TRANSFORMATION OF AGRARIAN STRUCTURE OF EU COUNTRIES WITHIN THE PERIOD OF 2010–2013

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Abstract. The aim of the paper is to determine the size and directions of changes and degree of differentiation of agrarian structure of EU countries within the period of 2010–2013. The research is based on Eurostat data presenting number of farms in groups of agricultural land area in particular countries. The areal groups are as follows: up to 5 ha of agricultural land, 5–20 ha, 20–50 ha, 50 ha and more. With the application of chosen methods of statistical analysis of structures direction and rate of changes of the structure under investigation were compared. Basing on fuzzy classification four groups of countries of similar structure were distinguished and the types of the structure under investigation were determined for EU countries in 2010 and 2013.

Key words: agrarian structure, European Union, classification of countries

INTRODUCTION

At the moment of the accession of new member countries to the European Union the level of their socio-economic development was in general lower than the "old" EU countries [Poczta and Kołodziejczak 2004], therefore the necessity of cutting down these differences and the adaptation of the economies so that they could be competitive with the EU. This concerned also agriculture, in particular the agrarian structure that in case of most new member countries was very fragmented and far from the structure of such countries as Germany, France and Great Britain [Bożek 2010]. Since the accession in new member countries significant changes of agrarian structure has been observed. They are the consequence of economic rationales as well as mechanisms introduced by Common Agricultural Policy of the European Union [Poczta 2013]. These changes are closely followed and analysed [Mierosławska 2008, Dzun 2009, Babiak 2010, Klepacki and Żak

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2013]. The aim of the paper is the determination of the range, directions of changes and the degree of differentiation of the agrarian structure of the European Union countries within the period of 2010–2013.

The main determinant of the agrarian structure is the areal structure of farms. This structure can be considered in two aspects: with respect to the shares of number of farms in distinguished areal groups of arable land in the total number of farms in the given country and with respect to the percentage of the area of arable land that is covered. The paper presents the results concerning the first capture of the research, i.e. the one concerning the number of farms in particular areal groups of arable land (the results concerning the area of arable land covered by farms in particular areal groups will be presented in a separate work). The research was carried out on the basis of the data from the internet database of the European Statistical Office – Eurostat, with regard to the years 2010 and 2013 presenting the number of farms according to areal groups of arable land in particular countries of the EU. In the research the following areal groups were assumed: up to 5 ha of arable land, 5–20 ha, 20–50 ha, 50 and more ha. With the application of chosen methods of statistical analysis of structures, the direction and rate of changes of the structure under investigation were compared in particular countries. Then on the basis of fuzzy classification groups of countries were distinguished of similar agrarian structure and types of the structure being investigated in countries of the European Union in the years 2010 and 2013.

RESEARCH METHOD

In the paper chosen methods of statistical analysis of structures were applied. In order to determine the degree of changes that took place in the structure over a certain period the following measure was implemented [Kukuła 1989].

If α is a partition structure investigated in time $t = 0, 1, ..., n$, consisting of r elements, i.e. the matrix $[\alpha_{tk}]_{(t=0,1, ..., n; k=1,...,r)}$ is given, where: $\sum_{t=1}^{r} \alpha_{ti} = 1$ and $0 \leq \alpha_{ti} \leq 1$,

then $v_{t,t-\tau} = \dfrac{\sum_{k=1}^{r} \left| \alpha_{tk} - \alpha_{(t-\tau)k} \right|}{2}$

determines the degree of changes of the structure over the period from $t - \tau$ to t. This measure takes values from the interval [0, 1]. Its high value indicates that the structure has undergone big changes. In particular, v_{n0} enables the comparison of the structure from the initial period $t = 0$ with the structure of the final period $t = n$.

The above measure was also applied in order to determine the degree of differentiation of typological groups. As a measure of inter-group differentiation (inter-group distance) the distance between the centres of gravity of groups calculated by the following formula:

$v_{ij} = \dfrac{1}{2} \sum_{l=1}^{r} \left| a_{il}^{*} - a_{jl}^{*} \right|$

where a_{il}^{*}, a_{jl}^{*} – the l-th element of the gravity centre of i-th and j-th group respectively (l-th element of the gravity centre of the group is the arithmetic mean of l-th elements of particular objects belonging to this group).

