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Economic Analysis of Beef Cattle Operations of Amasya Province in Turkey

Aysun Işık^a, Bilge Gözener^{a,*}

^a *Gaziosmanpaşa University Faculty of Agriculture, Department of Agricultural Economics, Tokat, Turkey*

*Corresponding author: bilge.gozener@gop.edu.tr

ABSTRACT: This study was conducted in Suluova town of Amasya province. Stratified sampling procedure was used to get sample size and 117 beef cattle operations were included in the analyses. The data for 2016-2017 production season gathered through questionnaires constituted the primary material of the study. Production costs and live weight gains of operations were calculated for different races (local, hybrid and culture races). Number of animals were identified as 5.89 for local races, 2.44 for hybrid races and 27.95 for culture races. As the average of operations, daily live weight gain was calculated as 718.83 g/animal for local races, 825.84 g/animal for hybrid races and 1 103.80 g/animal for culture races. Again, as the average of operations, total production cost was calculated as 1 655.34 TL for local races, 1 747.71 TL for hybrid races and 1 630.92 TL for culture races. Initial animal material cost constituted the greatest cost item in all groups. Feed consumption per kg live weight gain was calculated as 13.02 kg for local races, 7.70 kg for hybrid races and 7.13 kg for culture races. As compared to the other races, the live weight gain per kg feed was greater in culture races.

KEYWORDS: Beef cattle operation, Amasya province, Production costs

1. Introduction

Although Turkey has a significant place in livestock inventory of the world, the livestock industry of the country is still facing with various problems such as; low yield levels, problems about animal races, insufficient forage crop production, fluctuations in input-output costs, thus low income levels of growers, increase in animal diseases and insufficient measures against these diseases (Kan and Direk, 2006).

According to 2016 data of FAO, world bovine inventory is 1 billion 474 million 887 thousand 717 heads (Anonymous, 2016a). Bovine inventory of Turkey in 2017 is 16 million 105 thousand heads and 15 million 943 thousand 586 heads are composed of cattle (Anonymous, 2017).

Cattle inventory of present research region, Amasya province, in 2017 is composed of 32.47% culture races, 45.56% culture hybrids and 21.97% local races. Within Amasya province, cattle inventory of Suluova town in 2017 is composed of 10.04% culture races, 58.58% culture hybrids and 31.38% local races (Anonymous, 2017).

According to FAO 2016 data, world beef production is 384 million 650 thousand 183 tons. Of this production quantity, 57% was produced by the USA (18%), Brazil (14%), EU

(15%) and China (10%) (Anonymous, 2016a). Number of bovines slaughtered worldwide in 2016 is 302 018 862 and 65 973 820 tons beef were produced from these slaughters. In Turkey, number of bovines slaughtered in 2017 is 3 602 115 and 987 482 tons beef were produced from these slaughters. According to OECD-FAO data, meat consumption per capita worldwide in 2016 is 34.30 kg. Of such a consumption, 39.94% was composed of poultry meat, 36.15% pork meat, 18.95% bovine meat and 4.96% ovine meat. In Turkey, meat consumption per capita in 2016 is 29.00 kg and 56.90% of it was composed of poultry meat, 28.97% bovine meat and 14.13% ovine meat (Anonymous, 2016a).

The basic objectives of the present study were to determine the factors effecting live weight gains and to calculate production costs of beef cattle operations of Suluova town of Amasya province. Potential findings were assessed together and recommendations were provided to growers accordingly.

Özkan, Erkuş (2003) investigated economic structure, production factors, production costs and profitability of 40 beef cattle operations in villages of Bayburt province with intensive beef cattle operations. Researchers calculated the average cost per kg live weight gain as 2 226 thousand TL and among the costs, purchase of feeder cattle had the first place with a ratio of 33.20%.

Topçu (2004a) conducted a study with beef cattle operations of Erzurum province and calculated the cost per kg live weight as 2.80 TL for the 1st group operations, 2.84 TL for the 2nd group operations and 2.29 TL for the 3rd group operations. As the average of the operations, cost per kg live weight was calculated as 2.55 TL and marketing margin as 32.86%.

