

ASSESSING SUSTAINABLE PERFORMANCE IN AGRICULTURE

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Abstract: Romania has a significant agricultural potential due to the land owned, the workforce employed in this sector, the favorable climate conditions, but with all this the performance of Romanian's agriculture is reduced compared to the EU. One of the ways of modernizing and revitalizing agriculture is represented by investments from European funds that have as strategic direction the sustainable development of agriculture. This article develops a synthetic theoretical framework on the peculiarities of Romania's agriculture in the context of EU agriculture, the performance analysis of agricultural holdings, and last but not least a case study on the assessment of the sustainable performance of agricultural holdings in Romania by economic size classes. The objective of this article is to assess the sustainable performance of agricultural holdings in Romania compared to the EU by analyzing the link between the farm size and sustainable value in order to identify the performance growth directions. In order to achieve the proposed objective, the sustainable value method was used. The results highlight the fact that in Romania the medium-sized farms achieve the highest performance expressed through Sustainable Value.

Key words: agriculture, sustainable value, resource, results, performance, European Union.

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Introduction

In Romania, agriculture is one of the most important branches of the national economy, having a significant growth potential due to existing natural and human resources. Romania is one of the countries of the European Union with important resources for agriculture, occupying the 6th position in the EU in terms of utilized agricultural area, but the agricultural structure is not adapted to the developed countries of the EU. Romania's agriculture is characterized by a high level of fragmentation (with the largest number of farms in the EU, most of which are subsistence farms), and a low level of technology.

Taking into account the existing resources and technical and structural deficiencies, the implementation of the Common Agricultural Policy represents an important opportunity to develop a sustainable and competitive agriculture based on market orientation, open new horizons of productivity growth, food security, etc.

The low performance of Romanian agriculture compared to the EU is the result of the action of a complex of factors that aim in particular at the lack of adequate and sufficient technical basis, demographic factors that are reflected in the aging of the population, the low level of diversification of activities, credit system is not adapted to the particularities of agriculture, the existence of a large number of small farms that are producing for their own consumption, etc.

In the current economic context, the main way to ensure economic growth and revitalization is to use resources rationally and to increase the economic efficiency of activities. Due to the resources available to Romania, the agriculture is considered to be one of the most important factors of growth and economic development.

European programs for agriculture pay special attention to sustainable rural development, which implies a strong rural economy, a modern rural infrastructure, adequate technical equipment, the use of local natural resources, environmental protection.

The performance is a form of competitiveness that, on the one hand, results in achieving results through the achievement of strategic objectives and, on the other hand, ensures sustainable market sustainability [9].

Literature review

Over a long period of time, the measurement of economic performance was achieved through the financial statements and the indicators determined basis on these. The challenges of the economic environment require an integrated approach to economic performance, taking into account the impact and interaction of three factors: economic, social and environmental factors. For these reasons, an important place in recent approaches is the measurement of sustainable performance, which can be seen as a ratio between created value and the used resources, taking into account the social and environmental costs.

Measuring the sustainability of agricultural holdings at both microeconomic and macroeconomic level requires the use of a set of specific indicators that highlight the link between economic, social and environmental objectives.

Sustainable development assessment should consider the efficiency and effectiveness of the three dimensions (economic, social, environmental) simultaneously [5].

Sustainable development indicators are used to measure economically, socially and environmentally sustainable performance [10]. In order to support the decision-making process at all levels, it is necessary to use indicators for sustainable development measurement [2].

For an integrated approach of economic, social and environmental aspects, it is necessary to adopt a new perspective, which facilitates the conversion of profit-based financial accounting towards monitoring of business sustainability [4]. Extending the range of information used in traditional accounting and approaching it as Sustainability Accounting, ensures knowledge of various types of company impacts.

Sustainability assessment is a mainstream business activity that demonstrates the link between an organization's strategy and commitment to a sustainable global economy [11].

