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Correlations between fragmentation of farms in the Republic of Moldova and its impact on farm incomes compared to Poland and Romania

Abstract. The paper presents selected problems of farm management in terms of fragmented agriculture. The problem of land fragmentation was exemplified in these three countries of Central and Eastern Europe. The main purpose of the study was to compare the effectiveness of selected indicators of agricultural production in the three selected countries. For the analysis, the data on the concentration indexes was selected from: Lorenz concentration coefficient, the Gini index, and territorial concentration coefficient (Gini C and Stuck formula). In selected countries, there are a large number of small and very small farms. They represent the majority of farms managed by private owners. To a large extent, they are called semi-subsistence farms or social farms. Some of them provide part of their products on the market. Small farms are part of the so-called European Model of Agriculture – a model that consists of small family farms. It is difficult to indicate a correct definition of "small farm", as it may be defined differently depending on the region or country. In the EU, small farms occupy a dominant position, being a constant subject of debates and policy. The authors of the article stressed the need for strengthening the small farm position, for example by enlarging their acreage or by initiating horizontal or vertical cooperation in a way that shall not impair the role of small farms. They are important in biodiversity protection, preserving the rural landscape, as well as maintaining local tradition, culture and heritage.

Key words: land fragmentation, concentration index, land productivity, European model of small farms, farm management, the role of small farm, Moldova, Poland, Romania

Introduction

Nearly 14 million farmers exist in the EU and the average farm size is 15 hectares. The biggest agricultural holdings are located in the Czech Republic (the average farm size is 90 hectares) and Denmark (60 hectares) and the lowest are in Romania (3 hectares), Poland (6 hectares), Bulgaria (6 hectares), Hungary (7 hectares) and Italy (8 hectares) [Eurostat 2014].

Land fragmentation and the system of small farms is known as the European Model of Agriculture (EMA) [Kowalczyk, Sobiecki 2011]. Fragmented agriculture, family farms and, what should be stressed, high diversity, characterize European agriculture. There are many agricultural enterprises and organic farms, nevertheless very small and medium-sized farms have a dominant position [Musiał, Drygas 2013]. European agriculture still represents a fragmented model of agriculture and is mostly family-managed. Very often, the land is cultivated from generation to generation: retired owners pass the farm into the hands of their children [Poczta 2010]. The use of direct payments under the Common Agricultural Policy of the European Union provides strong incentive to keep small farms. It

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also significantly affects the increase in land prices [Światły, Turnau, Majchrzak 2011]. Therefore, introducing modulation (reduction of direct payments for the largest farms) will result in splitting the big farms into smaller ones [Zegar 2008].

Although the European Model of Agriculture is fragmented and based on family farms, the concept of "small farm" is not very clear. For the criterion of defining, the utilized agricultural area can be considered, as well as economic output, added value, allocation of production, work force, the source of income, etc. [EU Agricultural Economic Briefs: What is a small farm? 2011; The European Model of Agriculture – Challenges Ahead 2006]. Because of the size, a "small farm" may be a farm of 2 hectares in Poland, Romania or Moldova, while in France or Great Britain, we may consider a small farm as having an area of 30 or 50 hectares.

One-third (i.e. 3.6 million) of European agricultural holdings are in Romania, with an average area of 3.6 hectares, and 41% of them are managed by people over 65, according to recent data of Eurostat. Data shows some of the information obtained from the agricultural census conducted in 2013 - 2014 in all Member States. In the European Union in 2013, there were about 10.8 million agricultural properties, including over one third (33.5%) in Romania. The vast majority of the 3.7 million farms are subsistence farms and patches of agricultural land belonging to rural households.

Over the years, we can observe slow increasing in the average farm size in the EU: between 2003 and 2010, the average farm size increased from 12 to 14 hectares. At the same time, the number of farms reduced between 2003 and 2010 by 20% [Eurostat 2014]. However, small farms still dominate in Europe, and those above 50 hectares are only 5% of all farms. In relation to other countries in the world, e.g. the USA or Australia, these farms are still very small [Tóth 2014].

Materials and methods

The main purpose of the research was to assess the degree of land fragmentation in three countries in Central and Eastern Europe (Poland, Romania and Moldova), taking into account its impact on land productivity and management. The rate of land productivity was defined as the value of agricultural production per 1 hectare of utilized agricultural area (UAA).

To assess the degree of land fragmentation the calculations of Majchrzak [2014] were used: Lorenz concentration coefficient and the Gini index.

