

THE ECONOMIC FARM SIZE AND SUSTAINABLE VALUE DISPARITIES BETWEEN ROMANIA AND THE EU STATES

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Abstract. Romania is one of the EU countries with significant agricultural potential. The economic and social changes occurring after 1990 has profoundly affected the agriculture in Romania. The excessive land fragmentation due to land restitution to the former owners and their heirs, as well as the subsequent developments have led to a large number of small-sized agricultural holdings and a small number of large agricultural holdings, in terms of size and economy.

The sustainability performance must be assessed from the economic, social and environmental points of view. The paper aims to assess the sustainable performance of the agricultural holdings in Romania on economic size classes, to highlight the directions for enhancing the performance by reorganizing the agricultural structures. For achieving this purpose, we used the Sustainable Value-based approach. The results of comparison between Romania and other EU countries highlight the importance of medium-sized farms, which achieve the best performance expressed by the Sustainable Value.

Key words: economic farm size, sustainable value, sustainable performance, agricultural structures

JEL Classification: Q01, Q12, Q15, Q18

1. Introduction

The Common Agricultural Policy (CAP) for 2020 is integrated into the EU 2020 Strategy to achieve a green growth in the agricultural sector and the rural economy, i.e. a smart, sustainable and inclusive growth [EC, 2013]. The CAP reform aims to increase the competitiveness through efficient use of resources, to face the challenges regarding food security, environment & climate change, and territorial balance (COM, 2010). The achievement of these objectives is conditioned by the existence of appropriate agricultural structures, able to effectively and evenly exploit the natural, social and capital resources of the agricultural holdings.

Romania is one of the EU countries with important resources for agriculture. It holds 13.3 mil ha of utilized agricultural area (6th position in EU), but the agrarian structure is not adapted to the EU developed countries. In Romania, there is the largest number of agricultural holdings of EU, most of them being small or very small, but a few are very large, similar to the typical farms of the Latin American countries. This feature of Romanian agriculture was generated by the land ownership restoration after 1989. The excessive division of the agricultural lands, as well as the establishment of a large number of agricultural holdings, have led to agricultural productivity decrease, poverty in rural areas, abandonment of agricultural land cultivation, ineffective use of inputs, lack of capital accumulation in agriculture, and so on.

The integration in EU and implementation of the CAP (Common Agricultural Policy) has led to new challenges for Romanian agriculture, related to low competitiveness of the agricultural holdings in Romania, caused by the inadequate agrarian structure. About 90% of the agricultural holdings in Romania are subsistence farms that produce only for internal consumption. Their transformation into competitive commercial farms, able to effectively use the resources, is a priority of the agrarian policy in Romania.

The performance of agricultural holdings must be globally assessed, having in mind the economic, social and environmental components characterizing the sustainable development thereof. The sustainability assessment of an economic system is difficult, because it requires a large set of indicators for expressing specific issues. Their use involves further difficulties in the evaluation process, due to multiple criteria for assessing the sustainability. Therefore, it is appropriate to use a method which provides, through a synthetic indicator, an overview of the overall performance of the agricultural holdings. The Sustainable Value method (SV) enables a synthetic assessment of the agricultural

holdings contribution to the farming sustainability by assessing the efficiency resulting from the use of economic, social and environmental resources, compared to their opportunity cost.

The purpose of our paper is to assess the connection between the sustainable value created by the agricultural holdings of Romania and their economic size. Achieving optimal agrarian structure is an important issue of agriculture in all countries. This issue greatly influences the efficient use of resources in agriculture for obtaining productions able to ensure the population food security and the sustainable development of rural areas.

The relationship between the economic farm size and performance in the literature took mostly into account the economic issues. The research results are contradictory, identifying a direct linear relationship, a reverse relationship or a nonlinear connection.

This research proposes a more comprehensive vision of the economic relationship between farm size and performance, based on the information provided by the Sustainable Value Approach. For Romania, the transformation of subsistence farms into commercial small- and medium-sized farms is one of the directions which can increase the economic, social and environmental performance in agriculture.

Some issues presented in the paper, facing the agriculture in Romania, are also found in other countries that lately joined the Union. In this regard, the paper can be useful to the authorities having national or international jurisdiction in those countries, helping them to substantiate adequate policies for the sustainable development of agriculture and rural areas in line with the guidelines set out in the Europe 2020 strategy.

