FARMLAND SIZE INEQUALITY AND LAND CONCENTRATION IN BULGARIAN AGRICULTURE

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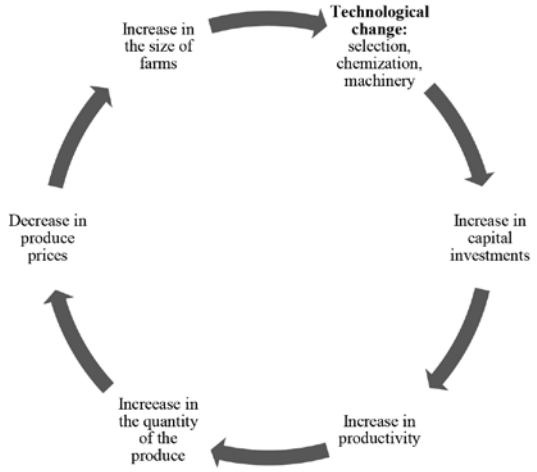
DOI: https://doi.org/10.31410/EMAN.S.P.2019.211

Abstract: *The aim of this paper is to examine the degree of inequality in farm size and the concentration of land in Bulgarian agriculture. Using a coefficient specified by Iosifescu, we study the degree of uneven distribution of farms in physical farm size groups in Bulgaria. The Gini Index is applied to compare the inequality in the utilized agriculture area distribution among farmers in Bulgaria and other EU member states. The assessment of the land concentration is based on a calculation of the mid-point hectare at national level and additional indicators.*

Keywords: *inequality, farm size, land concentration.*

1. INTRODUCTION

In the light of the Common Agricultural Policy implemented since 1994, the classic concept of the agricultural treadmill can be revised in a new light. Introduced by Cochrane (1958) [1], the concept explains the land concentration in agriculture under the influence of companies that create technological innovations (picture 1). Direct payments accelerate the treadmill cycle at the „increase in capital investment" stage, influencing market entry, growth and exit of farms. A natural consequence of the application of the income support for farmers is the increase in prices of fixed production factors and deliveries for the agricultural production [2]. This puts additional barriers to entry into agriculture and the development of small farms. Research has shown that the effect of this form of political intervention is to influence the speed of structural changes in agriculture [3].



Picture 1. A cycle of agricultural treadmill [1]

A serious social risk linked to the impact of Single Area Payment Scheme on the concentration process is the inequality in the distribution of the territorial size of farms. The aid per hectare

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results in an uneven distribution of the majority of the aid in favor of farms with a larger size [4]. Therefore, the possibilities of these farms to capitalize part of these funds are greater.

The aim of this paper is to examine the degree of inequality in farm size and the concentration of land in Bulgarian agriculture. The social significance of this issue stems from the fact that in many cases the distribution of the income of farms is strongly influenced by the distribution of their physical size [5].

2. METHOD

Secondary data on the structure of agricultural holdings in 2005, 2007, 2010 and 2013 has been used from the World Programme for the Census of Agriculture, available in the Eurostat statistical database [6], supplemented with available data from the survey on farm structure in Bulgaria in 2016 [7], carried out in compliance with the requirements of Regulation (EC) 1166/2008.

For the study on the changes in the farmland concentration, the average size of the agricultural holdings, the growth rate of the average size of the farms and the number of the farms indicators were used. The benchmark proposed by Longhrey and Donellan (2017) [8] was used for the comparative assessment of the level of agricultural land concentration in Bulgaria and in the other Member States of the European Union, namely the median value of the size of farms ("mid-point hectare"), calculated according to formula (1).

$$\tilde{x} = LL + w\frac{\frac{n}{2} - F}{f}, \text{ where:} \quad (1)$$

$\tilde{x}$ – the median value of the size of agricultural holdings;
LL – the lower limit of the median size class;
W – width of the interval in which the median value of the size of agricultural holdings is contained;
F – cumulative distribution of the hectares up to LL;
f – the number of hectares in the interval containing the median value of the size of agricultural holdings;
n – the total number of hectares in the population.

On the basis of the values of this indicator, we conclude that in fourteen European Union Member States (including Bulgaria) the median value of the farm size, in terms of utilized agriculture area (UAA), exceeds 100 hectares, i.e. according to this estimation method, these are the countries with the most concentrated land. Available data from Eurostat does not allow accurate estimation of the level of land concentration in these countries to be achieved by this method due to a lack of information on the width of the interval above 100 hectares.
In order to characterize comparatively the concentration of land in Bulgaria and the other thirteen EU Member States, we use two indicators, namely: 1) the mean size of agricultural holdings in the size class, which controls the highest relative share of the UAA in the country; 2) the share of agricultural land controlled by agricultural holdings in the size class which controls the highest relative share of UAA in the country.