The Lorenz coefficient reaches values of <0,1>, where the closer to 0, the lower the concentration; the closer to 1, the greater the concentration with respect to a fixed variable. In the paper, concentration with respect to farms greater than 50 hectares was taken into account. In turn, the Gini index is a measure of inequality of a random variable. It also ranges from 0 to 1, but the value of zero means complete uniformity and the growth of rate represents the increase of inequality [Statystyczne studium struktury agrarnej w Polsce, 2010]. For the Moldova case study, the territorial concentration coefficient (Gini C and Stuck formula) were also used.

For calculations, statistical data of Eurostat, data from the Central Statistical Office in Warsaw, the data of the Agency for Restructuring and Modernization of Agriculture and Ministry of Agriculture from Moldova Republic, and National Bureau of Statistics from Republic of Moldova were used, as well as scientific publications and research results.

The study focused on the analysis of mentioned factors in relation to three selected countries: Poland, Romania and Moldova. A strong similarity can be indicated in the level of development in agriculture, and similar problems faced by these countries. They are characterized by a fragmented agrarian structure, low average farm size and high employment in agriculture [Gospodarstwa rolne…, 2013].

Results and discussion

Agriculture in Poland is very fragmented: the average farm size in 2014 amounted to less than 11 hectares (but significantly differs in different regions) [www.arimr.gov.pl]. Despite a slight impact on the creation of benefit, this sector involves a large group of employees – about 12% (3.8 million people working in agriculture). Poland is among the countries with a large number of farms: more than 1.5 million according to Eurostat. Nearly 1.3 million farmers receive direct payments [Rolnictwo w 2014; Agricultural census, Eurostat 2010]. Unfavorable structure of agriculture is the result of many factors, including agrarian overpopulation, agricultural reforms (especially the reform of 1944), social conditions, the results of political transformation, as well as the current EU Common Agricultural Policy [Struktura agrarna – Land structure].

As we can see in Figure 1, small farms dominate: half of Polish farms had less than 5 hectares of agricultural land. Only 8% of all farms have more than 20 hectares but they manage almost half of the utilized agricultural area in Poland. Farms with more than 100 hectares covered 22% of agricultural land, but they represent only 1% in the structure of all farms (Figure 1).

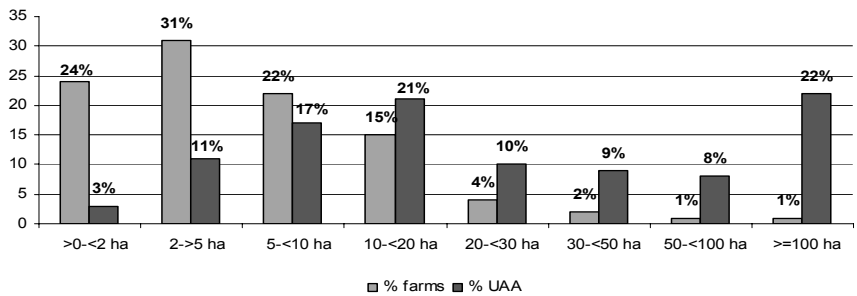


Fig. 1. Distribution of agricultural holdings and UAA in Poland in 2010 (in %)

Source: Agricultural census, Eurostat 2010.

Agriculture is a very important sector in the Romanian economy. It covers more than 3.5 million farms and employs over 28% of the national workforce – taking first position in the EU-27, followed by Poland. Family-run and semi-subsistence farms have a dominant position [Popescu, Condei 2015]. The utilized agricultural area is also very large compared to other countries. a huge decrease can be observed in the number of farms (-14% between 2003 and 2010) but still Romania struggles with a very fragmented agriculture [Agricultural census, Eurostat 2010]. Around 90% of all farms manage no more than 5 hectares, which means that there is a huge fragmentation (Figure 2).

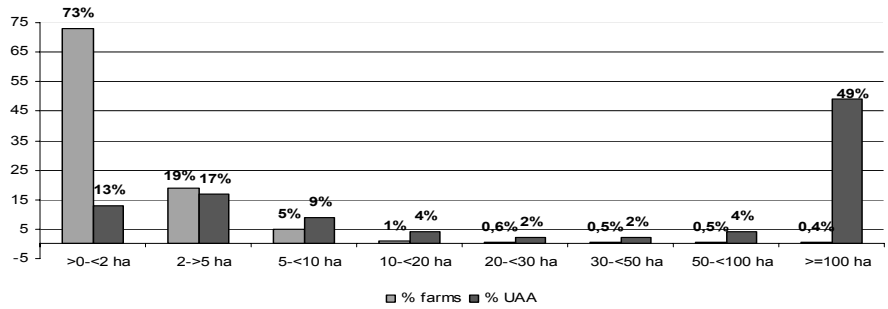


Fig. 2. Distribution of agricultural holdings and UAA in Romania in 2010 (in %)

Source: Agricultural census, Eurostat 2010.

