Economic analysis of sheep farms: a case study of Isparta Province, Turkey

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Abstract

The purpose of this study was to carry out the economic analysis of sheep farming in Isparta province, Turkey. The primary material of the study was comprised of original data acquired via survey method from a total of 80 farms determined by way of stratified sampling method. Accordingly, the farms were classified according to their size as 1st group (1-100 sheep, 23 farms), 2nd group (101-200 sheep, 22 farms) and 3rd group (>200 sheep, 35 farms). It was determined based on the study results that the production costs per animal unit (AU) decreases and net profit increases with increasing farm size. Indeed, production costs per animal unit in 1st, 2nd and 3rd group farms were determined as 5 424.13 TL, 4 221.83TL and 3 450.79 TL respectively, whereas net profits were determined as 2 467.26 TL, 2 761.26 TL and 3 314.77 TL. Production cost was determined as 4174.15 TL and net profit was determined as 2925.00 TL per animal unit according to all farms average. It was observed that the profit margin for one kilogram of cheese increased with increasing farm groups. Profit margin for one kilogram of cheese was determined as 4.24 TL/kg, 4.92 TL/kg and 5.60 TL/kg for 1st, 2nd and 3rd group farms respectively. Accordingly, it was found that larger farms are more advantageous with regard to economic criteria.

Key Words: Sheep farming. Performance. Cost. Profitability.

1. Introduction

Sheep farming holds an important place among animal production activities. Meadows and pastures that are not used for other purposes can be used for sheep farming. Sheep transform natural vegetation in such areas into various foods such as meat and milk which are required for nutritional purposes. They make use of poor meadows much better in comparison with other types of livestock. Moreover, they also produce products such as wool and leather

used for producing clothing (Emsen et al., 2008). Sheep farming which requires less capital and investment and which is important for making use of manpower is among the animal breeding activities which should be continued under conditions of Turkey (Şahinli, 2011).

Sufficient consumption of animal based proteins is an important condition for a healthy and balanced diet. People should meet at least 35-40% of their daily protein requirement from animal based products for a healthy and balanced diet (Cevger et al., 2008). For this purpose, red meat and milk have significant importance and priority. Sheep farming is the most important source of meat and milk production in Turkey after cattle (Kaymak and Sarıözkan, 2016).

The rural economic structure of Turkey as well as its geographical and natural conditions are suitable for ovine and especially sheep breeding. As a result, about 10% the red meat production and 6% of the milk production in Turkey are provided from sheep (Günaydın 2009).

Even though this was not the case for yield, there were significant quantitative improvements in sheep farming in Turkey since the beginning of the 1970's. Indeed, the number of sheep in Turkey reached 50 million in 1970. However, the number of sheep started decreasing rapidly afterwards due to various reasons thus dropping down to 20 million. The number of sheep increased significantly as a result of various precautions taken by the government in the last decade and the total number of sheep in Turkey reached 33.7 million according to 2017 data (Gökçen, H., 2017; TUIK, 2018).

The number of sheep in Isparta province where the study took place increased significantly in recent years. While the number of sheep in the city of Isparta was 134 516 in 2000, it reached 228 970 in 2017 with an increase of about 70% (TUIK, 2018). Data may be acquired by way of examining sheep farms which will help in determining proper policies related with sheep farming activities at the macro level. Thus, there is a need for studies which focus on the economic analysis of sheep farms. The purpose of this study was to carry out an economic analysis of sheep farms of different sizes in Isparta province, Turkey. Farms of different sizes were compared with regard to performance characteristics, feed consumption, production costs and profitability after which the group with the highest profitability was determined and thus various suggestions were made for carrying out more profitable sheep farming activities in the region.

2. Literature Review

Economic analysis of sheep farms has been analyzed in some previous studies. Raineri at al., (2015) indicated that variable costs represented 64.15% of total cost, while 21.66% were represented by operational fixed costs and 14.19% by the income of the factors. As for elasticity to input prices, the opportunity cost of land was the item to which production cost was more sensitive: a 1% increase in its price would cause a 0.2666% increase in lamb cost. Landman (2013) reported that wool prices and reasonable meat prices encourage sheep production, especially for wool producing sheep farming.

