COST ANALYSIS ON FARMS - LIMITS AND DETERMINANTS

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Abstract

Cost analysis is a basic premise for good financial management of every company. The aim of the research is to determine the costs in vegetable farms. In today's globalized world, production costs play a key role in every company. They define the company's potential, determine its possible limits and its activity. The research was conducted by questionnaire survey administered to a representative sample by economic size categories. The sample used in the field survey was representative of five economic size categories, 60 farms operating in the NE and SE development regions, 30 from each region and 5 from each county. The 5 farms in each county were identified according to economic size (below 100 thousand SO; 100 - 250 thousand SO; 250 - 500 thousand SO; 500 - 750 thousand SO; above 750 thousand SO). The cost analysis determined labor costs at a sample average of 529.1 lei/ha, input costs at a sample average of 1,003.74 lei/ha, depreciation costs at a sample average of 231.03 lei/ha and finance costs at a sample average of 172.74 lei/ha and other costs at an average of 315.12 lei/ha. These results can provide useful benchmarks for optimizing the production process and increasing the competitiveness of agriculture in the context of a multitude of environmental, geopolitical and economic challenges.

Key words: costs, agriculture, farm management, economic optimum

Monitoring and analyzing costs are basic prerequisites for good financial management of every company. An international comparison for the EU was made in 2004-2017 and was based on the Farm Accountancy Data Network (FADN). In terms of cost structure, specific costs amount to about 42%; overheads amount to 26%; depreciation amounts to 15%; wages are 10%; rent amounts to 5% and interest is 2% (Svoboda J. *et al*, 2020).

Another important cost-related concept is target cost, which is a cost management system for developing products whose profitability is considered sufficient to justify their production. The strategy behind target costing is that 80-85% of a product's life cycle cost is determined during the development phase (Kee R., 2010, 2013).

Romania occupies the following positions in the EU-28 ranking: 1 for number of farms (33.6%), 6 for area used (7.5%), 26 for average farm size (3.6 ha), 27 for number of farms with more than 50 ha (0.57%), 20 for area owned by farms with more than 50 ha (52.13%), 28 for production/standard farm (euro 3.3 thousand). Thus, the farm structure and land concentration in Romania is on a good trend, but the optimal farm size will be reached in the long term. This could ensure higher economic efficiency (Popescu A. *et al*, 2016).

According to the National Institute of Statistics, for crop production in 2018, the highest shares were held by the development regions: South-Muntenia 20.3%, South-East 19.1% and North-East 14.9%. By tradition, 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 sunflowers. Yields per hectare for these crops are typically higher than national averages (Marcu N. *et al*, 2016; NSI, 2018).

The aim of the research is to determine costs on crop farms. In today's globalized world, production costs play a key role in every company. They define the potential of the enterprise, determine its possible limits and activity. A company that wants to achieve its main goal must manage its costs (Vochozka, M., 2017).

A study conducted on Polish agriculture pointed out that in order to get the benefits of larger enterprises, farmers were required to change their entire production schedule. Thus, the role of adjustment costs and dynamic cost structure should be increasingly emphasized in research on agricultural performance (Rungsuriyawiboon S., Hockmann H., 2015).

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MATERIAL AND METHOD

The sample used in the field survey was representative of five economic size categories, 60 farms operating in the NE and SE development regions, 30 from each region and 5 from each county. The 5 farms in each county were identified according to economic size (below 100 thousand SO; 100 - 250 thousand SO; 250 - 500 thousand SO; 500 - 750 thousand SO; above 750 thousand SO).

The stages of conducting the research presented in this article were: establishing and delimiting the topic; formulating the objectives; establishing the instruments, auxiliary techniques; determining the research area; pre-analysis; operational documentation; establishing the structure of the research results; constructing the sample; drafting the questionnaire; pre-testing and finalizing the questionnaire; administering the questionnaire: validating the questionnaire responses; data analysis, processing and interpretation.

The research topic is represented by the general objective of the project "Constitution and implementation of partnerships for knowledge transfer between the Research Institute for Agriculture and Environment Iasi and the agricultural economic environment", ID / My SMIS Code: P_40_385_CF_POC123G_2018/ 119611, Contract No: 4/AXA1/1.2.3G/05.06.2018. SMIS Code, Subsidiary contract for industrial research and/or experimental development in effective collaboration between research organization and enterprise. Sub-Activity 2 - Research on cost analysis on crop farms and how it influences farmers' decisions. Thus, we delimit the topic to research on cost analysis on crop farms and how it influences farmers' decisions.

