

## Economic Analysis of Dairy Cattle Farms in Sivas Turkey

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### Abstract

This research aims to make economic analysis by considering the production activities of dairy cattle enterprises in Sivas Province, Turkey and to determine whether they are working profitably. This study was conducted in 80 dairy cattle farms, members of the Dairy Cattle Breeders Association of Sivas, in 2019-2020. Among the selected establishments, those with a maximum of 5 cows were defined as small-scale, those with up to 6-15 cows were medium-scale, and those with 16 or more cows were defined as large-scale enterprises. According to the results of the research, the percentage of cost items that comprise the cost consist of were as follows; 51.3% feed, 30.1% labor costs, 3.4% health expenses, 2.6% general administrative expenses, and 2.6% other expenses, respectively. Looking at examined the income items, milk income ranks first with 71.7%. This item is followed by calf income with 12.2%, an increase in inventory value with 11.4%, and state support with 4.6%. The average cost of 1 liter of milk was found to be \$ 0.19 in the study. When we look at the financial profitability, economic profitability, and profitability factors, it is seen that small-scale enterprises are located negatively position and the cost-to-return ratio of these enterprises is less than 1. These values show that small-scale farms' are not working profitably. In medium and large enterprises, these values are located in a positive area. It is seen that the ratio of cost to revenue in medium-sized enterprises is equal to "1", that these enterprises are in transition to the profit part, and in the analysis of the profitability parameters in large-scale enterprises, they have been seen located in the fully profitable region.

**Keywords:** Cost, Dairy Cattle, Economic Analysis, Profitability

### INTRODUCTION

Humanity has needed nutrition since its existence. Animal foods have become the top of the basic nutritional scale over time due to the important amino acids in it. Today, foods such as milk, meat, eggs, yogurt, butter play an active role in the daily diet. Livestock is an important sector in national animal husbandry policies in a country, especially due to the development of rural areas, helping the population to control migration mobility and supporting hidden employment. In this sector, dairy cattle farms have assumed an important role due to the added value they create.

Profitability is essential in dairy cattle farms. Today, these enterprises are negatively affected by increasing production costs. Besides, changes in policies, changes in consumer habits, crises, pandemics such as COVID-19, migration of the population from rural to urban, not finding qualified personnel, making profitable production more difficult.

Sivas is a province with large agricultural and pasture lands, traditionally animal-breeding culture, and intensive animal trade in the province. Because of all these features is an important province in terms of Turkey's livestock.

This study aims to determine whether the dairy cattle farms in Sivas are working profitably by making economic analysis.

### MATERIALS AND METHODS

This study was conducted in 80 dairy cattle farms, members of the Dairy Cattle Breeders Association of

Sivas. The dairy farms were chosen with a random sampling method from the 577 enterprises registered in the pedigree on the date of the study. Among the selected establishments, those with a maximum of 5 cows were defined as small-scale (n=30), those with up to 6-15 cows were medium-scale (n=30), and those with 16 or more cows were defined as large-scale enterprises (n=20) (Murat and Sakarya, 2012). Microsoft Excel (Microsoft Excel, 2007) program was used to evaluate the obtained information by processing it on the computer.

#### **Feed expenses**

Feed expenses in enterprises are evaluated separately as roughage and concentrate feed. Coarse and concentrated feeds purchased in the enterprise are included in the calculation with purchase prices. If the courtyard cost of the feed produced in the enterprise can be calculated, this value is included in the calculation, if it cannot be calculated, the value corresponding to 80 % of the market price is used (Günlü, 1997).

Formulas used;

For purchases; Quantity x Price (+ Shipping Transport cost)

For those produced; Courtyard cost = Market selling price - Estimated marketing costs

#### **Labor costs**

Labor costs were evaluated separately as family labor force and foreign labor force. Monthly payments made to the foreign workforce were evaluated according to the

declaration of the farms owner or at the minimum wage. The family workforce, on the other hand, was evaluated at the minimum wage after being converted to the adult male workforce unit (Erkuş et al., 1995).

#### **Veterinary medical expenses**

Veterinary service, artificial insemination, disinfection, vaccination, and medicine costs purchased together with the statements of the farms owners were evaluated together.

#### **Electricity and water expenses**

The amount of water used in the enterprises and the amount of electricity used for heating-lighting-milking units are calculated by multiplying the unit prices or by using the invoice information of the enterprise.

