Economic Analysis of Beekeeping Operations and Factors Affecting Production in Mediterranean Region of Turkey

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Abstract

The main objective of this study is to investigate economic analysis of beekeeping operations and determine factors affecting the production in the Mediterranean region. In this regard, the survey was conducted in 2013 and the data was obtained via face to face interviews with 139 beekeepers. In order to determine beekeeping enterprises, stratified sampling method was used in terms of owned hives. According to the results, the average honey cost in the region is 5.30 US$/kg. The average number of hives is 179.06 and the yield per hive is 12.3 kg/year. The average annual gross production value is 25029 and net profit is 19882 US$. The average relative profit was calculated as 2.70 US$/year. 15 variables were grouped under four factors affecting honey production as specific factors for enterprises, outsourcing, product diversity and auxiliary factors. In this frame, problems for beekeeping enterprises in Mediterranean region are identified, and then specific solutions are provided.

Keywords: Beekeeping, Economic analysis, Factors, Mediterranean region

Akdeniz Bölgesinde Arıcılık İşletmelerinin Ekonomik Analizi ve Üretimi Etkileyen Faktörler

Öz

Bu çalışmanın temel amacı, Akdeniz bölgesindeki arıcılık işletmelerinin ekonomik yapısını ve üretimini etkileyen faktörlerin incelenmesidir. Bu kapsamda 2013 yılında 139 arıcı ile yüz yüze görüşülerek anket gerçekleştirilmiş ve veriler elde edilmiştir. Örnekleme kapsamına alınacak arıcılık işletmelerini belirlemek için tabakalı örnekleme yöntemi kullanılmıştır. Sonuçlara göre, bölgede ortalama bal maliyeti 5.30 ABD $/kg'dır. Ortalama kovan sayısı 179.06 ve kovan başına verim 12.3 kg/yıl'dır. Ortalama yıllık brüt üretim değeri 25029 ABD $'ı ve net kar 19882 ABD $'ıdır. Ortalama nispi kar da 2.70 $/yıl olarak hesaplanmıştır. Bal üretimini etkileyen 15 değişken, işletmeye özel faktörler, dış hizmet alım faktörü, ürün çeşitliliği ve yardımcı faktörler olarak dört faktör grubunda toplanmıştır. Bu çerçevede, Akdeniz bölgesindeki arıcılık işletmelerinin sorunları tanımlanmış ve çözüm önerileri sunulmuştur.

Anahtar Kelimeler: Arıcılık, Ekonomik analiz, Faktör, Akdeniz bölgesi
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1. Introduction

Beekeeping is the act of keeping bees to provide or produce honey and other by-products. It is the practice of bee rearing which combines the knowledge of the biology and behavior of bees with that of the surrounding environment, the use of suitable equipment to produce honey and other bee hive product for the benefit of man (Obialor, 2003). Beekeeping requires very little capital, land and labor to start-up and can easily be practiced by men, women, youth and people with disabilities alike. This means that beekeeping provides an opportunity for many different members of the community to use available natural resources to support their livelihoods (Qaiser et al., 2013).

In Turkey, the beekeeping sector has improved in recent years. Among the reasons for these changes are the increase in migratory beekeeping and demand of beekeeping products, as well as some products like propolis and bee milk with an increase in yield and quality.

There were 8.1 million hives in Turkey in 2018. 21.3% of total hive number is in the Aegean Region and 15.95% of them are in the Mediterranean Region. The rest is in the other regions. Honey production increased from 73929 tons to 107920 tons in the last decade (TUİK, 2019). The most important honey producer regions depending on hive quantity are Aegean Region, Mediterranean Region, East Black Sea Region and Middle East Anatolia Region. Mediterranean Region supplies 17.57% of total honey production. Mediterranean Region is one of the most important honey production areas. However, it is known that some production and marketing problems exist in the area. Traditional production techniques, lack of producer organizations and lack of data registration system are some of these problems. In literature, there are many studies about socio-economic structures in beekeeping operations. Some of these studies define factors affecting beekeeping production. However, studies focusing on beekeeping operations which examine socio-economic structure and factors affecting the field in the Mediterranean Region are scarce, if any. In this respect, the present study aims to explore socio-economic structure, production quantity of beekeeping products, honey production cost and profitability and factors affecting honey production in beekeeping operations. In line with the findings, suggestions are presented to develop the beekeeping sector in the region.

