THE EFFICIENCY MATRIX AS TOOL FOR EFFICIENCY EVALUATION OF FARMS IN V4 COUNTRIES

Jana Miklovičová – Silvia Miklovičová

Abstract

Company efficiency is desirable relation between produced outputs and inputs which company uses in production process. In the paper we deal with compilation of efficiency matrix with chosen economic indicators. These indicators create inputs and outputs. One part of the paper will be analysing of indicators of farms in V4 countries. Followed period are years 2004 -2009. Favourable values of outputs we observed in Hungarian farms in 2008 and in other V4 countries was favourable year 2007. Farms in Slovakia as the only one of the V4 countries reached mainly loss in followed period. This situation had negative impact on all indicators which are in relation with net income. Efficiency indicators reached the lowest values in farms SR. The best results achieved farms in Poland. The values of all analysed inputs and outputs of efficiency matrix are lowest in comparison with other V4 countries.

Key words: efficiency matrix, economic indicators, farms, V4 countries

JEL Code: Q 12, Q 14, M 21

Introduction

Business processes transform inputs of all types into outputs, according to guidance (policies, rules), employing reusable resources of all types (Burlton, 2005). The aim of company is to maximize outputs with minimal inputs. Efficiency matrix is correlation between selected business inputs and its outputs. It is created of four quadrants. Efficiency is higher with higher indicator values of the first quadrant (there are efficiency indicators) and with lower indicator values of the fourth quadrant (performance indicators).

1 Development of indicators of efficiency matrix in V4 countries

The year 2004 was very important for V4 countries because of their entrance to the European Union. The matrix efficiency is created from inputs, which are: costs, personal costs,

agricultural land in ha and rent land. Outputs in our matrixes create: earning after taxes, value added and production. The data source is FADN – Farm Accounting Data Network.

1.1 Development of efficiency in Czech Republic

From the point of view of efficiency the first quadrant of matrix efficiency is very important because of relation between outputs and inputs. The efficiency is arguable where during the followed period is noticed the growth in this quadrant. The land market in Czech Republic got stronger after the entrance to the European Union and it had positive impact on the land sale in ownership of state and on the support of land buy from sources GRLF. The reached profit of farmers in 2004 in the amount of 26 601 € per hectare of agricultural land positive influenced the indicators of profitability. Farms reached the profitability of costs around 9,4%, profitability of personal costs 48,4%. From one hectare of land the Czech farms produce 106,374 € of profit and from one hectare of rent land produce about 9,575 € of profit more. From the reason of favourable weather the positive development had the indicator of production. On one euro of costs hit on 0,973 € of production and 0,32 € of value added. On one hectare of rent land hit on more euros of production and value added as on euro of agricultural land.

Tab.1: Efficiency matrix in Czech Republic in 2004

Indicators	Profit	Production	Value added	Costs	Agric.area	Rented area	Person.costs
Costs	0,094	0,973	0,320	1	0,001	0,001	0,194
Agric.area	106,374	1100,536	362,335	1131,603	1	0,917	219,742
Rented area	115,949	1199,595	394,948	1233,458	1,090	1	239,521
Person.costs	0,484	5,008	1,649	5,150	0,005	0,005	1
Profit	1	10,346	3,406	10,638	0,009	0,009	2,066
Production	0,097	1	0,329	1,028	0,001	0,001	0,200
Value added	0,294	3,037	1	3,037	0,003	0,003	0,606

Source: own calculation, FADN

In next years the efficiency indicators reached decreasing trend which was influenced by decreasing of chosen outputs. The year 2007 was important for Czech farms because in this year they started to apply the tools of CAP for 2007 – 2013. The reached results were positive influenced by supports and favourable price development. In 2007 the Czech farms reached the highest values of outputs from followed years. The profit in amount 39 184 € had positive impact on profitability of costs which reached the value 12% and profitability of personal costs 63,3%, profitability of production 13% and profitability of value added 35,2%. From

one hectare of land the Czech farms produced 165,431 € of profit and from one hectare rent land it was about 188,303 € more. The positive results we remarked in the relation to the value added too when on one euro of costs hit on 0,341 € of value added. Similar the highest values from followed years were remarked from hectare of agricultural land and rent land. The indicators of performance – the last quadrant should reach decreasing trend and this trend is unbroken in 2007, all indicators decreased opposite followed previous years.