Important regulations on the sustainability reporting are included in Global Reporting Initiative (GRI). The GRI Guidelines can contribute to improving the usefulness and quality of information reported by companies about their environmental, social and economic impact and performance [13]. Based on the Global Reporting Initiative context some studies developed and utilized a GRI Index in order to reflect the implications of the toxic emissions on firm's performance [3].

Measuring organizations' contribution to sustainable development can be done in a relative and absolute manner. According to the absolute approach, an organization contributes to sustainable development if the benefits are higher than the total internal and external costs. The best way to measure the organizations' contribution to the sustainable development using the relative approach is eco-efficiency, which implies reducing the impact on the environment as much as possible [6].

Concerning sustainable value, this highlights the value created by an organization/farm, sector of activity, by using a set of resources. It is considered that an entity creates value when is using the capital/ the resources more efficiently than the benchmark [12].

The Benchmark represents the opportunity costs of using resource [8], and it is extremely important that the benchmark and, consequently, the opportunity costs to be a feasible and comparable alternative.

Methodology

The objective of this research is to assess the sustainable performance of agricultural holdings in Romania compared to the EU, by analyzing the link between farm size and sustainable value in order to identify performance growth directions. In order to achieve the proposed objective, we used the sustainable value method.

The research hypothesizes are:

1. The size of the agricultural holding influences the performance in the sustainable development system;
2. The medium-sized agricultural holdings achieve a higher sustainable performance compared to the large agricultural holdings;
3. The medium-sized agricultural holdings achieve a lower sustainable performance compared to the large agricultural holdings.

We present below a macroeconomic performance analysis model using the sustainable value method.

The required information was taken from FADN - Farm Accountancy Data Network, for a period of 4 year, 2014-2017. The agricultural holdings for FADN are of commercial type, divided into 6 size classes (according to the ES6 grouping criterion): 2,000-8,000 euros; 8.000-25.000 euro; 25.000-50.000 euros; 50.000-100.000 euros; 100.000-500.000 euros; > 500.000 euros.

The classification of agricultural holdings according to their economic size highlights the categories of farms that create sustainable value.

The assessment of the sustainable performance of agricultural holdings in Romania is achieved through 10 variables that express 3 categories of resources: economic resources (utilised agricultural area, livestock, machinery, fertilizers, crop protection, stock of agricultural products, plants and seeds, energy), social resources (total labour input), environmental resources (environmental subsidies). As a result indicator, it was considered the total output.

We mention that the establishment of resources and results started from the methodology proposed by Illge, Hahn, Figge [8] and Burja [1].

The reference system against which the assessment of the sustainable performance of agricultural holdings in Romania is carried out is represented by EU agriculture, the resource and result variables mentioned above.

In order to determine the sustainable value of agricultural holdings according to their economic size, the effects size and the resources efficiency, the following calculation formulas [1] are used:

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

SV_i - Sustainable value for a farm of size i ;

r_{ij} , rb_{ij} - the quantity of resource of j type and i economic size of the agricultural holding, respectively the benchmark;

y_i , yb_i - the results of analyzed resource of the agricultural holding and benchmark;

$i = 1 \dots n$ is economic size and $j = 1 \dots m$ is the type of used resources.

The cost benefit ratio (Rrc) shows the relative contribution of different types of farms to sustainable performance compared to the benchmark.

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

y_i - value created

The relative resource efficiency ratio (Rer) allows the appreciation of the contribution of each type j resources to sustainable performance through comparisons between the analyzed system and the benchmark. It is recommended that the Rer indicator has values bigger than 1 in order to highlight that the farm uses its resources more efficiently than the benchmark.

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

Results and discussions

Between the agricultural holdings for Romania and those in the EU there are notable differences in terms of the results obtained and the used resources.

