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ANALYSIS OF INEQUALITY OF GROSS ADDED VALUE OF CONVENTIONAL AND ORGANIC FARMS IN SELECTED EU COUNTRIES

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Abstract

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The paper deals with the differentiation of gross added value of farms with a focus on mixed production from twelve selected European Union countries in view of the manner of farming. The objective is to define the effect of an ecological and conventional manner of farming on the differentiation of gross added value and to quantify the level of impact of subsidy policy on the elimination of the said inequality. The fulfillment of the said objective was based upon the quantification of the Gini coefficient, which was quantified for selected indicators on the basis of data from the FADN database for the year 2009. In order to assess the effect of the manner of farming on the differentiation of the analyzed indicators, a horizontal decomposition of the Gini coefficient was performed. On the other hand, a vertical decomposition of the Gini coefficient served to assess the effect of EU subsidy policy on the level of inequality of the indicator of gross added value. The obtained results indicate a lesser inequality of the economic productivity of European agricultural businesses, which is not significantly determined by an ecological or conventional manner of farming, but rather by the local specifics of individual countries and their agricultural-food markets, as well as the applied subsidy policy, which primarily in organic farming decreases the inequality of gross added value to a significant extent and strengthens the competitiveness as well as viability of agricultural businesses.

inequality, gross farm income, subsidy, Gini coefficient, organic farming, conventional farming, European Union

Organic farming has been financially supported by way of EU Common Agricultural Policy since 1992, when agro-environmental measures became one of the "accompanying measures" with mandatory implementation in every member state. Since that time, there has been a very dynamic development of this manner of farming in the EU.

Kouřilová (2005) states that the requirement for the assessment of the productivity of conventional and organic farming is a permanent and justified requirement of producers, consumer, traders as well as governing institutions. Mutual comparison of the production and economic results of conventional and organic farming, including the comparison of the effectiveness of such farming, is the object of a number of publications by McCrory (2001), Connolly (2002), Cisilino and Madau (2007), Kouřilová *et al.* (2009), Brožová (2011). The productivity and effectiveness of both farming systems is compared on the basis of various indicators – from hectare yields (Morris, 2001; Offermann and Nieberg, 2000), costs (Offermann and Nieberg, 2000; Cisilino and Madau, 2007) to profit and the rate of profitability (Connolly, 2002; Nieberg *et al.*, 2007; Brožová, 2011). A number of publications are also based upon indicators from the FADN – Farm accounting data network (Nieberg *et al.*, 2007; Cisilino, Madau, 2007), especially in the case of international comparison. Nieberg *et al.* (2007) monitored differences in terms of EU countries in regard to the indicator of net added value (gross added value minus amortization) per

AWU. He reaches the conclusion that in 2001 the value of such indicator was higher in all the countries of western Europe in the case of organic farms than in the case of conventional businesses. However, he points out the significant variability between individual countries as well as the significant effect of subsidy policy on the profitability primarily of organically farming businesses.

Differences in the effectiveness of both farming systems can be measured in various ways – by way of simple comparison on the basis of selected indicators (Offermann and Nieberg, 2000; Nieberg *et al.*, 2007; Brožová, 2011). The extent of disparity for both manners of farming within individual indicators can be, whether at the level of individual farms or in international comparison, comprehensively expressed by way of the Gini coefficient. This coefficient can be decomposed vertically or horizontally. This technique can help answer a whole range of questions pertaining to the nature and origin of inequalities. Horizontal decomposition enables a breakdown of the Gini coefficient into inequality within a group and inter-group inequality. For example, Kaditi and Nitsi (2011) decompose the inequality of farm income into individual components depending on the region, production focus and economic size. However, the decomposition of the Gini coefficient according to the manner of farming receives only very little attention in the professional literature.

Vertical decomposition enables the breakdown of an analyzed indicator (most commonly income) according to individual partial resources of which the analyzed indicator is composed, and the monitoring of which of the components contributes to overall inequality the most. This approach is often used to determine the distribution effects of subsidy policy. Farming income tends to be decomposed most often into income from subsidies and income generated by the market. The majority of authors reach the conclusion that subsidies contribute to a decrease in the inequality of income of agricultural businesses or households (Keeney, 2000; Witzke and Noleppa, 2006; Mishra *et al.*, 2009; Kaditi and Nitsi, 2011; Benni *et al.*, 2012). Just as farming income, the indicator of gross added value can be decomposed in this manner, specifically into value created by the business and into the balance of taxes and subsidies. The size of the gross added value is generally determined by the size of the business surplus.

The main aim of the paper is to define the effect of organic and conventional manner of farming on the differentiation of gross added value of mixed production businesses in selected EU countries. The paper is also focused on inequality and its individual components in consideration of the manner of farming in the case of the indicator of overall production, production consumption, subsidy and tax balance, and net added value. A further partial aim is to quantify the extent of the impact of subsidy policy on the elimination of the said inequality.

