

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

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

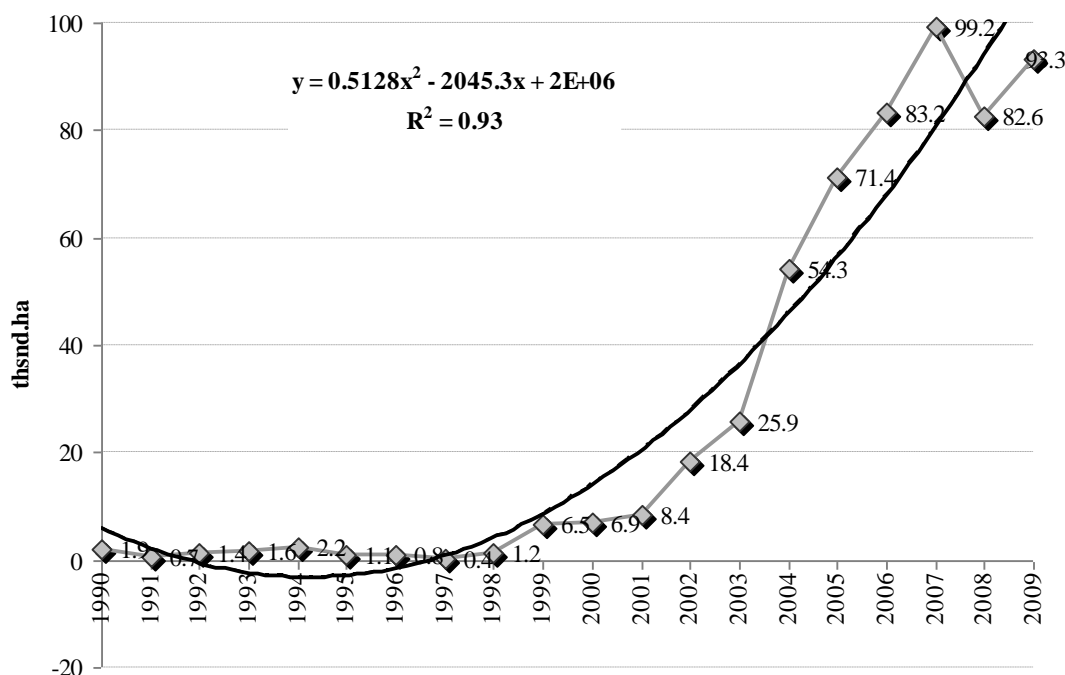
1. Trends in rape production in Latvia

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.



Source: authors' construction based on the CSB data

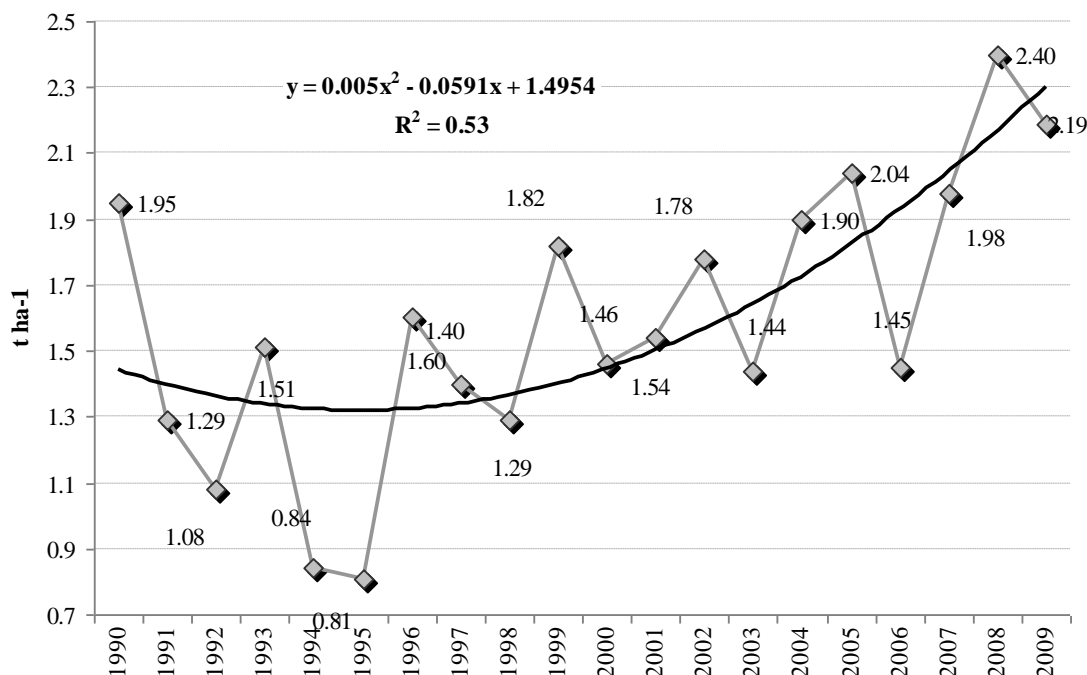
Fig. 1. Areas sown with rape in Latvia in 1990-2009, thou. ha

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.



