

# A STUDY ON THE PRODUCTION AND MARKETING OF BEE PRODUCTS PROVIDING BIODIVERSITY: CASE STUDY FROM TURKEY

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**Abstract.** This research aims to find out the marketing problems of the beekeepers in Muğla province, Milas district of Turkey and offer potential solutions. The main material of the research is the data gained via surveys, performed as face-to-face interviews with beekeeping farmers in Milas district. According to the data of Milas District Agriculture and Forestry Directorate, 721 beekeepers constitute the main part of the research. The proportional sample size has been determined as 62 people. The most significant problems that farmers face during the production are diseases and pests by 53.2%, while the most significant problem during marketing is the low selling price of honey by 80.6%.

**Keywords:** *beekeeping, beekeepers, honey, economy, price*

## Introduction

Beekeeping is seen as a strategically important sector that should be supported in order to protect biodiversity and transfer it to next generations, provide food security, increase diversity, support domestic economy by increasing employment, and prevent erosion threat (Yılmaz, 2015).

Global climate change is one of the most important problems facing today's societies. The agricultural sector, which meets the food, nutrition and fiber needs of the society, is one of the most vulnerable sectors against climate change (Arbuckle et al., 2013). Honey bee is the most valuable pollinator of agricultural products worldwide economically. Approximately 73% of the plants cultured in the world are pollinated by bees (Reddy et al., 2012). One of the main factors affecting honey production is the climate (Malisa and Yanda, 2015). That is, beekeeping sector is dramatically affected by drought and climate change. Sustainability of soil and water resources is of vital importance for beekeeping. Sustainability of soil and water resources is of vital importance for beekeeping because the bee needs healthy vegetation and flora. On the other hand, seasonal effects of global warming negatively affect bees. The effect of climate change on bees may cause the bees not to fulfill the function expected of them in pollination. This reduces the quality and quantity of crop production and can lead to economic loss of beekeepers.

Beekeeping is not a soil-based production field, for that reason it can be an only income source for the farmers who have no or limited land. Running with a limited budget, establishing and running the business with low expenses, generating income in short terms, marketing bee products easily and providing bee and bee breeds

domestically are the most significant reasons that make beekeeping attractive (OGM, 2013).

Beekeeping activities which is an important sub-sector of livestock provides a prominent added value. As a sub-sector of livestock and agriculture, beekeeping activity creates a significant added value for the economy. Sustainability of the added value is directly related to developing marketing opportunities for the products and analyzing marketing problems. Besides of having great geographical features and rich flora, Turkey has a significant place in global beekeeping sector with its colony assets (Köseman et al., 2016). Beekeeping in Turkey is an agricultural occupation done to produce honey only. Most of the beekeeping businesses are family-run businesses (Şahinler and Gül, 2003).

By the year of 2016, there are 90 564 654 bee hives in the world and they produce 1 786 996 ton honey approximately (FAO, 2018). By the same year in Turkey, these numbers are respectively 7 900 364 and 105 727.435 tons (TSI, 2018). Namely, Turkey produces 8.72% of the hive assets and 5.92% of honey production in the world. By the year of 2017, there are 83 210 beekeeping businesses in Turkey. By the same year, the number of total hives is 7 991 072. In Muğla province where the research is conducted, there are 6000 families that are bekeeping farmers in 334 villages. In Muğla province, the main product of beekeeping is pine honey; and Muğla provides 70-75% of the production in Turkey. In Muğla 35000-40000 people are employed in beekeeping sector (Şahin, 2015). By 2017, Muğla supplies 11.99% of the hive assets and 13.86% of honey production in Turkey (TSI, 2018).

Being the capital of beekeeping production, Muğla province Milas district has a significant potential in terms of beekeeping activities in Turkey. Beekeeping activities which is no longer a side income started to be basic living source for most of the families in rural areas in Milas district. By 2017, 15.39% of the beekeeping businesses of Muğla province is located in Milas district. By 2017, 18.04% of the natural honey produced in Muğla province and 2.06% of the beeswax have been produced in Milas district. On the other hand, 17.74% of the total hive assets of Muğla province (old and new) is located in Milas district (TSI, 2018).