The average farm size in Romania is about 3.7 hectares; farms are fragmented because they consist of many small parcels. The land fragmentation is partially the result of the land restitution from the 1990s. According to Popescu [2009] due to a large fragmentation of agricultural land, there is a need for initiating the processes of land consolidation.

Agriculture in Moldova is also very fragmented. The land reform of 1991 and post-land reform development have resulted in a polarized agricultural structure with an average land individual farm of 2 hectares, typically distributed in 3-4 parcels. Unfavorable structure of agriculture is the result of many factors, including agricultural reforms (especially the reform of 1990-1992), social conditions and the results of political transformation. In many cases, the fragmentation of land parcels has prevented the land market from developing [www.fao.org.nr]. Now the average private farm size in 2014 amounted to less than 4 hectares (but significantly differs in different regions). Farms with large acreage (more than 100 ha) are usually agricultural holdings (companies or cooperatives), and small farms with an area up to 5 hectares are run privately by farmers. Despite a slight impact on the creation of benefit, this sector in Moldova involves a large group of employees – about 361 thousand people work in agriculture [www.statistica.md].

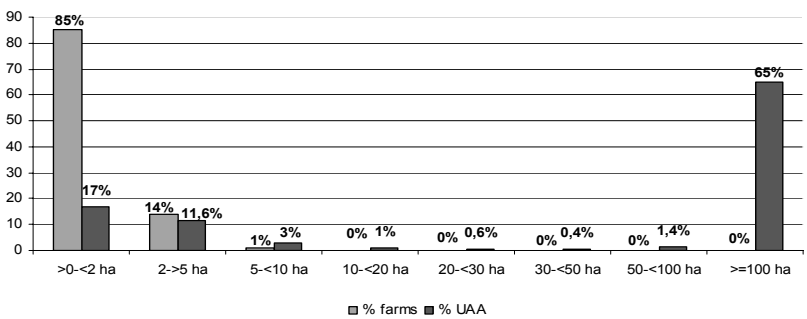


Fig. 3. Distribution of agricultural holdings and UAA in Moldova in 2010 (in %)

Source: Statistical Yearbook of the Republic of Moldova, National Bureau of Statistics 2011.

According to Eurostat, in 2010 there were over 12 million farms in the EU and almost 30% of them were located in Romania [Eurostat 2014]. A significant share in the structure

of EU farms is taken by Polish farms, with a share of 12.3% (Table 1). Currently, Poland has about 715 thousand farms with an area of 5 hectares, in Romania over 3 million. Moldova has almost 400 thousand peasant farms (33% of all farms). The remainder are agricultural cooperatives (232), joint stock companies (161) and limited liability companies (36240) [www.statistica.md]. In the group of Moldova, family (peasant) farms almost all manage an area of 5 hectares or less.

A systematic decrease in the number of farms in the EU can be observed, the same in Poland, Romania and Moldova, with the largest reduction found in farms with the smallest area [Alexandri, Luca 2012; Poczta, Śledzińska Mrówczyńska-Kamińska 2009]. At the same time, the number of larger farms, over 20-30 hectares, is growing. Despite the positive changes, in these countries there is still a very large group of small farms compared to the other European regions [Poczta 2010].

Table 1. Chosen characteristics of agriculture in the EU, Poland, Romania and Moldova

Year	EU 27	Poland	Romania	Moldova
		Number of farms [thousand]		
2003	15021	2172	4484	1125
2005	14482	2476	4256	1113
2007	13700	2390	3931	987
2010	12248	1506	3859	902
Change (2007-2003)	-2773	-665	-625	-223
		Number of farms <5 ha [thousand]		
2003	10959	1440	4205	746
2005	10349	1750	3870	427
2007	9644	1637	3530	229
Change (2007-2003)	-1314	+196	-674	-517
		Number of farms 5-<20 ha [thousand]		
2003	2538	619	256	127
2005	2615	608	355	158
2007	2553	628	370	187
Change (2007-2003)	+15	+9	+113	+60
		Number of farms 20-<50 ha [thousand]		
2003	835	90	9	8
2005	825	96	16	7
2007	804	101	16	6
Change (2007-2003)	-30	+11	+6	-2
		Number of farms <=50 ha [thousand]		
2003	688	17	14	12
2005	691	20	13	9
2007	698	23	14	5
Change (2007-2003)	+9	+5	0	-7
		Farm labour force [%]		
2010	5.7	13.5	28.7	15.8

Source: based on Eurostat 2014, BAEL data of Poland and Statistical Yearbook of the Republic of Moldova.

