black economy. Alike, regulations are costly to be satisfied and can stimulate the "exit option" (i.e. the decision to go underground). The efficiency of the public sector is linked to the shadow economy because a more efficient bureaucracy increases the expected value of the penalty for the underground agents and this lowers, other things being equal, the level of shadow economy. Further, it is likely that this inefficiency is positively related to the corruption, another potential determinant of the hidden economy, although its relation with the underground economy is ambiguous. Transparency International, an international agency collecting data on worldwide corruption, defines the corruption level as the degree to which economic agents perceive to be the homes of bribe-takers - public officials who abuse their office for personal gain. The link with the black economy is ambiguous because bribery sometimes is a substitute for going underground, sometimes bribe serve to avoid control (Schneider F., Enste D., 2000).

3. Size of the shadow economy and its relation to the tax system in Latvia

Although the exact size of the shadow economy is difficult to ascertain, in Europe it is believed to be about EUR 1.8 trillion (Schneider F., 2007). Since the global economy suffers through a recession, more people may be inclined to work outside the legal framework. In 2009 Professor Friedrich Schneider together with a global strategic management consulting company *A. T. Kearney* published a research "The Shadow Economy in Europe".



Source: authors' construction based on A.T.Kearney, 2009

Fig.2. **The shadow economy in relation to the total GDP in Europe, 2005**

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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According to A. T. Kearney research, Germany, Italy and France account for about half of Europe's shadow economy. In the Eastern Europe, with less developed countries, the shadow economy is much larger in comparison with the official economy than it is in the Western Europe (Figure 2).

Based on A. T. Kearney research data the shadow economy in Latvia is the highest in Europe reaching 39% of the GDP, thus causing LVL 3.6 billion large losses to the state. The revealed figure may be juxtaposed to the state budget revenues for 2010 equalling to 32.6% of the GDP. Even if the figure is exaggerated, it shows serious drawbacks in the national economy of Latvia. The breakdown of the state budget by sectors shows that the size of shadow economy equals 2.5 social budgets, 8 health or 18 education and science budgets (Zemāki nodokļi..., s.y.). The lowest shadow economy is observed in Switzerland and Austria (each 9%), the UK (10%) and the Netherlands (11%). In general, the highest shadow economy is seen in the Eastern Europe countries, like, Croatia (34%), Romania (35%), and Bulgaria (37%).

However a working paper from the World Bank (2010) "Shadow Economies All over the World" covering the period between 1999 and 2007 emphasises that the average size of the shadow economy throughout the analysed 162 countries in the study is 34.5% of the official GDP, or a little over a third the size of what they produce overall. Yet, the shadow economy's average rate of growth over the period has been rather modest: it grew from 33.7% of GDP in 1999 to 35.5% of GDP in 2007. The research has tried to assess the size of the shadow economy by different econometric methods and consequently rated Latvia as 109 with the share of shadow economy amounting to 41.6% of the official GDP indicator. The World Bank analysts have evaluated the shadow economy in Estonia and Lithuania as 40.3% and 31.9% of the GDP respectively. The rest EU countries have received lower assessments (Shadow Economies..., 2010).

The lowest level of the shadow economy according to the World Bank research is attributable to Switzerland (8.6%), the USA (8.8%), and Austria (9.8%). Small share of the shadow economy goes to Luxembourg, Japan, the UK, the Netherlands, and China. The research concludes that the level of the shadow economy in the world has slightly increased from 32.9% to 35.5% of the GDP between 1999 and 2007. At the same time, the shadow economy in Latvia has grown from 39.6% to 44.3% of the GDP. The World Bank experts identify four main driving forces of the shadow economy: 1) overall tax, both direct and indirect, and social security contribution burdens; 2) intensity of regulations; 3) public sector services; and 4) the state of the "official" economy. Thus the indicators like total tax burden, share of direct taxes, size of the public sector, efficiency of public sector management, unemployment rate, GDP per capita, and GDP growth rate were used to assess the share and size of the shadow economy. However, local economic experts assess the size of the shadow economy of Latvia ranging between 20-30% of the GDP; while the data provided by the Central Statistical Bureau (CSB) show that the size of the shadow economy has fluctuated between 11% and 16% within the recent five years in Latvia. According to the CSB, the highest share of the shadow economy governs in commercial service sector (24.1% of GDP in 2008) and construction (22.4%), followed by manufacturing industry (13.7%) and transport sector (11.8%). It means that different methods have been used in different studies; hence leading to diverse results.

An Austrian professor Friedrich Schneider has studied the shadow economy in different countries up to 2010. The following Figure 3 presents the size and development of 31 European shadow economies over the period of 2003-2010.

Latvia here ranks in the 7th position with the shadow economy of 27.3% of GDP. In the Eastern countries or the new European Union members, like Bulgaria, Cyprus, the Czech Republic, Latvia, Lithuania, and Poland have a higher shadow economies than the "old" European Union countries, like Austria, Belgium, Germany, and Italy; hence there is an increase of the size of the shadow economy from West to East. On average the Southern European countries have considerably higher shadow economies than the one in the Central and Western Europe (Schneider Fr., 2010).

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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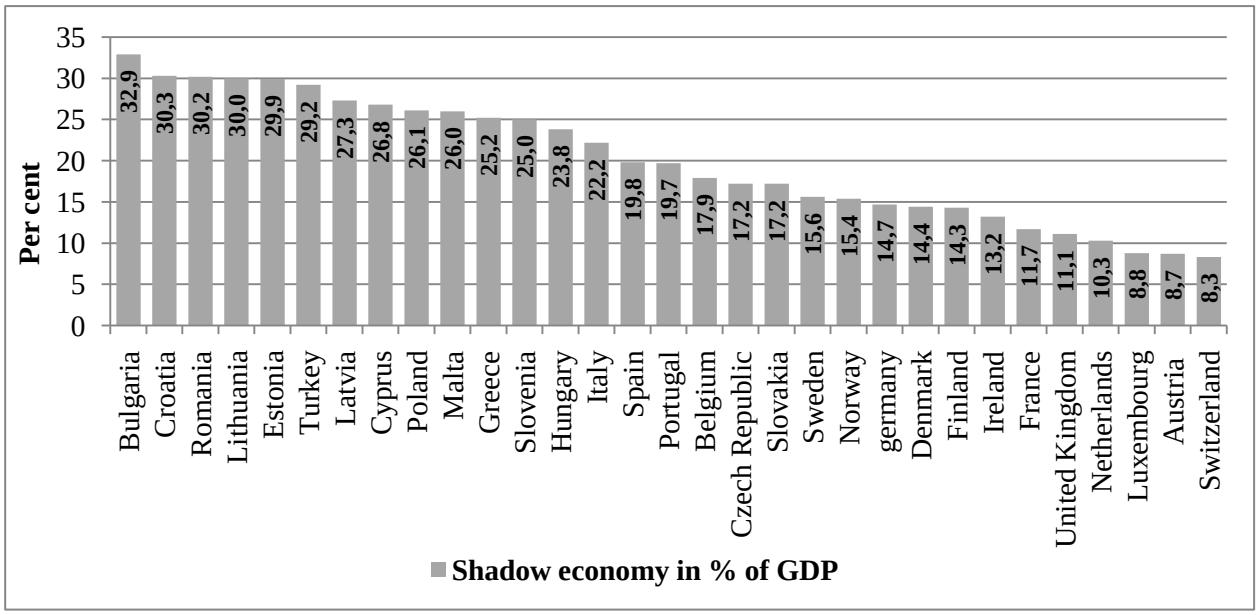