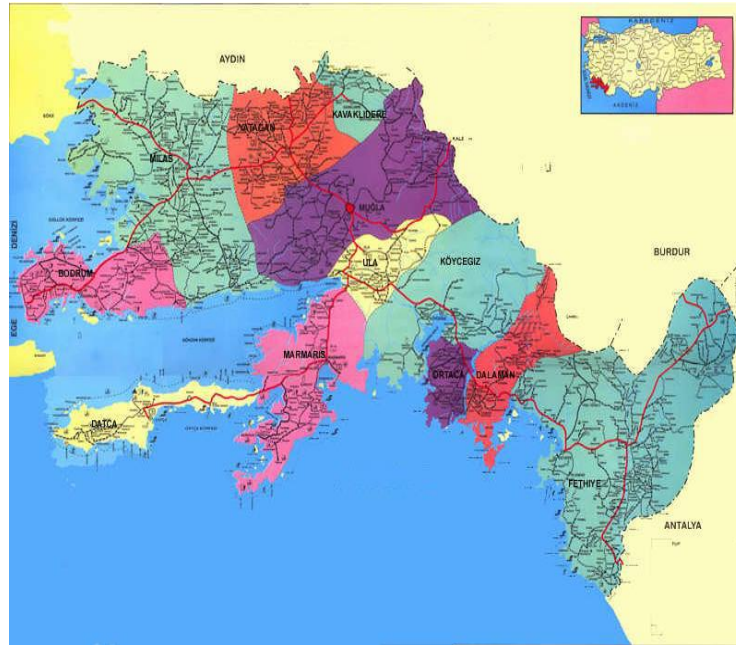
Main aim of the study is to indicate the structure of beekeeping production and marketing in Muğla province Milas district. Within this scope, firstly socio- economic structure of the beekeepers, the production and marketing structure of beekeeping goods produced in businesses and problems of the farmers that they face during production and marketing phase have determined; possible solution offers for the problems have suggested.

## Materials and methods

### *Study area*

The geographical position of Milas is 37° 18' 59" North and 27° 47' 2" East. Milas is located in the southwest of Turkey within the borders of Aegean Region in the Menteşe Mountainous area. Administratively, it is a central district located within the borders of Muğla province (*Fig. 1*). It is bordered by the city of Muğla and Yatağan district in the east, Yenihisar district of the city of Aydın in the west, Kocarlı, Karpuzlu and Çine districts in the north, Gökova Bay in the south and Bodrum district in the southwest (Çakar, et al., 2011).

It is possible to examine agriculture in Milas as fruit and vegetable, grain and industrial plant production. Because of its climate and geographical structure, Milas is one of the rare place where many products can be grown. Its primary agricultural products are olive, forage plants, wheat, barley, grain corn, cotton, tobacco, vegetables and citrus fruits. Milas is the most important olive and olive oil production area of the Aegean region. Industrialization related to olive cultivation has been the primary key industry of Milas for a very long time. Animal husbandry is also important in the district. Beekeeping and honey production as well as fish farming have a significant for district (Anonymous, 2015).



**Figure 1.** Map of Muğla Province. (Source: Anonymous, 2004)

### **Method applied when collecting data**

The main material of the research is data gained via surveys with face-to-face interviews done among the beekeeping farmers in Milas district of Muğla province in Aegean Region. According to the records of Agriculture and Forestry District Directorate of Milas, 721 beekeepers constitutes the main part of the research. Having specified by proportional sample volume (Newbold, 1995), interviews were done with the farmers. 90% confidence interval and 10% error margin is taken as a basis in the research. The data of the study were obtained from the face-to-face surveys conducted with beekeepers in Milas district in April-May 2017. Nine neighbourhood (village) of the district is examined as the scope of the research.

$$n = \frac{Np(1-p)}{(N-1)\sigma_p^2 + p(1-p)} \quad (\text{Eq.1})$$

In *Equation 1*: N = total number of farmers as interview; N = population; P is taken as 0.50 to be able to reach maximum sample volume; (1 - p) = 0.5;  $\sigma_{px}^2$  = variance. In the calculation, total number of the farmers that is to be interviewed is figured as 62.

### ***Method applied when analyzing data***

After acquiring the data for the research, assessment phase has been started. The data from the surveys has been coded and recorded. Definitive statistical analysis is used in order to assess the data.