Tab.2: Efficiency matrix in Czech Republic in 2009

Indicators	Profit	Production	Value added	Costs	Agric.area	Rented area	Person.costs
Costs	0,022	0,789	0,238	1	0,001	0,001	0,183
Agric.area	30,306	1102,834	332,714	1397,420	1	0,856	255,626
Rented area	35,408	1288,493	388,725	1632,671	1,168	1	298,659
Person.costs	0,119	4,314	1,302	5,467	0,004	0,003	1
Profit	1	36,390	10,978	46,110	0,033	0,028	8,435
Production	0,027	1	0,302	1,267	0,001	0,001	0,232
Value added	0,091	3,315	1	4,200	0,003	0,003	0,768

Source: own calculation, FADN

In 2009 majority of indicators of Czech farms decreased opposite 2004. This aspect was caused by business crises when 2009 is considered as the worst year in operating from 1993. Farms reached the profit but its value was the lowest from the followed 6 years period (7 025 €). Cost profitability decreased for this period about 77%, decreased tendency had the profitability of personal costs where was remarked the fall about 75 %. The share of profit on agricultural land and rent land decreased markedly what represents the fall opposite 2004 about 76 – 80 € per hectare. From 100 € of costs were created 79 € of production and 24 € of value added. From one hectare of agricultural land was produced more than 2,298 € as in 2004. Other increase was shown by the share of production on hectare rent land (increase about 88,898 €/ha). Share of value added on the agricultural land and rent land decreased what was caused by the lowest value of indicator value added which reached 77 123 €. From the point of view of input relation we register by Czech farms the growth of costs per hectare of agricultural land and rent land too. Share of land rent on total agricultural land decreased about 6,1%. The decrease was shown by the share of personal costs on total costs about 1,1%. Profitability of production decreased about 0,07 € and the similar development reached the profitability of value added too (decrease about 20,3%). The indicators of performance should be lower but except of share of total agricultural land and rent land on production and value

added which stayed the same as in 2004, we register increase trend by all others indicators of the last quadrant of matrix efficiency. It means not efficiency development.

1.2 Development of efficiency in Slovak Republic

The adoption of the CAP had a positive impact on the growth of the off-market and total income but at the same time, its production efficiency decreased and the production structure has changed (Chrastinová, Burianová, 2012). By analyse of efficiency indicators in the Slovak Republic the indicators to relation to profit reached negative results which were influenced by the reached loss for farms in Slovakia in amount – 8 266€. From 100 € of costs the farms in SR produced 2 € of loss and on 100 € of personal costs hit on 13,7 € of loss. On 100 € of costs hit on 87,6 € of production and 16,3 € of value added what is with comparison of other V4 countries the lowest value. From one hectare of land rent the farms produced more about 3,7% of production and value added from total agricultural land.

Tab.3: Efficiency matrix in Slovakia in 2004

Indicators	Profit	Production	Value added	Costs	Agricult.area	Rented area	Personnel costs
Costs	-0,020	0,876	0,163	1	0,001	0,001	0,145
Agricult.area	-15,667	690,480	128,548	788,461	1	0,964	114,230
Rented area	-16,249	716,119	133,322	817,739	1,037	1	118,472
Personnel costs	-0,137	6,045	1,125	6,902	0,009	0,008	1
Profit	1	-44,072	-8,205	-50,326	-0,064	-0,062	-7,291
Production	-0,023	1	0,186	1,142	0,001	0,001	0,165
Value added	-0,122	5,371	1	6,134	0,008	0,008	0,889

Source: own calculation, FADN

The not favourable year for Slovak farms was 2006 when farms reached the loss in amount 89 558 €. This loss had negative impact on all indicators which are connected with earning after taxes. The efficiency indicators decreased opposite last two years and in the relation of inputs to production and value added reached their highest minimums. Value added decreased on 12 979 € and decreasing was the value of production too on 338 643 €. 2007 was positive for Slovak farms because of the second wave of paid supports as in the Czech Republic. Slovak farms reached the profit 11 830 € which had positive impact on the efficiency indicators.