MATERIALS AND METHODS

The fulfillment of the aims of the paper was based on data from the FADN (Farm Accountancy Data Network) database for the year 2009, which, in the processing year, represented the newest available data. The data set consisted of average values of a sample of businesses from 12 European Union states, specifically from the Czech Republic (CZE), Poland (POL), Slovenia (SVN), Lithuania (LTU), Latvia (LVA), Italy (ITA), Germany (DEU), Austria (OST), Great Britain (UKI), Sweden (SVE), Denmark (DAN), Finland (FIN). The limited representation of the analyzed countries was the result of the unavailability of data, primarily of organically farming businesses in the remaining states. Quantitatively, the analyzed data set was based on 432,990 conventional farming businesses and 23,990 organic farming businesses with a focus on mixed production.

The methodical apparatus of the paper was the quantification of the Gini coefficient, which is a commonly utilized rate of inequality in studies focusing on income inequality in society. Stuart (1954) proposed the quantification of the said relative rate by way of the covariance between the income level $Y = (y_1, \ldots, y_n)$and the cumulative distribution function of income F(Y) with the ascending arrangement of households according to the amount of their income, see formula 1.

$$G = \frac{2\operatorname{cov}(Y, F(Y))}{\bar{Y}}. \tag{1}$$

The Gini coefficient quantified by way of the above formula achieves values in the interval of <0.1> for non-negative income. However, in the case of the occurrence of a negative income in the analyzed data set, the Gini coefficient quantified in the manner as stated above overvalues inequality and can actually achieve a value greater than 1 (see Chen *et al.*, 1982).

On the basis of formula 1, the inequality of gross added value, total production, output consumption, the balance of subsidies and taxes, and net added value, was analyzed comprehensively for organic as well as conventional businesses in the submitted article.

The effect of a specific manner of farming on the said inequality was analyzed by way of the decomposition of the Gini coefficient according to groups of analyzed subjects. The said decomposition is defined, for example, by Silber (1989), Lambert and Aronson (1993) as:

$$G = G_{WIT} + G_{BET} + R, \tag{2}$$

where:

G_{WIT} expresses inequality within the group, G_{BET} is the rate of intergroup inequality, and R is the residuum, achieving positive values, if the values of the analyzed variable (gross added value, total production, output consumption, the balance of subsidies and taxes, and net added value) of individual groups overlap.

Inequality within the group, representing a contribution of intra-group inequality in regard to overall inequality, is determined according to formula 3:

$$G_{WIT} = \sum_{i=1}^{g} s_i \lambda_i G_i\ , \quad (3)$$

where:
s_i is the share of the value of the analyzed variable in the i-th group in the value of the analyzed variable of the entire sample, λ_i is the share of the number of subjects in the i-th group in the overall number of subjects in the sample, and G_i is the Gini coefficient quantified according to formula 1 for the i-th group.

Intergroup inequality represents inequality provided there is an identical value of the analyzed variable in all of the subjects of the i-th group, specifically at a level of the average of the i-th group, i.e.

$$G_{BET} = \frac{2}{\overline{y}} \operatorname{cov}(\overline{y}, F(\overline{y}))\ . \quad (4)$$

The Gini coefficient quantified according to formula 1 for both groups (organic and conventional businesses) as well as the whole sample was further decomposed according to individual indicators (components), comprising gross added value. The procedure of the said decomposition was proposed by Lerman and Yitzhaki (1985). The said authors express the Gini coefficient as follows:

$$G = \sum_{k=1}^{K} S_k G_k R_k\ . \quad (5)$$

They then break the formulation stated above down in more detail as follows:

$$G = \sum_{k=1}^{K} \left(\frac{\operatorname{cov}[Y_k, F(Y)]}{\operatorname{cov}[Y_k, F(Y_k)]}\right)\left(\frac{2}{\overline{Y}_k} \operatorname{cov}[Y_k, F(Y_k)]\right)\left(\frac{\overline{Y}_k}{\overline{Y}}\right), \quad (6)$$

where:
S_k represents the share of component k in the gross added value, G_k is the Gini coefficient measuring inequality in the distribution of component k, R_k is the „Gini correlation coefficient" between component k and gross added value Y, which is defined as

$$R_k = \frac{\operatorname{cov}[Y_k, F(Y)]}{\operatorname{cov}[Y_k, F(Y_k)]},$$

whereby $-1 \le R_k \le 1$. $G_k R_k$ is termed the pseudo-Gini coefficient of component k – G_k'.

Stark, Taylor and Yitzhaki (1986) state that the effect of a certain component on the inequality of an analyzed variable depends upon:

- how significant the share of the given component in the analyzed variable (S_k) is;
- how evenly or unevenly the given component is distributed (G_k);
- how the given component is correlated with the distribution of the analyzed variable (R_k).

