Cost of sheep breeding: the case of Tokat Province, Turkey

Recebimento dos originais: 22/05/2023
Aceitação para publicação: 23/11/2023

Esra kaplan
Ph.D.in Agricultural Economics
Tokat Gaziosmanpasa University
Tokat Gaziosmanpasa University, Faculty of Agriculture, Department of Agricultural Economics
Taşlıçiftlik Campus, 60250 Tokat / TÜRKİYE
E-mail: **esra.gurel@gop.edu.tr**

Abstract

In this study, it was aimed to examine the socio-economic structure of the producers engaged in sheep breeding in the central district of Tokat province and to determine some practices related to sheep breeding activities. The main material of the research consists of primary survey data conducted by face-to-face interviews with 72 enterprises engaged in sheep farming activities. In addition, domestic and foreign sources on the subject and data obtained from public institutions and organisations were used. The survey data covers the production year 2021. Total production cost per animal was calculated as 144.39 USD. The ratio of variable costs in total costs is approximately 90%. Feed costs have the highest share in total production costs.

Key words: Tokat, Sheep, Breeding, Cost.

1. Introductıon

It is said that livestock breeding in Turkey is of great importance in terms of people's desire for a balanced and healthy diet and creating a source of financing necessary for development in the face of a constantly increasing population and sustainability in rural and economic development (Yılmaz Eser and Terzi 2008; Aral 1995).

Sheep breeding has an important place among animal production activities in the world. Turkey's natural and economic conditions, agricultural structure and traditions create a favourable environment for sheep breeding to be widely practised and to have an important place in animal husbandry (DPT 2001).

Sheep breeding has an important share and potential in the economy and agricultural sector of many countries. It has a very important role in terms of supplying animal-derived protein and other physiological needs necessary for healthy and balanced nutrition of humans (Güneş and Akın 2017). In this context, the importance of the subject cannot be denied. In Turkey, sheep farming is generally carried out extensively (Akçapınar et al. 2002).

On the other hand, sheep breeding is a branch of production that has been carried out for many years and has a certain infrastructure and experience in technique and breeding. In addition, it is known to have high adaptability and reproductive abilities, low feed costs since it is based on pasture, and short transition period to productivity (Tamer and Sarıözkan 2017). It can also be said that it has low capital and fixed investment costs, is important in terms of the utilisation of manpower and is among the livestock activities that need to be sustainable under Turkish conditions (Şahinli, 2011). In this context, it has an important place among animal activities.

When the number of sheep in the world is analysed, the number of ovine animals in EU countries was determined as 71.5 million in 2021. In the same period, Spain ranks first in the number of sheep among ovine animals in EU countries with 15 million 81 thousand. Romania with 10 million 49 thousand sheep, Greece 7 million 253 thousand, France 6 million 994 thousand, Italy 6 million 728 thousand and Ireland 3 million 991 thousand. In 2021, the total number of ovine animals in Turkey was 57 million 519 thousand and the sheep population was 45 million 178 thousand (TÜİK, 2022). In Tokat province, which is the subject of the research, the number of sheep increased from 225,575 in 2001 to 422,097 in 2021 (Anonymous, 2022).

In this research, it was aimed to calculate the cost of 1 head of sheep by using the data obtained from sheep farming enterprises in Tokat province through questionnaire survey. In addition, it was tried to reveal the technical and economic problems related to sheep breeding and to make suggestions for their solution.

2. Literature Review

Arıtunca and Karabacak (2020), conducted 83 questionnaires to determine the current situation of sheep breeding enterprises in 3 central districts of Konya Province (Selçuklu, Meram, Karatay). The enterprises were divided into 3 groups according to the number of sheep and the data were evaluated. 79.5% of the breeders were primary school graduates and all of the enterprises were registered members of the Breeding Goat and Sheep Breeders' Association. The ownership of the shelter of 92.8% of the enterprises belongs to the owner and fodder plants are produced in 61.4% of the enterprises. The number of milked animals in the enterprises is 84.3%.