For grouping of countries with respect to the similarity of agrarian structure the fuzzy classification was applied, which afterwards was transformed into classical classification. In classical classification the membership of objects in the given class is described by the zero-one variable, while in case of fuzzy classification the membership of an object in a given class is described by a continuous variable. They are the so-called membership functions that take values from the interval [0, 1].

The problem of fuzzy classification can be formulated as follows. Let's assume a set of Ω with n objects (countries in his case): P_1, P_2, ..., P_n. These objects are described by the values of r variables: X_1, X_2, ..., X_r (in the paper X_l denotes the share of the number of farms from the l-th areal group in the total number of farms in the given country). On the set of Ω the family of fuzzy classes: S_1, S_2, ..., S_k ($1 < K < n$) should be determined so that the following conditions were fulfilled:

1. $0 \le f_{S_j}(P_i) \le 1$ $(i = 1, ..., n; j = 1, ..., K)$ where $f_{S_j}(P_i)$ denotes the degree of membership of the object P_i to the class S_j.

2. $\sum\limits_{j=1}^{K} f_{S_j}(P_i) = 1$ $(i = 1, ..., n)$.

3. Objects for which the degrees of membership in the same class are high – are treated as very similar while the objects for which the degrees of membership in different classes are high – are treated as little-similar.

The creation of the fuzzy classification then is based on the determination for each object $P_i \in \Omega$ such a vector $f(P_i) = \left(f_{S_1}(P_i), f_{S_2}(P_i), ..., f_{S_K}(P_i) \right)$ that the conditions 1–3 are fulfilled.

There are several methods of the construction of the fuzzy classification [Jajuga 1984]. In the paper the iterative method based on the concept of fuzzy gravity centre was chosen. In his method in subsequent iteration the values of degrees of membership of objects in particular classes are being changed. This procedure is continued until these values stop changing in a significant degree. The classification obtained in this manner is then transformed into classical classification by the assumption that the object P_i belongs to the class (typological group) S_j, when $f_{S_j}(P_i) = \max\limits_{l} f_{S_l}(P_i)$.

INVESTIGATION RESULTS

Over the period of 2010–2013 significant changes in the number of farms in the countries of the European Union took place, which is presented in the Tables 1 and 2 (In Table 2 for easier capture of trends, countries of UE-15 and countries of UE-12 were grouped separately). General number of farms in the European Union (UE-27) decreased by 1,331.4 thousand, which makes 11%. The drop of number of farms occurred in all countries apart from the Czech Republic (where there was the increase of the total number of farms by 3.4 thousand, that is 14.8%).

The largest drop in the number of farms – in absolute values – was observed in Italy (610.7 thousand, i.e. 37.7%), Romania (229.3 thousand, i.e. 6%), Bulgaria (115.6 thousand, i.e. 31.2%), Hungary (85.7 thousand, i.e.14.9%), Poland (78 thousand, i.e. 5.2%), therefore in countries of high fragmentation of farms. Significant decrease of the number of farm also took place in France (43.8 thousand, i.e. 8.5%) and Portugal (40.6 thousand, i.e. 3.5%).

The least drop of the total number of farms was noticed in Estonia (0.4 thousand, i.e. 2%), Ireland (0.4 thousand, i.e. 0.3%), Slovakia (0.9 thousand, i.e. 3.7%) and also in Great Britain (1.8 thousand, i.e. 1%) and Slovenia (2.3 thousand, i.e. 3.1%).

The largest changes both in absolute and relative numbers concerned the number of very small farms, of the area up to 5 ha of arable land. The number of these farms dropped in all countries apart from the three countries (the Czech Republic, Ireland and Latvia) and the largest dynamics of the drop was noticed in Italy (50%), Finland (47%) and Belgium (43%). In absolute values the number of such farms decreased mostly in Italy, Romania, Bulgaria, Hungary and in Poland (Table 1), that is in countries, where the percentage of these farms is the highest in the EU. The shares of these farms also dropped in all countries apart from the Czech Republic and Latvia, where a slight increase was observed (Table 2).

The number of farm of the area of 5–20 ha also decreased, but the drop here was relatively smaller than the one noticed in case of farm of the area up to 5 ha and in most countries did not exceed 10%.

