THE DYNAMICS OF TECHNICAL AND ECONOMIC INDICATORS IN THE GROWTH OF SHEEP FOR MEAT

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Abstract

The paper aims to analyse the evolution of technical and economic indicators in sheep farming for meat production during the period of 2019–2024. It considers and analyses essential indicators such as production value, total expenditure level, feeding costs, investments in biological material, taxable income, net income with subsidies, net profitability rate, production costs, and marketing price. The calculations were made based on input allocations according to technologies and following the economic formulas for indicators studied. The findings show that the largest shares in the expenditure structure were represented by feed and biological material, while subsidies have decisively contributed to maintaining the stability of net income. The evolution of the selling price and production cost reflects the vulnerability of the field to market changes and how resources are managed. The paper highlighted the relationship between technical performance and economic sustainability, and the necessity to increase sheep farms efficiency and profitability.

Key words: *production, sheep, meat, profitability*

INTRODUCTION

The sheep farming as a viable option for animal production in various regions of the world. The breeding of small ruminants can help to meet the growing demand for food, while also providing a sustainable solution from a socioeconomic perspective and with a low impact on carbon dioxide emissions [1].

The continuous increase in the world population puts pressure on production systems that are already in a competitive environment. To respond to this challenge, many states are adopting more efficient supply models, oriented based on demand. According to estimates, the market value will experience steady growth, supported by forecasts of increased meat consumption [2].

Sheep meat, classified as red meat, is appreciated and widely consumed worldwide due to its distinct taste and nutritional value. It represents an important source of high-quality protein, essential for the body, along with other fundamental macronutrients such as carbohydrates and lipids, as well as vitamins and minerals necessary for maintaining health [3, 4].

The global demand for meat is on an upward trend. The main factors behind this development are, along with the population growth, the urbanization, and the strengthening of a middle class globally, due to increasing incomes, especially in low and middle-income countries. These changes have accelerated the dietary transition towards higher consumption of animal source products [5].

Sheep farming is a traditional activity, closely related to the history and identity of the Romanian people. Over time, shepherding – an essential component of Romanian agriculture – has contributed to ensuring food security and maintaining the continuity of rural life in these lands. Romania has about 6% of the agricultural area of the European Union, benefiting from quality land and considerable potential for

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the development and modernization of the livestock sector [6].

The long-term economic performance of sheep farms largely depends on the use of modern production technologies and the application of effective management practices.

From this perspective, adopting and leveraging the best agricultural solutions and innovations are essential strategic directions for increasing productivity and strengthening the competitiveness of the sheep sector, a field that still faces a low level of innovation integration. [7-9].

MATERIAL AND METHOD

Based on the growth technologies and specific input allocations, cost estimates and income and expenditure budgets were prepared, as an average/country, for sheep meat, for each year from 2019-2024. Following the economic formulas from the specialized literature, the technical-economic indicators were calculated, as follows:

Value of production = Value of production + Value of secondary production.

Total expenses = Variable expenses + Fixed expenses.

Taxable income = Value of production – Total expenses.

Net income = Taxable income - taxes.

Taxable income rate% = Taxable income/Expenditures for main production.

Cost of production = Total expenses/Total quantity of production.

Also, based on the applications available in Excel, statistical indicators such as average, standard deviation and coefficient of variation, and annual growth rate were calculated.

RESULTS

Figure 1 illustrates the evolution of the production value for sheep meat during the period 2019-2024, where it is observed a general increasing trend throughout the analysed period.

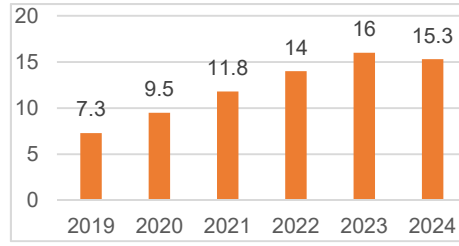

Fig. 1. The value of production for sheep meat, lei/kg

The expenses for feed intended for sheep meat production during the period 2019-2024 show a sharp initial increase in 2019, the expenses for feed were 3.2 lei/kg, and by 2022 they reached 7.9 lei/kg.

The year 2022 marks the highest level of expenses (7.9 lei/kg), while in 2023 the expenses decrease to 6.3, then in 2024 continue the downward trend to 5 lei/kg (Fig. 2).

