

## Efficiency evaluation in intensive growing of winter rape

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**Abstract:** The aim of the paper was to evaluate the efficiency of winter rape growing which is based on the calculations and an analysis of production and economic indicators in the given branch. The development analysis of yields per hectare, costs, revenues and production profitability was carried out over the years 2003–2009 in the Agro Žlunice and it was compared with the results of the Czech Republic as a whole. In the enterprise, it deals with the traditional growing technology with a higher intensity of the intensification factors inputs in growing. Yields per hectare in the farm reached very favourable values which supported the stable position of the enterprise in the market with this agricultural commodity. It is possible to see a competitive advantage in the level of the per hectare yields. An average yield in the joint-stock company from 2003 to 2009 was 4.34 t/ha and an average yield in the CR over the last seven years was 2.9 t/ha. The enterprise's yield is by 1.44 t per ha higher compared to the average yields in the CR. In comparison of the average costs per hectare over the evaluated period in the enterprise and in the CR – in the enterprise, the costs were by 2.71% higher compared to the CR (the enterprise 21 991 CZK/ha, the CR 21 394 CZK/ha). However, the enterprise Agro Žlunice, a.s. reached in comparison of the cost per 1 tonne of production by 31.31% lower costs than is the CR average. The amount of expenses incurred was compensated by high yields per hectare which the enterprise reached and thereby it improved the profitability of growing of this crop-plant. The highest share in the total costs belonged to direct material costs. The share of material costs in the enterprise over 7 years was 55.28%. Among the direct material costs, there are mainly seeds, fertilizers and chemical prophylactics. From the indicators of production profitability, there are expressed the profit achieved per 1 t of seeds from 1 ha of the area under crop and cost profitability. The profitability indicators considerably fluctuate during the evaluated years in the monitored enterprise and in the CR in dependence on the fluctuation of the seed price.

**Key words:** winter rape, yields per hectare, direct costs, overhead costs, revenues, profit, profitability

Oil plants belong to important crop-plants in the Czech Republic which enlarge the possibilities of an agricultural enterprise in growing a more varied structure of the plant species.

One of the main causes of the dynamic growth of the areas under the oil plant growing in the world is a change of the eating habits (a higher consumption of plant oils compared to animal fats) and a cheaper plant oil production compared to the possibilities provided by animal breeding. All kinds of oil plants are grown especially for two areas of use which are

the food consumption and various technical applications.

The Czech Republic ranked, after the accession into the European Union, among the biggest European rape growers. The large-scale growing of the best line and cross-breed varieties was the base of a very good quality of the domestic raw-material, in which the foreign countries are very interested.

A relatively stable perspective for rape growing is mentioned also by the European Commission in its report on the expected development of the oil-plant

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markets in the enlarged European Union by the year 2010. The area, on which oil plants are grown, should have increased by 500 thous. ha to 7.7 mil. ha by 2011. The main oil plant in Europe will be rape, of course. It is assumed that the rape production will gradually increase from the current level (c. 14 mil. t) to 19 million tonnes in 2011. This production increase is enabled by its use for the non-food purposes.

Rape seeds are utilised in many branches of the national economy; the most important is the food industry, agriculture and chemical industry where rape is used as a renewable energy resource (Volf 2005).

On the national scale, rape represents about 12% of the acreage of arable land at present, similarly as in Germany and France. However, because it is not grown in many areas (enterprises), its share in the cropping patterns reaches substantially higher values – commonly 20% of arable land. Nevertheless, farmers with 25–33% of rape in their total area are not rare. A large share in the increase in its areas in the last fifteen years belongs to the specialized enterprises where rape is the main market crop (Baranyk et al. 2007).

Oilseed rape is grown in the Central Europe largely as a winter crop with the vegetation period about 320 days (Diepenbrock and Grosse 1995).

Rape belongs among the intensive agricultural plants which react very well to the nutrition and fertilization level (Vaněk et al. 2002). In consumption of nutrients, rape is ranked among the nutrient-intensive crop plants (Fábry et al. 1992).

An application of nitrogen in rape supports the growth of the plants and increases the nitrogen accumulation in plants (Schjoerring et al. 1995).

The influence of the N-S fertilizers on the internal copper content in the oilseed rape plants was studied in field experiments. The evaluation involved two treatments of a single rate for the first spring fertilizer application with 100 kg N/ha in the AN treatment (nitrochalk), and 100 kg N/ha + 50 kg S/ha in the ANS treatment (ammonium nitrate and ammonium sulphate). A positive influence of the ANS fertilizer on the copper content in different parts of plants was determined (Balík et al. 2007).

From the economic point of view, rape growing has a dual effect for farming of agricultural enterprises:

- direct – production and sale of rape seed
- indirect – as a preceding crop, it increases the yield of cereals (a breaker of the cereal sequence)
- rape improves the soil structure by which it influences the nutrients management in soil (Baranyk et al. 2007).

To maintain the competitiveness of Czech rape production, it is necessary to keep the current yields

per hectare at the level of minimally 3 t/ha and not to increase the costs for rape growing by optimizing the technology (Novák and Janotová 2009).

Komberec (2000) states that rape growing outlook is optimistic in the world and in the EU, in spite of the continual fluctuation of its market price.