In another study, Topçu (2004b) separated 129 beef cattle operations of Erzurum province into four groups and calculated the average cost per kg live weight as 2.58 TL.

Kan, Direk (2006) investigated operational costs of 51 beef cattle operations in central town of Konya province and reported fixed operational costs of different size-groups as between 8 978 - 17 979 TL with an average value of 13 552 TL.

Uğurtaş (2008) conducted a study in Doğanbey district of Beyşehir town of Konya province and reported that 82.05% of gross output of agricultural enterprises with beef cattle operations came from cattle raising operations. The researcher also indicated decreasing operational costs per animal with increasing size of operations and reported such a value as 3 562 TL. The average daily live weight gain was reported as 1.251 g and the cost per kg live weight was reported as 7.586 TL.

Aydın, Sakarya (2012) conducted a study to determine profitability of 143 intensive beef cattle operations in Kars and Erzurum provinces and indicated that 27.33% of total operational costs was constituted by feed costs. The average cost per kg live weight was calculated as 6.99 TL.

2. MATERIAL and METHOD

The data gathered through questionnaires applied to 117 beef cattle operations of Suluova town of Amasya province constituted the primary material of the present study. The data gathered through questionnaires cover the production period of September 2016 – September 2017. Because of high population variability coefficient (111.49%) during the

initial sampling phase, stratified sampling method (*Neyman Method*) was used to determine sample volume (Çiçek and Erkan, 1996). For sample volume, 95% confidence interval and 5% deviation were used. The following equation was used to calculate sample volume (Çiçek and Erkan, 1996).

$$n = \frac{(\sum N_h * S_h)^2}{N^2 * D^2 + (\sum N_h * (S_h)^2)} , D = (d/z) \quad (1)$$

where; n = Sample volume, N_h = Number of operations in hth strata, S_h = Standard deviation of the data in hth strata, S_h² = Variance of the data in hth strata, N = Total number of operations within the sampling procedure, D = Certain % deviation from the mean, Z = t-table value for the relevant confidence interval. Proportional distribution method was used to allocate the specified sample volume into strata (Çiçek and Erkan, 1996).

Table 2.1. Stratification of operations constituting the population and number of operations selected from each stratum to the sample

Strata No	Strata boundary	Median of Strata	\bar{X}	Number of operations in the strata (N _h)	Standard deviation (S _h)	N _h * S _h	N _h *(S _h) ²	Sample volume
I	5 - 20	12.5	11.39	257	4.58	1 117.06	5 297.1812	59
II	21 - 50	35.5	31.36	146	7.88	1 150.48	9 065.7824	33
III	50 - +	--	101.2	107	48.76	5 217.32	254 396.5232	25
Total	-	-	36.21	510	39.68	7 574.58	268 853.2404	117

Meat production costs of the operations were calculated within the scope of data analysis. The manure revenue per animal was deducted from the total production costs per animal to get total cost per animal (Kıral, 1993). Cattle total live weight gain was divided by fattening duration to get daily live weight gain.

3. RESULTS and DISCUSSION

Distribution of beef cattle based on their races is provided in Table 3.1. As the average of operations, 16.23% of beef cattle was composed of local races, 77.04% culture races and 6.73% hybrid races. In a previous study, Gözener (2013) reported the ratio of local races as 47.40%. Cattle race, fattening duration and daily live weight gain are the primary designators of profitability of beef cattle operations (Gözener, 2013).

Table 3.1. Distribution of beef cattle based on their races (%)

	Operation Groups						Average of Operations (117)	
	1 st Group (59)		2 nd Group (33)		3 rd Group (25)		Number	Percentage
	Number	Percentage	Number	Percentage	Number	Percentage		
Local race	2.12	18.61	2.33	7.43	19.2	18.97	5.89	16.23
Hybrid race	0.90	7.90	2.33	7.43	6.2	6.13	2.44	6.73
Culture race	8.37	73.49	26.70	85.14	75.8	74.90	27.95	77.04
Total	11.39	100.00	31.36	100.00	101.2	100.00	36.28	100.00