Figure 3 shows the expenses for biological material for sheep meat during the period 2019-2024. For the year 2019 and the year 2020, the expense value was equal to 2.5 lei/kg, which suggests cost stability at the beginning of the period, followed by an increase in 2021, where it rises to 3.4 lei/kg, representing an upward trend.

In the analysed period 2019-2021, an upward trend is noted with taxable income increasing steadily from 0.3 in 2019 to 1.1 in 2021, while 2022 records a negative value of -2.1, and in recent years return to a stable positive trend, stabilizing at 2 lei/kg (Fig. 4).

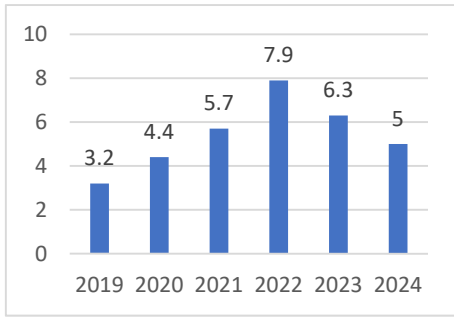

Fig. 2. Expenditure on feed for sheep meat

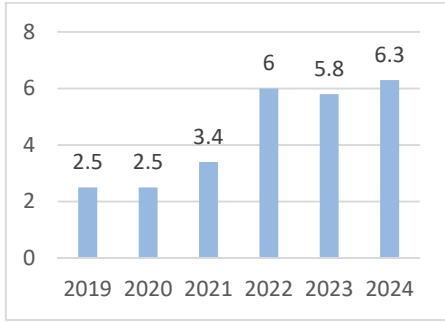

Fig. 3. Biological material for the sheep meat

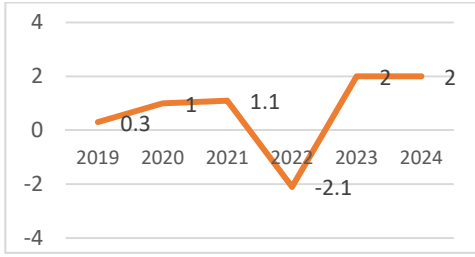

Fig. 4. Taxable income for the sheep meat

Regarding the graph of net income+subsidy, during the analysis period, it is noteworthy that starting from 2019, the values begin to rise to 1.6 lei/kg in 2021, while 2022 records a negative value of -0.019 lei/kg, then significantly increasing to 2.5 lei/kg in the last year of analysis (Fig. 5).

Regarding the taxable income rate in 2019, a relatively low value of 5.1% was recorded compared to the rest of the analysis period, which is expected to increase to 12.2% in 2020, reaching a maximum value of 15.6% in 2024 (Fig. 6).

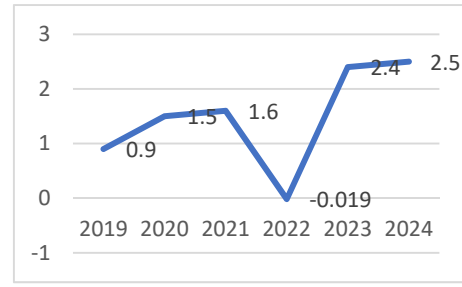

Fig. 5. Net income+subsidy for the sheep meat

Regarding the evolution of the net income rate + subsidies, the year 2019 records a value of 13.7% with a relatively good level, expected to increase in 2020 to 18.4%, while for the year 2022, a negative value of -1% is noted (Fig. 7).

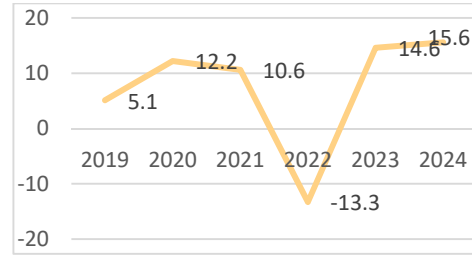

Fig. 6. Taxable income rate for the sheep mea

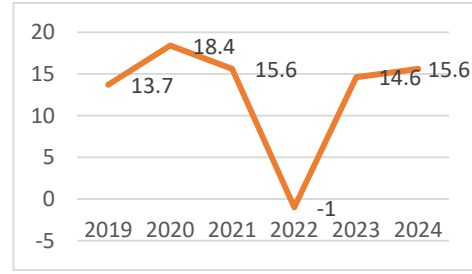

Fig. 7. Net income rate +subsidies for the sheep meat

The production cost for sheep meat followed a significant upward trend between 2019 and 2022, peaking in 2022 (16.1 lei/kg), followed by a slight reduction and stabilization in 2023-2024. Overall, costs have nearly doubled compared to 2019, highlighting inflationary pressure and

the increase in prices of the resources necessary for production (Fig. 8).

