

## The effects of livestock supports and external input use on profitability of beef cattle farming: the case of Samsun Province, Turkey

Reception of originals: 03/03/2019  
Release for publication: 13/10/2019

**Nevra Alhas Eroglu (corresponding author)**

Phd in Agricultural Economics

Institution: Regional Directorate of Turkish Statistical Institute

Address: Canik Municipality Mevlana campus, Samsun, Turkey.

E-mail: [nevraalhas@tuik.gov.tr](mailto:nevraalhas@tuik.gov.tr)

**Mehmet Bozoğlu**

Professor in Agricultural Economics (PhD)

Institution: Ondokuz Mayıs University, Department of Agricultural Economics, College of Agriculture

Address: Ondokuz Mayıs University campus, Samsun, Turkey.

E-mail: [mehmetbo@omu.edu.tr](mailto:mehmetbo@omu.edu.tr)

### Abstract

Though beef cattle breeding sector has been substantially supported in Turkey, domestic demand could not be sufficiently met and price of beef meat has been steadily increased. By the way, the cost of production has considerably been raised. The objective of this study is to examine the profitability of beef meat. The sample of the study was determined by stratified sampling method from the members of Red Meat Producers Association and the cross sectional data was collected from 171 beef cattle farms via farm surveys. The results of the study indicated that the production of average beef meat was 19067 kg, whereas gross profit and relative profit were USD 60435.24 and 1.34, respectively. The breeding material (40.79%), concentrate feed (34.46%) and roughage (6.49%) had the highest share in the production cost. The cattle breeding supports raised the relative profit to 1.40. The cost of beef meat and gross profit per kilogram was USD 7.42 and USD 3.17, respectively. The external input level of breeding material was 49.15%, whereas it was 40.01% for labor, 38.49% for roughage and 96.59% for concentrate feed. The high level of external input was a drawback for economic sustainability of the cattle farms. Therefore, the livestock supports should be revised in such a way that encourages mixed production (dairy and beef) and financial supports should be improved to access economies of scale.

**Keywords:** Cattle breeding, livestock support, external input use, profitability, Turkey.

### 1. Introduction

In Turkey, the share of animal production in the total agricultural gross production value was 58% in 2017. Although it was measured as 44% in 2000, the value of animal production had substantially increased in comparison with crop production during the seventeen year period (TurkStat, 2018a). Increased livestock supports had effected

considerably on this issue. For example, the budget of agricultural supports had nominally increased by 4.7 times over the period of 2000-2017, whereas the share of livestock supports has increased from 0.5% to 29.82% in the mentioned period (MFAL, 2015; MD, 2018). Although the increase in value of animal production was especially caused by rise of livestock, the number of cattle (10.7 million heads) in 2000 had not substantially changed until 2010. From 2010, the number of cattle had considerably increased by means of cattle import and reached 15.9 million heads in 2017. On the other hand, the amount of beef meat production was 354 thousand tones in 2000 and did not change until 2010, whereas it increased two times and reached to 618 thousand tons in 2010 and 987 thousand tons in 2017. Not only the methodological change of Turkish Statistical Institute (TurkStat), but also the rise of import since 2010 are the effective factors on the rise of number of cattle and amount of beef meat. For example, the number of imported cattle was 2700 head in 2000, it increased 139 thousand tons in 2010 and 799 thousand tons in 2017 (TurkStat, 2018b; TurkStat, 2018c).

The parity of beef meat-milk and the parity of beef meat-concentrate feed are much related with each other and they influence the developments of cattle breeding sector. The parity of beef meat-milk was 12.82 in 2000, while it increased to 22.21 in 2017. This parity has resulted in the difficulty to get breeding material in the long term and this would have adverse effect on cost and profitability of the sector. On the other hand, the prices of feed and beef meat during the period of 2000-2017 had nominally increased by 9.8 and 9.7 times, respectively (TFIA, 2018; TurkStat, 2018d). In this period, the prices increase of feed had been higher than the beef meat and this had increased the cost of beef meat production and had decrease profitability in the sector. The breeding material and feed as main inputs for cattle breeding have been significantly provided from out of farms and this issue has substantially determined the cost and profitability of the sector. Therefore, the evaluation of the cost and profitability analyses is worth considering.

The remainder of the paper is structured as follows. The second section introduces the literature review and the third section introduces data and methodology used in the research. The fourth section evaluates and discusses research results. The last section concludes the research.

## 2. Litratue Review

There have been a great number of studies concerning economic analysis of beef cattle breeding farms via cost and/or profitability in the literature (Imik et al., 2000; Cicek, 2002;

Ozkan, 2003; Ozkan and Erkus, 2003; Topcu, 2004; Koknaroglu et al., 2005; Ramsey et al., 2005; Cagi, 2006; Demircan et al., 2007; Hazneci, 2007; Yildirim et al., 2009; Aydin et al., 2010; Aydin and Sakarya, 2012; Mlote et al., 2013; Er and Ozcelik, 2014; Gozener and Sayili, 2015a; Gozener and Sayili, 2015b; Celik and Sariozkan, 2017).

