

## Milk production costs of dairy cattle farms; a case study from bafra district of Samsun Province, Turkey

Reception of originals: 09/10/2020  
Release for publication: 05/05/2021

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### **Abstract**

This study was carried out to conducting an economic analysis to determine the milk production costs of dairy cattle farms in Bafra district of Samsun province, Turkey. The data used in the study were obtained from the questionnaires conducted with 107 farms selected by simple random sampling method. The number of animals per farm was 39.19 animals and the ratio of dairy cattle in the total cattle number was 21.38%. The mean economic profitability rate of the farms was 4.33%, and financial profitability was 4.16%. The profitability factor of the farms was calculated 19.73%. Total amount of milk produced was 35964.94 L per farm and variable expenses constituted 78.03% of the dairy cattle production costs. The number of current dairy cattle was approximately 21.38 animals per farm and annual milk yield was calculated as 5.938.09 L per cattle. The results of the analysis of farms by groups indicated that average cost of 1 kg milk was 0.38 USD. The mean net profit per farm was determined as 6420.52 USD.

**Keywords:** Samsun. Milk Cost. Dairy Operations. Bafra Town. Economic Analysis.

### **1. Introduction**

Cattle is the most common bovine raised in the world and Turkey, and a large majority of milk production is met by dairy cattle (Aşkan and Dağdemir, 2016). The number of dairy cattle farms as of 2019 in Turkey was approximately 1112466. Forty percent of the dairy farms are small scale farms, which have 1 to 5 animals. Large-scale farms, which have more

than 50 cow constitute only 2.5% of the farms in Turkey. The scale of farms with the highest number of animals in 2019 was between 6 and 9 cows (ESK, 2020).

The value of milk production in animal production of Turkey is 41.20%. In 2017, milk production value increased by 18.50% compared to the previous year. The highest share in total milk production is drinking milk with 1.5 million tons and yogurt production with 1.17 million tons (TÜİK, 2020).

The number of bovine in Samsun province is more than 300 thousand units comprise about 2% of bovine presence of Turkey. Bafra district with approximately 50 thousand bovine constitutes 15% of the number of cattle in Samsun province and ranks the 1st in the province (TÜİK, 2020). The importance of the agricultural income of Samsun province in the Black Sea region economy, intensive plant and animal production in the region and especially the livestock activities carried out in the Bafra plain, which is one of the fertile plains, were important in determining the subject of the research.

The main purpose of the study was to determine the milk production cost in dairy cattle farms in Bafra district of Samsun province. The research conducted to reveal the status of the farms in the region is an original study in this discipline.

## 2. Literature Review

Several studies carried out to conduct an economic analysis of dairy cattle farms worldwide and also in different provinces of Turkey (Şahin et al., 2001; Tauer, 2001; Yılmaz et al., 2003; İçöz, 2004; Coşkun et al., 2005; Nizam and Armağan, 2006; Bayramoğlu and Direk, 2006; Koyubenbe and Candemir, 2006; Oliveira et al. 2006; Segala e Silva, 2007; Lopes et al., 2008; Silva et al., 2008; Tümer and Kumbasaroğlu, 2008; Demir and Aral, 2009; Gündüz and Dağdeviren, 2011; Keskin and Dellal, 2011; Tokmak et al., 2011; Murat and Sakarya, 2012; Külekçi, 2013; Michalickova et al., 2013; Demir et al., 2014; Souza, Rasia E Almeida, 2015; Özyürek et al., 2014; Ata and Yılmaz, 2015; Semerci et al., 2015; Aşkan and Dağdemir, 2016; Şahin and Gürsoy, 2016; Umamagesvari and Sivaram, 2017, Tapki, 2019).

Cost accounting provides useful information about the decision making process of managers in rural areas, and can be used by the companies outside the countryside, who needed such information (Segala e Silva, 2007). The cost accounting was defined as an accounting discipline used to determine, measure, store and deliver the costs of products, goods or services sold (Silva et al. 2008). Souza, Rasia and Almeida (2015) indicated that the

data gathered in some countries such as in Italy and the United States of America may also be used to generate more information.

Şahin et al (2001) reported the ratio of variable costs within the production costs of dairy cattle breeding in Adana province as 74.80%. The results indicated that dairy farming in the region is a profitable production branch, and the profitability is much higher especially in large farms. Significant differences were reported in labor, capital usage and annual activities between the funded and non-funded farms engaged in dairy cattle breeding in the Hatay province. In addition, a higher productivity level was obtained despite a relatively low production value (Yılmaz et al., 2003). Bayramoğlu and Direk (2006) calculated the ratio of variable costs within the production costs as 59.13%. The mean ratio of variable cost within the production costs was reported as 77.52% by Tapki (2019) who also determined the average milk production cost as 0.283 USD per liter.

Tauer (2001) conducted questionnaires with several dairy farms in New York and reported that most of the high costs in many small dairy farms were due to low productivity. Therefore, the researcher concluded that "productive small dairy farms can compete with large dairy farms in terms of cost per unit of milk production". Production cost for 50 cow farms was \$ 13.61 (45.5 kg milk), or \$ 0.299 per kg milk, which was more than the cost calculated for a 500 cow farm.

Şahin (2001) reported that the total milk production of the farms in Kayseri province was 697.294 kg/day, the average milk production per farm was 15.159 kg/day, and the ratio of feed cost within the total costs of the dairy cattle farms was 86.6%.

