POROVNÁNÍ NÁKLADŮ VÝROBY ŘEPKY OLEJNÉ V PROVOZNÍCH OBLASTECH ČESKÉ REPUBLIKY

COMPARISON OF COSTS OF OILSEED RAPE PRODUCTION IN PROCESS AREAS OF THE CZECH REPUBLIC

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Anotace:

Příspěvek se zabývá náklady na výrobu semen řepky olejné ve výrobních oblastech České republiky. Sledování a hodnocení přímých nákladů je velice důležité, neboť úroveň nákladů vůči prodejní ceně rozhoduje o rentabilitě dané komodity. Cílem příspěvku je poukázání na hlavní nákladové položky přímých nákladů na výrobu řepkových semen a jejich ekonomické hodnocení. Byla využita kalkulace nákladů na jednotku řepky olejné.

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Klíčová slova:

Přímé náklady, kalkulace nákladů, řepka olejná, provozní oblast

Summary:

This article deals with costs of oil seed rape production in production areas of the Czech Republic. Monitoring and evaluating prime costs are of significant importance. Costs level in relation to the realization price decides about profitability of the commodity. The objective of this contribution is to evaluate the main items of the prime costs connected to oil seed rape production. Cost calculation per unit of oilseed rape production was used.

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Key words:

Direct costs, cost calculation, oilseed rape, process area.

INTRODUCTION

Oilseed rape is cultivated on 16 % of the Czech arable soil. It is suitable to cultivate it in both the lowlands and also higher altitudes (around 700 meters above the sea level). The best conditions for oilseed rape are in places with annual temperature average around 8 $^{\circ}$ (6.5 – 8.5 $^{\circ}$ C) and with annual downfall's of 500 – 750 mm. [6] Potatoes and beet producing areas fairly correspond with these conditions.

Oilseed rape has the highest quality, yield and there are fewer risks of production in the potatoes producing area, while it has all of the needed inputs. The absolute yield in the fertile regions of lowlands (in the beet and corn producing areas) is lower than in the highlands. The lowlands are at risk of insect pest, illnesses, and droughts during the season of sowing and frosts. Nevertheless, growing of oilseed rape in lowlands has its benefits such as a very good value of oilseed rape as a preceding crop for successive wheat and its ability to fertilize the land.

The prime goal of a business in a market economic system is to achieve profit. An observation and evaluation of direct costs are of great importance, because the cost's level in relation to the market prices determines the profitability of the commodity. The benchmark of success in oilseed rape growing is the proportion of costs per unit of production to market prices. From this point of view, oilseed rape is one of the financially most interesting crops.

OBJECTIVES AND METHODS

The aim of this paper is to compare and evaluate the total costs of the main product of oilseed rape in the producing areas of the Czech Republic during the period of 1999 – 2003. The trends of the total costs of the main product per unit were also analysed and the structure of its components was explored as well.

The total costs of the main product were identified on the basis of the following calculation pattern [1]:

1. total direct material costs, of this:
   - seeds purchased,
   - seeds produced on the farm,
   - fertilizers purchased,
   - fertilizers produced on the farm,
   - crop protection,
   - other direct material;

2. other direct costs and services;
3. labour costs - wages;
4. depreciation;
5. machinery costs;
6. overheads;
7. total costs;
8. share of main product;
9. yield of main product;
10. costs of main product.

To achieve the stated goal the method of index analysis was used (calculation of basic and chain indexes). Basic indexes are indexes with fixed base number (a monitoring indicator during ` $k$ ` period - q_k). Time-comparing indicator - q_j. The row of indexes arises as follows:

$$I_{j/k} = \frac{q_j}{q_k}.$$

Chain indexes have a variable base number. By means of the chain indexes it is possible to compare indicators of each period with their value during the previous period. The row of indexes arises as follows:

$$I_{j/j-1} = \frac{q_j}{q_{j-1}}.$$

Regression analysis was used for trend description, in particular, linear trend function, which arises from the general form:

$$y_i = bx_i + a;$$

where y_i is fitted value of data in time series according to the trend;

a is absolute term (constant);
b is regression coefficient;
x_i is number of time- sequence.