Through the utilization of the decomposition stated above, it is possible to see to what extent the inequality of the gross added value is caused by the individual components and what change in the overall inequality occurs if the value of the given component changes by 1 %, whereby the value of the other components remains constant.

The contribution of the k-th component to the overall inequality can be expressed, according to Möllers (2006), as follows:

$$P_k = S_k \frac{G_k'}{G} \times 100\ . \quad (7)$$

Further, Möllers (2006) proposes the quantification of the relative concentration coefficient of the k-th component as:

$$g_k = \frac{G_k R_k}{G} = \frac{G_k'}{G}\ . \quad (8)$$

Component k, which has a relative concentration coefficient greater than 1, contributes to the growth of overall inequality, while at a value of this indicator of less than 1 it contributes to a decrease in overall inequality. In the event that the value of the indicator is equal to 1, there is a neutral effect.

The determination of the marginal contribution of the relevant component to the overall income inequality can be, according to Adams (1999), expressed by way of flexibility, which in this case expresses by how many percent the inequality of the analyzed variable changes when the value of component k increases by 1 %, see formula 9.

$$E_k = Sk \frac{(G_k' - G)}{G}\ . \quad (9)$$

The said relationship shows that a marginal increase in the value of component k decreases the overall inequality of the gross added value if:

a) R_k is negative or zero,

b) R_k is greater than zero and, at the same time, $G_k' < G$.

The quantification of the above variables was performed with the utilization of the data set described above in MS Excel.

RESULTS

Table I shows the size of agricultural business according to utilized area and number of workers in AWU. It is obvious, that Czech farms operate in conditions of a high concentration of land and labor. But there exist great differences between utilized agricultural area of conventional and organic farms. In the case of organic agriculture, farms in Poland

I: *Size of the agricultural businesses in selected EU countries in 2009*

	CZE	DAN	DEU	ITA	LTU	LVA	OST	POL	SUO	SVE	SVN	UKI
Utilised Agricultural Area (UAA) – Total	441,4	91,8	124,6	26,3	29,1	52,1	38,5	15,4	75,8	129,9	9,1	148,6
UAA – CF	460,4	115,6	114,1	25,8	44,6	51,7	35,1	16,4	65,3	93,2	10,9	161,8
UAA – OF	14,2	79,9	62,6	95,6	26,9	79,4	45,9	251,8	145,6	53,7	11,9	153,2
Labour input (AWU)	14,3	1,3	2,6	1,5	1,8	1,9	1,5	1,6	1,3	1,5	1,4	2,0

Source: Own processing from FADN data

and the UK have the largest acreage of agricultural land. The variability of the hectare area is higher in the case of conventional farms than in organic farms. ($\sigma_{kz} = 122.6$, $\sigma_{ez} = 69.5$).

Graph 1 shows that there are significant differences in the achieved level of gross added value among organic and conventional farms in individual countries. The Czech Republic (CR) achieves the highest level of gross added value per business, for both conventional businesses (210,374 Euros/business), as well as in the organic farming regime (104,090 Euros/business). That is primarily caused by the fact that agricultural businesses in the Czech Republic farm in conditions of a high concentration of production factors, primarily land and labor.

Among conventional businesses with mixed production in the Czech Republic, the indicator of total production (518,746 Euros/business) and output consumption (445,221 Euros/business) achieves the greatest value per business. In view of the bounded nature of the majority of subsidy titles in regard to farmed land, the volume of the balance of subsidies and taxes per business is also the greatest specifically in the Czech Republic.

In the case of conventional agriculture, the Czech Republic is at a level of 329.1% of the average of the selected countries in regard to the indicator of gross added value, whereas Poland, for example, is at a level of 13.5% (see Tab. II). In the case of a conventional manner of farming, Denmark (123,378 Euros/business), Germany (99,368 Euros/business) and Great Britain (94,681 Euros/business) are also situated above the average of the selected countries. On the other hand, countries such as Poland (8,609 Euros/business), Slovenia (11,867 Euros/business) and the Baltic countries of Latvia (12,591 Euros/business) and Lithuania (16,807 Euros/business) achieve the lowest level of gross added value per business. The volume of production and output consumption per business in conventional farming in those countries follows the order of gross added value.

As has been stated above, mixed production businesses farming in the Czech Republic in the regime of organic farming achieve the highest level of gross added value per business (see Fig. I), but in terms of created production (127,033 Euros/per business) they are only in fifth place within the group of analyzed countries. Output consumption achieves a value of 127,635 Euros (4th place) among such businesses. Therefore, it is clear that the gross added value is primarily determined by the volume of acquired subsidies. The balance of subsidies and taxes among Czech organic farming businesses achieves the greatest level among the analyzed states (104,692 Euros/business).

