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COORDINATES OF EFFICIENCY / INEFFICIENCY IN RAISING SHEEP

CHETROIU RODICA¹, IURCHEVICI LIDIA²

Abstract: *The paper highlights coordinates and aspects of the sheep breeding sector, which can lead to the creation of the framework of efficiency or inefficiency of production activities. The sheep sector is very diverse in terms of farm size, breeds and scale of production. Low average incomes, which limit investment in the sector and are not attractive to potential younger entrants, low modernization thresholds, infrastructure weaknesses, lack of training or a product marketing strategy are challenges for the sector. On the other hand, local market opportunities may arise from rural tourism, such as direct sale of products to those who value traditional quality products. Positive aspects can also arise from the sector's capacity to provide environment advantages: as the animals from this sector are grown mainly in extensive systems, they play a key role in landscapes and biodiversity conservation. The positive annual average rates of the last 10 years in Romania regarding the increase of sheep (+ 2.4%) and the increase of sheep meat production (+ 1.91%) indicate an upward trend of activities towards the production of sheep meat, in parallel with a slightly downward slope (-0.43% average annual rate) in the direction of milk production.*

Keywords: *efficiency, sheep, meat, milk*

JEL Classification: *O12, O13, Q12*

INTRODUCTION

The paper is part of the research conducted under the *ADER Project 24.1.2, Phase 2 - "Economic efficiency of sheep and goat farms of different sizes, located in different geographical regions and landforms"*, funded by the Ministry of Agriculture and Rural Development.

Sheep are part of the landscape and cultural heritage of many countries. They are a source of employment in disadvantaged agricultural areas, and the high quality traditional products they produce are generally recognized as a result of a sustainable and multifunctional form of agriculture, which contributes to maintaining the environment and social cohesion in rural areas. Analyzes have shown that many production systems are below the profitability threshold. For this reason, measures are needed both from farmers, in order to increase average production, improve technologies, apply proper management, and support measures from the state, in various forms, to ensure the sustainability of future small ruminant farms.

MATERIAL AND METHODS

The present study uses as research methods both the analysis of statistical data, their processing and the calculation of statistical indicators, to highlight in terms of dimensional and structural dynamics of the sheep sector, and the results of 47 case studies conducted on sheep farms for milk, located in different regions of the country, in different relief forms and of different sizes. For these, different indicators of economic efficiency were analyzed, as well as the correlations between them.

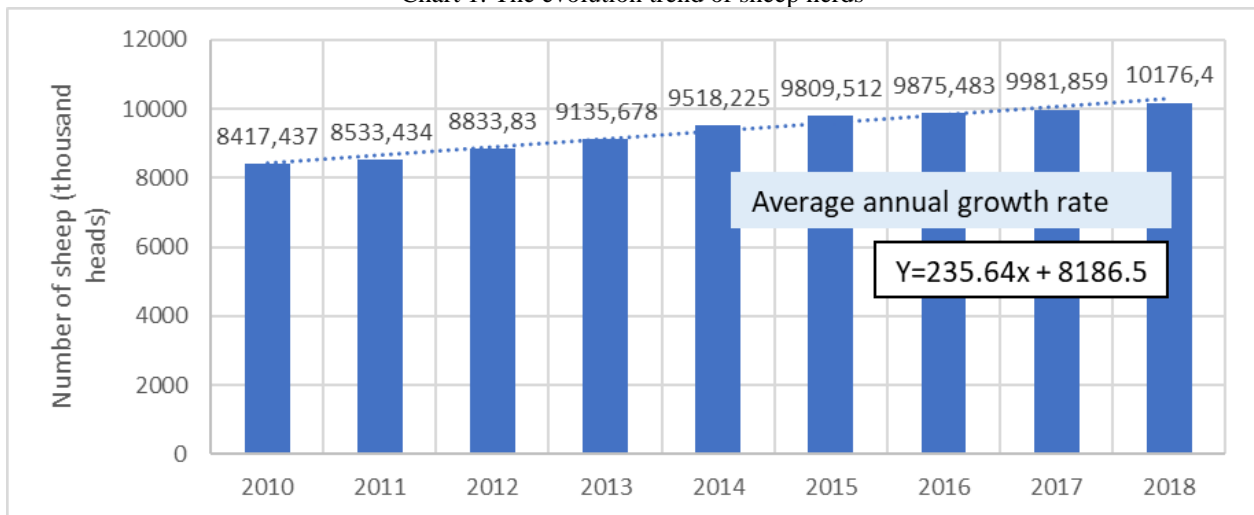
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RESULT AND DISCUSSIONS

At national level, sheep herds registered an increasing trend, in 2018 reaching the maximum number of the period, of 10176.4 thousand heads, by 20.89% more than in 2010. The average of the period studied is 9364.65 thousand heads, with a standard deviation of 618.66 thousand heads, which determined a coefficient of variation of 6.6%, indicating that the string taken into analysis is homogeneous. The average annual growth rate of sheep during the period 2010-2018 was 2.40%. Calculating the equation of the evolution trend of the herds, it can be seen that the value of the coefficient of x is positive, which indicates that, on average, annually, the number of sheep increases by 235.64 thousand heads (Chart 1).