Number of cattle in each races and live weight gains at the end of fattening period are provided in Table 3.2. Fattening durations did not vary much based on operation groups and the average value was 273.89 days for local races, 277.83 days for hybrid races and 270.52 days for culture races. Hazneci (2007) also investigated beef cattle operations and reported fattening duration as 264.65 days for local races, 254.48 days for hybrid races and 274.90 days for culture races. Yücel (2007) reported fattening duration as 250 days for small-size operations, 248 days for mid-size operations and 225 days for large-size operations and average of entire operations was reported as 244 days. Average daily weight gain per animal was calculated as 691.83 g for local races, 824.82 g for hybrid races and 1 108.35 g for culture races. In a similar study, daily live weight gain was reported as 707.25 g for local races, 849.73 g for hybrid races and 1 1338. 24 g for culture races (Gözener, 2013). In another study conducted in Kırşehir province, daily live weight gain was reported as 1 027.00 g for small-size operations, as 1 049.00 g for mid-size operations and finally as 1 036.00 g for large-size operations (Çelik and Sarıözkan, 2017).

Table 3.2. Live weights at the beginning and end of the fattening period and carcass yields

		Operation Groups			Total (117)
		1 st Group (59)	2 nd Group (33)	3 rd Group (25)	
		Value	Value	Value	
Local	Number of animals	2.12	2.33	19.20	5.83
	Initial live weight (kg/animal)	113.56	131.67	141.25	124.58
	Final live weight (kg/animal)	314.44	308.33	320.00	313.90
	Live weight gain (kg/animal)	200.88	176.66	178.75	189.32
	Fattening duration (day)	285	254.44	273.33	273.89
	Daily live weight gain (g/animal)	704.84	694.35	653.39	691.23
	Carcass yield (kg/animal)	148.66	158.33	161.25	154.08
	Hot carcass performance (%)	47.28	51.35	50.39	49.09
Hybrid	Number of animals	0.90	2.33	6.20	2.44
	Initial live weight (kg/animal)	120.83	137.50	150.00	131.76
	Final live weight (kg/animal)	346.67	366.25	387.50	360.92
	Live weight gain (kg/animal)	225.84	228.75	237.50	229.16
	Fattening duration (day)	288.33	265	270	277.83
	Daily live weight gain (g/animal)	783.27	863.21	879.63	824.82
	Carcass yield (kg/animal)	185.50	198.25	215.00	195.40
	Hot carcass performance (%)	53.51	54.13	55.49	54.14
Culture	Number of animals	8.37	26.70	75.80	27.95
	Initial live weight (kg/animal)	157.22	169.65	185.60	166.79
	Final live weight (kg/animal)	454.89	486.38	468.20	466.62
	Live weight gain (kg/animal)	297.67	302.59	282.60	299.83
	Fattening duration (day)	268.22	262.76	286.2	270.52
	Daily live weight gain (g/animal)	1 110.62	1 152.00	985.29	1 108.35
	Carcass yield (kg/animal)	262.33	280.17	269.80	268.96
	Hot carcass performance (%)	57.67	58.32	57.62	57.59

As the average of the operations, initial live weight at the beginning of fattening period was 124.58 kg in local races, 131.76 kg in hybrid races and 166.79 kg in culture races. The lowest carcass yield (154.08 kg) was obtained from the local races and the greatest carcass yield (268.96 kg) was obtained from the culture races. Yücel (2007) reported the initial live weight as 221.90 kg for small-size operations, 211.70 kg for mid-size operations and 201.80 kg for large-size operations. As the average of operations, hot carcass performance

was calculated as 49.09% for local races, 54.14% for hybrid races and 57.5% for culture races. The greatest performance was observed in culture races. Hazneci (2007) reported carcass performance a 52.72% for local races, 55.52% for hybrid races and 58.61% for culture races.