Larger drop of the number of these farms was observed in Finland (20%) and in Latvia (20%). In the Czech Republic and in Slovakia there was an increase of the number of these farms by about 18%, in Romania – by about 8%, while in Bulgaria, Ireland and Great Britain the number of these farms remained on the same level. In turn, the shares of this group of farms in 19 countries increased. The increase did not exceed 3 percentage points, apart from Italy, where there was an increase by nearly 10 percentage points. In other countries slight decrease of the shares of this group of farms took place, but in most cases it did not exceed 1 percentage point.

In the group of farms of the area of 20–50 ha in most „old" EU countries there was a decrease of the number from 1% in Ireland up to 13% in Finland, while in most "new" member countries the number of such farms increased from 3 up to 10%. The shares of farms of the area of 20–50 ha changed very slightly (in most cases by less than 1 percentage point), in different directions: in 18 countries there was an increase of the number, in the rest of countries – the decrease or no change (they practically remained on the same level).

In the group of largest farms in most countries a slight increase took place, by 1–5%. Most such farms occurred in Poland: 5.1 thousand, i.e. 19.2%. Taking into account new member countries the number of farms of the area of more than 50 ha dropped only in Romania (by 3.8%), while in other countries it remained on the same level or increased. In turn in 8 "old" countries (Belgium, Denmark, Greece, Spain, Ireland, Romania, Sweden) the number of such farms slightly decreased. The drop was on the level of 0.6% in France up to 5.3% in Sweden. With regard to the shares of the largest farms only in two countries the increase did not occur: in the Czech Republic and in Ireland, where there was a decrease by 2 and 0.2 percentage points respectively. Apart from these two countries the shares of these farms increased or remained on the same level, although the increase in most cases did not exceed 1 percentage point. Only in Finland and in France the increase was higher and reached 4.8 and 3.3 percentage point respectively.

Table 1. Number of farms (in thousands) in groups of agricultural land area in countries of EU in 2010 and 2013

Country	Total	Areal groups of arable land in ha				Total	Areal groups of arable land in ha			
		0–5	5–20	20–50	≥50		0–5	5–20	20–50	≥50
		2010					2013			
Austria	150	47.5	59.2	32.3	11.3	140.4	43.1	54.7	31.4	11.3
Belgium	42.9	9.7	12	12.2	9.0	37.8	5.5	11.8	11.8	8.7
Bulgaria	370	339	17.6	6.0	8.4	254.4	221	17.7	6.6	9.2
Cyprus	38.9	34.8	3.0	0.7	0.3	35.4	31.8	2.7	0.6	0.3
Czech Republic	22.9	3.5	8.1	4.4	6.8	26.3	4.9	9.5	4.8	7.1
Denmark	42.1	3.1	15.8	9.2	14.0	38.8	2.6	14.6	8.3	13.3
Estonia	19.6	6.6	7.5	2.7	2.8	19.2	6.3	7.3	2.6	3.0
Finland	63.9	6.2	21.3	21.7	14.7	54.4	3.3	17.1	18.9	15.1
France	516	139	96.8	88.5	192.0	472.2	116.4	85.9	79	190.9
Greece	723	557	133	25.5	7.0	709.5	544.4	132.1	26.2	6.9
Spain	990	526	253	108.0	104.0	965	506.5	251.6	105.2	101.8
Netherlands	72.3	20.7	21.1	19.2	11.3	67.5	18.5	19.5	17.9	11.6
Ireland	140	9.7	49.3	55.4	25.5	139.6	9.8	49.8	54.9	25.1
Lithuania	199.9	117	61.4	12.5	8.6	171.8	91.5	58.5	12.1	9.8
Latvia	83.4	28.3	40.2	9.6	5.3	81.8	34.9	31.9	9.4	5.6
Germany	299	27.4	110	76.1	85.2	285	24.6	103.6	71.4	85.2
Poland	1 507	831	553	95.3	26.5	1 429	777.8	517.2	102.4	31.6
Portugal	305	231	52.2	11.7	10.5	264.4	191.1	49.7	12.9	10.7
Romania	3 859	3 594	226	17.9	21.2	3 629.7	3 347.1	243.6	18.8	20.4
Slovakia	24.5	15.8	4.3	1.4	3.0	23.6	13.9	5.1	1.5	3.1
Slovenia	74.7	45.4	25.8	3.0	0.5	72.4	43.3	25.5	3.1	0.5
Sweden	71.1	8.9	30	15.2	17.0	67.2	7.7	29.4	13.9	16.1
Hungary	577	502	46	15.4	13.9	491.3	415.5	45.7	15.9	14.2
Great Britain	187	16.7	55.5	42.4	72.2	185.2	15.8	55.7	40.8	72.9
Italy	1 621	1 182	306	87.6	44.7	1 010.3	592.7	287.7	84.6	45.3
Luxembourg	2.2	0.4	0.4	0.3	1.1	2.1	0.3	0.4	0.3	1.1
Malta	12.5	12.2	0.3	0.0	0.0	9.4	9.1	0.3	0.0	0.0
Croatia	–	–	–	–	–	157.4	109.2	37.3	6.9	3.9
UE (27)	12 015	8 314	2 210	774	717	10 684	7 079.4	2 129	755.1	720.6