Source: authors' construction based on Fr. Schneider, 2010

Fig.3. **Size of the shadow economy in European countries in 2010, % of GDP**

One of the research tasks was to discuss relation of the shadow economy to the tax system; therefore, the authors emphasise relation between the shadow economy and tax payments. When there were no taxes or taxes were largely poll taxes, or taxes related to "presumptive" and highly visible activities, there were no shadow economic activities caused by the existence of taxes. However, as modern states developed and taxes became heavier and no longer "presumptive", taxpayers started to attempt to avoid them by pushing some of their activities "underground" or "in the shadow". The more successful they were in their attempts, the less tax they paid. Thus, a kind of "cold war" developed between the taxpayers that attempted to avoid paying the taxes, and the tax administrators that had to work harder to make the taxpayers comply with their tax obligations. As tax levels and tax rates increased, the efforts of taxpayers to avoid paying taxes intensified. The taxes that have been often assumed to be more connected with the shadow economy are the following: income taxes, value added taxes, excises, social security taxes, foreign trade taxes, and taxes on capital transfers. For these taxes, operating in the shadow created the possibility of evading paying them. Both the rates at which taxes are levied and the capacity of the tax administration to uncover these activities are important. The higher are the rates, the more likely it will be that the taxpayers attempt to evade the taxes by engaging in non-official and unreported transactions. The beneficiaries of these attempts may be either those providing goods and services (the sellers) or those buying them; while often both benefit.

The shadow economy has a tendency to increase during the economic slowdown; this tendency was fully experienced in Latvia. Between 2005 and 2008 the share of collected taxes of the GDP has annually been 30% on average; while within 2009 the share has decreased from 29.9% (Quarter 1) to 25.3% (Quarter 4). Different opinion polls of 2010 show that almost 50% of Latvia's population excuse not paying taxes. Various opinions govern regarding the amounts population is ready to pay as taxes: 12.2% of respondents are not willing to pay taxes at all, 40.1% would be ready to pay not more than 10% of their income, and 37.7% would be ready to pay 10%-20% of their income. It means that the majority of population is ready to pay not more than 1/5 of their income (Zemāki nodokļi..., s.y.).

However, the shadow economy leaves an unfavourable effect not only on the present state budget, but it also affects the state development in the future. The shadow economy facilitates unequal competition, increases risk and thus raises the price of capital, leading to improper statistics and concepts on the economic processes in the state and causing the adoption of

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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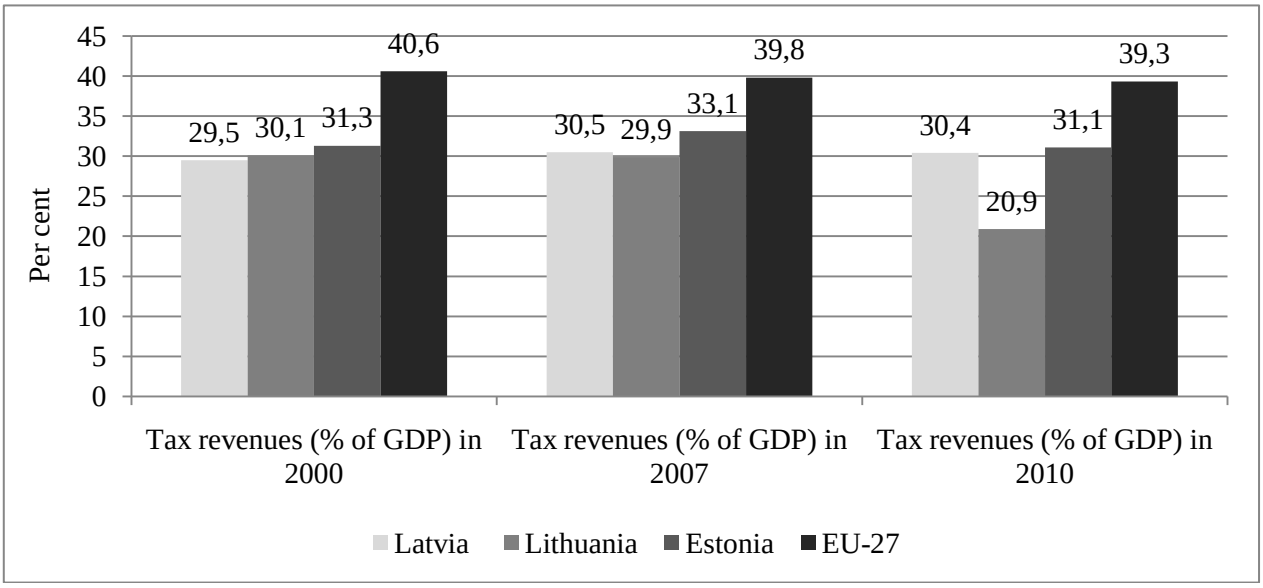
non-qualitative decisions on issues affecting the state development. Consequently, the shadow economy in the long-term may enhance social inequality and segregation. The reasons for paying taxes are the following: 36.3% of Latvia's population pay taxes to receive pension benefits, 24.0% - to receive different social allowances, while 18.2% of respondents pay taxes since it is stated by the legislation and 7.2% of respondents pay taxes as they are afraid of penalty sanctions. The result analysis leads to the conclusion that the population has a quite unclear view on the use of paid taxes. Figure 4 reflects the size of tax revenues in the Baltic States and the EU-27 countries.



Source: authors' construction based on Eurostat, 2010

Fig. 4. **Tax revenues in the Baltic States and the EU-27, 2000-2010**

Latvia has one of the lowest tax burden indicators (30.5%) among the European Union Member States, which is the 4th lowest indicator in the EU and is by 9.3 percentage points lower that the EU average indicator. Not only low tax rates compared with the other EU countries, but also high rates of tax non-payments explain the sharp discrepancies and essential differences in the principles related to tax collection. In 2007 tax revenues in percent of the GDP do not much differ from the figures of 2000 for the Baltic States, yet Estonia has shown slightly better results in tax collection (Figure 4). In Latvia general tax structure and individual types of taxes differ significantly from the EU countries. Tax burden in the old EU Member States is usually higher compared with the new members; besides the share of direct taxes in the new members is relevantly lower than in the old members, where the total tax structure covering direct and indirect taxes, and social payments is comparatively similar. In Latvia similar to other Central Europe and Eastern Europe countries the share of taxes for consumption in revenues is higher compared with the old EU Member States; while the share of revenues from capital, especially from households, is very low.