In this study the profitability and efficiency of different sheep production systems were evaluated and discussed. All four sheep production systems (number of animals, management, irrigation systems and feeding) were profitable over the long term with a positive profit margin. Suresh at al., (2008) reported that more than two-thirds of the farmers have been determined in the economic efficiency range of 70-85 percent.

The resource-poor farmers have been observed to realize higher economic efficiency than their rich counterparts. The major factor responsible for inducing improvement in efficiency has been identified as membership in farmers' organizations. Nazareenamma (1991) found that the average size of the family increased with increase in the size of the sheep farms. The result revealed that the cost of production of sheep per unit decreased with increase in the farm size. Among the variable costs, the share of labour cost was the highest over any other variable costs.

The percentage of variable costs was higher occupying 88 % of the total costs. The result revealed that the net returns per unit increased with increase in the farm size. Prabu at al., (2009) reported that the total cost per farm with attributed value of family labour per farm was lowest in small farmer category and highest in marginal farmer category. The results revealed that the net return with attributed value of family labour per sheep was highest in marginal farmers followed by small farmers, landless farmers and lowest in large farmers.

Şahinli and Özçelik (2013) found that the average gross production constituted of 44.71% crop production value and 55.29% animal production. The results showed that 36.77% of animal production value belonged to the sheep farming. The results revealed that the biggest share in variable costs were feed cost and labour with share of 63.47 and 24.24% respectively.

Aggelopoulos et al., (2009) reported that all efforts to reduce production costs should aim at: a) a productive use and rational utilization of the fixed capital, b) a reduction of production costs for animal food, c) a productive valorisation of family labour. Kltsopanidis (2001) compared four groups of sheep farms (I. group: >200 kg; II. group:151-200 kg; III. group: 100-150 kg; IV group: <100 kg) in terms of economic analysis. The result showed that the ewes of group I achieve high profit and high farm income. On the contrary, the result of rearing the ewes of group IV was negative or very low positive. The results revealed that the productivity analysis of the farm resources used in sheep farming shows the need for better organization of the labour, for better use of the pasture available and for using more quantities of silage instead of concentrates.

3. Materials and Methods

The main material of the study was comprised of original data acquired via face-to-face interviews with producers carrying out sheep farming activities in Isparta province, Turkey. In addition, similar studies carried out on the subject by different individuals and establishments were used as well as related reports and statistics. Survey data covers the 2017 production year period.

Surveys were conducted in the villages of Isparta Center, Yalvaç and Şarkikaraağaç districts based on data related with sheep farming production acquired from the records of the Association of Breeding Sheep and Goat Producers in the city of Isparta. The study population was comprised of all farms in these villages that are in accordance with the objective of the present study.

Neyman Method from among the stratified sampling methods was used for determining the number of samples subject to surveys (Yamane, 2001). According to this method, the number of samples representing the total population was calculated as 80 taking into consideration the confidence limit of 95% and error margin of 5%. Accordingly, the farms were classified according to their size as 1st group (1-100 sheep, 23 farms), 2nd group (101-200 sheep, 22 farms) and 3rd group (>200 sheep, 35 farms). Survey data were analyzed via EXCEL and all other required statistical package software. It was tested whether there were statistically significant differences between farm groups with regard to indicators such as yield, production cost, income and profitability according to significance levels of 0.01, 0.05 and 0.10.

