

Chetroui, Rodica

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CORRELATION OF TECHNICAL-ECONOMIC INDICATORS AT COW MILK - CASE STUDIES

RODICA CHETROIU¹

Abstract

The paper presents the average results for the period 2018-2020 of 54 case studies conducted in dairy farms located in different geographical regions of Romania, different landforms and of different sizes. In terms of farm size, it is between 5.0 - 568.3 dairy cows (6,002.3 - 682,261.4 SO), of the following categories: 3.7% semi-subsistence farms, 7.4% small farms, 77.8% medium farms and 11.1% large farms. The breeds of dairy cows exploited in the farms under the case studies are Holstein, Bălțată cu negru românească, Bălțată românească, Brună, as well as their crossbreds with Romanian or with imported breeds. The average size of the farms taken into account was 73.44 heads, with an average production of 4,554.94 liters / head. The average value of the unit cost was 1.55 RON / l, and the average profit per liter of milk was 0.01 RON / l, with a minimum of -0.29 RON / l and a maximum of 0.73 RON / l. The average taxable income rate was 0.22%, with a minimum of -19.51% and a maximum of 27.25%. The average profitability threshold in physical units resulting from the analyzes in the case studies is 5,506.29 liters / head, and the average profitability threshold in value units is 8,024.83 RON / head. The best correlations between technical and economic indicators indicate a very good association between total expenditures and production value, between expenditures for the main production and production value, as well as a good association between average milk production and total production value.

Keywords: indicators, cows, milk, expenditures, correlations

JEL Classification: O12, Q12, Q13

INTRODUCTION

The economic efficiency of production activities is the result of the judicious use of material, human, financial resources, as well as organizational, managerial and marketing skills of the results (Petcu, 2003). These coordinates also apply to the activity of exploiting cows for milk production.

In order to determine the economic efficiency, it was performed the calculation of specific technical-economic indicators. The dairy farming systems differ in terms of technical-material basis, structure of the forage base, labor force, genetic value of the animals, the way of production valorization etc. (Maciuc V., 2015).

But the factor that decisively influences the orientations, on all levels, in the valorization of production, is represented by the consumers' requirements (Voicu I., Voicu D., Ghiță E., Dudu Ș., 2011).

MATERIAL AND METHODS

This paper is the result of research conducted in 54 case studies in cow farms located in different geographical regions of Romania, in plains, hills, mountains and of different sizes. The size of the farms is between 5.0 - 568.3 dairy cows (6,002.3 - 682,261.4 SO), falling into the following categories: 3.7% semi-subsistence farms, 7.4% small farms, 77.8% medium farms and 11.1% large farms.

Based on data from 2018, 2019 and 2020, the average indicators of the economic efficiency of milk production were calculated, as well as the correlations between them, using the Pearson correlation coefficient between two quantitative variables, using the CORREL function, as well as the determination coefficient R^2 . The illustration of the relationship between two parameters was made using the Scatter graph.

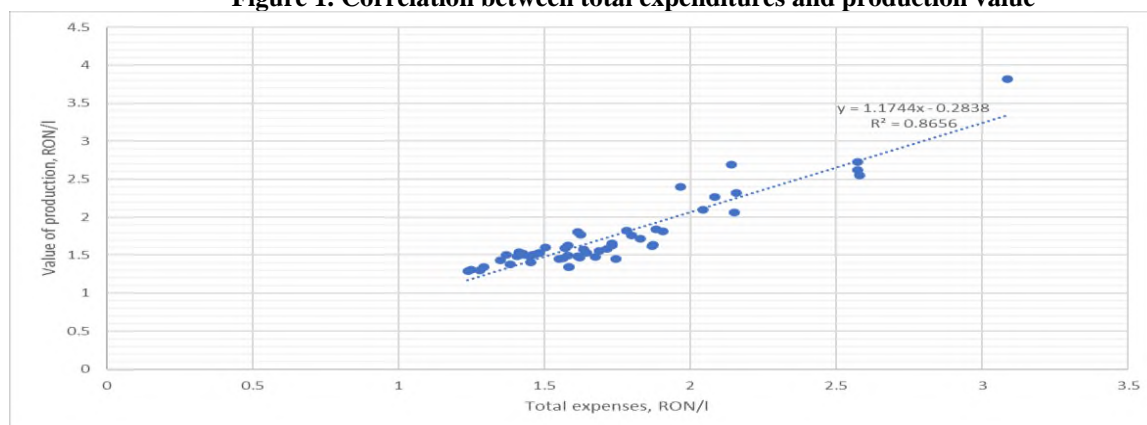
¹PhD. Eng. Chetrouiu Rodica, Scientific Researcher III, Research Institute of Agriculture Economy and Rural Development, e-mail: rodica.chetrouiu@iceadr.ro