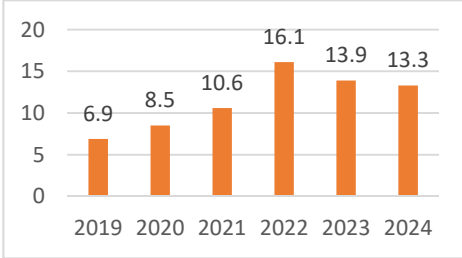

Fig. 8. Cost of production for the sheep meat

In 2019, the price is 7.3 and increases steadily until 2023, when it reaches its peak in 2023 (16), and in 2024, a slight decrease is observed to 15.3, but the level remains higher than in previous years. A constant and significant increase during the period 2019–2023, followed by a slight decline starting in 2024 is observed (Fig. 9).

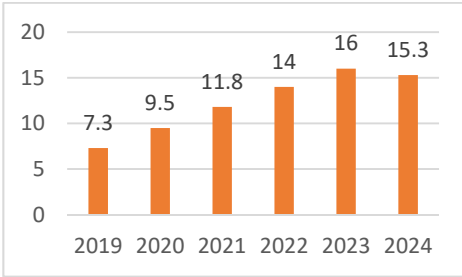

Fig. 9. Price for the sheep meat

DISCUSSIONS

The value of production has increased significantly from 7.3 lei/kg in 2019 to 15.5 lei/kg in 2024, representing a value increase (an increase of 112.3% compared to the base year). The average for the period studied is 12.31, indicating a relatively high level of the value of production. The standard deviation has a value of 3.42, indicating the existence of production variations from year to year. The coefficient of variation is 27.8%, suggesting a relatively low variability of production during the analysed period, with the sheep sector maintaining a stable evolution without major fluctuations. In 2019, the value was 7.3 lei/kg, and by 2023 it reached a maximum of 16 lei/kg, meaning it doubled compared to the beginning of the period. For the interval 2019-2022, the increase is constant and significant from 7.3 lei/kg to 14 lei/kg. The year 2023 records the highest value (16 lei/kg), while in 2024 there is a slight decrease to 15.3 lei/kg.

The analysed indicators show an upward trend in the costs associated with the production or consumption of sheep meat. The highest expenditure level was recorded in 2023, which may reflect the increase in production prices and market demand. Over the analysis period of 2019 to 2024, the trend is general, and expenses have doubled, confirming a growing cost burden on the sheep sector (Table 2).

The evolution of expenses in 2019, they were 6.9 lei/kg, and by 2024 they reached 15.3 lei/kg, which means an increase of 122%. The average for the analysed period is 12.08 lei/kg, indicating a high level of expenses overall. The standard deviation is 3.71, which indicates a relatively moderate variation in expenses from year to year (Table 2).

The expenses for feed (lei/kg) intended for sheep meat in the period 2019–2024, we can state that the evolution of expenses in 2019 was 3.2 lei/kg, and by 2024 it reached 5 lei/kg, which means a 56% increase compared to the base year. The average is 5.42 lei/kg, indicating a relatively high overall level of expenses (Table 3). In 2019, the price of biological material was 2.5 lei/kg, and in 2024 it reached 6.3 lei/kg, representing an increase of 152%, indicating an upward trend. The average is 4.41 lei/kg, which shows an intermediate level between the minimum and maximum values (Table 4).

Table 1. Statistical indicators calculated for sheep meat during the period 2019-2024 for the value of production

The value of production lei/kg	2019	2024	2024/2019 %	Average	Standard deviation	Coefficient of variation	Annual growth rate
	7.3	15.5	112.3%	12.32	3.43	0.28	15.95

Table 2. Statistical indicators calculated for sheep meat during the period 2019-2024 for the total expenses

Total expenses lei/kg	2019	2024	2024/2019 %	Average	Standard deviation	Coefficient of variation	Annual growth rate
	6.9	15.3	122%	12.08	3.72	0.31	17.27

Table 3. Statistical indicators calculated for sheep meat during the period 2019-2024 for the expenses for feed