Coefficients were used for transforming the animals for sheep farming in farms into animal unit (AU). Depreciation cost was calculated for the building, tools, machinery and animal capital. Depreciation ratios were taken as 2% for concrete buildings, 4% for adobe and wooden buildings, 4% for stone buildings, 1.5% for tool-equipment capital (Erkuş et al.,1995). Sheep depreciation was calculated via equation 1 (Kıral et al.,1999). Economic life for sheep was assumed as 5 years (Fidan, 2017).

$$Sheep\ depreciation = \frac{value\ as\ breeding\ stock - value\ of\ slaughtered}{productive\ life} \quad (1)$$

Equations 2 and 3 were used to calculate interest cost for machinery, building and sheep (Kral et al., 1999).

$$Interest = \frac{machinery\ or\ building\ worth}{2} * interest\ rate \quad (2)$$

$$\text{Sheep capital interest} = \left[\left(\frac{value\ as\ breeding\ stock - value\ of\ slaughtered}{2}\right) + value\ of\ slaughtered\right] * interest\ rate \quad (3)$$

Real interest rate was used to calculate interest cost for machine, building and sheep capital (Kadlec 1985).

$$I = \frac{(1+r)}{1+f} - 1 \quad (4)$$

I: Real interest rate

r: Nominal interest rate

f: Inflation rate

Nominal interest rate was 13.5%, whereas inflation rate was 11.9% in October 2017 when the survey was conducted. Accordingly, equation 4 was used for calculating the real interest rate as 1.43%.

Farms generally have more than one production activity. The ratio for their use in sheep farming activities was taken into consideration when distributing the common costs for

machinery. General administrative expenses were calculated as 3% of the variable costs. Wages paid to alien labor in the region were taken into consideration for the calculation of the family labor payments working at the farm. Gross production value was calculated by adding the value of the products obtained as a result of sheep farming activities and the annual productive inventory stock increase in value for the production activity. Gross profit was calculated by subtracting the variable costs from gross production value, while net profit was calculated by subtracting the production costs from gross production value. Relative return was calculated as the ratio of gross production value to production costs (Rehber and Tipi, 2005).

4. Result and Discussion

Table 1 shows the age, education and experience levels for the producers carrying out sheep farming activities subject to farm groups. It was determined that the age average of producers carrying out sheep farming activities was 47.95 years, level of education was 5.84 years and experience level was 23.31 years on average. It can be observed that the farms in the 1st group have higher values for all three characteristics. No statistically significant difference was determined between the farm groups with regard to age, education and experience data ($p>0.05$). Dağıstan (2002) carried out a study as a result of which it was put forth that the age average of producers carrying out sheep farming activities was 45.99 and that the average duration of experience in sheep farming was 24.14 years on average.

Table 1: Producers' features

Features	Farm groups			Mean	P value
	1. Group	2. Group	3. Group		
Producers' age (year)	49.22	46.77	46.91	47.95	0.741
Producers' education level (year)	6.00	5.68	5.74	5.84	0.828
Producers' experience (year)	24.65	21.68	22.86	23.31	0.732

Table 2 presents the average number of sheep and the numbers in animal units (AU) for the examined farms. Number of sheep per farm in terms of AU according to the average for all farms was calculated as 13.20. When examined with regard to farm groups AU was determined as 6.42 for 1st group farms, as 14.33 for 2nd group farms and as 26.94 for 3rd group farms. A statistically significant difference was determined between the farm groups with

regard to AU (p<0.01). Aktaş (2009) carried out a similar study in which average number of sheep for farms was determined as 19.94 AU. Dağıstan (2002) carried out a study presenting the average number of sheep in terms of AU as 19.35 for sheep farms.

Table 2: Number of sheep in farms

	Farm groups						Mean		P value	
	1.Group		2.Group		3.Group					
	Number	AU	Number	AU	Number	AU	Number	AU	Number	AU
Sheep	54.17^{c}	5.42^{c}	120.36^{b}	12.04^{b}	222.26^{a}	22.23^{a}	110.19	11.02	0.000	0.000
Ram	1.74^{c}	0.21^{c}	5.36^{b}	0.64^{b}	8.54^{a}	1.03^{a}	4.32	0.52	0.000	0.000
Yearling lamb	8.39^{b}	0.67^{b}	19.09^{a}	1.53^{a}	36.26^{a}	2.90^{a}	17.59	1.41	0.000	0.000
lamb	2.43^{b}	0.12^{b}	2.55^{b}	0.13^{b}	15.86^{a}	0.79^{a}	5.21	0.26	0.011	0.011
Total	66.74^{c}	6.42^{c}	147.36^{b}	14.33^{b}	282.91^{a}	26.94^{a}	137.30	13.20	0.000	0.000

AU: Animal Unit
^{abc} means with different superscripts on the same row are different (P < 0.01).

