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ECONOMIC ANALYSIS OF BEEKEEPING FARMS: A CASE STUDY OF ISPARTA PROVINCE IN TURKEY

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Abstract

This study focused on economic structure of different beekeeping farm sizes in Isparta province in Turkey. The main material of the study was comprised of original data acquired by way of survey method from 74 farms in Isparta province which carry out beekeeping activities. Neyman Method from among the stratified sampling methods was used for determining the number of samples that will be subject to surveys. Accordingly, the farms with 0-75 hives (31 farms) group I, farms with 76-150 hives (25 farms) were classified as the group II whereas farms with 151+ hives (18 farms) were classified as the group III. Gross production value per hive ranged from 254. to 271.54 USD and on average it was 267.32 USD. The share of honey sale was approximately 99% of the total gross production value. The lowest and the highest production cost per hive were 49.12 to 71.58 USD, respectively. The result showed that as the magnitude of farm size increased, production costs per hive declined. It means that bigger farms had advantages over small farms in terms of production costs per hive. It was determined that permanent labor and feeding costs played an influential role in total production costs. The proportion of permanent labor cost in total production cost for group I, group II, and group III was 42.36, 37.94, and 33.62 %, accordingly, and feeding costs comprised 32.01, 28.51 and 35.71 %, respectively, of total production cost. Gross profit per hive ranged from 180.21 to 240.42 USD and on average it was 235.77 USD. In addition, net profit per hive increased as farm size increased. Relative return is a criterion that measures the success of a commercial enterprise. Relative return for group I, group II and group III were 3.55, 4.96 and 5.48, respectively. Since the relative returns of all the farm groups were higher than 1 it can be concluded that all the farms were profitable in relative returns increased with the increase in farm size.

Key words**:** *beekeeping, production post, profitability*

INTRODUCTION

Beekeeping is an activity involving the use of plant sources, bees and labour for producing honey, pollen, royal jelly, propolis, and bee venom along with live material such as queen bees, cluster bees and package bees (Firatli et al., 2000) [3]. Beekeeping has an important position among agricultural activities since it contributes to plant growth by way of pollination, provides income in a short period of time, does not require high capital and is not dependent on land assets. Beekeeping provides work, income and healthy nutrition to the rural population in developing countries due to low operating costs, lower labour requirement, ease of storage of the obtained products and the fact that the obtained product is sold at a value price (Gunbey, 2007; Kizilaslan and Kizilaslan, 2007) [4,7].

Turkey has a favorable ecosystem and a strong production potential for beekeeping activities. There are about 8 million colonies in Turkey with a honey production of 105 thousand tons (TUIK, 2016) [12]. The proportion of Turkey in the number of colonies in the world is about 9% with a proportion of about 7% with regard to honey production. Turkey is ranked third in the world in terms of the number of colonies, and second in the world with regard to honey production. The Isparta province where the study was carried out in has a favorable ecosystem for beekeeping activities. Bees play an important role in the fertilization of fruit trees in Isparta with a high potential for fruit growth. The number of hives in Isparta province in 2016 was 32,384 with a honey production of 252 tons (TUIK, 2016) [12].

The purpose of this study was to analyze the economic structure of different beekeeping

farm sizes in Isparta province in Turkey. For this purpose, the beekeepers were grouped according to the number of hives after which they were compared with regard to production cost, income and profitability indicators. It is expected that the data acquired in the study shall provide valuable information to policy makers, producers, researchers and all relevant institutions.

MATERIALS AND METHODS

The main material of the study was comprised of original data acquired from beekeeping farms at the districts of Eğirdir, Yalvaç, Merkez, Sütçüler and Keçiborlu in Isparta province. In addition, similar studies carried out by related people and institutions as well as reports and statistics were also used. Survey data includes 2016 production data.