Input prices are projected into the costs of production, both in the items which a farmer cannot influence (purchasing price, taxes, lease, payments), and into the items which he/she can influence by his/her decision making (numbers of operations, assortments, dosages, etc.) (Nozdrovický and Rataj 2001).

In an intensive technology, the constant costs are considerably diluted (i.e. preparation of land and sowing, working expenses, the harvest and after-harvest treatment) in a bigger production volume per hectare, but at the same time, a complex growing technology has to be observed and a significant yield response to the invested inputs should be reached (Vašák 2000).

The economic position of Czech producers is related to the most important commodities of Czech agriculture through 2 indicators, profitability without supports ( $R - S$ ) and profitability with supports ( $R + S$ ). There was proved that the profitability  $R + S$  in the period I was positive for most plant commodities, while it was negative for most animal commodities. In connection with the membership of the CR in the EU, agricultural supports significantly increased for nearly all commodities as the consequence of applying the Common Agricultural Policy (CAP) on Czech agriculture. Therefore, there were monitored in the period II important positive changes of the indicator  $R + S$  for most commodities. For the average of the Czech Republic, there were obtained the following values of  $R + S$  in the period I, resp. period II: wheat 2.6%, resp. 24.9%, barley 27.7%, resp. 39.8%, rapeseed –18.0%, resp. 23.4%, sugar beet 9.1%, resp. 41.4%, potatoes 10.5%, resp. 2.5% (Foltýn et al. 2009).

According to Zúkalová (2000), the quality of oilseed rape seeds is a result of three factors: chemical composition given by the genetic base, changes of the chemical composition by various growing technologies, the year and There was introduced the financing and support programme of the rape methyl-ester (RME) and mixed fuel production. In the article, the availability and economic potential of the renewable energy sources till year 2010 are shown primarily. The RME and the bio-diesel form an important part of the biomass in the Czech Republic (Součková 2006).

Different responses of the winter oilseed rape varieties to various growing locality conditions as well as to the intensity of the technological inputs are known. The organic varieties provide a sufficient yield even within the extensive growing conditions.

Ten commonly grown line varieties in the Czech Republic were tested using the extensive organic growing technology. These varieties were evaluated for the occurrence of fungal diseases by ripening and the seed yield (Nerad et al. 2009).

## MATERIALS AND METHODOLOGY

The aim of the paper was to evaluate the efficiency of the winter rape growing which is based on the analysis of production and economic indicators achieved in the given branch. The output is a comparison of the expenses incurred on its growing in connection with the reached yields and the resulting economic effect valued by the profitability level. The development analysis of yields per hectare, costs, revenues and production profitability concerns the years 2003–2009 in the technology of rape growing in the enterprise Agro Žlunice, a.s. It deals with the traditional growing technology with a higher intensity of inputs of production factors in its growing.

For the efficiency analysis of the rape growing, there were used the data drawn from the internal databases and accounting of the company Agro Žlunice, a.s. From the accounting books, there were found out the items which were connected with the production and economic results in the branch. The data on realization were obtained from the agreement on the insurance of the production sale and the system of price tools.

The economic analysis was carried out over the period from 2003 to 2009.

The winter rape production is valued by the help of economic indicators of production intensity, costs and profitability. The indicator of production intensity is calculated from the ratio of production and the areas under crop.

The total costs for the winter rape growing in a standard structure are converted per 1 ha of the area under crop. Costs per one production unit are calculated from these costs and converted per hectare yields in the relevant structure. The costs are compared between both data collections and the influence of their different yield intensity in their level and structure is judged.

The cost profitability is expressed by the ratio of the reached profit in the branch and the expenses incurred.

From the achieved results, the evaluating tables and graphs were compiled which showed the time development of the evaluated indicators, and further the comparison of the reached enterprise level with the average of the Czech Republic.

## RESULTS AND DISCUSSION

The joint-stock company Agro Žlunice, a.s. came into being on the 6<sup>th</sup> of October, 1998. The company domicile is Žlunice, the region Jičín. The enterprise has been founded for indeterminate duration.

Žlunice is situated in the altitude of 250 meters above the sea level. The company operates in the area of the rape production type. The soil type is the pararendzina on terraced broken stones and gravel sands from the acid material. The soil is slightly acid to neutral; the content of phosphorus is 71 mg/kg, of potassium 173 mg/kg and of magnesium 147 mg/kg. The climatic region is BZ – mild warm area, mild dry, with a mild winter. The average yearly air temperature is 7–9°C in this area and the average yearly rainfall totals 500–600 (650) mm (in the vegetation period /i.e. April–September) is 380 mm. The site is plane.

The acreage of agricultural land, on which the Agro Žlunice, a.s. operates, is 2000 ha, of it, 1755 ha is arable land, 84 ha orchards, and 161 ha permanent grassland.

### Production results

Winter rape has been grown in the enterprise Agro Žlunice, a.s. since 1998 when the company was founded. The firm continues in the tradition of the winter rape growing which started already in 1993 in the Zemědělské obchodní družstvo Žlunice (agricultural cooperative). At the start of growing, an average yield of this crop-plant was only about 2 t/ha of rape seed. In the process, by a change of the technology, mechanization, varieties and the experiences of experts, the average yields of winter rape increased and thereby also the efficiency of this market crop plant grew.