In 2010 the largest decline in tax revenues was observed in Lithuania, i.e., by 9 percentage points compared with the figure of 2007. The EU-27 countries experienced a slight decline equalling to 0.5 percentage points. In 2007-2009 the low corporate income tax rate (15% versus 23.5% on average in the old EU Member States), non-taxation of dividends, capital and increase of capital, small share of property tax etc. explain the difference. The share of labour taxes in tax revenues of Latvia is similar with other EU Member States; though the indicator showing tax differences or the so-called *tax gap* characterising the difference between labour costs incurred by an employer and salary/wage received by an employee is above the average in Latvia (41.2% vs. 37.1% in the EU-25). Calculations show extremely high *tax gap* for low and average income, which is one of the reasons for the increase of inequality. Simultaneously the *effective rate* of labour force is below the average level of both the EU new and old Member States (31% vs. approximately 36.5%), which together with low untaxed minimum indicates the problem of tax administration, for example, pay-packets (Zemāki nodokļi...,

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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s.y.). For several years the common EU tax policy tendency is directed towards the reduction of labour force taxes, mainly reduction of personal income tax rates as well as proportionate increase of taxes for consumption, thus levelling the reduction of personal income tax. However, the reduction of, for instance, corporate income tax does not reduce the total share of capital taxes in tax revenues, since the base for taxation capital has been increased in Latvia.

One of the planned measures in the shadow economy prevention in Latvia is the concept of a single fine measure and delay payment deletion for those entrepreneurs, who return the principal tax debt sum until the fixed time-limit. Considering that the aim of the task is to ease the tax burden on entrepreneurs. At the moment, the Ministry of Finance continues the work in cooperation with partners on a detailed task scheme draft, to define the criteria as well as, study the legal nuances in order to offer the opportunity for wider target groups to organise their tax debt obligations. The plan also provides for a review of the existing corporate income tax and individual income tax privileges with the aim of creating a transparent and easily administered tax system, because every tax relief not only reduces government's budget revenues, but also increases the expenditure at the expense of administration costs (Latvia Minister for Finance …, 2011).

Conclusions

1. Shadow economy is a complex phenomenon, which is present to an important extent in developing, transition and developed countries. People are engaged in the shadow economy for various reasons. The analysis of causes of the shadow economy shows that an increasing burden of taxation and social security payments are the major driving forces for its growth.
2. The underground activity always results from a combination of opportunities and incentives. While the goodness of the institutional background seems to be the first incentive for not going underground, higher tax rates rise the advantages of being irregular, but can help to improve the efficiency of the bureaucracy and rises the costs of being underground.
3. Combating of the shadow economy requires not only punitive measures, which increase control and administrative burden, but also complex and innovative solutions to change the attitude of the society towards engagement in the shadow economy and enhance willingness to perform legal activities.
4. Information and education of the society on the use of taxed revenues and all the benefits an individual may gain from paying taxes as well as involvement of the society in the development of recommendations for combating shadow economy thus having all the information transparent would raise the awareness of the society and willingness to pay taxes.

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Problematic Aspects and Solutions of Corporate Income Tax in Latvia

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Abstract. Sharply increasing Gross Domestic Product as well as the Gross Domestic Product per capita by implementing a prudent and rational financial and economic policy related to the elaboration and implementation of principles of just tax policy in the interest of the entire population and to the reduction of corruption and "gray economy" in the country are the most important tasks set for the government of Latvia.
The proportion of revenues of corporate income tax in the consolidated national budget in Latvia ranges from 4.2% to 8.8%, i.e. quite significantly, over the previous years. The corporate income tax has two major goals: contribution to the government budget and promotion of business activity. The tax has to be effective and just. According to the law of the Republic of Latvia "On Corporate Income Tax", the tax rate is proportional and initially it was 25% of adjusted taxable income. However, since 2004 the rate was changed and set at 15% of adjusted taxable income, which is a quite low rate compared with the average rate in the EU Member States in 2010 (23.2%) and it can be viewed positively (Taxation trends ..., 2010).
Irrespective of the relatively low CIT rate, this tax not always serves to the interests of Latvia's small and medium enterprises, as this flat rate is applied to all enterprises (including large ones with the number of employees of more than 250), disregarding the size of profit, and the ability of all enterprises to pay the tax.
The paper researches, analyses, and reveals the positive and problematic aspects of CIT, and a comparative analysis of CIT rates in 27 EU Member States was done as well. The authors contribute to a vision of improving the CIT, which has to promote the development of Latvia's national economy.
Key words: taxes, corporate income tax, Latvia.

Introduction

The source of taxes has always been the Gross National Product – revenues that belong to the country's residents and enterprises. The base of this tax is directly related to the profitability of economic activity of enterprises, including the income gained from foreign investments, and excluding the interest and dividends earned by foreign investors in Latvia. The Central Statistical Bureau usually indicates it as gross domestic product. According to the output approach, a GDP constitutes the total value added of all types of economic activity as well as the sums of product taxes – value added, customs, and excise taxes. The total value added is computed by subtracting the value of intermediate consumption, i.e. the value of resources (goods and services) used in production, from the total output value of goods and services. In 2009, the GDP per capita in Latvia, in purchasing power standards, was one of the lowest in Europe; it was lower than in its neighbouring countries – Lithuania, Estonia, and Poland. Compared with Latvia, this indicator was still lower in Macedonia, Bulgaria, and Romania. Therefore, sharply increasing GDP as well as the GDP per capita by implementing a prudent and rational financial and economic policy related to the elaboration and implementation of principles of just tax policy in the interest of the entire population and to the reduction of corruption and "gray economy" in the country are the most important tasks set for the government of Latvia.

Taxes affect practically any resident; their change significantly affects the performance of enterprises and the development of the country's economy.

Before the beginning of the tax reform in 1995, the rate of corporate income tax (CIT) and the basic rate of personal income tax (PIT) were 25%, although the income of individuals that exceeded a certain amount was applied a different tax rate for a few years. Yet, since

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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1997, a flat rate of 25% was applied to incomes of individuals, and a flat rate was set for both income taxes. The mentioned flat rate provided neutrality relative to the type of income generated according to the economic nature of it.

According to the reform of CIT rate that was started in 2002, the CIT rate was gradually reduced to 15% in 2004. However, the PIT rate remained unchanged and 25% were charged on earned income until 31 December 2008. Since 1 January 2009, the PIT rate was set at 23%, but the tax rate charged on incomes from the economic activity was 15%, and it was applied since the taxation year of 2008. In 2010, the PIT rate was set at 26%, but on 1 January 2011, it was again reduced to 25%. In this way, a significant difference in the rates of income taxes emerged in the Latvian tax system during the recent years, which does not establish equal conditions for PIT and CIT payers. An analysis of tax revenues in 2009 showed a sharp decrease in PIT revenues and a smaller decrease in CIT revenues. No compromise between the rates of CIT and the classification of enterprises into micro, small, and large ones, which could promote the development of enterprises, was found until the end of 2010. Presently, the tax policy is perfected in the country, in which a significant role belongs to the CIT.

The aim of the paper is to research and analyse the essence and role of corporate income tax in Latvia's national economy, the mechanism of tax calculations, and to produce recommendations for perfecting the application of CIT, taking into account the experience of the EU Member States.

The following research tasks are set forth to achieve the aim:

1) to expose the essence and role of corporate income tax in Latvia's national budget revenues;
2) to make a comparative analysis of CIT rates, and to analyse and identify perfection possibilities for the CIT rate according to the just principles of taxation.

The research is based on the law of the Republic of Latvia "On Corporate Income Tax", other Latvian laws, and Eurostat data. The mechanism of tax performance was analysed in 27 EU Member States. Statistical analysis, induction and deduction, monographic, logical, and constructive methods were used in the present research. Data of the Central Statistical Bureau, the State Revenue Service of Latvia, and Eurostat were used for the research purpose.

