CONSIDERATIONS REGARDING THE DEVELOPMENT OF A SPECIFIC SPECIMEN FOR THE ANALYSIS OF COSTS IN AGRICULTURE

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Abstract

The purpose of the research presented in this paper is to develop a specific sample model for the analysis of costs in agriculture which was done by: 1. Scientific documentation to determine the main criteria to determine the relevance of including farm size ranges in the sampling structure; 2. sensitivity analysis in order to measure the impact of each criterion on farm-specific economic performance; 3. Interviews with farmers from a representative sample for the evaluation of farms by size categories; 4. restructuring the size ranges. The field researches were carried out in the second half of 2020, on two development regions of Romania: NE and SE. The average general score obtained by the entire sample is 4.7, which resulted in a structure of agricultural farms in economic size consisting of V intervals with the following limits: 100,000 SO, 250,000 SO, 500,000 SO, 750,000 SO, 1,000,000 SO.

*Key words**: agricultural structures, cost analysis, sampling techniques, economic dimension*

INTRODUCTION

In Romania, agriculture plays an important socio-economic role. Most people with below average incomes in Romania live in rural areas and earn their living from agriculture or agriculture-related activities. People living in rural areas over the age of 16 are 5% more likely to be poor than those living in urban areas. Also, those who live in rural areas and work in agriculture are 27% prone to be poor [29].

An important problem of agriculture is the fragmentation of land which is significantly more correlated with the diversification of households. They use a higher proportion of agricultural production for self-consumption than for more market-oriented households. Therefore, it could be assumed that land fragmentation has led to a more diversified food basket for self-consumption among subsistence farmers, thus increasing their nutritional security [5].

While the number of farms decreases, the average farm size increased to 3.66 ha/farm in Romania and 16.1 ha EU-28. Approximately 0.57% of farms with more than 50 ha work 52.43% of the land used. The economic performance of Romanian agriculture is the lowest in the EU at a value of approx. 3.30 thousand euro/farm, 10.7 times lower than the EU average. About 83% of farms produced less than 4,000 euros/farm. The inequality of the concentration of farms in Romania is attested by the value of Gini 0.582, with a concentration index of 73%, which shows that the first 10% of farms manage a very large agricultural area, compared to farms belonging to other size classes. Romania occupies the following positions in the EU-28 ranking: 1 for farms (33.6%), 6 for the area used (7.47%), 26 for the size of the average farm (3.6 ha), 27 for the number of farms with more than 50 ha (0.57%), 20 for the area owned by farms with more than 50 ha (52.13%), 28 for production/standard farm (Euro 3.3 thousand), 6 for contribution to

standard production of the EU, 6 to the value of the Gini coefficient and the concentration index that included the country in the sharp double category. Thus, the structure of the farm and the concentration of land in Romania is oriented on a good trend, but the optimal size of the farm will be achieved in the long run. This could ensure greater economic efficiency [20].

The evolution of agricultural production systems worldwide is influenced by the globalization of international trade in the current stage of socio-economic development, which amplifies the structural interdependence for the economies of different regions. For this purpose, it is necessary to analyze the evolution of production structures in the plant and animal sector of agriculture [13].

In Romania, the existence of a great diversity of farms is highlighted, which no longer falls strictly within a regular, desirable and legally defined typology. This situation reflects the correlation between the area used, the financial opportunities of the production cycles, the technical endowment and the intensification of the agri-food market activity [4].

The evolution of productions is characterized by an accentuated dynamics. Maize and wheat production has increased 2.8 times in the last decade, representing 50% and 38.5% respectively in cereal production. Romania ranks 2nd in corn and 5th in wheat in EU production. The increase in production is mainly due to the large cultivated area, 4.7 million ha, for these two cereals which represent 85% of the cultivated area in Romania. But, with 4.1 tons of corn and 3.9 tons of wheat per ha, the yield is 42.39% and 26.22% lower than the EU average, respectively. Romania has exported 11 times more corn and 34 times more wheat in the last decade. It also imported less corn, but more wheat, mainly for re-export. The Export/ Production ratio increased from 0.32 for maize and 0.82 for wheat, and the Export/ Import ratio reached 7.78 for maize and 5.83 for wheat. The value of exports and imports also had a high growth rate, while imports declined, resulting in a positive balance, both

below the decrease in the export price and the increase in the import price [19].