2. Literature review

In practice, the process of assessing the sustainability of an economic system is difficult because it requires a large set of indicators for expressing specific issues. The analysis of sustainable development in agriculture and rural areas generally considers four components: food security, employment and income generation, environmental and natural resource conservation, people's participation and empowerment (Van Mansveld and Mulder, 1993).

Over time, various indicators have been proposed to assess the agriculture sustainability at national or local level, recommending a set of Environmental Indicators for Agriculture referring to issues such as: agriculture in the broader economic, social and environmental context, farm management and the environment, use of farm inputs and natural resources and environmental impacts of agriculture. These indicators have been used in studies to assess the effects of agriculture on the environment in various countries, including Romania (OECD, 2001).

The set of indicators used to monitor the agricultural sustainability developed by the European Commission facilitate in particular the assessment of the connection between the agricultural practices and environmental impact. These agri-environmental indicators refer to the farm management practices, agricultural production systems, pressures and risks to the environment and status of natural resources. Although they have a great informational value, they primarily present global quantitative issues about the interaction of agriculture with the environment, and therefore they should be supplemented with other information to identify the issues specific to the regions and farms (COM, 2006).

In the literature, there are several approaches regarding the possibilities to assess the sustainability in agricultural holdings. These ones include the burden & value-oriented approaches which give the magnitude of the relative harmfulness of environmental and social impacts. The sustainability performance of the farms is studied in the context of the Life Cycle Analysis (LCA), Eco-Efficiency, Global Reporting Initiative (GRI), and Response Inducing Sustainability Evaluation (RISE). Based on the GRI guidelines, the GRI Index has been developed and used in order to reflect the implications of the toxic emissions on firm's performance (Clarkson et al. 2008; Clarkson et al. 2011). Although the introduction of sustainability reporting is only recommended by GRI, an increasing number of organizations are currently using these reports, delivering a value expression of their sustainability performance.

The Response Inducing Sustainability Evaluation is an assessment method based on a set of 12 indicators corresponding to some issues relevant for the life cycle assessment, and covers the key areas of the sustainable development. They were used for the evaluation of certain farms located in Brazil, Canada, China and Switzerland (Haeni et al., 2003).

Another set of methods are based on the value-oriented approaches and take into account the value resulting from the socio-economic and environmental impacts of the agricultural activities by comparison with an alternative resource allocation considered more sustainable (Tegtmeier and Duffy, 2006).

One of the value-oriented method is the Sustainable Value method (SV), developed as a means of measuring the agricultural eco-efficiency at microeconomic level. This enables a synthetic assessment of the farm contribution to the farming sustainability, taking into account the efficiency resulting from using the economic, social and environmental resources by comparison with their opportunity cost (Figge and Hahn, 2005; Illge et al., 2008; Van Passel et al., 2007). The sustainable value assessment can be also carried out by using other methods, such as Data Environmental Analysis or Regression Analysis.

In the literature, the sustainable value determination and sustainable performance assessment of the farms structured on size classes are less-addressed issues. Certain studies for assessing the sustainability performance at microeconomic level have been carried out for the dairy farms located in Germany and Netherlands, and the results

showed that the largest farms (more than 60-100 dairy cows) are more efficient and create higher sustainable value (Van Passel et al., 2006; Ehrmann, 2008).

The paper addresses to a less studied field, i.e. the farm performance sustainability, aiming to analyse the connection between the variation of the sustainable value and the sustainable development indicators, determined by reference to the economic size class of the agricultural holdings.

3. Methodology

To accomplish the basic objective of this research, i.e. the sustainability performance assessment of Romanian agricultural holdings, we used the Sustainable Value methodology (Figge and Hahn, 2004).

The Sustainable Value Methodology is based on the comparison between the values created by two entities when using economic, social and environmental resources. The entity established as basis for comparison is considered to have advantageous technical-productive and organizational structures, enabling a sustainable management of resources and representing, for the analysed entity, the opportunity cost of its capital. The analysed entity contributes to the sustainable development when the return of its resources exceeds the return of the benchmark's resources. This one proves sustainable performance when using its capital more efficiently than the benchmark, taking more advantage from using its resources.

The calculation formula for determining the Sustainable Value of the farms on economic size, is the following:

$$SV_i = \frac{1}{m} \sum_{j=1}^m r_{ij} \left(\frac{y_{ij}}{r_{ij}} - \frac{yb_{ij}}{rb_{ij}} \right) \quad (1)$$

where: SV_i is the sustainable value afferent to a farm having the economic size i ; r_{ij} and rb_{ij} represent the resource quantity of type j and economic size i of the analysed farm, i.e. of the farm considered as reference system; y_{ij} and yb_{ij} are the return of resources of the analysed and benchmark farm; $i = 1..n$ is the economic size and $j=1..m$ is the type of analysed resource.