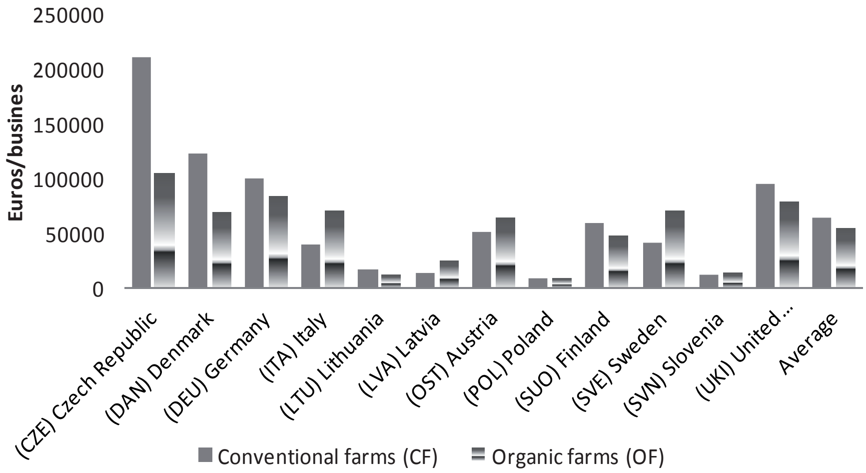
In the case of an organic manner of farming, the Czech Republic is at a level of 194.5% of the average of the analyzed countries in terms of the indicator of gross added value (see Tab. II). Germany (83,087 Euros/business), Great Britain (78,550 Euros/business) and Sweden (69,792 Euros/business) are also above the average. Danish businesses do achieve the greatest volume of created production as well as the greatest absolute difference between production and output consumption, but in view of a lesser balance of subsidies and taxes, they are only in fifth place in the ranking of countries in terms of the indicator of gross added value per business.

Similarly as in the case of conventional farming, Poland (7,647 Euros/business), Lithuania (12,179 Euros/business) and Slovenia (13,805 Euros/business) are situated below the average of the selected countries. Poland actually achieves a negative difference between production and output consumption and thus the generated gross added value is fully the result of obtained subsidies.

Upon conversion of gross added value to a per hectare rate, the results are completely different. While in the case of the assessment of the volume of gross added value converted to per business the Czech Republic held onto first place both in the case of conventional as well as organic farming, when converted to per hectare it is only in 9th place in the case of conventional farming and in second to last place in the case of organic farming. Mixed production businesses achieve 457 Euros per hectare in the case of a conventional manner of farming, and 413 Euros per hectare in the case of an organic manner of farming. It is evident that Czech businesses do not achieve such intensity of production. The final effect of a business is thus brought about primarily by the amount of farmed land.

Tab. III and Graph 2 also show that there are more significant differences in the achieved gross added value between individual states than between individual manners of farming. Differences in gross added value per one hectare between individual manners of farming are more significant primarily in Austria and Denmark.

In the case of conventional agriculture, the Czech Republic is (see Tab. III) at the level of 57.6%

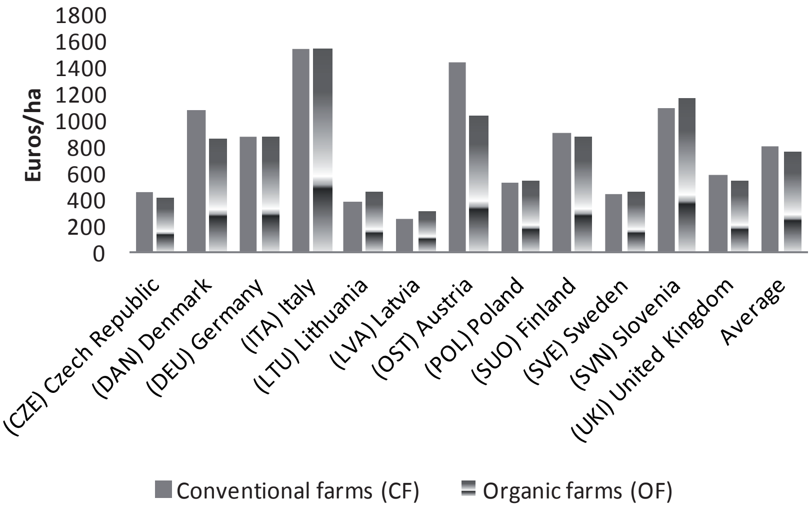


1: *Gross added value per business in selected EU countries in 2009*
Source: Own processing from FADN data