Romania was highlighted as the main producer and exporter of sunflower in the EU (about 24% of the total area harvested and that about 25% of total production). The approach of the subject aimed at highlighting the differences between the 8 existing development regions at national level, in Romania. The price is characterized by a multiannual national average of 1.39 lei/kg, with limits of 0.99 lei/kg for the West Region in 2014 and 1.61 lei/kg for the South Muntenia Region in 2016. If we look at indicator in light of its evolution over time, we see the existence of fluctuating trends [18]. According to the National Institute of Statistics, for plant production in 2018, the largest shares were held by development regions: South-Muntenia 20.3%, South-East 19.1% and North-East 14.9%. Traditionally, the South-East Region is a predominantly agricultural sector. Conditions in the region favor the cultivation of maize (mainly in the north), wheat (mainly in the center of the region), spring barley, plants for industrial processing and sunflower. Yields per hectare for these crops are usually higher than national averages. Also, it has worked to improve the land in the "Lakes Braila" which resulted in 76,700 ha of land available for agricultural use in alluvial "Big Island of Braila" [15].

Agricultural exploitation there are general tendencies to assess the commercial aspect, but the social aspect of agricultural exploitation without a legal status, representative for small farm households, must also be recognized [3].

To improve the economic and environmental sustainability of agriculture, information is needed to support research, teaching, and information dissemination programs [27]. However, conducting field research in general, and in particular with agricultural producers, is becoming increasingly difficult, given issues such as declining response rates and limited resources. While there are studies examining best practices for promoting higher response rates, few explicitly focus on agricultural producers [22]. Providing

incentives such as providing free use of databases for farmers' use can increase response rates to agricultural producers [2].

Following the review of the literature, it found that researchers show a growing interest in western EU cooperation in agriculture and alternatives to implement it in other areas [14] [22].

Farmers also need information on land preparation, soil fertility management, new varieties and hybrids, crop protection, harvesting techniques, pest and disease control, fertilization, crop rotation techniques, labor consumption, agrochemicals, irrigation management, application of pesticides. Farmers rely heavily on their previous experience and interpersonal relationships, such as colleagues/friends, progressive farmers, for agricultural information. Lack of timely access, inaccessibility, lack of awareness, rare visits by staff from information institutions, low level of education and language barriers are primary obstacles in acquiring information [16].

Research has shown that interaction and exchange of knowledge from multiple sources, especially from the actors in the production value chain, promoting the adoption of new technologies and best practices, thereby improving productivity and farmers' income [21].

Recent technology adoption literature has established the role of innovation as an interactive process, involving individuals and organizations with different types of knowledge in a particular social and institutional context [11]. Consequently, farmers' participation in expansion programs and technology adoption efforts has been described as a "co-creation of innovation [28]. firm, in terms of product, processes and practice, is now a key aspect of overall development [25].

Knowledge also provides tools for increasing performance based on the analysis of tax information [30]. The size and structure of expenditures differ depending on the type of production, the system practiced, the technologies used, etc., but regardless of the situation, the main problem to be pursued remains the optimization of the structure of expenditures so that their level determines maximum effect on production [31].

Table 1. Agricultural structures approved by the EU

Clase	SO (euro)	Agricultural area (ha)	The economic dimension (SO in 2019)
I	< 2 000	2.1	1,284
II	>=2 000 și<4 000	4.2	2,930
III	>=4 000 și<8 000	11	5,248
IV	>=8 000 și<15 000	16	11,983
V	>=15 000 și<25 000	22	18,244
VI	>=25 000 și<50 000	57	34,950
VII	>=50 000 și<100 000	121	74,087
VIII	>=100 000 și<250 000	231	167,433
IX	>=250 000 și<500 000	781	378,172
X	>= 500 000 și<750 000	970	590,747
XI	>=750 000 și<1 000 000	1,397	823,325
XII	>=1 000 000 și<1 500 000	1,434	1,225,248
XIII	>=1 500 000 și<3 000 000	2,704	1,922,952
XIV	>=3 000 000	5,132	4,584,656

Source: The regulation l (CE) Nr. 1242/2008 [8].