Table 3. 3. Production costs for local races (TL/operation) and rational distribution (%)

Cost Items	1 st Group (59)		2 nd Group (33)		3 rd Group (25)		Average of Operations (117)	
	Value	%	Value	%	Value	%	Value	%
Initial animal material cost	2 006.14	48.35	2 320.62	47.42	19 688.83	52.04	5 873.19	50.82
Feed cost	1 265.59	30.50	1 046.38	21.38	10 814.93	28.59	3 244.22	28.07
Feed hauling cost	19.29	0.46	14.63	0.30	0.00	0.00	13.85	0.12
Veterinary – Vaccine - Disinfection costs	66.85	1.61	73.93	1.51	313.56	0.83	121.56	1.05
Chain – halter – lighting costs	38.04	0.92	25.95	0.53	159.20	0.42	60.52	0.52
Transportation – animal loading – Municipality fees – hotel accommodation	8.62	0.21	24.38	0.50	73.56	0.19	26.94	0.23
Working capital interest (A/2*0.05)	85.11	2.05	87.65	1.80	776.25	2.05	233.51	2.02
Total of variable costs (A)	3489.64	84.10	3 593.53	73.44	31 826.33	84.12	9 573.78	82.84
General management costs (A*0.03)	104.69	2.52	107.80	2.20	954.79	2.52	287.21	2.49
Permanent labor costs	0.00	0.00	699.23	14.29	4 005.75	10.59	1 053.15	9.11
Tractor fuel cost	133.69	3.22	51.38	1.05	68.97	0.18	96.64	0.84
Tax and fees – insurance premiums	56.98	1.37	62.70	1.28	445.52	1.18	141.61	1.23
Building and machinery annual repair and maintenance costs	107.15	2.58	9.58	0.20	78.16	0.21	73.43	0.64
Building capital amortization – Building capital interest	149.95	3.61	279.95	5.72	319.25	0.84	222.80	1.93
Machine amortization - Machine capital interest	107.33	2.59	89.25	1.82	133.96	0.35	107.92	0.93
Total of fixed costs (B)	659.80	15.90	1 299.89	26.56	6 006.39	15.88	1982.77	17.16
Total production cost (A+B) = (C)	4 149.43	100.00	4 893.42	100.00	37 832.72	100.00	11 556.56	100.00
Production costs per animal (TL/animal)	1 957.28		2 100.18		1 970.45		1 982.26	
Number of animals	2.12		2.33		19.20		5.83	

Production costs were calculated for local, hybrid and culture races separately. For local races, average total production cost (Table 3.3) was calculated as 11 556.56 USD and production cost per animal was calculated as 1 982.26 USD. The greatest production cost was observed in the 2nd group operations.

Initial animal material cost constituted the greatest cost item. There were not much difference between the groups in local races. Of the production costs, 82.84% was composed of variable costs and 17.165 was composed of fixed costs. Among the production costs, initial animal material constituted the greatest cost item (50.82%) and it was respectively followed by feed cost (28.07%), permanent labor costs (9.11%), general management costs (2.49%), building capital amortization – building capital interest

(1.93%), tax and fees (1.23%), veterinary - vaccine and disinfection costs (1.05%), machinery amortization – machinery interest (0.93%), tractor fuel costs (0.84%), building-machinery annual repair and maintenance costs (0.64%), chain-halter and lighting costs (0.52%), transportation - animal loading – municipality fees and hotel accommodation costs (0.23%) and feed hauling costs (0.12%). Gözener (2013) reported the average production cost for local races as 37 826.89 TL and production cost per animal as 1 529.60 TL and indicated initial animal material costs (36.08%) as the greatest cost item.

For hybrid races, average total production cost (Table 3.4) was calculated as 4 878.40 USD and production costs per animal varied between 1 791.52 – 2 126.64 USD with an average value of 1 999.34 USD. As it was in local races, animal material cost had the first place (50.12%) also in production costs of hybrid races. It is quite remarkable that initial animal material cost and feed cost constituted the primary cost items accounting for 72.79% of total production costs. As the average of operations, 78.33% of total production cost was constituted by variable costs and 21.67% by fixed costs.