Purposive sampling was used for selecting the districts of Eğirdir, Yalvaç, Merkez, Sütçüler and Keçiborlu where extensive beekeeping activities are carried out in accordance with data acquired from the Isparta Union of Beekeepers. All beekeeping farms in these districts that fit the purpose of the study comprised the population. The districts selected as the study area make up about 78% of Isparta province and 71% with regard to the number of hives (TUIK, 2016) [12]. Hence, it can be stated that the study region has the required characteristics for representing the beekeeping farms in Isparta province

Neyman Method from among the stratified random sampling methods was used for determining the number of samples to be included in the survey (Yamane, 2001) [13]. The number of samples for representing the main population was calculated as 74 as a result of this method. Since the number of hives of different farms varies, it was decided to homogenize the population of beekeepers by classifying them into different layers. The beekeepers were classified into three groups according to the number of hives and frequency distribution. Furthermore, groups were classified based on the number of hives as follows: Group I (0-75 hives), Group II (76-150 hives) and Group III (151 and more hives). The number of beekeepers for Group I, II, III was 31, 25, and 18, respectively.

Production costs during beekeeping activities are required in order to calculate the honey production cost. Production costs have been classified into two groups as fixed and variable costs. Fixed costs are those that do not depend on production. Whereas variable costs decrease or increase depending on production (Kiral et al., 1999) [6]. Machinery depreciation machinery capital interest, bee capital interest, administrative costs and permanent labor were taken into consideration as fixed cost factors related with beekeeping activities. Depreciation ratio was considered as 10% when calculating the machinery depreciation from among the fixed cost factors (Oren et al., 2010) [8]. New machinery and bee capital was divided into two after which the real interest rate (2.31%) was applied when calculating the machinery and bee capital interest values (Kiral et al., 1999) [6]. Administrative costs were calculated as 3% of the total variable costs. Wage rate to foreign labor was taken as basis when calculating the family labor force wage included in the production costs.

Feeding, transportation, temporary labor, accommodation, hive, medication, packaging, insurance and revolving fund interest were taken into consideration as variable costs in this study. Revolving fund interest was calculated by applying half the agricultural credit interest rate applied by the T.R. Ziraat Bank for beekeeping activities (4%) to the total variable cost.

Production costs were comprised of the sum of fixed and variable costs. The cost of 1 kg of honey was calculated by dividing the total honey production costs per farm to the total honey production.

Gross product value for beekeeping activity was calculated by multiplying the product amounts acquired as a result of agricultural activities from beekeeping with the unit prices. Gross profit, net profit and relative return calculations were also made in the study for putting forth the profitability in honey production. The difference between variable costs and gross product equals to gross profit, which is a measure of success of

production branch for farm analysis. Net profit was obtained from the difference between production costs and gross product value. Division of gross product value to the production costs gives relative return.

RESULTS AND DISCUSSIONS

Cost factors for beekeeping activities were analyzed by classifying them into groups as fixed and variable costs. Variable costs increase or decrease depending on the production. These costs emerge upon production and vary subject to production amount. While fixed costs do not change depending on production or in other words, they are costs which emerge regardless of whether production activities are carried out or not (Inan, 2016) [5].

Costs for beekeeping activities are given in Table 1. As can be seen in the Table, the proportion of variable costs in production costs for Groups I., II. and III. were 52.04%, 56.82% and 60.06% respectively; whereas the proportion of fixed costs has been calculated as 47.96%, 43.19% and 39.94% respectively. Average proportion of variable and fixed cost in total production cost were 56.98 and 43.02%, respectively for all beekeeping farms.

