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THE EVOLUTION OF THE ECONOMIC SIZE OF AGRICULTURAL FARMS IN ROMANIA

ABSTRACT

This paper presents a general analysis of agricultural holdings in Romania. Thus, in this study, the economic size of the agricultural holding, the utilised agricultural area, the total crop production and the gross farm income were analysed, depending on the size of the agricultural holdings expressed in standard output. In addition, to clearly highlight the existing situation, statistical indicators such as standard deviation, coefficient of variation and growth rate were calculated. The current disparities are significant, and there is no clear evidence that they will be reduced or eliminated, because the structural problems facing Romanian agriculture can only be debated over a long period of time. The data used were extracted from the Farm Accountancy Data Network (FADN), for the period 2007–2021. The obtained results support the fact that the average economic size at the level of agricultural holdings in Romania is relatively stable, as far as this indicator is concerned. At the same time, the utilised agricultural areas have decreased and the total crop production has increased for all types of economic sizes, except for holdings with an economic size between 8,000 and 25,000 EUR.

1. INTRODUCTION

Agriculture is the foundation of a country's economy because it is responsible for providing food resources, and is the main source of food for mankind, taking into account the demographic explosion found in most states with a less developed economy. Agriculture is also the main supplier of raw materials for various industries (Micu *et al.*, 2013; Dumitru *et al.*, 2020). However, at the level of the European Union, the agricultural sector is the main user of land, representing approximately 50% of the total area of the region (Giannakis and Bruggeman, 2015). Among the EU member states, Romania has the most fragmented agricultural structure, with 31.8% of total farms in the entire region, mostly small farms (under two hectares) (Sterie *et al.*, 2020).

2. STATE OF KNOWLEDGE

The current situation of Romanian agriculture and implicitly of rural areas is linked to the agricultural structure of the country, being an important problem that Romania is currently facing, both in social and economic terms (Otiman, 2012; Ciutacu *et al*., 2015; Feher *et al*., 2017). Fragmentation and the high number of small holdings are the result of the application of laws on the privatisation of companies in the agricultural sector as well as of the application of land laws.

As a result of the application of common agricultural policies for more than 50 years, family farms have been established and supported in all EU member states. Many EU member states are characterised by agricultural holdings with areas between 10 and 50 hectares and between 10 and 100 hectares; in France, for example, they represent an important percentage of the agricultural area of the Union. The structure of French farms has developed over time under market conditions as well as with policy support, especially measures from the CAP policy programme (Piet *et al*., 2012).

Large farms of over 1000 hectares can be found in Germany as well as in Portugal and Spain. Despite significant differences in their agriculture, they eventually reached a structure of similar size (Bašek and Kraus, 2011; Arnalte and Ortiz, 2013).

The Netherlands is also one of the countries where high-performance agriculture is practiced with high production efficiency. Production efficiency is greatly influenced by the large number of livestock on the farm (Bašek and Kraus, 2011). The evolution and differences in the structure of farms in the European Union vary from state to state. While in Eastern Europe, the main differences between the agricultural structures of the countries are represented, in general, by the situations and moments related to the history of the agricultural sector from the communist period, later on these differences were the result of the emergence of agrarian reforms. In the countries of Western Europe, these differences between agricultural structures are highlighted by both institutional and political factors, but also by market conditions (Choisis *et al*., 2012).

However, Romania will not be able to align itself with other member states, such as France or Germany, in terms of the agricultural system. The studies show that the value of the unitary agricultural production in Romania, until 2038, would be 1,390 EUR/hectare, while in the other states it would exceed 2,000 EUR/hectare. In this sense, a scenario was created, which was based on an increase in the production value of 3%/year, noting that by the year 2038, the unit production value should be 2297 EUR/hectare, which would mean that Romania would align with the average registered at the EU level. Another optimistic scenario was also developed, using as a base a 4% increase in the value of production, which would mean that by 2038, Romania should have a unitary agricultural production of 2,868 EUR/hectare, which is impossible to achieve, observing the average annual

growth level of approximately 3% recorded in Romania from 1998 to the present moment (Feher *et al*., 2022).