2. Material and methods

The main material of the study was the primary data collected from the questionnaires answered by the beekeepers among eight provinces in Mediterranean Region. The study was conducted between 2012-2013 production seasons. The data were gathered in winter of 2012-13. The study was also supported by secondary data obtained from the Provincial Directorate of the Ministry of Agriculture and Forestry and Turkish Statistical Institute.

To test reliability and relevance of the items in the questionnaire were firstly tested in a pilot area and then necessary adjustments were completed. The questionnaire consisted of three sections. In the first section, the questions were directed toward general properties of operations and beekeepers, in the second section they were about honey production cost and profitability; in the third section, they were about marketing structure of beekeeping products. Also, secondary data were used from other national and international sources.

Research area was Mediterranean region of Turkey, which had 15.95% of total hives and 17.57% of total honey production in Turkey (TUIK, 2019). The suitability of the climate and the geographical location of the region are advantageous from the agricultural aspects. It provides a significant contribution to the economy of the region with crop production livestock (Yımaz et al., 2016). Mediterranean region is located between 35° N and 34° E latitudes and between 37° N and 34° E longitudes. The surface area of Mediterranean region is 89983 km^2. Mediterranean Region consists of Adana, Mersin, Hatay, Osmaniye, Kahramanmaraş, Antalya, Isparta and Burdur

provinces. All provinces were included in the sample. Beekeepers' list was obtained from Beekeepers Union. According to this list, there are 5793 beekeepers in the research area. 25.6% of these beekeepers were in Antalya, 23.0% of them were in Adana and 21.9% of them were in Mersin. The rest of the beekeepers were in other provinces (Table 1).

Table 1. Provincial distribution of the questionnaire applied

Provinces	Operation Size Groups						Total	
	1–200		201–300		301-+			
	n	%	n	%	n	%	n	%
Antalya	32	32.7	3	12.5	1	5.9	36	25.9
Adana	17	17.4	7	29.2	8	47.1	32	23.0
Mersin	15	15.3	10	41.7	5	29.4	30	21.6
Hatay	10	10.2	-	-	1	5.9	11	7.9
Osmaniye	7	7.1	2	8.3	1	5.9	10	7.2
Burdur	7	7.1	1	4.2	-	-	8	5.8
Kahramanmaraş	5	5.1	1	4.2	1	5.9	7	5.0
Isparta	5	5.1	-	-	-	-	5	3.6
Total	98	100.0	24	100.0	17	100.0	139	100.0

The numbers of the sample farms were determined by using "Stratified Sampling Method". Neyman method was employed in distributing sample farms to the strata (Çiçek and Erkan, 1996).

$n = (N\sum Nh^2Sh) / (N^2D^2 + \sum NhS^2h)$

$D^2 = d^2/ z^2$

The number of the sample was determined as 139 beekeepers with a 5% margin of error and 95% confidence interval. Some alternative strata models were evaluated and then the number of sample beekeepers were divided into three sub-groups by the number of colonies, as 1-200, 201-300 and 300<. Questionnaires were applied to 98 beekeepers in the group of 1-200 colonies (Group 1), 24 persons in the group of 201-300 colonies (Group 2) and 17 beekeepers in the group of 300< colonies (Group 3) (Table 1).

