Czech agriculture after the accession to the European Union – impacts on the development of its multifunctionality

České zemědělství po vstupu do Evropské unie – dopady na vývoj jeho multifunkčnosti

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Abstract: The article presents the evaluation of multifunctionality of Czech agriculture and its individual farm categories in the period of 2003– 2005. It compares the situation before and after the EU accession. The assessment is based on the set of indicators for the three elementary axes of multifunctionality: economic efficiency, relations to environment and relations to rural development. Applying the presented method of multi-criterion evaluation and during the period of 2003–2005 on average, the highest level of multifunctionality is found in the category of farms of physical persons with 101–300 ha (score 174) and the lowest level in the category of collective farms – cooperatives and joint stock companies (score about 115). However, compared with the pre-accession period, the collective farms show the highest growth of the score (by 17%) after the EU accession.

Key words: agriculture, multifunctionality, agricultural policy, farm categories

Abstrakt: Příspěvek hodnotí vývoj úrovně multifunkčního charakteru českého zemědělství a jeho jednotlivých kategorií farem za období 2003–2005. Porovnává situaci před a po vstupu ČR do EU. Relativní hodnocení v čase a mezi jednotlivými kategoriemi zemědělských podniků je založeno na množině indikátorů pro 3 základní osy multifunkčnosti: ekonomická výkonnost, vztah k životnímu prostředí, vztah k rozvoji venkova. V průměru let 2003–2005 podle představené metody vícekriteriálního hodnocení dosahují nejvyšší úrovně multifunkčnosti podniky fyzických osob se 101–300 ha (skóre 174) a nejnižší úrovně podniky z kategorie kolektivních farem – družstev a akciových společností (skóre kolem 115). V porovnání s předvstupním obdobím však úroveň multifunkčnosti vzrostla nejvíce u kolektivních farem (o 17 %).

Klíčová slova: zemědělství, multifunkčnost, zemědělská politika, kategorie zemědělských podniků

After the EU accession, the economic situation of Czech agriculture and almost all its farm categories has significantly improved. Compared with the pre-accession year 2003, the Net Value Added (NVA – income from production factors) per 1 worker (Annual Working Unit – AWU), it means the sources covering the costs on labour, land and capital, increased by nearly 60% in 2006. It is a consequence particularly of the increased supports to farms (doubled compared with the pre-accession period) and also – in spite of the continuing decrease of the Gross Agricultural Output – a relatively positive development of the terms of trade (relations between the farm gate prices and input prices).

Nevertheless, the question is, to what extent the multifunctionality of the Czech agriculture and its individual farm categories has been developing after the EU accession. It means, to what extent the increased supports to farms are converted also into a higher production of their positive externalities – public goods. The question is the main topic of the article.

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In part 1, the methodical approach to the evaluation of multifunctionality is presented, based on data publicly available (the Farm Accountancy Data Network – FADN-CZ, the State Agricultural Intervention Fund – SAIF). Part 2 presents the results of the evaluation of multifunctionality of Czech agriculture in the period of 2003–2005. The results are discussed in the final part, considering particularly the possible future changes of the EU Common Agricultural Policy (CAP).

MATERIAL AND METHODS

The methodical approach and modelling the evaluation of multifunctionality of agriculture has been developed and applied in more research projects under the EU 6th Framework Programme. There is a question e.g. of the project ENARPRI (European Network of Agricultural and Rural Policy Research Institutes – see Dwyer et al. 2005 and Doucha, Foltýn 2006) and also of the ongoing project SEAMLESS (System for Environmental and Agricultural Modelling; Linking European Science and Society). Economic aspects of multifunctionality in Czech agriculture are presented in Střeleček et al. (2006 and 2007). The impacts of structural supports for the Czech agriculture on regional development are studied in Boháčková, Hrabánková (2006).