Quantitative research aimed at carrying out cost analysis in the plant sector of national agriculture requires the use of coherent sampling procedures. The models of sampling structures proposed by the international literature and EU bodies (Table 1) are unsuitable for in-depth research into cost analysis. This phenomenon is due to the deficient information system in small and medium-sized farms, on the one hand, and the fragmentation of economic entities or the integration of processing and animal husbandry sectors in large farms, on the other hand [32].

MATERIALS AND METHODS

The purpose of the research presented in this paper is to develop a specific sample model for the analysis of costs in agriculture. The objectives of the paper are:

(1)Determining the main criteria to determine the relevance of including the size ranges of farms in the sampling structure;

(2)Analysis of the impact of each criterion on the economic performance specific to farms;

(3)Evaluation of farms by size categories;

(4)Restructuring the size ranges. They also represented the research stages presented in this article.

The field researches were carried out in the second half of 2020, on two development regions of Romania, NE and SE, which include 12 counties and are located from the northern end to the southern end of Romania.

1. The determination of the main criteria to determine the relevance of including the size

ranges of farms in the sampling structure consisted in documenting from the literature on the main issues related to the collection of information for economic research in agriculture.

2. The analysis of the impact of each criterion on the economic performance specific to farms was performed through the sensitivity analysis that highlighted the variability of gross profit depending on the variations determined by the total, partial or non-fulfillment of each criterion.

This analysis also allowed the determination of the threshold from which the overall score of the size category is considered relevant for the cost analysis.

3. The evaluation of farms by size categories was conducted in interviews with 124 farmers in the NE and SE development regions of Romania in the fourth quarter of 2020. The criterion "% of marketed production" was determined on the basis of the share of marketed production (with values from 0 to 1) and the other criteria were given the value "1" for fulfilling the criterion and "0" for not fulfilling it.

4. Restructuring of the size ranges was to be performed only if the overall score obtained by one or more size ranges was lower than the threshold set for the sensitivity analysis.

The entire field research was conducted by face-to-face interview and by telephone in the last half of 2020 on a representative sample. Sampling was performed by the Neyman method, a deviation criterion of 5% and a confidence level of 95%. Computer applications such as MS Excel, SPSS (Kolmogorov – Smirnov test, t-test) were used for data processing.

RESULTS AND DISCUSSIONS

The first stage of the research was to determine the main criteria by which to determine the relevance of including the size ranges of farms in the sampling structure. This consisted of documenting from the literature on the main issues related to the collection of information for economic research in agriculture. Among them were highlighted aspects related to the accounting, technical and management information recording system. These allowed the determination of criteria according to which to evaluate the vegetal farms by size categories. Meeting these criteria establishes that the farms surveyed can provide sufficient and consistent information on cost formation.

Table 2. Determination of the weight of evaluation criteria based on the variability analysis indicated sensitivity (5%)

No.	Evaluation criteria	gross profit variability (%)	variability in total criteria (%)	The importance of the criterion of coefficient
2	accounting records	4.41	8.88	0.89
3	technological records	3.78	7.61	0.76
4	economic records	3.41	6.85	0.69
5	highlighting implicit expenses	5.17	10.41	1.04
6	highlighting the costs of supply	3.72	7.49	0.75
7	highlighting marketing expenses	4.48	9.01	0.90
8	highlighting works and maintenance expenditures	5.23	10.53	1.05
9	% of marketed production	4.86	9.78	0.98
10	main objective - economic performance	4.92	9.90	0.99
11	shareholding company exclusively researched	9.71	19.54	1.95
	Total	49.69	100.00	10.00

Source: Own calculation.

Farms that belong to certain size categories and do not sufficiently meet these criteria will be grouped with the others. Basically, some size ranges will be cumulated because representativeness cannot be obtained for them.

The scientific documentation revealed 12 criteria, those presented in Table 2 of which a criterion regarding the highlighting of capital expenditures. This criterion was abandoned because capital expenditures are evident in the accounting records - criterion 2. There were

11 criteria (Table 3) that directly concern the accuracy of the information needed for cost analysis.