Calculating production costs, enterprise budget analysis was employed. In case the sources of the farm itself were used, these sources were priced based on the alternative cost (opportunity cost) principle. Production costs consisted of fixed and variable expenses. Fixed costs were calculated by depreciation of tools, interest expense of tools, interest expense of bees, family labor costs and administrative expenses. The components of variable expenses were sugar (food), medicine, honeycomb, water, transportation, temporary labor, accommodation cost, jars and the interest cost of circulating capital. To calculate the interest expense of tools, the interest expense of bees, firstly half of tools' and bees' value was determined and then this was multiplied by 7%. Agricultural loan interest rate of Ziraat Bank of Turkish Republic was used for calculating these values. The interest rate determined by Ziraat Bank was 7% for 2012. It was assumed that variable expenses were distributed homogenously and interest cost was calculated for the crop growing period. Administrative expenses were calculated by extracting 3% of variable cost (Mülayim, 2001). Family labor cost was evaluated within temporary labor costs. The interest cost of circulating capital was calculated based on agricultural loan interest rate of Ziraat Bank after taking half of the variable costs. Incomes and profitability of the production activity were calculated by the following formulas (Açıl and Demirci, 1984; Kıral et al., 1999).

$GPV = (HQ*F) + OPV$

in which GPV: gross output value; HPV; honey production value; OPV: other beekeeping products value

$GP = GPV - VC,$

in which GP: gross profit; GPV: gross output value; and VC: variable cost.

NP = GPV - PC

in which NP: net profit; GPV: gross output value; and PC: variable cost + fixed cost.

RP = GPV / PC

in which RP: relative profit (%); GPV: gross output value; and PC: production cost (variable cost + fixed cost) . Turkish Lira values have been converted to USD according to 2013 exchange rate.

In the study, factor analysis was used to find factors affecting honey production. The broad purpose of factor analysis is to summarize large datasets that consist of several variables, so that relationships and patterns can easily be interpreted. It is normally used to regroup variables into a limited set of clusters based on shared variance. Factor analysis uses mathematical procedures for the simplification of interrelated measures to discover patterns in a set of variables. This analysis operates on the notion that measurable and observable variables can be reduced to fewer latent variables that share a common variance and are unobservable, which is known as reducing dimensionality (Bartholomew et. al., 2011). These unobservable factors are not directly measured but are essentially hypothetical constructs that are used to represent variables.

In the 'classical factor analysis' mathematical model, p denotes the number of variables (X1, X2,…,Xp) and m denotes the number of underlying factors (F1, F2,…,Fm). Xj is the variable represented in latent factors. Hence, this model assumes that there are m underlying factors whereby each observed variables is a linear function of these factors together with a residual variate. This model intends to reproduce the maximum correlations.

Xj= aj1F1+aj2F2+.....+ajmFm+ej

where j=1,2,.....,p. The factor loadings are aj1, aj2,…,ajm which denotes that aj1 is the factor loading of jth variable on the 1st factor. The specific or unique factor is denoted by ej. The factor loadings give us an idea about how much the variable has contributed to the factor; the larger the factor, loading the more the variable has contributed to that factor.

The principal component method was applied on the evaluated statements. An eigenvalue greater than 1 was selected as the criteria for determining the number of factors to be extracted. Factor loadings higher than 0.4 were used in order to place original variables into a specific factor (Cerzak et al., 2011). The results were also combined with the orthogonal methods of rotation Varimax.

The best factorial model was formed by taking into account the values of KMO tests (Kaiser-Mayer-Olkin tests) and Barlett sphericity, the value of communalities and the logical sense between factors. The minimum of 0.50 was used as the acceptable limit of KMO. The values of the four stages of KMO and the communalities of each variable were assessed. In stages with two factors with communalities below 0.50, one item was removed at a time, and the result was checked for the next step. The analysis of anti-image correlation matrix and commonalities were conducted. The anti-image correlation matrix represents the partial correlations between variables after the factorial analysis, which indicates the level at which factors explain the results to one another. The commonality represents the proportion of variance of each variable in the analysis. The Kaiser-Mayer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The KMO statistics varies between 0 and 1. It is generally recommended to accept values greater than 0.5. Furthermore, values between 0.500 and 0.700 are mediocre, values between 0.700 and 0.800 are good, values between 0.800 and 0.900 are great and values above 0.900 are outstanding (Field, 2005). For the data in the study, the value is 0.768, which falls into the range of being good.