Ayvazoğlu Demir et al. (2015), carried out 66 questionnaires in order to reveal the socio-economic characteristics of the enterprises engaged in sheep breeding in Ardahan

province. These enterprises were divided into 3 groups and the average flock size was found to be 74.2±7.3 heads. In the study, it was determined that the total cost incurred for sheep farming activity in a production period was 2.337 $ in small-scale enterprises, 3.824 $ in medium-scale enterprises and 5.243 $ in large enterprises. Due to the fact that most of the enterprises are small-scale family businesses and that there is no market and price guarantee for the producer against the market conditions, it is stated that the enterprises cannot go to capital increase despite the support and incentives given.

Dalgıç and Demican (2019), conducted an economic analysis by using the data obtained from 80 sheep breeding enterprises in Isparta province by questionnaire method. The farms were classified into 3 groups according to their size. Among the results, it was determined that as the farm size increases, production costs per animal unit decrease and net profit increases. In the 1st, 2nd and 3rd group farms, production costs per animal unit were 955.29 $, 743.54 $, 607.74 $ and net profits were 434.53 $, 486.31 $ and 583.79 $, respectively.

Deniz et al. (2021), conducted 72 surveys in the central district of Hakkari and calculated the gross profit and profitability ratios of sheep farms using the survey data. It was determined that more than half of the gross income (53%) was obtained from the production value ($8,435) of lamb and goat sales values. It was determined that feed costs constituted 74.68% of variable costs and profit per sheep production unit was 71 $.

Kaymak and Sarıözkan (2016), conducted 62 questionnaires in order to determine the socio-economic structure and production costs of sheep farming enterprises in Korkut District of Muş Province and to offer solutions to the problems faced by breeders. The enterprises were divided into 3 sub-groups as small (less than 50 heads; 8 enterprises), medium (51-100 heads; 25 enterprises) and large (101-250 heads; 29 enterprises) according to the number of sheep. In the study, it was determined that the producers were sufficiently experienced, but their formal and vocational education levels were low. The largest share in the enterprises was feed with 61.9%, followed by labour costs with 30.5%. The proportion of fixed and labour costs in total costs decreased gradually in large enterprises. In small scale holdings, sales revenues, production costs and profit/loss per sheep were calculated as 96.53 $, 101.02 $ and -4.79 $, respectively. The same values were calculated as 113.85 $, 94.64 $ and 19.17 $ in medium-scale enterprises and 107.93 $, 76.99 $ and 31 $ in large-scale enterprises. As a result, it was found out that sheep farming in the region is less than 50 heads.

Kul et al. (2022), conducted 168 questionnaires to determine the sociodemographic characteristics of sheep breeders in Elazığ Province and the status of animal health activities

in enterprises. According to the findings of the study, 83.7% of the breeders were primary school graduates, all of them were engaged in sheep farming for economic reasons and 67.3% of the breeders stated that they were satisfied with sheep farming and 80.2% of them stated that they were planning to do it continuously. In the study, although the breeders in Elazığ wanted to do sheep farming continuously and increase their capacity, they stated that sheep farming has some basic problems and stated that the problems can be solved in time with training activities.

Şeker et al. (2022), aimed to determine the structural characteristics of the enterprises by using the data obtained from 167 enterprises engaged in sheep farming in Elazığ province by questionnaire. In the study, it was determined that 56.3% of the farms had their own land, 94.5% of the farms used troughs as sheep watering equipment, 55.8% preferred wooden feeders, 86.2% of the farms had 1 m2 or less walking area per sheep, and it was recommended by both breeders and relevant institutions and organisations that sheep breeding in the province should be brought to an appropriate level by taking into account the problems and solution suggestions identified in this study, and that incentives, support and interest-free loans should be increased to eliminate structural problems in enterprises.

Tamer and Sarıözkan (2017), examined the socio-economic structure and production costs of sheep farming enterprises in the central district of Yozgat province and used the data of 63 sheep farming enterprises. The enterprises were divided into three subgroups according to the number of sheep. It was determined that although the producers were sufficiently experienced, their education level was low. It was determined that feed costs had the largest share in total costs with 59.5%. The ratio of fixed and labour costs in total costs decreased as the scale of the enterprises increased. In small-scale enterprises, sales income, production costs and profit per sheep were calculated as 92.42 $, 76.20 $ and 16.21 $, respectively. The same values were calculated as $127.27, $70.54 and $56.74 in medium-scale enterprises and $126.67, $55.31 and $71.36 in large-scale enterprises.