For each function determination coefficient (R^2) was calculated. It shows how the function fits to the data in time-series. [2]

RESULTS

The Czech Republic is usually divided into five producing areas. For the purposes of this paper two of them (with the smallest share on the oilseed rape production) were assigned to other process areas. The resulted areas are the following: Corn and Beet, Potatoes, Potatoes-oats and Mountain areas.

Corn and Beet Process Area

Table No. 1 shows the cost calculations of the corn and beet process areas. It is obvious, that the total direct material costs are the highest costs components of the region in long-term. Of this, crop protection costs and fertiliser costs owe to the most important components. Labour costs and other important other direct costs and service costs have also an important role in this process area.

Table No. 1 shows, that oilseed rape production has never been profitable during the monitored period. The costs of the main product were higher than the average market prices. For example, the costs in 2003 were higher than the market price by 60 %!

Table No. 1: Costing in Corn and Beet process area (CZK.t^{-1})

Indicator	Unit	1999	2000	2001	2002	2003
Total direct material costs	CZK.ha^{-1}	6 449	7 230	8 129	9 682	8 602
Of this - seeds purchased	CZK.ha^{-1}	388	591	708	761	1 051
- seeds produces on the farm	CZK.ha^{-1}	44	10	8	25	26
- fertilisers purchased	CZK.ha^{-1}	2 684	2 872	3 442	4 018	2 736
- fertilisers produced on the farm	CZK.ha^{-1}	373	344	254	239	478
- crop protection	CZK.ha^{-1}	2 924	3 293	3 605	4 499	4 281
- other direct material	CZK.ha^{-1}	34	119	113	141	31
Other direct costs and services	CZK.ha^{-1}	2 200	2 325	2 432	2 380	2 165
Labour costs - wages	CZK.ha^{-1}	2 693	2 519	2 855	2 818	2 949
Machinery costs	CZK.ha^{-1}	2 294	2 461	2 131	1 930	1 631
Overheads	CZK.ha^{-1}	2 861	2 731	2 372	2 407	1 610
Total costs	CZK.ha^{-1}	16 496	17 268	18 728	20 021	17 608
Yield of main product	t.ha^{-1}	2,83	2,66	2,80	2,39	1,54
Costs of main product	CZK.t^{-1}	**5 824**	**6 497**	**6 681**	**8 393**	**11 416**
Average market price	CZK.t^{-1}	5 471	6 228	6 428	5 868	7 004

Source: Sine Farm Accountancy Data Network (FADN) by individual farms. Research Institute of agricultural Economics, Prague, 1.6.2005, http://www.vuze.cz/EN

Potatoes Process Area

Table No. 2 shows cost calculation for the Potatoes process area. Also in this process area the total direct material costs are the most important cost components in long-term, of this crop protection and the purchased fertilisers. The labour costs are also important cost components.

Analyzing the table it is evident, that oilseed rape production of this process area was rentable during the first years of the monitored period (1999 – 2001). Between the year 2002 and 2003 the costs of the main product were higher than the market prices. This situation was caused by unfavourable weather conditions during these two years. The weather had a fundamental influence on the oilseed rape production in the Czech Republic.