## **Results**

### ***General features of farms and farmers***

The ages of the farmers range from 27 to 74, and average age of the farmers is 48. When it comes to adaptation of new techniques and technologies, education level of the beekeepers has an important role (Ogunjimi et al., 2016). The education level of the beekeepers participating in the current study was found to be low. In the research, average education year of the farmers is figured as 5.9. Average household population of beekeepers is 3.6. It has been calculated that average agricultural experience of the farmers is 26.3 years, average experience as beekeepers is 19.5 years. It is found that 64.5% of the farmers who participated in the research took out loan. In the research, it is specified that only 9.7% of the farmers have business records regularly.

88.7% of the farmers (55 farmers) who participated in the research have other agricultural activities than beekeeping. Average business width of the farmers is figured as 23.1 decares. It is seen in the research that five farmers have no agricultural land. It is determined that 98.2% of the beekeeping businesses continue their agricultural activities on property land, 1.8% of them continue agricultural activities on rented land. 61.8% of the farmers make mixed production (crop+animal production), 32.7% make only crop production, 5.5% make only animal production.

Farmers who participated in the study stated that 38.1% of their agricultural income came from beekeeping activities. 25.8% of the farmers participating in the survey have non-agricultural income. Farmers are engaged in professions such as local headman, coffeehouse owner, fisherman, labourer apart from agriculture. There are farmers who are retired and traders, as well.

### ***Findings related to production and marketing***

6.5% of the farmers participating this research stated that they started beekeeping with old type hive, 88.7% of them started with buying colonies with modern hives and 8.1% of them started with buying swarm.

The reasons for farmers' to do beekeeping are examined and for this purpose *Table 1* is formed. The first reason of farmers' to do beekeeping is that there is no other source of income (37.1%). This is followed by the habit inherited from family (33.9%) and ability to access to the product in short time (29%).

Honey can be defined as the natural product in which the plant nectars, the secretions of the alive parts of the plants or the secretions of plant-absorbing insects that live on the living parts of the plants, are collected by the honeybee (*Apis mellifera*) and combined with their own specific substances, decreasing the water content and storing it in the honeycomb (Anonymous, 2005). Beekeeping activities can be considered as an important rural development tool, which provides a certain rate of income to a large number of farmers, in rural areas. Undoubtedly, the first condition for farmers to earn income from beekeeping activities is that they produce clean, hygienic and good quality honey. Determination of product properties, honey additives and residue levels of honey

produced by farmers can be measured by honey analysis. For this reason, it is very important for farmers to make honey analysis for honey they produced. In the study, it was determined that the farmers' honey analysis rate is quite low. It was determined that only two producers had honey analysis.

**Table 1.** Reasons for farmers to do beekeeping

Reasons to do beekeeping	n	%
Ease of maintenance	10	16.1
Short production period	18	29.0
Habit inherited from family	21	33.9
Curiosity, hobby	15	24.2
There is no other source of income	23	37.1
Because the product is suitable the region	2	3.2

\*Total passes 100% since there are more than one answer

The presence of colony in the production of bee products is of great importance. Naturally, as the number of colonies increases, the production amounts of bee products are expected to increase. For this reason, in this study, farmers' colony assets are investigated. In the study, the percentage of farmers indicating the increase in the colony assets in the last three years was 17.7% and the percentage of farmers indicating the decrease in it was 48.4% (Table 2).

**Table 2.** Change in the colony assets in the last three years

	n	%
Increased	11	17.7
No change	21	33.9
Decreased	30	48.4
Total	62	100.0

The migratory beekeeping is based on the principle of transporting colonies from one region to another in order to benefit from different flowering periods in plants and to protect the bees from adverse winter conditions. 77.4% of the farmers participating in the research is doing migratory beekeeping, 22.6% is doing fixed beekeeping.

It was determined that the farmers moved their hives to various provinces such as Kayseri, Ankara, Eskişehir, Sivas, Konya, Nevşehir, Tekirdağ, Niğde, Kütahya, Afyonkarahisar, Kars, Sakarya, Edirne and Burdur. A farmer who stated that he was a fixed beekeeper stated that he had moved his hives to the neighbouring villages. It is specified that the farmers usually go in May and return in August. When the farmers' honey harvesting frequency was examined, it was concluded that half of the farmers participating in the study do harvesting twice a year. 30.6% of the farmers harvest three times a year (Table 3).

In the study, the average number of hives owned by farmers was found as 162 units. Today, beekeeping business is one of the means of living of many families in rural areas. The products obtained from beekeeping business, such as pollen, propolis, beeswax and primarily honey, provide a significant added value in the income of the

producers engaged in beekeeping in rural areas (Çukur et al., 2016). 98.4% of the farmers interviewed in this study were identified to produce honey, 46.8% of them produce beeswax and 29% of them produce queen bees (*Table 4*).