In setting the objectives, the objectives of the research contract were 1 cost analysis on vegetable farms and 2 how costs influence farmers' decisions.

The human resources needed to carry out the activities involved in the above objectives were represented by 16 specialist researchers and research assistants who were grouped into 6 teams - 4 from Iasi University of Life Sciences and 2 from YXS Avalana LTD;

The research area was represented by the North-East and South-East development regions of Romania and the research population consisted of agricultural holdings in the crop sector with production structure predominantly oriented towards large-scale farming. North-East is a development region of Romania and includes the following counties: Bacău, Botoșani, Iași, Neamț, Suceava and Vaslui. The South-East development region comprises the counties of Braila, Buzau, Constanta, Galati, Tulcea and Vrancea.

The pre-analysis for the questionnaire was carried out with some farmers in the researched area in the form of a non-structured interview and led to the identification of the following elements: real costs on farms; costs per hectare, depending on the technology applied; costs per product; hidden costs on vegetable farms; structure of direct accounts and indirect costs in a modern farm and how they influence profit; impact of the digitization of technological flows on the economic efficiency of vegetable agricultural production; usefulness of a cost accounting application on vegetable farms.

Operational documentation referred to the collection of information on the topic, population, bibliographic documentation, knowledge of the results of other surveys on the same topic and in the same research universe (Kallio H. *et al*, 2016).

The construction of the sample was based on the stages of developing the questions in the questionnaire were: setting the content of the questions; choosing the type of questions; drafting the questions; determining the sequence of the questions.

Pre-testing the questionnaire for the size of the population under investigation - two development regions of Romania - is a long process and requires a significant consumption of human resources because it involves matching its content and form to the specific characteristics of the subjects - the farms in the territory. This stage was carried out in parallel with the stage of elaboration of the questionnaire because the researchers provide information about the content of the questions, the way of completing the answers and possible particularities of the farms. The implementation team carried out fieldwork at economic units in the area under study and obtained information on the relevance, clarity, functionality and accuracy of the questionnaire.

The results of the pre-testing consisted of comments on the content of the questionnaire form and the way it was completed. It was observed that there was a need to make predefined entries with the possibility of entering information other than the predefined ones, activities were correlated with crops and some machinery and inputs. It was proposed to link the crops with their specific works in order to avoid recording errors. New forms of recording values for the working capacity of machinery and human resources were also proposed.

The questionnaire was drafted digitally in Microsoft Excel Office application as a partially coded file to ensure homogeneity of data structure and integrity of content.

The finalization of the questionnaire was based on pretesting and involved obtaining the final form of the questionnaire which was used in the questionnaire administration phase. The final questionnaire is an Excel application called " Questionnaire AGRIECOTEC SC XXX SRL" with 11 sections: C1, C2, CAEN, SO, DAGREG, Depreciation, Financial Ch, Other expenses, Prices, Productions, Final questions.

Section "C1" aimed to provide the main information on the stage of development of the researched unit and its main peculiarities. It

includes: data on the economic operator / farmer, calculation of the economic size unit and information on human resources.

Section "C2" provides the information needed to establish direct costs and includes: Crop category, Agricultural work, Crop, U.M., Area / Quantity, Period (month), Machine (type), Make / Model, Aggregate (type), Make / Model, Diesel consumption (ltr/U.M.), Productivity (U.M./day), Input products, Type, Input consumption (U.M./ha), U.M., Input price (lei/UM), , R.U. used, Hourly rate lei/ha, Third party services rate (lei/UM), R.U. hours/total work, Rate in agreement (variable), Remarks.

The "CAEN" section was intended to provide default values for the activity field code and includes: activity name, CAEN code on one side and organization type.

The "SO" section aimed to provide predefined alternatives for calculating the economic dimension of II. Economic size unit calculation from section C1 where the selections made are correlated with the economic size coefficients for each crop type and summed up as an economic size indicator for the farm.

The section "DAGREG" has been designed to provide predefined values on crop, agricultural work, period, farm equipment, type/model, aggregate, input products, input human resources, human resources used, MU.

The "Depreciation" section allows obtaining information for determining indirect costs and includes: Name of fixed asset, depreciation expenses (RON/year), explanations for researchers.

The section "Financial Ch aimed at determining indirect costs as part of total costs. It includes: category, financial expenses (lei) and explanations for researchers with indicators: interest expenses and other financial expenses (commissions, penalties, etc.).