### 3. Material and Method

The research data were obtained from the dairy cattle farmers in Bafra district of Samsun province in July 2017 by a survey study. The sample size was determined using the simple random sampling method (Çiçek and Erkan 1996).

In the equation;

n: Sample size, N: Population (628), S: Standard deviation (9.11), t: Confidence interval (1.65), d: Acceptable error (0.10),  $\bar{x}$ : Mean (13.28).

The sample volume was determined by considering 10.0% margin of error and 99.0% confidence interval. The farms were divided into three groups based on the number of dairy cow per farm. Fifty out of 107 farms with 5 to 10 dairy cows were included into the 1st group

farm, 31 farms with 11 to 25 dairy cows were in the 2nd group farm, and the remaining 26 farms with 26 to 84 dairy cows were in the 3rd farm.

All the farms were evaluated together in the analysis of the annual activity results. Gross income, operating costs, actual costs, net income, agricultural income, disposable agricultural income, total family income and business functions were used to determine the degree of success. The profitability factor was calculated by the ratio of the net product to the gross income. Economic profitability was calculated as the ratio of net income to the active capital, and financial profitability was determined by subtracting the loan interest from the net revenue then adding the rent and sharecropper share and dividing it to the equity (Erkuş et al., 1995).

Milk production cost of the farms was calculated by subtracting the by-product income from the total milk production costs and dividing it to the total milk production.

#### 4. Results of the Study

The structure of the capital should be initially determined for profitable use of the capital (Açıl and Demirci, 1984). The capital was analyzed as active and passive capital considering the dairy cattle farm branch. The values and proportional distribution of the elements constituting the active capital by the farm groups surveyed were given in Table 1.

**Table 1: Value of active capital (USD/farm) and proportional distribution (%) in the farms surveyed**

Elements of Active Capital		Farm Groups						Mean Values of Farms (107)	
		1.Group (50)		2.Group (31)		3. Group (26)			
		Value	%	Value	%	Value	%	Value	%
Total of land capital		86654.70	67.70	116821.71	53.58	925257.97	72.55	299167.43	69.12
Fixed assets of the farms	Animal	34520.71	26.97	85056.35	39.01	264606.16	20.75	105070.49	24.27
	Tool and machine	2940.51	2.30	8980.43	4.12	61000.75	4.78	18798.49	4.34
	Total	37461.22	29.27	94036.78	43.13	325606.91	25.53	123868.98	28.61
Return assets of the farm	Material	2390.45	1.87	4040.48	1.85	11240.46	0.88	5018.97	1.16
	Available money/ credit	1482.72	1.16	3132.13	1.44	13245.80	1.04	4818.91	1.11
	Total	3873.17	3.03	7172.61	3.29	24486.27	1.92	9837.88	2.27
Total capital of the farm		41334.39	32.30	101209.39	46.42	350093.18	27.45	133706.85	30.88
Grand total		127989.09	100.00	218031.10	100.00	1275351.15	100.00	432874.28	100.00

Average active capital per farm was determined as 432874.28 USD of which 30.88% was farm capital and 69.12% was land capital. The active capital per farm increased with the increasing number of animals in the farms. The total value of farm capital in the active capital of the first group farms which had the lowest number of animals was 41334.39 USD. The total value of farm capital in the second group farms with more animals than the first group was 101209.39 USD and the farm capital in the third group farms with the highest number of animals was 350093.18 USD.

The loans obtained by the external sources related to agricultural production, the land value obtained by sharecropping and tenancy, the value and proportional distribution of the passive capital consisting of the total equity capital (Aras, 1988) were given in Table 2.

**Table 2: Values (USD/farm) and proportional distributions (%) of the passive capital of the farms surveyed**

	Farm Groups						Mean Values of Farms (107)	
	1. Group (50)		2. Group (31)		3. Group (26)		Value	%
	Value	%	Value	%				
Foreign Capital	2004.53	1.57	2618.11	1.20	7576.84	0.59	3536.31	0,82
Equity Capital	125984.56	98.43	215412.99	98.80	1267774.31	99.41	429337.97	99.18
Grand total	127989.09	100.00	218031.10	100.00	1275351.15	100.00	432874.28	100.00

Almost all (99.18%) of the farms surveyed in the study consisted of equity capital. The total passive capital of the farms was calculated as 432874.28 USD and the lowest ratio (0.08%) in the passive capital was from the tenancy of the lands. The results revealed that the dairy farms in the region mostly use their equity capital.

**Table 3: Milk yield (L/farm/year) of the farms surveyed**

	Farm Groups			Averages of the Farms (107)
	1.Group (50)	2.Group (31)	3.Group (26)	
Milk (liter)	35 462.20	89 495.16	347 571.53	126 956.26
Lactation Period (day)	274.60	277.74	275	275.60
Milk Production in a Lactation Period (L/farm)	129.14	322.23	1263.90	460.64
Daily Milk Production (L/Animal)	19.33	18.30	23.34	21.55
Annual Milk Production Per Cow	5 308.71	5 082.06	6 418.68	5 938.09

Annual total milk production per farm in dairy farms was 126956.26 L. Average annual milk production per cow was 5938.09 L, and the average daily milk production per cow was 21.55 L (Table 3). Average annual milk production per cow in Adana province was

reported as 4580.81 L (Yılmaz and Gül, 2010), 3255 L in Bafra district of Samsun province (Gündüz and Dağdeviren, 2011), 5832.47 L in Balya district of Balıkesir province (Birsin, 2012) and 4927 L in Nazilli district of Aydın province (Armağan, 1999).