Regarding the commercial agricultural holdings for Romania there is a fluctuating evolution with a tendency to increase the obtained results, which leads to a similar evolution of the used resources. The total production increased with 14% in 2017 compared to 2014, while net added value increased by 17% over the same period. The improvement of the obtained results is the consequence of the technology increase (increases with 17% in 2017 compared to 2014), the fertilizers consumption increase (13% in the above period), the crop protection products increase (4%), energy increase (14%). The utilized agricultural area grows only with 5% in 2017 compared to 2014, while the result indicators increase significantly, which highlights a superior efficiency of the agricultural land. The labor input in agriculture decrease with 3%, a positive aspect given the fact that Romania occupies the second position in the EU in terms of labor input in agriculture (the first place being occupied by Poland), mainly due to the high level of fragmentation.

If we compare the characteristics of Romanian agriculture with the EU agriculture, taking into account the information for table no. 1, there are many important gaps that lead to a low performance of agricultural holdings in Romania compared to the EU. The average area of a commercial agricultural holdings in Romania is about 10 ha, over 3 times lower than the EU, resulting in significant organizational and technical differences. Obviously the technical endowment, consumption and results are much lower in Romania compared to the EU. Compared to the EU average, the Romanian agricultural holdings have a technical endowment about 6 times lower than the EU, the consumption of fertilizers and energy is 5 times lower, the crop protection products are 6 times lower, the environmental subsidies are 45 times lower, while the labor input is similar (an average of 1,09 in Romania and 1,52 in the EU.) Concerning the results, the total output is 6 times lower and the value added 5 times lower in Romania vs. EU average.

The lower consumption as well as the lower animal density in Romanian farms compared to the EU highlight a lower ecological impact of the agricultural practices applied.

The significant differences between the results obtained by the Romanian and EU farms are highlighted in the Figure no. 1.

Table no.1 Resources and results of agricultural holdings in Romania and the EU

| FADN code | Indicators | Measure unit | Romania- average per holding | | | | UE- average per holding | | | |
|--------------------------|----------------------------|--------------|------------------------------|-------|-------|-------|-------------------------|--------|--------|--------|
| | | | 2014 | 2015 | 2016 | 2017 | 2014 | 2015 | 2016 | 2017 |
| Economic resource | | | | | | | | | | |
| SE025 | Utilised agricultural area | ha | 9.23 | 8.94 | 9.37 | 9.71 | 33.84 | 34.04 | 34.26 | 34.87 |
| SE080 | Livestock units | lu* | 4.73 | 4.58 | 4.83 | 4.69 | 25.8 | 27.01 | 27.37 | 27.91 |
| SE285 | Seeds and plants | euro | 595 | 628 | 677 | 696 | 3.009 | 3.079 | 3.079 | 3.177 |
| SE295 | Fertilisers | euro | 697 | 767 | 827 | 787 | 4.205 | 4.241 | 4.029 | 3.836 |
| SE300 | Crop protection | euro | 425 | 421 | 444 | 443 | 2.796 | 2.858 | 2.865 | 2.818 |
| SE345 | Energy | euro | 913 | 1.013 | 971 | 1.045 | 5.157 | 4.827 | 4.542 | 4.855 |
| SE455 | Machinery | euro | 4.850 | 5.977 | 5.769 | 5.675 | 32.335 | 33.049 | 32.467 | 33.067 |
| SE475 | Stock of agricultural | euro | 971 | 698 | 569 | 435 | 8.510 | 8.858 | 8.489 | 8.731 |

| products | | | | | | | | | | |
|-----------------------|-------------------------|-----------|--------|--------|--------|--------|--------|--------|--------|--------|
| Social resource | | | | | | | | | | |
| SE010 | Labour input | awu ** | 1,13 | 1,07 | 1,06 | 1,1 | 1,52 | 1,53 | 1,5 | 1,51 |
| Enviromental resource | | | | | | | | | | |
| SE621 | Environmental subsidies | euro | 25 | 20 | 30 | 20 | 1.061 | 1.018 | 1.077 | 1.197 |
| Results indicators | | | | | | | | | | |
| SE131 | Total output | euro | 11.434 | 10.734 | 11.787 | 13.088 | 70.914 | 71.926 | 71.604 | 76.188 |
| SE415 | Farm net value added | euro | 6.090 | 4.556 | 6.142 | 7.109 | 28.000 | 28.198 | 29.140 | 32.481 |