Source: Own calculations on the basis of www.europa.eu/eurostat.

Table 2. Dynamics of changes in the number of farms in EU countries in groups of agricultural land area in countries of EU in 2010 and 2013 (2010 = 100%)

Country	Farms in total (in thousands)		Areal groups of arable land in ha (%)			
	2010	2013				
EU (27)	–1 331.4	88.9	85.2	96.3	97.6	100.5
Austria	–9.6	93.6	90.7	92.4	97.2	100.0
Belgium	–5.1	88.1	56.7	98.3	96.7	96.7
Denmark	–3.3	92.2	83.9	92.4	90.2	95.0
Finland	–9.5	85.1	53.2	80.3	87.1	102.7
France	–43.8	91.5	83.7	88.7	89.3	99.4
Greece	–13.5	98.1	97.7	99.3	102.7	98.6
Spain	–25	97.5	96.3	99.4	97.4	97.9
Netherlands	–4.8	93.4	89.4	92.4	93.2	102.7
Ireland	–0.4	99.7	101.3	101.0	99.1	98.4
Germany	–14	95.3	89.8	94.2	93.8	100.0
Portugal	–40.6	86.7	82.7	95.2	110.3	101.9
Sweden	–4	94.4	86.5	98.0	91.4	94.7
Great Britain	–1.8	99.0	94.6	100.4	96.2	101.0
Italy	–610.7	62.3	50.1	94.0	96.6	101.3
Luxembourg	–0.1	95.5	75.5	100.0	100.0	100.0
Bulgaria	–115.6	68.8	65.2	100.6	110.0	109.5
Cyprus	–3.5	91.0	91.4	90.0	85.7	100.0
Czech Republic	3.4	114.8	140.0	117.3	109.1	104.4
Estonia	–0.4	98.0	95.5	97.3	96.3	107.1
Lithuania	–28.1	85.9	78.2	95.3	96.8	114.0
Latvia	–1.6	98.1	123.3	79.4	97.9	105.7
Poland	–78	94.8	93.6	93.5	107.5	119.2
Romania	–229.3	94.1	93.1	107.8	105.0	96.2
Slovakia	–0.9	96.3	88.0	118.6	107.1	103.3
Slovenia	–2.3	96.9	95.4	98.8	103.3	100.0
Hungary	–85.7	85.1	82.8	99.3	103.2	102.2
Malta	–3.1	75.2	74.0	101.3	–	–

Source: Own calculations on the basis of Table 1.

In order to compare the range of structural changes in particular countries the degree of structural changes was calculated (Table 3). The most intensive changes of the structure took place in Italy, where the degree of structural changes equals 0.1427, in Latvia – 0.0922, in Belgium – 0.0806, Finland – 0.0554, Slovakia – 0.0559, Lithuania – 0.0541. The littlest structural changes (less than 0,01) took place in Cyprus, Greece, Spain, Ireland, Romania, Slovenia.