Tab.4: Efficiency matrix in Slovakia in 2009

	Profit	Production	Value added	Costs	Agricult.area	Rented area	Personnel costs
Costs	-0,162	0,564	0,036	1	0,001	0,001	0,182
Agricult.area	-195,874	682,072	44,125	1210,274	1	0,961	220,488
Rented area	-203,893	709,996	45,931	1259,822	1,041	1	229,514
Personnel cosi	-0,888	3,093	0,200	5,489	0,005	0,004	1
Profit	1	-3,482	-0,225	-6,179	-0,005	-0,005	-1,126
Production	-0,287	1	0,065	1,774	0,001	0,001	0,323
Value added	-4,439	15,458	1	27,428	0,023	0,022	4,997

Source: own calculation, FADN

The financial and economic crisis which has recently slowed down the development of growth of the national economy has also influenced the Slovak agri-food business (Grznár, Szabo, 2012). Slovak farmers reached the highest amount of loss – 112 557 € from all followed years. The cost profitability after influence by not positive profit was deeper, Slovak farms produced on 100 € costs 16,2 € of loss, what is in comparison with 2004 increase about 14,2%. Similar trend had the profitability of personal costs which unfavourable value increased about 75,1%. The reason of this negative results was the higher amount of personal costs (126 701 €). On one hectare of agricultural land hit on 196 € of loss what is in comparison with 2004 cavity about 180,207 €. Similar negative trend we registered by the share of profit per hectare of rent land. From 100 € of costs produced the farms less euros of production as in 2004. From one hectare of they produced about 8,408 € of production and about 84,423 € of value added. The similar trend reached the share of production and value added and rent land. Personal costs created from total costs around 18% it means growth about 3,7% influenced by increasing of personal costs about more than half.

1.3 Development of efficiency in Poland

Terrain formation, soil and climate conditions determine the type and effectiveness of agricultural production. The soils of average to poor agricultural quality dominate in Poland. The quality of utilised agricultural area is rather poor as evidenced by a relatively low soil

quality index. Between V4 countries the Polish farms reached the most positive values of efficiency indicators. Relatively high amount is evidenced by the profitability of value added 84,4%. From 100 € of costs the Polish farms produced 127,7 € of production, 45,2 € of value added and 38,1 € of profit. From the point of view of land rent accrued to hectare of rent land about 2 808 € of production more and 993 € of value added more as from hectare of total agricultural land. From one euro of personal costs the farms produced 10 € of profit, 33,512 € of production and 11,85 € of value added what are the highest amounts from V4 countries which accrued to one euro of personal costs. This vale is influenced by the lowest amount of personal costs as in other countries.

Tab.5: Efficiency matrix in Poland in 2004

	Profit	production	Value added	Costs	Agricult.area	Rented area	Personnel costs
Costs	0,381	1,277	0,452	1	0,001	0,0003	0,038
Agricult.area	400,991	1343,593	475,099	1051,982	1	0,324	40,092
Rented area	1238,980	4151,429	1467,959	3250,408	3,090	1	123,878
Personnel costs	10,002	33,512	11,850	26,239	0,025	0,008	1
Profit	1	3,351	1,185	2,623	0,002	0,001	0,100
Production	0,298	1	0,354	0,783	0,001	0,001	0,030
Value addend	0,844	2,828	1	2,214	0,002	0,001	0,084

Source: own calculation, FADN

For Polish farmers was year 2007 successful. Significant improvement of incomes in agriculture, still much lower than in EU 15 countries, is mainly due to introduction of direct payments and higher prices in production (Florianczyk, 2005). In this year the polish farms reached the most positive values of efficiency indicators. The profitability of costs increased about 9,3 % opposite 2004 and similarly the profitability of production increased about 6,3%. From the point of view of all analysed outputs were registered the highest amounts of profit (9 868 €), production (27 346 €) and value added (11 676 €).