#### **Insurance expenses**

Insurance costs of live animals and buildings in the enterprise have been taken into account in accordance with the declaration of the breeder.

#### **Credit interests**

The foreign capital interest used for the enterprise has been examined. Interest rates were determined by comparing the grower's declaration with Ziraat bank interest rates and calculations were made accordingly.

#### **Inventory value change**

Heifers, calves, and bulls (Murat, 2011) were included in the calculation. Cattle older than 6 months are included in the inventory change. Those who are less than 6 months old are considered as calf income.

Formulas;  $IVC = YEVH + AVS + DAV - (VHBY + AVP)$

IVC = Inventory value change

YEVH = Year-end value of the herd

AVS = Animal value sold

DAV = Deceased animal value

VHBY = Value of a herd at the beginning of the year

AVP = Animal value purchased

If the change is negative, it is shown in the costs. If the result is calculated as positive, it is added to dairy farmers incomes.

#### **Milk cost for calves**

Calculated by multiplying the amount of milk given to calves by the liter price of the milk at that time.

#### **Live asset depreciation**

To calculate the economic wear of existing dairy cows; the butchery value of the cows was extracted from the breeding value of the cows, and then it was calculated by dividing it into its economic life (Açıl, 1977).

#### **Building and equipment depreciation**

"Correct line method" has been used to calculate the depreciation of buildings and equipment caused by wear and tear. In this method, it was obtained by subtracting the scrap value from the acquisition value adjusted for inflation and dividing it by its economic life (Gülten 1994).

$$\text{Annual depreciation} = \frac{\text{Current Acquisition Value} - \text{Scrap Value}}{\text{Economic Life}}$$

#### **Maintenance and repair costs**

The barn hay barn used for dairy cattle consisted of the expenditures made for maintenance and repair of the silo and caregiver buildings. In cases where the company does not have sufficient records regarding these expenditures, 1% of the acquisition price is maintenance; 2 % was accepted as a repair price (Açıl, 1977).

#### **Other expenses**

includes expenses such as transportation, communication, and stationery.

#### **Total sum of costs**

It consisted of feed, breeder heifer, labor, veterinary-health, maintenance-repair, depreciation, lighting-water, and other expenses. Cost of breeding heifers; It constitutes the sum of labor, feed and veterinary services and is evaluated within the total cost.

#### **Side income**

Fertilizer sales revenues consisted of the sum of calves revenues, inventory value increase, and revenues from government subsidies.

#### **Calf income**

It was obtained by multiplying calves less than six months by the market price in that region.

#### **Fertilizer sales income**

If there is fertilizer sales, it is obtained by multiplying the quantity sold by the unit price. If fertilizer is not sold or evaluated, it is not included in the accounts.

#### **State aids**

For that year, the amount of support received from the state was taken as a basis.

#### **Milk sales income**

Milk sales income, which constitutes a large part of the operating income, is obtained by multiplying the amount of milk produced and the unit sales price (local milk price is used).

#### **Total of revenues**

Consists of total milk sales and side income.

#### **Total cost**

It is obtained by subtracting the all of side income from the sum of expenses.

$$\text{Unit production cost} = \frac{\text{Sum of expenses (TL)} - \text{Total of side income (TL)}}{\text{Total milk produced (liters)}}$$

It was calculated as.

#### **Net profit/loss**

Calculated by subtracting total cost from milk sales income (Müftüoğlu, 1999).

#### **Economic Evaluation Rates**

##### **Profitability ratio**

Profitability ratio is one of the indicators of whether farms' are economically successful or not. In the enterprise, it is defined as the ratio of the profit obtained in a certain period to the capital used in the enterprise (Sakarya, 1982).

**Financial profitability**

This is also called "Equity Profitability". It is accepted as a measure of success in farms' and shows how much equity is used efficiently. It is expressed as the ratio of net profit obtained at the end of the production to equity of the same period. Financial profitability is calculated as follows (Alpugan et al., 1990);

$$\text{Fiscal Profitability} = \text{Net Profit} / \text{Equity}$$

**Economic profitability**

It is a measure of the extent to which economic resources used during production are used profitably and efficiently. It is the ratio of total net profit and passive capital interest total to active capital at the end of production.

$$\text{Economic Profitability} = \frac{\text{Net Profit} + \text{Passive Capital Interest}}{\text{Active Capital}} \times 100$$

**Cost-Revenue Ratio**

The cost-to-revenue ratio was calculated by looking at the ratio of the total sales income earned by the enterprises in a certain period to the sum of expenses in the same period (Müftüoğlu, 1999).

$$\text{Cost-to-Revenue Ratio} = \text{Total Sales Revenue} / \text{Total Costs}$$

If the cost to return ratio is equal to 1, it indicates the transition point to profit. If this ratio is greater than one, it means that the farms operates profitably, and that it is less than one indicates that the farms is in loss.