3. Results

In the operations, average household size is defined as 3.72 persons. In the area, beekeepers' average age is 48.82 years and education duration is 8.30 years. Beekeepers have worked on average for 18.23 years in this production field (Table 2). It was found out that there was a 5% significant difference between farm groups and farmer ages and experiences. 91.37 of the beekeepers conducted migratory beekeeping. The 3rd group consisted of only migratory beekeepers whereas this ratio was 95.83% in the 2nd group and 88.72% in the 1st group. Some of migratory keepers (31.3%) travelled within the region. The rest of them come from other regions; generally East Anatolian Region (28.4%), Middle Anatolian Region (15.5%) and South East Anatolian Region (14.9%).

Table 2. Beekeeper's features

Features	Operation Groups			Average
	1st Group	2nd Group	3rd Group	
Household size (persons)	3.83±1.49	3.21±1.10	3.83±1.33	3.72±1.42
Farmers' ages (years)*	49.72±10.86	50.25±9.87	41.59±10.86	48.82±10.96
Education duration (years)	8.49±4.12	7.38±2.95	8.53±3.24	8.30±3.85
Experiences (years)*	16.62±10.85	24.21±11.57	19.06±8.61	18.23±11.03

* $p<0.05$

It was found that 56.0% of total production cost was variable cost and 44.0% of was fixed costs. Variable costs had the highest ratio in the 3rd group (66.3%) and the lowest ratio in the 1st group. It is known that operations work more intensively while variable costs ratio increase. However, in these operations, source of high variable cost ratio was scale economics rather than intensive working. In the variable costs, transportation cost had the highest ratio (17.5%) since most of the beekeepers were migratory. It was followed by accommodation (9.1%) and food costs (8.1%). In the fixed costs, the highest ratio was family labor cost (31.6%). To summarize, it can be said that labor, transportation and food were important inputs for beekeeping.

In the region, average honey production cost was 5.3 US$/kg. Unit cost decreased when hive number increased. The reason of this decrease was scale economics. Thus, honey production cost was 3.58 US$/kg in the 3rd group, 4.90 US$/kg in the 2nd group and 7.19 US$/kg in the 1st group. Gross profit was 25029.3 US$ and net profit was 19882.2 US$ per operation. It can also be observed that higher operation size brought higher gross profit and net profit. While relative profit was calculated 2.7 US$, it was 2.4 in the 1st group, 2.2 in the 2nd and 2.6 US$ in the 3rd group (Table 3).

In the research area, honey and other beekeeping products production quantity are presented in Table 4. Average honey production in operations was 2206.7 kg and increased in parallel with operation size. Accordingly, this quantity was 1184.5 kg in the 1st group, 3483.9 kg in the 2nd group and 6296.5 kg in the 3rd group. On the other hand, there was 95.62 kg honey wax, 72.42 kg pollen and 1.89 kg bee milk production in operations. Propolis production (2.0 kg) was only available in the 1st group (Table 4). It was found out that there was a 5% significant difference between farm groups and food costs, medicine costs, honeycomb costs, transportation costs, temporary costs and jars costs.

Honey and other bee products were sold to directly consumers, intermediates, cooperatives and processors in the market. 64.0% of the operations sold strained honey to the consumers, while 84.6% of them comb honey to the consumers directly. Bee milk was produced by 6.5% of operations and pollen was produced by 9.4% of them and these products were sold to intermediates and consumers. Propolis was purchased by processors and consumers.