The share of farms with an area of 5 hectares in the structure of all farms in Poland is 55% and in Romania 92% (Table 1), in Moldova almost 30%. In addition, almost 40% of

farms in Poland and twice as many in Romania allocate half of their agricultural production for family consumption [Agricultural census, Eurostat 2010]. Taking into account the number of farms (private ownership) in Moldova, changes can be seen (Table 1). Over the years, the number of farms is increasing. The effects of consolidation can be seen: the number of larger farms is growing and the number of small farms is reducing. The biggest increase is seen in the group of 5 to 50 hectares. This is the result of systematic enlargement of small farms with the area of 5 hectares. However, still 98% of family farms in Moldova have less than 5 hectares, and these farms work on 42% of total agricultural land [Ignat, Moroz 2013].

The efficiency of agricultural production is largely determined by the spatial nature of the land factor [Podstawka, Ginter 2006]. Efficiency of the productivity factor in agriculture depends primarily on the areas of farms [Ryś-Jurek 2009]. According to Nowak [2011], the structure of agricultural land is the basic criterion for assessing the way in which agricultural land is managed. Farm size is influenced by many factors, including the nature of agricultural production, soil quality, climate, terrain, access to market, land prices, etc. [Majchrzak 2014; Zawadzka, Strzelecka 2012].

Considering the analyzed countries a systematic increase in the average farm size can be observed (Table 2). For the EU, the average farm was almost 15 hectares, in Poland it was 10 hectares. The average size of a farm in Romania is still small and is almost 4 hectares, while in Moldova we can observe an increase from 1 to almost 3 hectares (Table 2).

Table 2. Utilised agricultural area (UAA) and the average farm area in the EU, Poland, Romania and Moldova

Specification	Utilised Agricultural Area, UAA [thousand hectares]	Average area of farm [hectares]				
	2013	2003	2005	2007	2010	2012
EU 27	184202.0	11.8	12.1	12.9	14.4	14.7
Poland	14409.0	6.7	6.0	6.5	9.6	10.4
Romania	13055.0	3.2	3.4	3.6	3.8	4.1
Moldova	378418.8	1.9	2.2	2.5	2.6	2.9

Source: based on the data of Eurostat 2014, ARiMR Poland 2014 and National Bureau of Statistics of the Republic of Moldova 2014.

Fragmentation of land results in increasing costs for transport, it reduces labour productivity and farm income, and limits opportunities of development [Alboiu et al. 2012; Zawadzka, Strzelecka 2012]. Fragmentation of agricultural land can be analyzed using the Lorenz factor and the Gini index. Lorenz coefficient was determined around the farms with an area exceeding 50 hectares. The higher the ratio, the greater the concentration of farms of 50 hectares or more. In Poland and Romania, this figure falls far from the average for the EU 27. For Moldova, this figure also falls far from the EU 27 median (Table 3). In turn, the inequality coefficient of random variable (Gini index) for farms shows strong disparities in the structure of farms and their significant differences (the closer to 1, the greater the inequality).

Based on Gini indexes for each year, small changes can be noticed. According to Majchrzak [2014] we can observe slight concentration processes in Poland, which means creation of larger and medium-sized farms, and elimination of the smallest at the same time. In Romania, however, these processes occur slowly, the visible trend is even further

concentration of agricultural land around the farms of small and very small size. On the other hand, many more farms (holdings) exist in Moldova, with surface area over 50 hectares [www.statistica.md]. There, as in Poland, persists the process of slight deconcentration, creation of larger and medium-sized farms, with a tendency for small size farm cooperation.

Table 3. Lorenz concentration coefficient and the Gini index for agricultural land in the EU, Poland, Romania and Moldova

Specification	Lorenz concentration coefficient around farms up to 50 hectares	Gini index of concentration of agricultural land			
	2007	2003	2005	2007	2010
EU 27	0,78	0,82	0,81	0,81	0,82
Poland	0,63	0,67	0,69	0,67	0,62
Romania	0,59	0,73	0,70	0,70	0,77
Moldova	0,48	0,57	0,65	0,66	0,67

Source: Majchrzak 2014, and authors' calculations based on Statistical Year book of the Republic of Moldova 2014.

Land fragmentation hinders development; it makes achieving competitiveness impossible, and significantly impacts the level of agricultural income. Table 4 shows the changes in land productivity per 1 hectare of UAA in analyzed countries and the EU 27.

Table 4. Changes in land productivity in the EU, Poland, Romania and Moldova in 2000-2008

Specification	Land productivity per 1 hectare of UAA [euro]						
	2000	2003	2004	2005	2006	2007	2008
EU 27	1848.9	1904.0	1897.7	1907.0	1768.2	2084.6	2134.0
Poland	864.6	815.5	874.0	1020.0	1011.0	1288.3	1399.2
Romania	579.1	772.5	955.2	924.2	1017.6	1039.9	1326.2
Moldova	225.2	315.7	435.2	412.0	552.6	509.3	771.5

Source: Eurostat 2014, General Agricultural Census in the Republic of Moldova.