In accordance with the legislation on the classification of farms and agricultural holdings (Law 37/2015), there are a number of criteria according to which these are classified, as follows:

- Farms that specialise in crops (field crops, permanent crops and horticulture);
- Farms specialising in animal production (breeding of herbivorous animals and breeding of granivorous animals);
- Farms specialising in mixed productions (mixed crops, animal husbandry, mixed crops and animal husbandry and unclassified holdings);

In addition, agricultural holdings are also classified according to their economic size, as follows:

- Farms with an economic size below 1,999 EUR, are found under the name of semi-subsistence farms. Within these farms, the production obtained is totally used for own consumption.
- Farms with an economic size between 2,000 and 7,999 EUR are found under the name of small commercial farms. Within these farms, more than half of the production obtained is subject to commercialization.
- Agricultural holdings with a size between 50,000 and 999,999 EUR are found under the name of commercial farms or medium-sized agricultural holdings. Within these farms, 100% of the obtained production is marketed.
- Agricultural holdings with an economic size greater than 1,000,000 EUR are found under the name of commercial farms or large agricultural holdings. Within these farms, production is 100% marketed.

3. MATERIAL AND METHOD

The data used to carry out the quantitative and qualitative analysis come from the Farm Accountancy Data Network (FADN). This network was established in the European Union in 1965. The network uses data representing more than 5,000,000 holdings from the 27 EU Member States, a percentage of more than 90% of the total agricultural production of the European Union. The purpose of this network is to collect data related to the production and economy of holdings in order to be able to determine the incomes and business analyses of agricultural holdings.

Selected indicators at the level of Romania were analysed according to the economic size of the holdings, in the period between 2007 and 2021, being the most recent data available, as follows:

Source: Farm Accountancy Data Network (FADN).
Figure 1. Description of indicators used.

Based on the data, the statistical indicators were calculated as follows:

- Standard deviation: $\sigma = \sqrt{\dfrac{\Sigma(xi - \mu)^2}{N}}$ where;

    σ = standard deviation;
    xi= each value in the sample;
    N= sample size;
    μ= sample mean;

- Coefficient of variation CV= $\left| \dfrac{\sigma_x}{\bar{x}} \right|$ where;

    σ = standard deviation;
    | x̄ |: It is the mean of variable X in absolute value with x̄ ≠ 0

    - Growth rate $\bar{R} = (\bar{I} * 100) - 100$ where;

$\bar{I}$ = average global growth index;

