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RESEARCH ON THE DISTRIBUTION AND CONCENTRATION OF THE FARMS CULTIVATING MAIZE FOR GRAINS IN ROMANIA USING THE GINI COEFFICIENT

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Abstract

The purpose of the paper was to estimate the Gini coefficient in order to characterize the concentration and distribution of the farm dealing with maize cropping in Romania. In this purpose, a suitable mathematical model was used for different intervals of owned land, as follows: $G= D_X/2\,\bar{x} = (\sum_{i=1}^{n}\sum_{j=1}^{n} | xi - xj |) / 2\,\bar{x}\,n^2$. *The Gini coefficient had the values: 0.595 in 2007 and 0.640 in 2012, reflecting that the farms have an unequal repartition, being more concentrated to the farms with a smaller size. However, in the analyzed period, 2007-2012, it increased the percentage of the smallest farms with under 0.1 and 1 ha, it was reduced the share of the farms with 1-2 ha, and also of the ones with 2-5 ha. Also the weight of the farms with 5-10 ha declined. And, the share of the farms with over 20 ha increased from 0.42 % in 2007 to 1.24 %. The percentages changes because the number of farms growing maize decreased by about 28.42 %. The causes could be the following ones: the orientation of the farmers to the crops with a higher revenue than maize, because of the high production, the maize price was enough small, and the impossibility to work the land by a part the oldest population or deaths among old people owning land. As a conclusion, it was noticed a slight a positive aspect that the share of the farms larger than 20 ha increased to 1.24 %. The improvement of farm structure in Romania is still a long process and the best solution to shorten it is as farmers to join in associative forms.*

Key words**:** *farms concentration and distribution, maize for grains, Romania, the Gini coefficient*

INTRODUCTION

Romania is on the top position in the EU-28 for the cultivated area with maize for grains and on the 2ns position for grains production. However, the maize yield is the smallest in the EU, about 4,600 kg/ha and this is because of the small sized farms whose average accounts for about 1.1 ha. The sprayed cultivated area in very small plots is a consequence of the application of the Land Law No.18/1991 and led to the impossibility to apply modern technology and assure high production performance per surface unit. This is why, at present the farm structure reflects that most of the farms are very small, and just 1 % farms have over 20 ha.

The Gini Coefficient is a measure of inequality and could be used to evaluate the degree of concentration and distribution of agricultural holdings. This coefficient was established and described by Corrado Gini, an Italian statistician in his paper " Variabilita e mutabilita", published in the year 1912. [8].

This coefficient can be used to measure any form of uneven distribution. Usually the Gini coefficient can be utilized to show the population distribution by income size class [11], the distribution of the countries by GDP growth [1], the income disparities in the world, to provide an index of development [6, 7], the market share of an enterprise based on its turnover in the marketing studies [4] and in health equity in households surveys [13]. But it also can be used in any other fields of activity. [5]

Mathematically, the Gini coefficient is defined based on the Lorenz Curve, designed in a diagram, where the proportion of the population income (y axis) is combined with the cumulative earnings of the bottom x % of the population. In this case, the Gini coefficient is given by the ratio: G= A/ (A + B), where A= the area which lies between the

line of equality and the Lorenz Curve (A) over the total area under the line of equality (A and B). [2]. But, the Gini coefficient is also mathematically determined using the formula which reflects the half of the relative mean absolute difference, which is a mathematical equivalence [14].

In this context, in this paper, the Gini coefficient was used in Romania's agriculture to quantify the concentration and distribution of the farms cultivating maize for grains, by size interval in terms of owned area (ha).

Romania has the largest surface cultivated with the maize crop for grains in the EU-28, and for this reason, it comes on the 1st position, and also on the 2nd position regarding the total grains production.

Based on the empirical data provided by the National Institute of Statistics for the years 2007 and 2012 concerning the farm structure by land interval, the goal was to establish if the farm structure changed from Romania's adhesion to the EU in the year 2007 till 2012.

As it is known, in Romania there are about 2,5 million small farms, whose land is sprayed in small plots, which produce maize and this dispersion of land has a deep impact on the yield.