The enterprise uses the traditional growing technology. A specific feature of the traditional technology of the winter rape growing is by the means of tillage. Suitable is a medium-deep tillage with an immediate treatment in order to crumble the arising lumps. If a preceding crop, eventually a vegetation course allows, a stubble ploughing is a part of this procedure. "A chemical stubble ploughing" by Roundup is costly (usage mainly in the minimization technology of growing) and it postpones the rape sowing. It liquidates above all the first wave of weeds, but the next application of herbicides and graminicides is usually necessary.

The used growing technology features a higher amount of inputs in production – a number of treatments of plants against diseases and pests where also

Table 1. Development of the areas under crop, production and average rape yields in the Agro Žlunice in 2003–2009 (ha)

Vegetation year	Acreage under crop (ha)	Production in (t)	Average yield (t/ha)
2003	201.07	720.92	3.58
2004	218.23	1147.34	5.25
2005	238.55	1017.61	4.26
2006	257.14	1106.98	4.30
2007	271.11	1170.65	4.31
2008	313.85	1280.95	4.08
2009	305.69	1398.65	4.57

Source: Internal information (26.2.2010)

a second growth regulation appears. At the same time, also higher dosages of mineral fertilizers are applied here – a higher intensity of the nitrogen fertilization on the level of ca 210 kg/ha.

The areas under oilseed rape gradually increased in the monitored years 2003–2009 (Table 1). A year-on-year increase in the areas under crop represents ca 20 ha. It is given by a higher efficiency of rape growing against other crop-plants.

The average yield in the joint-stock company was 4.34 t/ha in 2003–2009, and the average yield in the CR over the last seven years was 2.9 t/ha.

The difference of the yields per hectare in the company and the reached yields per hectare in the CR was almost constant in the monitored years 2005 to 2009 and it moved in the range of ca 1.12 to 1.38 t.

The yields per hectare reached very favourable values in the enterprise which supported a stable position of the firm in the market with this agricultural commodity. It is possible to see a competitive advantage of the level of the achieved yields per hectare.

To maintain the competitiveness of the Czech rape production, it is necessary to keep the present yields per hectare at the level of minimally 3.5 t/ha and not to increase the costs for the rape growing by the optimisation of the growing technology.

### Economics of the winter rape growing

For farmers as well as for the company Agro Žlunice, a.s., winter rape became one of the most important market crop plants grown on the territory of the Czech Republic. An important factor in growing of this plant is the suitable chosen growing technology in which it is possible to achieve favourable yields, the production quality and favourable operating results. Very important is the knowledge of the particular input factors in the production – the evaluation of the given state of growth, the subsequent contributions in the production, their level and structure. A compilation of a suitable plan of the growing technology, including the financial expression, demands a high expertness and a mutual cooperation of the whole company management.

The production efficiency of winter rape can be evaluated by many indicators from the area of costs and profitability.

### Production cost-demands

The level of expenses incurred on the rape growing is influenced by the main factors as the natural conditions in which rape is grown, the production intensity, and the total farming level. The total costs are given by a number of inputs into the production process and their price. In the recent years, input prices have an increasing trend, while the rape seed prices fluctuated

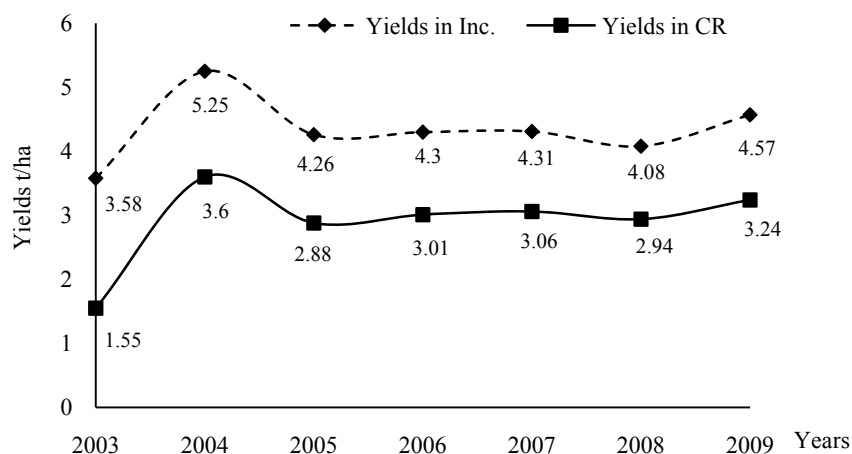


Figure 1. Comparison of yields in the Agro Žlunice with the CR (t/ha)

Table 2. Total costs and costs per hectare in the Agro Žlunice in comparison with the CR

Year	Total costs (CZK)	Hectares under crop	Costs/ha (CZK)	Costs/ha in CR (CZK)
2003	3 843 773	201.07	19 117	19 054
2004	4 816 589	218.23	22 071	19 541
2005	4 508 953	238.55	18 901	19 721
2006	5 455 589	257.14	21 216	19 588
2007	5 986 705	271.11	22 082	20 982
2008	6 970 994	313.85	22 211	22 873
2009	8 661 891	305.69	28 336	28 000

Source: Internal information (26.2. 2010)  
Collection Hluk (2009) – costs per hectare in the CR over 2009, estimate

and did not increase significantly (except 2008). This unfavourable development between the increasing costs and the stagnating price can be partially eliminated by a thorough agronomic practice and a maximum use of subsidies from the endowment titles.