Performance characteristics of sheep according to farm groups are presented in Table 3. As can be seen in the table, the number of milked sheep per farm varies between 46.13 and 147.43 subject to farm groups with an average of 83.13. The difference between the number of milked sheep according to farm groups average was determined to be statistically significant (p<0.01). Milk yield per sheep was determined as 0.45 lt/days according to the mean value for all farms. Yield values were determined as 0.47 lt/day for 1st group farms, as 0.43 lt/day for 2nd group farms and as 0.41 lt/day for 3rd group farms. The reason for the high milk yield in small farms may be higher consumption of concentrate feed.

Table 3: Performance characteristics of sheep in farms

Performance characteristics	Farm groups			Mean	P value
	1. Group	2. Group	3. Group		
Number of milking sheep (head)	46.13^{c}	95.91^{b}	147.43^{a}	83.13	0.000*
Milk yield (lt/sheep.day)	0.47^{a}	0.43^{ab}	0.41^{b}	0.45	0.037**
Average lactation length (day)	101.09	94.77	94.29	97.63	0.827
Lactation milk yield (lt/sheep)	48.46	41.25	39.30	44.23	0.215
Culling age (year)	5.74b	6.05^{ab}	6.23^{a}	5.94	0.014**
Number of lamb born per 100 does lambing	121.41	120.22	118.39	120.41	0.777
Grazing duration (day)	237	243	245	240	0.246

*: p<0.01; **: p<0.05
^{abc} means with different superscripts on the same row are different.

A statistically significant difference was determined between the yield average of 1st and 3rd group farms ($p<0.05$). Bilginturan (2008) reported the daily milk yield per sheep for sheep farms as 0.448 lt on average. Average lactation length was determined as 101.09 days for 1st group farms, as 94.77 days for 2nd group farms and as 94.29 days for 3rd group farms for a mean value of 97.63 days. Lactation milk yield values were determined as 48.46, 41.25 and 39.30 lt for 1st, 2nd and 3rd group farms respectively. Culling age mean value was determined as 5.94 years according to the averages for all farms. Culling age was determined as 5.74 years, 6.05 years and 6.23 years for 1st, 2nd and 3rd group farms respectively with a statistically significant difference between the average values for 1st and 3rd group farms ($p<0.05$).

Gezer (2010) carried out a study indicating a culling age of 6.03 years for sheep. Number of lamb per lambing was determined as 121.41% for 1st group farms, 120.22% for 2nd group farms and 118.39% for 3rd group farms while the mean for all farms was determined as 120.41%. Grazing duration was determined as 237 days for 1st group farms, 243 days for 2nd group farms and 245 days for 3rd group farms with a mean value for all farms as 240 days.

Daily dry matter intakes (DMI) for farms in the 1st group in the study area was determined to be higher in comparison with farms in the 2nd and 3rd groups. Indeed, daily dry matter intakes (DMI) per AU was determined as 6.02 kg for 1st group farms, as 5.56 kg for 2nd group farms and as 5.24 kg for 3rd group farms. While the mean daily dry matter intakes (DMI) per AU was calculated as 5.71 kg for all farms. Of the feed given to the animals, 51.70% was roughage, 46.41% was concentrate feed and 1.89% was green chopped forage. The primary roughage consumed by animals at farms are; factory feed, barley, wheat, oat, beet pulp, cottonseed meal, sunflower meal, roughages were; hay, dry grass, alfaalfa, vetch and green chopped forages were; silage, alfaalfa and sainfoin (Table 4).