**Rantability factor**

It is calculated by dividing the sum of net profit and passive capital interest earned at the end of production by the sum of revenues.

**RESULTS**

Information on the economic analysis findings of the enterprises in which the study is conducted is presented in Table 1.

**Table 1:** Proportional distribution of economic analysis findings of enterprises according to their scales.

Income-Expense Items	Small scale	Medium scale	Large scale	Average
<b>1. Total feed cost</b>	40,9	55,9	57,1	<b>51,3</b>
<b>a) Concentrated feed purchased (%)</b>	56,3	55,9	56,4	56,2
<b>b) Purchased roughage cost (%)</b>	43,7	44,1	43,6	43,8
<b>2. Total workforce (%)</b>	41,8	25,0	23,5	<b>30,1</b>
<b>a) Foreign workforce amount (%)</b>	0,0	0,0	30,9	10,3
<b>b) Family workforce amount (%)</b>	100,0	100,0	69,1	89,7
<b>3. Health expenses (%)</b>	2,7	3,6	3,8	<b>3,4</b>
<b>4. Water cost (%)</b>	0,3	0,3	0,4	<b>0,3</b>
<b>5. Electrical cost (%)</b>	0,6	0,7	0,7	<b>0,7</b>
<b>6. Fuel cost (%)</b>	0,3	0,8	0,5	<b>0,5</b>
<b>7. Operating insurance cost (%)</b>	0,0	0,0	0,0	<b>0,0</b>
<b>8. Credit interest (%)</b>	0,3	0,6	0,5	<b>0,5</b>
<b>9. Milk given to the calves (%)</b>	0,3	0,4	0,3	<b>0,3</b>
<b>10. Inventory value decrease (%)</b>	3,4	2,2	0,1	<b>1,9</b>
<b>11. General administrative expenses (%)</b>	2,7	2,6	2,5	<b>2,6</b>
<b>12. Live depreciation of assets (%)</b>	2,0	2,2	2,6	<b>2,3</b>
<b>13. Equipment depreciation (%)</b>	0,6	0,7	0,6	<b>0,6</b>
<b>14. Equipment maintenance and repair costs (%)</b>	0,6	0,7	0,4	<b>0,6</b>
<b>15. Building amortizations (%)</b>	1,3	1,1	3,4	<b>1,9</b>
<b>16. Building maintenance and repair expenses (%)</b>	0,4	0,5	0,3	<b>0,4</b>
<b>17. Other (%)</b>	1,8	2,6	3,4	<b>2,6</b>
<b>18. GENERAL TOTAL OF COSTS</b>	100,0	100,0	100,0	<b>100,0</b>
<b>a) Milk income (%)</b>	69,1	73,6	72,5	<b>71,7</b>
<b>b) Calf income (%)</b>	16,4	10,8	9,4	<b>12,2</b>
<b>c) Increase in inventory value (%)</b>	9,9	10,5	13,8	<b>11,4</b>
<b>d) Subsidies (%)</b>	4,6	5,1	4,3	<b>4,7</b>
<b>19. REVENUE TOTAL</b>	100,0	100,0	100,0	<b>100,0</b>
<b>20.1 Liter Milk Cost (TL)</b>	2	1,2	0,7	<b>1,3</b>

While the highest proportion of cost items in the enterprises included in the research is labor costs with 41.8 % in small-scale enterprises, it is determined as feed expenses with 55.9 % and 57.1 % in medium and large-scale enterprises, respectively. While the second biggest expense of enterprises is feed with 40.9 % in small-scale enterprises, it constitutes 25.0 % and 23.5 %, respectively, in medium and large-scale enterprises had had labor costs.

Among the cost items in small-scale enterprises, labor force with 41.8 %, feed with 40.9 %, decrease in inventory value with 3.4 %, health expenses with 2.7 %, and general

administrative expenses with 2.7 %. The remaining 8.5 % consists of other expense items in the table.