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.

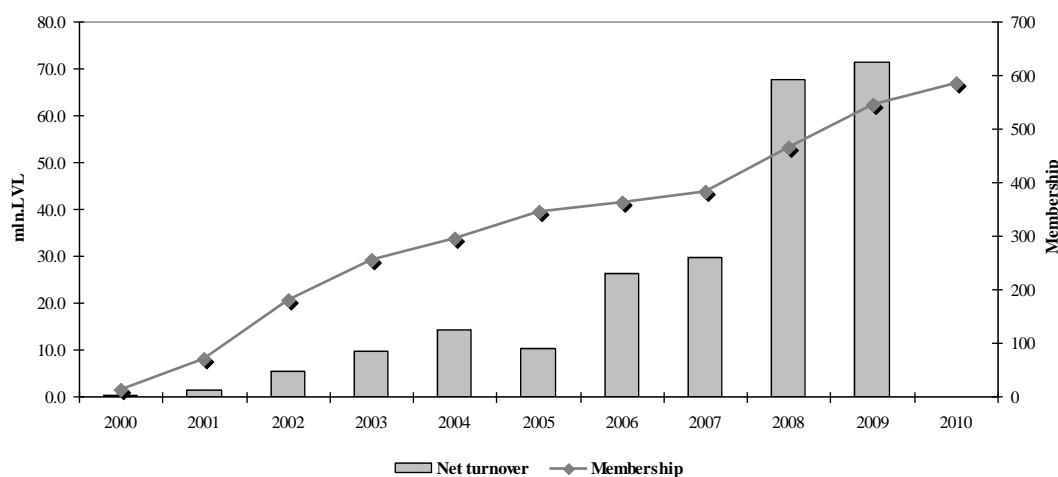
The cooperative of agricultural services LATRAPs is administered by general meetings of its members and its board. The functions of its board are separated from the executive functions, thus, its employees cannot be its members.

By means of SAPARD¹ 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

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).



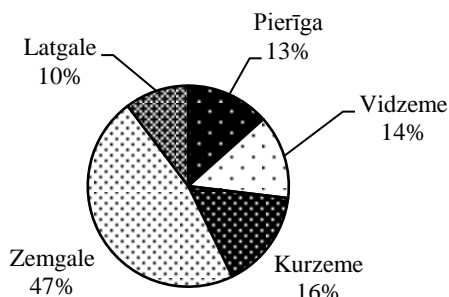
Source: authors’ construction based on the cooperative LATRAPs data
Fig. 3. Net turnover of the cooperative LATRAPs (mIn.LVL) and its membership in 2000-2010

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.

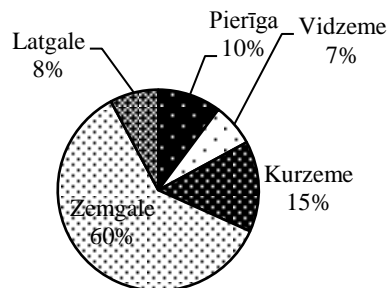
The function of the Department of Purchase and Sale of Grain and Rapeseed is to coordinate the supply of products produced by the members to the cooperative. Owing to planning the circulation of products, which allows collection of grain and rapeseed in large quantities, the cooperative has a possibility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

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.

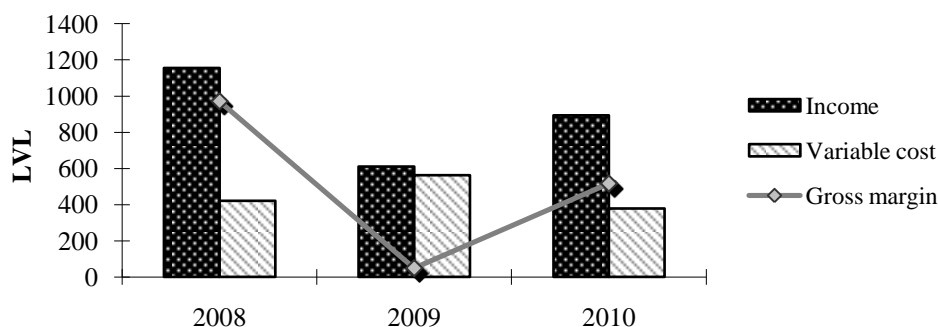
Gross margin was chosen to be an indicator for calculating economic efficiency; it is calculated according to the following equation:

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

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.