Table 3. Costs and profitability of the beekeeping production field

Cost Variables	Operation Groups						Average	
	1st Group		2nd Group		3rd Group			
	US$	%	US$	%	US$	%	US$	%
1. Food (sugar etc.)**	535.9	6.3	1605.0	9.4	2 346.7	10.4	942.0	8.1
2. Medicine**	190.1	2.2	347.2	2.0	547.0	2.4	260.9	2.2
3. Honeycomb**	537.4	6.3	1100.53	6.5	1 450.26	6.4	746.3	6.4
4. Water	191.9	2.3	236.3	1.4	55.5	0.3	182.9	1.6
5. Transportation**	1191.1	14.0	2569.8	15.1	6237.0	27.7	2046.3	17.5
6. Temporary labor**	430.6	5.1	939.6	5.5	1 699.1	7.5	673.6	5.8
7. Accommodation	544.3	6.4	3145.7	18.4	1115.3	5.0	1063.3	9.1
8. Jars**	239.4	2.8	537.1	3.2	858.0	3.8	366.4	3.1
9. Interest cost of circulating capital	168.9	2.0	458.6	2.7	626.0	2.8	274.8	2.4
10. Variable costs	4029.6	47.3	10939.6	64.1	14934.8	66.3	6556.4	56.0
11. Administrative cost	120.9	1.4	328.2	1.9	448.1	2.0	196.7	1.7
12. Family Labor cost	3531.4	41.5	3930.6	23.0	4289.2	19.0	3693.01	31.6
13. Interest expense of bee capital	523.6	6.2	1176.2	6.9	1 783.9	7.9	790.4	6.8
14. Depreciation of tools	227.2	2.7	510.4	3.0	797.5	3.5	345.9	3.0
15 Interest expense of tools capital	79.5	0.9	178.7	1.1	279.1	1.2	121.1	1.0
16. Fixed Costs	4482.7	52.7	6124.0	35.9	7597.7	33.7	5147.06	44.0
17. Production Costs	8512.3	100.0	17063.7	100.0	22532.5	100.0	11703.5	100.0
18. Honey prod. quantity (kg/opr)	1184.5		3483.9		6296.5		2206.6	
19. Honey prod. cost (US$/kg)	7.19		4.90		3.58		5.30	
20. Beekeeping products value	7106.5		9868.0		21916.7		9110.5	
21. Gross production value	20585.6		37023.7		58156.5		31585.7	
Gross profit	16555.7		26084.1		43221.7		25029.3	
Net profit	12073.1		19960.0		35624.0		19882.2	
Relative profit	2.4		2.2		2.6		2.7	

*Beekeeping Products: beeswax, pollen, bee milk, propolis, queen bee, ** $p<0.05$

Table 4. Production quantity of beekeeping products

Products	Operation Size Groups			Average
	1st Group	2nd Group	3rd Group	
Honey (kg)*	1184.5	3483.9	6296.5	2206.7
Beeswax (kg)*	62.0	172.3	170.9	95.6
Pollen (kg)	54.0	45.9	170.8	72.4
Bee milk (kg)	3.1	0.7	1.0	1.9
Hive (piece)*	46.4	100.3	114.6	67.0
Propolis (kg)	2.0	-	-	2.0
Queen bee (item)*	75.4	130.0	193.3	96.3

* $p<0.05$

In the study, factors affecting honey production were defined by factor analysis. Factor matrix can be interpreted in two ways as vertical and horizontal. For vertical interpretation, each factor is examined separately and the dependency of variables on each factors are described. Whereas for horizontal interpretation, how each variable relates to factors determined is explained. The factors which had eigenvalues greater than 1 were included and the numbers of the emerging factors were determined. Subsequently, four factors were gathered from the 15 variables that could affect honey production. These factors explained 72.191% of total variance (Table 5).

Table 5 - Factors affecting honey production

Variables	Factors				Dependency (h^2)	Cronbach's alpha
	1	2	3	4		
Age of beekeeper (year)	**-.745**	.239	-.009	.037	.613	.763
Number of hives (item)	**.733**	.423	.342	-.095	.843	
Total honey income (US$/year)	**.651**	.317	.285	.123	.620	
Honey price (US$/kg)	**-.741**	-.126	-.107	.245	.636	
Winter colony losses (%)	**.804**	.085	.088	-.019	.661	
Benefited government aid (US$)	**.731**	.415	.349	-.041	.830	
Food (sugar) cost (US$)	**.769**	.415	.048	-.147	.787	
Transportation cost (US$)	**.798**	.239	.294	-.001	.781	
Temporary labor cost (US$)	-.032	**.786**	.352	-.200	.783	.667
Used basic honeycomb quantity (kg)	.275	**.816**	-.005	-.068	.745	
Tools cost (US$)	.261	**.602**	-.151	.303	.545	
Number of queen bee excluder (item)	.435	.063	**.785**	-.092	.818	.586
Other products incomes (US$)	.147	.044	**.884**	.052	.808	
Beekeeping working duration (day)	.117	.204	-.147	**-.764**	.661	.501
Non-farm income (US$)	-.082	.135	-.140	**.808**	.698	
Eigenvalues	6.457	1.614	1.425	1.333		
Variance	43.047	10.761	9.497	8.887		
Cumulative Variance	43.047	53.807	63.304	72.191		
KMO value				.768		