Table 3. Number of farms (%) in groups of agricultural land area in countries of EU in 2010 and 2013

Country	Areal groups of arable land in ha				Areal groups of arable land in ha				$v_{2013.2010}$
	0–5	5–20	20–50	50 and more	0–5	5–20	20–50	50 and more	
	2010				2013				
Austria	31.7	39.5	21.5	7.5	30.7	39.0	22.4	8.0	0.081
Belgium	22.6	28.0	28.4	21.0	14.6	31.2	31.2	23.0	0.046
Bulgaria	91.6	4.8	1.6	2.3	86.9	7.0	2.6	3.6	0.003
Cyprus	89.5	7.7	1.8	0.8	89.8	7.6	1.7	0.8	0.039
Czech Republic	15.3	35.4	19.2	29.7	18.6	36.1	18.3	27.0	0.011
Denmark	7.4	37.5	21.9	33.3	6.7	37.6	21.4	34.3	0.013
Estonia	33.7	38.3	13.8	14.3	32.8	38.0	13.5	15.6	0.055
Finland	9.7	33.3	34.0	23.0	6.1	31.4	34.7	27.8	0.032
France	26.9	18.8	17.2	37.2	24.7	18.2	16.7	40.4	0.004
Grece	77.0	18.4	3.5	1.0	76.7	18.6	3.7	1.0	0.006
Spain	53.1	25.6	10.9	10.5	52.5	26.1	10.9	10.5	0.016
Netherlands	28.6	29.2	26.6	15.6	27.4	28.9	26.5	17.2	0.005
Girland	6.9	35.2	39.6	18.2	7.0	35.7	39.3	18.0	0.054
Lithuania	58.5	30.7	6.3	4.3	53.2	34.1	7.0	5.7	0.092
Latvia	33.9	48.2	11.5	6.4	42.7	39.0	11.5	6.8	0.014
Germany	9.2	36.8	25.5	28.5	8.6	36.4	25.1	29.9	0.013
Poland	55.1	36.7	6.3	1.8	54.4	36.2	7.2	2.2	0.034
Portugal	75.7	17.1	3.8	3.4	72.3	18.8	4.9	4.0	0.009
Romania	93.1	5.9	0.5	0.5	92.2	6.7	0.5	0.6	0.056
Slovakia	64.5	17.6	5.7	12.2	58.9	21.6	6.4	13.1	0.010
Slovenia	60.8	34.5	4.0	0.7	59.8	35.2	4.3	0.7	0.017
Sweden	12.5	42.2	21.4	23.9	11.5	43.8	20.7	24.0	0.024
Hangary	87.0	8.0	2.7	2.4	84.6	9.3	3.2	2.9	0.011
Great Britain	8.9	29.7	22.7	38.6	8.5	30.1	22.0	39.4	0.143
Italy	72.9	18.9	5.4	2.8	58.7	28.5	8.4	4.5	0.014
Luxembourg	18.2	18.2	13.6	50.0	14.4	19.0	14.3	52.4	0.038
Malta	97.6	2.4	0.0	0.0	96.8	3.2	0.0	0.0	0.008
Croatia					69.4	23.7	4.4	2.5	
EU (27)	69.2	18.4	6.4	6.0	66.3	19.9	7.1	6.7	0.029

Source: Own calculations on the basis of Table 1.

The high differentiation of the structure under investigation is still observed in the countries of EU (Table 3). In 2013 farms of the area up to 5 ha constitutes from 6.1% in Finland up to 92.2% in Romania, the shares of farms of 5–20 ha reach from 7% in Bulgaria up to 43.8% in Sweden. Very large divergence concern also the shares of farms of the area of 20–50 ha: from 2.6% in Bulgaria up to 39.3% in Ireland and farms of the largest area more than 50 ha: from 0.6% in Romania up to 40.4% in France. These numbers are very far from the average values for the whole European Union, which equal 66.3, 20, 7, 6.7% respectively (Table 3).

On the basis of the method of fuzzy classification method grouping of countries with respect to the level of similarity of the structure presented in the paper was carried out for the years 2010 and 2013 (two countries were not taken into account: Malta and Luxembourg because of the small number of farms, disjunctive to the rest of countries).

The calculations were carried out with the application of original computer program that for the given set of multidimensional objects determines gravity centres for clusters and computes values of membership functions for particular objects in these clusters. Initial values of degrees of membership in fuzzy classes were determined at random, which did not influence the final classification. The computation stopped when the maximum (by classes and elements) of the modulus of the difference of values of membership degrees in two subsequent iterations were less than 0.000001.

On the basis of the calculations carried out four groups of countries were distinguished. The composition of these groups and their characteristics in the years under investigation are presented in Tables 4 and 5.