4. RESULTS AND DISCUSSIONS

Analysing the economic size classes, it can be noticed that increases in the average economic sizes are recorded only for semi-subsistence holdings (2,000–8,000 EUR) and for small holdings (8,000–25,000 EUR). Thus, semi-subsistence holdings show the most pronounced growth, of 40.5%; in 2007, the average economic size of holdings was 4.2 thousand EUR, to reach 5.9 thousand EUR in 2021. At the same time, a more representative decrease can be found in the case of holdings between 25,000 and 50,000 EUR, by 7.5% in 2021 compared to 2007, when the average economic size of agricultural holdings was 37.3 thousand EUR. In the case of agricultural holdings with economic sizes between 50,000–1,000,000 EUR, 100,000–500,000 EUR and over 500,000 EUR, there are decreases of 5.2%, 0.4% and 3.3% respectively in the last year compared to the value averages recorded in 2007 (Figure 2).
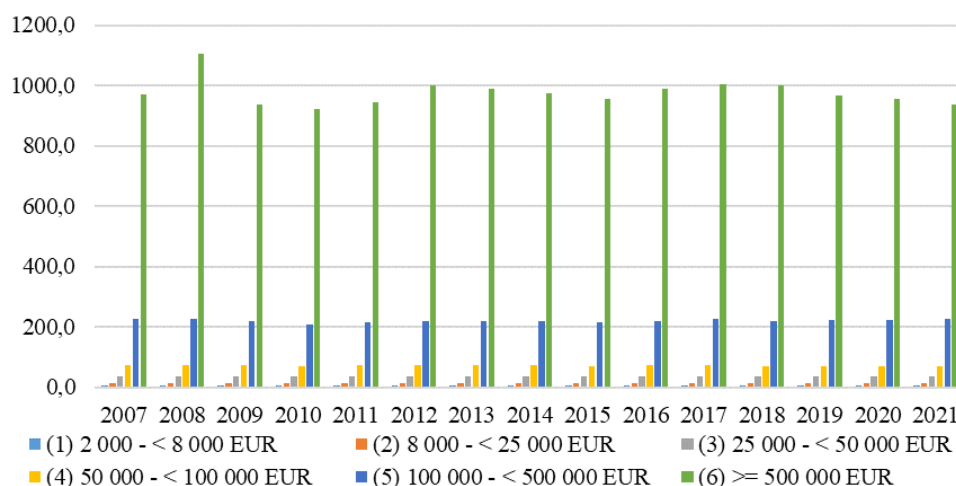
Source: Graphic representation based on data provided by the FADN Public Database (SO).
Figure 2. (SE005) The economic size of holding expressed per 1,000 EUR
of standard production at the level of Romania (thousand EUR).

From the analysis of the statistical indicators calculated for the economic size of holdings in Romania, in the analysed period, the following results were obtained: the standard deviation registered limits between 0.67 hectares for the agricultural holdings with an economic size between 2,000–8,000 EUR and 43.54 hectares for large agricultural holdings, with an economic size of over 500,000 EUR.

The coefficient of variation oscillated from 4% for agricultural holdings with an economic size of over 500,000 EUR to 14% for small holdings with an economic size between 2,000–8,000 EUR.

The growth rate is characterised by positive values only for agricultural holdings with an economic size between 2,000–8,000 EUR and 8,000–25,000 EUR, this having the value of 2% and 1%, respectively. For the other economic size classes of agricultural holdings, the pace was characterized by negative values, -1% for agricultural holdings with an economic size between 25,000–50,000 EUR, -0.4% for those between 50,000–100,000 EUR, -0.03% for those between 100,000–500,000 EUR and -0.2% for agricultural holdings over 500,000 EUR (Table 1).

Table 1

Statistical indicators calculated for the economic size of holding expressed per 1000 EUR of standard production at the level of Romania

Economic size	Min	Max	Average	Standard Dev.	Coef. Var (%)	Growth Rate (%)
(1) 2,000 – < 8,000 EUR	4	6	5	0.67	14%	2%
(2) 8,000 – < 25,000 EUR	12	15	14	0.77	6%	1%
(3) 25,000 – < 50,000 EUR	35	37	36	0.80	2%	-1%
(4) 50,000 – < 100,000 EUR	69	73	72	1.10	2%	-0.4%
(5) 100,000 – < 500,000 EUR	208	227	221	4.92	2%	-0.03%
(6) >= 500,000 EUR	924	1.105	977	43.54	4%	-0.2%

Source: FADN Public Database (SO).

