

THE ANALYSIS OF EFFICIENCY SCENARIOS IN THE MILK PRODUCTION SECTOR, BY SPECIES

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Abstract

In the dairy sector, the economic efficiency issues have a complex causality and are essential for the future and continuity of these activities. The objective of this paper is to evaluate the average level of technical-economic indicators in dairy cow, sheep and goat farms, at the country level, based on the estimates regarding different categories of expenses and the average prices on the free market, at the level of the year 2023 and using formulas in economic specialty literature. Thus, depending on the efficiency level of the farm, possible scenarios for varying technical-economic indicators were simulated, obtaining different results regarding the profitability of the farms, with positive or negative values. Thus, for an average level of 6000 l of milk/cow and a price of 2 RON/l, the rate of net income with subsidies was -4.26%. In sheep milk, for a production of 60 liters/head and 5 RON/liter, the above indicator was -2.77%, and in goat milk, at 270 liters/head and 4,5 RON/liter, the rate of net income with subsidies was 13.05%. Indicators that may vary refer to the level of milk production, the price of milk at the producer, the value of secondary production (calf/lamb/kid/manure capitalized on the market), or the allocation of different levels of fixed or variable expenses. The application by farmers of some scenarios of increase or decrease in the level of different technical-economic indicators constitutes an important managerial tool for the planning process of production activities.

Key words: indicators; cows; sheep; goat

INTRODUCTION

Breeding of dairy animals (cows, sheep, goats) is a production sector which, like other sectors, is affected by the consequences of the economic crisis, the prices of inputs (energy, fuel, fodder, etc.), climate change and the constraints exerted of these. Economic factors have a say in the production and marketing processes and the milk sector is also dependent on the existing competitive situation [4]. Even farmers that have been managing animals in a sustainable way, lead to adapt them to the local conditions [10], the climate change has direct effects on animal productivity and indirect effects on the availability of fodder and pastures. Local breeds of sheep and goats are adapted to marginal rural areas, which are suitable for extensive rearing of small ruminants [1].

Environmental factors influence, especially, feeding technology, exploitation and implicitly individual production of cows, sheep, and goats. Current trends refer to aspects regarding the introduction of new technologies, improved production management, reduced production costs and environmentally friendly production systems [7].

The feeding of dairy animals has a decisive role on production, all other environmental factors modifying to a greater or lesser extent, the degree of conversion of feed into milk. Compared to cow's milk, that of small ruminants (sheep, goats) is generally not consumed directly, but is used for dairy products such as various cheeses, used for self-consumption, or sold as traditional quality products [9].

The application of a rational diet, as type, level, and way of feeding, always has

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a positive effect on the quantitative and qualitative production of milk. On the contrary, unbalanced feeding in nutrients negatively influences the productive level of cows. To protect the milk sector in periods of economic imbalances, a series of mechanisms should be used, which provide a margin of safety through different forms of interventions (subsidy allocations, the application of technologies that reduce production costs, the use of lower feed prices, etc.) that stimulate the farmer to make a profit.

The objective of this study is to evaluate the average level of technical-economic indicators in dairy cow, sheep and goat farms, at the country level, based on the estimates regarding different categories of expenses and the average prices on the free market, at the level of the year 2023. Thus, according to the efficiency level of the farm, possible scenarios for varying technical-economic indicators were simulated, obtaining different results, positive or negative regarding the profitability of the farms.

MATERIAL AND METHOD

The methodology for determining economic efficiency involves the development and use of a system of indicators, like costs, income, profit, taxable income rate, net income rate, net income rate with subsidies etc., following the relations established in specialty economic literature, that quantifies both the efforts made to obtain the respective production and the effects resulting from these efforts. The present paper is based on scenarios of economic efficiency in milk production for three species – dairy cows, sheep, and goats. For dairy cows, scenarios were calculated for a production level of 6000 l/head and a herd of 100 heads/farm, for sheep for an average production of 60 l/head and a herd of 1000 heads, and for goats for a milk production of 270 l/head and a herd of 200 heads.