RESULTS AND DISCUSSIONS

The average size of the 54 farms taken into account was 73.44 dairy cows / farm, with an average production of 4,554.94 liters of milk / head (ICEADR, 2021). The average value of production was 1.73 RON/liter, respectively 7,880 RON/head, the total expenses being 1.71 RON/l, ie 7,788.9 RON/head. The average value of the unit cost was 1.55 RON/l, being between 1.13-2.94 RON/l. The average producer price for milk was 1.56 RON/l, between 1.1-3.67 RON/l. Average profit/average loss per product unit: 0.01 RON/l, with a minimum of -0.29 RON/l and a maximum of 0.73 RON/l. The average taxable income rate was 0.22%, with a minimum of -19.51% and a maximum of 27.25%. The average rate of net income without subsidies was -0.10%, with a minimum of -19.51% and a maximum of 24.53%. The average profitability threshold in physical units was 5506.29 l/head, and the value threshold was 8024.83 RON/head. The average rate of exploitation risk was 146.63%, and the security index was negative: -0.47, being between -6.85 and 0.67.

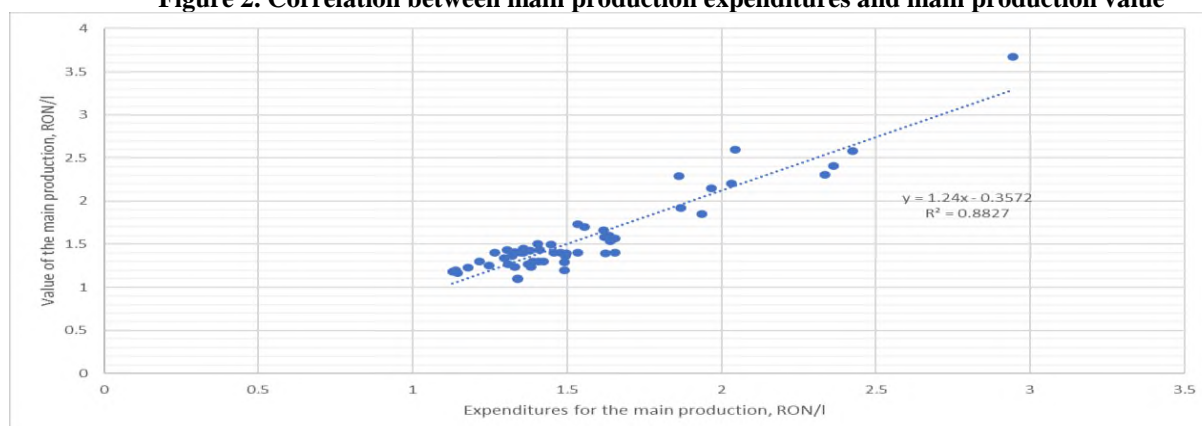
The correlation coefficient of 0.93 calculated between the total expenses and the value of production indicates a very good correlation between the two variables, and the determination coefficient R^2 shows that 86.56% of the value of production can be explained by the linear relationship with total expenses (Figure 1).

Figure 1. Correlation between total expenditures and production value



The correlation coefficient of 0.94 calculated between the expenditures for the main production and the value of main production indicates a very good correlation between the two variables, and the coefficient of determination R^2 shows that 88.27% of the value of main production can be explained by the linear relationship with main production expenditure (Figure 2).