II: *Relative difference from the average in gross added value per business*

	POL	SVN	LVA	LTU	ITA	SVE	OST	SUO	UKI	DEU	DAN	CZE
CF	13,5%	18,6%	19,7%	26,3%	62,3%	63,5%	78,7%	91,8%	148,1%	155,4%	193,0%	329,1%
OF	14,3%	25,8%	45,1%	22,8%	131,3%	130,4%	119,7%	87,5%	146,8%	155,2%	126,8%	194,5%

Source: Own processing



2: *Gross added value per hectare in selected EU countries in 2009*
Source: Own processing from FADN data

III: *Relative difference from the average in gross added value per hectare*

	LVA	LTU	SVE	CZE	POL	UKI	DEU	SUO	DAN	SVN	OST	ITA
CF	30,7%	47,5%	54,9%	57,6%	66,0%	73,7%	109,7%	113,2%	134,5%	137,3%	180,7%	194,3%
OF	40,5%	60,4%	60,7%	55,1%	71,7%	71,8%	115,8%	116,1%	113,2%	154,5%	136,3%	204,1%

Source: Own processing

of the average of gross added value per hectare. Only Slovenia is among the new member states above this average. The average conventional mixed production business in the Czech Republic achieves production of 1,127 Euros per hectare, the difference between production a output consumption is 160 Euros per hectare. In terms of the difference between production and output consumption, the countries of the EU-15 with the exception of Sweden and Finland range within the interval of 1,220 Euros per hectare in Italy to 400 Euros per hectare in Great Britain. Out of the EU-

10 countries, Poland and Lithuania also achieve a greater value of such difference than the Czech Republic. With the exception of Latvia, Sweden and Finland, where there are worse conditions for agricultural production, the Czech Republic lags behind in the creation of value from a unit of contributed land. The resulting production is thus achieved thanks to a more extensive manner of farming. The greatest values of gross added value per hectare were achieved in Italy (1542 Euros/ha), and further also in Austria (1435 Euros/ha) and Slovenia (1090 Euros/ha).

Business farming in organic agriculture in the Czech Republic achieve 55.1% of the average of the selected EU countries. The average organic business in the Czech Republic achieves production of 505 Euros/ha, and output consumption is at a level of 509 Euros/ha. It is evident that the value of created production does not cover output consumption; the achieved level of added value of 413 Euros/ha is thus brought about only by operating subsidies, as the balance of taxes and subsidies is at a level of 416 Euros/ha. The Czech Republic and Finland, as the only ones of the analyzed countries, achieve a negative difference between production and output consumption. The greatest difference between outputs and output consumption was just as in the case of conventional agriculture, achieved in Italy (1170 Euros/ha) and in Austria (464 Euros/ha). Italy and Austria can thus be considered to be countries that are able to utilize their farmed area the most effectively regardless of the amount of subsidies, both in the case of conventional as well as organic farming. Specifically these two countries (Italy – 1532 Euros/ha, Austria 1032 Euros/ha) along with Slovenia (1160 Euros/ha) can be considered to be countries with the highest level of gross added value per hectare. On the other hand, the lowest level of gross added value per hectare was achieved in Latvia (304 Euros/ha) and in the Czech Republic.

A clear quantification of the described inequality is provided by the Gini coefficient, the values of which for the selected indicators are set out on a per business basis in Tab. IV and on a per hectare basis in Tab. V. It is evident that the Gini coefficient of the individual indicators achieves greater values, i.e. less equal distribution, if the values of the indicators are set out as converted to a per business basis rather than a per hectare of land basis. That is caused by the effect of the size of agricultural businesses in individual countries.

On a per business basis, output consumption shows the most unequal distribution (0.536), while on a per hectare basis it is the indicator of total production (0.329). The least unequal distribution in both tables is seen for the indicator of gross added value (0.412 for gross added value/business and 0.274 for gross added value/ha). The above is the result of the positive effect of subsidies on the equalization of such indicator. Primarily subsidies for LFA and organic agriculture are aimed at equalizing losses in the case of farming as a result of unfavorable conditions or the application of organic farming principles, which is of course also reflected in the added value of a business.

Further, the decomposition of the Gini coefficient was performed for individual indicators according to groups of businesses. The selected groups in individual countries were conventional businesses and businesses farming on an organic basis.

Tab. IV shows that the values of the Gini coefficients of individual indicators are determined more by the difference in the achieved values between individual countries (WIT) than between both manners of farming (BET). Such fact applies both to indicators converted to a per business basis as well as to a per hectare basis (see Tab. V). Primarily in the case of the indicator of gross added value converted to a per business basis as well as per hectare, the effect of the manner of farming on overall inequality is very low. It can thus be stated that the manner of farming is not the main determinant of the ability of businesses of individual countries to achieve the required effect per unit of area. The effect of the manner of farming is more distinct in the case of the indicator of production and output consumption, although even such contribution is also still low. The above is also evidenced by the values of the residuum, showing an overlap of the values of all of the indicators with the exception of overall production in the case of conversion to a per business basis.