The total utilised agricultural area, at national level, registered significant decreases, with the exception of small holdings, those in the range of 8,000–25,000 EUR, which registered increases by approximately 14% in 2021 compared to 2007. The most significant decreases were registered in the holdings with an economic size between 100,000–500,000 EUR and over 500,000 EUR, by 36% in 2021 compared to the first year analysed (Figure 3).
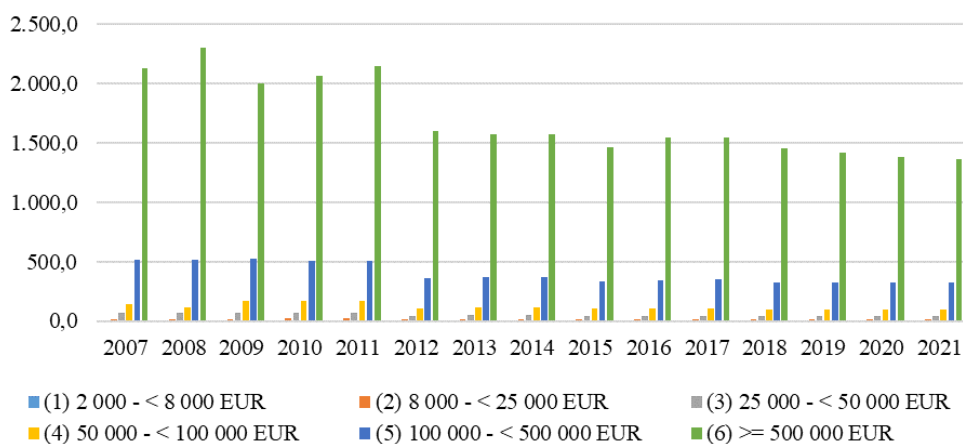
Source: Graphic representation based on data provided by the FADN Public Database (SO).
Figure 3. (SE025) – Total utilised agricultural area in Romania (ha).

From the analysis of the statistical indicators calculated for the total agricultural area used in Romania, the following results were obtained in the analysed period: the standard deviation recorded limits between 0.91 hectares for agricultural holdings with an economic size between 2,000–8,000 EUR and 323.93 hectares for large agricultural holdings, those with an economic size of over 500,000 EUR.

The coefficient of variation oscillated from 15% for agricultural holdings with an economic size between 2,000–8,000 EUR to 24% for agricultural holdings between 25,000–50,000 EUR. The rate is characterised by negative values for all six classes of economic size, this having the value of 1% (Table 2).

Table 2

Statistical indicators calculated for the total utilised agricultural area in Romania

Economic size	Min	Max	Average	Standard Dev.	Coef. Var (%)	Growth Rate (%)
(1) 2,000 – < 8,000 EUR	5	8	6	0.91	15%	-0.6%
(2) 8,000 – < 25,000 EUR	12	21	15	2.50	16%	0.9%
(3) 25,000 – < 50,000 EUR	42	72	53	12.51	24%	-3.4%
(4) 50,000 – < 100,000 EUR	97	171	121	27.37	23%	-2.6%
(5) 100,000 – < 500,000 EUR	322	525	400	84.12	21%	-3.1%
(6) >= 500,000 EUR	1.365	2.302	1.702	323.93	19%	-3.1%

Source: FADN Public Database (SO).

Regarding the indicator of total crop production in Romania, this has generally an upward trend. Total crop production refers to total sales along with farm utilization. Holding consumption and closures assessment from which the opening assessment is reduced in relation to the number of hectares (except for the area leased for a short period of time and the area not in production).

So, at the level of categories of agricultural holdings, classified by the economic size, the most significant increases were registered in the case of large holdings with an economic size of over 500,000 EUR, where total crop production was by 86% higher in 2021 compared to 2007, when the production value was 376.9 EUR/ha. Total crop production obtained in small holdings decreased instead by 8% in 2021, compared to the production of the first analysed year. Thus, the effects of investments made in the technology of holdings through financing programmes can be observed (Figure 4).