The mentioned research mainly introduced cross sectional studies about cost and/or profitability of cattle breeding activity except for Koknaroglu et al. (2005) that used panel data over the period 1988-1997. Celik and Sariozkan (2017), Demircan et al. (2007), Er and Ozcelik (2014), Gozener and Sayili (2015a), Hazneci (2007), Imik et al. (2000), Ozkan (2003), Ozkan and Erkus (2003) and Topcu (2004) studied at the local level whereas the studies such as Aydin et al. (2010), Aydin and Sakarya (2012), Gozener and Sayili (2015b), Ramsey et al. (2005), Mlote et al. (2013) and Yildirim et al. (2009) were carried out at regional level or other. The primary data of all studies were obtained via farm surveys except for Ramsey et al. (2005) and Koknaroglu et al. (2005) that used the official data.

Aydin et al. (2010) highlighted the effects of policies over the cattle breeders whereas Aydin and Sakarya (2012), Celik and Sariozkan (2017), Demircan et al. (2007), Hazneci (2007), Imik et al. (2000), Ozkan (2003), Ozkan and Erkus (2003), Gozener and Sayili (2015b) introduced economic analysis of the farms in detail. Er and Ozcelik (2014), Gozener and Sayili (2015a) and Mlote et al. (2013) concentrated on the cost of production and profitability while Koknaroglu et al. (2005) and Ramsey et al. (2005) introduced the factors affecting the cost and profitability. Topcu (2004) argued the relation between the input use and production costs whereas Yildirim et al. (2009) revealed the comparison of cross and native breed on profitability.

Most of the studies indicated that breeding material and feed were the main type of costs in cattle breeding and they suggested some policies in order to decrease the costs and increase the profitability. Aydin et al. (2010) highlighted the effects of cattle import on cost and profitability of cattle breeding farms and argued that the imports should be limited with breeding cattle, the supports should be increased and cost decreasing and productivity increasing policies should be introduced. Aydin and Sakarya (2012) also highlighted that the main cost of farms were breeding material and dairy farming should be improved in terms of profitability in order to improve cattle breeding. Celik and Sariozkan (2017), Demircan et al. (2007) and Er and Ozcelik (2014) indicated that the scale of the farms was effective on the profitability on behalf of large scaled farms. Gozener and Sayili (2015a) highlighted that feed was the main cost of breeding and the researchers mentioned that the effective unionization

would solve the basic problems of breeders such as input and marketing. The unionization was also introduced by Gozener and Sayili (2015b) who also highlighted that breeding material and feed were main costs and extension and effective unionization should be improved. Hazneci (2007) introduced the essence of extension and record keeping. Imik et al. (2000) highlighted the specialization and scale in order to lessen the costs. Ozkan (2003) and Ozkan and Erkus (2003) introduced the cost of inputs, essence of scale, specialization and marketing. Ramsey et al. (2005) indicated that economies of scale existed in beef cattle farms whereas Koknaroglu et al. (2005) indicated that the performance and profitability of the farms were affected by some indicators such as housing type, season and concentrate level. Mlote et al. (2013) revealed that beef cattle breeding was profit worthy but price of breeding material and transportation was the main cost. Topcu (2004) indicated that farms should be encouraged to grow forage crops and labor should be technically informed by government.

Although the economic analysis was extensively found in the literature, the effects of the supports and external input use has not been searched yet. Therefore, the objective of this study was to examine the profitability of cattle breeding farms depending on livestock supports and external input rate in Samsun province, Turkey. The study is expected to guide the producers and decision makers on developing cattle breeding sector.

### 3. Material and Method

#### 3.1. Material

The sample of the study was selected from 799 cattle breeding farms who are the members of two Beef and Lamb Producers Associations in Samsun province. The threshold was taken account as 130 cattle and the samples were determined in three strata. Both full count and strata sampling methods were used to determine sample farms. The 38 farms who have 130 or more cattle herd size were selected by full count method and 137 farms who have a herd size of less than 130 cattle were selected by strata sampling method in 2 strata (Formula 1). In the formula,  $n$  is the sample size and  $N$  is population size.  $N_h$  is the number of units in the strata of  $h$ ,  $S_h$  is the standard deviation in the strata of  $h$ ,  $D^2=(d^2/Z^2)$ ,  $d$  is the level of precision (acceptable sampling error) and  $z$  is the value from  $z$  score table (Yamane, 2001).

$$n = \frac{N \sum(N_h S_h^2)}{N^2 D^2 + \sum(N_h S_h^2)} \quad (1)$$

The total number of surveyed cattle farms was 171 and the sampling method was determined at a confidence interval of 99% and error of 1%. The data of the study was collected via farm surveys during the period July-December, 2015.

### 3.2. Method

In this study, partial budgeting analysis method was used in order to estimate cost and profitability of the farms. This method has only taken the cost and income cattle breeding activity into consideration and the cost and income of other farm activities were out of scope. All indicators of cost and profit were measured for one production year.

The income of the beef cattle farming was calculated by the multiplication of the amount of production and selling price of beef meat. The total cost of the farms was the sum of variable and fixed costs. The variable costs include breeding material, temporary labor, concentrate feed and roughage, salt, water, veterinary cost, disinfection, halter, repair and maintenance of machinery, marketing, insurance, membership fee to the union and interest of variable capital. The fixed costs include permanent labor, general administration, depreciation and interest of building and machine and, repair and maintenance of buildings. The cost sheet was generated from the approach of Kiral et al. (1999).