Chart 1. The evolution trend of sheep herds

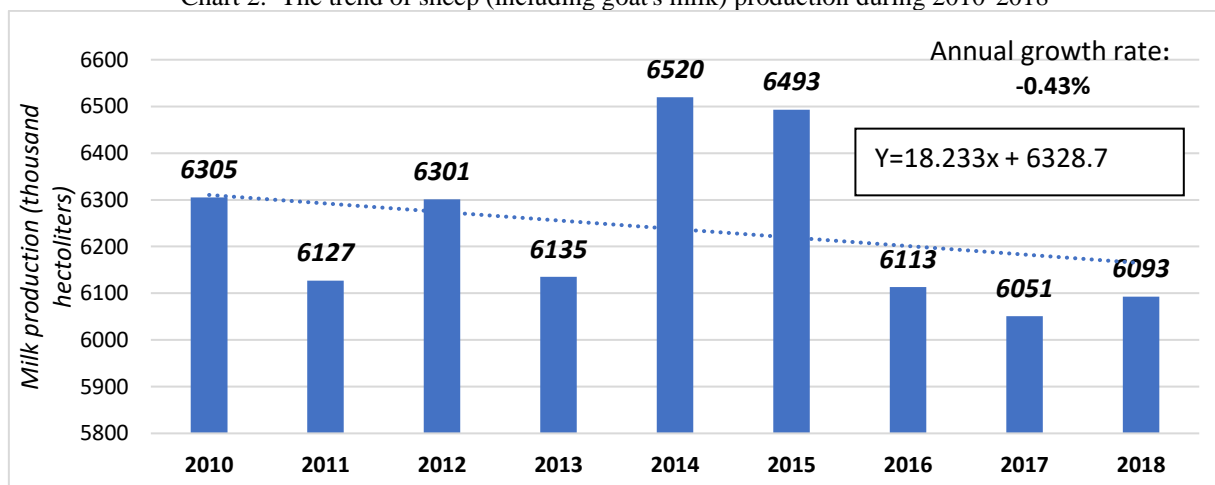


Source: Own calculations following NIS data

Analyzing the evolution of sheep (including goat) milk production over the period 2010-2018, as can be seen in Chart 2, it followed an oscillating trend, recording the maximum value of the period of 6520 thousand hectoliters in 2014.

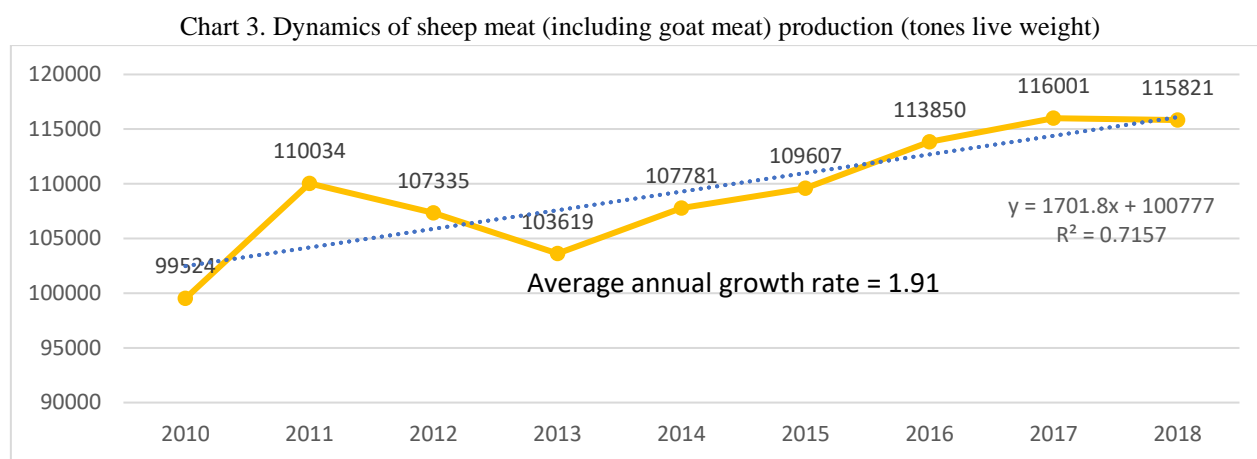
After 2015, milk production decreased to 6051 thousand hectoliters (in 2017). The average value of milk production recorded during the studied period is 6238 thousand hectoliters, with a standard deviation of 165.85 thousand hectoliters, which led to a low coefficient of variation of 2.66%. The average annual registered rate is a negative one, of -0.43%.

Chart 2. The trend of sheep (including goat's milk) production during 2010-2018



Source: Own calculations following NIS data

Regarding the dynamics of sheep meat production, as indicated by the data in Chart 3, the trend followed was an increasing one, so that in 2018, there was a higher amount than in 2010 by 16.4%, the average annual growth rate being 1.91% during this time. The minimum of the period was at the beginning of the interval (99524 tons), and the maximum was reached in 2017 (116001 tons), the coefficient of variation being 0.05.