**Table 3.** *Farmers' honey harvesting frequency*

	<b>n</b>	<b>%</b>
Once in every three weeks	2	3.2
Once in a month	6	9.7
Twice a year	31	50.0
Three times in a year	19	30.6
Four times in a year	1	1.7
Once in a year	3	4.8
Total	62	100.0

**Table 4.** *Number of farmers producing bee products*

	<b>n</b>	<b>%</b>
Number of farmers producing extracted honey	61	98.4
Number of farmers producing comb honey	17	27.4
Number of farmers producing beeswax	29	46.8
Number of farmers producing swarm	23	37.1
Number of farmers producing queen bee	18	29.0
Number of farmers producing pollen	7	11.3

The average production quantities of bee products are shown in *Table 5*. From the farmers participated in this research, it is determined that the average amount of extracted honey production was 2334.5 kg, the average comb honey production amount was 81 kg and the average beeswax production amount was 48.9 kg. In the study, average extracted honey production per hive was calculated as 14.41 kg.

**Table 5.** *Average production amount of bee products*

	<b>Production amount</b>
The amount of extracted honey (kg)	2334.5
The amount of comb honey (kg)	81.0
The amount of beeswax (kg)	48.9
The amount of swarm (unit)	10.2
The amount of queen bee (unit)	16.3
The amount of pollen (kg)	3.8

It was specified that 87.1% of farmers have problems with honey production. Farmers who have problems with honey production are asked about their problems and *Table 6* is formed according to the answers. Diseases and pests (53.2%) and negative effects of global warming (41.9%) are among the most important problems of beekeepers.

**Table 6.** Farmers' problems related to honey production

	<b>n</b>	<b>%</b>
Diseases and pests	33	53.2
Accommodation and safety issues in migratory beekeeping	25	40.3
Negative effects of global warming	26	41.9
High transportation costs	25	40.3
High production costs	18	29.0
Lack of information about beekeeping	9	14.5
Decrease of crop production	8	12.9
Non-diversification of bee products	7	11.3
Lack of tools and equipment	5	8.1
Problems related to breeding bees	4	6.5
Difficulties in obtaining loans	4	6.5
Honey analysis results do not appear	2	3.2
Quality problems	1	1.6

\*Total passes 100% since there are more than one answers

When the sales status of bee products is examined, it was specified that 91.9% of the farmers sold extracted honey and 16.1% sold comb honey and beeswax (Table 7).

**Table 7.** Number of farmers selling bee products

	<b>n</b>	<b>%</b>
Number of farmers selling extracted honey	57	91.9
Number of farmers selling comb honey	10	16.1
Number of farmers selling beeswax	10	16.1
Number of farmers selling swarm	2	3.2
Number of farmers selling pollen	2	3.2

When the average sales amount of bee products were examined in the study, it was identified that the average amount of extracted honey sales of the farmers is 2323.7 kg, the average comb honey sales amount is 75.7 kg and the average beeswax sales amount is 12.4 kg (Table 8).

The farmers' sales prices of bee products are shown in Table 9. As shown in the table, the sales price of comb honey is 5.96 €, extracted honey is 2.16 €, beeswax is 7.09 €, pollen is 7.70 € and swarm is 77.03 €.

**Table 8.** The average sales amount of bee products

	<b>Sales amount</b>
The sales amount of extracted honey (kg)	2323.7
The sales amount of comb honey (kg)	75.7
The sales amount of beeswax (kg)	12.4
The sales amount of swarm (unit)	1.6
The sales amount of pollen (kg)	3.1

**Table 9.** Actual and expected average sales prices of bee products. (Source: TCMB, 2018)

	Sales price (TL)	Sales price (€)	Expected sales price (TL)	Expected sales price (€)
Comb honey	23.2	5.96	45.5	11.68
Extracted honey	8.4	2.16	14.4	3.70
Beeswax	27.6	7.09	41.9	10.76
Pollen	30	7.70	100	25.68
Swarm	300	77.03	400	102.71

\*As of 15 May 2017 1 Euro = 3.8946 TL

Sales prices of bee products and sales prices of bee products according to farmers are shown in *Table 9*. As it is seen from the table, sales prices of bee products are well below the sales prices expected by farmers. The price differences were calculated as 5.72 € in comb honey, 1.54 € in extracted honey, 3.67 € in beeswax, 17.89 € in pollen and 25.68 € in swarm.