Table 4: Daily dry matter intake per AU (kg/d)

Feed ingredient	Farm groups						Mean		P value
	1. Group		2. Group		3. Group				
	DMI kg/AU	%	DMI kg/AU	%	DMI kg/AU	%	DMI kg/AU	%	
Concentrate	2.76	45.84	2.60	46.86	2.47	47.13	2.65	46.41	0.468
Roughage	3.15	52.40	2.78	50.05	2.76	52.68	2.95	51.70	0.451
Green chopped forage	0.11[ab]	1.76	0.17[a]	3.08	0.01[b]	0.19	0.11	1.89	0.001
Total	6.02	100.00	5.56	100.00	5.24	100.00	5.71	100.00	0.166

DMI: Dry matter intake AU: Animal Unit
[ab] means with different superscripts on the same row are different ($p<0.01$)

Cost items for sheep farming activities were classified as fixed and variable costs. Variable costs either increase or decrease subject to volume of production. These expenses appear with production activities and vary according to the amount of production. While fixed costs are always present regardless of whether production is made or not and do not change subject to production volume (İnan, 2016).

Production costs for farms are presented in Table 5. While the share of variable costs in production costs increases with increasing farm groups, the share of fixed costs decreases. Indeed, the shares in production costs of variable costs for groups 1, 2, and 3 were calculated as 58.50%, 66.43%, 67.00% and 64.28% respectively; while the shares of the fixed costs were calculated as 41.50%, 33.57%, 33.00% and 35.72%.

Table 5: Production cost in farms

Expenses	Farm groups						Mean		P value
	1. Group		2. Group		3.Group				
	TL	%	TL	%	TL	%	TL	%	
Feed	13654.91^{c}	39.22	28404.55^{b}	46.94	44173.14^{a}	47.51	24720.19	44.85	0.000*
Veterinary medication	2391.30^{c}	6.87	3840.91^{b}	6.35	6585.71^{a}	7.08	3722.84	6.75	0.000*
Rent of pasture	877.39	2.52	1636.36	2.70	2885.71	3.10	1536.21	2.79	0.478
Marketing	1878.26^{b}	5.39	3325.00^{ab}	5.49	4594.29^{a}	4.94	3152.84	5.72	0.000*
Temporary labour	134.78	0.39	125.00	0.21	295.71	0.32	164.44	0.30	0.792
Other costs	1264.35^{b}	3.63	2604.55^{a}	4.30	3369.14^{a}	3.62	2133.33	3.87	0.000*
Total variable costs (A)	20368.74^{c}	58.50	40200.23^{b}	66.43	62299.80^{a}	67.00	35429.84	64.28	0.000*
Management expenses (A x 3%)	611.06^{c}	1.76	1206.01^{b}	1.99	1868.99^{a}	2.01	1062.90	1.93	0.000*
Permanent labour	11790.76^{b}	33.86	16333.52^{b}	26.99	24543.57^{a}	26.40	15883.55	28.82	0.000*
Building depreciation	957.39^{b}	2.75	904.55^{b}	1.49	1605.71^{a}	1.73	1072.46	1.95	0.002*
Building capital interest	342.27^{b}	0.98	323.38^{b}	0.53	574.04^{a}	0.62	383.40	0.70	0.002*
Sheep depreciation	95.22^{b}	0.27	101.36^{ab}	0.17	105.57^{a}	0.11	99.35	0.18	0.035**
Sheep capital interest	3.40^{b}	0.01	3.62^{ab}	0.01	3.77^{a}	0.00	3.55	0.01	0.035**
Machinery depreciation	623.91^{b}	1.79	1362.50^{ab}	2.25	1858.57^{a}	2.00	1118.07	2.03	0.010*
Machinery capital interest	25.41^{b}	0.07	82.81^{a}	0.14	119.15^{a}	0.13	63.36	0.11	0.000*
Total fixed costs (B)	14449.43^{c}	41.50	20317.75^{b}	33.57	30679.39^{a}	33.00	19686.64	35.72	0.000*
Production costs (A+B)	34818.17^{c}	100.00	60517.97^{b}	100.00	92979.19^{a}	100.00	55116.48	100.00	0.000*

TL: Turkish Lira; 1USD=3.65 TL; *: p<0.01; **: p<0.05
^{abc} means with different superscripts on the same row are different.