3. Material and Method

In order to calculate the sample volume that will constitute the material of the study, firstly, Tokat sheep and goat breeding association was interviewed. The data set collected in order to determine the knowledge of the producers about sheep breeding, operating costs and production costs constitutes the material of the study. This data set is based on the survey method.

According to the information obtained from Tokat Provincial Directorate of Agriculture and Forestry, there are 143 enterprises registered in the central district of Tokat. Surveys were conducted by face-to-face interviews with 50% of these enterprises (72 enterprises), and frequencies and ratios were calculated and interpreted using the data obtained from these surveys. The data obtained covers the production period of 2021. In addition, the results of scientific studies previously conducted in different regions on the subject constituted the secondary material of the research.

In the calculation of the cost of a head of animal, production costs were calculated for a production period. In sheep breeding, 3% of the production costs were taken as provision for general administrative expenses (Özkan and Kuzgun 1997). Other costs incurred in sheep production were calculated by multiplying the quantities used in production by the cost prices to the farm.

In addition, regression analysis was conducted to investigate the relationship between sheep farming income and the factors affecting the cost. In this context, in econometric studies, collecting the data of dependent and independent variables accurately from reliable sources and preparing the analysis data in accordance with the model affect the consistency of the estimates (Gujarati, 2003). Regression analysis is used to analyse the relationship between two or more variables. Relationships between two variables are called simple regression analysis, while relationships between more than two variables are called multiple regression analysis. The shape of the relationship between variables is tried to be determined numerically. This relationship can be linear or non-linear (Çakıcı et al., 2015).

The names of the variables used in regression analysis were abbreviated in order to include them in the analysis more easily. The abbreviations are shown in Table 1.

Table 1: Definition of variables

Variables	Definition
SFTI	Sheep Farming Total Income
NSI	Non-sheep income
LY	Livestock Year
FC	Feed Costs
CP	Crop Production
NSB	Number of Sheep Breeders
NLB	Number of Lambs Born

NLD	Number of Lambs Died
UM	Union Membership

4. Results and Discussion

It was determined that 48.61% of the producers were primary school, 27.78% were secondary school, 15.28% were high school, 5.56% were associate degree and 2.78% were undergraduate. In many previous studies such as Tüfekci and Oflaz (2015), Karadaş (2017), Aydıner, (2018), Kul et al. (2022), it was observed that primary school graduates had the highest rate when the educational status of sheep breeders was examined. 17.46% of the producers consist of families of 2 and 3 individuals. 82.54% of them consist of families with 4 or more individuals. Their average age is 46.20 years. The average number of years the participants have been engaged in animal husbandry is 28.01 and the average number of years they have been engaged in sheep breeding is 24.17. 79.17% of the producers (57 people) are members of the union. In the studies conducted by Köseman et al. (2022), Kul et al. (2022), Özsayın and Everest (2019) and Karadaş (2017), it was found that the highest age range of the breeders was 31-50 years. In the studies conducted by Köseman et al. (2022), Karadaş (2017) and Tüfekci (2020), the average duration of sheep breeding activity was found to be over 20 years. The results of the present study and the previous studies are similar. Although the average age of the breeders in this study was similar and in the same range (31-50), it is noteworthy that it is slightly higher. This situation can be explained by the fact that sheep breeding, which is generally a long-term activity, depends on the experience of the breeders.

It was determined that 72.22% of the producers had income other than sheep farming and 27.78% had no income other than sheep farming. Non-sheep farming income sources and their values are given in Table 1.

When Table 2 is analysed, it is seen that the income of the producers from cattle breeding (5 432.10 $) is also high. In addition, it was determined that they also obtained income from other agricultural activities.

Table 2: Non-sheep farming income sources and values (year/$)

Pensioner	115.99
Employee	307.11
Fruit	6.94
Vegetable	86.72
Cattle	5 432.10
Other	21.68

The distribution of non-sheep agricultural production of the producers is given in Table 3. As a result of the questionnaire study, it was determined that sheep farmers also engaged in cattle breeding and herbal production (Table 3).