Table No. 2: Costing in Potatoes process area (CZK.t^{-1})

Indicator	Unit	1999	2000	2001	2002	2003
Total direct material costs	CZK.ha^{-1}	6 308	6 480	7 928	9 215	8 396
Of this - seeds purchased	CZK.ha^{-1}	259	342	444	637	865
- seeds produces on the farm	CZK.ha^{-1}	25	34	30	33	23
- fertilisers purchased	CZK.ha^{-1}	2 775	2 677	3 593	4 014	3 111
- fertilisers produced on the farm	CZK.ha^{-1}	279	369	359	361	487
- crop protection	CZK.ha^{-1}	2 688	2 907	3 392	4 080	3 855
- other direct material	CZK.ha^{-1}	282	152	110	89	55
Other direct costs and services	CZK.ha^{-1}	2 075	2 002	1 633	1 773	1 712
Labour costs - wages	CZK.ha^{-1}	2 318	2 594	2 481	2 948	2 580
Machinery costs	CZK.ha^{-1}	2 121	2 527	1 937	2 142	1 827
Overheads	CZK.ha^{-1}	2 793	2 584	2 158	2 589	2 014
Total costs	CZK.ha^{-1}	15 617	16 192	16 917	19 551	17 336
Yield of main product	t.ha^{-1}	2,88	2,95	3,01	2,45	1,65
Costs of main product	CZK.t^{-1}	**5 425**	**5 490**	**5 619**	**7 984**	**10 509**
Average market price	CZK.t^{-1}	5 450	6 046	6 537	5 923	7 308

Source: Sine Farm Accountancy Data Network (FADN) by individual farms. Research Institute of agricultural Economics, Prague, 1.6.2005, http://www.vuze.cz/EN

Potatoes-Oats and Mountain Process Area

Table 3 shows the costs calculation of the Potatoes-oats and Mountain process area. The total direct material costs represent the most important costs components of this area in long-term (crop protection and the purchased fertilisers). The labour costs are also other important cost components. The labour costs, other direct costs and service costs are also important components in this process area.

From Table No. 3 it is also obvious, that the areas` oilseed rape production were profitable also during the first years of the monitored period (1999 – 2001). Between years 2002 and 2003 the costs of the main product were again higher than the average market prices.

Table No. 3: Costing in Potatoes-oats and Mountain process area (CZK.t^{-1})

Indicator	Unit	1999	2000	2001	2002	2003
Total direct material costs	CZK.ha^{-1}	5 470	5 595	6 746	7 914	7 600
Of this - seeds purchased	CZK.ha^{-1}	270	304	774	569	797
- seeds produces on the farm	CZK.ha^{-1}	49	34	35	26	49
- fertilisers purchased	CZK.ha^{-1}	2 442	2 246	2 599	3 166	3 015
- fertilisers produced on the farm	CZK.ha^{-1}	409	338	336	236	340
- crop protection	CZK.ha^{-1}	2 103	2 421	2 753	3 691	3 247
- other direct material	CZK.ha^{-1}	197	251	248	227	151
Other direct costs and services	CZK.ha^{-1}	2 109	1 938	2 068	1 983	2 268
Labour costs - wages	CZK.ha^{-1}	2 317	1 979	2 190	2 594	2 258
Machinery costs	CZK.ha^{-1}	1 962	1 770	1 610	1 598	1 669
Overheads	CZK.ha^{-1}	2 411	2 282	1 782	2 254	1 841
Total costs	CZK.ha^{-1}	14 272	13 574	15 026	17 080	16 373
Yield of main product	t.ha^{-1}	2,81	2,75	2,77	2,25	1,58
Costs of main product	CZK.t^{-1}	**5 086**	**4 933**	**5 428**	**7 599**	**10 341**
Average market price	CZK.t^{-1}	5 513	6 316	6 534	5 917	7 046

Source: Sine Farm Accountancy Data Network (FADN) by individual farms. Research Institute of agricultural Economics, Prague, 1.6.2005, http://www.vuze.cz/EN

Costs of Main Product

Table No. 4 shows the development of the costs of the main product during the period of two years 1999 – 2003 including the before mentioned basic and chain indexes. It can be seen that the costs of the main product are the lowest in Potatoes-oats and Mountain process areas in long-term. It is according to the localized background of oilseed rape production. The highest costs of the main product are in the Corn and Beet process area.