Source: Own calculations following NIS data

In order to identify the most vulnerable sheep farms for milk, the indicators of economic efficiency within the sheep farms that are the subject of the case studies were calculated and analyzed. In this sense, the farms were grouped on the 3 relief forms (plain, hill, mountain), in the order of their size (subsistence, semi-subsistence, small, medium farms, up to the lower limit of the large ones), specifying, also the geographical region of origin.

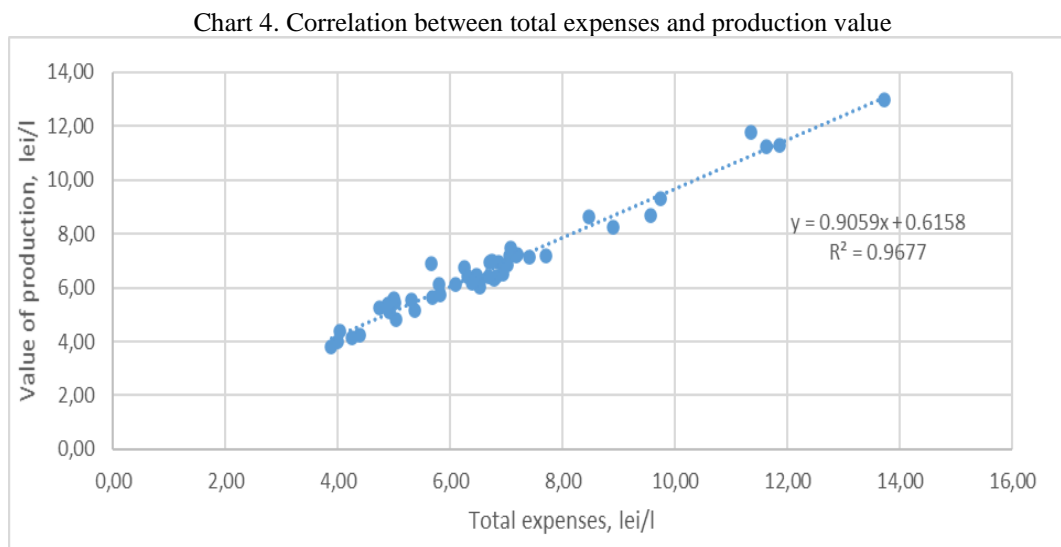
The analysis of the various synthesis indicators highlighted the fact that there is a complexity of factors that contribute to obtaining favorable economic results on a farm and these refer to the size of the farm, the average and total milk production, the costs incurred, the market context for the sale of production, the degree of production processing (primary processing, or the creation of added value by delivering assortments of cheese such as bellows cheese, etc.), the general management of the farm, etc.

The average size of the farms taken into study was 516.75 heads, with an average production of 74.18 liters / head. The average value of production was 6.72 lei / liter, respectively 498.49 lei / head, total expenses being 6.74 lei / l, meaning 499.9 lei / head. The average value of the unit cost was 3.39 lei / l, being between 2.51-5.44 lei / l. The average deliver price for milk was 3.38 lei / l, between 2.47-5.01 lei / l. The average labor productivity in physical expression was 0.28 hours-man / l, while the average labor productivity in value expression was 16.13 lei / hour-man. Average profit / average loss per product unit: -0.02 lei / l, with a minimum of -0.86 lei / l and a maximum of 1.22 lei / l.

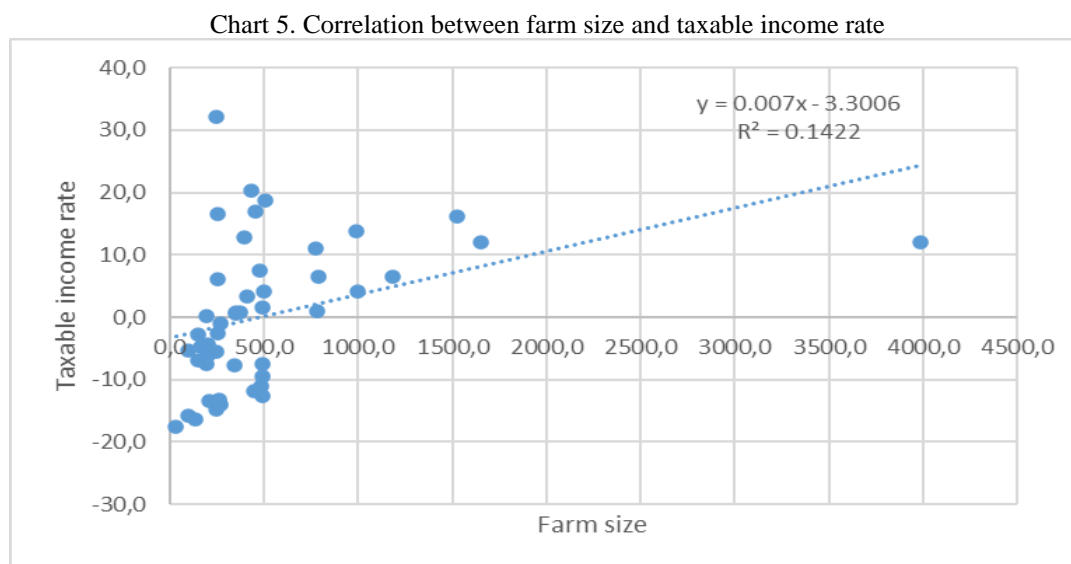
The average taxable income rate was 0.3%, with a minimum of -17.55% and a maximum of 32.07%. The average net income rate without subsidies was -0.18%, with a minimum of -17.55% and a maximum of 28.87%. The average profitability threshold in physical units was 153.35 l / head, and the value threshold was 490.24 lei / head. The average rate of exploitation risk was 222.95%, and the security index was negative: -1.22. On average, the total income / head of animal in the case studies is 1.6% above the break-even point, which indicates that the farms are in an unstable situation from an economic point of view.