Table 1. Production costs of beekeeping farms

Cost items (USD farm^{-1})	Farm groups							
	I. Group		II. Group		III. Group		General	
	USD	%	USD	%	USD	%	USD	%
Feed	1,237.42	32.01	1,858.28	28.51	3,982.12	35.71	2,115.00	32.37
Transportation	179.47	4.64	557.95	8.56	477.81	4.29	379.90	5.81
Temporary Labour	44.04	1.14	222.19	3.41	316.89	2.84	170.59	2.61
Accommodation	77.48	2.00	163.58	2.51	206.62	1.85	137.98	2.11
Honeycomb	218.87	5.66	411.26	6.31	615.56	5.52	380.36	5.82
Medication	86.09	2.23	193.05	2.96	420.20	3.77	203.49	3.11
Packing	69.21	1.79	131.13	2.01	273.18	2.45	139.74	2.14
Insurance	21.52	0.56	23.84	0.37	147.35	1.32	52.91	0.81
Revolving fund interest	77.48	2.00	142.38	2.18	257.62	2.31	143.23	2.19
Total variable costs (A)	2,011.59	52.04	3,703.64	56.81	6,697.35	60.06	3,723.01	56.98
Administrative costs	60.26	1.56	111.26	1.71	200.99	1.80	111.72	1.71
Permanent Labour	1,637.42	42.36	2,473.51	37.94	3,749.01	33.62	2,433.51	37.24
Bee capital interest	3.31	0.09	7.28	0.11	17.22	0.15	8.04	0.12
Machinery capital interest	15.89	0.41	23.18	0.36	50.33	0.45	26.73	0.41
Machinery depreciation	137.09	3.55	200.00	3.07	435.76	3.91	230.99	3.54
Total fixed costs (B)	1,853.97	47.96	2,815.23	43.19	4,453.31	39.94	2,810.99	43.02
Total production costs (A+B)	3,865.56	100.00	6,518.87	100.00	11,150.66	100.00	6,534.00	100.00
Honey production (kg farm^{-1})	1,382.00	-	3,088.00	-	5,888.00	-	3,054.41	-
Honey cost (USD kg^{-1})	2.80	-	2.11	-	1.89	-	2.14	-

Source: Data from field survey, 2016

Of all cost items, permanent labor had the highest proportion with 34.24 %. Family labor comprised most of the permanent labor cost. Another important cost in beekeeping activities was feeding costs. The proportion of feeding costs in total production costs was 32.01, 28.51, 35.71 and 32.37% for first, second third and all beekeeping farms, respectively. Beekeeping farms use honey, sugar, pollen and fresh yeast for feeding the bees. Honeycomb and transportation had a share of 5.82% and 5.81%, respectively, in the total production costs. Transportation cost stemmed from the fact that majority of the farms (49 farms) carried out migratory beekeeping activities.

The production cost for 1 kg honey decreased as farm size increased. Indeed, the production costs for 1 kg honey for the I., II. and III. groups were 2.80, 2.11 and 1.89 USD, respectively. Average production cost for 1 kg honey was 2.14 USD for all farms. The reason why only the honey cost was included in the cost table was that all other products excluding honey had a small proportion in the total gross production value.

A study conducted in Turkey by Ceyhan et al., (2016) [1], found that the proportion of variable costs in total production cost was

60%, the proportion of fixed costs was 40% and that labor (26%), feeding (19%) and transportation (15%) costs were the most important cost items. In addition, it was also found that the production cost decreased with increasing beekeeping farm size. Saner et al., (2011) [10], found out that 63.26% of the total production costs was comprised of variable costs, while 36.74% was comprised of fixed costs and that colony renewal was ranked number one among variable costs with a proportion of 19.05% followed by fuel/transportation costs with a proportion of 12.04%. Ozturk et al., (2015) [9], conducted a study and found that average honey production cost in the Mediterranean Region was 9.55 TL/kg and that the honey production cost decreased with increasing farms sizes. Oren et al. (2010) [8], found that 54.33% of the production cost was comprised of variable costs and that 45.67% was comprised of fixed costs with a cost of 4.66 TL for 1 kg of honey. Gross product values for farm sizes are given in Table 2. Gross product value for beekeeping activities was comprised of honey, pollen, royal jelly and propolis sales. The average gross product value in the farms was 31,543.44 USD which increased as farm size increased. Indeed, gross product values were calculated as 13,741.72, 32,313.25 and 61,132.78 USD for I., II. and III. groups, respectively. Honey made up 98.85% of the total gross product value for all farms.