Farmers' extracted honey selling areas are presented in *Table 10*. As it can be seen from the table, the majority of the farmers sell extracted honey to the merchant (75.8%).

**Table 10.** Farmers' selling places of extracted honey

	n	%
Directly to the customer	6	9.7
Merchant	47	75.8
Wholesaler	3	4.8
Retailer	7	11.3

\*Total passes 100% since there are more than one answers

In this study, it is determined that 99% of the produced honey is sold while 1% is preserved for home consumption.

Reaching agricultural information at the right time has a vital importance for the success of farmers. The access of farmers to reliable, timely and necessary information will reduce the risks and uncertainties of farmers and help them to make the right decision (Mbagwu, et al., 2018). Access to agricultural marketing information of farmers and other agricultural stakeholders can be improved through accessible agricultural marketing information systems (Amer et al., 2018). Agricultural information is a critical component in increasing small-scale agricultural production and in reaching farmers' profitable markets. In the case of reaching market information by farmers, yield increase will be achieved (Wawire et al., 2017). Access to the market is one of the most important factors affecting the performance of agriculture and plays an important role in developing and diversifying the means of living of small farmers in developing countries. Inadequate access to market information leads to moral damage and high transportation costs and hence prevents some farmers from accessing the market (Okello et al., 2014). By means of reaching agricultural markets, small-scale farmers are able to increase agricultural production, realize economic growth and reduce hunger and poverty (Magesa et al., 2014). Market information flow to small-scale farmers is poor. This complicates farmers' access to the market (Matto, 2018; Wawire



et al., 2017). In this study, when farmers' status of access to information related to domestic (market price, production, demand) and foreign (market price, production, demand) markets is examined, it was determined that 48.4% of the farmers have access to the information related to domestic market and 17.7% of the farmers had access to the information related to the foreign market.

When the extracted honey sales of the farmers is examined, it is determined that in general they sell the extracted honey in cash (69.4%) (Table 11). Examining the months of extracted honey sales of the farmers, it draws attention that honey is sold intensively in September, October and November (Table 12).

Agricultural marketing, especially in developing countries, plays an important role in reducing poverty sustainably and ensuring household food safety (Katengeza, 2012). 83.9% of farmers were found to have problems with honey marketing when this problem was examined. Low sales price of honey (80.6%), unfair competition (38.7%), fluctuations in market prices (27.4%), and inability to access market related information (21%) are amongst the most important problems faced by farmers in honey marketing (Table 13).

## Discussion

This study was carried out in order to reveal the production and marketing structures of bee products of beekeepers in Milas district of Muğla province. Farmers participating in the research can be said to be middle-aged. In a research done by Adedeji et al. (2016), it is specified that 90% of the beekeepers is in 40- 49 age range.

**Table 11.** Farmers' form of sale of extracted honey

	n	%
Cash	43	69.4
Dated	6	9.7
Cash+dated	8	12.9
Does not sale	5	8.0
Total	62	100.0

**Table 12.** Farmers' sales months of extracted honey

	n	%
January	6	9.7
February	3	4.8
March	1	1.6
April	1	1.6
May	1	1.6
June	-	-
July	8	12.9
August	11	17.7
September	26	41.9
October	34	54.8
November	25	40.3
December	15	24.2

\*More than one answers received

**Table 13.** *Farmers' problems related to honey marketing*

	<b>n</b>	<b>%</b>
Low sales price of honey	50	80.6
Unfair competition	24	38.7
Fluctuations in market prices	17	27.4
Inability to access information about the market	13	21.0
Lack of financial power	11	17.7
Distrust to the trader	10	16.1
Inadequate honey consumption of consumers	9	14.5
Non-diversification of bee products	5	8.1
Insufficient storage conditions	4	6.5
Inability to receive the sales price in time	4	6.5
Changes in consumer demand	3	4.8
No payment in advance	3	4.8
The farmers cannot see the honey analysis reports due to the fact that the analysis made by the companies	2	3.2
Inability to obtain products with the same quality	1	1.6
Insufficient support	1	1.6

\*Total passes 100% since there are more than one answers

It was determined that the farmers participating in the study were highly experienced in beekeeping (19.5 years). In a research done by Belie (2009) in Ethiopia, average experience of the beekeepers is figured as 14.5 years. In a research done by Ceyhan and Canan (2017) average age of beekeepers is figured as 49, average experience is figured as 21 years.