Correlations between different indicators

The Pearson correlation coefficient of 0.98 calculated between total expenditure and production value indicates a very good association between the two variables, and the determination coefficient R^2 shows that 96.77% of production value can be explained by the linear relationship with total expenditure (Chart 4).

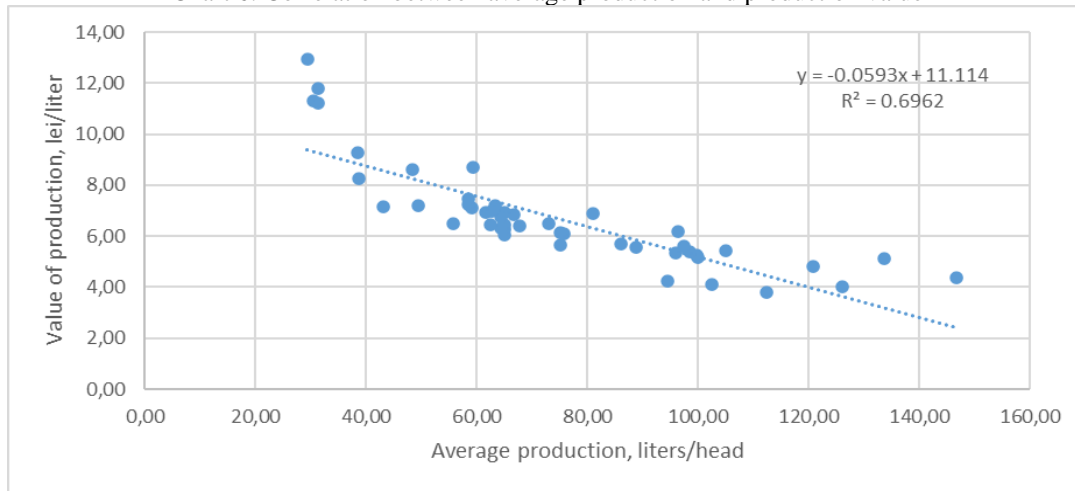


The correlation coefficient of 0.38 calculated between the size of the farm and the taxable income rate indicates an acceptable degree of association between the two variables, and the determination coefficient R^2 of 0.1422 shows that 14.22% of the taxable income rate can be explained by the linear relationship with farm size (Chart 5).



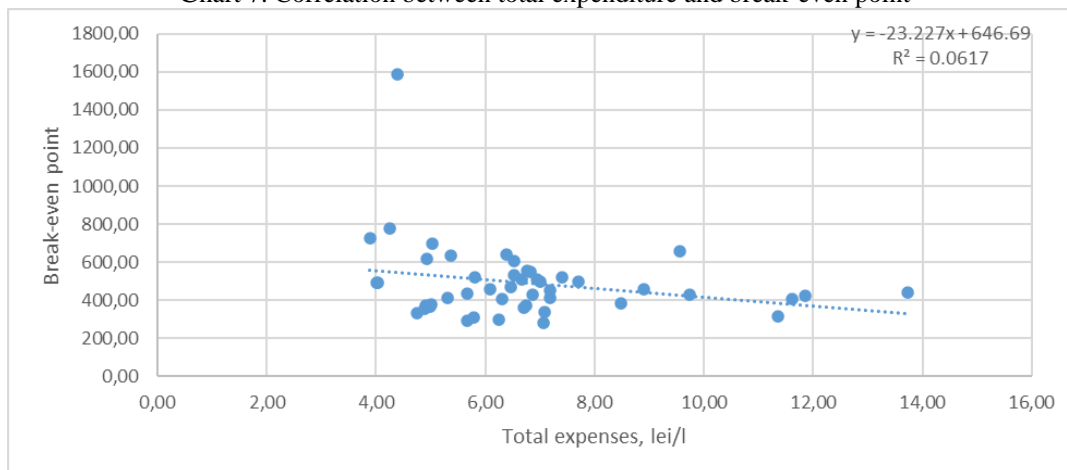
The correlation coefficient of -0.83 calculated between the average production and the production value indicates a very good association between the two variables, and the determination coefficient R^2 of 0.6962 shows that 69.62% of the production value can be explained by linear relationship with average milk production (Chart 6).