The first factor explained 43.047 of total variance and comprised 8 variables. This factor was named as "specific factors for operations". This factor included age of beekeepers, the number of hives, total honey income, honey quantity loss, benefited government aid, food (sugar) cost and transportation cost. These variables had high dependency. The average factor loading of variables was calculated as 0.747 and varied between 0.651 and 0.804. The second factor explained 10.761% of total variance and was marked as "outsourcing factor". This factor had variables of temporary labor cost, used basic honeycomb quantity and tools cost. Factor loading of these three variables was 0.735 in average and cumulative variance of was 53.807.

The third factor explained 9.497% of total variance and was marked as "product variety". The number of queen bee excluders and other beekeeping products incomes comprised this factor. The average factor loading and cumulative variance were determined as 0.835 and 63.304% respectively. The fourth factor explained 8.887% of the total variance and entitled as "co factors". This factor included beekeeping working duration and non-farm income variables. Factor loading of them was 0.786 and cumulative variance was 72.191%.

4. Discussion

Production costs are classified into two parts. The findings of the study indicated that 56.0% of total production costs were variable cost and 44.0% was fixed costs in the beekeeping production field in the Mediterranean Region. Variable cost ratio was found 64.7% by Parlakay et. al. (2005) in Tokat province in Turkey. Also, Saner et al. (2004) obtained slightly lower ratio, quoted as 46.9%, in İzmir and Muğla provinces. Kadirhanoğulları et. al. (2016) determined that 63.11% of the production costs were fixed costs and 36.89% of the variable costs in Igdir province in Turkey. Some studies conducted in other countries reported variable cost to be higher than these findings. Qaiser et al. (2013) found the variable cost ratio 72.6% in Pakistan.

Similarly, this ratio was calculated as 70.1% by Babatunde et al (2007) in Nigeria. The more variable cost is, the more intensive operations

exist. It can be said that beekeeping operations were similar to other study areas and represent an average value. However, they are less intensive for some other countries.

In the study, the most important variable cost elements were transportation, accommodation and honeycomb costs, whereas the most fixed cost elements were family labor cost, interest expense of bee capital and depreciation of tools. Transportation and accommodation had quite high ratios since migratory beekeeping was common among beekeepers, 91.4% of total interviewed persons were migratory beekeepers. Also, family labor cost was found to be quite important in fixed cost. As a matter of fact, this production activity was accepted as a good way to evaluate family labor force.

Relative profit gives income gathered from one unit cost. According to the findings of this research, relative profit was calculated as 2.7. Saner et al. (2004) defined as 1.30 in some provinces in the Aegean Region and Parlakay et al. (2005) gathered as 1.2 in Tokat province. It can be said that in the Mediterranean Region there is a higher profit rate by the money invested. Özsayın and Karaman (2018) calculated that the relative profit in beekeeping enterprises in Gökçeada ranged between 1.89 and 2.57. The relative profit may vary due to reasons such as regional factors, number of hives and marketing type. In the operations examined, honey, as final product, beeswax, bee milk and propolis were produced. In the operations examined, honey had 71.2% of total gross product value and other beekeeping products had 28.8% of the value. In a similar study in the same region, Akdemir et al. (1990) reported that honey was the basic product of beekeeping activity and honey comprised 74.8% of total gross product value, while other products had 25.2% of the value. Saner et al. (2004) suggested that during the period, other products production has not reached higher ratios. But, it is taken into account that the demand of organic honey and other products have improved in the world. Beekeepers in Turkey need to follow the improvement and produce other products more.