In accordance with Cristoiu (2007) and utilising the findings from the above mentioned projects, multifunctionality of agriculture and its individual farm categories is evaluated by 3 main axes:

Axis I – Economic performance – sustainability
Axis II – Relations to environment
Axis III – Relations to rural development

The evaluation according to the three axes relates to the agricultural sector as one farm and to the following farm categories:

– cooperatives (COOPS)
– joint stock companies (JSC)
– other farms as legal entities (other LE)
– farms as physical entities up to 50 ha (PE 50)
– farms as physical entities with 51–100 ha (PE 51–100)
– farms as physical entities with 101–300 ha (PE 101–300)
– farms as physical entities with more than 300 ha (PE 300)

The selected farm categories reflect the specific Czech farm structure emerging during the transformation after 1989.

Indicators relating to each axis reflect directly or indirectly the level of multifunctionality of agriculture. On principle, the indicators come of public information sources, partly complemented with the normative coefficients. The public sources are represented by the data from the FADN-CZ and from the Ministry of Agriculture of the Czech Republic 2004– 006, complemented with the data of the SAIF on the real utilisation of agro-environmental programmes on farms. Understandingly, the link-up to the public information sources limits the set of indicators (the broader set of indicators see e. g. the OECD 1998). Particularly for individual farm categories, there is no possibility to apply some indicators, which are important especially for the assessment of their relations to rural development (e.g. the relations of farms to the development of human and social capital in rural areas, to the development of the rural infrastructure including recreation potentials, etc.). In spite of these limits, the applied set of indicators can be considered as a basis, which can be gradually enlarged in a further research and by special surveys and thus give a more precise evaluation.

Each indicator is characterised by the direction of its impact on multifunctionality. The positive sign (+) means: the higher the value of an indicator, the better the impact on multifunctionality. The negative sign (–) means: the higher the value of an indicator, the worse the impact on multifunctionality.

Each indicator is also characterised by its (political) weight in the scale 1–5: the higher the weight, the more importance for the evaluation of multifunctionality from the point of view of politicians. It is evident, that the attaching of weights to indicators can be influenced by a subjective position of evaluators, particularly by the position of policy makers. The weights applied in the article have to be considered as a rough estimation of the positions, based on the actual empirical experience.

The survey of the applied indicators is presented in Table 1. It is necessary to note, that the Net Value Added per worker (NVA/AWU; AWU = Annual Working Unit = a worker calculated by the FADN methodology) as an indicator for the assessment is used both in the Axis I with a lower weight and in the Axis III with a higher weight (as a source influencing the quality of life of agricultural workers, or agricultural households in rural areas, respectively).

The multi-criterial evaluation of multifunctionality of the Czech agriculture and its farm categories for the period of 2003–2005 is based on a relative approach, on relations among the farm categories including Czech agriculture as one farm:

The absolute value of a given indicator is adjoined to each farm category. The difference between the maximum and the minimum value of the indicator is determined:

$$D_i = I_i^{K\max} - I_i^{K\min}$$

where:
I = indicator
$i = 1, \ldots, n$
n = number of indicators
K = farm category $K = 1, \ldots, p$
p = number of farm categories

For each indicator and farm category, the ordinal value in the interval 0–5 (where 0 = the worst value; 5 = the best value, depending on the direction of the effect of an indicator) is calculated:

$$H_i^K = (I_i^K - I_i^{K\min})/(D_i/5)$$

for the indicators I_i ($i = 1, \ldots, n$) with the direction of effects "+", or

$$H_i^K = (I_i^{K\max} - I_i^K)/(D_i/5)$$

for the indicators I_i ($i = 1, \ldots, n$) with the direction of effects "–" respectively.

The values H can be multiplied by the weight of each indicator:

$$R_i^K = H_i^K \times V_i$$

where: V_i = weight of the indicator I_i

The total sum of the values R (or H, if the weights are not applied, respectively) for each axis is calculated:

$$O_I^K = \sum R_i^K$$

where $i = 1, \ldots, n_1$ are the total sums for the indicators of the axis I,

Table 1. Indicators applied for the assessment of multifunctionality of Czech agriculture