MATERIALS AND METHODS

The empirical data regarding the distribution of the farms dealing with maize cropping were collected from the National Institute of Statistics, 2015, providing the number of farms by size interval in terms of cultivated area size (ha) for the years 2007 and 2012.

The Gini Coefficient was calculated using the formula :

$G= D_X/2\ \bar{x}= (\sum_{i=1}^{n} \sum_{j=1}^{n} | xi - xj |) / 2\ \bar{x}\ n^2$

as mentioned by Molnar, M.(2010) [11], and Iosifescu et al., (1985) [10] who used the formula:

$G= Dm/ 2\ \bar{x} = (4\ (| x - Me | | yx - yMe |) / n^2)/2\ \bar{x}$

This formula is suitable to be used when the variables are distributed by inequal intervals or classes.

The Gini coefficient values were interpreted as follows: G=0, it is about a perfect equality among the distributed variables, G=1, it is about a perfect inequality regarding the distribution of the variables, as most of them are grouped in a place.

The Gini Index was also determined as percentage, being equal to the Gini coefficient multiplied by 100. [3].

In order to be an unbiased estimate of the true value of the variables, it was multiplied by n/n-1. [9].

The results were tabled and correspondingly interpreted.

RESULTS AND DISCUSSIONS

The Gini coefficient calculation for the farm structure cultivating maize for grains in the year 2007. is presented in Table 1.

The Gini coefficient was higher than 0, G>0, reflecting a higher inequality of the farm size within this distribution in the year 2007.

The farm structure by land interval in 2007 is presented in Fig.1.

One can notice that most of the farms have a small size, mainly under 5 ha. About 30.62 % farms have between under 0.1 and 1 ha, 31.87 % between 2 and 5 ha and 24.59 % have 1-2 ha.

About 9.84 % farms have between 5 and 10 ha, 2.21 % have between 10 and 20 ha, and only 0.42 % have over 20 ha.

The Gini coefficient calculation for the farm structure cultivating maize for grains in the year 2012 is presented in Table 2.

The Gini coefficient was G= 0.640, by 7.56 % higher than in the year 2007, reflecting that in 2012 the distribution of farms is more unequal than in 2007.

The farm structure by land interval in 2012 is presented in Fig.2. One can notice that most of the farms have still a small size, mainly under 5 ha. About 39.66 % farms have between under 0.1 and 1 ha, 24.12 % between 1-2 ha, 26.84 % between 2 and 5 ha. About 6.59 % farms have between 5 and 10 ha, 1.49

% have between 10 and 20 ha, and only 1.24 % have over 20 ha.

Table 1.The Gini coefficient calculation for farm dispersion in 2007, Romania

LAND SURFACE INTERVAL (HA)	X_I	Y_X	|X- 52,705|	$\|Y_X - 5\|$	|X- 52,705| $\|Y_X - 5\|$
UNDER 0.1- 1	732,319	1	679,614	4	2,718,456
1-2	588,066	2	535,361	3	1,606,083
2-5	762,192	3	709,487	2	1,481,974
5-10	235,467	4	182,762	1	182,762
10-20	52,705	5	0	0	0
20-30	6,958	6	45,747	1	45,747
30-50	4,781	7	47,924	2	95,848
50-100	3,152	8	49,553	3	148,659
OVER 100	5,293	9	47,412	4	189,648
$\sum xi$	2,390,933	-	-	-	6,406,177
$\bar{x}$	265,659.22				
DX	316,354.41				
$2\bar{x}$	265,659.22				
G	0.595				

Source: National Institute of Statistics. Own calculations.