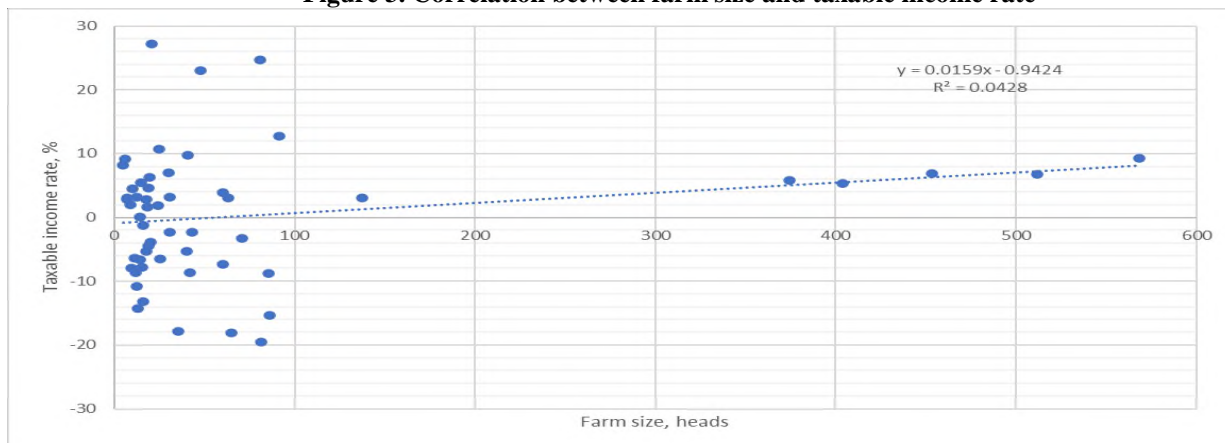
Figure 2. Correlation between main production expenditures and main production value



The correlation coefficient of 0.21 calculated between farm size and taxable income rate indicates a weak correlation between the two variables, and the determination coefficient R^2 shows

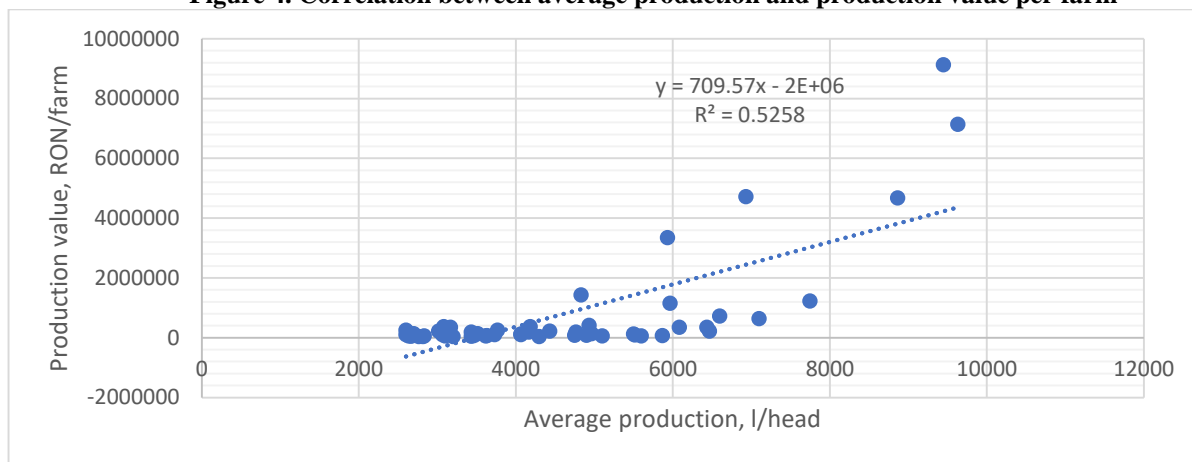
that only 4.28% of taxable income rate can be explained by the linear relationship with the farm size (Figure 3).