Feed expenses are ranked number one with 44.85% among all cost expenses according to farm average in the study region. It was determined that the share of feed expenses in production expenses increases with increasing farm size. Indeed, the shares of feed expenses in total production expenses were determined for 1st, 2nd and 3rd group farms as 39.22%, 46.94% and 47.51% respectively. While the share of feed expenses in variable expenses was calculated as 69.77% according to mean value. Accordingly, it can be indicated that feed expenses comprise majority of the variable expenses. The difference between farm groups with regard to feed expenses was determined to be statistically significant ($p<0.05$). Other expense items in the study region that make up the cost are; permanent labor (28.82%), veterinary-medication (6.75%) and marketing (5.72%) expenses.

The gross production value of a production activity equals the sum of the increases in market price based value of the products acquired as a result of agricultural activities and the annual productive inventory stock increase in these production activities (Rehber and Tipi, 2016).

Gross production values for sheep farming production activity in the examined farms subject to size groups are shown in Table 6. It was determined that the gross production value increases with farm size. Gross production values were calculated as 50 655.86 TL, 100 099.32 TL and 182 293.29 TL for 1st, 2nd and 3rd group farms respectively.

Table 6: Income in farms

Income items	Farm groups						Mean		P value
	1. Group		2. Group		3. Group				
	TL	%	TL	%	TL	%	TL	%	
Cheese sale	5260.33^{b}	10.38	9704.32^{a}	9.69	13294.00^{a}	7.29	8357.10	8.92	0.000*
Milk sale	330.43	0.65	298.41	0.30	86.00	0.05	270.03	0.29	0.471
Butter sale	71.30^{b}	0.14	122.73^{ab}	0.12	505.71^{a}	0.28	176.86	0.19	0.092***
Cottage cheese sale	0.00	0.00	0.00	0.00	68.57	0.04	14.00	0.01	0.532
Sheep value appreciation	43413.04^{c}	85.70	87456.82^{b}	87.37	164681.43^{a}	90.34	82609.19	88.13	0.000*
Manure sale	76.04	0.15	218.18	0.22	134.29	0.07	134.52	0.14	0.510
Wool sale	75.47^{c}	0.15	175.18^{b}	0.18	269.63^{a}	0.15	147.79	0.16	0.000*
Family self-consumption	1218.33^{b}	2.41	1445.68^{ab}	1.44	1709.93^{a}	0.94	1393.22	1.49	0.021**
Support	210.91^{b}	0.42	678.00^{ab}	0.68	1543.73^{a}	0.85	636.14	0.68	0.013*

Gross product value	50655.86[c]	100.00	100099.32[b]	100.00	182293.29[a]	100.00	93738.84	100.00	0.000*

* : p<0.01; **: p<0.05; ***: p<0.10

[abc] means with different superscripts on the same row are different.

A statistically significant difference was observed between the gross production values according to farm group average (p<0.05). Sheep value appreciation and cheese sales made up a significant portion of gross production value. The share of sheep value appreciation in gross production value was 85.70% in the 1st group, 87.37% in the 2nd group and 90.34% in the 3rd group. The difference between the sheep value appreciation among farm groups was determined to be statistically significant (p<0.05). The share of cheese sale in gross production value was determined as 10.38% in the 1st group, 9.69% in the 2nd group and 8.20% in the 3rd group.