Table 2. Income of beekeeping farms

Income items (USD farm^{-1})	Farm groups							
	I. Group		II. Group		III. Group		General	
	USD	%	USD	%	USD	%	USD	%
Honey	1,3641.39	99.27	3,2105.30	99.36	60,106.62	98.32	31,181.55	98.85
Pollen	95.36	0.69	81.79	0.25	881.457	1.44	281.99	0.89
Royal jelly	0.00	0.00	125.50	0.39	110.2649	0.18	69.22	0.22
Propolis	4.97	0.04	0.66	0.00	34.43709	0.06	10.68	0.03
Gross product value	13,741.72	100.00	32,313.25	100.00	61,132.78	100.00	31,543.44	100.00

Source: Data from field survey, 2016

Gross profit, net profit and relative return per farm and per hive for all groups were presented in Table 3. Gross profit is a significant measure of succession to determine the competitive strength of production activities in the farms with regard to the use of scarce production factors. In other words, gross profit is a signicant parameter indicating the success of the farms (Erkus et al.,1995) [2]. As it can be observed in the table, average gross profit was 27,820.43 USD which increased with increasing farm size. Indeed, average gross profit was 11,730.13 USD for I. group as 28,609.60 USD for II. group and as 40,906.78 USD for III. group. Average net profit per beekeeper was 98,76.16, 25,794.37 and 49,982.12 USD for I., II. and III. farm groups, respectively. Accordingly, it can be observed that average net profit per beekeepers increased with increasing farms size.

Another criterion that measures the success of beekeeping activity is relative return. Relative return was calculated as 3.55, 4.96, 5.48 and 4.83 for I., II. and III. group farms. Accordingly, farms acquired 4.77 TL income per 1 TL production cost. Ozturk et al., (2015) [9], found that relative return average for the Mediterranean Region of Turkey was 2.7. The results showed that the amount of honey per hive was 25.88 kg based on average of all groups. Additionally, it was also determined that the production costs per hive declined as farm size increased. Indeed, production costs per hive for I., II., III group farms were 71.58, 54.78, 49.12 and 55.37 USD respectively. Gross profit per hive was 217.22 USD for I. group farms, as 240.42 USD for II. group farms, as 180.21 USD for III. group farms and the average of all groups was 235.77 USD. The net profit per hive for Group I, II, and III was 182.89, 216.76, and 220.19, respectively. The average of all groups was 211.94 USD. The most important reason why profitability increased per hive with increasing farm size was the decrease in production costs parallel to farm size (Table 3). Saner et al., (2005) [11], found that the net profit earned by

beekeepers from 1 kg honey increased with increasing farm size (number of hives).
In general, it was determined that the beekeepers made profit in all farm groups. High honey yield per hive and the fact that they sell 98.65% of the honey as retail with high prices (average: 10.13 USD kg^{-1}) enabled them to make higher profit.

Table 3. Profitability indicators of beekeeping farms

Profitability indicators (USD $farm^{-1}$)	Farm groups			
	I. Group	II. Group	III. Group	General
Gross product value	13,741.72	32,313.25	61,132.78146	31,543.44
Total variable costs	2,011.59	3,703.64	6,697.35	3723.01
Total fixed costs	1,853.97	2,815.23	4,453.31	2,810.99
Total production costs	3,865.56	6,518.87	11,150.66	6,534.00
Gross profit	11,730.13	28,609.60	40,906.78	27,820.43
Net profit	9,876.16	25,794.37	49,982.12	25009.44
Relative return	3.55	4.96	5.48	4.83
Profitability indicators (USD $hive^{-1}$)				
Hive number (hive $farm^{-1}$)	54	119	227	118
Honey yield (kg $hive^{-1}$)	25.59	25.95	25.94	25.88
Gross product value	254.48	271.54	269.31	267.32
Total variable costs	37.25	31.12	89.10	31.55
Total fixed costs	34.33	23.66	19.62	23.82
Total production costs	71.58	54.78	49.12	55.37
Gross profit	217.22	240.42	180.21	235.77
Net profit	182.89	216.76	220.19	211.94
Relative return	3.55	4.96	5.48	4.83

Source: Data from field survey, 2016

CONCLUSIONS

In conclusion, it can be stated that majority of the production costs of beekeeping farms is comprised of labor (39.85%) and feeding (32,37%) costs. It was also determined that production costs per hive decreases with increasing farm size. It was observed that majority of the gross product value of beekeepers comes from honey (98.85%) and very low ratios for products such as pollen, royal jelly and propolis. It was determined that net profit and relative return per hive increases with increasing farm size. In general, it was determined that the beekeepers made profit in all farm groups. High honey yield per hive and the fact that they sell 98.65% of the honey as retail with high prices enabled them to make higher profit.