Table 3.4. Production costs for hybrid races (TL/operation) and rational distribution (%)

Cost Items	1 st Group (59)		2 nd Group (33)		3 rd Group (25)		Average of Operations (117)	
	Value	%	Value	%	Value	%	Value	%
Initial animal material cost	789.26	48.95	2 285.88	46.13	6 563.22	52.57	2 445.14	50.12
Feed cost	265.50	16.47	962.95	19.43	3 277.49	26.25	1 105.80	22.67
Feed hauling cost	20.16	1.25	13.58	0.27	41.38	0.33	22.84	0.47
Veterinary – Vaccine - Disinfection costs	34.39	2.13	85.07	1.72	144.60	1.16	72.23	1.48
Chain – halter – lighting costs	21.58	1.34	41.97	0.85	71.49	0.57	37.99	0.78
Transportation – animal loading – Municipality fees – hotel accommodation	14.91	0.92	35.18	0.71	123.45	0.99	43.82	0.90
Working capital interest (A/2*0.05)	28.64	1.78	85.61	1.73	255.54	2.05	93.20	1.91
Total of variable costs (A)	11 74.45	72.84	3 510.24	70.84	10 477.15	83.92	3 821.02	78.33
General management costs (A*0.03)	35.23	2.19	105.31	2.13	314.31	2.52	114.63	2.35
Permanent labor costs	0.00	0.00	699.23	14.11	1 426.44	11.43	502.01	10.29
Tractor fuel cost	87.43	5.42	91.28	1.84	0.00	0.00	69.83	1.43
Tax and fees – insurance premiums	28.35	1.76	120.17	2.43	158.62	1.27	82.08	1.68
Building and machinery annual repair and maintenance costs	81.82	5.07	85.77	1.73	19.54	0.16	69.63	1.43
Building capital amortization – Building capital interest	133.21	8.26	233.15	4.71	70.23	0.56	147.94	3.03
Machine amortization - Machine capital interest	71.89	4.46	109.93	2.22	18.68	0.15	71.25	1.46
Total of fixed costs (B)	437.93	27.16	1 444.84	29.16	2 007.82	16.08	1 057.38	21.67
Total production cost (A+B) = (C)	1 612.37	100.0 0	4 955.08	100.00	12 484.97	100.0 0	4 878.40	100.00
Production costs per animal (TL/animal)	1 791.52		2 126.64		2 013.71		1 999.34	
Number of animals	0.90		2.33		6.20		2.44	

Variable costs constituted the greatest cost items in total production cost of culture races. The ratio of variable costs was 82.57% in the 1st group, 85.97% in the 2nd group and 90.32% in the 3rd group and the average of operations was calculated as 87.98%. Among

the groups of operations, the 1st group had the greatest production cost. As the average of operations, total production cost for culture races was calculated as 65 702.94 USD and animal material cost again constituted the greatest cost item (53.34%) (Table 3.5). In a previous study conducted by Özkan and Erkuş (2003), average production cost was reported as 17 321.000 thousand TL and 86.70% of this total cost was constituted by variable costs and 13.30% by fixed costs. The initial animal material costs had the first place (38.50%) and feed cost had the second place (29.80%) within the total cost. As the average of operations, production cost per animal was 704.106 thousand TL.

Table 3.5. Production costs for culture races (TL/operation) and rational distribution (%)