The outcomes of annual activities were examined to reveal the success status of the farms. The elements that constitute the gross revenue of the farms surveyed were given in Table 4.

**Table 4: The gross revenue value per farm (USD/farm) and proportional distributions (%) of the farms surveyed**

		Farm Groups						Averages of the Farms		
		1. Group (50)		2. Group (31)		3. Group (26)		Farms (107)		
		Value	%	Value	%	Value	%	Value	%	
Animal products	Dairy Caw	Milk	8287.93	24.14	19490.27	27.30	103781.49	43.28	34737.51	36.57
		Cheese	829.22	2.41	6144.72	8.61	22984.91	9.58	7752.85	8.16
		Yoghurt	2078.50	6.05	5529.10	7.75	16458.81	6.86	6572.49	6.92
		Butter	4137.65	12.05	13747.65	19.26	28947.70	12.07	12950.46	13.63
		Dairy Caw	15333.30	44.65	44911.74	62.92	172172.91	71.79	62013.32	65.28
	Poultry (Egg)	27.02	0.09	185.65	0.26	134.32	0.05	99.05	0.10	
	Total	15360.32	44.74	45097.39	63.18	172307.23	71.84	62112.37	65.38	
Plant Products		11137.82	32.44	8529.55	11.95	40063.46	16.71	17410.81	18.33	
Service income	Equipment-machine rental	856.66	2.49	1041.76	1.46	2629.66	1.10	1341.11	1.41	
Inventory Value Increases		6126.35	17.84	15630.53	21.90	23088.64	9.63	13001.58	13.69	
Residence rental cost		856.66	2.49	1085.62	1.51	1722.59	0.72	1133.41	1.19	
Grand total		34337.81	100.00	71384.85	100.00	239811.58	100.00	94999.27	100.00	

The livestock production asset of the farms was calculated as 65.28%, plant production asset was 18.33%, service income asset was 1.41%, inventory increase asset was 13.69% and residence rent was 1.19%. The ratio of gross income to active capital, which was average of 21.95% for the farms surveyed, was determined as 26.83% for the first group farms, 32.74% in the second group farms and 18.80% in the third group farms.

The ratio of animal production value was very high within the gross product of the farms examined. In similar studies on dairy cattle farms, animal production value within the gross production value was reported as 42.57% (Bayramoğlu, 2003), 79.46% (Gündüz and Dağdeviren, 2011), 58.05% (Aydemir, 2019) and 83.00% (Semerci et al., 2015).

The values and proportional distributions of operating costs for the farm groups surveyed were given in Table 5.

Gözener, B.; Mollaoğlu, E.

**Table 5: The value of operating costs per farm (TL/farm) and proportional distribution (%) of the farms surveyed**

		Farm Groups						Averages of the Farms (107)	
		1. Group (50)		2. Group (31)		3. Group (26)			
		Value	%	Value	%	Value	%	Value	%
Labor Costs	Foreign Labor	496.32	1.64	1210.82	2.25	9145.78	4.78	2805.06	3.68
	Family labor for wage	5837.39	19.26	6488.16	12.06	6764.00	3.53	6251.09	8.20
	Total	6333.71	20.90	7698.98	14.31	15909.78	8.31	9056.15	11.88
Material Costs	Plant Production	359.99	1.19	2241.76	4.17	11257.20	5.88	3553.09	4.66
	Feed (cattle)	5638.01	18.60	13761.62	25.57	36921.43	19.30	15593.16	20.45
	Feed (small ruminants)	403.23	1.33	2833.09	5.26	3914.58	2.05	1960.43	2.57
	Salt cost	8.49	0.03	4.09	0.01	3.87	0.00	6.09	0.01
	Chain-halter	34.84	0.11	90.47	0.17	140.28	0.07	76.58	0.10
	Vitamin-mineral	5.64	0.02	25.69	0.05	300.24	0.16	83.03	0.11
	Disinfection	211.61	0.70	319.84	0.59	1380.80	0.72	527.07	0.69
	Animal purchase value	11014.42	36.33	15192.36	28.23	87154.07	45.55	30726.08	40.29
Total	17676.24	58.31	34468.92	64.05	141072.46	73.73	52525.53	68.88	
Marketing Costs		415.30	1.37	1606.96	2.99	3655.48	1.91	1547.88	2.03
Other Current Costs		3774.96	12.45	5699.82	10.59	21435.21	11.20	8623.90	11.32
Depreciation		2113.55	6.97	4337.25	8.06	9277.08	4.85	4498.47	5.89
Total Operating Costs		30313.75	100.00	53811.93	100.00	191350.01	100.00	76251.94	100.00

The operating costs of the farms consist of labor, material, marketing, other current costs and depreciation cost. The ratio of material costs in operating costs was 68.88%, the labor cost was 11.88%, the other current cost was 11.32%, the depreciation cost was 5.89% and the marketing cost was 2.03%. Labor costs, which were consisted of foreign labor and family labor were 11.88%. The results revealed that the majority of farms in the region were family farms. The share of family labor in total labor cost was 8.20%, and the foreign labor cost was 3.68%.