Through its contents, SV indicates the absolute size of the value created in a sustainable manner by the agricultural holdings of various economic sizes. To take into account the size effects and to make comparisons between farms of various sizes, we can calculate the indicator *Return to cost ratio* (RTC_i). This one shows the relative contribution of various types of farms to the sustainable performance compared to the benchmark:

$$RTC_i = \frac{y_i}{y_i - SV_i} \quad (2)$$

where y_i represents the created value; SV_i - sustainable value of the agricultural holding of economic size class i .

To expand the analysis and take into account the input resources, we build the indicator called *Relative efficiency ratio* of resources (RER_j). Using these indicators, we can assess the contribution of each resource of type j to the sustainable performance, through comparisons between the analysed system and the benchmark:

$$RER_{ij} = \frac{y_i}{r_{ij}} : \frac{yb_i}{rb_{ij}} \quad (3)$$

The values of the indicator which are higher than 1 indicate that the farm uses more efficiently its resources than the benchmark, and if the values are sub-unitary, the holding gets less return from the input resources compared to the benchmark.

The information needed for analysis was taken from the Farm Accountancy Data Network and covers the period 2008-2012. The agricultural holdings listed in FADN are commercial-type farms, and are presented by economic size, divided into 6 size classes - ES6 grouping: (1)2000 - 8000 euro; (2)8 000 - 25000 euro; (3)25000 - 50000 euro; (4)50000 - 100000 euro; (5)100000 - 500000 euro and (6) >500000 euro. Under the new regulations in the EU, the economic size of an agricultural holding is measured as the total Standard Output of the holding expressed in euro (EC, 2008). Using in research the holdings classification by economic size aimed to highlight the types of farms that actually apply the more sustainable practices and create sustainable value.

The assessment of sustainability performance of the agricultural holdings was carried out using a group of variables expressing the economic, social and environmental resources that create a return in the economic activity and have an impact on the agricultural sustainability. The selection of variables is based on the previous studies on the contribution of resources to create sustainable value (Illge et al., 2008; Van Passel et al., 2007). We took into account the following resources: the fixed capital (land, machinery, and livestock), circulating capital (energy, fertilizers, and

crop protection substances), human capital (labour input in AWU) and environmental subsidies. As return indicator, we used the total output. The benchmark against which we perform the sustainability performance assessment of Romanian farms is represented by the European Union agriculture.

4. Results and discussions

The agricultural holdings in Romania differ significantly from the EU ones, which refers to the small size of the utilised agricultural area, due to the fragmentation of the owned land. Also, the technical endowment and consumptions are lower, which explains the much lower economic performance. A summary of the inputs and outputs of Romanian farms compared to the EU farms is presented in Table 1.

Table 1. Economic, social and environmental capital of agricultural holdings, Romania and EU, 2008-2012

Indicators	Romania average on farm		EU average on farm		Indicators/UAA 2012		
	2008	2012	2008	2012	Romania	EU	RO/EU %
Utilised agricultural area, ha	8.45	10.05	29.87	32.65	-	-	-
Machinery, euro	4678	5118	27566	33346	509.25	2742.89	18.6
Total livestock units, LU	6.35	6.69	24.74	26.05	0.67	2.46	27.2
Energy, euro	781	921	4083	5344	91.64	406.27	22.6
Fertilizers, euro	479	704	3318	4138	70.05	330.15	21.2
Crop protection, euro	277	391	2083	2470	38.91	207.26	18.8
Total labour input, AWU	1.72	1.3	1.69	1.56	0.13	0.17	76.5
Environmental subsidies, euro	6	61	912	1119	6.07	90.75	6.7
Total output, euro	10735	12760	57155	71248	1269.65	5687.06	22.3
Farm net value added, euro	5171	7093	24423	29587	705.77	2430.15	29.0

Source: FADN database and own calculation

Within the commercial-type agricultural holdings in Romania, it was an economic growth in the period following the EU accession (2008-2012), reflected by the increase in total farm output (19%) and farm net value added (37%). The phenomenon of agricultural activities expansion (increase of productive area and technical basis) has also modified the structure of production factors. In this period, the consumption of fertilizers (47%), crop protection substances (41%) and energy (18%) have increased, while the labour force participation rate has decreased (24%).