Table 4. Membership of EU countries in typological groups

Group	Composition of group	
	2010	2013
I	Bulgaria, Cyprus, Greece, Portugal, Romania, Hungary, Italy	Bulgaria, Cyprus, Greece, Portugal, Romania, Hungary
II	Spain, Lithuania, Poland, Slovakia, Slovenia	Spain, Lithuania, Latvia, Poland, Slovakia, Slovenia, Italy, Croatia
III	Austria, Estonia, Netherlands, Latvia	Austria, Estonia, Netherlands
IV	Belgium, Czech Republic, Denmark, Finland, France, Ireland, Germany, Sweden, Great Britain	Belgium, Czech Republic, Denmark, Finland, France, Ireland, Germany, Sweden, Great Britain

Source: Own investigations.

The largest fragmentation occurs in case of group I. In 2010 in the countries of this group 83.8% of the total number of farms was contributed by very small farms, of the area less than 5%, 11.5% was formed by farms of the area of 5–20 ha, while farms from the upper areal groups constituted non-significant ratio: 20–50 ha – 2.8% and more than 50 ha – 1.9%. In 2013 the composition of this group changed: Italy, where intensive structural changes took place belongs to group II, with countries of less fragmented structure than the one in countries of group I. The transfer of Italy to group II and minor structural changes in Cyprus, Greece, Romania are the reason for the fact that in 2013 the average structure of group I practically did not change.

Table 5. Characteristics of groups of countries with similar agrarian structure in 2010 and 2013

Group	Value	Areal groups of arable land in ha (%)				Areal groups of arable land in ha			
		<5	5–20	20–50	50 and more	<5	5–20	20–50	50 and more
		2010				2013			
I	Average	83.8	11.5	2.8	1.9	83.7	11.3	2.8	2.2
	$s(x)$	7.74	5.83	1.52	1.03	7.07	5.28	1.40	1.41
	$V(x)$	0.09	0.51	0.55	0.55	0.08	0.47	0.51	0.65
II	Average	58.4	29.0	6.6	5.9	56.2	30.5	7.5	5.8
	$s(x)$	4.03	6.87	2.29	4.66	7.16	6.01	2.50	4.02
	$V(x)$	0.07	0.24	0.34	0.79	0.13	0.20	0.33	0.70
III	Average	32.0	38.8	18.3	11.0	30.3	35.3	20.8	13.6
	$s(x)$	2.12	6.74	6.02	4.06	2.22	4.54	5.41	3.99
	$V(x)$	0.07	0.17	0.33	0.37	0.07	0.13	0.26	0.29
IV	Average	13.3	33.0	25.5	28.2	10.2	35.3	26.6	27.9
	$s(x)$	6.69	6.40	6.88	6.79	4.13	4.15	7.11	6.27
	$V(x)$	0.50	0.19	0.27	0.24	0.40	0.12	0.27	0.22

Source: Own calculations.

In countries of group II farm sof the area up to 5 ha constitute significantly less ratio than in group I (58.4% in 2010 and 56.2% in 2013), while there are much more farms of the area of 5–20 ha (29% in 2010 and 30.5% in 2013). There are more large and very large farms in comparison with group I – 7.5 and 5.8% respectively in 2013. In 2013 three new countries appeared in group II: Latvia, Italy, Croatia. Group II has the most similar structure to the average structure of European Union.

Group III has more uniform distribution of structure than the two previous groups. The shares of farms of the area up to 5 ha and 5–20 ha were on close levels in 2010 – 32 and 38.8% respectively, farms of the area of 20–50 ha constituted 18.3%, while farms of the largest area – 11%. In 2013 the shares of the first two groups are lower – 30.3 and 35.3% respectively, while the shares of the two upper groups are higher and equal 20.8 and 13.6% respectively. In 2013 Latvia left this group and moved to group II.

Group IV consists of farms of best agrarian structure. In 2010 more than a half of total number of farms was constituted by the two upper areal groups: 25.5 and 28.2% respectively, while the shares of the smallest farms up to 5 ha were on the level of 13.3%. In 2013 in group IV the shares of the first and the last areal group are lower (in comparison with the year 2010) while the shares of the two middle groups are higher).

The distinguished typological groups has a high intra-group differentiation, measured by $V(x)$, in those areal categories that constitutes relatively small percentage and low differentiation in other areal categories.