The calculations performed are based on the following elements: technological estimates, revenue and expenditure budgets and economic efficiency indicators for the

milk product. Total expenses include variable expenses and fixed expenses. Variable expenses are feeding costs, expenses with biological material (replacement costs), energy and fuel, medicine, supplies and animal insurance [3]. From total of these expenses, feeding costs have the largest share, over 60%. Fixed expenses include labor expenses, depreciation expenses and loan interest expenses.

The system of indicators reflects the influence of different factors on the production process and allows a complex analysis of economic efficiency in milk production. Expenses highlight the consumption of material means and labor, necessary to operate activities. For the activity of a farm to be profitable, it is necessary that the value of the income exceeds that of the expenses, so that the farm obtains a minimum profit.

In the situation of average milk productions considered at country level, the costs are high, and the price of milk delivered to processors is quite low, and it is obvious that many farms are in losses. That is why several variants were calculated, with the variation of technical-economic indicators and prices. Thus, one of the scenarios is the production value increases by a certain level, so that the farm goes from loss to profit. Another scenario is the delivery price of milk, as main product, which was increased by different values, and in the third scenario, if the farm owns enough land to ensure forages from its own production, variable expenses can be reduced, resulting in profit. On the other hand, if the value of production decreases by a certain percentage, profitability decreases, or losses occur.

RESULTS

Dairy cows

In the expenditure estimates for the dairy cows' farm, the main variable expenses (forages) are detailed, as they have the largest share (Table 1).

Table 1 - Estimate of expenses - dairy cows

Specification	Quantity kg/head/year	Price RON/kg; RON/head	Value RON/head/year	Value per farm RON/farm
1. Feed expenses			8,244.0	824,400.0
Alfalfa hay	1,500	0.88	1,320.0	132,000.0
Pasture	3,600	0.35	1,260.0	126,000.0
Corn silage	10,800	0.17	1,836.0	183,600.0
Combined feed	2,200	1.74	3,828.0	382,800.0
2. Biological material		7,675	1,534.9	153,493.4
3. Energy and fuel			317.1	31,714.1
4. Medicines and sanitary material			208.5	20,850.2
5. Other material expenses			181.6	18,163.8
6. Supply quota			249.7	24,968.6
7. Insurance			18.4	1,841.9
TOTAL VARIABLE EXPENSES			10,754.3	1,075,432.1
8. Labor costs			1,914.0	191,400.0
9. General expenses			209.7	20,972.4
10. Interest on loans			239.3	23,928.4
11. Depreciation			250.0	25,000.0
TOTAL FIXED EXPENSES			2,613.0	261,300.8
TOTAL EXPENSES			13,367.3	1,336,732.8

Notes: Source: own calculations, based on average input allocations of farms at national level and input prices on free market

The income and expenditure budget illustrates, in addition to the different expenditure categories, the technical-economic indicators regarding the profitability of the farm, which demonstrate

that the financial results are negative, the gross income rate being -8.23%, and the net income rate with subsidies of -4.26% (Figure 1).