The second stage, the analysis of the impact of each criterion on the economic performance specific to the farms was performed through the sensitivity analysis. It highlighted the variability of gross profit depending on the changes determined by the total, partial or non-fulfillment of each criterion.

The sensitivity analysis applied to a 5% input data variability indicated a total change in gross profit of 57.33%. It was weighted as variability from the total criteria and resulted in a set of coefficients of importance of the criteria from 0.59 for the criterion "economic records" to 1.69 for the criterion "shareholding exclusively in the researched company".

Table 3. Main criteria for including farm size ranges in the sampling structure

No.	Evaluation criteria	Source
1	agriculture - main activity	[12; 26]
2	accounting records	[10; 17]
3	technological records	[7]
4	economic records	[23]
5	highlighting implicit expenses	[1]
6	highlighting the costs of supply	[9]
7	highlighting marketing expenses	[10]
8	highlighting works and maintenance expenditures	[6]
9	% of marketed production	[24]
10	main objective - economic performance	[12]
11	shareholding company exclusively researched	[1; 9]

Source: Own calculation.

This analysis also allowed the determination of the threshold of the general score from which the size category is considered relevant for the cost analysis at a value of 5.00 points. This value is determined by the correlation between the mean variability per criterion (5.21%) and the 95% confidence level after which the Neyman sampling method was applied. The third stage, the evaluation of the farms by size categories was performed based on the information taken from the interview on a representative sample. The evaluation of the farms according to the criterion "agriculture - main activity" (Fig. 1) indicates that in 33.6% of the surveyed farms agriculture represents the basic activity of the household or economic unit. Only 2.7% of

farms with a size between 2,000 and 50,000 SO and 22.7% of farms with an economic size of more than 75,000 SO do agriculture as their main activity. The first category is represented by peasant households or small farms that have several activities, including agriculture. They use agricultural products obtained for the family's own needs or to supplement the income obtained from other fields of activity. The second category, medium and large farms, usually have legal status but have a diversified production structure that includes animal husbandry, seed production, its conditioning, trade or other services. The accounting records are specific to farms with legal status and are regulated by the legislation in force. These are usually medium and large entities, over 100,000 SO.
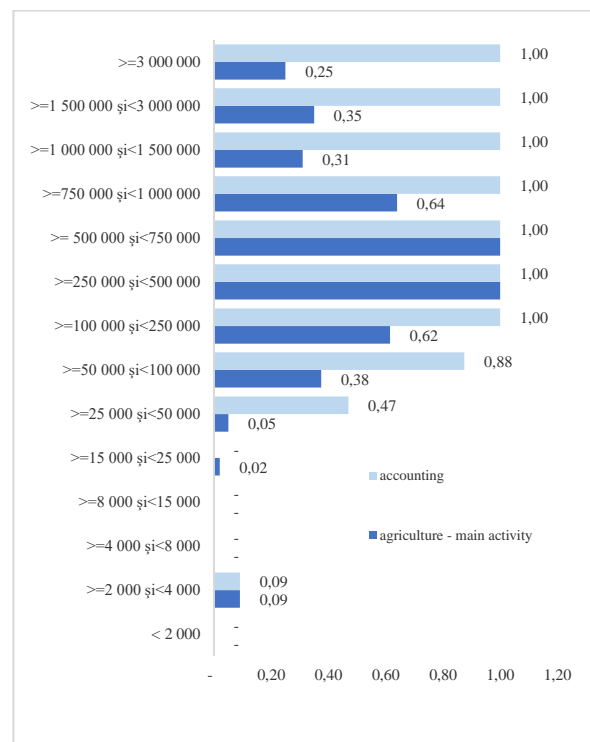

Fig. 1. Evaluation of farms according to the criteria "accounting" and "agriculture - main activity"
Source: Own calculation.

The criterion "economic records" (Fig. 2) is met by 44.7% of the surveyed farms. Farms with a size of less than 50,000 SO in a proportion of 95.3% do not make economic records. Those with an economic size of over 75,000 SO make these records only in proportion of 16.7% because the complexity of the activity requires a large volume of work and economic skills to achieve this

information system. Technological recordings are more often made, in a proportion of approx. 57.3% and are achieved mainly through technology sheets and crop budgets. The economic data contained in them are often strictly indicative but the technical ones rigorously specify the period of completion of the works, the surfaces, the physical need for inputs and other important information.