In the medium-sized enterprises, among the cost items, the top five ranks are feed with 55.9 %, labor with 25.0 %, health expenses with 3.6 %, general administrative expenses with 2.6 %, and other expenses with 2.6 %. The remaining portion of 10.3 % is composed of other items in the table.

In large-scale enterprises, among the cost items, the top five ranks are feed with 57.1 %, workforce with 23.5 %, health expenses with 3.8 %, building depreciation with

3.4 %, and other expenses with 3.4 %. The remaining 8.8 % consists of other expenses in the table.

When income items are analyzed, milk income ranks first in small enterprises with 69.1 %. This is followed by calf income with 16.4 %, inventory value increase with 9.9 %, and government supports has with 4.6 %.

Looking at the same findings for medium-sized farms, milk income ranks first with 73.6 %. This is followed by calf income with 10.8 %, inventory value increase with 10.5 %, and government supports has with 5.0 %.

In the large-scale dairy farms income still ranks first with 72.5 %. This is followed by a 13.8 % inventory value increase, 9.4 % calf income, and 4.2 % government supports has.

Findings related to financial profitability, economic profitability, rantability factor, and cost-revenue ratio are presented in Table 2. When the economic rates of small-scale enterprises are analyzed, it is seen that they do not work profitably. The general values remain in the minus region and it is seen that the cost-to-product ratio is below 1. It is observed that the profitability situation has occurred in medium and large enterprises. When the cost-to-product ratio is analyzed, it is observed from the table that medium-sized enterprises make a profit and large-scale enterprises operate more profitably.

**Table 2:** Distribution of profitability findings according to farms'

Profitability Ratios	Small scale	Medium scale	Large scale
Financial profitability	-2,8	14,4	22,6
Economic profitability	-2,8	14,2	22,3
Rantability factor	-0,1	0,3	0,6
Cost - product ratio (o / I)	0,7	1,0	1,3

The percentage capital distribution in the enterprises in which the study was carried out within the scope of the project has generally appeared in a similar character (Table 3). In these calculations, land value has not included in the calculations. Because there were huge differences between the values of the lands where the enterprises are located. Since the lands of some enterprises were included in the zoning plan, the fair value was very high. This situation has increased the deviation value in calculations. The purpose of the calculations is not to calculate the value of the whole farms when it is sold, but to determine whether it operates economically under the current working conditions. In small and large enterprises, the largest share of capital is in equity capital, while in medium-sized enterprises, the largest part of capital is in active capital. The largest share in active capital is animal capital.

**Table 3:** Distribution of capital structure according to farms'

Capital Structure	Small scale	Medium scale	Large scale
<b>I. Active capital (%)</b>	49,2	49,6	48,7
a) Real estate capital (%)	12,1	8,4	21,3
b) Animal capital (Animal value at the end of the period) (%)	35,4	34,6	32,9
c) Equipment capital (tool, equipment) (%)	9,3	8,8	4,3
d) Material capital (feed, fuel oil) (%)	18,5	21,8	18,1
e) Bank and farms safe (any value of money spent) (%)	24,7	26,4	23,3
<b>II. Passive capital (debts, loans, etc.) (%)</b>	0,4	1,0	0,8
<b>III. Equity capital (%)</b>	50,4	49,4	50,5
Total Capital (%)	100	100	100

## DISCUSSION AND CONCLUSION

When the findings of the study are examined, feed expenses constitute the first place in the average cost items that make up the cost (51.3 %). In many previous studies, feed cost ranks first among cost elements (Günlü et al., 2001; Günlü and Sakarya, 2001; Çelik and Sarıözkan, 2017)

In the study, average labor cost takes the second place among the cost factors (30.1 %). This finding is in line with the work of Aktürk and his friends in 2010 (19.47 %) and the work of Türkyılmaz and Aras in 2002 (16.43 %).

The top five average cost items in the projects within the scope of the project are feed (51.3 %), labor expenses (30.1 %), health expenses (3.4 %), general administrative expenses (2.6 %) and other expenses ( 2.6 %).

Looking at the income items, milk income (71.7 %) ranks first. This item is followed by calf income with 12.2 %, an increase in inventory value with 11.4 %, and state support with 4.6 %.