Upon the conversion of the indicators to a per business basis (Tab. IV), conventional agriculture businesses show a much more unequal distribution on the basis of the values of the Gini coefficients than organic farms. For example, the variability of gross added value measured by way of the variation coefficient is at a level of 93.3% among conventional businesses, while achieving a value of 59.7% among organic businesses. That can be explained by the greater variability of the hectare area of conventional

IV: *Decomposition according to groups, unit: business*

Business	Gini sample	Gini organic	Gini conventional	WIT	BET	R
Gross added value	0,412	0,319	0,466	0,199	0,044	0,169
Production	0,519	0,421	0,530	0,246	0,229	0,044
Output consumption	0,536	0,452	0,542	0,255	0,150	0,131
Balance of subsidies and taxes	0,447	0,384	0,500	0,220	0,025	0,203
Net added value	0,438	0,356	0,489	0,213	0,032	0,193

Source: Own processing

V: *Decomposition according to groups, unit: hectare*

Hectare	Gini sample	Gini organic	Gini conventional	WIT	BET	R
Gross added value	0,274	0,255	0,287	0,136	0,014	0,124
Production	0,329	0,316	0,286	0,149	0,122	0,058
Output consumption	0,320	0,296	0,278	0,142	0,120	0,058
Balance of subsidies and taxes	0,279	0,250	0,280	0,131	0,066	0,082
Net added value	0,329	0,316	0,286	0,149	0,122	0,058

Source: Own processing

VI: *Decomposition according to sources, unit: hectare*

	Sample			Organic			Conventional		
Hectare		BST	P-OC		BST	P-OC		BST	P-OC
Gini	0,274	0,175	0,420	0,270	0,190	0,453	0,305	0,208	0,404
Sk		0,596	0,404		0,694	0,306		0,504	0,496
Pk		38,087	61,913		48,730	51,268		34,351	65,650
gk		0,639	1,533		0,702	1,675		0,682	1,323
Ek		–0,215	0,215		–0,207	0,207		–0,160	0,160

Source: Own processing

businesses than that which is achieved by organic farms (σ_{kz} = 122.6, σ_{cz} = 69.5). After the elimination of the effect of the size of the business, by way of the conversion of indicators to a per hectare basis, a decline in the values of the Gini coefficient for organic and conventional businesses is evident, see Tab. V, showing a decline in overall variability. The variation coefficient of gross added value per hectare of organic farms achieves 48.7%, while it goes down to 53.5% in the case of conventional farms.

To what extent the said inequality of gross added value is caused by the production capability of farms and to what extent it is affected by subsidy policy can be defined by way of the decomposition of the Gini coefficient according to the components of gross added value, see Table VI. On the basis of indicator S_k, it is evident that in the case of organic businesses, two thirds of the gross added value are comprised of subsidies and one third is comprised of the gross effect created by agricultural activity, which is constituted by the difference between production (P) and output consumption (OC). Conventional agriculture creates its gross added value through its own activity at a level of approximately one half, with the remainder consisting of subsidies. The tools of subsidy and tax policy thus have a significant share in the economic performance of agricultural businesses in the individual countries and thereby also significantly affect the competitiveness of agriculture of the individual countries.

In the case of both analyzed manners of farming, the balance of subsidies and taxes (BST) decreases the inequality of gross added value, see g_k and E_k in Tab. VI. Nevertheless, their positive effect on the equalization of differences between individual countries is more significant among organic farms, where an increase of the balance of subsidies and taxes by 1% brings about a decline in inequality of 0.21%. In conventional agriculture, the elasticity of subsidies achieves a value of –0.16%. That is caused by the variability of aid to organic farmers in individual EU countries. For example, in Italy the balance of subsidies and taxes has a 23.7% share in the gross added value, while in Finland such share is 117.5%.

Overall, we can thus say that there are differences in economic performance between individual agricultural production businesses, which, however, are not significant and which are successfully eliminated by the subsidy and tax policy of the state. In a number of countries, subsidies thus have a significant share in the economic effect of agricultural activity and eliminate the negative difference between the value of production and the amount of output consumption. The above applies to both organic farming as well as conventional farming. An example of the said countries are primarily Finland and the Czech Republic. However, the dependency of businesses on subsidy resources is much more significant in the case of the organic manner of farming, where the average balance of subsidies and taxes converted to a per hectare basis is 30.2% higher than in the case of conventional businesses and the average share of such balance in the gross added value exceeds the same indicator in the case of the conventional manner of farming by 47.7 percentage points.