The evaluation of the farms according to the criterion "highlighting the supply costs" (Fig. 3) indicates that 58.7% of the surveyed farms determine the supply costs.
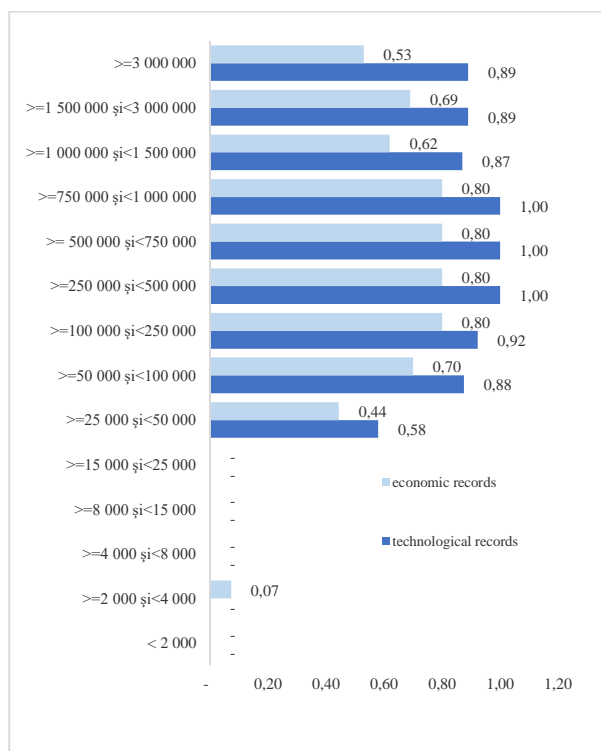
Fig. 2. Evaluation of farms according to the criteria "economic records" and "technological records"Source: Own calculation.

Some of them have a system of accounting records and can make these calculations or others record these expenses in the production activity although they do not have accounting records. Only 1.5% of farms with a size of less than 25,000 SO highlight supply costs. A percentage of 61.3% of farms with an economic size of over 75,000 SO, higher than the average value of the sample but 13.4% lower than farms with sizes between 50,000 SO and 1,000,000 SO. Determining the implicit costs requires knowing the tariffs for agricultural services available in the area to which each farm has access. The best alternative that has been abandoned by carrying out various self-directed activities changes from one year to another. Thus, farms must create a dynamic database comprising suppliers in their area and adapt this database at least annually. Only 7.9% of the researched farms make these databases, most of them in the size range 500,000 SO - 750,000 SO (30.8%).
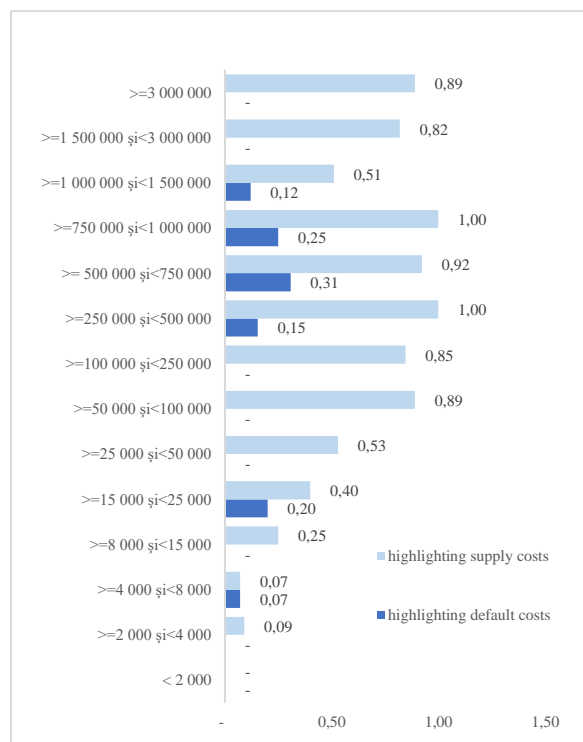

Fig. 3. Evaluation of farms according to the criteria "highlighting supply costs" and "highlighting default costs"
Source: Own calculation.