Axis	Indicator	Direction[5]	Weight (1–5)
I	NVA/AWU	+	1
	(NVA-operational subsidies-investment subsidies)/AWU	+	5
	production/AWU	+	2
	rate of indebtedness	–	4
	intermediate consumption/production	–	3
	operational surplus/capital (assets)	+	5
II	% of organic farming on grassland in total farmland[2]	+	4
	% of organic farming on arable land and permanent crops in total farmland[2]	+	5
	% of integrated farming in total farmland[3]	+	2
	% of catch crops in total farmland[3]	+	1
	% of land in other agro-environmental programmes[3]	+	5
	% of arable land in total farmland	–	5
	Livestock Units of ruminants/ha	+	2
	balance of N[4]	–	4
	balance of P[4]	–	3
	balance of K[4]	–	3
III	AWU/100 ha	+	5
	NVA/AWU	+	4
	share of leased land in total farmland	–	3
	share of non-agricultural incomes in total incomes[1)]	+	4

[1] Data from bookkeeping (other economic data according to the FADN methodology)
[2] Data from the State Agricultural Intervention Fund.
[3] Data from the State Agricultural Intervention Fund. Other agro-environmental programmes: maintenance of grassland, grassland foundation, bio-zones
[4] Normatives applied on production structures according to the FADN.
[5] The higher the value of an indicator, the more positive the effects and vice versa.
NVA = Net Value Added; AWU = Annual Working Unit

$$O_{II}^{K} = \sum R_{i}^{K}$$

where $i = n_1+1, \ldots, n_2$ are the total sums for the indicators of the axis II,

$$O_{III}^{K} = \sum R_{i}^{K}$$

where $i = n_2+1, \ldots, n$ are the total sums for the indicators of the axis III.

The relative distances from the virtual best farm categories V, which ever reaches the values $H_i^V = 5$, or $R_i^V = V_i \times 5$ respectively, is defined:

$$S_o^K = (O_o^K / \sum R_i^V) \times 100$$

where o = I, II, III are the axes of multifunctionality, and the total sum for all axes:

$$S^K = \sum S_o^K$$

The relative values S_o^K in the interval 0–100 and the total sums of these values S^K are applied for the complex evaluation of multifunctionality of Czech agriculture and its farm categories by the individual axes and in total.

RESULTS AND DISCUSSION

The results of the evaluation of multifunctionality of Czech agriculture, with the application of the methodology described in Part 1, are presented in Table 2a (without weights), or in Table 2b (with weights), respectively.

Using the weighted evaluation (data from Table 2b), there is a possibility to derive some conditional findings. Evidently, the conditionality is given by the number and selection of indicators and by the applied weights of indicators. As it is mentioned before, e. g. indicators characterising the relations of farm categories to the development of human and social capital in rural areas and to its infrastructure (including recreational potentials) are not included in the set of the applied indicators owing to data availability. At the same time it is obvious that these indicators are politically and socially very relevant and that they can significantly influence the level of multifunctionality in the individual farm categories. Only considering these limits, it is possible to interpret the results of the evaluation as follows:

– In the period of 2003–2005, the order of the farm categories by their total level of multifunctionality is presented in Table 3. The highest level of multifunctionality across all 3 axes in the average of the years 2003–2005 is calculated for the category of physical entities with 101–300 ha and for the category of other companies (mainly limited liability companies). At same time, the lowest level of multifunctionality is calculated for the categories of collective farms (coops and joint-stock companies).
– After the EU accession, there are changes in the level of multifunctionality (the ratio 2005/2003) in the following order:
  1. Coops (improvement by 17.1%)
  2. Joint-stock companies (improvement by 9.4%)
  3. Physical entities with 51–100 ha (improvement by 3.2%)
  4. Other legal entities (improvement by 1.8%)
  5. Physical entities up to 50 ha (worsening by 7.5%)
  6. Physical entities with 101–300 ha (worsening by 18.6%)
  7. Physical entities with more than 300 ha (worsening by 24.9%)
– The order is influenced especially by the developments in the axes I and II, as an obvious consequence of much higher supports from the Pillar I of the CAP after the EU accession, and of an adjustment of farm practices to supports from the Pillar II of the CAP (a reduction of the production of private goods to the benefit of the production of public goods). For example in the case of coops, the score for the axis I increased more than four times in 2005 compared with 2003, but at the same time the score for the axis II decreased by nearly 40%.
– From the comparison of the scores 2005 to 2003, it is evident, that the EU accession has brought much more advantages for farms as coops and companies than for farms as physical entities. This finding corresponds with the FADN data. The data show that after the EU accession, more profits generated by higher direct payments and the LFA payments have been absorbed especially by coops and companies.
– Considering the scores in the individual axes, the orders of farm categories are different than the order for all axes. There can be mentioned e. g. the lowest score in the axis III for all farms as physical entities with more than 50 ha. However, the indicators for the axis III with the highest weights reflect the level of employment on farms (AWU/100 ha). The low level of employment on these farm categories is evidently the consequence of a quicker and deeper transformation (restructuring) after 1989 (corresponding e.g. with a low level of livestock production on these farms).