Table 3: Distribution of agricultural production other than sheep farming

	Frequency	Percentage (%)
Cattle	2	2.78
Crop production	28	38.88
Cattle + Crop production	38	52.78
None of them	4	5.56
Total	72	100.00

When the labour force potential of the producers is examined, it is stated that 62.5% of them employ domestic labour and 37.5% employ foreign labour. The average monthly labour cost of those who employ foreign workers is $114,501.

87.50% of the producers grow forage crops. The average land area used for breeding is 266.98 da. 98.61% of the farmers own their own pens and 1.30% of them use rented pens.

When we look at the sheep asset distribution of the enterprises, the average number of mother ewes is 147.65, the number of lambs born is 156.17, the number of lambs that died is 19.89 and the total number of lambs is 136.28. While 69.44% of the enterprises buy concentrate feed from outside, 30.56% do not buy concentrate feed. Among those who buy concentrate feed from outside, 57.43% of them buy meal, 19.13% buy fodder, 3.90% buy alfalfa, 18.93% buy straw, 58% buy corn. 31.94% of the enterprises stated that they did not take the animals to the plateau. 68.06% stated that they did.

The distribution of total sheep farming income of the enterprises is given in Table 4. As a result of the examination, it was determined that a significant part of the income of the enterprises participating in the survey was made up of the sale of lambs, as well as the sale of sheep, cheese, milk and yoghurt.

Table 4: Sheep farming income distribution of the enterprises (USD/enterprise)

	%	Average Value ($)
Sale of lamb	81.89	13 486.47
Sheep sale	13.23	2 179.63
Cheese sale	4.13	681.13
Milk sales	0.67	109.61
Sale of yoghurt	0.08	12.53
Total	100.00	16 469.37

When Table 5 is analysed, it was determined that a significant majority of the holdings sold their animals to butchers, 63.89% sold them for sacrifice and 23.61% sold them for breeding.

Table 5: Type of sale of animals

	Frequency	Percentage (%)
Butchery	65	90.28
Sacrifice	46	63.89
Breeding	17	23.61

While 68.05% of the producers find sheep breeding profitable, 31.95% do not find it profitable.

The distribution of production costs of one head of sheep is given in Table 6.

Table 6: Production costs of one head of sheep

	Value ($)	%	%
Rough feed	15.34	11.87	10.63
Roughage	91.18	70.54	63.15
Veterinarian	6.38	4.94	4.42
Foreign labour force	10.62	8.22	7.36
Family labour force	3.43	2.66	2.38
Other	2.29	1.77	1.59
Variable cost total	129.26	100.00	89.52
General administration	3.88	25.63	2,69
Amortisation	6.61	43.67	4,58
Maintenance and repair	4.65	30.70	3.22
Fixed costs total	15.13	100.00	10.48
Total production costs	144.39		100.00

When Table 6 is analysed, total production cost per animal was calculated as 144.39 USD. The ratio of variable costs in total costs is 89.52%. Feed costs have the highest share in total production costs.

The results of some studies conducted in different regions and countries on sheep farming on production costs are given below.

In a similar study conducted by Kaymak and Sarıözkan (2013) with sheep farms in Korkut district of Muş province, the largest share in total costs was feed with 61.9%, followed by labour costs with 30.5%. In general, sales income per sheep, production costs, production costs and profit/loss per sheep were calculated as $168.6, $136.45 and $24.05, respectively, and it was stated that unit costs decreased, sales income and profit increased, and it was necessary to enlarge the scale of enterprises.

In a similar study conducted by Tamer and Sarıözkan (2017) with 63 sheep enterprises in the central district of Yozgat province, sales income per sheep was calculated as $134.61, production costs as $73.36 and profit as $61.26. In addition, they stated that feed had the largest share in total costs in the enterprises with 59.5%.

Deniz et al. (2021) conducted a survey with 72 sheep farms in Hakkari Central district in 2021 and calculated the gross profit and profitability ratios of the sheep farms using the survey data. It was determined that more than half of the gross income (53%) was obtained from the production value ($8,435) lamb and goat sales values. Feed costs accounted for 74.68% of variable costs and profit per sheep production unit was determined as 71 USD.

According to the results of regression analyses, the following tables are given and interpreted.