A significant presumption of the successful winter rape growing is the statement-keeping on the incurred expenditures and the achieved incomes in the branch in order to inform the company management on the incurred financial means in the production and possible expected revenues throughout the economic year.

In the analysis of rape production costs, it is purposeful to deal with the structure of expenses incurred and their level in conversion per 1 ha of the area under crop and per 1 tonne of production.

The increase of costs is influenced above all by the growth of the agricultural inputs prices, the increase of work expenses and service expenses (Novák and Janotová 2009) (Table 2).

The total costs per 1 ha of area under crop have increased from 2003 to 2009. Over 7 economic years, it means an accrual in the total costs of the Agro Žlunice to 148 % and in the CR to 147 %.

Table 3. Comparison of the average costs and rape yields of the Agro Žlunice and the CR (CZK/t)

Average over 7 years (2003–2009)	Agro Žlunice a.s.	CR
Costs CZK/ha	21 991	21 394
Yield t/ha	4.34	2.9
Costs CZK/t of production	5 067	7 377

Source: Internal information (26.2.2010)  
Collection Hluk (2009) – costs per hectare in the CR

The enterprise AGRO Žlunice, a.s reaches, in comparison of costs per 1 tonne of production, by 31.31% lower costs than the CR average. With almost the same cost per 1 ha of the area under crop, owing to different yields, the costs per 1 t of production differ by 2310 CZK in favour of the Agro Žlunice (Table 3).

The Table 4 shows the particular cost items and the share of the particular cost items in the total costs recorded in the Agro Žlunice. The particular cost items can be monitored in a seven-year horizon and in the CR in a five-year growing horizon (2004–2008). For the cost evaluation, the total costs are divided into the relevant categories according to the calculation pattern.

The biggest share in the total costs is taken by the direct material costs. The share of the direct material costs in the company over 7 years is 55.28%. Among the direct material costs, there are mainly seeds, fertilizers and chemical profilactics.

There is a steady growth trend of the expenditures for seeds. The share of seeds in the total costs is 5.9%. The cost growth depends on the structure of the purchased seeds. A gradual increase of the ratio of the hybrid seeds contributes to the increase of expenditures, but also to the growth of yields per hectare, because the hybrid rape varieties are much yielding. From 2003 to 2009, the expenditures for seed increased by 59.8%. Seed prices are expressed in two price categories and they are presented per 1 seed unit (VJ). The price category is according to the division into line and hybrid varieties. Prices of the line varieties are 800–1400 CZK/VJ and of the hybrid varieties 1400–2000 CZK/VJ. With a higher growing intensity the company uses the varieties in

Table 4. Structure of average costs per 1 ha of area under crop in the Agro Žlunice

Indicator/year	Average costs (CZK/ha)	Share of particular costs (%)
Total direct material costs	12 156	55.28
– seeds	1 193	5.42
– fertilizers	4 982	22.65
– chemical profilactics	5 982	27.21
Other direct costs and services	2 632	11.97
Total work costs	2 014	9.16
Other costs	2 686	12.21
Working expenses	2 502	11.38
<b>Total costs (average)</b>	<b>21 991</b>	<b>100</b>

Source: Internal information (26.2.2010)

the proportion 1 : 1. In the enterprise, the expenditures for seeds are by 2.8% lower than in the total CR (in 2004–2008). In order to use the expenditures incurred in expensive high-quality seeds, it is necessary to secure enough of the nutrients for the necessary growth and development of plants. Fertilizers are the basic aspect of the reached yield and quality. The share of fertilizers in the total costs is 22.65%. The used basic fertilizers are LAV 27%, DAM 390 and mixed fertilizers NPK-S, NS. Prices of the basic fertilizers are very unbalanced in the last year, which is connected with the market situation.

The enterprise uses a higher growing intensity which is given by a higher dosage of nutrients in fertilizers and thereby also higher expenditures than the Republic average is. The expenditures for fertilizers are in the company by 19.9% higher than in the CR. From 2003 to 2009, the costs for fertilizers increased by 17.9%.

Without chemical profilactics, it is not possible to secure either the required quality or the quantity and to secure a good health state of a plant. To secure the good health state, the share in the total costs for chemical profilactics is 27.21%. The used chemical profilactics are herbicides, insecticides and fungicides. Higher expenditures in the enterprise are caused by the use of the dual regulation of the plant (autumn and spring) which has a very positive influence on rooting, strengthening of the root collar, a more massive branching, and generally a vehement growth habit of plants, which is a positive aspect of the high plant yield. The enterprise in this category disposes of the costs higher by 28.9% compared to the whole CR. In the company, the costs for chemical profilactics increased from 2003 to 2009 by 76.8%.

Generally summarized, the direct material costs have the highest possible influence rate on yield, the required quality of the rape seed and the level of the growing profitability.

On the contrary, a too high input intensity can lead to a waste and it is risky especially in case of decrease in the selling prices (see the year 2008/09) of technology (Markytán 2009), which the analysis confirms.

Among other direct costs and services, there are the expenditures for transport charges, field works in the form of service (a combine harvest), aerial works, consultancy and services, and the rent from land. They share in the total company costs by 11.97%.