Figure 3. Correlation between farm size and taxable income rate



The correlation coefficient of 0.73 calculated between the average milk production and the value of total milk production indicates a good correlation between the two variables, and the determination coefficient R^2 shows that 52.58% of the value of total milk production can be explained by linear relationship with average milk production. This means that milk price, which participates in creating its value and occupies the remaining 47.42%, has a decisive importance on the economic results of the farm. Thus, the management and marketing strategies of the farm are very important and have to find the optimal solution for production valorization (Figure 4).

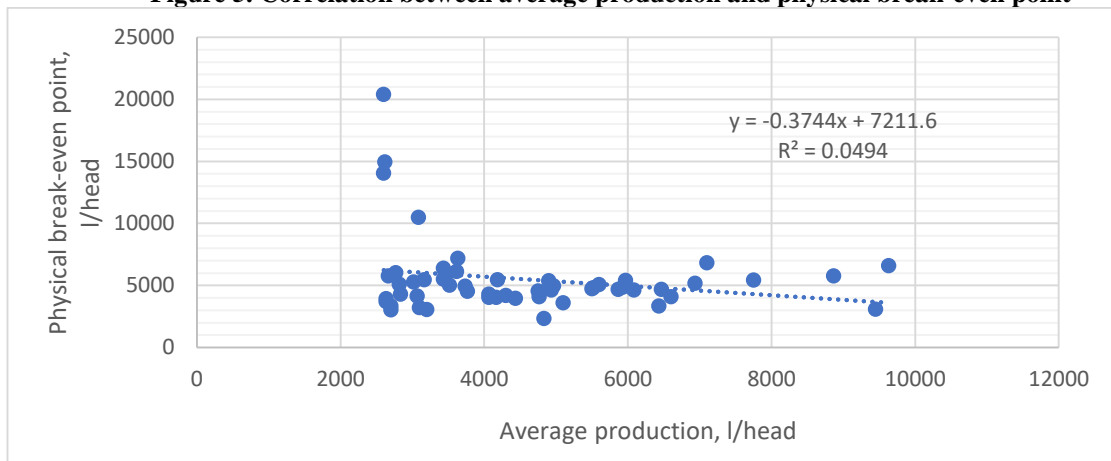
Figure 4. Correlation between average production and production value per farm



Source: ICEADR Calculations

The correlation coefficient of -0.22 calculated between the average production and the physical break-even point indicates a weak correlation between the two variables, and the determination coefficient R^2 shows that only 4.94% of the break-even point can be explained by the linear relationship with average production (Figure 5).

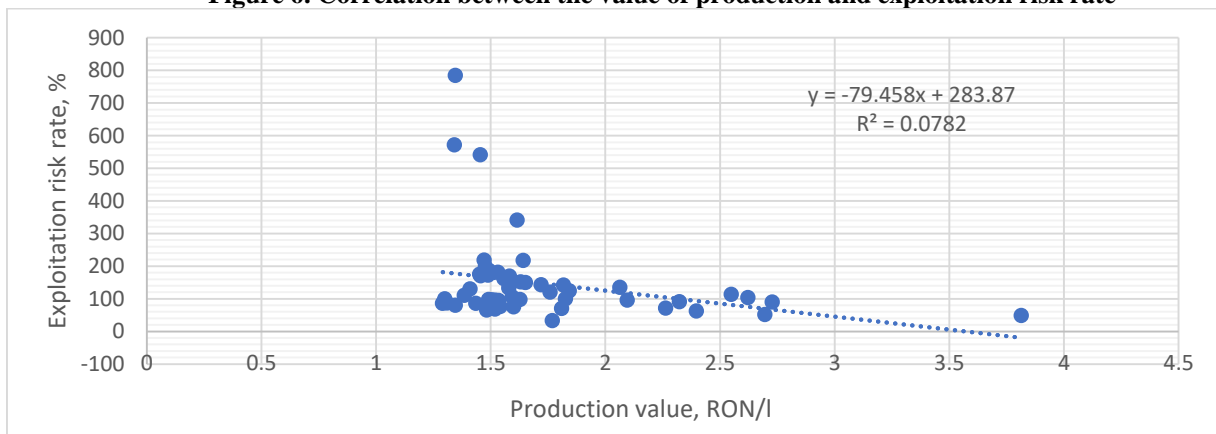
Figure 5. Correlation between average production and physical break-even point



The break-even point is influenced by the difference between the value of production and variable costs. This relationship includes, therefore, both the average production, the price, but also the variable expenses, and within them, the largest share is held by the feed expenses. Therefore, the optimization management of all these indicators is a determining factor in obtaining favorable economic results on the farm.