The distribution of material cost was as follow; animal purchase value was 40.29%, cattle feed purchase cost was 20.45%, plant production cost was 4.66%, disinfection cost was 0.69%, ovine animals feed purchase cost was 2.57, salt cost was 0.10% and vitamin mineral cost was 0.11%. In the similar studies, the feed costs and labor costs were reported as 3.63 and 40.86% in Niksar district of Tokat province (Yeteroğlu, 2010), and 34.70 and 18.84% in Şavşat district of Artvin province (Aydemir, 2019).

**Table 6: Actual costs (USD/farm) of farms surveyed**

	Farm Groups			Averages of the Farms (107)
	1. Group (50)	2. Group (31)	3. Group (26)	
Total Operating Costs (A)	30313.75	53811.93	191350.01	76251.94

Gözener, B.; Mollaoğlu, E.

Family Labor for Wage (B)	5837.39	6488.16	6764.00	6251.09
Rents and Shareholder Share (C)	0.00	102.90	527.89	158.08
Loan Interests (D)	400.85	381.07	3050.77	1039.03
Total of Actual Costs [(A-B)+(C+D)]	24877.21	47807.73	188164.68	71197.96

The results of the surveys conducted with the farms indicated that the actual costs calculated for the first group farm was 24877.21 USD, in the 2nd group farms was 47807.73 USD and in the third group farms was 188164.68 USD (Table 6).

In the farm analysis, net revenue is used for comparisons between the farms (Erkuş et al., 1995). The net revenue obtained in the farms surveyed was given in Table 7.

**Table 7: Net income (USD/farm) of the farms surveyed**

	Farm Groups			Averages of the Farms (107)
	1. Group (50)	2. Group (31)	3. Group (26)	
Gross Revenue (A)	34337.81	71384.85	239811.58	94999.27
Operating Costs (B)	30313.75	53811.93	191350.01	76251.94
Net Income (A-B)	4024.05	17572.92	48461.57	18747.33

The net income per farm in the first group farms was 4024.05 USD, 17572.92 USD in the second group farms and 48461.57 USD in the third group farms.

**Table 8: Agricultural income (USD/farm) of the farms surveyed**

	Farm Groups			Averages of the Farms (107)
	1. Group (50)	2. Group (31)	3. Group (26)	
Gross Revenue (A)	34337.81	71384.85	239811.58	94999.27
Actual Costs (B)	24877.21	47807.73	188164.68	71197.96
Agricultural Revenue (A-B)	9460.60	23577.12	51646.90	23801.31

The agricultural revenue of the farms surveyed increased with the size of the farms, and the agricultural revenue per farm in the 1st group farms was 9460.60 USD followed by the 2nd group farms as 23577.12 USD and the 3rd group farms as 51646.90 USD (Table 8). The rates of economic profitability, financial profitability and profitability factor of the farms were given in Table 9.



Gözener, B.; Mollaoğlu, E.

**Table 9: Profitability rates (%) of the farms surveyed**

	Farm Groups			Averages of the Farms (107)
	1. Group (50)	2. Group (31)	3. Group (26)	
Economic Profitability	3.14	8.06	3.80	4.33
Financial Profitability	2.88	1.74	3.62	4.16
Profitability Factor	11.72	24.62	20.21	19.73

The ratio of net income to active capital in the first group farms was 3.14%, 8.06% in the second group farms, 3.80% in the third group farms and the average of the farms was 4.33%. The financial profitability was calculated as 4.16% and the profitability factor was as 19.73%. The farms earn an average of 4.16 USD profit for every 100 USD of equity and 19.73 USD of each 100 USD of gross product was gross income (pure product). Lower financial profitability compared to the economic profitability indicates inefficient use of the equity (Aydın and Unakıtan, 2016). The results showed that the financial profitability ratio was lower than the economic profitability in all the farm groups surveyed.

In a similar study, Bayramoğlu (2003) calculated the economic profitability ratio as 4.19%, the financial profitability ratio as 2.41%, the profitability factor as 19.21%, the economic profitability ratio as 1.24%, the financial profitability ratio as 0.93% and the profitability factor as -0.01%. In another study, Murat and Sakarya (2012) reported the financial profitability ratio in 2007 as 0.54%, the economic profitability ratio as 1.08%, the profitability factor as 0.02 and the cost-income ratio as 1.07%, and in 2008 aforementioned ratios were determined as 0.93, 1.24, -0.01 and 1.11, respectively.

The products produced in the farms can be consumed inside and outside the farms, as well as used as processed. The amount of milk produced in the farms and the types of usage were given in Table 10.

**Table 10: The amount of milk production (kg) and proportional distribution (%) of the farms surveyed**

	Farm Groups						Averages of the Farms (107)	
	1.Group (50)		2.Group (31)		3.Group (26)			
	kg	%	kg	%	kg	%	kg	%
Used in the Farms	10012.60	28.23	35277.11	39.42	94639.23	27.23	37895.70	29.85
Consumed in the Family	1523.20	4.30	1781.93	1.99	2353.46	0.68	1799.91	1.42
Sold	23926.40	67.47	52436.12	58.59	250578.84	72.09	87260.65	68.73

Gözener, B.; Mollaoğlu, E.