Table 7: Descriptive statistics for businesses

Variables	*Percent*	*Average*	Standard Deviation *sd*	*Minimum*	*Maximum*
Total income from sheep farming		145 000	111602.0344	30 000	500 000
Non-sheep income TL		38 648	55572.56355	0	270 000
Livestock Year		28	16.40508	2	63
Feed costs		22 845	25712.21471	0	108 500
Crop production		9 115	11286.56636	0	60 000
Number of sheep breeders		148	84.09739	35	385
Number of lambs born		156	106.44088	25	550
Number of lambs dying		19	19.26944	2	100
Union membership					
1	79.2				
2	20.8				

Descriptive statistics of the enterprises are given in Table 7. According to this, the total income of sheep farming is minimum 3.374 $ and maximum 56.242 $. The average sheep farming income is 16.5 $.

Table 8: Pearson correlation coefficients between variables

Variables	UM	NSI	LY	FC	CP	NSB	NLB	NLD
UM	-0.305**							
NSI	0.198	-0.004						
LY	0.058	0.012	0.042					
FC	0.586**	-0.190	0.216	0.001				
CP	0.234*	-0.253*	0.148	0.221	-0.062			

NSB	0.613**	-0.332**	0.076	-0.055	0.407**	0.264*		
NLB	0.813**	-0.319**	0.113	-0.029	0.640**	0.313**	0.662**	
NLD	0.504**	-0.001	0.295	0.063	0.521**	0.058	0.380**	0.622**

*: p<0.05 düzeyinde önemli, **p<0.01 düzeyinde önemli

Table 8 shows the results of correlation analyses between dependent and independent variables. According to the results of the correlation analysis, there is a positive relationship between total income from sheep farming, which is the dependent variable, and feed costs, crop production, number of mother ewes, number of lambs born and number of lambs died. There is a significant negative relationship between total income from sheep farming and union membership. Apart from sheep farming, the income of the operators and the year of animal husbandry variables do not have a negative or positive relationship with the dependent variable.

Table 9: Regression analysis results

Parameters								
Coefficients (b1)	-0.045	0.099	0.090	0.084	-0.065	0.130	0.687	-0.056
Levels of significance (P)	0.567	0.178	0.225	0.423	0.451	0.176	0.001	0.578
VIF	1.269	1.107	1.127	2.258	1.517	1.868	3.711	2.107

Before starting the regression analysis, it was determined which variables would be included in the model. For this process, all variables included in the study were first included in the model as independent variables and it was tried to determine with which variables the most appropriate model could be created with the Backward method. With this preliminary study, the appropriate model was determined and multiple linear regression analysis was performed with those variables.

The results of the regression analysis are given in Table 3. Firstly, the R2 value of the model was found as 0.701. Accordingly, the multiple linear regression equation in which the total income of sheep farming was estimated as SFTI= -0.045 E + 0.099 NSI + 0.090 LY + 0.084 FC -0.065 CP + 0.130 NSB + 0.687 NLB -0.056 NLD. According to the results of regression analysis, there is a significant relationship between the number of lambs born and total income from sheep farming.

5. Conclusion

It was determined that the educational level of the producers in the research region was low and the age distribution was high. In the findings obtained, it is seen that the number of family members is high, family labour force is high and foreign labour force is low. The high number of family members has disadvantages as well as advantages. These disadvantages lead to the following result: In addition to the fact that the high number of individuals reduces the foreign labour force, since the income obtained from sheep breeding is not sufficient for the family, as seen in the results obtained, it has caused some individuals in the family to find different ways of income other than sheep breeding. It has been determined that sheep breeding enterprises not only engaged in sheep breeding but also orientated towards other agricultural sectors such as cattle breeding and crop production.

Although it was determined that most of the producers grow fodder plants, it was revealed that the enterprises could not produce enough roughage and concentrate feed for themselves.

In line with the data obtained from the sales income of the enterprises, it is seen that the highest income is obtained from the sale of lambs. It is necessary to support the transition to a modern production system by raising the education level of the breeders. More production with less cost, more profit and better quality breeding should be ensured. Fodder plant production should be increased and made more comprehensive, and fodder plant production should be encouraged. In this way, producers will reduce their costs by closing the roughage and concentrate feed deficit.