The average wage of unpaid family labor such as the manager of the farm and economically active population of the household was estimated by the wage of hired labor for the same work in the region. The depreciation ratio (range from 2% to 10%) and economic life of the assets was taken into consideration in calculation of annual depreciation of buildings and machines (OG, 2014). The straight-line method of depreciation was used in the study and this method assumes that the value of equipment decreases at a constant rate for each year of its economic life (Miyata, 1980). As the breeding animals was stayed less than one year in the farm, they were not taken into consideration in the estimation of depreciation. The interest of variable capital was estimated for the expense of inputs. The building capital costs include depreciation, interest, repair and maintenance of the buildings that have been used for cattle breeding activity such as barn, hay barn, etc. The depreciation and interest rate for machines was calculated like buildings. General administration cost was taken as 3% of variable costs (Erkus et al., 1995).

The gross profit, net profit and relative profit were the indicators of economic performance. The gross profit and net profit were calculated by subtracting variable costs and

total costs from the gross production value of the cattle breeding activity, respectively. The relative profit is the proportion of gross production value to total costs. (Kiral et al., 1999). The cost and profitability indicators of beef meat production were calculated per farm, per cattle and per kilogram of beef meat and calculated dividing all indicators by 171 farms, average number of annual cattle and annual production of beef meat, respectively.

The main four inputs such as breeding material, concentrate feed, roughage and labor were calculated in terms of source and divided into internal and external inputs. Therefore, the ratio of external input use was calculated with dividing the value of external input by value of total input. The farms were classified into 3 groups (low external input use, medium external input use and high external input use). The mean and one standard deviation were taken into consideration for classification and the ranges of groups are presented in Table 1.

**Table 1: Distribution of external input rates**

Level of external input use	Interval of groups (%)
Low	0-44,28
Medium	44,29-85,62
High	85,63-100

## 4. Results and Discussions

### 4.1. Descriptive statistics

The descriptive statistics of beef cattle farms in terms of farm structure, manager and beef cattle breeding activity was presented in Table 2. Forty percent of farms were located in Bafra and Çarşamba districts and average distance of the farms to district center was 8.26 km. The average household size was 6.84 people and 68.18% of them were in economically active age. The average farm size of 32% farms was more than 10 ha and 82% of them grow forage crops. Although more farms of first stratum was growing forage crops, less of them had farm size of 10 ha in contrast to other strata. The average membership duration in the Beef and Lamb Producers Association was 4.29 years and only 3.5% of farm managers participated in the management of association. Seventy six percent of the farms have non-agricultural income (Table 2).

The descriptive statistics indicated that the main profession of 88% farm manager was farmer. This ratio was increasing with the strata. The average age of the farm managers was 49.16 and 66% of them were over 45 years old. The average age of the farmers in the studies of Celik and Sariozkan (2017) and Ozkan and Erkus (2003) were found similar results. The

average experience of the farmers in beef cattle farming was 20.20 years. The average experience of the farmers were also found similar by Celik and Sariozkan (2017), Ozkan (2003), Ozkan and Erkus (2003) and Cagi (2006). About 64.91% of farm managers graduated from primary school, whereas only 18% of them graduated from high school and above.

The results of the study indicated that 51% of the farms were specialized in cattle breeding. The fifty seven percent of them keep physical or financial records and the more the farm size was, the higher number of farms have kept record. Almost %25 and 59% of the farms employed permanent and temporary labor for cattle breeding activity, respectively and the ratio of permanent labor has increased with the strata. The average agricultural supports and cattle breeding supports take by the farms were USD 4969.73 and USD 2425.19, respectively and both of them has increased in the each stratum in comparison with the previous one.

The results of the study indicated that 71% of farms were satisfied with cattle breeding and 49% of them planned to increase their beef cattle number in the future. On the other hand, Celik and Sariozkan (2017) highlighted that 91% of cattle farms had tendency to continue beef cattle breeding. The main problems of the farms were high and increase concentrate feed and roughage prices, inefficient agricultural policies and the negative effect of cattle import on production and price of beef meat. The main expectations of the farms were determined as getting stability in beef cattle market, decreasing feed price, rising livestock supports, giving livestock supports based on meat quality, hygiene and amount of production, rising beef meat prices, paying timely livestock supports and supplying more technical assistance to the farms.

**Table 2 Descriptive statistics of beef cattle farms in terms of stratum**

Variable	I		II		III		All Farms	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
<b>Farm structure</b>								
Distance of the farm to the district center (km)	8.53	6.63	7.35	5.80	8.10	8.33	8.26	6.85
The farm in Bafra ve Çarşamba districts (Yes=1, No=0)	0.40	0.49	0.44	0.51	0.38	0.49	0.40	0.49
Household size (unit)	6.49	3.00	6.63	3.14	8.15	5.77	6.84	3.77
Farm size over than 10 ha (Yes=1, No=0)	0.25	0.44	0.30	0.47	0.56	0.50	0.32	0.47
Growing fodder crop (Yes=1, No=0)	0.85	0.36	0.78	0.42	0.76	0.43	0.82	0.39
Membership duration into the Beef and Lamb Producers Association (year)	4.09	1.57	3.96	2.16	5.21	2.40	4.29	1.90