Cost Items	1 st Group (59)		2 nd Group (33)		3 rd Group (25)		Average of Operations (117)	
	Value	%	Value	%	Value	%	Value	%
Initial animal material cost	11 359.83	57.49	34 639.05	55.74	91 478.74	51.15	35 045.19	53.34
Feed cost	3 982.18	20.15	15 854.43	25.51	62 184.86	34.77	19 767.23	30.09
Feed hauling cost	63.70	0.32	163.01	0.26	375.17	0.21	158.27	0.24
Veterinary – Vaccine - Disinfection costs	242.18	1.23	803.34	1.29	1 722.93	0.96	716.86	1.09
Chain – halter – lighting costs	171.78	0.87	365.34	0.59	667.99	0.37	332.40	0.51
Transportation – animal loading – Municipality fees – hotel accommodation	97.12	0.49	295.71	0.48	1 143.97	0.64	376.82	0.57
Working capital interest (A/2*0.05)	397.92	2.01	1 303.02	2.10	3 273.07	2.20	1 409.92	2.15
Total of variable costs (A)	16 314.70	82.57	53 423.90	85.97	3 939.34	90.32	57 806.68	87.98
General management costs (A*0.03)	489.44	2.48	1 602.72	2.58	161 513.00	2.71	1 734.20	2.64
Permanent labor costs	364.43	1.84	2 558.56	4.12	4 845.39	3.95	2 415.94	3.68
Tractor fuel cost	571.79	2.89	560.78	0.90	787.36	0.44	614.75	0.94
Tax and fees – insurance premiums	204.90	1.04	904.74	1.46	1 748.05	0.98	732.02	1.11
Building and machinery annual repair and maintenance costs	579.82	2.93	644.64	1.04	575.29	0.32	597.14	0.91
Building capital amortization – Building capital interest	552.17	2.79	1466.01	2.36	1 583.07	0.89	1 030.20	1.57
Machine amortization - Machine capital interest	681.09	3.45	982.13	1.58	709.28	0.40	772.02	1.18
Total of fixed costs (B)	3 443.64	17.43	8 719.57	14.03	17 317.69	9.68	7 896.26	12.02
Total production cost (A+B) = (C)	19 758.35	100.00	62 143.47	100.00	178 830.69	100.00	65 702.94	100.00
Production costs per animal (TL/animal)	2 360.62		2 327.47		2 359.24		2 350.73	
Number of animals	8.37		26.70		75.80		27.95	

Table 3.6. End of fattening period cost per animal of investigated operations

		Operation Groups			Average of Operations (117)
		1 st Group (59)	2 nd Group (33)	3 rd Group (25)	
		Value	Value	Value	Value
Local	Production cost (TL/animal) (1)	1 957.28	2 100.18	1 970.45	1 982.26
	Manure revenue (TL/animal) (2)	-	-	-	-
	Cost per animal (1-2)	1 957.28	2 100.18	1 970.45	1 982.26
Hybrid	Production cost (TL/animal) (1)	1 791.52	2 126.64	2 013.71	1 999.34
	Manure revenue (TL/animal) (2)	-	-	-	-
	Cost per animal (1-2)	1 791.52	2 126.64	2 013.71	1 999.34
Culture	Production cost (TL/animal) (1)	2 360.62	2 327.47	2 359.24	2 350.73
	Manure revenue (TL/animal) (2)	6.09	17.42	34.48	17.71
	Cost per animal (1-2)	2 354.53	2 310.05	2 324.76	2 333.02

End of fattening period cost per animal is provided for each races in Table 3.6. In present operations, there is no manure revenue for local and hybrid races since the revenue earned from manure sale was not able to compensate transportation and labor costs. As the average of operations, the cost per animal was 1 982.26 USD in local races, 1 999.34 USD in hybrid races and 2 350.73 USD in culture races. Gözener (2013) reported the cost per animal as 1 495.67 TL for local races, 1 813.76 TL for hybrid races and 2 261.83 TL for culture races.

Table 3.7. The cost per kg live weight

		Operation Groups			Average of Operations (117)
		1 st Group (59)	2 nd Group (33)	3 rd Group (25)	
		Value	Value	Value	Value
Local	Total production cost (TL) (1)	4 149.43	4 893.42	37 832.72	11 556.56
	Manure revenue (TL) (2)	-	-	-	-
	Live weight at the end of fattening period (3)	666.61	718.41	6 144.00	1 830.04
	Cost per kg live weight (1-2 / 3)	6.22	6.81	6.16	6.32
Hybrid	Total production cost (TL) (1)	1 612.37	4 955.08	12 484.97	4 878.40
	Manure revenue (TL) (2)	-	-	-	-
	Live weight at the end of fattening period (3)	312.00	853.36	2 402.50	880.64
	Cost per kg live weight (1-2 / 3)	5.17	5.81	5.20	5.54
Culture	Total production cost (TL) (1)	19 758.35	62 143.47	178 830.69	65 702.94
	Manure revenue (TL) (2)	50.97	465.03	5 487.36	494.99
	Live weight at the end of fattening period (3)	3 807.43	12 986.35	35 489.56	13 042.03
	Cost per kg live weight (1-2 / 3)	5.18	4.75	4.89	5.00