The 'Other expenditure' section aims to determine indirect expenditure as part of total expenditure. It includes: type of expenditure, amount and explanations for researchers. Indicators include: expenditure on supplies (lei/year), expenditure on repairs and maintenance (lei/year), rent (lei/ha), expenditure on services from third parties (lei/year) and expenditure on training and professional development (lei/year).

The "Prices" section made it possible to determine the value of production and therefore forms the basis for determining the main indicators of the holding's results. It includes the categories: product, for conventional product (lei/kg), for organic product (lei/kg), price for production sold from the field, price for production sold after storage and explanations for researchers.

The "Production" section was designed to determine the value of production and therefore forms the basis for determining the main indicators of the holding's results. It includes: product, production for conventional product (t/ha), for organic product (t/ha), for production sold from the field, for production sold after storage and explanations for researchers.

The section "Final questions" participated in determining the following elements: share of production sold from the field (value/%), production storage capacity, production conditioning capacity, losses due to foreign bodies, splitting, humidity, quantity of organic products sold at conventional product price, suitability of digital application for farm management and organizational dysfunctions.

The administration of the questionnaire or actual data collection was done by teams of researchers, each of which was assigned two counties with five farms in each county. They contacted the farmers and included them in the sample in the previous stage and at the beginning of this stage proceeded to complete the questionnaires. The necessary information was requested from the person directly involved in agricultural production such as the agronomist, farm manager or owner, when he/she fulfils all the other roles specified above - especially on small farms (Van Knippenberg D., 2023).

In order to identify the main elements that characterize the researched phenomenon, a preliminary analysis of the data was carried out using the TwoStep Cluster Analysis procedure which is an exploratory tool designed to reveal natural groupings (or clusters) in a dataset that would otherwise not be evident. The algorithm used by this procedure has several desirable features that differentiate it from traditional clustering techniques: the ability to create clusters based on both categorical and continuous variables. Automatic selection of the number of clusters. Ability to efficiently analyze large data files. Clustering principles To handle categorical and continuous variables, the two-step cluster analysis procedure uses a probability distance measure that assumes the variables in the cluster model are independent. In addition, each continuous variable is assumed to have a normal (Gaussian) distribution and each categorical variable is assumed to have a multinomial distribution. Empirical internal tests indicate that the procedure is quite robust to violations of both the independence and distributional assumptions, but you should try to be aware of how well these assumptions are met.

RESULTS AND DISCUSSIONS

Labor costs are represented by employees' wages plus payroll contributions. The categories of employees that were taken in the research were: manager, accountant, engineer, supply manager, storekeeper, maintenance and repair mechanic, skilled worker, unskilled worker, driver, machinist, foreman, apprentice, laborer and security guard. Calculations are based on the number of people employed, the rate (lei/month), the net income and the number of hours worked/day. Wage costs by

crop were: maize 61.0 lei/ha, sunflower 53.0 lei/ha, wheat 81.0 lei/ha, rapeseed 59.0 lei/ha, soya 52.0 lei/ha.

Within the sample surveyed labor costs ranged from a minimum of 468.8 lei/ha on farms with an economic size of less than 100,000 SO in the SE region to a maximum of 594.4 lei/ha on farms between 500,000 SO and 750,000 SO in the SE development region. The average value of the sample was 529.1 lei/ha (*Figure 1.a*).