Results and discussion

Essence and role of corporate income tax in revenues of Latvia's government budget

The Parliament of the Republic of Latvia passed the law "On Corporate Income Tax" on 9 February 1995, the President announced the law on 1 March 1995; and the law came into force on 1 April 1995. CIT has remained since the Soviet times when it was called a profit tax. The transition to CIT in 1995 was related to avoiding differentiated and higher tax rates, and setting a flat rate for residents irrespective of the type of business and the form of property ownership. The rates of profit tax were differentiated as follows: 65%, 45%, 35%, and 25%. The maximum or the so-called special rate of 65% was applied to organisers of gambling. The other rates of profit tax were applied as follows: 45% - to the banking industry, insurance, and commerce, 35% - to state enterprises, and 25% - to other enterprises (Zvejnieks A., 2006).

CIT belongs to the group of direct taxes along with PIT and real estate tax. The main drawback of the present tax system in Latvia is that all the three taxes had proportional tax rates until the end of 2010; the rates were equal within the same tax. It led to fast and extensive stratification by wealth among Latvia's residents and to an increase in social tension. Due to this reason, many EU Member States have rejected proportional tax rates and introduced progressive tax rates, thus putting the tax burden on those who can bear it (Ī. Vītola, A. Boruks, 2006).

In Latvia, the CIT has proportional rates: until 2002, the rate was as high as that of PIT or 25%, the basic rate of CIT was 22% in 2002, 19% in 2003, but since 2004 this rate was reduced to 15%. These rates are applied to Latvia's residents, permanent agencies of non-residents, and offshore companies (tax-free and low-tax zones).

The CIT does not have to be paid by natural entities and individual (family) enterprises (including farms and fishing farms) that are exempt from submitting annual reports in accordance with the "Annual Accounts Law" (passed on 19 October 2006) (Par uzņēmumu...,1995). These individuals and legal entities paid the PIT on incomes of enterprise

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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at a rate of 26% in 2010 and they pay a 25% rate in 2011. If using single-entry bookkeeping, the taxable income gained from economic activity is determined in accordance with the provisions of Section 11 of the law "On Personal Income Tax". However, if any of the mentioned taxpayers (whose annual income exceeded LVL 45000 until 31 December 2006 and LVL 200000 as of 1 January 2007) use double-entry accounting, the taxable income is determined in accordance with the Chapter 2 of the law "On Corporate Income Tax" (Par uzņēmumu..., 1995).

The tax reform in 1995 in Latvia was implemented to achieve two major goals – to ensure stable budget revenues for financing priority social and economic activities, limiting financial deficits; and to contribute to the economic growth in the country by promoting fair competition and abolishing both unnecessary privileges or preferences and too high tax rates for several economic sectors (Salmiņš J., 2005). To boost the economic development, consumption instead of income was taxed more as result of the reform, thus stimulating an increase in savings and investments in the country. Under the law "On Taxes and Fees", the CIT and the personal income tax (PIT) compose a single income tax system (Par nodokļiem.., 1995). It means that any person who gains income in this country is whether a CIT or PIT payer. The 2010 law "On Micro-enterprise Tax" supplemented this system with a tax for micro-enterprises that is paid on their income gained. For this reason, individual enterprises and farms may choose a tax to pay when performing their economic activity – the PIT (26% of taxable income), the CIT (15% of taxable income), or the micro-enterprise tax (9% of taxable income). A part of CIT payers applied for paying the micro-enterprise tax, complying with the requirements of application of the micro-enterprise tax.

The new micro-enterprise tax was introduced on 1 September 2010 to simplify the procedure of paying taxes, and to reduce the tax burden on enterprises (micro-enterprises with less than 5 employees and an annual turnover of less than LVL 70 000) and self-employed individuals. It is planned that the new tax will promote business activity in the country and will reduce the high rate of unemployment. The micro-enterprise tax comprises several taxes: state mandatory social insurance contributions (SMSIC), PIT, CIT, and it also includes the business risk fee. In essence, the concept of micro-enterprise tax is oriented towards introducing the progressiveness of taxes, which can be viewed positively. However, according to the authors, the micro-enterprise tax has several negative aspects:

1) it could be a short-term tax, as the transitional provisions of the law of the republic of Latvia "On Micro-enterprise Tax" state that the Cabinet has to assess its usefulness until 1 October 2011 and to make a report on it to the Parliament. Therefore, the payers of micro-enterprise tax are not able to plan their performance in long-term, which, of course, does not promote business development;
2) payers of micro-enterprise tax have limited economic development possibilities and they face the lack of motivation of employees (their annual turnover may not exceed LVL 70 000, not more than 5 employees may be hired, and wages of employees may not exceed LVL 500; in case these limitations are violated, higher tax rates have to paid or even the status of micro-enterprise might be lost);
3) employees of payers of micro-enterprise tax might have smaller social guarantees (amount of pensions and state benefits) if compared with employees of other enterprises, as a SMSIC of 65% in proportion to the number of employees might turn out much smaller compared with the case when SMSIC are paid from earned income. For instance, a micro-enterprise having a monthly turnover of LVL 10 000 and paying LVL 400 to its employees, pays SMSIC of LVL 117 for every employee; whereas an enterprise, which is not a payer of micro-enterprise tax and has insured its employees for all types of social insurance, makes a contribution of LVL 140.36, i.e. 20% more.
4) if a payer of CIT becomes a payer of micro-enterprise tax, such an enterprise loses the right to transfer its loss from economic activity to the next years of taxation (Mikrouzņēmumu..., 2010).

In the future, too, if a payer of micro-enterprise tax changes its status to that of CIT payer, the losses accumulated over the previous years cannot be transferred and are lost forever.

The micro-enterprise tax cannot be suitable for all enterprises, as it cannot be directly compared with the CIT and PIT. This tax may be more appropriate for enterprises having lower

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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production costs (for instance, providers of services) and less appropriate for, for instance, enterprises producing goods.

The experience of the EU Member States shows that in many countries (Lithuania, Sweden, Luxembourg, Malta, Italy, Romania, Belgium, Hungary et al.) support for small and medium enterprises is included in the provisions of their CIT law.

After taking into consideration the above-mentioned, one can conclude that, the present law "On Micro-enterprise Tax" in Latvia is only a temporary solution, which is not oriented towards the long-term development of enterprises. A solution could be the elaboration of a support mechanism for small and medium enterprises and its inclusion in the law of the Republic of Latvia "On Corporate Income Tax".

Table 1 provides the analysis of the changes in the planned revenues from the CIT in the period of 2002-2009.

Table 1

Planned and collected revenues from the CIT in Latvia in the period of 2002-2009, thou. LVL

Taxation year	Planned	Collected	Plan performed, %
2002	97633.1	109713.0	112.4
2003	93200.0	93938.6	100.8
2004	126645.0	127847.6	100.9
2005	170250.0	180668.3	106.1
2006	246550.0	253810.1	102.9
2007	405321.0	399751.4	98.6
2008	529000.0	503116.8	95.1
2009	210000.0	197176.6	93.9

Source: *Nodokļu ieņēmumi..., 2010*

As it is shown in Table 1, the planned revenues from the CIT in the years 2002-2009 are not collected, which can be explained by the affect of the economic crisis. It points at a need to reconsider both the tax collection control mechanisms and the provisions for applying the CIT.