Chart 6. Correlation between average production and production value



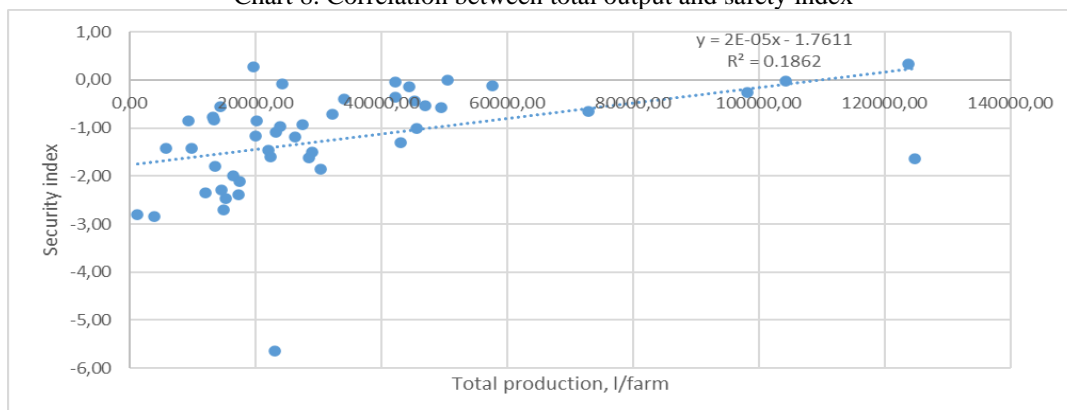
The correlation coefficient of -0.25 calculated between the total expenses and the break-even point indicates an acceptable degree of association between the two variables, and the determination coefficient R^2 of 0.0617 shows that only 6.17% of the break-even point can be explained by the linear relationship with total expenditures (Chart 7).

Chart 7. Correlation between total expenditure and break-even point



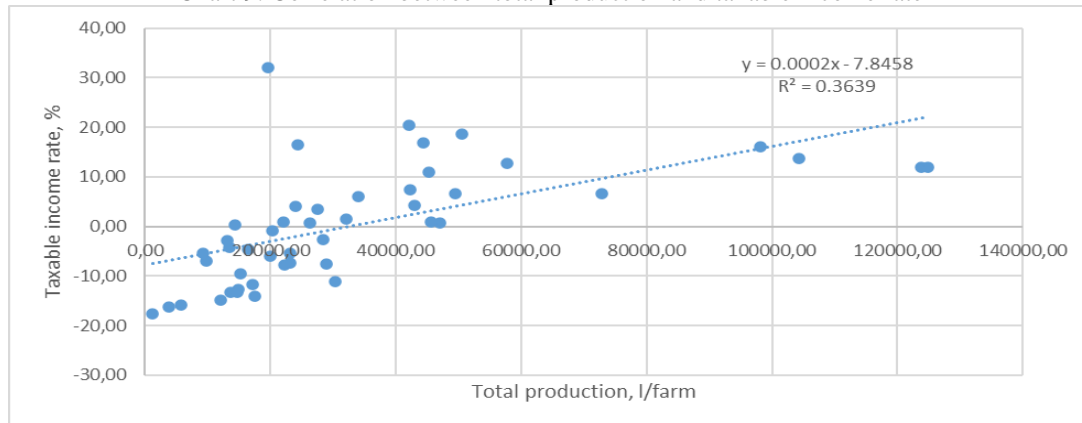
The correlation coefficient of 0.43 calculated between the total output and the safety index indicates an acceptable degree of association between the two variables, and the determination coefficient R^2 of 0.1682 shows that 18.62% of the safety index can be explain by the linear relationship with total milk production (Chart 8).

Chart 8. Correlation between total output and safety index



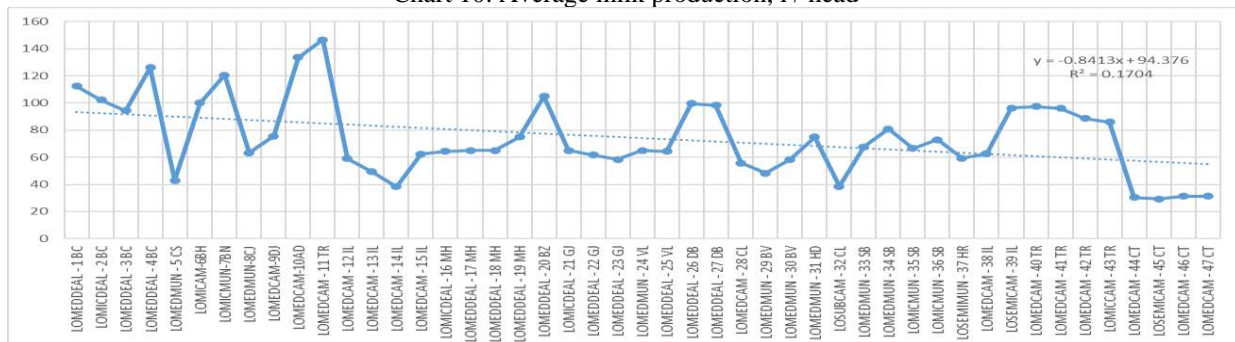
The correlation coefficient of 0.60 calculated between total production and taxable income rate indicates a good correlation between the two variables, and the determination coefficient R^2 shows that 36.39% of the taxable income rate can be explained by the linear relationship with total milk production (Chart 9).