Highlighting the costs of servicing the works (Fig. 4) is done in 59.0% of the farms surveyed with the lowest value (9.0%) in the case of farms below 25,000 SO. The evaluation of the farms according to the criterion "highlighting the marketing expenses" shows that 63.3% of them have information about the marketing expenses and the rest do not consider them necessary or priority.

Economic performance is not a priority for 65.2% of farms (Fig. 5) because small farms produce for their own consumption most of the time and many medium and large farms are concerned with increasing agricultural area, increasing the level of capitalization,

increase the volume of activity or simply do not have sufficient economic skills.
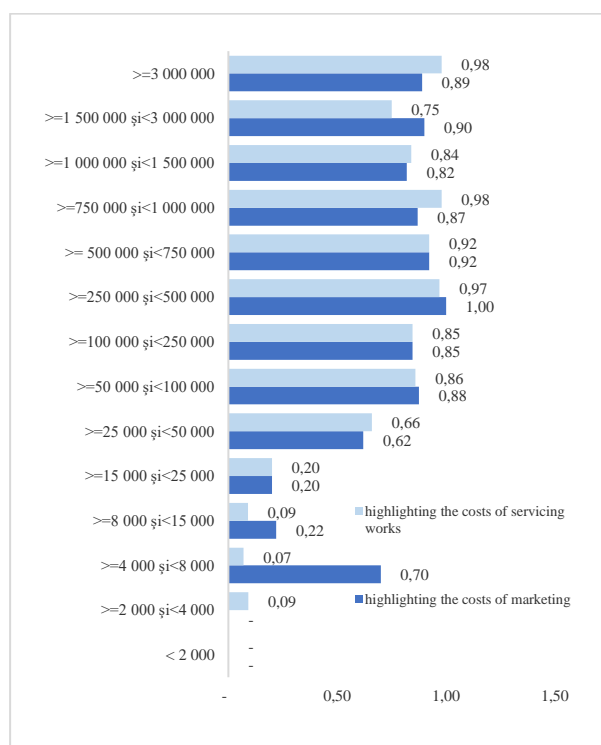

Fig. 4. Evaluation of farms according to the criteria "highlighting the costs of servicing works" and "highlighting the costs of marketing"
Source: Own calculation

The criterion "% of marketed production" shows that 55.9% of the sample production is marketed, agricultural products from small farms below 50,000 SO are used in a proportion of approx. 86.0% for self-consumption. And farms larger than 1,000,000 SO sell only part of the production (59.7%) because the rest is used as input for other activities such as animal husbandry or product processing.

The evaluation of the farms according to the criterion "shareholding exclusively in the researched company" (Fig. 6) indicates that 58.3% of the researched farms have owners who do not own other economic activities. The first ten categories with dimensions of up to 75,000 SO have only this activity in a majority proportion of 74.2%.

The other higher categories in size are owned by people with superior entrepreneurial skills who seek to maximize the efficiency of investments.

As the minimum threshold required to include a size range is 5.00, it is necessary to reshape

the size structure of agricultural holdings needed to determine costs.

The last stage involved the cumulation of size ranges with values below the threshold of 5.00 at neighboring ranges to ensure their relevance in cost analysis.
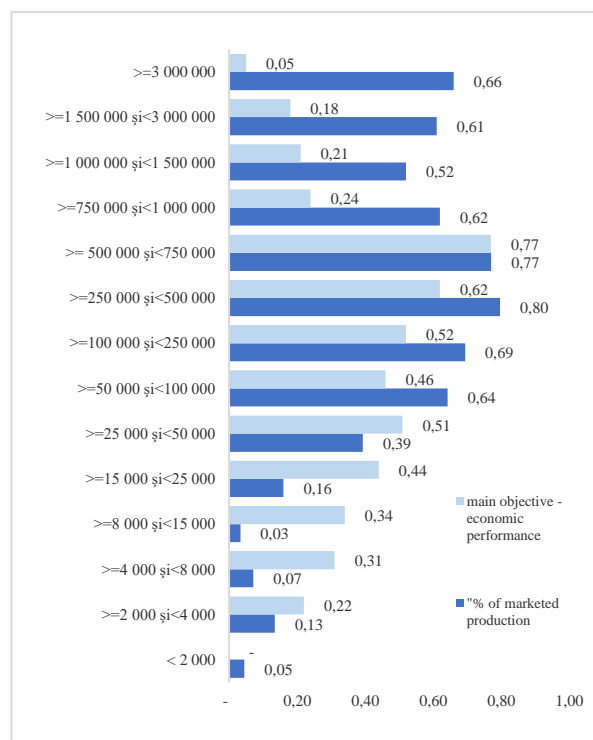