In 2009, the CIT revenues collected from the large tax payers accounted for LVL 78 million or 39.6% of total CIT revenues; while other CIT payers contributed LVL 119.2 million. The CIT revenues collected from the large tax payers have decreased by LVL 143.8 million or 64.8% compared with 2008 (Gūte G., 2010). This indicates that Latvia's largest CIT payers are its small and medium enterprises.

According to the SRS information, the largest CIT payments in 2009 were made by the enterprises, which operate in the following industries of the national economy: 1) financial services - LVL 44.2 million, which is LVL 66.4 million or 60% less than in 2008; 2) construction - LVL 40.1 million (LVL 31.6 million or 44% less than in 2008); and 3) wholesale except automobiles and motorbikes - LVL 38.4 million (LVL 26 million or 40.4% less than in 2008) (Gūte G., 2010).

According to the data of the Statistical Yearbook of Latvia (2005, 2006, 2007, 2008, and 2009), the total tax revenues in the national consolidated budget were LVL 2545.7 million, accounting for 80% of total budget revenues, while the revenues collected from non-taxes and other sources accounted for 20%. Of the tax revenues over the analysed five years (2005-2009), three direct taxes – the PIT, the CIT, and the real estate tax (RET) – provided a significant share in the tax revenues: 23.4% in 2005, 27.9% in 2008, and 21.1% in 2009. The revenues of direct taxes have increased in absolute figures over the analysed period (2005-2009) compared with the base year of 2005, but their share in the total tax revenues decreased in 2009 (21.1%) (Table 2).

In Latvia, just like in many EU Member States (Austria, Belgium, Germany, France, Italy et al.), there is a large share of indirect tax revenues and a significant amount of social contributions. Therefore, according to the criterion of tax revenue structure, Latvia belongs to the European continental system (K.Ketners, 2009). Yet, Latvia's CIT rate of 15% is different from the high CIT rates in France, Belgium, Germany, and Austria.

Beginning with the years 1994-1995, Latvia gradually introduced a tax system accepted in the Western Europe, and the share of CIT revenues stabilised at 5-6% of total revenues in

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the national consolidated budget (Table 2). However, the share of CIT revenues (8.8%) in the total revenues in 2008 shows that the CIT significantly contributes to the national budget on certain conditions.

Table 2

Percentage distribution of revenues in the national consolidated budget in Latvia in 2005-2009

Tax and non-tax revenues	2005	2006	2007	2008	2009
Revenues in national consolidated budget	**100**	**100**	**100**	**100**	**100**
Tax revenues	*79.6*	*79.9*	*81.6*	*82.7*	*77.7*
incl. PIT	15.9	15.8	16.6	17.9	15.4
CIT	**5.6**	**6.1**	**7.5**	**8.8**	**4.2**
RET	1.9	1.6	1.4	1.2	1.5
PIT, CIT, RET in total	23.5	23.5	25.5	27.9	21.1
Value added tax	23.5	22.4	22.5	19.5	16.9
State social insurance contributions	30.4	24.0	25.7	24.5	28.1
Excise tax	0.6	8.8	8.4	9.4	10.6
Customs tax	0.3	0.5	0.5	0.5	0.3
Natural resource tax	0.7	0.3	0.2	0.2	0.2
Other tax revenues	0.6	0.5	0.9	0.7	0.5
Non-tax revenues, other national level payments and donations	*20.4*	*20.1*	*18.4*	*17.3*	*22.3*

Source: *Statistikas gadagrāmatas 2005-2009*

Application of CIT in Latvia and other EU Member States

So far, the CIT has not always served to the interest of Latvia's population, as a flat tax rate is applied to the taxable income of all enterprises irrespective of the amount of their profit and their ability to pay it. By means of CIT, it was not allowed to protect the domestic market, especially micro enterprises (in Latvia - enterprises with less than 5 employees and an annual turnover of less than LVL 70000), and to perform a social function by ensuring the wellbeing of a wide stratum of population as well as even regional development. For this reason, progressive CIT rates are introduced in several EU Member States and elsewhere in the world; this tax is paid by those enterprises that are able to do it. Besides, a higher tax rate is applied to medium and large enterprises, which are usually also economically stronger. For instance, CIT rates range within 24.98%-33.99% in Belgium, 6.75%-21.84% in Luxembourg, and 12.5%-25% in Portugal (Table 3).

The corporate income tax in the EU Member States in 2010 had different rates (Table 3). Table 3 shows that the rates of CIT tend to decrease if compared with the year 1995 (rates have decreased by 8.7 percentage points on average during the period of 2000-2010).

In 2010, progressive tax rates were set, according to Eurostat, in Belgium, France, Ireland (only until 2010), Great Britain, Luxembourg, the Netherlands, Portugal, Spain, Lithuania (since 2009), and Hungary. In many states, the progressiveness of this tax is based on the support introduced during the recent years for small and medium enterprises (in Belgium, France, Great Britain, Luxembourg, Lithuania et al.). Romania has set fixed CIT payments for small, enterprises (from EUR 550). In some states (Italy, France), different tax rates are set depending on the region where an enterprise operates (Taxation trends..., 2010). In Germany, the tax rates are differentiated taking into consideration the provisions of sales tax that are applicable together with CIT. In general, a trend of differentiating the tax rates is observed in the EU Member States over the recent years, thus introducing progressive tax rates.

The essence of progressive tax rates is that the tax burden among taxpayers is distributed according to the size of tax base: the larger is the tax base, the higher is the rate.

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Table 3

Standard CIT rates in 2010 and their changes in 27 EU Member States, % and %-points

EU Member States	CIT rates, %	Changes in CIT rates in 2010 compared with 2000, %-points
Austria	25	-9.0
Belgium	24.98-33.99	-6.2
Denmark	25	-7.0
France	15- 34.43	-3.4
Greece	25	-16.0
Ireland	10-12.5	-11.5
Italy	11-27.5	-9.9
Great Britain	21-28	-2.0
Luxembourg	6.75-21.84	-8.9
Netherlands	20-25.5	-9.5
Portugal	12.5-25	-8.7
Finland	26	-3.0
Spain	20-30	-5.0
Germany	15.83-30	-21.8
Sweden	26.3	-1.7
Czech republic	19	-12
Estonia	21	-5.0
Cyprus	10	-19.0
Latvia	15	-10.0
Lithuania	5-15	-9.0
Malta	35	0.0
Poland	19	-11.0
Slovakia	19	-10.0
Slovenia	20	-5.0
Hungary	10-30	1.0
Bulgaria	10	-22.5
Romania	16	-9.0
On average	x	**-8.7**

Source: *data summarised by the authors based on Taxation Trends ..., 2010*

Progressive tax rates correspond to A.Smith's principle of paying capacity that is based on the convention of equal contribution. This theory supports a view that progressive tax rates ensure the protection of interests of taxpayers. In the EU Member States, where progressive tax rates are applied, this idea is mostly based on the motives of protection and justice for poor strata.

Based on the above-mentioned considerations, the authors suggest introducing progressive CIT rates in Latvia within a range from 5% to 25% (in accordance with the Commission Regulation (EC) No. 70/2001 and its amendments), depending on the amount of income of enterprise (for instance, a tax rate for enterprises with 250 and more employees could be higher); the present law "On Micro-enterprise Tax" has to be abolished, and support for small and medium enterprises has to be integrated in the law of the Republic of Latvia "On Corporate Income Tax".