Total Produced	35462.20	100.00	89495.16	100.00	347571.53	100.00	126956.26	100.00
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Total amount of milk produced in the farms surveyed was calculated as 126956.26 kg per farm of which 68.73% is sold to outside, 29.85% is processed and used in the farm and 1.42% is allocated for consumption within the family. The milk in the farm is processed to make cheese (13.60%), yogurt (69.78%) and butter (16.62%) (Table 3.11).

**Table 11: The type of usage and proportional distribution (%) of milk production in the farms surveyed**

		Farm Groups						Averages of the Farms (107)	
		1.Group (50)		2.Group (31)		3.Group (26)		Kg	%
		Kg	%	Kg	%	Kg	%		
Type of Usage in the Farm	Cheese	127.98	4.98	875.32	11.28	3 660.92	16.49	1 202.97	13.60
	Yoghurt	1 956.60	76.13	5 355.80	69.02	15250	68.69	6 171.59	69.78
	Butter	485.50	18.89	1 528.65	19.70	3 290.96	14.82	1 469.42	16.62
	Total	2 570.08	100.00	7 759.77	100.00	22 201.88	100.00	8 843.98	100.00

Dairy cattle production costs of the farms surveyed were given in Table 12. The average production costs per farms was USD 47953.34, of which 78.03% consists of variable costs and 27.97% consists of fixed costs. The largest share among the variable costs was feed obtained from outside the farm with 45.15% followed by feed provided in the farm with 17.97%, veterinary and medicine costs with 6.84%, labor cost with 6.66%, transportation cost with 0.83% and salt cost with 0.01%. Variable expenses were calculated as 9043.82 USD in the 1st group, 26438.60 USD in the 2nd group, and 105080.44 USD in the 3rd group. The results revealed that operating variable costs increase with the increase in farm size (Table 12).

**Table 12: Dairy cattle production costs and proportional distribution of the farms surveyed (%)**

		Farm Groups						Averages of the Farms (107)	
		1.Group (50)		2.Group (31)		3.Group (26)		Value	%
		Value	%	Value	%	Value	%		
Variable costs (A)	Feed from outside the farm	6826.63	52.41	17480.29	51.18	55924.15	42.50	21843.44	45.55
	Feed obtained in the farms	1011.95	7.77	4552.16	13.33	28095.36	21.35	8618.63	17.97
	Salt cost	8.49	0.07	4.09	0.01	3.87	0.00	6.09	0.01
	Veterinary medicine cost	797.73	6.13	3467.67	10.15	7830.63	5.95	3280.20	6.84
	Labor (maintenance) cost	232.15	1.78	370.10	1.08	12263.53	9.32	3195.63	6.66
	Transportation cost	132.01	1.01	473.82	1.39	822.62	0.63	398.85	0.83
	Chain-halter cost	34.84	0.28	90.47	0.26	140.28	0.11	76.58	0.15
	Total	9043.82	69.45	26438.60	77.40	105080.44	79.86	37419.43	78.03
Fixed Costs (B)	General Administration Costs (A*0.03)	271.31	2.08	793.16	2.32	2047.60	1.56	854.12	1.78
	Building capital depreciation	1104.40	8.48	1482.14	4.34	5042.87	3.83	2170.85	4.53
	Building capital interest	1349.29	10.36	1991.00	5.83	9135.98	6.94	3427.30	7.15
	Building capital maintenance	312.46	2.40	491.18	1.44	1572.24	1.19	670.35	1.40

Gözener, B.; Mollaoğlu, E.

Cow depreciation	440.85	3.38	556.52	1.63	1205.05	0.92	660.06	1.38
Cow capital interest	456.02	3.50	1223.27	3.58	3892.73	2.96	1513.40	3.16
Equipment-machine capital depreciation	38.25	0.29	1098.88	3.22	2840.27	2.16	1026.40	2.14
equipment-machine capital interest	8.30	0.06	79.97	0.24	758.85	0.58	211.44	0.43
Total	398089	30.55	7716.11	22.60	26495.58	20.14	10533.91	21.97
Total Production Costs (A+B)(C)	130305.16	100.00	34154.72	100.00	131576.02	100.00	47953.34	100.00

The highest share of fixed costs was the building capital interest with 7.15%. Other important costs included in the fixed costs were building capital depreciation with 4.53%, cow capital interest with 3.16%, equipment-machine capital depreciation with 2.14%, building capital maintenance cost with 1.40%, cow depreciation with 1.38%, and equipment-machine capital interest with 0.43% (Table 12).

In a similar study, Turan (1997) stated that 68.5% of the production costs per farm consisted of variable costs, 57.0% was from the feed and 8.0% was from the capital depreciation. Bayramoğlu and Direk (2006) determined that 59.13% of the production costs per farm consisted of variable costs, while Gündüz and Dağdeviren (2011) found that 74.58% of the production costs consisted of variable costs.

**Table 13: Dairy farm activity production values (USD/farm) and proportional distributions (%) of the farms surveyed**

	Farm Groups						Averages of the Farms (107)	
	1.Group (50)		2.Group (31)		3.Group (26)		Value	%
	Value	%	Value	%	Value	%		
Milk production value	11914.50	97.00	31690.92	89.06	140800.93	89.27	48962.31	90.05
Inventory value increase-Dairy Cattle	368.27	3.00	3892.89	10.94	16920.90	10.73	5411.56	0.95
Grand Total	12282.77	100.00	35583.81	100.00	157721.83	100.00	54373.87	100.00

Total value of dairy cattle activities per farm was calculated as 54373.87 USD of which the milk production value was 48962.31 USD and corresponded to 90.05% of the total value. The value of milk production activity in the 1st group farms was calculated as 12282.77 USD, in the 2nd group farms as 35583.81 USD, in the 3rd group farms as 157721.83 USD (Table 13).

