

BEEKEEPING AS A RURAL DEVELOPMENT ALTERNATIVE IN TURKISH NORTHWEST

ALTUNEL, T.^{1*} – OLMEZ, B.²

¹*Faculty of Forestry, Kastamonu University, Kuzeykent Campus, 37200 Kastamonu, Turkey
(phone: +90-532-570-9455; fax: +90-366-215-2316)*

²*Kastamonu Regional Directorate of Forestry, Halime Cavus st. No 7, 37100, Kastamonu, Turkey
(phone: +90-542-337-1364; fax: +90-366-214-1508)*

**Corresponding author*

e-mail: taltunel@kastamonu.edu.tr; +90-532-570-9455; fax: +90-366-215-2316

(Received 12th Feb 2019; accepted 28th Mar 2019)

Abstract. Turkey is one of the best areas for beekeeping because of its geography, climate, and the diversity of flora and fauna. Beekeeping is a traditional and socio-economic activity which is performed throughout Anatolia and has a place in our culture. Besides this, bee-keeping is very important to protect biodiversity and pass it onto the next generations, and also to provide and enhance food security. There are more than 100,000 families with 6.6 million colonies in Turkey. With all those, bee-keeping contributes to Turkish economy around US\$ 5-6 billion, not only through bee products but also pollination. As a part of the national policy, ORKÖY (the office of forest-village relations) provides micro-credits to villagers, who live in and around forested areas. In this study, ORKOY branch office distributed 30 beehives to 80 villagers with beekeeping certificates (in 2016 and 2017) and let them put their hives in the “honey forest” which was established in the region by the Forest Directorate. Face-to-face surveys, interviews and observations were conducted with 80 participants who benefited from beehive support and “honey forest.” At the end of the study, socio-economic effects and welfare improvement of local people through beekeeping and producing of bee products are analyzed in the northwest of Turkey.

Keywords: *honey production, villagers, socio-economic, social forestry, Turkey*

Introduction

Nowadays, the world population and the amount and quality of the produced goods and services do not increase at the same rate. The increase in the population increases demands and expectations, and thus it increases the expectations of people from agriculture and forest areas. Forests have versatile benefiting opportunities in terms of variety and quantity. The concept of “agricultural forestry” (agroforestry) was defined for the first time in the 1980s by some international organizations such as FAO. Agricultural forestry is the research and development of the possibilities of multi-faceted utilization from the same plot of land and the planning of agricultural and forest-related products, mostly animal husbandry, in the same field together. In this context, beekeeping and production of bee products are among the best examples of agricultural forestry practices. When the effect of bees on pollination is considered, it is observed that the beekeeping sector is also supported by forestry institutions to conserve biological diversity in forests, prevent erosion by the development of forest areas, and increase the quality of honey and honey products (OGM-1, 2018; FAO-1, 2018).

The first findings on obtaining bee products by human beings were found in nest paintings in the Mesolithic rocks which are thought to be about 8000 years old. In 1919, in the Arana Cave in the city of Valencia in Spain, the Mesolithic rock paintings dated

to 6000 BC and demonstrating a human figure harvesting honey from the bee colony in the tree cavity were determined. Similar depictions, older than the Mesolithic period, were also found in the rock paintings in India. Based on these depictions dating back to many years ago, it could be stated that the history of beekeeping traces back to 16,000 years ago (Genç, 2003). Furthermore, according to the information on the tablets, the ancient Egyptians used honey in food, medicine, and religious ceremonies 4000 years ago. The Sumerians, who lived in Mesopotamia, are known to accept honey as medicine in 3000 years BC (Bakan, 2009; Nakamura, 2009).

Literature review

In a study conducted in Japan, a significant decrease in the number of bees detected due to environmental factors, infectious diseases, and pesticides (Kohsaka et al., 2017). Beekeeping, which is an important way to protect biodiversity and to transfer it safely to future generations, is also very important in terms of providing food security in the world and increasing its diversity. However, with the extinction of bee colonies in the world in recent years, food security and continuity of the ecosystem have become endangered (Phillips, 2014). Therefore, beekeeping is a strategic sector that needs to be supported as a state policy.

With its different climate and soil types, flowering opportunities for different trees throughout the year, large flora areas, topographic structure, highlands, meadows and pastures, various fruit species, industrial plants (such as sunflower and cotton), forage crops and legume fields, trees of many species such as chestnut, pine, acacia, linden, spindle, eucalyptus, rhododendron, etc., shrubs, maquis shrublands and mixed forests, Turkey represents a magnificent country in terms of natural resources required for beekeeping, honey variety, and quantity. Because of these features, beekeeping has been one of the ancient and common production varieties in Anatolia (Sıralı, 2015).