Participation in the management of the Management of Beef and Lamb Producers Association (Yes=1, No=0)	0.02	0.13	0	0	0.12	0.33	0.04	0.18
Non-agricultural income (Yes=1, No=0)	0.77	0.42	0.67	0.48	0.79	0.41	0.76	0.43
<b>Manager</b>								
The main profession as farmer (Yes=1, No=0)	0.85	0.35	0.89	0.32	0.94	0.24	0.88	0.33
The cattle farming experience (year)	20.59	10.80	17.78	11.12	20.85	11.71	20.20	11.02
High school or over education (Yes=1, No=0)	0.15	0.36	0.22	0.42	0.21	0.41	0.18	0.38
<b>Cattle farming</b>								
Specialized in beef cattle breeding (Yes=1, No=0)	0.47	0.50	0.63	0.49	0.53	0.51	0.51	0.50
Keeping record (Yes=1, No=0)	0.43	0.50	0.81	0.40	0.85	0.36	0.57	0.50
Temporary labor employment (Yes=1, No=0)	0.52	0.50	0.74	0.45	0.71	0.46	0.59	0.49
Permanent labor employment (Yes=1, No=0)	0.10	0.30	0.37	0.49	0.65	0.49	0.25	0.44
Agricultural supports (USD)	2361.07	2783.06	5346.62	3330.97	13110.22	15101.68	4969.73	8283.30
Cattle breeding supports (USD)	1194.58	1661.66	3690.27	3098.23	5401.97	5926.93	2425.19	3614.39

#### 4.2. Profitability and supports

The average cost of beef meat production per farm was presented in Table 3. The main costs were determined as breeding material and feed. The share of breeding material, concentrate feed and roughage in the total cost was 40.79%, 34.46% and 6.49%, respectively. The share of total feed was 40.95%. However, the share of feed in the total cost was determined as 48.3% by Ozkan and Erkus (2003) and 33.1% by Celik and Sariozkan (2017). On the other hand, Gozener and Sayili (2015), Imik et al. (2000), Celik and Sariozkan (2017) indicated that the highest cost of production was breeding material and it ranged from 42.24% to 41.13%. According to Aydin et al. (2010), the main reason of rising prices in beef meat was the breeding material that was provided from out of farm. The share of variable costs was 90.84%, whereas the share of fixed costs was 9.16% (Table 3). The share of fixed costs was found as 6.02% by Celik and Sariozkan (2017), 13.3% by Ozkan and Erkus (2003) and 30.47% by Topcu (2004).

**Table 3: The production costs per farm (USD)**

Type of cost	Strata			All Farms	
	I	II	III	Amount	(%)
Breeding material	30454.70	90780.48	119780.36	57740.48	40.79

Temporary labor	378.24	1092.03	1446.43	703.33	0.5
Roughage	5140.84	14037.82	18234.91	9149.12	6.49
Concentrate feed	25477.15	78367.79	100680.97	48781.11	34.46
Salt	26.17	79.33	114.04	52.04	0.04
Water	147.16	343.72	433.16	235.06	0.17
Veterinary	251.55	1300.79	894.10	544.98	0.39
Medicine	521.81	1523.75	2121.47	998.07	0.71
Disinfection	30.36	53.40	107.86	49.41	0.03
Halter	51.97	103.68	183.04	86.19	0.06
Electricity	198.13	605.05	1290.88	479.66	0.34
Membership fee to the union	105.18	117.80	116.16	109.36	0.08
Insurance	63.12	391.98	253.23	152.85	0.11
Repair and maintenance of machines	185.84	526.55	614.40	324.85	0.23
Marketing	353.67	995.42	1433.82	669.76	0.47
Pasture	13.60	10.71	0.00	10.44	0.01
Vitamin and mineral	50.40	88.23	182.84	82.70	0.06
Interest of circulating capital	4441.49	13329.30	17352.14	8411.86	5.94
<b>Total variable costs (A)</b>	<b>67891.38</b>	<b>203747.85</b>	<b>265239.81</b>	<b>128581.27</b>	<b>90.84</b>
General administration	2036.74	6112.44	7957.19	3857.44	2.73
Permanent labor	1605.87	4520.26	9472.55	3630.17	2.56
Depreciation of buildings	740.93	2836.48	3538.49	1628.04	1.15
Interest of buildings	1171.73	3419.62	6569.34	2599.87	1.84
Repair and maintenance of buildings	171.67	364.16	505.80	268.50	0.19
Depreciation of machines	270.25	639.91	659.03	405.92	0.29
Interest of machines	360.05	785.68	1110.07	576.38	0.41
<b>Total fixed costs (B)</b>	<b>6357.23</b>	<b>18678.55</b>	<b>29812.48</b>	<b>12966.32</b>	<b>9.16</b>
<b>Total costs (A+B)</b>	<b>74248.61</b>	<b>222426.40</b>	<b>295052.28</b>	<b>141547.59</b>	<b>100.0</b>

The average total cost was USD 1910.22 per cattle and most of the expenses in variable cost were lesser in the III. stratum in comparison with other strata as a result of economies of scale (Table 4). Er and Ozcelik (2014) also indicated that there was an inverse relation between the costs and the scale of farms. Demircan et al. (2007) determined the average cost within the range of USD 1647 to USD 1658, whereas it was found USD 1816.29 by Celik and Sariozkan (2017) and USD 1548.52 by Er and Ozcelik (2014).