The cost per unit of milk production in the dairy cattle farms was given in Table 14.

**Table 14: Cost for unit milk production of the dairy cattle farms surveyed**

	Farm Groups			Averages of the Farms (107)
	1.Group (50)	2.Group (31)	3.Group (26)	
Total production costs (USD) (A)	13024.70	34154.72	131576.02	47953.35
Amount of milk produced (kg) (C)	10045.95	25352.74	98462.19	35964.94
(USD/kg) (A/C)	0.37	0.38	0.38	0.38

The production cost of 1 kg milk was calculated as 0.37 USD for the 1st group farms and 0.38 USD for the 2nd and 3rd group farms. In similar studies on dairy farms, the cost of 1 kg milk production was reported as 0.61 TL/L in Bafra district of Samsun province (Gündüz and Dağdeviren, 2011), 0.35 TL/L in Turhal district of Tokat province (Tümer and Birinci, 2011), and in Bayburt, Erzincan and Erzurum provinces which were included in the TRA1 Level 2 Region were 0.62, 0.54 and 0.60 TL/L, respectively (Aşkan and Dağdemir, 2016).

Net profits per farm in dairy cattle production of the farms surveyed were shown in Table 15.

**Table 15: Net profit per farm in dairy cattle production of the farms surveyed**

	Farm Groups			Averages of the Farms (107)
	1.Group (50)	2.Group (31)	3.Group (26)	
	Value	Value	Value	Value
Gross production value (USD/Farm) (A)	12282.77	35583.81	157721.83	54373.87
Production costs (USD/Farm) (B)	13024.70	34154.72	131576.02	47953.35
Net Profit (USD) (A-B)	-741.93	1429.10	26145.80	6420.52

The results showed that net profit per farm increased with the increase in the farm size. Net profit was calculated as 741.93 USD for the first group farms, 1429.10 USD for the second group farms, 26145.80 USD for the third group farms, and the average net profit of the farms was 6420.52 USD.

The net profit per farm calculated using variable costs in dairy cattle production of the farms surveyed were given in Table 16.

**Table 16: Net profit per farm calculated using variable costs in dairy cattle production of the farms surveyed**

	Farm Groups			Averages of the Farms (107)
	1.Group (50)	2.Group (31)	3.Group (26)	
	Value	Value	Value	Value
Gross production value (USD/Farm)	12282.77	35583.81	157721.83	54373.87
Variable costs (USD/Farm)	9043.82	26438.60	105080.44	37419.43
Net profit (USD) (A-B)	3238.95	9145.21	52641.39	16954.44

The farms appear profitable when fixed costs, which are not actually spent by the producer, are not included in the calculations. Therefore, the results cause farms owners to

continue breeding for coming years. Net profit was calculated as 3238.95 USD for the 1st group farms, 9145.21 USD for the 2nd group farms, 52641.39 USD for the 3rd group farms, and the average net profit of the farms was 16954.44 USD.

## 5. Conclusion

In this study, the annual activity outputs, capital structures, active and passive capitals, profitability, debts and costs of the dairy farming enterprises in Bafra district of Samsun province were determined. The average active capital per farm for the farms surveyed was calculated as 432874.28 USD. The average share of animal capital in active capital was determined as 24.27%.

Average annual total milk production per farm in dairy farms surveyed was calculated as 126956.26 kg. The highest production among the products obtained in the dairy cattle farms was yogurt with 6171.59 kg per year, followed by butter with 1469.42 kg per year. Cheese production had the lowest share among the dairy products with 13.60%. Animal production value among the performance indicators had a very high share (65.28%) in gross output.

The share of cattle feed costs in the operating costs was 20.45%. The total amount of milk produced in the farms surveyed was calculated as 126956.26 kg per farm, and the average production cost per farm was calculated as 47953.34 USD. The cost of 1 kg milk was determined as 0.38 USD when the farms were evaluated within the groups. The average net profit per farm was determined as 6420.52 USD.

Some recommendations can be made based on the results of the research and the observations obtained during the stages of the study. The most common problems faced by farms are high animal purchase prices, high input and feed prices, difficulty in animal care and lack of labor. Therefore, a detailed study should be carried out by the relevant institutions and producer organizations and the aforementioned problems of the farms should be eliminated.

The results of the research showed that the producers did not have problems with milk production and they processed milk into butter, cheese and yoghurt to increase their income.

Producers should be trained on better revenue-generating processes and marketing methods, and they should be encouraged to establish producer associations to support producers in all areas. Support should also be provided to producers to increase the herd sizes and reduce input and production costs.

## 6. References

AÇIL, A. F.; DEMİRCİ, R. Agricultural economics lectures. Ankara University Faculty of Agriculture, 1984.

ARAS, A. Agricultural Accounting. Ege University Faculty of Agriculture, Publication No: 486, Bornova-İzmir, 1988.