The characteristics of agricultural holdings in Romania show however the generalized farming systems within the European Union. The average area of an agricultural holding of commercial type in Romania is about 10 ha, i.e. over 3 times lower, and there are significant organizational and agrotechnics differences compared to the EU average. Obviously, the technical endowment, consumptions and results are much lower. We can get a view on the sustainable performance by analysing comparatively the inputs and outputs per utilised agricultural area. We note that the farms in Romania have a lower technical endowment than the EU farms (18.6% machinery) and a lower consumption of energy (18.6%), fertilizers (21.2%) and crop protection products (18.8%). The environmental subsidies represent only 6.7% compared to the EU average. In these conditions, the economic performance achieved by the farms in Romania is lower than the EU average (total output euro/ha: 22.3%; farm net value added euro/ha: 29.0%). The lower consumptions of energy, fertilizers and crop protection products, as well as the lower density of livestock in Romanian farms compared to the EU show a lower environmental impact of the applied agricultural practices. This is an advantage for the agricultural holdings in Romania in terms of land conversion to organic agriculture.

The analysis of sustainability performance of Romanian farms was carried out on the segment of commercial-type agricultural holdings, structured according to the economic size. A quantitative analysis based on the data listed in Table 2 highlights disparities in the distribution of farms by size class and utilized agricultural area between Romania and the developed countries (Germany and France), or the countries which lately joined the EU (Bulgaria and Poland).

We note that, in Romania, the majority of agricultural holdings are included in the categories *very small farms* (88.21%) and *small farms* (9.37 %). A similar situation is found in Bulgaria. This is the consequence of excessive fragmentation of the land since the abolition of the old farm structures after 1989 and the reconstitution of ownership. In Poland, the very small farms and small farms have significant proportions (37.30 and 42.29), but the medium and small-sized farms are well represented (12.99%). In the developed countries (Germany and France), the majority of agricultural holdings are included in the categories medium-small, medium-large or large farms. In terms of physical size, we see that, in Romania and Bulgaria, the farms which get outputs ≥ 500000 EUR are holding large areas of land compared to those located in Germany and France.

Table 2. The distribution of farms by size class and utilized agricultural area, year 2012

Economic Size	Bulgaria		Germany		France		Poland		Romania		EU	
	%	UAA	%	UAA	%	UAA	%	UAA	%	UAA	%	UAA
2 000 - < 8 000	74.18	3.02	-	-	-	-	37.30	8.29	88.21	0.14	35.70	5.33
8 000 - < 25 000	16.08	18.24	-	-	0.60	7.34	42.29	13.71	9.37	13.09	30.02	16.18
25 000 - < 50 000	3.42	53.37	20.96	28.92	18.42	44.5	12.99	27.06	1.21	54.36	11.67	33.24
50 000 - < 100 000	2.95	121.15	25.15	42	29.10	65.58	4.90	47.1	0.59	141.46	9.87	59.01
100 000 - < 500 000	2.65	545.19	47.05	82.25	48.58	111.68	2.23	105.27	0.52	450.73	11.25	103.86
>= 500 000 EUR	0.72	1491.3	6.84	441.88	3.30	114.36	0.29	618.87	0.10	1429.53	1.49	302.87
Total	100	35.71	100	85.57	100	85.36	100	18.84	100	10.08	100	32.66

Source: Own calculation, based on FADN

The sustainability performance of Romanian farms, expressed by the Sustainable Value for Romania in the period 2008-2012, is presented in Table 3.

Table 3. Sustainable value of the agricultural holdings of Romania, 2008-2012

Farm size (euro)	SV of farms, euro					Return to cost ratio, 2012
	2008	2009	2010	2011	2012	
(1) 2000-8000	729	1,344	1,720	1,644	990	1.17
(2) 8000-25000	1,417	2,339	3,077	3,628	3,058	1.19
(3) 25000-50000	480	3,336	6,567	7,002	4,997	1.10
(4) 50000-100000	-37,486	-10,846	-6,590	-5,638	-14,322	0.88
(5) 100000-500000	-206,266	-166,563	-132,950	-125,715	-169,183	0.68
(6) >=500000	-705,326	-788,092	-425,005	-1,381,485	-1,029,745	0.63

Source: Own calculation

We see that only the holdings included in classes 1, 2 and 3 have created sustainable value, while the other types of farms had negative sustainable value. Also, we see that, in 2012, the large and very large holdings (classes 4, 5 and 6) managed ineffectively the resources, obtaining lower income than the opportunity cost ($RTC < 1$). Another observation is that (with few exceptions), in the first four years of the analysed period, it was a tendency to increase the SV with increasing the size of farms, up to an output of 50,000 euro (class 3), which shows a trend to consolidate the small-sized farms. In the analysed period, the agricultural holdings which obtained a total output of 25000-50000 euro (class 3) got the maximum sustainable value. They are considered medium-sized farms and achieved the highest yield of economic social and environmental input resources.