In the study, it was determined that most of the farmers received loans (64.5%). In a research done by Belie (2009), it is determined that 85% of the beekeepers take out loan.

It was determined that very few of the farmers participating in the study kept their business records regularly (9.7%). In a research done by Mujuni et al. (2012) in Uganda, it is found that 10% of the beekeepers keep a record of hive numbers. In a research done by Şeker et al. (2017), it is pointed out that 69.1% of the beekeepers do not have a record.

It was determined that a significant number of farmers participating in the research also carried out other agricultural activities besides beekeeping. In a research done by Burucu and Bal (2018) in Kastamonu province, it is seen that 66.7% of the farmers conduct other agricultural activities than beekeeping. In a research done by Tullu (2014) in Ethiopia, it is found that the income of the farmers is supplied from beekeeping by 40%, other animal activities by 33% and crop production by 27%. In a research done by Abazinab et al. (2016), it is indicated that 63.4% of the income of the farmers is supplied by beekeeping activities. 8.82% of the farmers who participated in the research done by Kekeçoğlu et al. (2013) perform only beekeeping, the ones who does other agricultural activities and beekeeping activities are found to be 49.26%. In a research being conducted by Kalayu et al. (2017), 27.7% of farmer income is determined from crop production, 23.8% from animal production, 16.9% from beekeeping activity and 15.4% from irrigation. In the study conducted by Chauhan and Sharma (2000), it was

determined that 69% of household income of farmers came from beekeeping. In a research done by John (2014) in Tanzania, 52.50% of the farmers' basic income source was determined to be beekeeping.

High majority of the beekeepers (88.7%) participating in the current study started the business of beekeeping with colonies in modern hives. Guyo and Legesse (2015) found that 92% of the farmers started beekeeping by trapping swarms while 7% of them started with the gift hives received from their family. In the research conducted by Tesfaye et al. (2017), it was determined that the 98.3% the farmers start beekeeping by trapping swarms and 1.7% of the farmers start with inherited hives from family. Abazinab et al. (2016) specified that 71.7% of the farmers started beekeeping via trapping swarms, while 28.3% of them started beekeeping through the gifted hives from family. In the research conducted by Gebreyohans and Gebremariam (2017), it is determined that 38% of the farmers started beekeeping through the gifted hives from family, 35% of them started via purchasing the hives and 15% of them started beekeeping using the hives retrieved from governmental and non-governmental organizations.

In the research, the most important reason for farmers to start beekeeping was determined to be obtaining yields in a short time. In the research done by Burucu and Bal (2018) in Kastamonu province, the first reason of farmers' to start beekeeping is the habit inherited from family by 67.90%. In the study conducted by Tunca and Çimrin (2012), it was determined that beekeeping activities is the only source of income for 17% of the farmers and additional source of income for %57 of them. In a research conducted by Borum (2017) in South Marmara Region, it is determined that 83.75% of the farmers do beekeeping as side job and hobby. In a research conducted by Şahinler and Gül (2003) in Hatay province, it is specified that 38.95% of the beekeepers do beekeeping to make a living, 42.11% of them do it with the aim of side income and 18.95% of them pursue it as a hobby.

The colonies possessed by nearly half of the beekeepers participating in the current research have decreased in the last three years. In a research conducted by Potts et al. (2010) that involves 18 European countries, it was determined that the number of hives decreased in central European countries while it increased in some Mediterranean countries. Demir et al. (2017) found that 8.8% of the farmers were considering to leave the beekeeping in the future. In the study conducted by Çevrimli and Sakarya (2018), the rate of farmers who is considering to increase the number of bee hives in the next years was found to be 57.5%.

It was determined that most of the beekeepers (77.4%) participating in the current research perform migratory beekeeping. In a study conducted in Croatia by Barlovic et al. (2009), it was determined that one third of the farmers were migratory beekeepers. In a study conducted in India by Sharma et al. (2013), it was found that the farmers were carrying 250-300 hives to 300-800 km away. Another study by Adgaba et al. (2014) found that 93% of the farmers were migratory beekeepers.