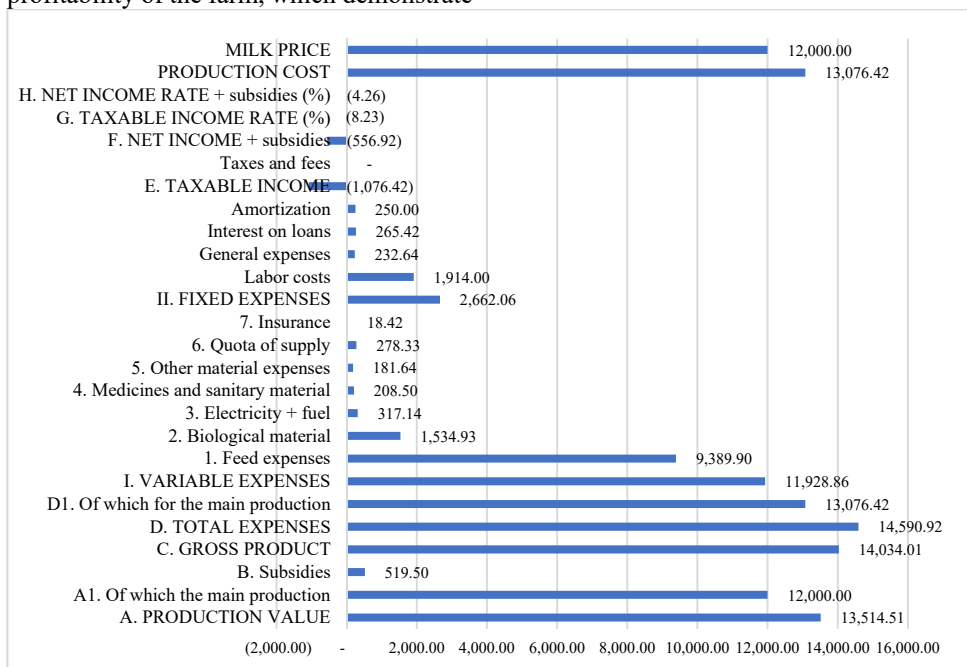


Figure 1 - The income and expenditure budget for dairy cow
Source: own calculations

In the first scenario, to obtain a positive result, the farm needs to increase the value of production by 70%, this involves both the level of average production, the milk price, as well as the value of secondary production. If the production value decreases by 20%, the result changes, increasing the losses (Table 2).

Table 2- Scenario simulation – increase in value of production

Indicators	Values	%	Breakeven point	Result obtainable at a 70% increase in production value	Result obtainable with a 20% decrease in production value	Maintaining the initial result when fixed expenses are reduced by 10%
Total production value	13,514.51	100	22,689	22,974.66	10,811.61	11,245.62
Variable expenses	11,928.86	88.27	20,026.78	20,279.07	9,543.09	9,926.19
Margin on variable expenses	1,585.64	11.73	2,662.06	2,695.59	1,268.52	1,319.44
Fixed expenses	2,662.06		2,662.06	2,662.06	2,662.06	2,395.85
Taxable income (gross result)	-1,076.42		0.00	33.54	-1,393.54	-1,076.42

Source: own calculations

In the following scenario, a 10% increase in the farm gate milk price was considered, which resulted in a shift from loss to profit (Table 3).

Table 3- Scenario simulation – increase in producer milk price

Indicators	Values when increasing milk price by 10%	%	Breakeven point	Result obtainable with a 10% decrease in production value	Maintaining the initial result when fixed expenses are reduced by 10%
Total production value	14,714.51	100	14,062	13,243.06	13,308.34
Variable expenses	11,928.86	81.07	11,399.64	10,735.98	10,788.90
Margin on variable expenses	2,785.64	18.93	2,662.06	2,507.08	2,519.44
Fixed expenses	2,662.06		2,662.06	2,662.06	2,395.85
Taxable income (gross result)	123.58		0.00	-154.98	123.58

Source: own calculations

In scenario 3, if the farm owns forage base area and uses feed from its own production, forages prices can decrease by 12%, resulting in cost reduction and profit (Table 4).

Table 4 - Scenario simulation – decrease in forages expenditures

Indicators	Values when decrease forages costs by 12%	%	Breakeven point	Result obtainable at a 10% increase in production value	Result obtainable with a 10% decrease in production value	Maintaining the initial result when fixed expenses are reduced by 10%
Total production value	13,514.51	100	12,794	14,865.96	12,163.06	12,235.12
Variable expenses	10,754.32	79.58	10,180.88	11,829.75	9,678.89	9,736.23
Margin on variable expenses	2,760.19	20.42	2,613.01	3,036.21	2,484.17	2,498.89
Fixed expenses	2,613.01		2,613.01	2,613.01	2,613.01	2,351.71
Taxable income (gross result)	147.18		0.00	423.20	-128.84	147.18

Source: own calculations

Sheep

The expenditure estimates for sheep is presented in Table 5, showing that, as in dairy cows case, the expenses with forages

have the largest share in variable expenditures, 82.7% and total costs per sheep is 838.6 RON per year.