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

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

	<i>Yield, t ha⁻¹</i>	<i>Seeds</i>	<i>Fertilisers</i>	<i>Plant protection means</i>	<i>Agricultural works</i>
<i>Yield, t ha⁻¹</i>	1				
<i>Seeds</i>	0.24955	1			
<i>Fertilisers</i>	0.16144	0.12036	1		
<i>Plant protection means</i>	0.38002	0.27973	0.19192	1	
<i>Agricultural works</i>	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.

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.

Bibliography

1. Arhipova, I., Bāliņa, S. (2006). *Statistika ekonomikā un biznesā*. Rīga: Datorzinību centrs. 360 lpp.
2. *Augkopības rokasgrāmata* (2001). Sast., red. A. Ruža. Jelgava: Latvijas Lauksaimniecības konsultāciju un izglītības atbalsta centrs. 324 lpp.
3. Biodegvielas ražošana un pielietošanas Latvijā (2003.-2010.). Retrieved: <http://polsis.mk.gov.lv/LoadAtt/file23778.doc>. Access: 25 January 2011.
4. Directive 2003/30/EC of the European Parliament and of the Council. *EUR-Lex*. Retrieved: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:123:0042:0046:EN:PDF>. Access: 25 January 2011.
5. Kļavis, A. (2007). „Latrapš” – paši sev saimnieki. *Lauku biznesa laikraksts*, Volume 28 (96), 9 lpp.
6. *Latvijas lauksaimniecība 2000. gadā* (2001). Rīga: Latvijas Republikas Centrālā statistikas pārvalde. 50 lpp.
7. Kochetkov, Y., Yurkovskaya, T. (2010). Prospects of Bio Fuel Development in Latvia. **In:** *Ekonomika ir vadyba: Aktualijos ir perspektyvos, Mokslo darbai, 2010*, No.15 Šiaulių Universitetas Socialinių mokslų fakultetas. pp.110-117. ISSN 1648-9098.
8. *Latvijas lauksaimniecība 2004. gadā* (2005). Rīga: Latvijas Republikas Centrālā statistikas pārvalde. 36 lpp.
9. *Latvijas lauksaimniecība 2007. gadā* (2008). Rīga: Latvijas Republikas Centrālā statistikas pārvalde. 36 lpp.
10. *Lauksaimniecības gada ziņojums (1994. gads un 1995. gada 1. pusgads)* (1995). Rīga: Latvijas Republikas Zemkopības ministrija. 247 lpp.
11. *Lauksaimniecības gada ziņojums (1998)*. Rīga: Latvijas Republikas Zemkopības ministrija. 112 lpp.
12. *Lauksaimniecības gada ziņojums (2000)*. Rīga: Latvijas Republikas Zemkopības ministrija. 144 lpp.
13. Lauksaimniecības pakalpojumu kooperatīvā sabiedrība „LATRAPs” Retrieved: <http://www.latrap.lv/index.php?langs=353>. Access: 25 January 2011.
14. *Lauku saimniecību struktūra Latvijā 2007. gada jūnijā* (2008). Rīga: Latvijas Republikas Centrālā statistikas pārvalde. 76 lpp.
15. Loko, V., Koik, E., Tamm, K. (2005). Profitability of Grain and Rapeseed Production in Estonia: Future Prospects. **In:** *Agronomy Research*, Volume 3(1), pp. 81-90.
16. Morar, F. (2011). Economic Efficiency of Spring Rape (Brassica napus L. Ssp. Oleifera dc) *Lucrări Științifice*, Volume 52, seria Agronomie. Retrieved: <http://www.revag.ro/data/manuals/y9zNhCinWP.pdf>. Access: 25 January 2011.
17. Rape, Production. *Eurostat*. Retrieved: <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tag00104>. Access: 25 January 2011.
18. Rape, Area. *Eurostat*. Retrieved: <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tag00099>. Access: 25 January 2011.
19. Ruža, E. (2000). Rapsis – Latvijas lauku perspektīva. *Agrarius 2000*, 8.-9. lpp.
20. Sieling, K., Kage, H. (2010). Efficient N Management Using Winter Oilseed Rape. **In:** *Agronomy. Sustainable Development*, Volume 30 (2010) pp. 271-279.
21. Vanags, J., Turka, I. (2009). Economics Aspects of Growing Genetically Modified (GM) Rapeseeds in Latvia. **In:** *LLU raksti*, Volume 22 (317), pp. 18-29.