ARMAĞAN, G. A Research on Structural Characteristics and Planning of Dairy Cattle Farms: Nazilli Ör Coop Case Study, E.Ü. Doctoral Thesis, Bornova, 1999.

AŞKAN, E.; DAĞDEMİR, V. Milk Production Cost and Profitability in Dairy Cattle Farms Receiving Support and Incentives in TRA1 Level 2 Region. *Journal of Agricultural Economics Research*, v. 2, n. 1, p. 1-12, 2016.

ATA, N.; YILMAZ, H. Reflections of Implementations of Livestock Production Support Policies On Dairy Farms in Turkey: The Case of Burdur Province. Süleyman Demirel University. *Journal of Agricultural Faculty*, v. 10, n. 1, p. 44-54, 2015.

AYDEMİR, A. Economic Analysis of Dairy Cattle Farms: The Case of Artvin Şavşat District, Unpublished Master's Thesis. 2019.

AYDIN, B.; UNAKITAN, G. Comparative economic analysis of agricultural farms active in the Thrace Region. *Anatolian Journal of Agricultural Sciences*, v. 31, n. 2, p. 223, 2016.

BAYRAMOĞLU, Z. Economic Analysis of Farms within the Scope of Dairy Cattle Project in Konya Province. Master Thesis, Selcuk University, Institute of Science, Konya. 2003.

BAYRAMOĞLU, Z.; DIREK, M. The Econometric Analysis of Dairy Farms Which Members of Development Cooperatives In Konya Province. *Selçuk Journal of Agriculture and Food Sciences*, v. 20, n. 40, p. 12-20, 2006.

BİRSİN, S. Current situation, problems and solution suggestions of dairy cattle farming in Balya district of Balıkesir province (Master's thesis, Gaziosmanpaşa University, Institute of Science). 2012.

COŞKUN, H.; TUNÇTÜRK, Y.; ALTINDAĞ, S.; DEMİR, A. 2005. Available Status, Problems and Suggestions for Dairy Plants in Van. *Yüzüncü Yıl University, Journal of Agricultural Sciences*, v. 15, n. 1, p. 11-15, 2005.

ÇİÇEK, A.; ERKAN, O. Agricultural Economics Research and Sampling Methods. Gaziosmanpaşa University, Faculty of Agriculture Publications, No: 12, 188 p, Tokat. 1996.

DEMİR, P.; ARAL, S. The faced problems and solution proposals of dairy farms in Kars province. *Turkish Veterinary Medical Society*, v. 80, n. 3, p. 17-22, 2009.

DEMİR, P.; YILMAZ, A.; SARIÖZKAN, S. Socio-Economic Structure and Production Costs of Dairy Cattle Farms in Kars Province. *Yüzüncü Yıl University Journal of Veterinary Faculty*, v. 25, n. 1, p. 1-6, 2014.

ERKUŞ, A.; BÜLBÜL, M.; KIRAL, T.; AÇIL, A. F.; DEMİRCİ, R. T. Agricultural Economics. Ankara Faculty of Agriculture Education Research and Development Foundation Publications, No: 5, Ankara. 1995.

ESK. 2019 Sector Assessment Report  
[https://www.esk.gov.tr/upload/Node/10255/files/2019\\_Yili\\_Sektor\\_Degerlendirme\\_Raporu.pdf](https://www.esk.gov.tr/upload/Node/10255/files/2019_Yili_Sektor_Degerlendirme_Raporu.pdf) E.T. 02.06.2020. 2020.

GÜNDÜZ, O.; DAĞDEVİREN, M. Determination of milk cost and functional analysis of factors affecting production in Bafra district. *Yüzüncü Yıl University Journal of Agricultural Sciences*, v. 21, n. 2, p. 104-111, 2011.

İÇÖZ, Y. *The Analysis of Profitability and Productivity of Dairy Cattle Enterprises in Bursa Province*. Agricultural Economy Research Institute, No: 166, ISBN: 975-407-148-9. 2004.

KOYUBENBE, N.; CANDEMİR, M. Comparison of the Technical Efficiencies of Dairy Farms in Ödemiş, Tire, Bayındır and Torbalı Districts, the Basin of Küçük Menderes. *Journal of Animal Production*. v. 47, n. 2, p. 9-20, 2006.

KÜLEKÇİ, M. Efficiency Analysis of Dairy Cattle Farms: Case Study in Erzurum. Atatürk Univ., *J. of the Agricultural Faculty*, v. 44, n. 2, p. 103-109, 2013.

LOPES, M.A.; CARDOSO, M.G.; CARVALHO, F.M.; LIMA A.L.R.; DIAS, A.S.; CARMO, E.A. Economical results of milk production systems in Lavras region (MG) throughout the years 2004 and 2005: a multicase study. *Arquivo Brasileiro de Medicina Veterinaria e Zootecnia*, v. 60, n. 2, p. 428-435, 2008.

MICHALICKOVA, M.; KRUPOVA, Z.; KRUPA, E. Technical Efficiency and its determinants in dairy cattle. *Review of Agricultural and Economics*, v. 16, n. 1, p. 2-11, 2013.

MURAT, H.; SAKARYA, E. The economic analysis of dairy cattle enterprises in Centre Anatolia Region which members of cattle breeders association of Turkey. *Journal of Turkish Veterinary Medical Society*, v. 83, n. 1, p. 5-14, 2012.