Table 5 - Estimate of expenses - sheep

Specification	Quantity kg/head/year;	Price RON/kg; RON/head	Value RON/head/year	Value per farm RON/farm
1. Feed expenses			581.6	575,937.6
Hay	144.0	0.67	97.1	97,113.6
Succulent fodder	350.0	0.40	141.6	141,624.0
Green fodder	1,200.0	0.13	161.9	161,856.0
Concentrates	120.0	1.46	175.3	175,344.0
Coarse fodder	50.0	0.11	5.6	
2. Biological material		409.3	68.2	68,219.3
3. Energy and fuel			21.08	21,075.4
4. Medicines and sanitary material			9.62	9,621.4
5. Other material expenses			11.77	11,768.3
6. Supply quota			9.9	9,891.0
7. Insurance			0.8	818.6
TOTAL VARIABLE EXPENSES			703.0	697,331.6
8. Labor costs			108.0	108,000.0
9. General expenses			10.4	10,383.6
10. Interest on loans			15.6	15,640.7
11. Depreciation			1.6	1,600.0
TOTAL FIXED EXPENSES			135.6	135,624.3
TOTAL EXPENSES			838.6	832,955.9

Notes: Source: own calculations, based on average input allocations of farms at national level and input prices on free market.

The income and expenditure budget for sheep shows that the results of the activities are negative, the loss being 9.2 RON/head (Figure 2).

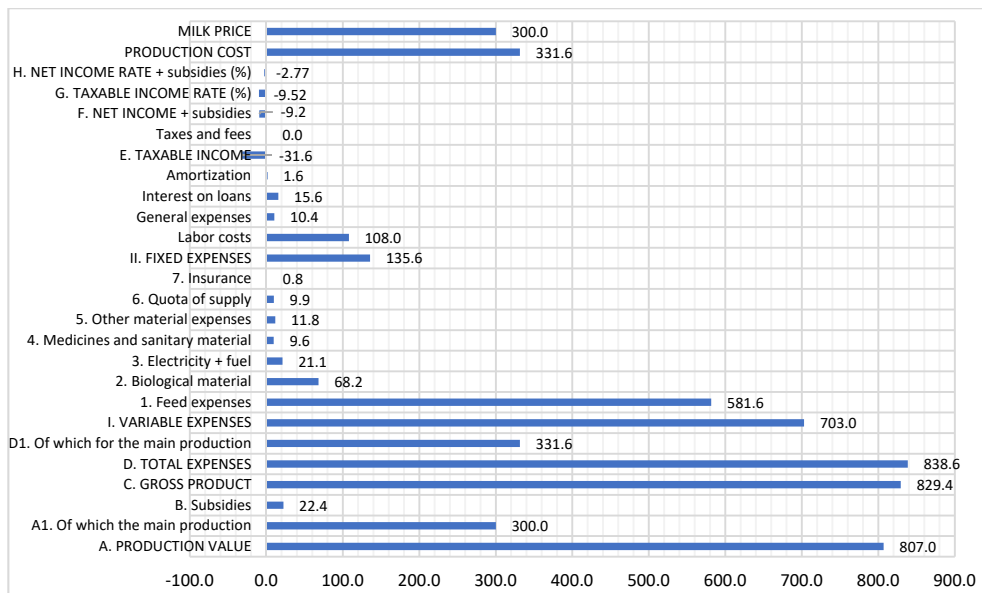


Figure 2 - The income and expenditure budget for sheep
Source: own calculations

In the first scenario for sheep, to obtain a profit, it is necessary that the production value increases by at least 31%. In this case, since the value of the secondary production (the value of the lamb and the reformation)

is higher than that of the main production (milk), the regulation of income can be done more easily compared to cow, where a much higher growth was required (Table 6).