From the analysis of statistical indicators calculated for total crop production in the analysed period, the following results were obtained: the standard deviation recorded limits between 121.2 EUR/hectare for agricultural holdings with an economic size of 2,000–8,000 EUR and 165.4 EUR/hectare for agricultural holdings with an economic size of over 500,000 EUR (Table 3).
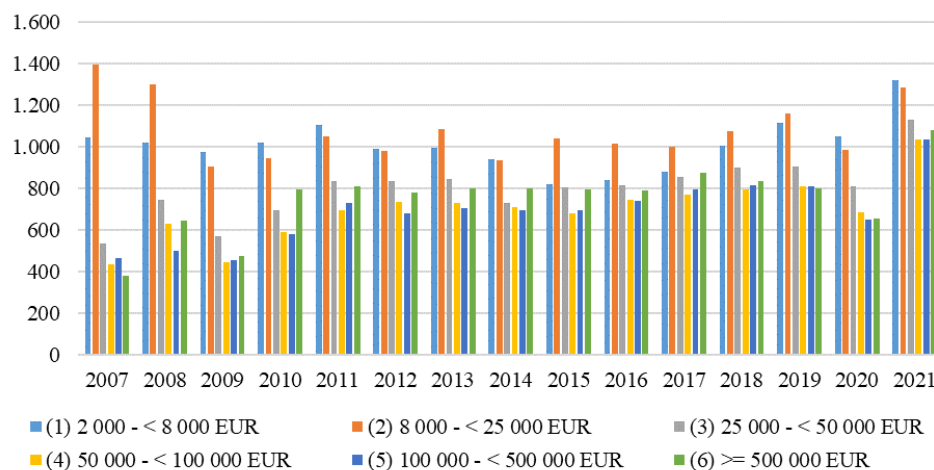
Source: Graphic representation based on data provided by the FADN Public Database (SO).
Figure 4. (SE136) – Total crop production in Romania (EUR/ha).

The coefficient of variation oscillated from 12% for farms with an economic size between 2,000–8,000 EUR and those over 500,000 EUR to 22% for farms with an economic size between 100,000 and 500,000 EUR and those over 500,000 EUR. The growth rate is characterised by positive values, with the exception of agricultural holdings with an economic size between 8,000–25,000 EUR, where this value is -0.6% (Table 3).

Table 3

(SE136) – Statistical indicators calculated for total crop production

Economic size	Min	Max	Average	Standard Dev.	Coef. Var (%)	Growth Rate (%)
(1) 2,000 – < 8,000 EUR	821	1318	1007	121.2	12%	1.7%
(2) 8,000 – < 25,000 EUR	903	1395	1076	145.8	14%	-0.6%
(3) 25,000 – < 50,000 EUR	536	1130	800	141.6	18%	5.5%
(4) 50,000 – < 100,000 EUR	436	1032	698	144.9	21%	6.4%
(5) 100,000 – < 500,000 EUR	452	1035	689	151.1	22%	5.9%
(6) >= 500,000 EUR	377	1079	753	165.4	22%	7.8%

Source: FADN Public Database (SO).
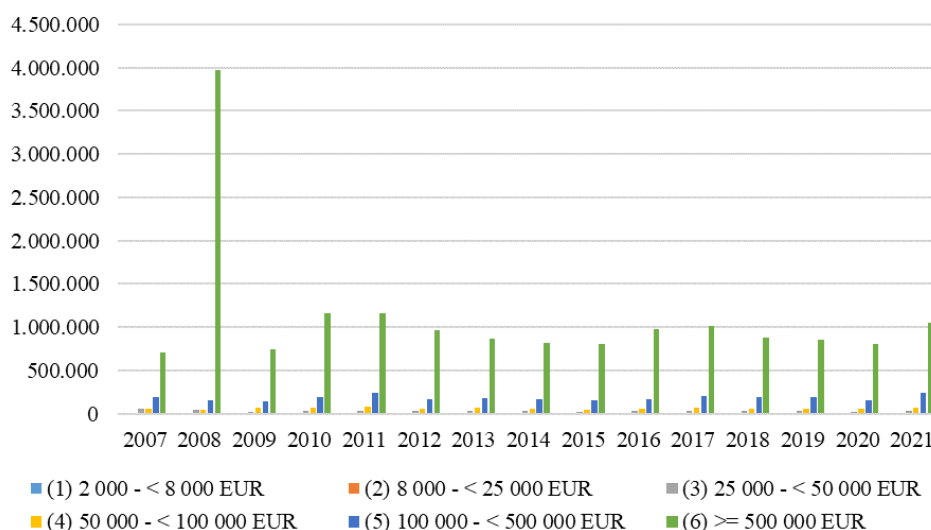
Source: Graphic representation based on data provided by the FADN Public Database (SO).
Figure 5. (SE270) – Total inflows (EUR) at the level of Romania.