Table 2a. Results of the assessment of multifunctionality of Czech agriculture – without weights

Axis	Year	Absolute values				Deviation from Czech average			
Farm category		Axis I	Axis II	Axis III	total	Axis I	Axis II	Axis III	total
Coops	2003	9.80	43.47	37.33	90.60	–18.40	–5.61	–14.40	–38.40
	2004	48.03	39.27	57.69	145.00	–2.64	–5.98	–0.14	–8.76
	2005	31.27	27.03	42.70	101.01	–8.47	–6.93	–2.65	–18.05
	average	29.70	36.59	45.91	112.20	–9.83	–6.17	–5.73	–21.74
	2005/03	318.98	62.19	114.41	111.49	x	x	x	x
Joint-Stock Companies (JSC)	2003	30.90	26.08	50.00	106.98	2.70	–22.99	–1.72	–22.02
	2004	52.11	25.86	60.91	138.89	1.45	–19.39	3.07	–14.87
	2005	44.05	27.75	45.80	117.61	4.31	–6.22	0.45	–1.45
	average	42.35	26.57	52.24	121.16	2.82	–16.20	0.60	–12.78
	2005/03	142.57	106.38	91.61	109.93	x	x	x	x
Other legal entities (Other LE)	2003	23.73	84.35	51.82	159.89	–4.47	35.27	0.09	30.89
	2004	42.68	74.78	58.06	175.51	–7.99	29.53	0.22	21.76
	2005	38.94	79.46	48.06	166.46	–0.80	45.50	2.71	47.40
	average	35.11	79.53	52.65	167.29	–4.42	36.76	1.01	33.35
	2005/03	164.08	94.21	92.76	104.11	x	x	x	x
Physical entities to 50 ha (PE 50)	2003	45.26	43.55	64.59	153.39	17.06	–5.53	12.86	24.39
	2004	48.67	56.54	66.15	171.36	–2.00	11.29	8.32	17.60
	2005	75.57	23.92	50.00	149.49	35.83	–10.05	4.65	30.43
	average	56.50	41.34	60.25	158.08	16.96	–1.43	8.61	24.14
	2005/03	166.96	54.93	77.42	97.45	x	x	x	x
Physical entities with 51–100 ha (PE 51–100)	2003	45.20	43.91	32.76	121.87	17.01	–5.17	–18.96	–7.13
	2004	54.29	63.65	39.64	157.58	3.62	18.40	–18.20	3.83
	2005	49.91	55.77	34.21	139.89	10.18	21.80	–11.14	20.83
	average	49.80	54.44	35.54	139.78	10.27	11.68	–16.10	5.84
	2005/03	110.42	127.02	104.42	114.79	x	x	x	x
Physical entities with 101–300 ha (PE 101–300)	2003	86.63	60.94	31.29	178.87	58.43	11.87	–20.43	49.87
	2004	65.68	70.53	32.22	168.43	15.01	25.28	–25.61	14.67
	2005	67.83	50.01	33.81	151.64	28.09	16.04	–11.54	32.59
	average	73.38	60.49	32.44	166.31	33.84	17.73	–19.20	32.38
	2005/03	78.29	82.06	108.05	84.78	x	x	x	x
Physical entities with more than 300 ha (PE 300)	2003	78.90	61.02	30.15	170.07	50.70	11.94	–21.58	41.07
	2004	82.40	46.64	27.00	156.03	31.73	1.38	–30.83	2.28
	2005	63.68	39.60	30.06	133.34	23.94	5.63	–15.29	14.28
	average	74.99	49.08	29.07	153.15	35.46	6.32	–22.57	19.21
	2005/03	80.70	64.89	99.72	78.40	x	x	x	x
Czech Republic	2003	28.20	49.08	51.72	129.00	x	x	x	x
	2004	50.67	45.25	57.84	153.75	x	x	x	x
	2005	39.74	33.97	45.35	119.06	x	x	x	x
	average	39.54	42.77	51.64	133.94	x	x	x	x
	2005/03	140.92	69.21	87.68	92.29	x	x	x	x