CONCLUSIONS

On the basis of the quantification of the Gini coefficient for selected indicators of mixed production businesses, we can say that the said inequalities are significantly affected by the size of the agricultural businesses, which is significantly different for the analyzed countries. The Gini coefficient of gross added value converted to a per business basis achieved 0.412 points, while being only 0.274 points when converted to a per hectare basis. Such effect can be demonstrated best on the example of the Czech Republic. Agricultural businesses in the Czech Republic achieve the highest gross added value in the case of both manners of farming when converted to a per business basis. However, after the elimination of the effect of the area of agricultural land, it is evident that in the case of conventional agriculture, the Czech Republic is only in ninth place, and in second to last place in the case of organic farming out of the twelve analyzed countries. In the case of organic farming in the Czech Republic, it is also evident that the achieved gross added value per hectare is comprised primarily of obtained operating subsidies, as the difference between production and output consumption is negative. It can thus be stated that the Czech Republic lags behind in the creation of value per unit of contributed land.

The result of horizontal decomposition of the Gini coefficient confirms that inequality in the analyzed indicators is primarily conditioned by a difference in the achieved values between the individual countries rather than between both manners of farming. Such a conclusion is also applicable even after the elimination of the effect of the area of the agricultural business, i.e. after the conversion of the indicators to a per hectare of agricultural land basis. The manner of farming is thus not the main determinant of the ability of businesses to achieve gross added value per unit of area. There are significant differences among the analyzed countries in the indicator of gross added value per hectare, which are determined not only by the amount of operating subsidies per hectare of agricultural land, but also by the ability to create added value per unit of area. Both in the case of conventional farming as well as in the case of organic farming, such ability is the highest in the case of Italy and Austria. To what extent the differences in gross added value per hectare are brought about by the subsidy policy and to what extent they are caused by the production capability of the farm, can be determined by way of the vertical decomposition of the Gini coefficient. The high dependency on subsidy resources in organic farming is best evidenced by the following fact. Two thirds of the gross added value per hectare on average for all of the analyzed countries are comprised of subsidies and one third is comprised of the production margin. These subsidies have a positive effect on the equalization of inequalities in the achievement of gross added value per hectare. Such conclusion also applies to conventional farming businesses, but in the case of organic farming that positive effect of subsidies is more significant.

SUMMARY

The paper addresses the differentiation of gross added value of farms with a focus on mixed production from a selected twelve European Union countries in consideration of the manner of farming. The aim is to define the effect of an organic and conventional manner of farming on the differentiation of gross added value and to quantify the level of the impact of subsidy policy on the elimination of the said inequality. The fulfillment of the said aim was based upon the quantification of the Gini coefficient, which was quantified for selected indicators on the basis of data from the FADN database for the year 2009. The said indicators are gross added value, overall production, output consumption, the balance of subsidies and taxes, and net added value. In order to assess the effect of farming on the differentiation of the analyzed indicators, the horizontal decomposition of the Gini coefficients was performed. On the other hand, the vertical decomposition of the Gini coefficients served for the assessment of the impact of EU subsidy policy on the level of inequality of the indicator of gross added value. The Gini coefficient of the indicator of gross added value per hectare was decomposed for the entire sample, and, further, for conventional and organic farming businesses, according to the individual indicators, comprising gross added value – i.e. the balance of taxes and subsidies and the accounting added value or, in other words, the difference between the overall production and output consumption. The result of the horizontal decomposition of the Gini coefficient confirms that the inequality in the analyzed indicators is primarily conditioned by the difference in the achieved values between the individual countries rather than between both manners of farming. This conclusion is also applicable even after the elimination of the effect of the area of the agricultural business, i.e. after the conversion of the indicators to a per hectare of agricultural land basis. The manner of farming is thus not the main determinant of the ability of businesses to achieve gross added value per unit of area. The extent to which the differences in gross added value per hectare are brought about by subsidy policy and to what extent they are caused by the production capability of the farm can be determined by the vertical decomposition of the Gini coefficient. The high dependency on subsidy resources in organic farming is best evidence by the following fact. Two thirds of gross added value per hectare on average for all of the analyzed countries are comprised by subsidies and one third is comprised by the production margin. These subsidies have a positive effect on the equalization of inequalities in the achievement of gross added value per hectare. This conclusion also applies to conventional farming businesses, but in the case of organic farming this positive effect of subsidies is more significant.

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REFERENCES

ADAMS, R. H., 1999: *Nonfarm Income, Inequality, and Land in Rural Egypt.* World Bank Policy Research Working Paper 2178 [online]. [cit. 2010-08-15]. Available from: <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=636206>.

BENNI, N., FINGER, R., MANN, S., LEHMANN, B., 2012: The distributional effects of agricultural policy reforms in Switzerland. *Agricultural Economics*, 58, 11: 497–509. ISSN 0139-570X.

BROŽOVÁ, I., 2011: The economic performance analysis of organic farms in the Czech Republic. *Agricultural Economics*, 57, 5: 240–246. ISSN 0139-570X.