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REFERENCES

[1]Ceyhan, V., Cinemre, H.A., Yeninar, H., Demiryurek, K., Bozoglu, M., Kılıc, O., Oztürk, A.I., Emir, M., Canan, S., Yildirim, C., Baser, U., 2016, Current situation problems and future of beekeeping in Turkey. Editörler: Vedat Ceyhan- Murat Emir, Baskı ve Cilt: Erol Ofset, Kapak Tasarımı: Sengir., S., Samsun.
[2]Erkus, A., Bulbul, M., Kiral, T., Acil, A.F., Demirci, R., 1995, Agricultural economics. Ankara Üniv. Zir. Fak. Eğitim, Araştırma ve Geliştirme Vakfı Yayınları, Ankara.
[3] Firatli, C., Genc, F., Karacaoglu, M., Gencer, H.V., 2000, Comparative Analysis of beekeeping in Turkey, problems-suggestions. TMMOB. Ziraat Mühendisleri Odası. V. Türkiye Ziraat Mühendisliği Teknik Kongresi. 17-21 Ocak 2000, Cilt 2, Sayfa:811-826, Ankara.
[4]Gunbey, V.S., 2007, The determination of migratory beekeeping movements in the province of Van.Yüzüncü Yıl Üniversitesi. Fen Bilimleri Enstitüsü. Zootekni Anabilim Dalı. Yüksek Lisans Tezi. Van.
[5]Inan, I.H., 2016, Agricultural Economics and Management. İdeal Kültür Yayıncılık.
[6]Kiral, T., Kasnakoglu, H., Tatlidil, F., Fidan, H., Gundogmus, E., 1999, Data base guide and production cost methodology for agricultural products. Tarımsal Ekonomi Araştırma Enstitüsü, Yayın, Ankara, No. 37.
[7] Kizilaslan, H., Kizilaslan, N., 2007, Factors Affecting Honey Production in Apiculture in Turkey. Journal of Applied Sciences Research. 3(10): 983-987.

[8] Oren, M. N., Alemdar, T., Parlakay, O., Isık Yilmaz, H., Seçer, A., Gungor, C., Yaşar, B., Bahadır Gurer, B., 2010, Economic analysis of beekeeping farms in Adana province, Turkey. Tarımsal Ekonomi Araştırma Enstitüsü, TEAE Yayın No: 178, Ankara.
[9] Ozturk, C., Subası, S., Uysal, O., Secer, A., Alemdar, T., Oren, M.N., 2015, Determination of technical and economic structure of beekeeping farms in Mediterranean Region, Turkey. T.C. Gıda, Tarım ve Hayvancılık Bakanlığı Tarımsal Ekonomi ve Politika Geliştirme Enstitüsü, Tepge Yayın No:254, Ankara.
[10]Saner, G., Yucel, B., Yercan, M., Karaturhan, B., Engindeniz, S., Cukur, F., Koseoglu, M., 2011, A research on the technical and economic development of organic and conventional honey production and the determination of alternative market opportunities: A case study of Kemalpaşa District of İzmir province. T.C. Gıda, Tarım ve Hayvancılık Bakanlığı Tarımsal Ekonomi ve Politika Geliştirme Enstitüsü, Tepge Yayın No:195, Ankara.
[11] Saner, G., Engindeniz, S., Cukur, F., Yucel, B. 2005, A research on the technical and economic structure and problems of beekeeping farms in İzmir and Muğla provinces, Turkey. Tarımsal Ekonomi Araştırma Enstitüsü Yayın No: 126, Ankara.
[12] TUIK., 2016, TUIK (Turkish Statistical Institute). www.tuik.gov.tr; Accessed: 13 October 2017.
[13]Yamane, T., 2001, Basic Sampling Methods. Translators: A. Esin, M.A. Bakır, C. Aydın, E.Gurbuzsel, Publishing of Literatur, No:53, İstanbul.