**Table 4: The production costs per cattle**

Type of cost	Strata			All Farms
	I	II	III	
Breeding material	780.69	821.10	755.24	779.33
Temporary labor	9.70	9.88	9.12	9.49
Roughage	131.78	126.97	114.97	123.48
Concentrate feed	653.09	708.82	634.81	658.40
Salt	0.67	0.72	0.72	0.70
Water	3.77	3.11	2.73	3.17
Veterinary	6.45	11.76	5.64	7.36
Medicine	13.38	13.78	13.38	13.47
Disinfection	0.78	0.48	0.68	0.67
Halter	1.33	0.94	1.15	1.16
Electricity	5.08	5.47	8.14	6.47
Membership fee of unions	2.70	1.06	0.73	1.48
Insurance	1.62	3.55	1.60	2.06
Repair and maintenance of machines	4.76	4.76	3.88	4.39

Marketing	9.06	9.00	9.04	9.04
Pasture	0.35	0.10	0.00	0.14
Vitamin and mineral	1.29	0.80	1.15	1.12
Interest of circulating capital	113.85	120.56	109.41	113.54
Total variable costs (A)	1740.36	1842.87	1672.38	1735.47
General administration	52.21	55.29	49.86	52.06
Permanent labor	41.17	40.88	59.35	48.99
Depreciation of buildings	18.99	25.66	22.17	21.97
Interest of buildings	30.04	30.93	41.16	35.09
Repair and maintenance of buildings	4.40	3.29	3.17	3.62
Depreciation of machines	6.93	5.79	4.13	5.48
Interest of machines	9.23	7.11	6.96	7.78
Total fixed costs (B)	162.97	168.94	186.79	174.98
Total costs (A+B)	1903.32	2011.82	1848.70	1910.22

The income, variable and fixed costs and gross and net profit of cattle breeding activity per farm and per cattle were presented in Table 5 and Table 6. The average beef cattle income was USD 189016.51, whereas total variable cost and total fixed costs were calculated as USD 128581.27 and USD 12966.32, respectively. The average gross profit was USD 60435.23 and average net profit was USD 47468.92 (Table 5). The farms utilized USD 2425.19 cattle breeding support on average and their average net profit increased to USD 49894.11 via supports. The supports increased the average net profit of the farms by 5.11% and the least effect was obtained in III. stratum due to higher net profit in comparison with other two strata. At least one stratum is statistically different in terms of variable costs, fixed costs, cattle breeding income, gross profit, net profit and net profit with supports ( $p=0.000<0.05$ ). Each stratum is statistically different in terms of fixed costs, cattle breeding income and gross profit, whereas II. and III. strata are statistically similar in terms of variable costs and cattle breeding income and, I. and II. strata are statistically similar in terms of net profit and net profit with supports.

**Table 5: Income, cost and profit per farm (USD)**

Variables	Strata			Mean	F test (p value)
	I	II	III		
Cattle breeding income	96335.99 <sup>a</sup>	282819.79 <sup>b</sup>	414374.39 <sup>c</sup>	189016.51	37.822
Variable costs	67891.38 <sup>a</sup>	203747.85 <sup>b</sup>	265239.81 <sup>b</sup>	128581.27	43.839
Gross profit	28444.61 <sup>a</sup>	79071.94 <sup>b</sup>	149134.58 <sup>c</sup>	60435.24	20.050
Fixed costs	6357.23 <sup>a</sup>	18678.55 <sup>b</sup>	29812.48 <sup>c</sup>	12966.32	44.207
Net profit	22087.38 <sup>a</sup>	60393.39 <sup>a</sup>	119322.10 <sup>b</sup>	47468.92	15.502
Cattle breeding supports	1194.58 <sup>a</sup>	3690.27 <sup>b</sup>	5401.97 <sup>b</sup>	2425.19	25.109
Net profit with supports	23281.96 <sup>a</sup>	64083.67 <sup>a</sup>	124724.07 <sup>b</sup>	49894.11	16.225

The results of the study indicated that total cattle breeding income per cattle was USD 2551.18, while gross profit and net profit were USD 815.70 and USD 640.69, respectively (Table 6). The cattle breeding support per cattle was USD 32.73 and net profit with supports

was USD 673.42. The strata of the study are not statistically different in terms of cattle breeding income, gross and net profit per cattle. Celik and Sariozkan (2017) highlighted that large and medium scale farms were profitable, whereas small scale farms were not. On the other hand, Topcu (2004) indicated that farm groups lost.