Table 2b. Results of the assessment of multifunctionality of Czech agriculture – with weights

Axis / Farm category	Year	Absolute values				Deviation from Czech average			
		Axis I	Axis II	Axis III	total	Axis I	Axis II	Axis III	total
Coops	2003	8.07	37.46	42.29	87.82	–17.14	–7.13	–13.23	–37.50
	2004	46.55	42.62	63.56	152.72	–3.12	–0.22	1.33	–2.01
	2005	32.96	23.49	46.41	102.86	–8.71	–1.71	–1.20	–11.61
	average	29.19	34.52	50.75	114.47	–9.65	–3.02	–4.36	–17.04
	2005/03	408.34	62.70	109.76	117.12	x	x	x	x
Joint-Stock Companies (JSC)	2003	31.78	17.17	55.39	104.35	6.58	–27.43	–0.12	–20.97
	2004	51.31	14.67	67.11	133.10	1.64	–28.16	4.89	–21.63
	2005	46.96	17.61	49.56	114.13	5.30	–7.59	1.95	–0.34
	average	43.35	16.49	57.36	117.19	4.51	–21.06	2.24	–14.31
	2005/03	147.74	102.58	89.47	109.38	x	x	x	x
Other legal entities (Other LE)	2003	23.53	84.44	55.59	163.56	–1.67	39.84	0.08	38.25
	2004	40.77	77.89	61.75	180.41	–8.90	35.06	–0.47	25.68
	2005	38.94	79.46	48.06	166.46	–2.73	54.26	0.45	51.99
	average	34.41	80.60	55.14	170.15	–4.43	43.05	0.02	38.64
	2005/03	165.46	94.11	86.45	101.77	x	x	x	x
Physical entities to 50 ha (PE 50)	2003	54.11	42.85	64.59	161.54	28.90	–1.75	9.07	36.23
	2004	58.00	61.79	66.15	185.94	8.33	18.96	3.93	31.22
	2005	75.57	23.92	50.00	149.49	33.90	–1.28	2.39	35.01
	average	62.56	42.85	60.25	165.66	23.71	5.31	5.13	34.15
	2005/03	139.65	55.83	77.42	92.54	x	x	x	x
Physical entities with 51–100 ha (PE 51–100)	2003	49.85	44.01	31.58	125.44	24.64	–0.58	–23.94	0.12
	2004	60.29	55.02	38.30	153.61	10.62	12.19	–23.93	–1.11
	2005	54.94	42.70	31.84	129.48	13.27	17.50	–15.77	15.00
	average	55.02	47.25	33.90	136.18	16.18	9.70	–21.21	4.67
	2005/03	110.21	97.02	100.83	103.22	x	x	x	x
Physical entities with 101–300 ha (PE 101–300)	2003	91.37	64.52	30.48	186.38	66.17	19.93	–25.03	61.06
	2004	65.00	87.99	30.97	183.95	15.33	45.15	–31.26	29.23
	2005	63.70	55.92	32.08	151.70	22.03	30.72	–15.53	37.23
	average	73.36	69.48	31.18	174.01	34.51	31.93	–23.94	42.50
	2005/03	69.71	86.67	105.25	81.39	x	x	x	x
Physical entities with more than 300 ha (PE 300)	2003	77.05	67.88	29.71	174.64	51.84	23.29	–25.80	49.33
	2004	77.57	58.76	26.50	162.84	27.90	15.93	–35.72	8.11
	2005	53.95	47.77	29.44	131.15	12.28	22.57	–18.17	16.68
	average	69.52	58.14	28.55	156.21	30.68	20.60	–26.57	24.71
	2005/03	70.02	70.37	99.07	75.10	x	x	x	x
Czech Republic	2003	25.21	44.60	55.52	125.32	x	x	x	x
	2004	49.67	42.83	62.22	154.73	x	x	x	x
	2005	41.66	25.20	47.61	114.47	x	x	x	x
	average	38.85	37.54	55.12	131.51	x	x	x	x
	2005/03	165.29	56.51	85.76	91.35	x	x	x	x