In Romania, gross farm income by category of agricultural holdings, at the level of the 2007 period, decreased, for small agricultural holdings (8,000–25,000 EUR) and for agricultural holdings with an economic size between 25,000–50,000 EUR, of 0.3% and 41% respectively, in the year 2021 compared to the year 2007. However, the most important increases were registered in the holdings with an economic size of over 500,000 EUR, *i.e.* 49% in 2021 compared to the first year of analysis (Figure 5).

Table 4

(SE270) – Statistical indicators calculated for total entries at the level of Romania (EUR)

Economic size	Min	Max	Average	Standard Dev.	Coef. Var (%)	Growth Rate (%)
(1) 2,000 – < 8,000 EUR	2,199	4,267	3,474	508	15%	1.4%
(2) 8,000 – < 25,000 EUR	6,893	12,516	10,460	508	5%	0.0%
(3) 25,000 – < 50,000 EUR	21,906	53,186	32,095	1,362	4%	-3.7%
(4) 50,000 – < 100,000 EUR	46,426	76,906	60,039	7,559	13%	1.7%
(5) 100,000 – < 500,000 EUR	141,008	247,555	185,041	8,167	4%	1.7%
(6) >= 500,000 EUR	706,537	3,974,723	1,119,434	30,909	3%	2.9%

Source: FADN Public Database (SO).

Following the analysis of the statistical indicators calculated for gross farm income at the level of agricultural holdings in Romania, a standard deviation was

noted between 508 EUR for holdings with an economic size between 2,000 and 8,000 EUR and 30,909 EUR for holdings with an economic size greater than or equal to 500,000 EUR. As regards the coefficient of variation, this ranged from 5% for holdings with an economic size of 8,000 - <25,000 EUR to 15% for those with an economic size between 2,000–8,000 EUR (Table 4).

5. CONCLUSIONS

The polarisation between large and small agricultural holdings in Romania is a complex subject, with social, economic and environmental implications. On the one hand, small farms are crucial for rural communities. They not only provide a means of livelihood for a significant population, but also contribute to the preservation of a rural way of life and biological diversity through traditional agricultural practices. On the other hand, large agricultural holdings are essential for food security and competitiveness in the international market, often having access to more efficient technologies and practices. Maintaining a balance between these two types of agricultural holdings is essential for sustainable development in order to ensure the sustainability of rural communities, food security, biological diversity and resilience, as well as social cohesion.

The average economic size of farm in Romania has registered a significant increase only for agricultural holdings with an economic size between 2,000 and 8,000 EUR, respectively 8,000–25,000 EUR, while those of medium and large sizes have registered a decrease. In the case of small holdings, this increase is attributed to the decrease in the number of subsistence and semi-subsistence agricultural holdings determined by the measures adopted in the last two development programmes, an aspect that contributed to their merge. These types of holdings have been absorbed by medium and large-sized farms.

Although the utilised agricultural areas in Romania decreased in general for most of the intervals analysed, the total crop production (EUR/ha) registered considerable increases for all types of economic sizes, except for small agricultural holdings, those with an economic size between 8,000–25,000 EUR.

The decrease in areas simultaneously with the increase in total crop production can be attributed to the increase in crop yields, which has been possible due to the increase in the degree of mechanisation, as well as the rational use of new agricultural techniques.

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