Even if the firm tries to economize on some of these costs, see the aerial works, which are successfully decreased thanks to the purchase of the drawn sprayer with a higher patency and efficiency, conversely the costs for the combine harvest increase. The company

owns 2 combine-harvesters of the mark Class, and with an increase of the harvested area and a very short period for the harvest, it solves this problem with combine-harvesters services purchased from foreign operators.

The rent from land is another increasing factor which influences the growing costs.

The enterprise owns 10% of the total agricultural land and 90% of plots it has on lease. The rent for the leased land moves from 1400 CZK to 2700 CZK according to the bonited soil-ecological units (BPEJ).

The labour costs share in the total expenditures by 9.16%. In this group, there are the tractors and combine-harvester works, works of self-propelled loaders, etc. The accrual in the company, from 2003 to 2009, amounts to 17.4%. The CR compared to the enterprise has the labour costs by 50.1% higher. Regarding the impossibility of the direct determination of the wage expenditures, these items are recorded in the indirect product costs.

The item “other expenses” includes the costs connected with the use of the intra-enterprise mechanization. It shares in the total company costs by 12.21% and in comparison with the CR, it is by 7.6% lower.

The indirect production costs of plant production include mainly the costs of depreciation of the multipurpose buildings and machines (sowing machines, sprayers for plant protection, harvesters, ploughs, machines for soil preparation, etc.) and other costs arisen in production which could not be assigned to the particular crop-plants grown in the plant production.

The administrative expenses are given by the relevant share of costs connected with the administration and organization of the enterprise.

Financial means spent for overhead costs in the Agro Žlunice represent a considerable share in the total costs for rape growing – 11.38%. Of the total overhead costs, the enterprise expenses are 60.7% and the administration expenses 39.3%.

From the cost calculation in the Table 5, there is obvious a difference between the level and the structure of costs per one production unit between both data collections with the almost same cost level per 1 ha of area under crop. The cause is a different degree of the achieved resulting intensity in the form of per hectare yields (the difference 1.14 t in favour of the Agro Žlunice). The differences in the share of direct material costs are significant (64.2% and 49.7%). In the Agro Žlunice, in spite of a higher volume of these costs per 1 ha of area under crops, in the recalculation per 1 production unit, their values are similar or lower. The share of all other costs (in fact of a fixed character) and their extent is significantly higher in

Table 5. Structure and level of costs per 1 production unit (1 tonne) of area under crops in Agro Žlunice in comparison with chosen file of the CR in the year 2008

Cost item	Agro Žlunice		Czech Republic	
	CZK	%	CZK	%
Total direct material costs	3 493	<b>64.2</b>	3 870	<b>49.7</b>
– seeds	332	<b>6.1</b>	414	<b>5.3</b>
– fertilizers	1 496	<b>27.5</b>	1 682	<b>21.6</b>
– chemical profilactics	1 665	<b>30.6</b>	1 657	<b>21.3</b>
Other direct costs and services	600	<b>11.0</b>	732	<b>9.4</b>
Total work costs	474	<b>8.7</b>	1 037	<b>13.4</b>
Other costs	505	<b>9.3</b>	901	<b>11.6</b>
Working expenses	372	<b>6.8</b>	1 239	<b>15.9</b>
Total costs	<b>5 444</b>	<b>100.0</b>	<b>7 779</b>	<b>100.0</b>
Costs per 1 hectare	22 211	<b>100.0</b>	22 873	<b>100.0</b>
Yield per hectare-tonne		4.08		2.94

Source: Internal information (26.2. 2010)

Collection Hluk (2009) – costs per hectare in the CR

the ČR collection (50.3% and 3909 CZK for a tonne) in comparison with Agro Žlunice (35.8% and 1951 CZK for a tonne). It is again connected with the achieved yield intensity.

The expenditure increase is caused above all by the growth of agricultural input prices, the increase of labour expenditures and the costs for technology services (Novák and Janotová 2009). The results of the cost development analysis in the monitored enterprise show a similar trend.

The increase of costs in the rape growing is not caused only by the price increase of the particular inputs, but also by the increase in their frequency. Besides inputs concerning the basic agricultural technology, there is also an increase of other operations in the rape growing in several last years. Above all, it regards the application of regulators, stimulants, leaf fertilizers and desiccants.

### Production profitability

Profitability of the rape growing is, besides the growing own costs per 1 tonne of seed, influenced considerably by the reached realization process. From 2004, it is necessary to add subsidies into the profitability calculations and also the payments provided to agricultural enterprises in the frame of the rules of the Common Agricultural Policy of the EU.

The encashment is in practice one of the most important and finalizing phases in the production of winter rape seed. Regarding the time price fluctuation,

it is very complicated in the last years to decide whether the produced rape seed should be stored or sold at the time of harvest. In more cases, it was very advantageous to store the production for a certain time from the harvest and thereby to gain a more suitable position in bargaining for the price with business partners.

The time interval from the harvest time to the final sale can mean as many as several hundred crowns differences in the sale price for 1 t. At the harvest time, the price is influenced mainly by a higher offer of rape seed which pushes down the price.

Pricing of rape takes place during the year in several periods when the influence of various factors changes. The trading itself concentrates to the time around the harvest.

The price for August in the period before harvest (January–June) is influenced most considerably by the a running out of the last year's production in this period. Also the weather development has a great significance and its influence on the expected oil plant production. At the beginning, it is not traded much in this period; the price is low, however, with the coming harvest the demand grows, the contracts start to be closed and the price rises.