The average land productivity in the EU is not very high, reaches values oscillating around 2 thousands euro per 1 hectare. Land productivity in Poland and Romania is much lower than the average of the EU 27, as well as in Moldova (Table 4). Over the years 2000-2008, a significant increase can be seen in this rate (especially in Romania). According to Eurostat [2014] in almost all countries, the rate of land productivity is increasing year-on-year, with the highest values in the Netherlands, Malta, Cyprus and Belgium. Nowak [2011], on the basis of the analyses, concluded that the highest productivity growth occurred in the new member states (e.g. Romania), which according to the author, is a result of direct payments absorption and other aid programs for farmers.

The farm size versus economic efficiency: the case of Moldova

Below are the results of analysis carried out in the North Moldova districts (Table 5). The study involved the analysis of agricultural land and the value of agricultural production. Next, these data were used to calculate the concentration of the variables.

Table 5. Agricultural characteristics of the North of Moldova districts

Districts	In the period of 2008-2012			
	Utilized agricultural land		The value of agricultural production in the comparable prices [euro]	
	[thousand hectares]	[%]	[thousand]	[%]
Mun. Balti	836	5.0	19.9	1.0
Briceni	1720	10.0	631.3	29.2
Donduşeni	1123	6.8	118.8	5.5
Edineț	190	1.2	27.3	1.2
Făleşti	1322	8.0	147.1	6.8
Floreşti	1002	6.0	107.6	5.2
Ocnița	3998	24	361.2	16.7
Râşcani	444	2.6	52.0	2.4
Sângerei	2520	15.0	367.5	17.0
Soroca	3546	21.4	324.5	15.0
Total	16701	100.0	2157.5	100.0

Source: author calculations based on data specialized form T 6.1. and 9.64 in territorial T., National Bureau of Statistics of the Republic of Moldova 2014.

The research shows that farms in the north of Moldova are very diverse in terms of agricultural land and global production. The Balti farms occupy only 5% by area and less than 1% by volume of production. Briceni, occupying 10% of the surface, has the global production share at 29.2%. Farms in Edinet region occupy 1.2% of all utilized agricultural area, and in the Soroca - 21.4% (Table 5).

Based on the data in Table 5, the territorial concentration coefficient (territorial distribution) was determined using the square root of the sum of squares ratio (n) administrative (territorial) units reflecting the total amount of northern districts by formula Gini C (CG) and the ratio of the concentration Struck (Gs)

$$C_G = \sqrt{\sum g_i^2} \Rightarrow \sqrt{\frac{1}{n}} \le C_G \le 1$$

where:

g_i – the share of agricultural land.

The second concentration ratio is calculated as:

$$C_S = \sqrt{\frac{n\sum g_i^2 - 1}{n-1}} \Rightarrow 0 \le C_s \le 1$$

From calculations, the average of 2004-2006, the following results of the coefficients were obtained and shown in Table 6.

Table 6. Gini index, Struck farmland and overall output (in comparable prices of the 2005) in farms of 50 hectares and more of UAA, in the North of Moldova, average 2008-2012

Indicator	Type of coefficient	
	C^G	C_S
Utilized agricultural land [hectares] *(S)*	0.374	0.209
The value of global production (in comparable prices 2005) thousand *(VPG)*	0.412	0.277

Source: author calculations based on data specialized form T 6.1. and 9.64 in territorial T., National Bureau of Statistics of the Republic of Moldova 2014.

The calculations resulted in low Gini index, which indicated low uniformity of agricultural land distribution in the studied districts, and agricultural production is even lower.

$$C_{G_{(S)}} = \sqrt{g_i^2} = \sqrt{0.14} = 0.374 \qquad C_{G(VPG)} = \sqrt{0.17} = 0.412$$

Struck coefficient confirms this conclusion:

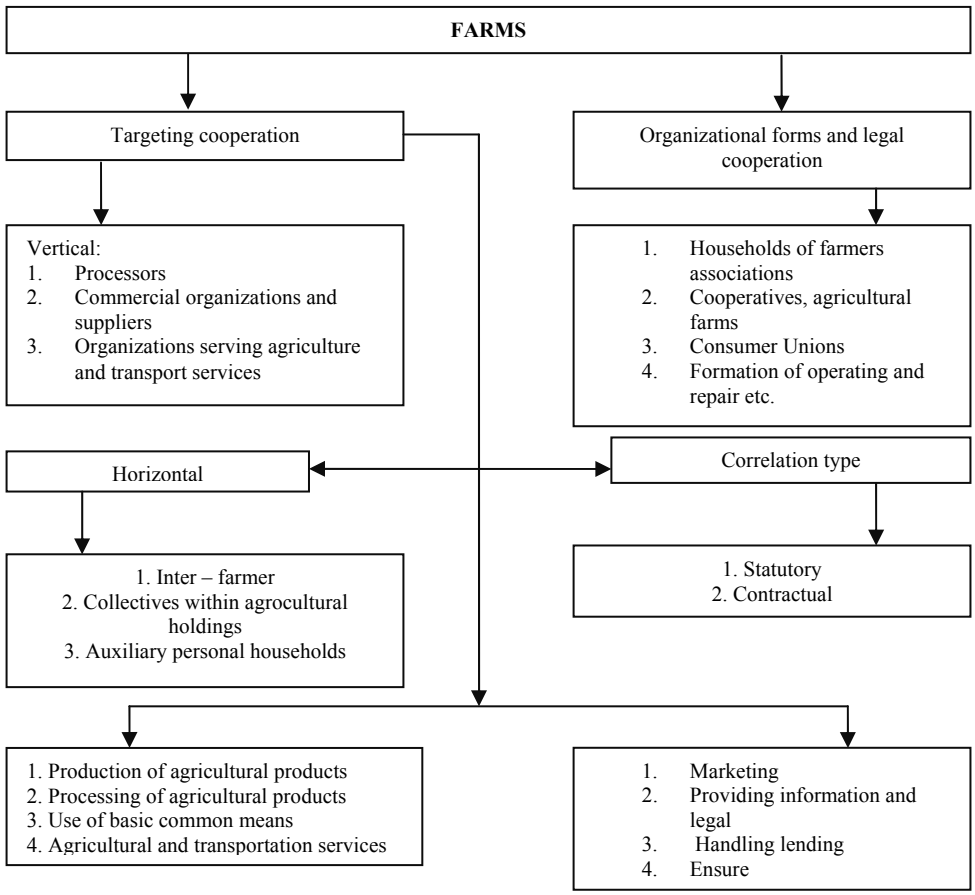
$$C_{S_{(S)}} = \sqrt{\frac{10 \cdot 0.14 - 1}{10 - 1}} = \sqrt{\frac{1.4 - 1}{9}} = \sqrt{\frac{0{,}4}{9}} = \sqrt{0.044} = 0.209$$

$$C_{S(VPG)} = \sqrt{\frac{10 \cdot 0.17 - 1}{10 - 1}} = \sqrt{\frac{1.7 - 1}{9}} = \sqrt{\frac{0.7}{9}} = \sqrt{0.077} = 0.277$$

The study allows concluding that the concentration of agricultural production is very low. The concentration of agricultural production of farms can be achieved by grouping the factors of production (consolidation of farms of the same profile) branches and units of various sizes, growth providing technical agricultural and professional qualification to act positively towards the concentration of production, to increase the weighted branches and crops in regions of fragmented agriculture.

Fragmented agriculture: new model of small farm

According to Dacko and Dacko [2014], area structure reflects the state of a country's agricultural system and can change due to the impact of the components of this system, as well as external factors. Therefore, a system consists of many interacting elements. Despite the obstacles posed by a fragmented system of agriculture, there are many voices supporting small, family-run farms in Europe. Small farms should have a permanent place in European agriculture [Musiał 2010; Zegar 2012]. The argument supporting small farms is primarily the fact that they have a social character, they are very often environmentally friendly, they help to preserve rural landscape, contribute to biodiversity, tradition and culture [Kiełbasa 2015]. The system of agriculture in Europe should be changed, but it cannot be based on the elimination of small, family farms. The need to create a network of processing enterprises in rural areas is the cornerstone of sustainable development of the rural areas. The new form of small farm management should include for example cooperation between producers and processors of raw materials (Scheme 1).



Scheme 1. The forms of farms cooperation

Source: prepared by the authors based on their scientific research.

According to Scheme 1, we can observe two directions of farm cooperation: vertical and horizontal. Vertical cooperation includes processing, supplies and transport of agricultural production; while horizontal cooperation involves interrelationships from farming – this means sharing and applying marketing activity, providing information, with service credit, insurance and other levers of economic mechanism.

The land consolidation process is a very long operation. In Western European countries, it lasts for hundreds of years. This process gained momentum in EU countries in the early 1950s and still continues today. Strengthening small and medium-sized farms provides a real opportunity to: increase the effectiveness of using agricultural land on the principles of regional and erosion control; organize and implement complex necessary measures to protect the soil - the main natural wealth of a country; implement actual performance of agriculture; and the create sustainable development [Popescu 2009]. Achieving this goal will be possible by land consolidation and owner cooperation in producing good quality and competitive products [Popa, Timofti 2009].