CISILINO, F., MADAU, F. A., 2007: Organic and Conventional Farming: a Comparison Analysis through the Italian FADN. In: *Proceedings of the 103rd EAAE Seminar „Adding Value to the Agro-Food Supply Chain in the Future Euromediterranean Space"* [online]. [cit. 2012-08-15]. Available from: http://orgprints.org/14139/1/Cisilino-Madau.pdf.

CONNOLY, L., 2002: Costs and margins in organic production in comparison with conventional production. In: *Signposts to Rural Change. Proceedings Rural Development Conference,* 93–100. [online]. [cit. 2012-06-12]. Available from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.195.1035&rep=rep1&type=pdf#page=92.

CHEN, CH.-N., TSAUR, T.-W., RHAI, T.-S., 1982: The Gini Coefficient and Negative Income. *Oxford Economic Papers*, 34, 3: 473–478. ISSN 0030-7653.

KADITI, E. A., NITSI, E. I., 2011: Vertical and horizontal decomposition of farm income inequality in Greece. *Agricultural economic review*, 12, 1: 69–80. ISSN 1109-2580.

KEENEY, M., 2000: The distributional impact of direct payments on Irish farm incomes. *Journal of Agricultural Economics*, 51, 2: 252–265. ISSN 1477-9552.

KOUŘILOVÁ, J., 2005: Porovnání efektivnosti ekologického a konvenčního zemědělství. *Acta Universitatis Bohemiae Meridionales*, 8, 2: 61–64. ISSN 0139-8849.

KOUŘILOVÁ, J., PŠENČÍK, J., KOPTA, D., 2009. *Dotace v zemědělství z hlediska komplexního pohledu a s přihlédnutím k ekologickému zemědělství.* 1st ed. Brno: Academic Publishing House Cerm, Ltd., 106 p. ISBN 978-80-7204-637-9.

KOUŘILOVÁ, J., 2010: *Multifunkční ekologické a konvenční zemědělství se zřetelem na podhorské a horské oblasti.* 1st ed. Brno: Academic Publishing House Cerm, Ltd., 161 p. ISBN 978-80-7204-683-6.

LAMBERT, P. J., ARONSON, J. R., 1993: Inequality Decomposition and the Gini coefficient revisited. *Economic Journal*, 112: 51–92. ISSN 1468-029.

LERMAN, R. I., YITZHAKI, S., 1985: Income Inequality Effects by Income Source: A New Approach and Applications to the United States. *Review of Economics and Statistics*, 67, 1: 151–156. ISSN 0034-6535.

MCCRORY, L., 2001: *An Economics Comparison of Organic and Conventional Dairy Production and Estimations on the Cost of Transitioning to Organic Production* [online]. [cit. 2013/02/15]. Available from: http://nofavt.org/assets/pdf/economic_comparison_organic_conventional_dairy.pdf.

MISHRA, A., EL-OSTA, H., GILLESPIE, J. M., 2009: Effect of agricultural policy on regional income inequality among farm households. *Journal of Policy Modeling,* 31, 3: 325–340. ISSN 0161-8938.

MÖLLERS, J., 2006: *Außerlandwirtschaftliche Diversifikation im Transformationprozess.* Halle: IAMO, 291 p. ISBN 3-938584-14-9.

NIEBERG, H., OFFERMANN, F., ZANDER, K., 2007: Organic Farms in a Changing Policy Environment: Impacts of Support Payments, EU-Enlargement and Luxembourg Reform. In: *Organic Farming in Europe: Economics and Policy,* vol. 13. Stuttgart: University of Hohenheim, 234 p. ISBN 978-3-933403-12-4.

OFFERMANN, F., NIEBERG, H., 2000: Economic Performance of Organic Farms in Europe. In *Organic Farming in Europe: Economics and Policy*, vol. 5. Stuttgart: University of Hohenheim, 198 p. ISBN 3-933403-04-9.

SILBER, J., 1989: Factor components, population subgroups and the computation of the Gini index of inequality. *Review of Economics and Statistics*, 71, 1: 107–115. ISSN 0034-6535.

STARK, O., TAYLOR, J. E., YITZHAKI, S., 1986: Remittances and inequality. *Economic Journal*, 96, 383: 722–740. ISSN 1468-029.

STUART, A., 1954: The Correlation Between Variate-Values and Ranks in Sample from a Continuous Distribution. *British Journal of Mathematical and Statistical Psychology*, 7, 1: 37–44. ISSN 2044-8317.

VON WITZKE, H. and NOLEPPA, S., 2006: *Distributive Effects of Direct Payments in German Agriculture under the New Common Agricultural Policy of the European Union* [online]. [cit. 2012-26-08]. URL:<http://www.agrar.hu-berlin.de/fakultaet/departments/daoe/ihe/Veroeff/GMF_final_Engl_Distr.pdf>.

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