To estimate the degree of inequality in the distribution of land, the coefficient of Iosifescu and the Gini coefficient were used. To measure the degree of inequality in the distribution of the

number of farms in the groups of farms according to farm size, coefficient (I), adapted by Iosifescu [9] was applied. Similarly to the Gini coefficient, the Iosifescu coefficient takes values from 0 to 1. The value of the coefficient is 0 in case of equal distribution of the number of farms in each size class. Value 1 (or 100%) indicates a maximum level of inequality.

$$I=\frac{Dx}{2\bar{X}}, \text{ where:} \quad (2)$$

$$Dx=\frac{4\sum_{i=1}^{n}|xi-MeX||yxi-MeYx|}{n^2}, \text{ where:} \quad (3)$$

i = 1….n –the size classes by UAA;
n – number of UAA size classes;
xi – number of holdings falling within interval i;
MeX – number of holdings falling within the central interval (if we have nine size classes of UAA, this is the fifth interval);
Yxi – serial number of interval i;
MeYx – median of the serial numbers of intervals.

The Gini coefficient (G) is used to measure the inequality in the distribution of land among farms and is calculated on the basis of the geometrical interpretation of the Lorenz curve according to the formula (4).

$$G=\frac{\frac{1}{2}-\frac{1}{2}\sum_{i=1}^{n}(p_i-p_{i-1})\,(Q_i+Q_{i-1})}{\frac{1}{2}}, \text{ where: (4)}$$

Pi is the cumulative percentage of the number of agricultural holdings;
Qi is the cumulative percentage of the UAA.

3. RESULTS

Figure 1 shows the average size of agricultural holdings in Bulgaria during the years 2005 -2016.

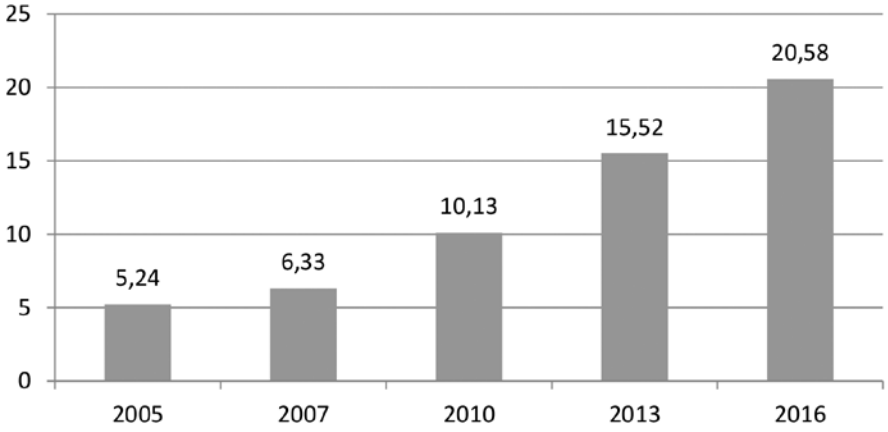

Figure 1: Average size of agricultural holdings with UAA (hectares), excluding the common land, 2005-2016.
Source: author's calculations, based on Eurostat data and MAFF, Agrostatistics Department, DG ARP, FSS

Statistical regions (NUTS -2)	***Average UAA (ha)***			***Growth rate of the average size of agricultural holdings, 2010 -2016 (%)***
	2010	2013	2016	
Bulgaria	10,13	15,52	20,58	103,14
Northwestern	15,41	28,56	43,86	184,65
Northern Central	17,10	26,60	35,20	105,84
Northeastern	17,72	28,09	39,66	123,83
Southeastern	13,42	21,44	29,57	120,31
Southwestern	3,66	5,65	7,39	101,81
Southern Central	4,19	6,47	7,96	89,93

Table 1: Average size of agricultural holdings with UAA by NUTS -2 statistical regions, excluding the common land, 2010 -2016
Source: Author's calculations, based on MAFF data, Agrostatistics Department, DG ARP, FSS

The average size of agricultural holdings in Bulgaria has increased almost fourfold during this period, indicating a process of increasing concentration of land. Such a process is observed in all NUTS -2 statistical regions of the country, but with differences in the growth rate of the average farms' size (Table 1).