Tab.6: Efficiency matrix in Poland in 2009

Indicators	Profit	Production	Value added	Costs	Agricult.area	Rented area	Personnel costs
Costs	0,333	1,094	0,420	1	0,001	0,0003	0,060
Agricult.area	365,082	1200,055	460,328	1096,995	1	0,286	65,738
Rented area	1277,438	4199,044	1610,707	3838,432	3,499	1	230,019
Personnel cost	5,554	18,255	7,002	16,687	0,015	0,004	1
Profit	1	3,287	1,261	3,005	0,003	0,001	0,180
Production	0,304	1	0,384	0,914	0,001	0,001	0,055
Value added	0,793	2,607	1	2,383	0,002	0,001	0,143

Source: own calculation, FADN

Opposite the most effective year 2007 we registered the decrease in 2009. From the point of view of related outputs to inputs we evidenced the decrease by majority of indicators of first quadrant what we can consider as not effective development and the similar situation is registered in the last quadrant of matrix efficiency too. We registered the not positive increase of all indicators of performance opposite 2004.

1.4 Development of efficiency in Hungary

Year 2004 was significant for Hungary too. Crop cultivation brought profit and reached good production results. Of 100 € of costs the Hungarian farms gained 11 € of profit, around 96 € of production and 31 € of value added. From one hectare of agricultural land Hungarian farms produced 128 € of profit. The share of outputs hit on the hectare of rent land is higher as than share of outputs on the total agricultural land.

Tab.7: Efficiency matrix in Hungary in 2004

Indicators	Profit	Production	Value added	Costs	Agric.area	Rented are	Person.costs
Costs	0,112	0,955	0,311	1	0,001	0,001	0,131
Agric.area	128,073	1089,797	355,102	1140,851	1	0,682	149,077
Rented area	187,904	1598,905	520,991	1673,810	1,467	1	218,719
Person.costs	0,859	7,310	2,382	7,653	0,007	0,005	1
Profit	1	8,509	2,773	8,908	0,008	0,005	1,164
Production	0,118	1	0,326	1,047	0,001	0,001	0,137
Value added	0,361	3,069	1	3,213	0,003	0,002	0,420

Source: own calculation, FADN

In the next followed years the chosen inputs and outputs increased and the most positive was the year 2008 in comparison of inputs and outputs. This year was influenced mainly by production and increasing export which had positive impact of farmer`s income. Crop production had outstandingly good crop yields coupled with good average selling prices. In this year all analysed indicators reached the highest amounts. The Hungarian farms reached profit in amount of 16 244 €, the value of production grew up on 82 240 € and we registered the increase by value added in amount of 30 730 €. This positive trend was influenced by quantified values of efficiency indicators which were the highest from followed years and influenced the value of performance indicators too. The performance indicators reached required decreasing trend.

Tab.8: Efficiency matrix in Hungary in 2009

	Profit	Production	Value added	Costs	Agricult.area	Rented area	Personnel costs
Costs	0,121	0,889	0,289	1	0,001	0,001	0,124
Agricult.area	144,696	1063,326	346,017	1196,640	1	0,642	148,301
Rented area	225,404	1656,425	539,018	1864,099	1,558	1	231,020
Personnel cosi	0,976	7,170	2,333	8,069	0,007	0,004	1
Profit	1	7,349	2,391	8,270	0,007	0,004	1,025
Production	0,136	1	0,325	1,125	0,001	0,001	0,139
Value added	0,418	3,073	1	3,458	0,003	0,002	0,429

Source: own calculation, FADN

Business crises had impact on Hungarian agriculture too which is shown in the decreasing values of analysed outputs. Profit decreased about 52%, value added about 40% and total production about 32%. By comparison of first and the last year was shown increase but just by comparison of profit with inputs. In the last quadrant of matrix efficiency was registered the decrease opposite 2004 just by comparison of inputs to profit.