The cost per kg live weight is provided in Table 3.7. The lowest cost per kg live weight of local races was observed in the 3rd group operations, the lowest value of hybrid races was observed in the 2nd group operations and the lowest value of culture races was observed in the 1st group operations. The cost per kg live weight decreased with increasing operation

sizes. As the average of operations, the cost per kg live weight was calculated as 6.32 USD for local races, 5.54 USD for hybrid races and 5.00 USD for culture races. The greatest cost per kg live weight was observed in local races. Uğurtaş (2008) reported the cost per kg live weight as 8.14 TL in the 1st group operations, 7.32 TL in the 2nd group operations and 7.29 TL in the 3rd group operations.

The cost per kg live weight gain in investigated beef cattle operations is provided in Table 3.8.

Table 3.8. The cost per kg live weight gain

		Operation Groups			Average of Operations (117)
		1 st Group (59)	2 nd Group (33)	3 rd Group (25)	
		Value	Value	Value	
Local	Production cost (TL) (1)	2 143.29	2 572.80	18143.89	5 683.37
	Manure revenue (TL) (2)	-	-	-	-
	Total live weight gain at the end of fattening period (3)	425.87	411.61	3 432.00	1 103.74
	The cost per kg live weight gain (1-2 / 3)	5.03	6.25	5.29	5.15
Hybrid	Production cost (TL) (1)	823.12	2 669.20	5921.77	2 433.26
	Manure revenue (TL) (2)	-	-	-	-
	Total live weight gain at the end of fattening period (3)	203.26	532.99	1 472.50	559.15
	The cost per kg live weight gain (1-2 / 3)	4.05	5.01	4.02	4.35
Culture	Production cost (TL) (1)	8 398.52	27504.42	87 351.95	30 657.76
	Manure revenue (TL) (2)	50.97	465.03	2 613.79	494.99
	Total live weight gain at the end of fattening period (3)	2 491.49	8 079.15	21 421.08	8 380.25
	The cost per kg live weight gain (1-2 / 3)	3.35	3.35	3.95	3.60

*Production costs apart from initial animal material cost.

As the average of operations, the greatest cost per kg live weight gain was observed in local races (5.15 USD) and the lowest cost was observed in culture races (3.60 USD). The cost per kg live weight gain of hybrid races was calculated as 4.35 USD. Significant differences were not observed in cost per kg live weight gain of the races and operation groups. In local races, the cost per kg live weight gain was 5.29 USD for 3rd group operations, 6.25 USD for 2nd group operations and 5.03 USD for the 1st group operations. In hybrid races, the cost per kg live weight gain was 4.02 USD for 3rd group operations, 5.01 USD for 2nd group operations and 4.05 USD for the 1st group operations. In culture races, the cost per kg live weight gain was 3.95 USD for 3rd group operations, 3.35 USD for 2nd group operations and 3.35 USD for the 1st group operations. Uğurtaş (2008) reported the cost per kg live weight gain as 10.21 TL for the 1st group operations, 9.54 TL for the 2nd group operations and 8.39 TL for the 3rd group operations.

Net and gross profits of beef cattle operations were calculated. Net profit was positive only in hybrid races. In local, hybrid and culture races, net profit was negative in 1st group operations since gross production value was not able to compensate total production costs (Table 3.9).

Table 3.9. Net profit per operation and animal of investigated beef cattle operations

		Operation Groups			Average of Operations (117)
		1 st Group (59)	2 nd Group (33)	3 rd Group (25)	
		Value	Value	Value	Value
Local	Gross production value (1)	3 976.72	5 723.88	34 578.62	10 778.30
	Production costs (2)	4 149.43	4 893.42	37 832.72	11 556.55
	Net profit (1-2)	-172.71	830.45	3 254.10	-778.25
	Net profit per animal (TL)	-81.47	356.42	-169.49	-133.49
Hybrid	Gross production value (1)	1 491.33	5 456.07	12 616.09	4 986.68
	Production costs (2)	1 612.37	4 955.08	12 484.99	4 878.40
	Net profit (1-2)	-121.04	500.99	131.11	302.82
	Net profit per animal (TL)	-134.49	215.02	21.15	108.28
Culture	Gross production value (1)	15 380.11	56 386.80	151 909.54	56 119.05
	Production costs (2)	19 758.35	62 143.47	178 830.69	65 702.94
	Net profit (1-2)	-4 378.23	-5 756.67	-26 21.15	-9 583.89
	Net profit per animal (TL)	-523.09	-215.61	-355.16	-342.89