Table 7.

Holdings and utilised agricultural area in the EU Member States, 2013

	Number of holdings			Utilised agricultural area			Average area per holding, hectares	
	in thousands	Share of EU total	Change 2013/2003	In 1000 hectares	Share of EU total	Change 2013/2003	2003	2013
EU*	**10 841.0**	**100.0%**	**-27.5%**	**174 606.6**	**100.0%**	**0.1%**	**11.7**	**16.1**
Belgium	37.8	0.3%	-31.3%	1 307.9	0.8%	-6.2%	25.4	34.6
Bulgaria	254.4	2.3%	-61.8%	4 650.9	2.7%	60.1%**	4.4	18.3
Czech Republic	26.3	0.2%	-42.6%	3 491.5	2.0%	-3.9%	79.3	133.0
Denmark	38.8	0.4%	-20.1%	2 619.3	1.5%	-1.5%	54.7	67.5
Germany	285.0	2.6%	-30.9%	16 699.6	9.6%	-1.7%	41.2	58.6
Estonia	19.2	0.2%	-47.9%	957.5	0.5%	20.3%	21.6	49.9
Ireland	139.6	1.3%	2.9%	4 959.4	2.8%	15.4%	31.7	35.5
Greece	709.5	6.5%	-13.9%	4 856.8	2.8%	22.4%	4.8	6.8
Spain	965.0	8.9%	-15.4%	23 300.2	13.4%	-7.4%	22.1	24.1
France	472.2	4.4%	-23.1%	27 739.4	15.9%	-0.2%	45.3	58.7
Croatia	157.4	1.5%	:	1 571.2	0.9%	:	:	10.0
Italy	1 010.3	9.3%	-48.6%	12 098.9	6.9%	-7.8%	6.7	12.0
Cyprus	35.4	0.3%	-21.7%	109.3	0.1%	-30.1%	3.5	3.1
Latvia	81.8	0.8%	-35.4%	1 877.7	1.1%	26.1%	11.8	23.0
Lithuania	171.8	1.6%	-36.9%	2 861.3	1.6%	14.9%	9.2	16.7
Luxembourg	2.1	0.0%	-15.1%	131.0	0.1%	2.2%	52.3	63.0
Hungary	491.3	4.5%	-36.5%	4 656.5	2.7%	7.0%	5.6	9.5
Malta	9.4	0.1%	-14.8%	10.9	0.0%	0.8%	1.0	1.2
Netherlands	67.5	0.6%	-21.1%	1 847.6	1.1%	-8.0%	23.5	27.4
Austria	140.4	1.3%	-19.2%	2 726.9	1.6%	-16.3%	18.7	19.4
Poland	1 429.0	13.2%	-34.2%	14 409.9	8.3%	-0.1%	6.6	10.1
Portugal	264.4	2.4%	-26.4%	3 641.6	2.1%	-2.2%	10.4	13.8
Romania	3 629.7	33.5%	-19.1%	13 055.9	7.5%	-6.3%	3.1	3.6
Slovenia	72.4	0.7%	-6.2%	485.8	0.3%	-0.1%	6.3	6.7
Slovakia	23.6	0.2%	-67.1%	1 901.6	1.1%	-11.0%	29.8	80.7
Finland	54.4	0.5%	-27.4%	2 284.4	1.3%	1.7%	29.9	42.0
Sweden	67.1	0.6%	-1.1%	3 028.6	1.7%	-3.1%	46.1	45.1
United Kingdom	185.2	1.7%	-34.0%	17 327.0	9.9%	7.6%**	57.4	93.6
Norway	43.7	-	-24.9%	987.1	-	-5.1%	17.9	22.6

* At EU level, the changes 2013/2003 have been calculated excluding Croatia for which data are not available for 2003.
** See country note.
Shares might not add up to 100% due to rounding.