– The price at the harvest time is influenced by a high demand on the rape seed because the growers do not have mostly own storage capacities. At this time, a surplus of supply over demand appears; the price is pressed down and stagnates.

– The price after harvest (November–December): several weeks after harvest the prices usually grow

Table 6. Evaluation of profit/losses of rape growing in the Agro Žlunice 2003–2009 (CZK)

Indicator	2003	2004	2005	2006	2007	2008	2009
Cost/ha (CZK/ha)	19 117	22 071	18 901	21 216	22 082	22 211	28 336
Cost/t (CZK/t)	5 340	4 204	4 437	4 934	5 123	5 444	6 200
Yield (t/ha)	3.58	5.25	4.26	4.30	4.31	4.08	4.57
Sale price/t (CZK/t)	4 133	6 248	5 504	6 886	7 246	9 659	6 378
<b>Evaluation</b>							
Revenue/ha (CZK/ha)	14 796	32 802	23 447	29 610	31 230	39 409	29 147
Profit/loss/ha (CZK/ha)	-4 321	10 731	4 546	8 394	9 148	17 198	811
Profit/loss/t (CZK/t)	-1 207	2 044	1 067	1 952	2 123	4 215	177
Cost profitability (%)	-22.6	48.6	24.1	39.6	41.4	77.4	2.9

Source: Internal information (26.2.2010)

and the price develops already according to the known crop.

- The rape price in the period January to May: at the beginning of the year, the rape price stagnates; it regards the period when rape reserves decrease and the price gradually increases. If there is a lack of the raw material, the price can increase.

The profitability level as well as the level of own costs is influenced also by different natural conditions. Also the production intensity significantly influences the profitability level. Of the production profitability indicators, a profit achieved from 1 ha of the harvested area, a profit from 1 t of the realized production and the cost profitability indicator are used.

Considering the growing profitability, it issues from the data obtained from the company accounting – expenses incurred and revenues of the valued branch.

In the evaluation of growing profitability, only the achieved profit (loss) is stated and by this calculation, it is not possible to influence or in other way to adjust the operating result.

In the enterprise Agro Žlunice, a loss is showed only in the year 2003 on the level of 4 321 CZK/ha. The loss was caused by a very bad wintering of the growths and low revenues which the company received for the production. The quality of the produced rape seed was bad (a high content of impurities – goosegrass, germination).

In the Table 7, the year 2009 is only informative; the data are estimated. In comparison of the results of rape growing, the observed subject reaches more favourable values than the Republic averages (Tables 6 and 7).

The average realization price in the enterprise was 6579 CZK/t, and 6930 CZK/t in the CR. The realization price in the CR is by 5.3% more advantageous than in the company. The lower realization price is influenced in the enterprise by the term of sale. The term of sale has a very big effect on price and it is given by the possibility (impossibility) of storage of the given commodity. The company did not own its own storage premises in 2008 and it has been forced to sell the rape seed during

Table 7. Evaluation of profit/losses of rape growing in the CR in 2003–2009 (CZK)

Indicator	2003	2004	2005	2006	2007	2008	2009
Cost/ha (CZK/ha)	19 054	19 541	19 721	19 588	20 982	22 873	28 000
Cost/t (CZK/t)	12 293	5 428	6 848	6 508	6 857	7 780	8 642
Yield (t/ha)	1.55	3.6	2.88	3.01	3.06	2.94	3.24
Sale price/t (CZK/t)	7 167	6 296	5 674	6 806	7 356	9 064	6 150
<b>Evaluation</b>							
Revenue/ha (CZK/ha)	11 109	22 666	16 341	20 486	22 509	26 648	19 926
Profit/loss/ha (CZK/ha)	-7 945	3 125	-3 380	898	1 527	3 775	-8 074
Profit/loss/t (CZK/t)	-5 126	868	-1 174	298	499	1 284	-2 492
Cost profitability (%)	-41.7	16.0	-17.1	4.6	2.4	5.6	-8.9

Source: Collection of papers Hluk (2009)



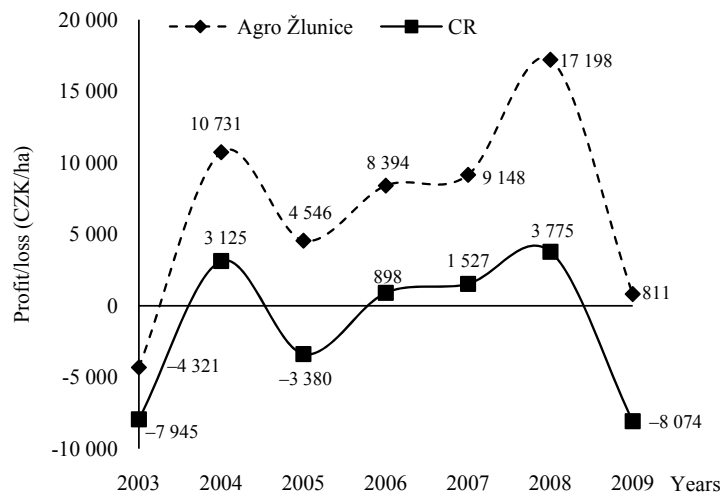


Figure 2. Graphic presentation of the profit/losses of the Agro Žlunice and the CR 2003–2009 (CZK/ha)

harvest when the price in this period was lower than in a later sale for many years in succession.