**Table No. 4: Costs of main product in all process areas in the Czech Republic**

Costs of Main Product (CZK.t^{-1})	1999	2000	2001	2002	2003
Corn and Beet Process Area	**5 824.00**	**6 497.00**	**6 681.00**	**8 393.00**	**11 416.00**
Basic Index (%)	100.00	111.56	114.71	144.11	196.02
Chain Index (%)	100.00	111.56	102.83	125.62	136.02
Potatoes Process Area	**5 425.00**	**5 490.00**	**5 619.00**	**7 984.00**	**10 509.00**
Basic Index (%)	100.00	101.19	103.58	147.17	193.71
Chain Index (%)	100.00	101.19	102.35	142.09	131.63
Potatoes-Oats and Mountain Process Area	**5 086.00**	**4 933.00**	**5 428.00**	**7 599.00**	**10 341.00**
Basic Index (%)	100.00	96.99	106.72	149.41	203.32
Chain Index (%)	100.00	96.99	110.03	139.99	136.08

Source: own calculation

The costs of the main product of oilseed rape are still increasing (see Chart No. 1). This is well documented by using calculations of basic and chain indexes (see Table No. 4).

The base for the basic indexes is year 1999. At the beginning of the monitored period (2000, 2001) the costs showed only a slow increase. During the year 2000 the cots of the main product per unit even mildly decreased in comparison to 1999 in Potatoes-oats and Mountain process areas (but not in other regions). The year 2002 shows a general increase of costs of the main product in comparison to 1999 by about 45 – 50 %. During the year 2003 the costs of the main product has already doubled compared to the 1999.

From the chain indexes calculation it is obvious, that the highest increase of the costs of the main product per unit in the Czech Republic was found between the years 2001-2002 and 2002, 2003 (in both cases by about 30 – 40 %).
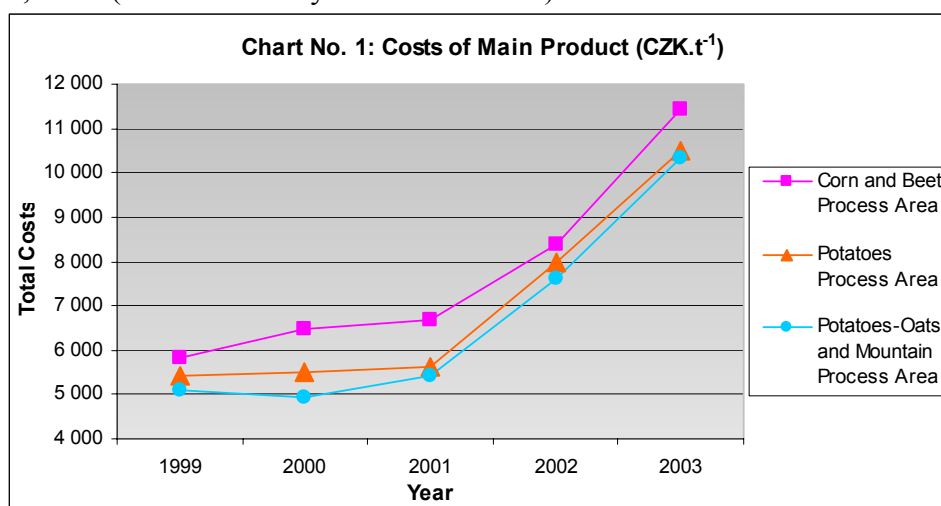
Source: Sine Farm Accountancy Data Network (FADN) by individual farms. Research Institute of agricultural Economics, Prague, 1.6.2005, http://www.vuze.cz/EN

By means of regression analysis the specification of linear functions has been determined. These functions show the main trend of the costs of the main product per unit in all process areas. The determination coefficient is relatively high, which means, that it fairly

describes the real situation. Table No. 5 shows analytical shapes of linear trend functions and their determination coefficients.