A very essential aspect in applying the CIT is the transfer of losses of previous years. In Latvia, in accordance with Paragraph 1, Section 14 of the law of the Republic of Latvia "On Corporate Income Tax", enterprises have the right to cover their losses chronologically from taxable income of the next eight periods of taxation (if an entity who paid before the PIT becomes a CIT taxpayer, it has the right to cover its losses from taxable income of the next three periods of taxation). If a micro-enterprise taxpayer, which before was a CIT payer, becomes again a CIT payer, it losses the right to cover its losses of the previous periods, which is undoubtedly viewed negatively. According to the practise of application of CIT in the EU, it is legal to cover losses for an indefinite period in several countries (Ireland, Sweden, Malta, Slovenia, Austria, Cyprus, and Denmark). In Austria, covering losses is limited to 75% of taxable income (Taxation trends..., 2010). The authors believe that it is useful to introduce a

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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provision in Latvia's legislation that allows enterprises to cover their losses for an indefinite period, which would be significant support for businesses.

The CIT provisions have to promote the introduction of new technologies and the development of businesses and regions.

Since 2006 in Latvia, faster depreciation is allowed for new equipment (by applying special coefficients) in accordance with Paragraph 1, Section 13 of the law of the Republic of Latvia "On Corporate Income Tax", which is viewed positively. However, it has to be taken into consideration that not all businesspersons are able to purchase new equipment. Faster depreciation is stipulated in the law also for information technologies (computers, communication equipment etc.) by setting a double depreciation rate of 70%; whereas the double depreciation rate for equipment and machines is only 40%, which does not indicate significant support for businesses. The CIT law has to stipulate solutions of regional problems as well. Presently, in accordance with the Regional Development Law, if a Latvian enterprise is registered and operates in a special support territory, the coefficients are applied to the categories of fixed assets (1.5 for Category 1, 1.8 for Category 3, 2 for Category 4 etc.), which, of course, is support for particular enterprises. Nevertheless, it is advised to differentiate the CIT rates by region, where an enterprise operates (as in France), thus largely supporting Latvia's lagging behind regions (for instance, Latgale).

According to the authors, the lack of operational capital is a large problem for Latvian enterprises; as a result, the enterprises are forced to use expensive loans for their expansion, which, especially during the economic crisis, is not always economically appropriate. This problem could be solved by letting enterprises have their undistributed profit. A partial solution of this problem in Latvia was found in 2009 – a 10% rate of PIT on interest income was introduced as of 1 January 2010. Yet, the experience of Estonia is valuable – if profit is left undistributed, a rate of 0% is applied to taxable income, whereas the standard CIT rate of 21% is applied in Estonia to the taxable profit that is distributed.

By reducing the rate of CIT in Latvia, several tax allowances were abolished (for small enterprises and those producing high technology products and software products etc.). It will be possible to grant tax allowances to supportable industries by introducing a progressive tax system in the future.

Transforming the corporate income tax in Latvia, according to the authors' recommendations, would include several advantages. First, the CIT would be more just compared with the present one. Second, it would approach the practise of taxation in the EU, it would increase the objectivity, and use of this tax in developing the national economy as well as it would assist in improving Latvia's tax system.

Conclusions

1. A proportional and low CIT rate of 15% is set in Latvia compared with other EU Member States.
2. Latvia's largest CIT payers are its small and medium enterprises, and the provisions for applying the CIT are equal for enterprises with both large and small income, which is not socially just.
3. In many EU Member States, the progressiveness of CIT is based on the support introduced for small and medium enterprises over the recent years (Belgium, France, Great Britain, Luxembourg, Lithuania etc.).
4. In such EU Member States as Italy, France, and others, different CIT rates are set depending on the region where an enterprise operates.
5. In EU states, the CIT rates are different and usually are within a range of 12.5%-33.9%.
6. So far, the CIT has not always served to the interest of Latvia's population, as a flat tax rate of 15% is applied to the taxable income of all enterprises irrespective of the amount of their profit and their ability to pay it.
7. By means of CIT, a possibility to protect the domestic market, especially micro enterprises, is not used in Latvia.
8. The new law "On Micro-enterprise Tax" in Latvia is only a temporary solution that is not oriented towards the long-term development of its national economy.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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Recommendations

1. Latvia is advised to change its proportional CIT rates to progressive rates that are differentiated within a range of 5-25% depending on the amount of income of enterprise (in accordance with the Commission Regulation (EC) No. 70/2001 and its amendments).
2. Support for micro-enterprises as well as small and medium enterprises has to be integrated in the law of the Republic of Latvia "On Corporate Income Tax".
3. Undistributed profit should remain at the disposal of enterprises by setting a 0% rate of CIT for undistributed profit, as it is done in Estonia.
4. It is useful to introduce a provision in Latvia's legislation that allows CIT payers to cover their losses incurred over the taxation year for an indefinite period.
5. It is useful to introduce support mechanisms for economic and regional development in the law of the Republic of Latvia "On Corporate Income Tax".

The mentioned recommendations will enable further development of Latvia's national economy and its faster approximation to the average EU development level.

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Business Insurance in Polish Agriculture – Situation and Development Directions

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Abstract. One of the methods for managing production risk in the agriculture involves crop and animal production insurance which has been a voluntary insurance to date. In July 2008, the crop insurance became obligatory for farmers using direct payments, yet the state refunded 50% of the premium paid by a farmer. This article presents the situation of agricultural insurance in Poland in the period of 2003-2009. It also presents the proposed changes to be introduced in 2012. The paper also contains an attempt to take a stand on the solutions proposed.

In 2009, subsidies from the budget for compulsory insurance in Poland amounted to approximately PLN 131 million (ca. 72.78 PLN/farm). It was found that most farmers used the compulsory insurance to prevent risk of loss in business, which includes liability insurance of a farmer and buildings within the farm, and since July 2008, the crop insurance in a specified range. It was pointed out that the obligation to insure together in one insurance policy various risks including those not occurring in the region is not conducive to active risk management by insurance. Farmers should be able to choose the risks that would be insured on their farms. The proposed changes seem to be constructed to lower budget expenses for agricultural insurance, and make a better position of insurance companies due to the distribution of risk between all farms.

Key words: agriculture, insurance, production risk.

Introduction

The aim of the article is to present the economic insurance system in the Polish agriculture in the period of 2003-2009 with a particular focus on the evolution of legal regulations. It specifies the changes that took place in the utilisation of the insurance cover by Polish farmers.

It was found out that farmers applied, to the greatest extent, obligatory insurance, including farmer's third party liability insurance and insurance of buildings located on a farm, and from July 2008 vegetable production insurance to a certain extent. Potential directions of changes in the economic insurance system of the agriculture were also presented, since the recent years have proven that it is far from being perfect and still requires refining.

Risks found in agriculture

Agriculture is an activity, which is exposed to the impact of external factors, including without limitation weather conditions, largely than other activities. Draught, flood or slight frosts in the springtime are only some of the risks affecting the production volume and quality.