Fluctuations of the realization prices and price inputs in the production are the reason of the unbalanced profitability/ rate of loss of rape growing during the observed period. The total rape market situation changes often and also the prices of rape seed react to these up- and- downs.

The current direct payments and the national top-up payments improve significantly the total rape growing economics.

The CR has, since the accession into the EU, applied the system of the unified payment per area (SAPS) when a direct payment and a national subsidiary payment (TOP UP) are paid per every hectare of the agriculturally used area.

Including the direct and subsidiary payments in presentation in the Table 8, the profit is increased by 4391 CZK/ha at the average per 1 year which represents an increase by 34.1% of profit per hectare.

## CONCLUSION

The significance of rape in European agriculture is almost irreplaceable and it still slightly increases, which is also proved by the rape growing development in the

Czech Republic, as well as by the development in the monitored enterprise Agro Žlunice, a.s. Rape has been grown in the CR for many years; its production had been insufficient for Czech processors by 1995 and growers were not able to meet the demand. Only in the mid-90s, the supply was evened up with the demand and the CR became a self-sufficient country in oil-plants.

Rape is grown in the company Agro Žlunice, a.s. from the start of the joint-stock company which means from 1998 till present.

The paper aim was to evaluate the efficiency of the winter rape growing, which is based on the calculations and an analysis of the production and economic indicators in the given branch. The development analysis of yields per hectare, costs, revenues and production profitability was carried out over the years 2003–2009 in the Agro Žlunice and it was compared with the results in the Czech Republic. In the enterprise, it deals with the traditional growing technology with a higher intensity of inputs of the intensification factors in growing.

In the cropping pattern, rape takes 19.94% of the total arable land in the company (in 2010) and in 2003 the rape share in the cropping pattern was 12%. From 2003 to 2010, rape growing increased by 7.94% in the cropping pattern. A year-on-year accrual of areas under crop amounts to 20 ha.

Table 8. Profit/loss including subsidies in the Agro Žlunice 2004–2009 (CZK/ha)

Indicator	2004	2005	2006	2007	2008	2009
Profit/loss/ha (CZK/ha)	10 731	4 546	8 394	9 148	17 198	811
Subsidies (CZK/ha)	3 312	4 426	4 755	4 547	4 414	4 894
<b>Total profit with subsidy</b>	<b>14 043</b>	<b>8 972</b>	<b>13 149</b>	<b>13 695</b>	<b>21 612</b>	<b>5 705</b>

Source: Internal information (26.2.2010)

The yields per hectare in the company achieved very favourable values which support a stable position of the enterprise in the market with this agricultural commodity. A big comparative advantage can be seen in the level of the yields per hectare. The average yield in the joint-stock company from 2003 to 2009 is 4.34 t/ha, and the average yield in the CR over the last seven years is 2.9 t/ha. The yield in the company is by 1.44 t/ha higher against the average yields in the CR.

The total costs in the enterprise increased from 2003 to 2009. Over 7 economic years, it means an accrual by 125% in the total costs and the increase in areas under crop is by 52%, which is a big disproportion. The growth of the total costs was influenced by an increase of the areas under crop, and other significant factor was a gradual growth of prices of the particular technological inputs and service costs, and further the increase of labour expenses.

In comparison of the average costs per hectare over the assessed period in the company and in the CR, the company has by 2.71% higher expenditures per hectare against the CR (the company 21 991 CZK/ha; the CR 21 394 CZK/ha). However, in comparison of costs per 1 tonne of production, the enterprise AGRO Žlunice, a.s. achieved by 31.31% lower costs than the CR average. The amount of expenses incurred was compensated by the high yields per hectare, which the company reaches and thereby it improves the profitability of growing of this crop plant. The highest share in the total costs belongs to the direct material costs. The share of direct material costs in the company over 7 years is 55.28%. Among the direct material costs, there are mainly seeds, fertilizers and chemical profilactics.

The enterprise uses a higher growing intensity which is given by higher dosages of fertilizers and thereby also higher costs than the Republic average. The expenditures for fertilizers are in the company by 19.9% higher than in the CR. From 2003 to 2009, the costs for fertilizers in the firm increased by 17.9%.

Without chemical profilactics, it is not possible to secure either the required quality or quantity and to secure a good health state of the plant. To secure a good health state, the share in the total costs for chemical profilactics is 27.21%. The used chemical profilactics are herbicides, insecticides and fungicides. In this category, the company disposes by 28.9% higher costs against the CR. The expenditures for chemical profilactics in the firm increased by 76.8% from 2003 to 2009.

The financial means spent for overhead expenses in the Agro Žlunice create a considerable share in the total costs for the rape growing – 11.38%. Of the

total working expenses, the indirect product costs amount to 60.7% and the administrative expenses are 39.2%. Comparing the labour expenses in the company and the CR (2004–2008), the nationwide costs are by 27.2% higher.

From production profitability indicators, there are expressed the profit achieved from 1 t of seed from 1 ha of area under crops and the cost profitability. According to the chain index, the growth rate of the company profit represents in average 129.5% and according to the basic index, the highest increase of profit against 2003 was in 2008, when it reached 398%. The profitability indicators considerably fluctuate during the monitored years in the observed company and in the frame of the CR in dependence on the fluctuation of the realization seed prices.