Source: author's view based on the data for FADN

lu= livestock unit

awu= annual work unit

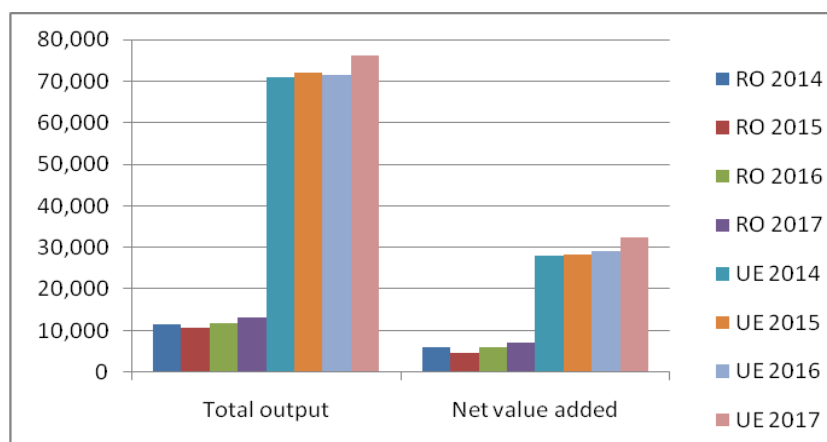


Figure no.1. The dynamics of agricultural outputs in Romania compared to the EU

The sustainable performance of Romanian agricultural holdings expressed in terms of sustainable value is presented in table no. 2.

Tabel no. 2. Sustainable value of agricultural holdings for Romania

| Farm size (in euro) | 2014 | 2015 | 2016 | 2017 |
|---------------------|----------|------------|----------|----------|
| (1) 2000-8000 | 1.234 | 666 | 1.063 | 646 |
| (2) 8000-25000 | 3.081 | 1.669 | 2.879 | 3.934 |
| (3) 25000-50000 | 2.136 | 1.952 | 5.383 | 7.997 |
| (4) 50000-100000 | -4.508 | -8.007 | -1.383 | 1.486 |
| (5) 100000-500000 | -97.063 | -123.419 | -137.844 | -93.759 |
| (6) >=500000 | -783.770 | -1.158.646 | -956.670 | -873.745 |

Source: author's view based on the data for FADN

Tabel no. 3 Cost Benefit Ratio of agricultural holdings for Romania

| Farm size (in euro) | 2014 | 2015 | 2016 | 2017 |
|------------------------|------|------|------|------|
| (1) 2000-8000 | 1.28 | 1.15 | 1.25 | 1.12 |
| (2) 8000-25000 | 1.23 | 1.14 | 1.22 | 1.28 |
| (3) 25000-50000 | 1.05 | 1.05 | 1.14 | 1.20 |
| (4) 50000-100000 | 0.95 | 0.91 | 0.98 | 1.02 |
| (5) 100000-500000 | 0.72 | 0.68 | 0.67 | 0.76 |
| (6) >=500000 | 0.62 | 0.55 | 0.63 | 0.65 |

Source: author's view based on the data for FADN

Analyzing the information for table no. 2, it can be noted that the Romanian agricultural holdings from the first three size classes (small and medium-sized farms) have positive values, respectively create sustainable value, while large and very large farms (> 50.000 euro) do not create sustainable value, recording negative values. The medium farms with an economic size ranging from 25.000-50.000 euro (size class 3) create the highest sustainable value, achieving the highest efficiency of used resources.