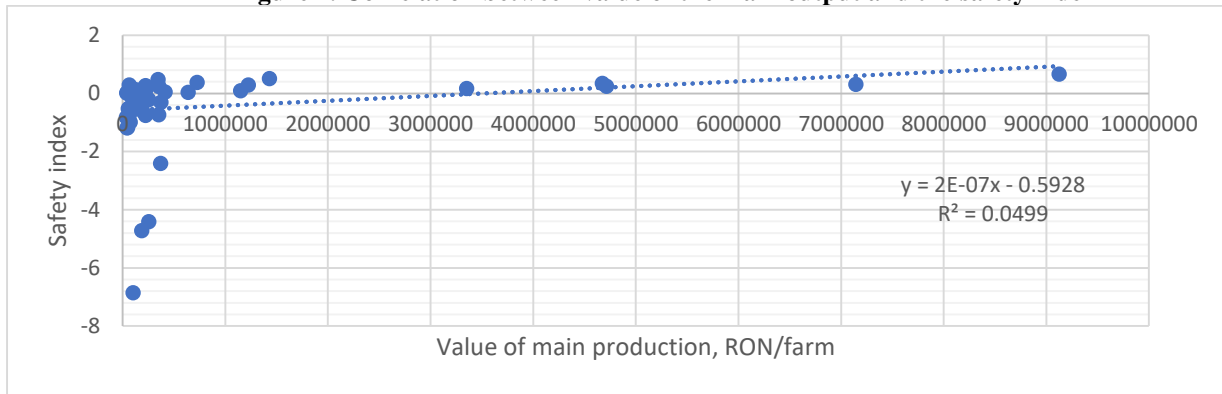
The correlation coefficient of -0.28 calculated between the value of production and the exploitation risk rate indicates an inverse relationship and an acceptable degree of correlation between the two variables, and the determination coefficient R^2 shows that 7.82% of the exploitation risk rate can be explained by the linear relationship with the value of production (Figure 6).

Figure 6. Correlation between the value of production and exploitation risk rate



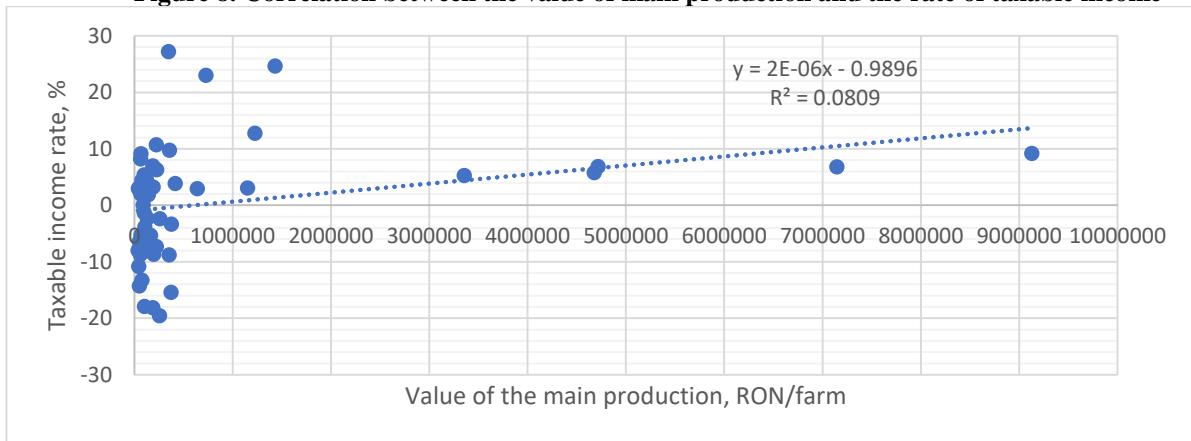
The correlation coefficient of 0.22 calculated between the value of the main output and the safety index indicates a weak correlation between the two variables, and the determination coefficient R^2 shows that only 4.99% of the security index can be explained by the linear relationship with the value main production (Figure 7).