The compiled cost structure should help the further planning of the rape growing. The obtained experience should be a guide for the rape growing at the optimum cost level. In case of unfavourable results, the items in which the reserves for the cost reduction consist should be determined.

With the increase of the rape production intensity, above all the costs for the purchased fertilizers and chemical profilactics grow, while the other cost items show a smaller dependency on the reached production intensity. A considerable interest of entrepreneurs in agriculture in farming on agricultural land increases also other costs – the rent from land. Presently, the rent moves between 1500–2700 CZK/ha according to the BPEJ. Vice versa, the prices of seeds, pesticides and services grow to a small degree.

According to the long-term results, it can be stated that the increase of the intensification inputs is efficient because with the increase in production intensity and the yields per hectare, the production costs per 1 tonne of rape seed decrease.

Subsidies belong to the stable and regular income items of the company. The current direct payments and the national subsidiary payments significantly improve the economics of crop-plant growing (SAPS and TOP UP).

Rape growing represents a significant economic contribution for the enterprise and the profitability level is dependent on the reached realization prices and on the level of the per hectare yields.

The elaborated analysis showed that the rape growing in the company is at a high level in comparison with the Republic average, however, also there are some reserves for the improvement of economic results. Despite considerable fluctuations in the achievement of profitable oilseed rape growing in the company Agro Žlunice, a.s., it is the second most important market crop in the firm.

## REFERENCES

- Balík J., Pavlíková D., Tlustoš P., Černý J., Jakl M. (2007): The fluctuation of copper content in oilseed rape plants (*Brassica napus L.*) after the application of nitrogen and sulphur fertilizers. *Plant Soil Environment*, 53: 143–148.
- Baranyak P., Fábry A. et al. (2007): Rape – Growing – Use – Economics (in Czech). Profi Press, s.r.o., Prague; ISBN 978-80-86726-26-7
- Diepenbrock W., Grosse F. (1995): Rapeseed (*Brassica napus L.*) physiology. In: Diepenbrock W., Becker H.C. (eds.): Physiological potentials for yield improvement of annual oil and protein crops. *Advances in Plant Breeding*, 17: 21–53.
- Fábry A. et al. (1992): Oil-plants (in Czech). 1<sup>st</sup> ed. Ministry of Agriculture CR, Prague; ISBN 80-7084-043-9.
- Foltýn I., Kopeček P., Zedníčková I., Vávra V. (2009): Profitability development of key Czech agricultural commodities in the period 2002–2006. *Agricultural Economic – Czech*, 55: 181–199.
- Komberec S. (2000): Economics of rape growing (in Czech). In: Collection of papers from the 17<sup>th</sup> Evaluation Workshop System of Rape Production and System of Sun-flower Production (in Czech). Hluk, SPZO, Prague.
- Markytán P. (2009): Results of rape growing in the Czech Republic in 2008/2009 (in Czech). In: Collection of papers from the 26<sup>th</sup> Evaluation Workshop System of Rape Production and System of Sun-flower Production (in Czech). Hluk, SPZO, Prague, pp. 182–188.
- Nerad D., Škeřík J., Kazda J., Kuchtová P., Baranyak P. (2009): Potential of line varieties of winter oilseed rape within organic growing technology. *Scientia Agriculture Bohemica*, 40: 1–5.
- Novák J., Janotová B. (2009): Results of rape growing in the Czech Republic in 2008/2009 (in Czech). In: Collection of papers from the 26<sup>th</sup> Evaluation Workshop System of Rape Production and System of Sun-flower Production (in Czech). Hluk, SPZO, Prague, pp. 189–193.
- Nozdravický L., Rataj V. (2001): Price comparison of two way of winter rape treatment (in Polish). In: Problemy inżynierii rolniczej na progu III tysiąclecia: Technika – Środowisko Człowiek: XXX lecie Instytutu Inżynierii Rolniczej Akademii Rolniczej u Szczecinie, Poligrafia Akademii Rolniczej, pp. 208–212.
- Schjoerring J. K. et al. (1995): Nitrogen incorporation and remobilization different shoot components of field-grown winter oilseed rape (*Brassica napus L.*) as affected by rate of nitrogen application and irrigation. *Plant and Soil*, 177: 225–264.
- Součková H. (2006): Rape methyl-ester as a renewable energy resource in transport. *Agricultural Economic – Czech*, 52: 244–249.
- Vaněk V. a kol. (2002): Nutrition and Fertilization of Field and Garden Crop-plants (in Czech). 3<sup>rd</sup> ed. CUA, Prague.
- Vašák J. (2000): Oilseed rape (in Czech). In: Vašák et al. (2000): Řepka. Agrospoj, Prague, pp. 9–31.
- Volf M. (2005): Results of rape growing in the Czech Republic in 2004/2005 (in Czech). Collection of papers from the 22<sup>th</sup> evaluation workshop Evaluation Workshop System of Rape Production and System of Sun-flower Production (in Czech). Hluk, SPZO, Prague, pp. 3–20.
- Zukalová H. (2000): Winter rape quality and breeding (in Czech). In: Vašák et al. (2000): Řepka. Agrospoj, Prague, pp. 60–78.

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