In Figure 1, we plotted the Sustainable Value of Romanian farms versus the opportunity costs of some EU countries with modern agriculture (Germany and France), or which lately joined the EU (Bulgaria and Poland).

We can see that, for the small and medium-sized farms, the sustainable value in Romanian agriculture is slightly positive, except France (class 2), Germany (class 3) and Bulgaria (class 1). But, starting with the farms whose economic size is higher than EUR 50,000, Romania creates negative sustainable value. The worst sustainable performance is recorded in relation to Germany, followed by France and the EU average. A negative situation is also recorded in relation to Poland and Bulgaria, especially for the large and very large farms.

Also, this situation demonstrates that the very large agricultural structures, found in some Latin American countries, exist in Romania, but do not achieve sustainable performance and are not specific to the EU countries with well-developed agriculture.

For Romania, the agricultural production system applied in medium-sized farms seems to provide the best conditions for sustainable growth. These farms create more value through the rational use of economic, social and environmental resources.

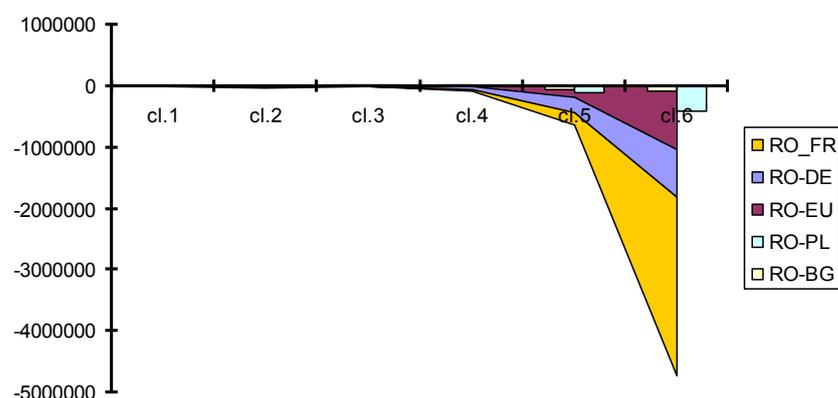


Figure 1. Sustainable Value of Romanian farms, assessed based on the opportunity costs of some EU countries, year 2012 (source: FADN database)

The analysis of the relative efficiency ratio of the agricultural resources in Romania compared with the agricultural resources in the EU countries (RER_j) highlights some issues regarding the factors affecting the value created in agriculture (Table 4 and Figure 2).

Table 4. Comparison between the efficiency of agricultural holding resources in Romania and EU, 2012

Farm size (euro)	Relative efficiency ratio of resources (Romania – EU)						
	Total UAA	Total livestock units	Machinery	Fertilisers + Crop protection	Energy	Total labour input	Envir. Subs.
(1) 2000-8000	1.11	0.63	1.83	1.46	1.27	0.81	2.58
(2) 8000-25000	1.16	0.47	2.39	1.65	1.83	0.74	6.47
(3) 25000-50000	0.74	0.73	1.80	1.14	1.52	0.72	5.57
(4) 50000-100000	0.50	1.24	1.52	0.73	0.95	0.65	3.79
(5) 100000-500000	0.32	2.93	0.77	0.60	0.70	0.52	2.26
(6) >500000	0.31	0.85	0.59	0.64	0.91	0.52	1.81