Also, in the first three years, there is a tendency to increase the sustainable value simultaneous with the increasing of the the holdings size up to an output of 50.000 euros, which highlight a direction of consolidation of small and medium agricultural holdings.

We also notice that large and very large holdings (4, 5 and 6 size classes) managed the resources in an inefficient way with lower incomes than the opportunity cost ($Rrc < 1$).

The analysis of the relative efficiency ratio (Rer) of the agricultural resources in Romania compared to the EU highlights a series of aspects regarding the factors that influence the value created in agriculture (table no.4).

Tabel no. 4. Efficiency of agricultural holdings in Romania compared to the EU in 2017

| Farm size (in euro) | Labour input | Utili sed agric ultur al area | Livest ock units | Mac hiner y | Stock of agricul tural produc ts | Fertilise rs | Ener gy | Seeds and plant s | Crop protec tion | Enviro nment al subsid ies |
|------------------------|-----------------|--|------------------------|-------------------|---|-----------------|------------|----------------------------|------------------------|--|
| (1) 2000-8000 | 0.92 | 0.47 | 0.79 | 1.85 | 2.57 | 1.31 | 1.05 | 0.98 | 1.21 | 68.63 |
| (2) 8000-25000 | 0.81 | 1.26 | 0.56 | 1.84 | 3.56 | 1.47 | 1.33 | 0.89 | 1.62 | 574.36 |
| (3) 25000-50000 | 0.59 | 1.04 | 1.64 | 0.58 | 0.27 | 0.86 | 0.66 | 1.39 | 0.84 | 0.00 |
| (4) 50000-100000 | 0.82 | 0.67 | 1.23 | 1.04 | 5.06 | 0.77 | 0.99 | 0.60 | 0.86 | 121.11 |
| (5) 100000-500000 | 0.65 | 0.39 | 3.60 | 0.68 | 5.46 | 0.53 | 0.66 | 0.47 | 0.68 | 58.41 |
| (6) >=500000 | 0.57 | 0.31 | 1.68 | 0.59 | 4.61 | 0.46 | 0.72 | 0.65 | 0.66 | 0.79 |

Source: author's view based on the data for FADN

The efficiency of the used resources in order to obtain the production/output, in the case of small and medium agricultural holdings (the first three size classes) is superior, compared to large and very large agricultural holdings (the last three size classes), which is highlighted by the level of the relative efficiency ratio (Rer).

It is noted that the efficient use of resources in small and medium farms positively influences the sustainable value while less efficient use of resource in large farm leads to losses in terms of sustainable value.

The comparison between small and medium-sized farms and large farms in terms of resource efficiency makes it clear that small and medium-sized farms have a better return on the use of the technical endowment, obtain a better use of resources such as fertilizers, energy, crop protection, seeds and plants.

Conclusions

The current national and international context, the global economic and social transformations, have led to a change and orientation towards a sustainable agriculture system that takes into account three important dimensions: economic, social and environmental dimension.

The performance is a widely discussed topic in the literature, with multiple connotations, its importance being underlined by the organizations need to cope with competition.

The assessment and measurement of organizations' performance must be seen in a global context due to the multitude of variables that act on it as well as the fact that achieving a certain level of performance involves the operation of micro and macro systems.

From our point of view, the sustainable development is a global concept involving the interaction of a variety of subsystems, the agricultural holdings being an essential actor that contributes to the sustainable development (through a three-dimensional approach- economic, social, environmental) alongside other external and internal factors.

The obtained results show that the size of the Romanian agricultural holdings significantly influences the sustainable performance measured by the sustainable value, thus examining the research hypothesis no. 1. Moreover, the results of the sustainable value indicators point out that in Romania during the analyzed period, only small and medium size farms are performing.

The results of the indicators highlight the fact that in Romania, the large agricultural holdings are not performing while the small and medium farms accomplish an efficient resource management, they get better results compared to large farms and therefore they are performing in the sustainable system. These aspects highlight the verification of the research hypothesis no. 2

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