Chart 9. Correlation between total production and taxable income rate



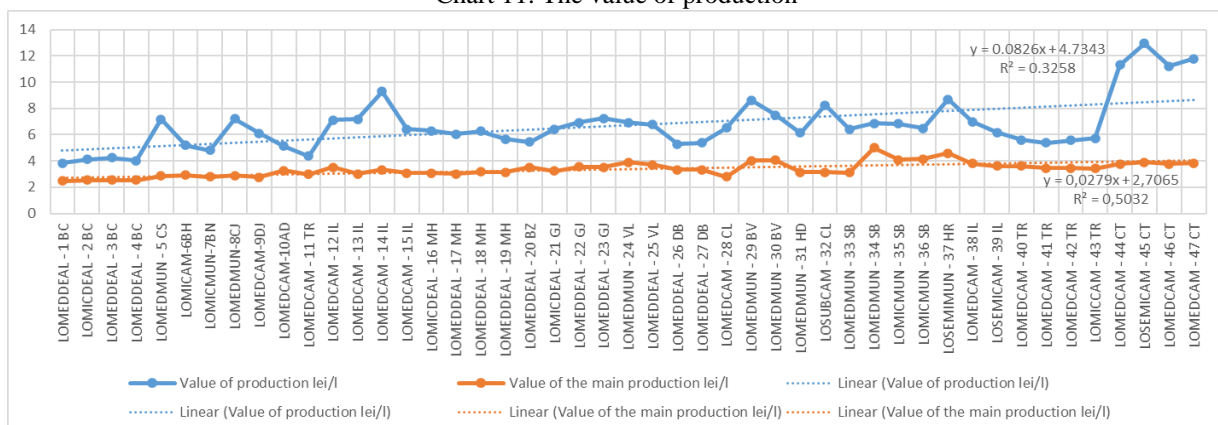
In the following graphs, the main synthesis indicators of the farms in the case studies are shown. The average milk production was between 29.33 l / head in Dobrogea area, for Merino sheep and 146.67 l / head in the southern part of Muntenia, in the plain area, for Carabașă sheep (Chart 10).

Chart 10. Average milk production, l / head



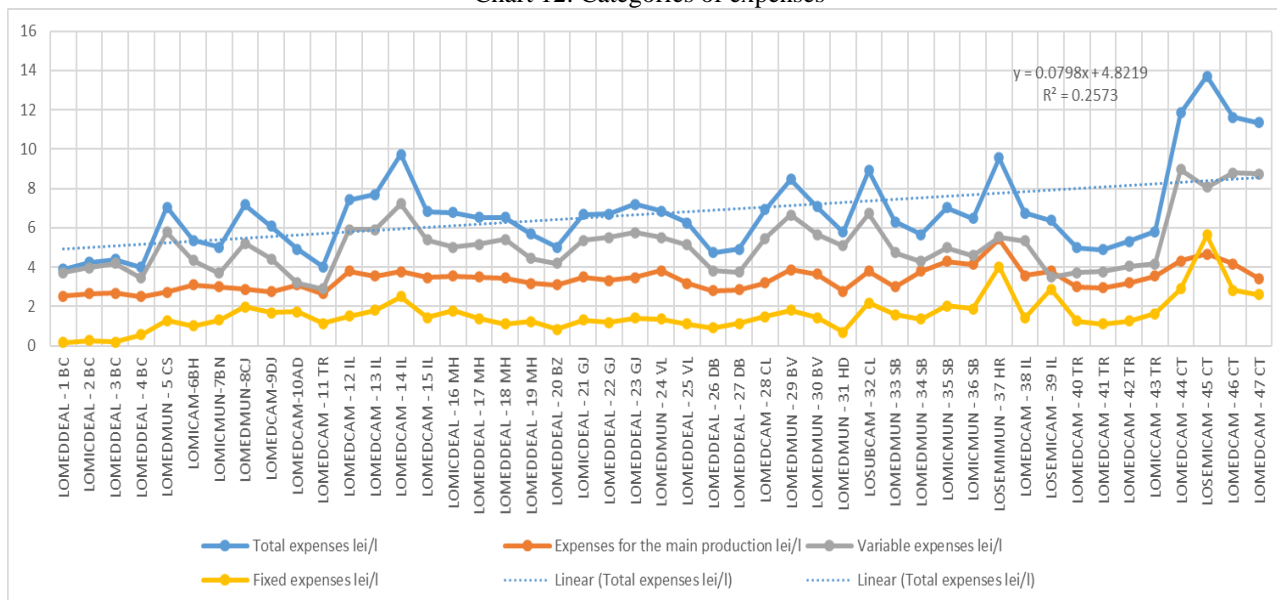
The value of production was between 3.82 lei / l and 12.96 lei / l, at the upper pole being farms that process milk, transforming it into specialties, such as bellows cheese, thus creating added value (Chart 11).