Figure 7. Correlation between value of the main output and the safety index



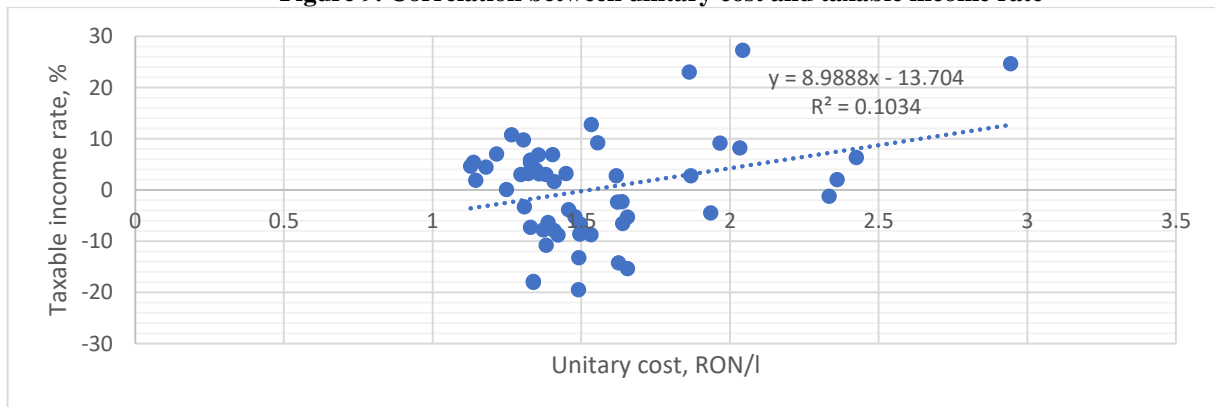
The correlation coefficient of 0.28 calculated between the value of main production and the taxable income rate indicates an acceptable correlation between the two variables, and the determination coefficient R^2 shows that 8.09% of the taxable income rate can be explained by the linear relationship with the value of the main production (Figure 8).

Figure 8. Correlation between the value of main production and the rate of taxable income



The correlation coefficient of 0.32 calculated between the unit cost and taxable income rate indicates an acceptable degree of correlation between the two variables, and the determination coefficient R^2 shows that 10.34% of the taxable income rate can be explained by the linear relationship with unitary cost (Figure 9).

Figure 9. Correlation between unitary cost and taxable income rate



CONCLUSIONS

The farmers work in a complex economic environment, which is constantly evolving and with which they are in permanent relations (Manole V., 2001). The highest correlations calculated in the present study are those between total expenditures and production value, indicating that the allocation of resources leads to an increase in the results of the activity results and, subsequently, of their value. Therefore, higher milk production involves higher costs, but the results are superior comparing with the low production levels. So, there is also a good correlation between the average milk production and the value of the total production, illustrated above.

The acceptable correlations are between the value of production and the rate of exploitation risk, respectively the rate of taxable income, which means that the size of the activity results determines the level of profitability and the degree of risk of the production activity carried out. Also, the level of unit costs directly influences the profitability of the farm. The average break-even point in physical units resulting from the analyzes in the case studies is 5,506.29 liters / head, and the average break-even point in value units is 8,024.83 RON / head.

It should be noted that the market situations are different, in the sense that there are some farms which, even if they obtain high average yields per head, still fail to obtain an advantageous price for milk (high yields require a high level of inputs and, consequently, higher costs) and then the results may be even worse than farms which, despite modest productions, obtain a satisfactory average price to cover their expenses and result in a certain level of profit. Therefore, the price obtained for the milk has a decisive influence on the economic efficiency of the farm.

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