In the Southwestern and Southern Central regions, the size of farms is the smallest and grows relatively slowly; a slowdown in the overall trend of reducing the number of farms is also observed [10]. Traditionally, most of the permanent crops in the country are concentrated in these areas and they produce most of the fresh vegetables, melons, watermelons and strawberries grown in the open air. The average size of farms is the largest in the Northwestern, North Central and Northeastern regions, covering about 68% of the cereal crops area and a larger share of the technical crops grown in the country.

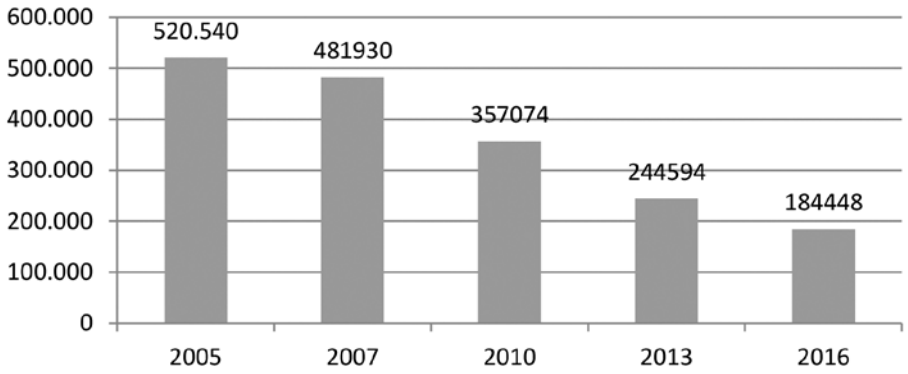

Figure 2: Number of holdings with UAA, without statistical units, providing common land for animals' grazing
Source: author's calculations, based on data from Eurostat and MAFF, Agrostatistics Department, DG ARP, FSS

The farmland concentration in Bulgaria is accompanied by the release of land resources from small farms that dropped out of the market during this period (Figure 3), as well as an increase in the UAA during the period (65% according to Eurostat data and 39 % when deducting the common land from the UAA on the basis of data from the study on the structure of agricultural holdings in Bulgaria).

In spite of the debated increase in the UAA in the country, the number of agricultural holdings decreases almost three times in the period 2005 -2016 (fig. 2). This is due mainly to a decrease in the number of small farms with UAA under 10 ha (fig.3). During the period 2005 -2013, the number of small holdings (less than 10 hectares) decreased by over 50% (fig. 3).

The opposite tendency is evident in the number of largest farms, those with 100 hectares or more of utilized agricultural area. In the period 2005-2013 their number increases by more than 60% (fig. 4).

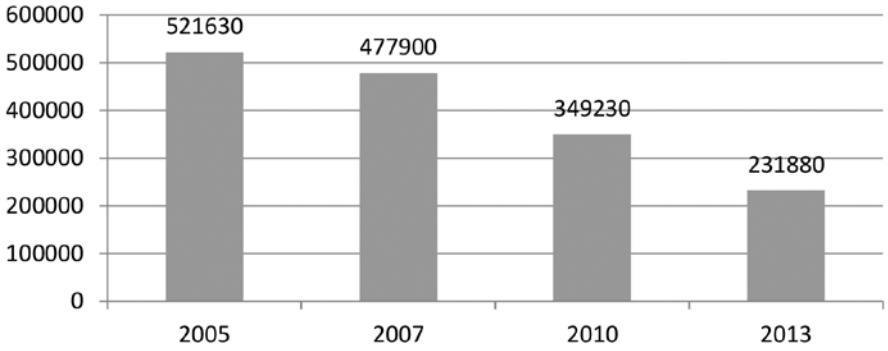

Figure 3: Number of holdings with less than 10 hectares of UAA, 2005-2013
Source: author's calculations, based on data from Eurostat

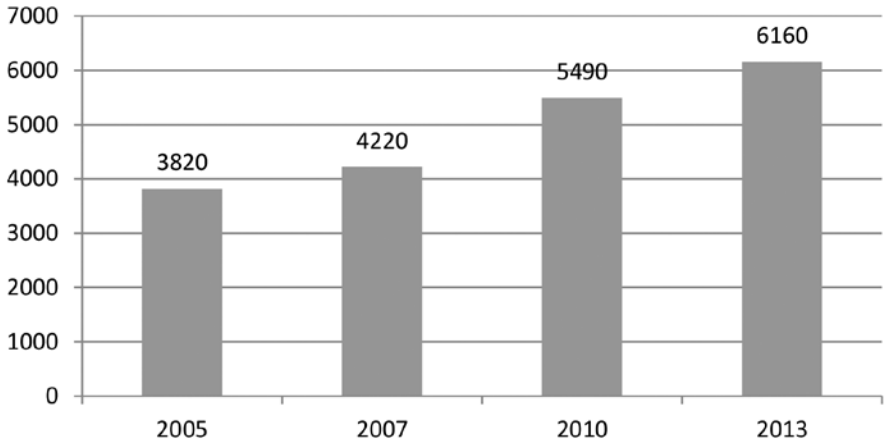

Figure 4: Number of holdings with UAA 100 hectares or over
Source: author's calculations, based on data from Eurostat