Table 6 - Scenario simulation – increase in value of production

Indicators	Values	%	Breakeven point	Result obtainable at a 31% increase in production value	Result obtainable with a 20% decrease in production value	Maintaining the initial result when fixed expenses are reduced by 10%
Total production value	807.00	100	1052	1057.17	645.60	701.81
Variable expenses	702.95	87.11	916.28	920.87	562.36	611.32
Margin on variable expenses	104.05	12.89	135.62	136.30	83.24	90.49
Fixed expenses	135.62		135.62	135.62	135.62	122.06
Taxable income (gross result)	-31.58		0.00	0.68	-52.39	-31.58

Source: own calculations

The sheep farm can obtain a profit if the price of milk increases by 12%, the rate of net income with subsidies reaching 8.09% (Table 7).

Table 7- Scenario simulation – increase in producer milk price

Indicators	Values when increasing milk price by 12%	%	Breakeven point	Result obtainable with a 20% decrease in production value	Maintaining the initial result when fixed expenses are reduced by 10%
Total production value	843.00	100	816	674.40	761.36
Variable expenses	702.95	83.39	680.75	562.36	634.88
Margin on variable expenses	140.05	16.61	135.62	112.04	126.49
Fixed expenses	135.62		135.62	135.62	122.06
Taxable income (gross result)	4.42		0.00	-23.59	4.42

Source: own calculations

If the sheep farm owns enough land to produce fodder and stops buying it, the simulation of the scenario with a 10% reduction in feed expenses shows that the

farm achieves positive financial results (Table 8).

Table 8 - Scenario simulation – decrease in forages expenditures

Indicators	Values when decrease forages costs by 10%	%	Breakeven point	Result obtainable at a 10% increase in production value	Result obtainable with a 10% decrease in production value	Maintaining the initial result when fixed expenses are reduced by 10%
Total production value	807.00	100	640	887.70	726.30	742.97
Variable expenses	639.05	79.19	507.05	702.95	575.14	588.35
Margin on variable expenses	167.95	20.81	133.26	184.75	151.16	154.62
Fixed expenses	133.26		133.26	133.26	133.26	119.93
Taxable income (gross result)	34.69		0.00	51.49	17.90	34.69

Source: own calculations

Goats

The estimates of expenditures for goats indicates that total costs per year are of

1,528.5 RON, the large majority being variable costs, of which, forages expenditures have 85% (Table 9).

Table 9 - Estimate of expenses - goats

Specification	Quantity kg/head/year;	Price RON/kg; RON/head	Value RON/head/year	Value per farm RON/farm
1. Feed expenses			807.0	159,832.8
Hay	270.0	0.67	182.1	36,417.6
Succulent fodder	450.0	0.40	182.1	36,417.6
Green fodder	1600.0	0.13	215.8	43,161.6
Concentrates	150.0	1.46	219.2	43,836.0
Coarse fodder	70.0	0.11	7.9	
2. Biological material		409.3	68.2	13,643.9
3. Energy and fuel			25.09	5,017.7
4. Medicines and sanitary material			17.91	3,581.1
5. Other material expenses			12.79	2,558.2
6. Supply quota			13.4	2,679.5
7. Insurance			0.8	163.7
TOTAL VARIABLE EXPENSES			945.3	187,476.9
8. Labor costs			540.0	108,000.0
9. General expenses			14.0	2,793.1
10. Interest on loans			21.0	4,206.4
11. Depreciation			8.3	1,660.0
TOTAL FIXED EXPENSES			583.3	116,659.5
TOTAL EXPENSES			1,528.5	304,136.3

Notes: Source: own calculations, based on average input allocations of farms at national level and input prices on free market.

Comparing to the other two species, goats raising is a profitable activity and in

the present study the rate of taxable income is of 11%, the milk price being 4.5 RON/l (Figure 3).