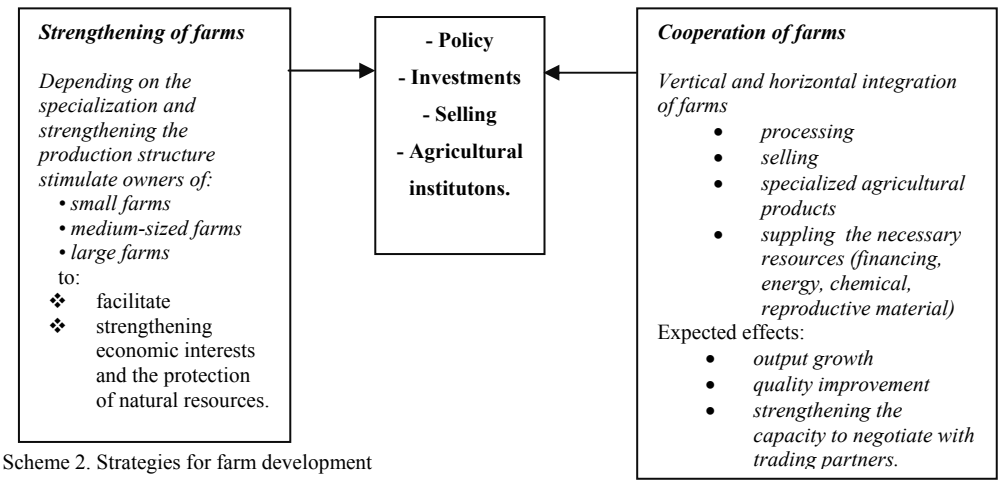
Source: Eurostat 2014.

To address the situation in agriculture a complex set of economic, legal and organizational structures must be developed. This strategy envisages sustainable development of agriculture by implementing advanced technologies of cultivation, processing, packaging and marketing, etc., which ensure the country`s food security and increase farmers income [Strategies of development of the agro food sector in Moldova in the period 2006-2015]. Therefore, the fundamental subject of farm development should contribute to economic efficiency and consolidation (Scheme 2). Achieving these basic policies would serve a solid foundation for the development of private initiative, a favourable environment for the activity of all categories of farmers to resist competition. At the same time it would promote the development of rural areas as the natural, social and cultural regeneration of the economy will help rural communities in which they operate. The process of consolidation is inevitable - not only purchase and sale, but in exchanging or leasing term, as well as by associations or union landowners. It means building the future

shape of a more rational and efficient use of land. A good example is the government programme of land consolidation in Moldova. The Moldovan Ministry of Agriculture and Food Industry proposed to create the so-called "consolidation centers" [Land Consolidation Program, Moldova].

Eurostat Analysis shows developments on them for 10 years (between 2003 and 2013) and demonstrates that Romania did not produce too high a concentration of holdings: if in 2013 the average area was only 3.1 ha, in a decade it rose only 0.5 ha.

The largest farms are in the Czech Republic - where the average area of a farm is over 133 hectares (it almost doubled in 10 years), and the UK - where the average area increased from 57 ha in 2003 to 93, 6 ha in 2013.



Scheme 2. Strategies for farm development

Source: developed and shaped by authors on the basis of "Strategy of development of the agrifood sector in Moldova in the period 2006-2015".

The Czech Republic has the average area of holdings because they occurred as a property concession. Most received shares from former agricultural cooperatives. Although the country has broken into agriculture in Europe, the number of properties decreased in 10 years to only 19.1%.

Conclusions

The problem of fragmented agriculture has concerned Europe for many years, especially in its Eastern parts. The three European countries that were analyzed – Poland, Moldova and Romania – struggle with similar problems in development of their agriculture and competitiveness. When it comes to small family farms, it can be noted that in these countries they are very fragmented and achieve poor economic results. The following conclusions were indicated on the basis of the analysis and discussion:

1. In these countries enlargement processes can be seen. The number of small farms is reducing, and larger farms are increasing. There is also an increase in the average size of a farm (in Poland currently it is 10 ha, in Romania 4 ha and in Moldova 3 ha).

However, these processes are slow and face a number of barriers (natural conditions, traditional model of farm management, the lack of funds for investments, etc.).

2. Large fragmentation of the agrarian structure adversely affects economic results and land productivity. Fragmentation contributes to a significant reduction in small farm competitiveness.
3. Indexes of land concentration indicate processes of deconcentration of small farms and creation of a greater number of larger farms in Poland. In Romania, these processes occur slowly due to the large number of very small family farms. Slightly better are indicators for Moldova, because this country has a large number of agricultural companies, but the problem of small farms still exists.
4. The case of the north of Moldova shows a large distribution of indicators within one country. The authors indicate the possibility of farm consolidation of the same profile in certain regions, which goal would be the improvement of small farm competitiveness and providing a source of income.
5. The structure of farms and land structure points to a system of agriculture in Europe. This system consists of many different elements, mutually dependent and influencing each other. Increasing small farm effectiveness requires the cooperation of small holders, for example through cooperation between producers and processors of raw materials.
6. To improve the competitiveness of small farms the processes of land consolidation are essential. However, is should be remembered that these are long-term processes, so the effects can be seen after several years.
7. The role of small farms should be emphasized, especially for environmental protection and sustainable development. Their social role is also very important: they manage small plots, which, to some extent, provide food for farm families. Usually products are not sold on the market, and most are consumed on the farm (semi-subsistence farming). Therefore, the European model of agriculture should not exclude small family farms.

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