In the study, the cost of 1 liter of milk was found to be \$ 0.19 (Central Bank of the Republic of Turkey dated

01.07.2020 dollar exchange rate are based on data) (TCMB, 2020). The value found was lower than in previous studies. In the past studies; \$ 0.28 from Yener and Oğuz (2014), 0.26 \$ from Yılmaz et al. (2016), 0.31 \$ from Oğuz and Yener (2017) and \$ 0.33 from Karakayacı (2020) the cost of as 1 liter of milk was found by. These values are compatible with the milk production cost of small enterprises (0,29 \$). The fact that the animal sales movement is active in the enterprises included in the study during the year, taking savings measures due to the course of the national economy during the study period, and changes in the dollar exchange rate explains the formation of these different values.

In general, it has been determined that as the enterprise-scale grows, productivity and profitability increase. Also, it has been observed that the genetic capacity of animals, fitness score values, the level of welfare of the shelter area, the suitability and technological features of the equipment used, the effective use of marketing channels have been directly proportional to the farm scale. These parameters are getting better as the farms

scale increases. It has been observed that farms' produce roughage in their structure and they are dependent on the outside in factory feed. Hay, meadow grass, clover, vetch has been generally producing as roughage.

The workforce has been becoming dependent on family members as the enterprise-scale gets smaller. As the scale of the farms grows, outsourced worker support also has been increasing. When the credit debt status of enterprises is analyzed, it is determined that 40% of small and medium-sized enterprises and 20 % of large-scale enterprises have credit debt. During the study period, it was learned that many farms' just ended their credit debt. Under normal circumstances, it has been declared by the enterprises' owner that more than half of the enterprises have credit debt almost every period. It was determined that the loans received were used to close the existing debts rather than farms development.

Looking at the income situation, it is mostly seen from milk sales with 71.7 % of the income. This is followed by a 11.4 % increase in inventory, subsidies with 4.6 %, and calf income with 12.2 %. As the other studies, milk income ranks first among the income items of the enterprises (Oğuz and Yener, 2017; Semerci et al., 2015; Bayramoğlu and Direk, 2006; Yılmaz et al., 2016; Demircan et al., 2006).

When we look at the financial profitability, economic profitability, and profitability factors, it is seen that small-scale enterprises are located negatively position and the cost-to-return ratio of these enterprises is less than 1. These values show that small-scale farms' are not working profitably. In medium and large enterprises, these values are located in a positive area. It is seen that the ratio of cost to revenue in medium-sized enterprises is equal to "1", that these enterprises are in transition to the profit part, and in the analysis of the profitability parameters in large-scale enterprises, they have been seen located in the fully profitable region.

When the profitability status of the enterprises was analyzed, it was determined that small-scale enterprises are not operating profitably. It was determined that the profitability rates of large and medium-sized enterprises are mostly in the positive area.

Livestock enterprises are established to make a profit. These farms owners would have to work at a minimum wage in the worst case to subsist their families if they were not a livestock enterprise. The current net minimum wage in Turkey is TL 2.943 (Aile ve Çalışma, 2020). When farms' are evaluated over this value; 6.7 % of small-scale enterprises, 73.3 % of medium-sized enterprises, and 100 % of large-scale enterprises were analyzed as profitable.

As a result of this research; Profitability increases as the enterprise-scale grows. Besides, labor productivity, feed efficiency, and efficient use of resources is also increasing. Family-type farms' are in a disadvantaged area at the point of earning money. For a profitable dairy cattle farms, it has to necessary to use resources effectively, use marketing channels correctly, determine the right management model, and plan the appropriate scale size. Family-type farms', mostly located in rural areas, are important both in terms of the added value they create and in supporting hidden employment in the country's economy. In this study, it was determined that family-type farms' suffer losses. The fact that these loss-making enterprises give up production and head towards cities will bring about different economic and social problems. In this regard, it would be meaningful to continuously provide technical and financial (grants, supports) support to such

enterprises by the relevant ministry in a certain order. Organizations that grants to livestock projects such as the Agricultural and Rural Development Support Institution are required to help family-type farms owners whose economic situation is not very good by taking facilitating measures to grow their farms'. Moreover, some banks give loans for the development of agriculture and animal husbandry in Turkey (especially Ziraat Bank). However, they want high mortgages to lend. For this reason, family-type farms' with low income cannot easily benefit from these loans. Facilitating measures by such organizations (such as banks) when granting loans to family farms owners will ensure that these farms', which are under hidden employment, remain in the sector and continue to create added value for the country's economy.

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#### Conflict of Interest

The author declare that there is no conflict of interest in the content of the article.

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