Environment, climate and flora have important effects on the number of harvests made. Therefore, the number of harvests may vary from region to region. It was found that half of the participating beekeepers have two honey harvests a year. In a study conducted by Gebremeskel et al. (2014), the rate of farmers who harvested once a year is specified as 61.5%, twice a year is 36.5% and three times a year is 1.9%. In their study, Kiros and Tsegay (2017) shows that more than 70% of the farmers harvested honey once a year while 25% harvest three times a year. In a study conducted by

Abejew and Zeleke (2017), it is specified that 34% of farmers harvest more than twice per year. In a study conducted by Abazinab et al. (2017), it is showed that the rate of farmers who harvested once a year is 37.8%, twice a year is 52.8% and three times a year is 9.4%. In the study conducted by Gebreyohans and Gebremariam (2017), it was found that 75% of the farmers harvested in September and October and 34.16% in July and August.

When the literature is reviewed, it is seen that there are significant differences between the numbers of hives possessed by beekeepers because many factors can be effective on the number of hives possessed. The participating beekeepers were found to have 162 hives on average. In a study conducted by Sarab et al. (2018) in Iran the average number of hives was found as 176. In another study conducted by Kadirhanogullari (2016) in Iğdır province, it was determined that each business has 67 units of bee hives on average. In another study conducted by Tarekegn et al. (2017), it is determined that the families doing beekeeping business has 19 hive assets on average. In the research done by Moniruzzaman and Rahman (2009), the average number of hives owned by farmers was found as 28. In the research conducted by Kezic et al. (2008), farmers with up to 60 hives were referred as hobby beekeepers, farmers who has between 61 to 150 hives were referred as part-time beekeepers and farmers with more than 151 hives were referred as professional beekeepers. In that research, it was determined that 56% of farmers were doing beekeeping as hobby, 31% of them were part time beekeepers and 13% of them were professional beekeepers. In the study conducted by Kutlu (2014) in Gaziantep province, it is determined that the rate of farmers who consider beekeeping as the main source of income is 54%, as a side income is 37% and as a hobby is 9%.

Almost all of the participating farmers (98.4%) were determined to produce honey. In the study conducted by Öztürk (2017), it was determined that 82.5% of the farmers produce only honey and 17.5% produce pollen and royal jelly besides honey production. In the study conducted by Grgic et al. (2018) in Croatia, the yield of honey per hive was found to be 18.33 kg. In the study conducted by Yıldırım and Açar (2008) the yield of honey per hive was found to be 10.72 kg. In the study conducted by Onurlubaş and Demirkıran (2017), it was determined that on average the farmers produced 2555.75 kg of honey annually. In the study conducted by Peter (2015), the average honey yield per hive in South Africa during the 2007/08 period is reported to be 12.77 kg. In a study conducted by Vural and Karaman (2009) in Bursa province, the average hive asset of farmers was found to be 168.40 and the average honey production was 4527.33 kg.

It was determined that the most important problem faced by the beekeepers during the production phase was diseases and pests. Effective and proper fight against bee diseases and pests is seen as very important in terms of the sustainability of beekeeping in the district. In other studies on the subject, diseases and pests have been found to be an important problem. In the study conducted by Ahikiriza (2016), it was concluded that limited information about production, diseases and pests, low colony assets and fires are the most important problems related to production. In a survey conducted by Yemane and Taye (2013) in Ethiopia, it was determined that the problems of beekeeping were insufficiency of beekeeping equipment, inadequate colony assets, high prices of modern hives, pests and beekeepers' lack of knowledge. In a study conducted by Ogunjimi et al. (2016) in southwest Nigeria, it was determined that the most important problems of the beekeepers regarding the production were the lack of information about beekeeping, the

lack of loan opportunities and the existence of insufficient processing technologies.. In the study conducted by Aksoy et al. (2017) in Erzurum province, the most important factors affecting honey production are found to be unsuitable climate conditions and winter loss. In the study conducted by Gebreyohans and Gebremariam (2017), 83.3% of the farmers stated that they see bee pastures as the most important problem especially in the dry season. In the study conducted by Ogunjimi et al. (2016), it is determined that the most important problems related to beekeeping is inadequate training related to beekeeping practices, insufficient loan opportunities and lack of beekeeping equipments.

In the current study, the most important bee product sold was found to be honey. In their study, Adedeji et al. (2016) stated that 74% of farmers produce honey for commercial purposes. In the study conducted by Burucu and Bal (2018) in Kastamonu province, it is determined that 82.72% of the farmers sell their honey.