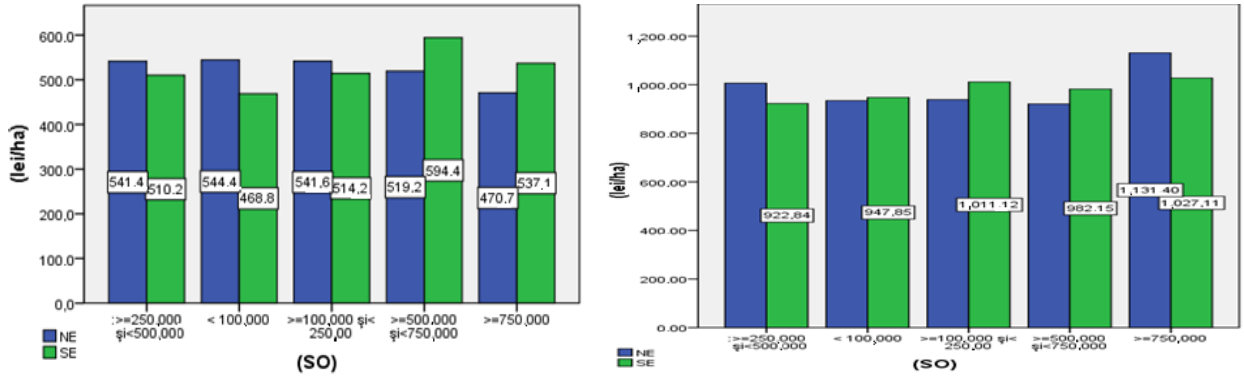

Figure 1 **Average labour cost (a) Average input cost (b) (lei/ha)**

An important problem in Romanian agriculture is the profile of farmers, the vast majority of whom use a larger share of agricultural production for their own consumption than for the market. (Ciaiana P. et al. 2018) However, over time the number of farms has decreased and the average farm size has increased to 3.66 ha/farm in Romania, a much lower value compared to 16.1 ha EU-28. About 0.57% of farms with more than 50 ha work 52.4% of the land used. On the other hand, the economic performance of Romanian agriculture is the lowest in the EU at ca. 3.30 thousand euro / farm, 10.7 times lower than the EU average. The unequal concentration of farms in Romania is attested by the Gini value 0.582, with a concentration index of 73.3%, which shows that the top 10% farms manage a very large agricultural area, compared to farms belonging to the other size classes (Popescu A. et al, 2016).

Input costs were analyzed for each crop according to the following components: liquid fertilizer, mineral fertilizer, organic fertilizer, insecticide, insect-fungicide, diesel, nematicide, pesticide, seed, baling twine, seed treatment, adjuvant, amendments, herbicide, fungicide. Input costs in the sample surveyed ranged from a minimum of 922.84 lei/ha on farms with an economic size between 250,000 SO and 500,000 SO in the SE region to a maximum of 1,131.40 lei/ha on farms larger than 750,000 SO in the NE development region. The average value of the sample was 1,003.74 lei/ha (Figure 1.b). Diesel costs by crop were: maize 462.8 lei/ha, sunflower 530.4 lei/ha, wheat 520.0 lei/ha, rapeseed 504.4 lei/ha, soybean 494.0 lei/ha.

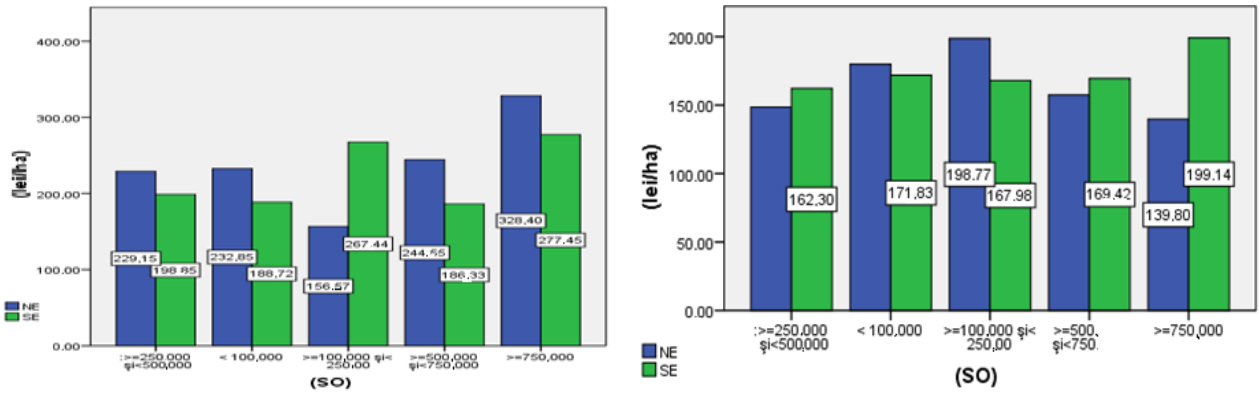

Figure 2 **Average cost with depreciation (a) Average financial cost (b) (lei/ha)**

Depreciation costs were requested from farmers by categories of machinery that were part of the agricultural production process. The amount of these costs was related to the specific cultivated area for each crop. This gave the capital input per ha. Within the sample surveyed these ranged from a minimum of 156.57 lei/ha on farms with an economic size between 100,000 and 250,000 SO in the NE region to a maximum of 328.40 lei/ha on farms larger than 750,000 SO in the NE

development region. The average value of the sample was 231.03 lei/ha (Fi*gure 2.a*). For the main crops the depreciation costs were: maize 225.4 lei/ha, sunflower 225.5 lei/ha, wheat 230.5 lei/ha, rapeseed 224.0 lei/ha, soybean 227.3 lei/ha.