**Table 6: Income, cost and profit per cattle (USD)**

Variables	Strata			Mean	F test (P value)
	I	II	III		
Cattle breeding income	2469.52	2558.06	2612.70	2551.18	2.553
Variable costs	1740.36	1842.87	1672.38	1735.47	0.456
Gross profit	729.16	715.19	940.32	815.70	0.972
Fixed costs	162.97	168.94	187.97	175.01	1.178
Net profit	566.20	546.25	752.35	640.69	0.069
Cattle breeding supports	30.62	33.38	34.06	32.73	0,188
Net profit with supports	596.82	579.63	786.41	673.42	0,094

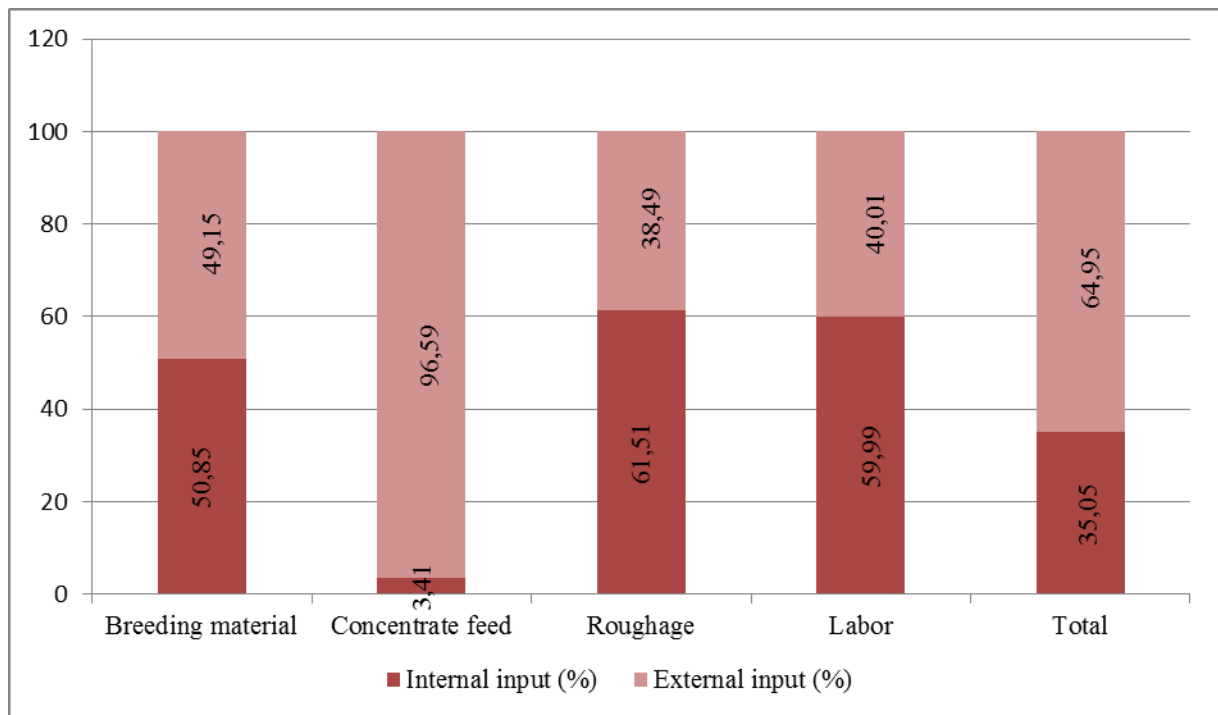
The cost and profitability indicator per unit production (kg) was presented in Table 7. The amount of beef meat production was 19066.59 kg, whereas the cost and selling price of one kg beef meat were USD 7.42 and USD 9.91 respectively. The gross profit per kg was USD 3.17 and the net profit per kg was USD 2.49. The relative profit of beef cattle breeding activity was 34%, while it was calculated 40% for the third stratum. The average support per kilogram was USD 0.13 and the farm who has more herds, the more support was granted to them. The net profit with support per kilogram was USD 2.62 and the supports increased their relative profit by 5.11%. Therefore, the results of the study indicated that the supports had limited impacts on profitability of beef cattle farms. Yıldırım et al. (2009) highlighted that the profitability ratio of small and medium-scaled farms was negative, whereas it was 21.3% for large-scaled farms. Demircan et al. (2007) supported our results.

**Table 7: Some indicators per unit production**

Variables	Strata			Mean
	I	II	III	
Average product (beef meat, kg)	10040.97	28452.23	40813.81	19066.59
Cost (USD/kg)	7.39	7.82	7.23	7.42
Selling price (USD/kg)	9.59	9.94	10.15	9.91
Gross profit (USD/kg)	2.83	2.78	3.65	3.17
Net profit (USD/kg)	2.20	2.12	2.92	2.49
Relative profit (%)	0.56	0.55	0.60	0.58
Support (USD/kg)	0.12	0.13	0.13	0.13
Net profit with support (USD/kg)	2.32	2.25	3.06	2.62
Relative profit with support (USD/kg)	0.59	0.58	0.63	0.60
The effect of support on profitability (%)	5.41	6.11	4.53	5.11

### 4.3. Profitability and external input rates

The basic inputs of beef cattle breeding activity are breeding material, concentrate feed, roughage and labor. The distribution of inputs by source and total external input rate is presented in Figure 1. About forty percent of labor was rented from out of farm, whereas external input use ratio was determined by 38.49% and 96.59% for concentrate feed and roughage, respectively. On the other hand, 49.15% of breeding material was provided from out of farm. Almost 65% of basic inputs were provided externally. Therefore, it can be considered that beef cattle farms of Samsun are dependent on external inputs in cattle breeding activity and it is a risk factor for their economic sustainability.