According to the results obtained within the scope of sheep breeding production cost calculations, the total production cost is 144.39 USD. The ratio of variable costs in total costs was determined as 89.52%. The highest share in total production costs is feed costs.

In addition, according to the results of correlation analysis, there is a positive relationship between total income of sheep farming, which is the dependent variable, and feed costs, crop production, number of mother ewes, number of lambs born and number of lambs killed. According to the results of regression analysis, there is a significant relationship between the number of lambs born and total income from sheep farming.

6. References

AKÇAPINAR H.; ÜNAL N.; ATASOY F.; ÖZBEYAZ C.; AYTAÇ M. Karayaka ve Bafra (Sakız × Karayaka G1) koyunlarının Lalahan Hayvancılık Araştırma Enstitüsü şartlarına uyum kabiliyeti. Lalahan Hay Araşt Enst Derg, 42,1, 11-24. 2002.

ARAL S. Konya'nın hayvancılık potansiyeli ve il kalkınmasındaki rolü. İAV, İstanbul. 1995.

ARITUNCA, D.; KARABACAK, A. Konya Merkez İlçelerinde Koyunculuk İşletmelerinin Durumu. Bahri Dağdaş Hayvancılık Araştırma Dergisi, 9 (1) , 13-24. Retrieved from https://dergipark.org.tr/en/pub/bdhad/issue/56875/798317. 2020.

AYVAZOGLU DEMİR, P.; ADIGÜZEL IŞIK, S.; AYDIN, E.; YAZICI, K.; AYVAZOĞLU, C. Socio-economic Importance of Sheep Breeding Farms in Ardahan Province. *Van Veterinary Journal*, *26*(3). 2015.

ÇAKICI, M.; OĞUZHAN, A.; ÖZDİL, T. İstatistik, Ekin Basım Yayın Dağıtım, Bursa. 2015.

DALGIÇ V.; DEMIRCAN V. Economic analysis of sheep farms: a case study of Isparta Province, Turkey. Custos e @gronegócio *on line*, ISSN 1808-2882, Recife, volume 15, número 3, p. 1-521, Julho/Setembro. 2019.

DPT, VIII Beş Yıllık Kalkınma Planı ÖİK Raporu. Ankara. 2001.

GUJARATI, D. N. Basic Econometrics, McGraw Hill, Newyork. 2003.

GÜNEŞ H.; AKIN P.D. Koyun Barınakları. Türkiye Klinikleri J Vet Sci Intern Med-Special Topics. 3(1):1-5. 2017.

KAYMAK, K.; SARIÖZKAN, S. Muş İli Korkut İlçesinde Koyunculuk İşletmelerinin Sosyo-Ekonomik Yapısı ve Üretim Maliyetleri. Van Veterinary Journal, 27 (3) , 141-146. Retrieved from https://dergipark.org.tr/tr/pub/vanvetj/issue/37753/437555. 2016.

KUL, S.; ŞEKER, İ.; KÖSEMAN, A. Elazığ İlindeki Koyun Yetiştiricilerinin Sosyodemografik Durumu ve İşletmelerdeki Hayvan Sağlığı Faaliyetleri. Erciyes Üniversitesi Veteriner Fakültesi Dergisi, 19 (3) , 195-202. DOI: 10.32707/ercivet.1205149. 2022.

ŞEKER, İ.; KUL, S.; KÖSEMAN, A. Elazığ İlindeki Koyunculuk İşletmelerinin Yapısal Özellikleri. Kocatepe Veterinary Journal, 15 (3) , 322-331. DOI: 10.30607/kvj.1099329. 2022.

TAMER, B.; SARIÖZKAN, S. Yozgat Merkez İlçede Koyunculuk Yapan İşletmelerin Sosyo-Ekonomik Yapısı ve Üretim Maliyetleri* . Erciyes Üniversitesi Veteriner Fakültesi Dergisi, 14 (1) , 39-47. Retrieved from https://dergipark.org.tr/tr/pub/ercivet/issue/28168/301802. 2017.

YILMAZ ESER B, TERZİ H. Türkiye'de işsizlik sorunu ve Avrupa istihdam stratejisi. Erc Üniv İktisadi ve İdari Bil Fak Derg, sayı: 30.229- 230. 2008.