Literature on insurance contains several dozen of possible classifications of the insurance risk made using different criteria (Sangowski T., 2001, Michalski T., 1999). It distinguishes, among others, static and dynamic, pure and speculative, subjective and objective risks. All those risks occurring in connection with the agricultural activity pursued by a human may be divided into three groups taking account of the risk source or object directly exposed to a certain risk: natural risks, social risks, and personal risks. According to the author, two of them make the agricultural activity highly risky, i.e. price risk (due to low elasticity of demand and supply in the market for agricultural products) and production risk.

Literature on the subject presents many methods enabling a farmer to assume a specific approach to the threats. They enable implementing a relevant action strategy, which is preceded by the selection, implementation, and later modifications. All these activities are referred to as **risk management.** There are four basic risk management methods, which, if combined, form a loss minimisation strategy. They include (Klimkowski C., 2004):

1) risk avoidance involving withdrawal from activities exposed to losses;
2) risk stopping involving financing the losses inside a farm;

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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3) risk control, i.e. taking of activities aimed at reduction in the frequency of losses and reduction in their value;
4) risk transfer involving a transfer of some of the risks onto another entity.

The losses that most often occur in agriculture include losses caused by natural disasters. Only some of the related risks may be managed by the risk control (cheap and effective method); while the other risks, in particular, those related to losses due to catastrophes, should be transferred out of the farm by purchasing an insurance policy.
It is impossible to the method of risk avoidance at all with such activity, since it would involve abandonment of the agricultural production.

In practice, risk management is implemented in a different way than expected upon consideration of theoretical issues. As farmers do not tend to estimate the risk of losses in the agricultural production, the risk is, to a great extent, retained inside a farm. The foregoing also results from too expensive agricultural insurance policies, in particular voluntary insurance policies. If a farmer evaluates the risk of loss below the purchase cost of an insurance policy (risk transfer), s/he resigns from the insurance. It results from the fact that insurance companies having relevant knowledge in that respect evaluate the risk in agricultural insurance too high, and farmers cannot afford buying such expensive insurance policies or they are not profitable to them. The observed low profitability of some commonly taken agricultural activities makes it impossible to cover them with an additional insurance, even more that the most frequent risks of such activities are not covered by insurance (exclusions of the insurer's liability) or the insurance scope is limited (deductible).

This article aims to describe the economic security system of Polish agriculture in the years of 2003-2009, taking into account the evolution of regulation. This was achieved by performing several tasks:

- to set out the changes in the use of cover by Polish farmers in the analysed years;
- to compare the selected crop insurance in insurance companies offering agricultural insurances with premium surcharge;
- to make synthetic review of the changes in the system of business insurance in agriculture.

Primarily analytical methods for the study of literature as well as review and analysis of the data from secondary sources were used in the article. Information and statistical data on agriculture and agricultural insurance from the Central Statistical Office (CSO) of Poland and the Polish Financial Supervision Authority (FSA) served as the basis for comparisons.

Evolution of the current solutions

After 1990, farmers had to withdraw only two types of obligatory insurance. First of them was the third party liability insurance, the other one was the utility building insurance against fire. The system did not secure farmers against production and price risk. It was solely tort liability insurance. An insurance company was not liable for losses, which did not exceed 50% of the lowest remuneration of employees determined by the Minister for Labour and Social Policy (deductible).

The definition of an agricultural farm in the farmers' TPL insurance was changed pursuant to the act on obligatory insurance, which entered into force on 1 January 2004 (Ustawa… 2003). A considerable change also included resignation from the deductible, which resulted in payment of compensation to farmers even in the case of very small losses.
The other obligatory insurance included building insurance against fire, gale, hail, lightning, avalanche, flood, explosion, rock burst, and aircraft fall. The price of the insurance depends on the value of buildings and the loss probability (e.g. frequency of floods in a certain area). The rates also provide for the material type of which a facility is built (brick or wood – in the case of wood, the premium is higher), and roof covering (hard or other). If the losses caused by a random event did not exceed the value of 500 kg of rye, the compensation was not paid (deductible) (Kufel J., 2001).
In the act of 2004, the catalogue of losses occurring in agricultural buildings was extended by the following events: temporary submersion, pouring rain, and snowfalls, at the same time deleting the conditional deductible.

As regards voluntary crop and livestock insurance, it is notable that since 2006, pursuant to the act of 7 July 2005 on subsidies for crops and farm animals, the insurance has

ISSN 1691-3078; ISBN 978-9984-9997-5-3
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been subsidised by the state budget. The act was amended twice. In 2007, it was changed into the act on crop and farm animal insurance (Ustawa… 2007) and since 2008 each farmer has been obliged to insure at least 50% of acreage of crops subject to direct payments. Crop insurance became thus obligatory to some extent.

Table 1 presents examples of insurance costs of the selected crops against hailstorm and hailstorm with slight frost during springtime offered by companies that have been leading the agricultural production insurance sector for many years.

Table 1

Comparison of obligatory insurance cost against hailstorm (G) and hailstorm with slight frost during springtime (G+PW) in several insurance companies

Crop	Risk	Area (ha)	Yield (t/ha)	Estimated price per 1 t (PLN)	Sum insured (PLN)	Premium to be paid by producer		
						PZU S.A.	Concordia	„TUW"
Winter wheat	G*	8	7	450	25 200	126.00	118.44	126.00
Winter barley	G	5	6	500	15 000	75.00	42.30	75.00
Corn for grain	G+ PW**	4	8	500	16 000	240.00	220.80	168.00
Total		17	-		56 200	441.00	381.54	369.00

G – hailstorm, G + PW – hailstorm with slight frost during springtime
Source: Laska, D. (2009). Koszty ubezpieczeń w rolnictwie na przykładzie wybranych gospodarstw. Praca inżynierska. Warszawa 2009

The crop insurance cost at PZU S.A is by PLN 72 (19.5%) higher than at TUW "TUW".

Other obligatory insurance in agriculture, i.e. farmers' TPL insurance and agricultural building insurance are offered by insurance companies that have been selling obligatory insurance pursuant to the same terms for many years (the act of 22 May 2003 on obligatory insurance applies … Dz. U. (Journal of Laws) No. 124 of 16 July 2003).

However, it is worth considering whether the agricultural insurance system should be aimed solely at mitigating the effects of random events. In the current economic situation, it seems that even a more important function of the mentioned system should be to **stabilise the agricultural production and mitigate the variability of results of running a farm triggered by an unstable economic situation.** The aforementioned matter is also emphasised in some studies (Klimkowski C., 2004).

Utilisation of insurance by farmers

In the period of 2003-2009, farmers did not fully withdraw obligatory insurance policies despite the threatening penal sanctions (fines) for the failure to do so. Both, as regards the building insurance and the third party liability insurance, approximately 20% of the insurance possibilities were not used during the whole period.

The extent of utilisation of the obligatory and voluntary insurance by farmers in the period of 2003-2009 is presented in Table 2.