Expenses for feed lei/kg	2019	2024	2024/2019 %	Average	Standard deviation	Coefficient of variation	Annual growth rate
	3.2	5	56%	5.42	1.62	0.29	9.34

Table 4. Statistical indicators calculated for sheep eat during the period 2019-2024 for the biological material

Biological material lei/kg	2019	2024	2024/2019 %	Average	Standard deviation	Coefficient of variation	Annual growth rate
	2.5	6.3	152%	4.42	1.81	0.41	20.3

The standard deviation of 1.80 suggests a quite significant variation in price evolution. The coefficient of variation Regarding the evolution of taxable incomes during the analysis period 2019-2024, there is a noticeable increase in taxable income from 0.3 lei/kg to 2 lei/kg, representing a percentage increase of 567%, indicating high dynamics. The average value of 0.72 lei/kg is much lower than that reached in 2024, which shows us that high values were recorded towards the end of the period and confirms an upward trend (Table 5).

The evolution during the analysis period of net income + subsidy increased from 0.9 lei/kg to 2.5 lei/kg, which represents an increase of 178%, showing a general upward trend. The average value is 1.48 lei/kg, suggesting a progressive increase but also significant fluctuations between years (Table 6).

(0.41) indicates moderate to high volatility (41%), confirming price instability during the analysed period (Table 4).

The taxable income rate has increased from 5.1% to 15.6%, which means an increase of over 200%. Their average of 7.47% shows us that generally, the sector has remained at lower values, which can confirm that the high values have appeared in recent years (Table 7).

Regarding the evolution of the net income rate + subsidies slightly increased between 2019 and 2024, remaining at a good level for farmers. However, the high volatility indicated by the coefficient of variation shows that the sector remains vulnerable to external factors, even though in the long term the general direction is positive (Table 8).

Table 5. Statistical indicators calculated for sheep eat during the period 2019-2024 for the taxable income

Taxable income lei/kg	2019	2024	2024/2019 %	Media	Standard deviation	Coefficient of variation
	0,3	2	567%	0,7166	1,5250	2,1279

Table 6. Statistical indicators calculated for sheep eat during the period 2019-2024 for the net income +subsidy

Net income+subsidy lei/kg	2019	2024	2024/2019 %	Average	Standard deviation	Coefficient of variation
	0.9	2.5	178%	1.48	0.95	0.64

Table 7. Statistical indicators calculated for sheep eat during the period 2019-2024 for the taxable income rate

Taxable income rate %	2019	2024	2024/2019 %	Average	Standard deviation	Coefficient of variation
	8.9	15.6	206%	7.47	10.83	1.45

Table 8. Statistical indicators calculated for sheep eat during the period 2019-2024 for the net income rate +subsidies

NET INCOME RATE + subsidies (%) lei/kg	2019	2024	2024/2019 %	Average	Standard deviation	Coefficient of variation
	13.7	15.6	14%	12.82	6.95	0.54

The production cost of sheep meat has seen a very large increase between the years 2019 and 2024, with an average annual rate of about +14%. Even though the indicators show a clear upward trend, the moderate volatility suggests that this increase has been rather constant and progressive (Table 9).

Table 9. Statistical indicators calculated for sheep eat during the period 2019-2024 for the cost of production

Cost of production lei/kg	2019	2024	2024/2019 %	Media	Standard deviation	Coefficient of variation
	6.9	13.3	93%	11.55	6.95	0.54

The table 10 shows a clear upward trend in price (lei/kg) between the period of 2019 and 2024, with an increase of over 100%. The average and statistical indicators confirm that, although there are variations from year to year, the value was 7.3 lei/kg in 2019, and it reaches 15.3 lei/kg in 2024 (Table 10).

Table 10. Statistical indicators calculated for sheep eat during the period 2019-2024 for price

PRICE lei/kg	2019	2024	2024/2019 %	Average	Standard deviation	Coefficient of variation	Annual growth rate
	7.3	15.3	110%	12.32	3.43	0.28	15.95

CONCLUSIONS

The analyzed data shows a significant increase in total expenses in 2024 compared to 2019, which reflects inflationary pressure and an increase in the prices of inputs necessary for production. Taxable revenues and subsidies increased, and the taxable income ratio indicated an improvement in the profitability of the sector towards the end of the period.

The selling price increased in proportion to costs, and the value of production doubled. The sector is characterized by moderate to high volatility, meaning that it is sensitive to external factors such as the market, inflation, etc.

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