**Figure 1: Internal and external input use of the cattle breeding farms (%)**

The external input use ratio of the farms in livestock production was presented in Table 8. It can be concluded that the external input use ratio was higher for the specialized farms on beef cattle breeding (70.28%) in comparison with the mixed farms (59.43%). Therefore, the beef cattle farms should be encouraged to carry out mixed type of production in order to decrease their external input uses and production costs. On the other hand, the external input use ratio of the farms is not statistically different in terms of strata, record keeping and education level of manager.

**Table 8: External input rates in terms of the content of livestock production (%)**

Variables	Percent
Specialized in beef cattle breeding	70.28
Mixed farming (beef cattle breeding and dairy)	59.43
Mean	64.95

The cost and profitability indicators of the farms in terms of the level of external input use ratio were given in Table 9. The results of the study highlighted that all indicators of the farms who use external inputs at medium level was quite greater than other farm groups. Nonetheless, the gross profit and net profit of the farms who use external input at medium level was worth considering. Gross profit of these farms was approximately two times higher than the farms that use external input at other levels. On the other hand, net profit of the farms who use external inputs at medium level was almost one and a half times higher than the farms who use external inputs at low level, whereas four times higher than the farms who use external inputs at high level. Beside, indicators of cattle breeding supports and net profit with supports of medium level farms were also quite high in contrast to other level of external input. Therefore, the results show that the farms should use external input at medium level in order to perform the best profitability performance.

**Table 9: Cost and profit indicators of farms (USD)**

Variables	Level of external input			
	Low	Medium	High	Mean
Cattle breeding income	87917.89	222689.49	139207.33	189016.51
Variable costs	41231.09	150684.06	116098.89	128581.27
Gross profit	7537.08	15180.19	8519.03	12966.32
Fixed costs	46686.80	72005.43	23108.44	60435.24
Net profit	39149.72	56825.24	14589.41	47468.92
Cattle breeding supports	1407.15	2800.72	1764.35	2425.19
Net profit with supports	40556.87	59625.96	16353.75	49894.11

## 5. Conclusions

This study examined the profitability of beef cattle farms in Samsun province of Turkey in terms of livestock supports and external input use. The results of the study indicated that the rate of external input was extremely high and this was increased by specialization of the farms and eventually the capital demand of the farms has risen. The high rate of external input use was quite risky for economic sustainability of farms. Thus, the mixed farming (dairy and breeding) should be encouraged in order to provide their breeding material internally and the amount of the supports for fodder crops should be raised. The

results of the study highlighted that the economies of scale is particularly valid for large scale farms and the supports should be reorganized such as the larger the herd of the farm, the more support it has been granted. The farms could be encouraged to expand the scale of the farm. As the cattle breeding activity takes a long period for the transformation of the costs into income, the farms should be financially supported. The young farmers should also be supported and encouraged to take part in agricultural activities due to the high rate of external input of labor. The high profit in spite of high rate of external input and costs is influential on the satisfaction of farmers, but the mentioned regulations are essential for the long term sustainability of the sector. This study has taken the aspects of economic analysis and sustainability of the beef cattle breeding sector into consideration, but the environmental, social and political sustainability should be considered in order to reach the complete view of the sector.

## 6. References

- AYDIN, E.; CAN, M.F.; ARAL, Y.; CEVGER, Y.; SAKARYA, E. The effects of livestock and red meat import decisions on the cattle fatteners in Turkey. *Vet Hek Der Derg*, v. 81, n. 2, p. 51-57, 2010.
- AYDIN, E.; SAKARYA, E. Economic analysis of intensive cattle breeding enterprises in the provinces of Kars and Erzurum. *Kafkas Univ Vet Fak Derg*, v. 18, n. 6, p. 997-1005, 2012.
- CAGI, U. A scientific survey on beef cattle enterprises in Antakya region. Thesis (M.Sc.). Mustafa Kemal University, Institute of Health Sciences, Department of Zootechny, Hatay, 2006.
- CELIK, C.; SARIOZKAN, S. Economic Analysis of Cattle Breeding Enterprises in the Centre of Kırşehir Province. *Journal of Harran University Veterinary Faculty*, v. 6, n. 1, p. 38-45, 2017.
- CICEK, H. The profitability and productivity analyses of cattle breeding enterprises in Afyon. Thesis (PhD). Ankara University, Institute of Health Sciences, Ankara, 2002.
- DEMİRCAN, V.; KOKNAROĞLU, H.; YILMAZ, H.; DERNEK, Z. Economic analysis of beef cattle farms in Turkey. *Journal of Applied Animal Research*, v. 31, n. 2, p. 143-148, 2007.
- ER, S.; OZCELİK, A. Determining of beef cost in cattle breeding farms in Ankara province. Proceeding of the XI. National Agricultural Economics Congress, September 3-5, Samsun, Turkey, 2014.

ERKUS, A.; BULBUL, M.; KIRAL, T.; ACIL, A. F.; DEMIRCI, R. Agricultural Economics. Ankara University, Agricultural College Foundation of Education, Research and Development, Publication no:5, Ankara, 1995.