In the research, it was determined that there were significant differences between the actual sales prices of bee products and the sales prices expected by the farmers for their products. In a research done by Kezic et al. (2008), it was found that the average selling price of honey for beekeeping professionals was 2.07 €/kg. In a study conducted by Cejvanovic et al. (2011) in Bosnia and Herzegovina the wholesale price of honey was found to be 2.11 €/kg. In a research conducted by Saner et al. (2004) in İzmir and Muğla provinces, the farmers' wholesales price of the extracted honey is calculated to be 1.65 €/kg. In a research conducted by Demir et al. (2017), it is specified that only 37.5% of the farmers were satisfied with the current honey prices. In a research conducted by Köseman et al. (2016) it is found that the rate of the farmers stating that in the last five years their beekeeping income is decreased is 38.3% while the farmers stating that their income has increased and decreased in this period is 39.6%.

In the study, it was determined that high majority of the beekeepers were found to be selling their products to traders. It was specified, by Onurlubaş and Demirkıran (2017) in their study in Edirne province, that 37.5% of the honey produced by the farmers was sold directly to the consumers.

It the current study, it was also found that the amount of honey allocated to the consumption of the beekeepers' their own families is very low (1%). In their study, Shibru et al. (2016) found that 95.8% of the farmers sold the honey immediately after the harvest while 4.2% of them stocked the honey for home use. In a study conducted by Girma et al. (2008) it is determined that 90% of the honey is sold and 10% is consumed at home. In their study Lemita (2010) found that farmers sold 97% of the produced honey in local markets for cash and 3% of them consumed at home. In a study conducted by Kinati et al. (2013) in Ethiopia, it is determined that 75% of the honey sold after between one and six months, while 1.7% of it is stocked more than two years by the farmers. In the study conducted by Ambaw and Teklehaimanot (2018), it was determined that 39.7% of the farmers did not stock honey while 41.7% of them stocked from one to six months.

In this study, it was also determined that honey was sold in almost all months. In the research conducted by Abebe (2009) in Ethiopia it was found that farmers sold 27% of the honey in December, 25% of it in January and 18% of it in February.

The low sales price of honey was determined as the most important problem faced by beekeepers in marketing. In the study conducted by Kadirhanoğulları (2016), it was determined that the lack of effective marketing cooperatives to market the produced honey was stated as the biggest problem of all the farmers. In a study conducted by

Kumar (2013) in India, low honey sales prices, high cost of transporting hives from one place to another and financial difficulties experienced during the purchase of raw materials have been identified as problems by farmers.

## Conclusion

Bees are vital for the continuity of the ecosystem as they ensure the pollination of plants. Beekeeping is a very important agricultural activity in terms of diversifying agricultural income and agricultural activities in rural areas and increasing agricultural income. Beekeeping has an important place both in Muğla and Milas.

The average honey production per hive in Turkey is about 14.63 kilograms (Şahin, 2015). In the research, the average extracted honey production per hive was found to be 14.41 kg, this figure appears to be slightly less when it is compared to average production of Turkey. It is thought that productivity will increase due to the modern beekeeping techniques of the farmers. Therefore, relevant agricultural extension programs should be organized. It was determined that 87.1% of farmers had problems with honey production. Diseases and pests (53.2%) and negative effects of global warming (41.9%) are among the most important problems of beekeepers. Beekeeping courses should be organized in order to solve the problems of farmers related to production, to increase their technical knowledge on bee farming and diseases and pests. Farmers should be educated with practical trainings.

It is stated that 83.9% of farmers have problems with honey marketing. The most important problem farmers face with honey marketing is the low price of honey (80.6). There are no beekeeping cooperatives in the research area. This reduces the bargaining power of beekeepers and beekeepers sell bee products at low prices. In the research, it was determined that the sales prices of bee products were significantly lower than the sales prices expected by farmers. On the other hand, it has been determined that the farmers' rate of accessing information about market is low. In addition to the beekeeping techniques, farmers have to know and follow supply, demand, domestic and foreign markets, sales, price formation etc. closely. Agricultural marketing extension can be defined as a training program that provides information that farmers need to solve marketing problems. Therefore, an agricultural marketing extension program should be applied to meet farmers' needs, and farmers' problems about the market should be solved.

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