The applied methodology is the main topic of the article. The methodology can be further developed, particularly from the point of view of the structure and the number of indicators of multifunctionality and their weights. In this way, the more objective arguments for the total evaluation of the multifunctionality of the Czech agriculture can be gained.

Considering this, the presented values and the orders of farms categories have to be assessed with caution, as argued before. Anyway, looking for the answers, which farm categories are better utilising

Table 3. Order of farm categories by their scores (weighted)

Farm category	2003		2004		2005		Average 2003–2005		2005/2003	
	order	score	order	score	order	score	order	score	order	index
A. By the total score										
Coops	7	87.82	6	152.72	7	102.86	7	114.47	1	117.12
JSC	6	104.35	7	133.10	6	114.13	6	117.19	2	109.38
Other LE	3	163.56	3	180.41	1	166.46	2	170.15	4	101.77
PE 50	4	161.54	1	185.94	3	149.49	3	165.66	5	92.54
PE 51–100	5	125.44	5	153.61	5	129.48	5	136.18	3	103.22
PE 101–300	1	186.38	2	183.95	2	151.70	1	174.01	6	81.39
PE 300	2	174.64	4	162.84	4	131.15	4	156.21	7	75.10
B. By the score of the Axis I										
Coops	7	8.07	6	46.55	7	32.96	7	29.19	1	408.34
JSC	5	31.78	5	51.31	5	46.96	5	43.35	3	147.74
Other LE	6	23.53	7	40.77	6	38.94	6	34.41	2	165.46
PE 50	3	54.11	4	58.00	1	75.57	3	62.56	4	139.65
PE 51–100	4	49.85	3	60.29	3	54.94	4	55.02	5	110.21
PE 101–300	1	91.37	2	65.00	2	63.70	1	73.36	7	69.71
PE 300	2	77.05	1	77.57	4	53.95	2	69.52	6	70.02
C. By the score of the Axis II										
Coops	6	37.46	6	42.62	6	23.49	6	34.52	6	62.70
JSC	7	17.17	7	14.67	7	17.61	7	16.49	1	102.58
Other LE	1	84.44	2	77.89	1	79.46	1	80.60	3	94.11
PE 50	5	42.85	3	61.79	5	23.92	5	42.85	7	55.83
PE 51–100	4	44.01	5	55.02	4	42.70	4	47.25	2	97.02
PE 101–300	3	64.52	1	87.99	2	55.92	2	69.48	4	86.67
PE 300	2	67.88	4	58.76	3	47.77	3	58.14	5	70.37
D. By the score of the Axis III										
Coops	4	42.29	3	63.56	4	46.41	4	50.75	1	109.76
JSC	3	55.39	1	67.11	2	49.56	2	57.36	5	89.47
Other LE	2	55.59	4	61.75	3	48.06	3	55.14	6	86.45
PE 50	1	64.59	2	66.15	1	50.00	1	60.25	7	77.42
PE 51–100	5	31.58	5	38.30	6	31.84	5	33.90	3	100.83
PE 101–300	6	30.48	6	30.97	5	32.08	6	31.18	2	105.25
PE 300	7	29.71	7	26.50	7	29.44	7	28.55	4	99.07

public supports for their multifunctionality (for the production of positive externalities/public goods) is one possibility, how to apply the methodology and results. It is very close to policy making questions linked with the effective targeting of supports in the future in the form of their modulation, capping and degresivity. Owing to the specific Czech farm structure, compared with the farm structures prevailing in the EU-15, these questions are politically very sensitive and topical in the Czech Republic. The results with the application of the given methodology in the meantime only indicate that the most positive development of multifunctionality is up to now linked with larger farms as physical entities.

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