Chart 11. The value of production



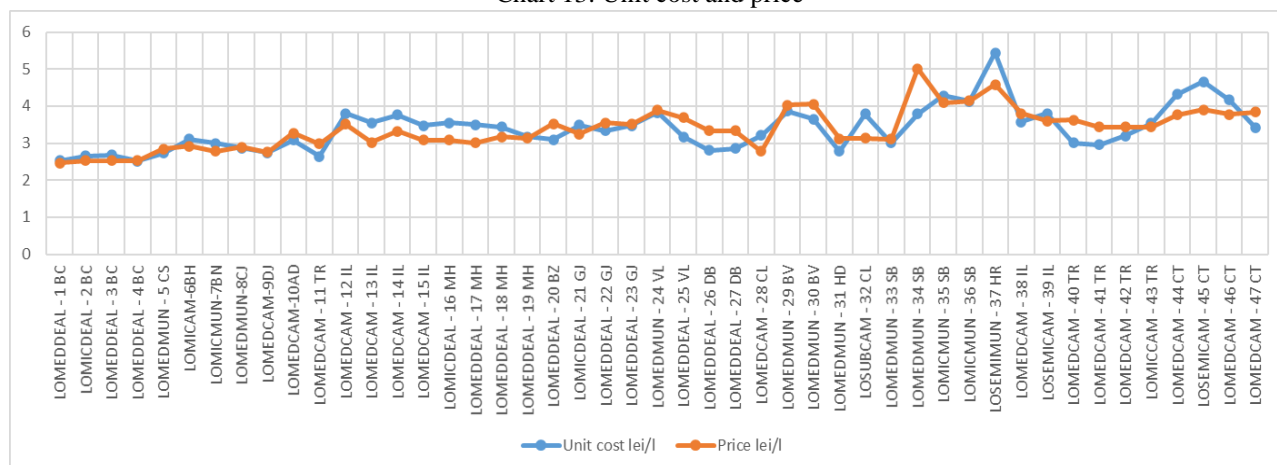
The total expenses were between 3.88 lei / l and 13.72 lei / l, the higher values being in the case of farms with low milk production (30 liters / head or less than 30 liters / head). The expenses for the main production (milk) were between 2.51 lei / l and 5.44 lei / l, the increased values being found especially in the case of farms with small milk productions or of the farms in the mountain area. The variable expenses were between 2.90 lei / l and 8.96 lei / l, and the fixed ones between 0.16 lei / l and 5.64 lei / l (Chart 12).

Chart 12. Categories of expenses



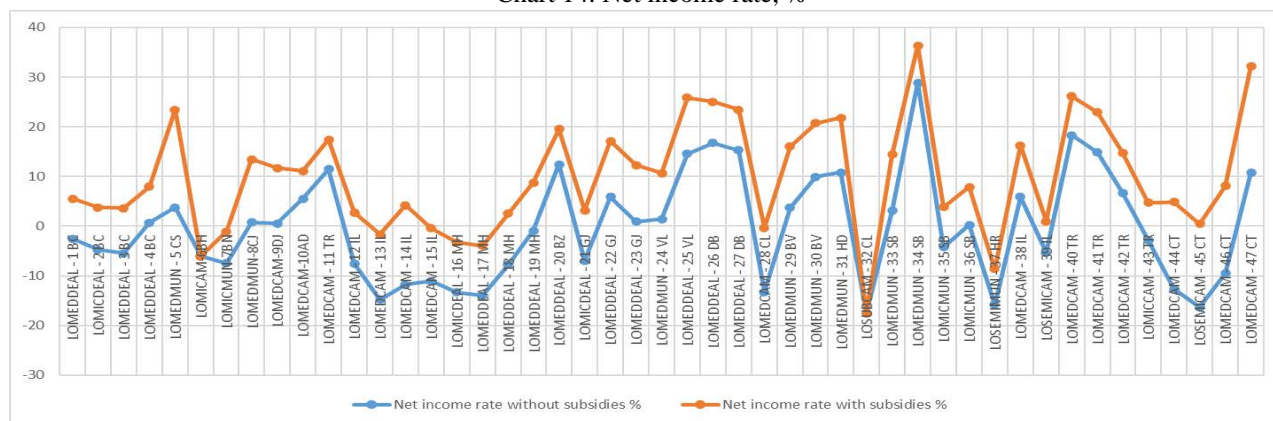
The unit cost was between 2.51 lei / l and 5.44 lei / l, the higher values being generally found in farms with low average milk production, or with low production and low number of animals. The calculated price of milk delivered was between 2.47 lei / l and 5.01 lei / l, the highest being found, in general, in mountain farms, where milk is transformed in different categories of cheese (Chart 13.).