Table No. 5: Trend analysis of costs of main product

Process Area	Trend function	R^2
Corn and Beet Process Area	y' = 1.308x + 3.8382	0.8438
Potatoes Process Area	y' = 1.2662x + 3.2068	0.8037
Potatoes-Oats and Mountain Process Area	y' = 1.3176x + 2.7246	0.8110

Source: own calculation

DISCUSSION

Substantial increase of the oilseed rape area has unfavourably affected its regionalisation, which has an important influence on the quality and costs of the production. The extent of oilseed rape area has been increasing throughout the Czech Republic. This expansion is relatively faster in the lowlands Polabí, Haná and southern Moravia. The highlands on the border of the Czech Republic and in Moravia (Českomoravská Vysočina) represent the regional centre of the oilseed rape production. Oilseed rape production in this area is indeed well-founded. There is no competitor to oilseed rape after the decrease of potatoes and fodder plants areas. The second main region is Haná. However, this region is much more suitable for intensive grain growing. In this region oilseed rape represents an excellent preceding crop for wheat, but there is a possibility of its successful replacement by growing peas.

The best quality of oilseed rape (i.e. unctuosity) is usually achieved at higher altitudes (from the sea level for growing potatoes to Mountain process area). From the agronomic and economic point of view, there are also some less suitable areas for the oilseed rape production, for example:

- the areas of storm shade of Krušné hory (highly suitable for mustard);
- the areas around Moravian rivers, the region of Haná, Polabí and lower Povltaví (suitable for sunflower);
- other corn process areas (suitable for sunflower).

In these places the oilseed rape production is desirable only as an excellent foregoing crop for alimentary wheat and for reclamation (in areas with manure deficit).

There is no possibility for further expansion of the extent of oilseed rape growing areas; therefore the only way to raise its production in the Czech Republic is only by means of yield increase – intensification of production.

CONCLUSIONS

All purposeful production, not only agricultural, has to be economical and should result in profit creation, alternatively in minimalization of loss. Therefore, attention should be paid to monitoring and observance of agro technical rules and to removing the principal causes of yield decreases. These causes vary from region to region. Lower costs can be reached through cutdown of the input costs, service and indirect costs. Another important decision affects the intensity of production. Too high inputs into intensive technology of rapeseed production can negatively influence the economic results of agricultural business. From a long-term point of view, extensive rapeseed growing can also be hazardous, considering the risk of various diseases and spread of insects.

From the recent development of agricultural production is evident that the current period is characterized by economic instability. The input prices reflect the costs of production, regardless the influence of producers. The input and output costs are influenced by the market environment and by the weather and the extent of adherence to technological rules on the other hand. Rapeseed oil is characterized by favourable economics of production

while good yields of it are reached. The Czech market prices practically reach the level of world market prices. It is presumable, that this dependence will determine the profitability of rapeseed production in the Czech Republic also in the future.

REFERENCES
[1] ROSOCHATECKÁ, E. *Ekonomika podniků*. Praha : PEF ČZU v Praze, 2001. ISBN 80 – 213 – 0770 – 6.
[2] SEGER, J., HINDLS, R., HRONOVÁ, S. Statistika pro ekonomy. Praha: Professional Publishing, 2003. ISBN 80 – 86419 – 34 - 7.
[3] *Situační a výhledová zpráva Olejniny*. Praha : MZe ČR, 2004. 36 s. ISBN 80-7084-258-X.
[4] Sine Farm Accountancy Data Network (FADN) by individual farms. Research Institute of Agricultural Economics, Prague, 1.6.2005, http://www.vuze.cz/EN.
[5] VANČUROVÁ, P. Factors Underlying the Profitability in the Rapeseed Production. *Collection of papers of international scientific conference – Agrarian Prospects XIII*. Prague : FEM CUA, 2004. 6 p. ISBN 80 – 213 – 1190 – 8.
[6] VAŠÁK, Jan aj. Systém výroby řepky. Česká a slovenská pěstitelská technologie ozimé řepky pro roky 1997-1999. Praha : Svaz pěstitelů a zpracovatelů olejnin, 1997. 115 s.

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