The evolution of agricultural production systems worldwide is influenced by the globalization of international trade in the current socio-economic stage of development, which amplifies structural interdependence for economies in different regions. To this end, it is necessary to analyze the evolution of production structures in the plant and animal sector of agriculture (Medelete, DM., Panzaru, RL., 2015). In Romania, the existence of a great diversity of holdings that no longer fit strictly into a regular, desirable and legally defined typology is evident. This situation reflects the correlation between the area used, the financial opportunities of the production cycles, the technical equipment and the intensification of the agri-food market activity, (Brumă, I.S., Bohatereț, V.M., 2016).

Financial costs were represented by interest costs, commissions, penalties, etc. These are specific to the farm as a whole, but to determine the financial cost per ha, the total value of these costs was related to the area cultivated regardless of the production structure. This decision was taken because no credits were identified for the operational activity and no specific financial costs per crop were delimited. These ranged from a minimum of 139.80 lei/ha on farms larger than 750,000 SO in the NE region to a maximum of 199.14 lei/ha on farms larger than 750,000 SO in the SE development region. The average value of the sample was 172.74 lei/ha (*Figure 2.b*). Reported by main crops, these expenditures were: maize 41.7 lei/ha, sunflower 44.7 lei/ha, wheat 45.9 lei/ha, rapeseed 43.6 lei/ha, soybean 42.9 lei/ha.

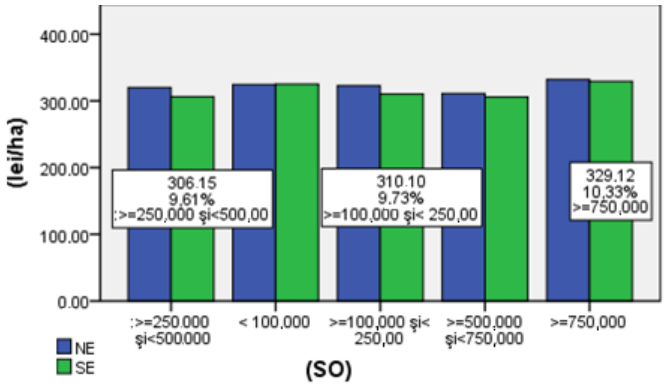

Figure 3 **Average cost with other consumptions (lei/ha)**

The other categories of expenditure were grouped under other consumption and represented supply costs (RON/year), repair and maintenance costs (RON/year), lease costs (RON/ha), third party service costs (RON/year), training and professional development costs (RON/year). Third party service costs per crop were: maize 930 lei/ha, sunflower 1,155 lei/ha, wheat 1,250 lei/ha, rape 1010 lei/ha, soya 1,005 lei/ha. These values are all the more important as Romania has emerged as the main producer and exporter of sunflower in the EU (about 24% of the total area harvested and about 25% of total production). For farming there is a general tendency to evaluate the commercial aspect, but the social aspect of farming without a legal status, representative of small farm households, should also be recognized. (Bohatereț, V.M., Brumă, I.S., 2015)

The surveyed farms had such costs with variations ranging from a minimum of 306.15 lei/ha for farms with an economic size between 250,000 SO and 500,000 SO in the SE and NE regions to a maximum of 329.12 lei/ha for farms larger than 750,000 SO in the SE development region. The average value of the sample was 315.12 lei/ha (Figure 3). Average direct costs per crop were: maize 875.4 lei/ha, sunflower 938.0 lei/ha, wheat 963.8 lei/ha, rapeseed 914.8 lei/ha, soybean 901.4 lei/ha.

CONCLUSIONS

The cost analysis for farms by economic size categories in the Ne and SE development regions determined labor costs within the sample surveyed with a sample average value of 529.1 lei/ha, input costs with an average of 1,003.74 lei/ha.

Depreciation costs varied from a 156.57 lei/ha for farms with an economic size between 100,000 and 250,000 SO in the NE region to a maximum of 328.40 lei/ha for farms larger than 750,000 SO in the NE development region. The average value of the sample was 231.03 lei/ha.

Financial costs had an average sample value of 172.74 lei/ha

The other cost categories were grouped under other costs and represented supply costs, repair and maintenance costs, lease costs. The surveyed farms had such costs with variations ranging from a minimum of 306.15 lei/ha for farms with an economic size between 250,000 SO and 500,000 SO in the SE and NE regions to a maximum of 329.12 lei/ha for farms larger than 750,000 SO in the SE development region. The average value of the sample was 315.12 lei/ha.

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