Comparing the structure of the distinguished typological groups in 2010 and 2013 one can notice that the structure of group I practically did not change. In other typological groups the shares of farms of the area up to 5 ha dropped significantly (2–3 percentage points), the shares of farms of the area slightly increased (more or less 1 percentage

points). The shares of other farms changed in different directions, but the changes were not significant.

In order to estimate in what direction the inter-group differentiation changes (if the groups are getting similar or divergent) measures of inter-group differentiation were calculated for the years 2010 and 2013 (Table 6). The largest distance in both years occurs in case of groups I and IV and the shortest – in case of groups III and IV. Within the period of 2010–2013 the inter-group differentiation increased in case of group I and other groups and between group II and IV. In turn, the distance between group II and IV and group III and II decreased.

Table 6. Inter-group differentiation in 2010 and 2013

Group	2010			2013		
	II	III	IV	II	III	IV
I	0.2541	0.5189	0.7053	0.2754	0.5345	0.7353
II	–	0.2648	0.4512	–	0.2591	0.4599
III	–	–	0.2444	–	–	0.2009

Source: Own calculations.

CONCLUSIONS

On the basis of the analysis of the agrarian structure of the countries of European Union carried out over the period of 2010 and 2013 the following conclusions can be formulated.

Over the period under investigation positive changes took place: there was a drop of the total number of farms in all EU countries (apart from the Czech Republic), while the largest drop of the number of farms was observed in countries of a high degree of fragmentation of agriculture: Bulgaria, Romania, Italy, Poland and Portugal, which can be seen as a positive phenomenon.

The largest decrease of the number of farms, both in absolute and relative capture occurred in the areal group of farms up to 5 ha of arable land. At the same time there was an increase of the number of farms from the upper areal groups. The largest increase of the number of these farms was observed in new member countries of the EU (EU-12).

The agrarian structure of the EU countries is very differentiated. Four groups of countries can be distinguished. Group I constitutes of six countries of the highest degree fragmentation of farms: Bulgaria, Greece, Portugal, Romania, Hungary and Cyprus, where in 2013 where on average the share of the smallest farms of the area of up to 5 ha was on the level of 83.8% of the total number of farms, farms of the area of 5–20 ha have the contribution of 11.5%, farms of the area of 20–50 ha constitute 2.8%, and farms of the area of more than 50 ha form only 1.9% on average. Less fragmentation is observed in countries of group II: Spain, Lithuania, Poland, Slovakia, Slovenia, in which the percentage of farms from the subsequent areal groups on average is as follows: 58, 29, 7 and 6% respectively. Group III (Austria, Estonia, the Netherlands, Latvia) differs from the previous groups because of high shares of largest farms and the distribution of structure is as follows: 32, 39, 18 and 11% respectively. Group IV (Belgium, the Czech Republic, Denmark, Finland, France, Ireland, Germany, Sweden, the Great Britain) consists of

countries of best agrarian structure of farms: 13, 33, 26 and 28%. Within the period under investigation the composition of groups did not change significantly – only two countries changed their membership in groups. The group of countries of the highest fragmentation of farms decreased.

In 2013 the structure of typological groups seems more beneficially than in 2010: the shares of farms of the area less than 5 ha are lower while the shares of farms of the largest area are higher.

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PRZEMIANY STRUKTURY AGRARNEJ KRAJÓW UNII EUROPEJSKIEJ W OKRESIE 2010–2013

Streszczenie. Celem pracy jest określenie skali, kierunków przemian oraz stopnia zróżnicowania struktury agrarnej krajów Unii Europejskiej w okresie 2010–2013. Badania przeprowadzono na podstawie danych Eurostatu przedstawiających liczbę gospodarstw w grupach obszarowych użytków rolnych w poszczególnych krajach. W pracy przyjęto następujące grupy obszarowe gospodarstw: do 5 ha użytków rolnych, 5–20 ha, 20–50 ha, 50 i więcej ha. Posługując się wybranymi metodami statystycznej analizy struktur, porównano kierunek i tempo zmian badanej struktury w krajach Unii Europejskiej. Na podstawie klasyfikacji rozmytej wyodrębniono cztery grupy krajów o zbliżonej strukturze oraz określono typy badanej struktury w krajach Unii Europejskiej w latach 2010 i 2013.

Słowa kluczowe: struktura agrarna, Unia Europejska, klasyfikacja krajów