Strained honey was generally sold directly to consumers. In some cases, intermediates cause consumer prices to go up as a result of their profit margins. Selling directly to consumers prevents the high margins and provides higher producer price and lower consumer price. In the study, between 55.6% and 84.6% of beekeepers sold their products directly to consumers, whereas 64.0% of them sold only strained honey directly to consumers.

Factors affecting the production in beekeeping enterprises were investigated in different regions with different methods. Kızılaslan and Kızılaslan (2007) conducted study on determining the relation between the factors affecting honey production in Turkey, Multiple Regression Method has been used. As a result of the analysis made, the following factors, among those that affect honey production, have been found to be statistically important: honey consumption per person, number of beehives, and the money that the producers get and honey exportation values. Vural and Karaman (2009) analyzed of apiaries' technical and economic aspects in Turkey. However, there are other factors that increase honey production aside from hive types. For example, even though Turkey is one of the considerable honey producers in the World, it doesn't have an effective structure in world markets. So honey production falls behind in quality in domestic markets. In a similar study carried out in Romania, according to the results of the logistic regression model, the following factors determine beekeepers' intention to start an enterprise: the modernization of the beekeeping exploitation, collaboration with other enterprises from the beekeeping sector, belonging to a beekeeping association (different from Romanian Beekeepers' Association), the strategy to export beekeeping products and to create alliances with other enterprises, the commercialization of bee products by distribution to a few stores and the age of beekeepers (Popa et al. 2011). Anyiro et al. (2012) determined that the multiple regression analysis using linear functional form as the lead

equation revealed that all the significant variables (variable cost, quantity of honey and price of product) had positive influence on the profitability of commercial honey bee production in the area.

Masuku (2013) found that honey production was explained by the farmer's experience and colony size, implying that an increase in the farmer's experience by 1% would result in 0.41% increase in the amount of honey produced, while a 1% increase in colony size would result in 0.57% increase in honey production. Tassinari et al. (2013) proposed model could be used to estimate the annual honey yield per hive in regions and to detect production factors more related to beekeeping. Honey productivity was associated with the number of hives, wild swarm collection and losses in the apiaries.

Adgaba et al. (2014) determined that despite the extensive beekeeping practices in Saudi Arabia, relevant information related to socio-economic profiles of beekeeping and factors affecting the adoption of improved beekeeping technologies were lacking. The less acceptance of box hive was also implicated with its unsuitability to the biology and ecology of the local bees, which may indicate lack of consideration of these factors in selection and adoption of the technology.

Karadaş and Birinci (2018) found that Determination of risk factors affecting beekeeping production is inevitable for more profitable beekeeping. Also, development of strategies against these risk factors is more likely to happen through a new statistical approach, a combination of explanatory factor analysis, and stepwise regression analysis techniques.

In this study, factors affecting honey production were determined as specific factors for operations, outsourcing factor, product variety and co-factors. Some variables such as the number of hives, winter colony losses, food cost, transportation cost, temporary labor cost and tools cost caused higher cost. These variables affected the success of operations. Additionally, other beekeeping products income is quite important and effective to increase operations' income.

5. Conclusions

It was found that 56.0% of total production cost was variable cost and 44.0% of it was fixed costs. Transportation, accommodation and honeycomb costs in variable costs and family labour cost, interest expense of bee capital and depreciation of tools in fixed costs had important ratios. In the region, migratory beekeeping is quite common. But, there were some problems about transportation and accommodation. Beekeepers' accommodation areas and flora density should be re-identified and reorganized to increase efficiency. Taking measures to reduce the negatively factors affecting the honey production will increase the profitability of the beekeeping operation. It has been determined that increasing the share of other bee products is effective in increasing business revenues. However economic measures of beekeeping access profitability and financial strength, also it is important for providing secondary occupation and self-employment opportunities for many beekeepers. Beekeeping activities not only in Turkey shows a great potential in improving the livelihoods of the farmers and viable income generating activity that can create jobs for the youths also whole the world. For these reasons improvements in education and extension can contribute to enrich beekeeping product variety.

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