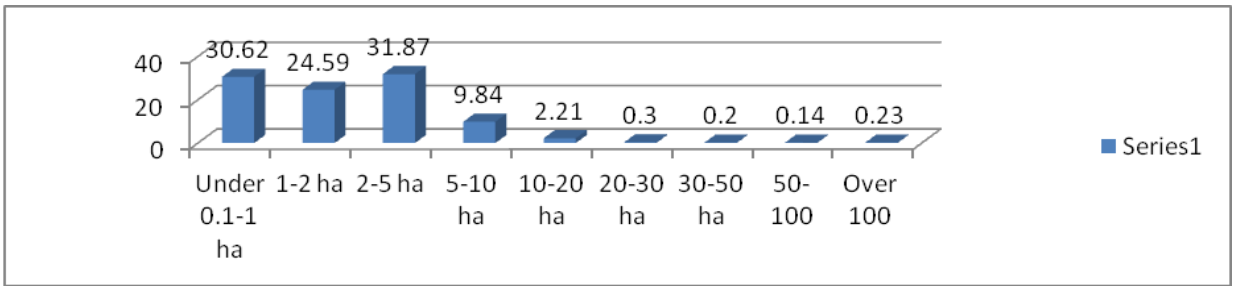

Fig. 1.The structure of the farms growing maize by land interval (%), Romania, 2007.
Source: National Institute of Statistics. Own calculations.

Table 2.The Gini coefficient calculation for farm dispersion in 2012, Romania

LAND SURFACE INTERVAL (HA)	X_I	Y_X	|X- 28,138|	$\|Y_X - 5\|$	|X- 28,138| $\|Y_X - 5\|$
UNDER 0.1- 1	753,346	1	725,208	4	2,900,832
1-2	459,232	2	431,094	3	1,293,282
2-5	509,754	3	481,616	2	963,232
5-10	125,282	4	97,144	1	97,144
10-20	28,138	5	0	0	0
20-30	6,262	6	21876	1	21,876
30-50	5,237	7	22,901	2	45,802
50-100	4,527	8	23,611	3	70,833
OVER 100	7,276	9	20,862	4	83,448
$\sum xi$	1,899,054	-	-	-	5,476,449
$\bar{x}$	211,006				
DX	270,441.92				
$2\bar{x}$	422,012				
G	0.640				

Source: National Institute of Statistics. Own calculations.

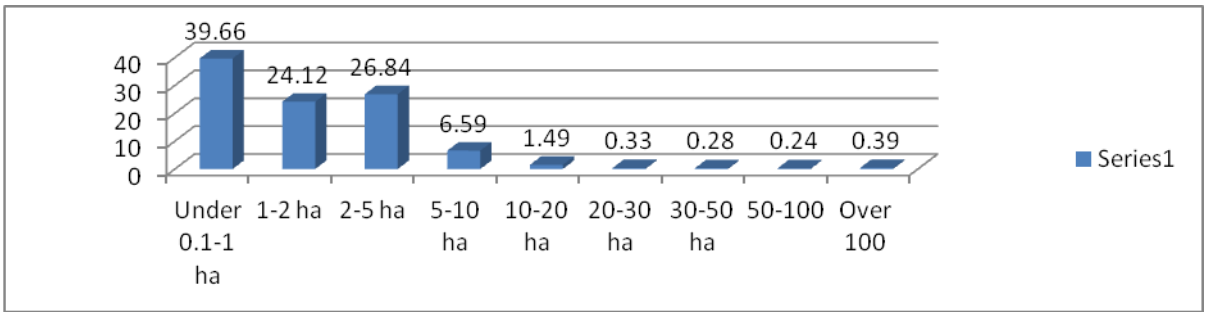

Fig. 2. The structure of the farms growing maize by land interval (%), Romania, 2012.
Source: National Institute of Statistics. Own calculations.

CONCLUSIONS

In the period 2007-2012, it increased the percentage of the smallest farms with under 0.1 and 1 ha, it was reduced the share of the farms with 1-2 ha, and also of the ones with 2-5 ha. Also the weight of the farms with 5-10 ha declined. And, the share of the farms with over 20 ha increased from 0.42 % in 2007 to 1.24 %. The percentages changes because the number of farms growing maize decreased by about 28.42 %. The causes could be the following ones: the orientation of the farmers to the crops with a higher revenue than maize, because of the high production, the maize price was enough small, and the impossibility to work the land by a part the oldest population or deaths among old people owning land.

The Gini coefficient and Gini index reflect that the distribution of farms is more accentuated, the inequality persists and even is stronger.

However, a positive aspect is the fact that the share of the farms larger than 20 ha increased to 1.24 %.

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