Table 2

Utilisation of the obligatory and voluntary insurance by farmers in the period of 2003-2009

Type of insurance	2003	2004	2005	2006	2007	2008	2009*
1. Number of farms (mln)	1.850	1.852	1.782	1.806	1.808	1.810	1.810
2. Obligatory farm buildings insurance (mln)	1.507	1.517	1.492	1.443	1.588	1.641	1.624
3. Share of insured farms in % (2/1)	81	82	84	80	88	91	90
4. Farmers liability insurance (mln)	1.512	1.485	1.504	1.444	1.410	1.454	1.441
5. Share of insured farms in % (4/1)	82	80	84	80	78	80	80
6. Voluntary insurance of crops (number of policies issued, thou.)	45	39	36	49	90	87	42

Source: authors' calculations based on PFSA and CSO data, for 2009 preliminary data

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
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Between 36 thousand and 49 thousand (in 2006) voluntary crop insurance policies were withdrawn in the analysed period. Thus, no special interest was observed despite subsidies to premiums from the state budget. In 2008, the number of policies rose to 87 thousand, since the obligation to insure 50% of crops subject to direct payments was introduced in that year.
Voluntary crop insurance subsidised by the state budget have been available in Poland since 2006. The act governing the operation of insurance was amended and at the beginning criticised by the insurance and agricultural entities. The funds reserved in the budget for subsidies to property insurance for 2006 (PLN 55 million) were not used because the mechanism described in the property insurance act did not operate as expected. They were allocated to the aid for farmers who sustained losses during draught (Agriculture and Rural Development Commission, 2006). The amounts used for subsidies to premiums in agriculture insurance in the period of 2006-2009 are presented in Table 3.

Table 3

Subsidies to insurance premium in agriculture in Poland in the period of 2006-2009

Item	**2006**	**2007**	**2008**	**2009**
Amounts used for subsidies for agricultural insurance (million PLN)	9.81	31.33	61.25	131.14

Source: Lomott-Janowicz, A., Łyskawa, K. (2009). Wspieranie ubezpieczeń rolnych przez państwo – doświadczenia polskie i wskazania unijne. Wiadomości Ubezpieczeniowe. No. 2, pp.127-142. and State Budget Reports

In consequence of a still underdeveloped and unstable agricultural insurance system in Poland, the number of agricultural insurance policies concerning buildings, movable property, crops or animals still decreases, not due to the poor awareness of insurance, which is often emphasised, but mainly due to the lack of funds to cover the insurance costs. The opinion that the voluntary agricultural production insurance should become more accessible was reflected in the act, which has been implemented since 2006, assuming subsidisation of the costs of vegetable and animal production insurance, which was voluntary until 1 July 2008 (Kozmana M., 2005). The support may be considered an orientation of the agricultural development. The demand for such activities oriented at modernisation of the vegetable production area is also presented by Klepacki (2001).
It was believed that the poor interest of farmers in the production insurance was greatly affected by prices of policies that were not subsidised by the state. All EU Member States where the government does not subsidise insurance policies face similar problems, and the market for agricultural insurance is underdeveloped. Therefore, the economic factor of the insurance seems to be the decisive factor for a farmer to choose insurance with a specific insurer. The foregoing is best evidenced by the results of a survey carried out among customers of one of the insurance companies (Wicka A., 2005), and in some press releases (Łuczak P., 2001). Therefore, the mentioned market niche seems to be the most appropriate to use by mutual insurers. However, in order for the activities to be effective, not only the mutual insurance companies have to be active, but also state support is required, as already mentioned above.
It is notable that it is difficult to recommend subsidisation of another activity, but it may take place through a support of self-insurance initiatives, which will enable attaining two goals: improvement of the cooperation between farmers and extension of the insurance cover.

Proposed changes

The agricultural insurance system in Poland has been subject to continuous modifications since 1990. The modifications concern, in particular, the obligatory or voluntary nature of the production insurance. It should be determined whether in order to satisfy the statutory obligation a farmer should insure crops against several risks (package) or one risk like it is the case now. It is notable that being able to choose one risk only, most of the farmers insured crops against hail, since that insurance policy was the cheapest. It costs several PLN/ha and enables a farmer to satisfy the statutory obligation (Bromberek J., 2011).

An important advantage of the solutions used to date involved an easy procedure of the use by a farmer of the subsidised insurance – a farmer paid 50% of the insurance premium without submitting any additional documents.
The changes to enter into force in 2012 will render it more difficult for farmers to access refunds. In accordance with the plans presented by the Ministry of Agriculture and Rural Development, a farmer who wants to have his premium subsidised will have to take out insurance and apply to the Poviat Office of the Agency for Restructuring and Modernisation of Agriculture (ARMA) for subsidisation of the insurance premium together with the application for direct payments. The subsidy to the premium may not exceed 65% of the premium paid.
The funds allocated to refunds of premiums to farmers will be derived from payments. This involves another change. The compensation will be payable to a farmer if losses caused by the event insured cause a reduction in the average annual farm production by at least 30%. If the losses reduce the income by less than 30%, the compensation is not paid to a farmer at all (Szelągowska A., 2010). The aforementioned provision will not be changed until 2013.
Furthermore, it is proposed to restore the application of earlier packages, which render it impossible for farmers to choose one of the risks to be inured, e.g. the one that is considered most frequent in a certain area.
New solutions also determine the deadline by which a farmer shall present ARiMR with the insurance policies, i.e. 30 September. The previously mentioned provision arouses a lot of controversy, because farmers take out only a part of the insurance cover by that date. For instance, insurance against bad overwintering is taken out in October and November (by 30 November).

The modifications proposed will be subject to consultations, but some issues, due to a change of the source of subsidisation of insurance premiums (from the state budget into funds allocated to the uniform area payment (JPO)), will certainly not be changed.
According to the authors, the solutions proposed are not favourable for farmers, since first, they complicate the manner of utilisation of insurance premium subsidies. In addition, they constitute temporary solutions and they will be changed after 2013 again. Continuous changes in the insurance system will not positively affect the farmers' attitude towards usefulness of the insurance cover.

Conclusions

According to the authors, the insurance of crop production could remain compulsory, on the condition that the obligation of protection could be the one chosen by the farmer's risk, which the possibility of execution is more likely in the area. It seems that so far the solution of paying by the farmers 50% of the premiums for insuring the risks of their choice without filling out additional documentation was simple and understandable for farmers. The proposed solution of making the full payment for package of insurance risks and applying for reimbursement of half of the contributions in the administrative process is little understood and has no ties to the real risk perception, so distorts the idea of insurance.

The real beneficiary of such a solution will be insurance companies, which would be able to obtain insurance premium for the risks that would not happen. Another beneficiary is the state; it will decrease the insurance subsidies in agriculture. Hence, farmers receive neither better risk protection nor the lower cost of insurance.
The agricultural insurance system in Poland has been subject to continuous modifications since 1990. The changes involve, in particular, the obligatory or voluntary character of the production insurance. The third party liability insurance of a farmer operating an agricultural farm and insurance of buildings located on an agricultural farm have remained obligatory, although some corrections have been made in that area.
In the period of 2003-2009, farmers did not fully withdraw obligatory insurance policies despite the threatening penal sanctions (fines) for the failure to do so. They used crop insurance to a very limited extent. At first, it was voluntary insurance with the state budget subsidy (2006), and later obligatory insurance to a certain extent (2008).
The lack of stability of solutions concerning the agricultural insurance also results from their relation with the Common Agricultural Policy of the European Union. The introduction of high deductible and package solutions, which limit the possibility of conscious risk management by farmers, will not contribute to a reduction in farmers' aversion to insurance.

ISSN 1691-3078; ISBN 978-9984-9997-5-3
Economic Science for Rural Development
No. 24, 2011

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