The differences between the income from cheese sales of the 1st group and those of the 2nd and 3rd groups were determined to be statistically significant (p<0.05). Aktaş (2009) carried out a study in which it was reported that the average animal production value per farm was 55 227.32 TL. It was indicated that 89.25% of this value is due to productive inventory stock value increase. It was put forth as a result of a study by Koca (2014) that the average animal production value per farm was 42 968.88 TL and it was also determined that 77.10% of this value is due to the increase in sheep value appreciation.

Gross, net and relative returns per farm and AU for the farms in the study area according to farm size groups are given in Table 7. Gross profit is an important success criterion for determining the competitive strengths of the production activities with regard to the use of the existing sparse production factors. In other words, gross profit is an important criterion indicating the success of a farm organization (Erkuş et al.,1995).

Table 7: Gross profit, net profit and relative return in farms

	Farm groups			Mean	P value
Values (TL/Farms)	1. Group	2. Group	3. Group		
Gross product value	50 655.86[c]	100 099.32[b]	182 293.29[a]	93738.84	0.000*
Variable costs	20 368.74[c]	40 200.23[b]	62 299.80[a]	35429.84	0.000*
Production costs	34 818.17[c]	60 517.97[b]	92 979.19[a]	55116.48	0.000*
Gross profit	30 287.12[c]	59 899.09[b]	119 993.49[a]	58309.00	0.000*
Net profit	15 837.69[c]	39 581.34[b]	89 314.10[a]	38622.37	0.000*
Relative return	1.45[b]	1.65[b]	1.96[a]	1.70	0.000*
Values (TL/AU)					

Gross product value	7 891.39[a]	6 983.08[ab]	6 765.56[b]	7099.14	0.001[*]
Variable costs	3 173.13[a]	2 804.43[a]	2 312.17[b]	2683.22	0.000[*]
Production costs	5 424.13[a]	4 221.83[b]	3 450.79[c]	4174.15	0.000[*]
Gross profit	4 718.26	4 178.65	4 453.39	4415.93	0.269
Net profit	2 467.26[b]	2 761.26[ab]	3 314.77[a]	2925.00	0.083[***]
Relative return	1.45[b]	1.65[b]	1.96[a]	1.70	0.000[*]

* : p<0.01; ***: p<0.10
[abc] means with different superscripts on the same row are different.

It can be stated that the average gross profit per farm in the examined farms increases with increasing farm size and that the large farms are more successful in comparison with small farms with regard to management principles. Indeed, it was determined that average gross profit was 30 287.12 TL in 1st group farms, 59 899.09 TL in 2nd group farms and 119 993.49 TL in 3rd group farms (p<0.01). It was also observed that the net profit per farm increases with increasing farm size for the farms included in the study. Net profit per farm was calculated as 15 837.69 TL, 39 581.34 TL and 89 314.10 TL for 1st, 2nd and 3rd group farms respectively (p<0.01). Relative return is another criteria used for measuring the success of sheep farming activities. Relative return indicates the income obtained for an expense of 1 TL.

Relative return should be greater than 1 in order for a farm to be considered as profitable. Relative returns were determined as 1.45, 1.65 and 1.96 for 1st, 2nd and 3rd group farms respectively. Based on these results, the farms made profit in all groups since relative return values are all greater than 1. It was determined that profitability increases with increasing farm size groups. The difference between the relative return values of 3rd group farms and those of the 1st and 2nd group farms was determined to be statistically significant (p<0.01).

Gross production values per animal unit were calculated as 7 891.39 TL, 6 983.08 TL and 6 765.56 TL for 1st, 2nd and 3rd group farms respectively with a statistically significant difference between the 1st and 3rd group farms (p<0.01). Whereas the variable costs per animal unit was determined as 3 173.13 TL for 1st group farms, as 2 804.43 TL for 2nd group farms and as 2 312.17 TL for 3rd group farms. The difference between the variable costs per animal unit for 3rd group farms and those of the 1st and 2nd group farms was determined to be statistically significant (p<0.01).