Fig. 5. Evaluation of farms according to the criteria "main objective - economic performance" and "% of marketed production"
Source: Own calculation.

Thus, intervals I-IV were cumulated with interval VI because it obtained a score of 6.39 and intervals XII-XIV were cumulated with interval XI because the latter obtained a score of 6.17.

Consequently, the result was a structure of agricultural farms with an economic size consisting of V intervals: interval I with a size of less than 100,000 SO; interval II with a size between 100,000 SO and 250,000 SO; interval III with a size between 250,000 SO and 500,000 SO; interval IV with a size between 500,000 SO and 750,000 SO and interval V with a size greater than 1,000,000 SO.
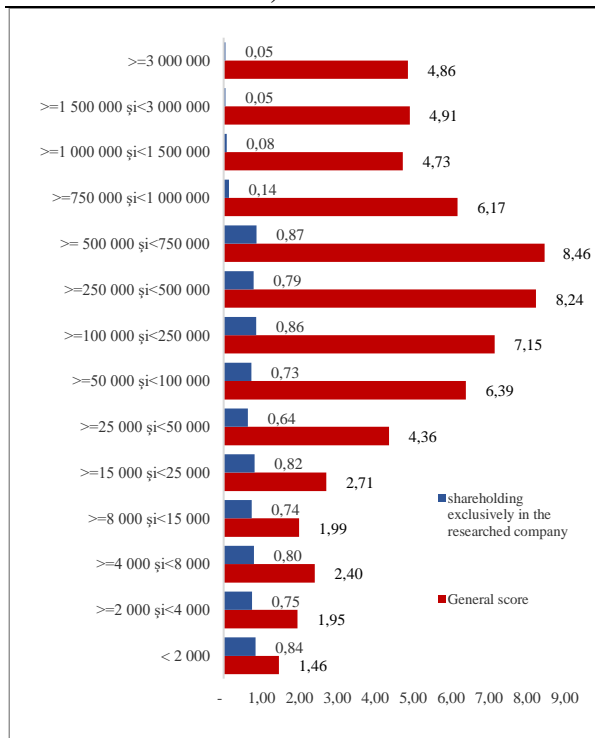
Fig. 6. Evaluation of farms according to the criteria "shareholding exclusively in the researched company" and "General score"
Source: Own calculation.

CONCLUSIONS

After the evaluation of the farms in the sample, it was determined that 33.6% of them have agriculture as their main objective.

Small and medium farms have more activities in addition to agriculture, use agricultural products for the family's own needs or sell them to supplement the income obtained from other areas of activity.

Large farms have a diversified or integrated production structure. The accounting records are specific to farms with legal status and the economic records are made by approx. 44.7% of farms.

Technological records are found at approx. 57.3% of farms instead the opportunity costs can be determined at 7.9% of them.

Expenses for servicing the works are registered in 59.0% of the cases and those for marketing in 63.3% of them. Economic performance is a priority for 34.8% of farms because small farms produce for their own consumption and medium and large farms are concerned with increasing agricultural area, increasing the level of capitalization, etc.

The percentage of marketed production at the level of the sample is 55.9%, the rest being intended for self-consumption or used as raw materials for integrated activities.

Approx. 58.3% of farms owned exclusively in the unit because the other higher categories in size are owned by people with superior entrepreneurial skills who seek to maximize investment efficiency. The average general score obtained by the entire sample is 4.7, which resulted in a structure of agricultural farms in economic size consisting of V intervals with the following limits: 100,000 SO, 250,000 SO, 500,000 SO, 750,000 SO, 1,000,000 SO. Such a structure provides a sufficient information system for cost analysis in agriculture.

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