The greatest net profit per animal of local races was observed in the 2nd group operations (356.42 USD) and the greatest net profit per animal of hybrid races was also observed in the 2nd group operations (215.02 USD). The net profit was calculated as - 133.49 USD for local races, 108.28 USD for hybrid races and - 342.89 USD for culture races. As the average of operations, the greatest net profit was observed in hybrid races. Gözener (2013) reported net profit as 22 715.78 TL for local races, 13 094.01 TL for hybrid races and 5 454.66 TL for culture races and they were all positive.

Gross profit was calculated by subtracting variable costs from gross production value. Gross profits of the operations are provided in Table 3.10.

Table 3.10. Gross profit per operation and animal of beef cattle operations

		Operation Groups			Average of Operations (117)
		1 st Group (59)	2 nd Group (33)	3 rd Group (25)	
		Value	Value	Value	Value
Local	Gross production value (1)	3 976.72	5 723.88	34 578.62	10 778.30
	Variable costs (2)	3 404.52	3 505.88	31 050.08	9 340.28
	Gross profit (1 - 2)	572.20	2 218.00	3 528.54	1 438.03
	Gross profit per animal (TL)	269.91	951.93	183.78	246.66
Hybrid	Gross production value (1)	1 491.33	5 456.07	12 616.09	4 986.68
	Variable costs (2)	1 145.80	3 424.62	10 221.62	3 727.82
	Gross profit (1 - 2)	345.53	2 031.45	2 394.47	1 258.85
	Gross profit per animal (TL)	383.92	871.86	386.20	515.92
Culture	Gross production value (1)	15 386.20	56 404.22	151 944.02	56 153.57
	Variable costs (2)	16 314.70	53 423.90	161 513.00	57 806.68
	Gross profit (1 - 2)	-928.50	2 980.32	-9 568.98	-1 653.11
	Gross profit per animal (TL)	-110.93	111.62	-126.24	-59.15

As the average of operations, the greatest gross profit per animal was observed in hybrid races (515.92 USD) and the lowest gross profit per animal was observed in local races (246.66 USD). The gross profit per animal of culture races was calculated as - 59.15 USD. Considering the operation groups, the greatest gross profit in all races was observed in the 2nd group operations.

5. CONCLUSION

The data gathered from 117 beef cattle operations in Suluova town of Amasya province and covering 2016 – 2017 production season were used in this study and the costs per animal and per kg live weight gain were calculated for different animal races.

As the average of operations, the cost per animal was calculated as 1 982.26 USD for local races, 1 999.34 USD for hybrid races and 2 333.02 USD for culture races. While culture races had the greatest cost at the end of fattening period, local races had the least cost. As the average of operations, the net profit was calculated as – 778.25 USD/operation in local races, 302.82 USD /operation in hybrid races and – 9 583.89 USD /operation in culture races. The net profit was positive only in hybrid races. Again, as the average of operations, gross profit was calculated as 1 438.03 USD/operation in local races, 1 258.85 USD /operation in hybrid races and – 1 653.11 USD /operation in culture races.

Variable costs had the greatest share in total production costs and initial animal material and feed costs had the first places within variable costs. The present research site has quite high potential for beef cattle operations and already has intensive beef cattle operations.

In Turkey, generally small-size household operations are common. Small size of operations is the primary restriction for efficiency of these operations in development of livestock sector and such restrictions then significantly hinder rural and economic development. Present production costs are quite high in these beef cattle operations. Therefore, it is recommended that beef cattle operations of the region should be rationalized, their sizes should be increased and production activities should be professionalized and state incentives should be put in practice to realize these recommendations.

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