Conclusion

In the first quadrant is in Poland from V4 countries the highest share of output per hectare of land rent and per hectare of total area. The reason is that in Poland was the amount of total utilised area in average around 17 hectares what is around 38 times less than the total utilised area in Slovakia. The similar trend is quantified in matrix efficiency by the relation of outputs to personal costs where the values in Poland are above the values of other countries V4. Average value of personal costs in polish farms is 1 026 € what is for instance in comparison with Slovak farms 97 times lower value. From the point of view of the second quadrant we can say that in all farms of V4 countries the land area accrue to 100 € of costs were 0,1 hectare. The same trend was shown by land rent on 100 € of costs too except of Poland where on 100 € of costs accrued less than 0,03 hectare of land rent. The share of personal costs on total costs was the highest in Czech farms and it was in average 19 % and the lowest in Polish farms in average 5%. The share of land rent on utilised area was more than 90% in Czech and Slovak farms. From the point of view of the third quadrant the negative results are influenced by reached loss in Slovak farms. The most positive values of profitability of production and value added reached the farms in Poland where on 100 euros of production accrued 36,1 € of profit and on 100 € of value added 84,5 € of profit in 2007. On one euro of profit accrued the

highest share of production (43 €) and value added (12 €) in 2007 in Slovakia. In the fourth quadrant the Czech farms reached on 1 euro of profit around 46 € of costs, what is the highest amount from V4 countries. This value was influenced by overfull of profit in Czech farms in 2009 when the profit over fell about 4 times opposite the last year. On the base of quantified matrixes we can say that 2007 was successful for Poland, Slovakia and Czech Republic. In this year countries started to use financial support from the second package of European Union sources. Hungarian farms were positive influenced by revenues from crop production and export in 2008. From the point of view of total efficiency evaluation it is not kept the trend of increasing indicators of efficiency and decreasing indicators of performance in Poland, Slovakia and Czech Republic. In Hungary the relations between inputs and outputs shows the negative tendency of increasing efficiency indicators except the relations analysed by inputs and outputs to profit.

References

1. Burlton, R.T. Effective Business Transformation through Process Management. Business Rules Journal, Vol.6, No.7 (July 2005)
2. Coelli, T. – Rao, D.S.P. – Battese, G.E. An introduction to efficiency and productivity analysis. Kluwer Academic Publisher Boston. 275 p. ISBN 0-7923-8062-2
3. Florianczyk, Z. Impact of CAP instruments on level of agricultural incomes in Poland in first year of accession. Rural Development, 2005, Vol.2, p.67-69. ISSN 1822-3281
4. Grznár, M. – Szabo, Ľ. Disparities in the utilisation of production factors in the agriculture of Slovakia and of the European Union. Agricultural Economics Czech, 2012, Vol.58, p.49-55. ISSN 0139-570X
5. Chrastinová, Z. – Burianová, V. Economic efficiency of Slovak agriculture and its commodity sectors. Agricultural Economics Czech, 2012,Vol.58, Issue 2, p.92-99. ISSN 0139-570X
6. http://www.mpsr.sk/sk/index.php?navID=122
7. http://www.minrol.gov.pl/eng/content/view/full/18560
8. http://eagri.cz/public/web/mze/zemedelstvi/publikace-a-dokumenty/zelene-zpravy/
9. http://www.vm.gov.hu/main.php?folderID=1862

Contact

Jana Miklovičová
Slovak University of Agriculture, Faculty of Economics and Management, Department of Economics
Tr. A. Hlinku. 2, 949 76 Nitra, Slovakia
jana.miklovicova@uniag.sk

Silvia Miklovičová
Slovak University of Agriculture, Faculty of Economics and Management, Department of Economics
Tr. A. Hlinku 2, 949 76 Nitra, Slovakia
silva.miklovicova@gmail.com