Chart 13. Unit cost and price



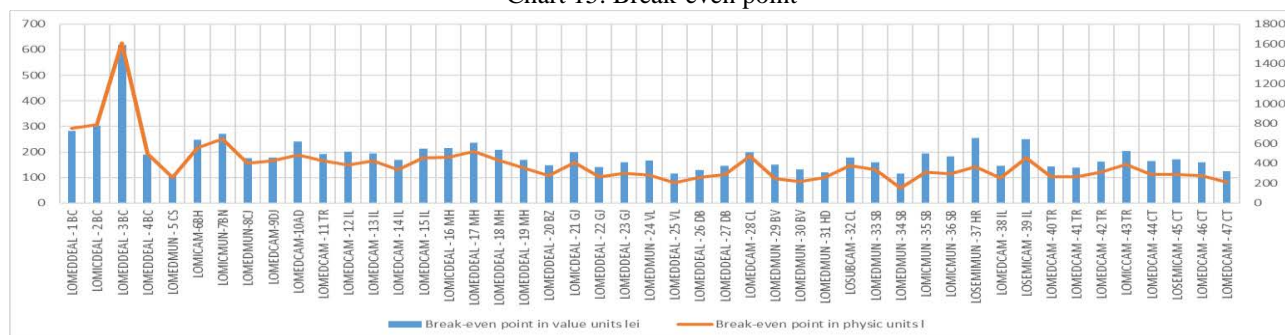
The economic results of the farms studied were different, some registering losses of different degrees, others a certain profit. Losses have occurred in different categories of farms in different regions or landforms, in farms with small herds and small productions, or even in farms with high productions but small herds. The net income rate without subsidies was between -17.55% and 28.87%, and the net income rate with subsidies (NTA) was between -17.55% and 36.36% (Chart 14).

Chart 14. Net income rate, %



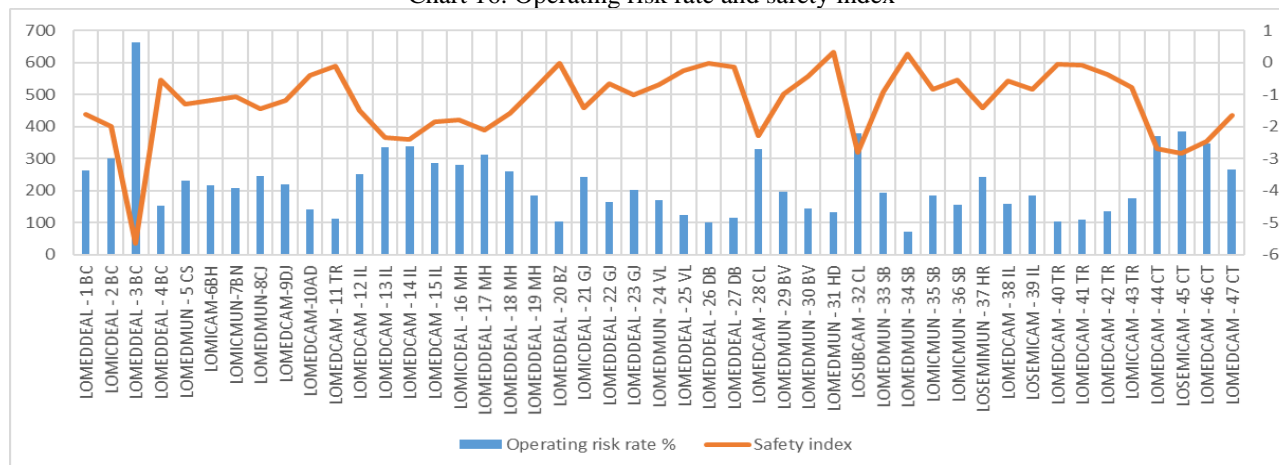
The break-even point in physical units was between 58.82 l / head and 626.37 l / head, and the value threshold between 283.07 lei / head and 1586.81 lei / head (Chart 15).

Chart 15. Break-even point



The exploitation risk rate (Chart 16) was between 72.62% and 664%, being higher in holdings with small number of animals and small productions, or even in holdings with high productions but small number of animals. There are also high-risk situations in which farms with large numbers and high yields obtain low capitalization prices and then production costs are not covered, resulting in losses. The safety index was between -5.64 and 0.33, and the positive values were in only 4.2% of the farms (in the mountain area, at over 240 heads and over 75 l / head, with added value of products).

Chart 16. Operating risk rate and safety index



CONCLUSIONS

Analyzing the averages of synthetic indicators by relief forms, it is found that the highest value of production is found in the plain area (7.41 lei / l), but the highest value of the main production - milk is found in the mountain area (3.71 lei / l). The highest total expenses are in the plain area (7.53 lei / l), but the highest expenses with the main production - milk are in the mountain area (3.62 lei / l). The unit cost of milk has the highest value in the mountain area (on average 3.62 lei / l), but also the highest capitalization price in the mountain area (average of 3.71 lei / l, with maximum of 5 lei / l). The profitability threshold in physical units is the highest in the hill area (192.38 l / head) and the lowest in the mountain area (on average 121.98 l / head). The lowest rate of exploitation risk is in the mountain area, where we meet the highest safety index. Comparing the farms that had a profit with those that registered losses, on average, those with a negative result produced milk with 3.61 lei / l and sold it with 3.26 lei / l, and those with a positive result produced with 3.19 lei / l and they sold with 3.49 lei / l.

The comparative analysis of the synthetic indicators on farm size segments highlights the fact that the smallest size segments, below 100 heads and 101-200 heads, generally have the lowest values of profitability indicators, high profitability thresholds, high operating risk rates and low security indices. They also have among the highest unit costs and the lowest labor productivity.

We consider that farms in these categories are the most economically vulnerable and fail to adapt quickly to changes in the economic environment, unless the lower number of heads is compensated by a high average production per head. In the case of larger farms, even if the average production is not high, it is compensated by the number of heads, which will ensure positive results. The sale of value-added products at higher prices is an important factor in obtaining favorable economic results.

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