Source: Own calculation, based on FADN

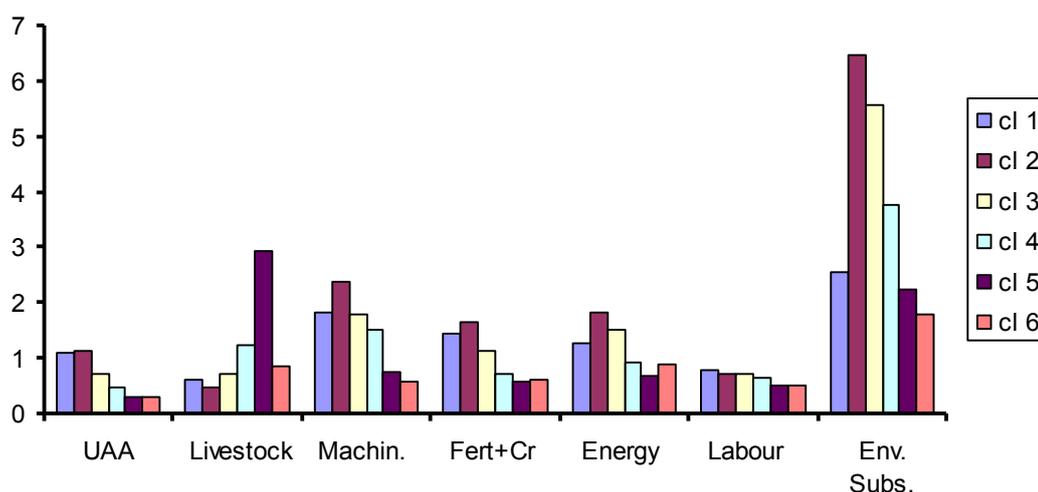


Figure 2. The Relative Efficiency Ratio of resources held by the agricultural holdings versus their sizes (Romania – EU)

It appears that the majority of resources involved in obtaining agricultural production in small and medium-sized farms (classes 1, 2 and 3) have a much higher efficiency than the holdings included in the classes 4, 5 and 6 (larger farms). The higher productivity of the socio-economic and environmental resources of the smaller farms make

them to positively contribute to the sustainable agriculture growth, while the lower productivity of the larger farms leads to loss of sustainable value.

Comparing the two groups of farms, it is found that the medium-sized farms create a higher yield per hectare and have a better efficiency in using the technical-production basis. They also ensure a higher recovery of the consumed energy and substances used for fertilization and protection of the plants which, in terms of environmental impact, demonstrates aspects of eco-efficiency. Other studies analysing the relation between the farm size and efficiency in agriculture provide similar conclusions (IFOAM, 2013; Galluzzo, 2013; Burja, 2014).

The analysis of Relative Efficiency Ratio on environmental subsidies versus the farm size shows also that the environmental subsidies ensure a better support for the sustainable development of the medium-sized farms. They provide the necessary financial incentives for more environmentally friendly actions.

5. Conclusions

The activities of agricultural holdings correspond to the concept of multifunctionality. They have unique characteristics that differentiate them from the other sectors of the economy, playing an important role in the management of natural factors and having profound implications on the social inclusion and quality of life in rural areas. The full achievement of the agriculture multifunctionality contributes to the sustainable development of rural areas, and it is closely related to the actions taken at the micro economic level to increase the economic efficiency while meeting the other social and environmental commands (Wilson, 2007).

The assessment of sustainability performance of Romanian farms for the period 2008-2012 revealed the existence of specific ways of exploiting agricultural resources compared to the model generalised in the European Union. There are significant efficiency differences between the farms of different sizes in terms of using the socio-economic and environmental resources.

The obtained results show that the size of agricultural holdings is an important element on which the performance in the sustainable development system depends, which is consistent with the results of recent studies on agricultural efficiency.

The medium-sized agricultural holdings have been identified as viable economic systems, whose sustainable performance levels are comparable with the European ones. They provide a sustainable management of resources and create positive value, contributing to local and regional development. These holdings bring economic benefits, provide support to a large proportion of the rural population and also contribute to the preservation and conservation of the environment. They use advantageously all the available resources compared to the opportunity cost, and the economic activities carried out have minimal interference in the ecosystems.

Since in the commercial sector of Romanian agriculture there are more than 87% very small holdings, the increase of performance in the agricultural sector seems to be closely related with the increase in size of the holdings, up to reasonable sizes (EU average) enabling a better organization of production systems and increasing the value per unit of resource input.

The paper took into account only the commercial agricultural holdings. In Romania, more than 70% of the agricultural holdings are producing food for self-consumption. The subsistence holdings are a challenge for the future of agriculture in Romania. They must be transformed into commercial farms.

The overall conclusion of the paper states the need for strategic guidance and actions that lead to structural changes in the agricultural production in Romania. It is required a transition from the small-scale farming, characteristic for the present Romanian agriculture, to that type of modern agriculture specific to the European Union, where the development on sustainable bases ensures the economic viability of the farms and increased sustainable performance.

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