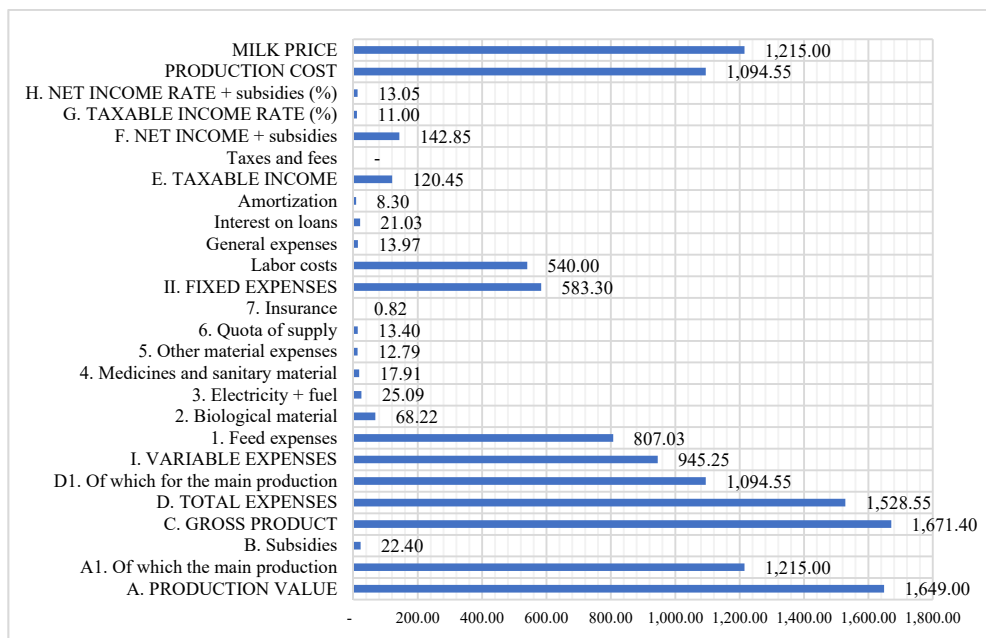


Figure 3 - The income and expenditure budget for goats
Source: own calculations

Scenario simulation shows that total production value is 1,649 RON/head and taxable income is of 120.45 RON/head

(Table 10). If the value of production decreases by 18%, the result will be a loss of 6.22 RON/head.

Table 10 - Scenario simulation – increase in value of production

Indicators	Values	%	Breakeven point	Result obtainable at a 10% increase in production value	Result obtainable with a 18% decrease in production value	Maintaining the initial result when fixed expenses are reduced by 10%
Total production value	1,649.00	100	1367	1,813.90	1,352.18	1,512.32
Variable expenses	945.25	57.32	783.47	1,039.78	775.11	866.91
Margin on variable expenses	703.75	42.68	583.30	774.12	577.07	645.42
Fixed expenses	583.30		583.30	583.30	583.30	524.97
Taxable income (gross result)	120.45		0.00	190.83	-6.22	120.45

Source: own calculations

DISCUSSIONS

Currently, the milk production sector is in a difficult period, due to the high prices of the inputs necessary for the development of farm activities and discouraging imports [6]. In these conditions, some farmers have reoriented to other activities. In the case of farms that have economic losses, it is necessary for the farmer to make a deeper analysis of the production conditions and the economic results and to find solutions for the continuity of the activity, keeping into account that profitability is a fundamental component of economic efficiency [11]. The restricted access to the market, as well as the limited availability of natural resources in the case of small farmers hinders their economic development and limits the intensification of the management of activities [5].

In the current study, by increasing the value of total production, the farm can go from loss to profit, and this implies both increasing the average milk production, delivery price, but also increasing the value

of the secondary production (the value of the calf/lamb/kid, recycled manure, and reform value). In the present case, the value of the secondary production is of 11.2% of the value of production in dairy cows, 62.8% in sheep and 26.3% in goats. The improvements in the feeding efficiency can be obtained with the integration of feeding models for different farms in different technology conditions [5].

CONCLUSIONS

The calculations from this study have demonstrated that, depending on the level of profitability of the farms, through effective management, farmers can have solutions to recover the economic situation. Thus, the farm's income can increase through direct marketing of milk to consumers, through investments in primary milk processing units, or valorization through milk dispensers. In the situation of the existence of the land necessary to produce fodder in the farm, the reduction of the largest

category of expenses - the expenses with fodder - is ensured.

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