NİZAM, S.; ARMAĞAN, G. Determination of the productivity of dairy farms for the market in Aydın (Master's thesis, Adnan Menderes University Institute of Science). 2006.

OLIVEIRA, C. A.; ALMEIDA, J.C. DE C.; PIMENTEL, F. J.; LINHARES, M. L. AND BRANCO, C. A. C. Geroleite Project dairy farmer training: Cooperative Miracema-RJ case. *Custos e @gronegocio on line* - v. 2 - n.2 – Jul/Dec. 2006.

ÖZYÜREK, S.; KOÇYIĞIT, R.; TUZEMEN, N. Structural Features of Dairy Farmers In the Erzincan: The Example of Çayırılı District. *Journal of Tekirdag Agricultural Faculty*, v. 11, n. 2, p. 19-26. Tekirdağ. 2014.

SEGALA, C. Z. S.; SİLVA, I. T. Apuração dos custos na produção de leite em uma propriedade rural do município de Irani, SC. *Custos e @gronegocio On Line*, Recife, v. 3, n. 1, p. 61-86. 2007.



SEMERCİ, A., PARLAKAY, O., ÇELİK, A. D. Economic analysis of dairy cattle farms: Hatay province example. *Namık Kemal University, Journal of Tekirdağ Faculty of Agriculture*, v. 12, n. 3, p. 8-17, 2015.

SILVA, H. A.; KOEHLER, H. S.; MORAES, A.; GUIMARÃES, V. D. A.; HACK, E.; CARVALHO, P. C. F. Análise de viabilidade econômico da produção de leite a pasto e com suplementos na região dos Campos Gerais - Paraná. *Ciência Rural*, v. 38, n. 2, p. 445-450, mar. 2008.

SOUZA, M. A.; RASIA, K. A. AND ALMEIDA, L. B. Práticas de gestão estratégica de custos adotadas por empresas brasileiras de segmentos do agronegócio. *Custos e @gronegócio on line*, v. 11, n. 3, Jul/Set. 2015.

ŞAHİN, K. GÜRSOY, A.K. Socio Economic Structure of Dairy Cattle Raising Enterprises in Iğdır Province. *Nevşehir Journal of Science and Technology*, Special Issue, v. 5, p. 118-129. Nevşehir. 2016.

ŞAHİN, K., Structural features and marketing problems of dairy farms in Kayseri. *Yüzüncü Yıl University Journal of Agricultural Sciences*, v. 11, n. 1, p. 79-86, 2001.

ŞAHİN, K.; GÜL, A.; KOÇ, B.; DAĞISTAN, E. Intensive Dairy Cattle Production Economics in Adana Province. *Yuzuncu Yil University Journal of Agricultural Sciences*, v. 11, p. 2, p. 19-28. 2001.

TAPKİ, N. The comparison of dairy farms in different scales regarding milk production cost and profitability in Turkey: A case study from Hatay province. *Custos e @gronegócio on line* - v. 15, n. 2, Apr/Jun. 2019.

TAUER, L.W. Efficiency and competitiveness of the small New York dairy farm. *Journal of Dairy Science*, v. 81, n. 11, p. 2573-2576, 2001.

TOKMAK, T.; ÜNALAN, A.; ÇİÇEK, R. *Economic Analysis of Dairy Cattle Farms in Niğde*, 7. National Animal Science Congress, 14-16 September 2011, Çukurova University Agricultural Faculty Department of Animal Sciences, Adana. 2011.

TURAN, A. The effects of cooperatives on dairy farms in Çerkeş District. Turkish Cooperative Education Foundation Publications, n. 5, 1997.

TÜİK. Agricultural production statistics, Statistics in Turkey. Turkey Statistical Institute, Ankara. <http://www.tuik.gov.tr> (Access date: 05.04.2020). 2020.

TÜMER, E.İ.; KUMBASAROĞLU, H. The Calculation of the Cost of Milk in Enterprises with and without Animal Insurance: A Case Study in Turhal District in Tokat Province. Atatürk University, *Journal of the Faculty of Agriculture*, v. 39, n. 2, p. 187-194, 2008.

TÜMER, E. İ., BİRİNCİ, A. Analysis of Factors Affecting Milk Cost in Animal Husbandry: Tokat Province. *Atatürk University Faculty of Agriculture Journal*, v. 42, n. 1, p. 35-39, 2011.

UMAMAGESWARI, M.; SIVARAM, P.D.M. Economics of milk production in Tamil Nadu- A comparative study. *Indian Journal of Dairy Science*, v. 70, n. 2, p. 221-227, 2017.

YETEROĞLU, K. Economic analysis and marketing problems of dairy farms in Niksar district of Tokat province (Master's thesis, Gaziosmanpaşa University, Institute of Science). 2010.

YILMAZ, İ.; DAĞISTAN, E.; KOÇ, B.; ÖZEL, R. Analysis of Dairy Farming Activities and Factor Productivity in Projected and Non-Projected Dairy Farms in Hatay Province (Turkey). *Mediterranean Agricultural Sciences*. v. 16, n. 2, p. 169-178, 2003.

YILMAZ, H. AND GÜL, A. A general assessment of dairy farming projects implemented through Cooperatives in Adana Province. Turkey IX. *Agricultural Economics Congress*, v. 2, p. 534-541. 2010.