GOZENER, B.; SAYILI, M. Production cost and factors affecting live weight gain in cattle breeding in the Turhal district of Tokat province. *Journal of Agricultural Sciences*, v. 21, n. 2, p. 288-299, 2015a.

GOZENER, B.; SAYILI, M. TR83 bölgesinde sığır yetiştiriciliğine yer veren işletmelerin ekonomik analizi ve teknik etkinlik. Tarımsal Ekonomi ve Politika Geliştirme Enstitüsü, Yayın no: 247, Ankara, 2015b.

HAZNECI, K. Efficiency analysis of cattle breeding farms in Suluova district of Amasya, Turkey. Thesis (M.Sc.). Ondokuz Mayıs University, Institute of Life Sciences, Department of Agricultural Economics, Samsun, 2007.

IMIK, H.; GUNLU, A.; TEKERLI, M.; KOCAK, S. Economic Analysis of Cattle Breeding in Afyon Province and Necessity Measurement for Profitable Cattle. *Lalahan Hay Arařt Enst Derg*, v. 40, n. 2, p. 1-15, 2000.

KIRAL, T.; KASNAKOđLU, H.; TATLIDIL, F.; FIDAN, H.; GUNDOGMUS, E. Database guide and production cost methodology for agricultural products. Agricultural Economics Research Institute, Publication no: 37, Ankara, 1999.

KOKNAROđLU, H.; LOY, D. D.; WILSON, D. E.; HOFFMAN, M. P.; LAWRENCE, J. D. Factors affecting beef cattle performance and profitability. *The Professional Animal Scientist*, v. 21, p. 286-296, 2005.

MFLA. 2015. Strategy of Red Meat. Ministry of Food Agriculture and Livestock, General Directorate of Livestock, Ankara.

MD (Ministry of Development). 2018. 11. Development Plan, Competitive Production in Agriculture and Food, Special Commission Report, Ankara.

MIYATA, E.S. Determining fixed and operating costs of logging equipment. U.S. Department of Agriculture Forest Service Gen. Tech. Rep. NC-55. 16 p. 1980.

MLOTE, S.N.; MDOE, N.S.Y.; ISINIKA, A.C.; MTENGA, L.A. Profitability analysis of small scale beef cattle breeding in the Lake Zone in Tanzania. *Journal of Agricultural Economics and Development*, v. 2, n. 5, p. 203-216, 2013.

OG (Official Gazette). 2014. Communique on the Amendment of the General Communique of the Tax Procedure No 25446 (Seq Id No: 439), Ankara.

OZKAN, U. Economic analysis of cattle breeding farms in Bayburt province. Thesis (M.Sc.). Ankara University, Institute of Science, Ankara, 2002.

OZKAN, U.; ERKUS, A. Economic analysis of cattle breeding farms in Bayburt province. *Journal of Agricultural Sciences*, v. 9, n. 4, p. 467-472, 2003.

RAMSEY, R.; DOYE, D.; WARD, C.; MCGRANN, C.; FALCONER, L.; BEVERS, S. Factors effecting beef cow-herd costs, production and profits. *Journal of Agricultural and Applied Economics*, v. 37, n.1, p.91-99, 2005.

TFIA. 2018. Turkish Feed Industry Association, Statistics. Available from <http://www.yem.org.tr/Birligimiz/istatistikler> [Viewed 25 July 2018].

TOPCU, Y. A research on input using and the production cost in cattle breeding farms of Erzurum province. *Atatürk University Journal of Agricultural faculty*, v. 35, n. 1-2, p. 65-73, 2004.

TURKSTAT. 2018a. Agricultural Prices and Economic Accounts. Available from [http://www.turkstat.gov.tr/PreTablo.do?alt\\_id=1004](http://www.turkstat.gov.tr/PreTablo.do?alt_id=1004) [Viewed 25 July 2018].

TURKSTAT. 2018b. Livestock Statistics. Available from [http://www.tuik.gov.tr/PreTablo.do?alt\\_id=1002](http://www.tuik.gov.tr/PreTablo.do?alt_id=1002) [Viewed 25 July 2018].

TURKSTAT. 2018c. Foreign Trade Statistics. Available from <https://biruni.tuik.gov.tr/disticaretapp/disticaret.zul?param1=25&param2=0&sitcrev=0&isicrev=0&sayac=5802> [Viewed 25 July 2018].

TURKSTAT. 2018d. Agricultural Prices and Economic Accounts. Available from [http://www.turkstat.gov.tr/PreTablo.do?alt\\_id=1004](http://www.turkstat.gov.tr/PreTablo.do?alt_id=1004) [Viewed 25 July 2018].

YAMANE, T. *Elementary Sampling Theory*. Prentice Hall Inc., Englewoods, New Jersey, 2001.

YILDIRIM, İ.; CIFTCI, K.; CEYLAN, M. Comparison of profitability of cross and native breed cattle breeding farms in Turkey. *Journal of Applied Animal Research*, v. 35, n. 1, p. 17-20, 2009.

## 7. Acknowledgements

This study is quoted from a part of the PhD thesis of Nevra ALHAS EROĞLU. It was supported by The Scientific and Technological Research Council of Turkey (TUBITAK) and Ondokuz Mayıs University.