Table 2 shows the values of the Gini coefficient, characterizing the farmland size inequality in the six NUTS-2 regions in Bulgaria.

	2005	***2007***	***2010***	***2013***
Bulgaria	0,887	0,912	0,938	0,934
Northwestern	0,886	0,925	0,950	0,937
North Central	0,909	0,930	0,937	0,925
Northeastern	0,926	0,941	0,941	0,929
Southeastern	0,938	0,940	0,944	0,933
Southwestern	0,661	0,775	0,919	0,921
South Central	0,744	0,802	0,890	0,904

Table 2: Values of the Gini coefficient by NUTS-2 statistical regions in Bulgaria, 2005-2013
Source: author's calculations, based on data from Eurostat

The data in table 2 show that there is high inequality in the distribution of the physical size of agricultural holdings in the statistical regions of Bulgaria in 2005 (with values of the Gini coefficient over 0.7 and below 0.9 only in the Southwestern and South Central regions) and this inequality increases in the year of accession of the country to the European Union. With the exception of the Southeastern Region, the inequality in 2013 exceeds the values for 2005, with the increase in the value of the indicator being particularly high in the Southwestern and South-Central regions.

Table 3 presents the values of some indicators of land concentration and farmland size inequality in the EU Member States where the median size of an agricultural holding exceeds 100 hectares, i.e. the countries with the most concentrated size of agricultural holdings.

State	***Average farm size in the size class "≥100 hectares" (hectare)***	***Share of agricultural land controlled by farms ≥100 hectares (%)***	***Yosifiscu coefficient***	***Gini coefficient***
Bulgaria	631,57	83,65	0,535	0,934
Czech Republic	662,0842	87,80	0,356	0,755
Denmark	229,43	69,02	0,405	0,604
Germany	270,60	56,97	0,517	0,615
Estonia	393,34	73,53	0,436	0,777
Spain	249,69	55,53	0,381	0,774
France	175,92	61,90	0,267	0,574
Latvia	344,75	53,06	0,516	0,757
Luxemburg	156,51	53,74	0,347	0,486
Hungary	392,75	64,44	0,540	0,917
Portugal	348,92	57,87	0,521	0,824
Slovakia	743,99	90,38	0,302	0,864
Sweden	210,43	55,24	0,548	0,625
United Kingdom	320,67	75,04	0,355	0,621

Table 3: Farmland size inequality and concentration in selected Member States, 2013.
Source: author's calculations, based on data from Eurostat

The information in the table shows relatively high levels of farmland concentration in Bulgaria - the average size of the largest agricultural holdings (100 and over 100 hectares) and the share of agricultural land controlled by this group of farms is higher only in the Czech Republic and Slovakia. The level of inequality in the distribution of the number of farms in the size classes classified according to the utilized agricultural area in Bulgaria is relatively high (the value of the Iosifescu coefficient is higher only for Sweden). The comparison of the Gini coefficient values for the EU Member States with the most concentrated land shows Bulgaria's leading position regarding the unequal distribution of land among agricultural holdings.

4. CONCLUSIONS

Firstly, during the period 2005-2016 there is a process of farmland concentration in Bulgaria, reflected in the increase of the average size of the farms in the country (almost four-fold) and in each of the six NUTS-2 statistical regions, as well as in a reduction in the number of farms (nearly three times). As a result of these changes Bulgaria ranks among the three Member States of the European Union with the most concentrated farmland.

Secondly, the findings of this research are consistent with previous studies [11] indicating that the sharply dual farm structure, as a feature of the so-called „Soviet model of agriculture" has not been overcome in the process of land restitution in post-communist Bulgaria. In 2005, the Gini coefficient is under 0.9 in only two of the six statistical regions of the country.

Thirdly, the inequality in the land distribution among agricultural holdings increases after Bulgaria's accession to the European Union in 2007. A comparison with the other EU Member States with the most concentrated farmland shows that in 2013 Bulgaria occupies a leading position in terms of the inequality in the physical size of agricultural holdings.

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