It was observed that the production costs per animal unit in the examined farms decreased with increasing size, while net profit increased. Production costs per animal unit were determined for 1st, 2nd and 3rd group farms as 5 424.13 TL, 4 221.83 TL and 3 450.79

TL respectively (p<0.01). While the net profit per animal unit was determined as 2 467.26 TL, 2 761.26 TL and 3 314.77 TL for 1st, 2nd and 3rd group farms respectively.

The difference between the net profit values per animal unit of the farms in the 1st and 3rd groups was determined to be statistically significant (p<0.10). It was observed when a comparison is made with regard to gross profit that small farms have higher gross profit values. Gross profit per animal unit was determined as 4 718.26 TL for 1st group farms, as 4 178.65 TL for 2nd group farms and as 4 453.39 TL for 3rd group farms. No statistically significant difference was observed between the gross profit values per AU of the groups. Dağıstan (2002) carried out a study in which the gross profit per AU was calculated as 195.2 million TL, net profit was calculated as 88.4 million TL and relative return was calculated as 1.40.

Cheese production cost and profit margin for the examined farms are given in Table 8. Cheese production farms were determined as 7.98 TL/kg, 6.56 TL/kg and 4.97 TL/kg for 1st, 2nd and 3rd group farms respectively with a statistically significant difference determined between the farms in group 3 and those of the 1st and 2nd groups (p<0.01).

Table 8: Cheese production cost and profit margin in farms

Farm groups	Ratio of cheese sale value in gross product value (%) A	Total production costs (TL) B	Ratio of cheese production costs in total production costs (C = A x B)	Amount of cheese produced (kg) D	Cheese cost (TL/kg) E=C/D	Cheese sale price (TL/kg) F	Profit margin (TL/kg) G= F-E
1. Group	10.38	34818.17^{c}	3 615.67^{b}	452.89^{b}	7.98^{a}	12.23^{a}	4.24^{b}
2. Group	9.69	60517.97^{b}	5 867.03^{a}	894.52^{a}	6.56^{a}	11.48^{a}	4.92b^{a}
3. Group	7.29	92979.19^{a}	6 780.64^{a}	1363.58^{a}	4.97^{b}	10.58^{b}	5.60^{a}
P value	0.156	0.000	0.000	0.000	0.000	0.001	0.011

^{abc} means with different superscripts on the same row are different (p<0.01).

Accordingly, it was observed that large farms are more advantageous with regard to production costs for one kilogram of cheese. Cheese profit margin was calculated by taking into consideration the difference between the production cost for one kilogram of cheese and its sales price. It was determined that the profit margin for one kilogram of cheese increases with increasing farm size. Profit margin for one kilogram of cheese was determined as 4.24 TL/kg in the 1st group, as 4.92 TL/kg in the 2nd group and as 5.60 TL/kg in the 3rd group. A statistically significant difference was determined between the profit margins of the farms in

the 1st and 3rd groups ($p<0.01$). As a result, it can be stated that large farms are more advantageous with regard to profit margin.

5. Conclusion

In this study, the performance characteristics, feed use, production costs and profitability values were compared for sheep production farms of different sizes in the city of Isparta as a result of which the farm group with the highest profitability was determined. Based on the study result, it was put forth that milk yield during lactation (lt/sheep), number of lambs per lambing (%) and feed consumption per animal unit are higher in small farms. It was calculated based on the farm average that the share of feed cost in variable costs is 69.77 %. Hence, it is considered that the incentives provided for feed input should be increased. The share of productive inventory stock increase in GPV (Gross Production Value) was determined as 88.13%. It was observed that while production costs per animal unit in farms decreased with increasing farm size, net profit increased. Moreover, it was also determined that the cheese profit margin (TL/kg) increases with increasing farm size. Larger farms were determined to be more profitable in comparison with smaller farms based on the acquired results. Thus, it is important to carry out policies for increasing the capacity of farms. In addition, does should be bred with more efficient races in order to improve herd population and yield in farms.

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