Since beekeeping is an activity that requires knowledge but does not need muscle power and intensive workforce, children, the elderly or women who cannot be sufficiently effective in other production works can be directed to beekeeping activities. Furthermore, since it is an activity generating revenue in a short time, it is also an activity with high socio-economic importance which enables the income of people living in forests or adjacent villages to increase. Therefore, beekeeping is regarded as an alternative source of livelihood for people from all sociologically different segments, such as nuclear families, retirees, farmers with little or no land, teachers or village imams (OGM-2, 2018).

Beekeeping can be performed in two ways. Beekeeping, which is performed without changing the location of hives throughout the year, is called stationary beekeeping. Migratory beekeeping is a way of beekeeping in which bee colonies are carried to areas with more favorable nectar and pollen resources throughout the year and in which productivity is higher (Özkırım, 2018). Migratory beekeepers carry about half of their bee colonies in winter to the coastal areas of the Mediterranean, Aegean, and Black Sea regions. These beekeepers, who travel around Turkey throughout the season and change places of their hives three times a year, move primarily to the Central Anatolian plateau with the beginning of April, then to high plateaus in the summer months, and finally to the areas in Muğla and İzmir for pine honey production since September (TAB-1, 2018).

Since the beekeeping activity produces directly or indirectly the foods needed by people by playing a significant role in the pollination of plants, whether it is stationary or migratory beekeeping, it is also indispensable for herbal product agriculture. Approximately 85% of pollination in flowering plants in nature occurs through honey bees (Ghamdi et al., 2017).

Honey is composed of many components, such as approximately 82% carbohydrate, 17% water, 0.7% minerals, and 0.3% proteins, vitamins, phenolic compounds, free amino acids, and organic acids (Karabagias et al., 2014; Ozmen and Alkin, 2006; Islam et al., 2012). As a result of beekeeping activities, products such as honey, pollen, propolis, royal jelly and bee venom, which are very important for people and used in the treatment of various diseases, are produced. A method of treatment with bee products, which is called “Apitherapy,” has become a rapid trend in the world, especially in China. Among these products, propolis is known as a potent antibiotic, and royal jelly is known as an energy supply and hormonal source. Honey and pollen also have high nutritional value and are known to be effective in the treatment of diseases and infections (OGM-3, 2018; TAB-2, 2018).

The quality and quantity of nectar sources depend on the season, environmental, meteorological conditions, blooming stage of the plant, and even time of the day (Farkas and Zajacz, 2007). There are about 200 kinds of components in honey. Honey is a versatile consumption product which has high nutritional value and which displays easy digesting, disease-protective and therapeutic properties due to vitamins, minerals, flavonoids, phenolic and organic acids, amino acids and enzymes in its content. Moreover, in a study conducted, heavy metals were determined in honey samples, and it was stated that bee products could be an effective and cheap method in the prevention of environmental pollution as an indicator substance (Ozmen and Alkin, 2006; Spilioti et al., 2014).

Regarding its source, honey is divided into two as nectar honey (flower honey) and secretion honey (pine honey). Flower honey is obtained from many forest trees, shrub florals, and shrub species such as chestnut, linden, acacia, rhododendron, and from herbaceous plants inside the gaps in forests or on the edges of forests, and depending on the season, flower honey can be obtained in all parts of Turkey (DPT, 2018). Pine honey is obtained in Muğla and its vicinity, in the Mediterranean region where Calabrian pines are intense, and its source is pine, oak and abies species. Approximately one-fourth of the honey produced in Turkey is pine honey (DPT, 2018; Subaşı, 2004).

Beekeeping in the world and Turkey

According to the figures of FAO, the total number of beehives in the world is around 79.9 million, and approximately 1 million 592 thousand tons of honey is produced annually from these beehives. One-fourth of the total honey produced in the world is the subject of trade. When countries in the world are ranked according to the number of their hives, India ranks first with 11.5 million hives. However, China, which has 9 million hives, is the most honey-producing country in the world, with approximately 466 thousand tons of honey produced per year. After China, Turkey ranks second with 114 thousand tons, Argentina produces 80 thousand tons, Ukraine 74 thousand tons, and the Russian Federation produces 68 thousand tons of honey. China and Argentina are prominent in the export of honey, while the American and European Union countries are prominent in the import of honey (FAO-2, 2018; Karasın and Kaptan, 2015).

The countries, where honey production per hive is more than the world average of 22 kg, are Canada with 56 kg/hive, China with 52 kg/hive, Mexico with 39 kg/hive, Argentina with 27 kg/hive, and the USA with 26 kg/hive. In Turkey which ranks 12th in the world with its 15 kg of honey production per hive, despite the great hive presence, production per hive is low since the efficiency of honey production is low. With the highest number of hives in the world, India is the last among the world countries with an average of 4 kg of honey production per hive (Sıralı, 2015).

There are different principles and rules on this subject in each of the 12 countries that perform 80% of the export of honey and bee products in the world; therefore, production at international standards is not possible. For example, while the most important factor in the European countries is honey's being GMO-free, in North America, filtered, pasteurized, and liquid honey is preferred. In the Middle East, people consider crystallized honey as fake honey and do not prefer it (Kuvancı et al., 2017).

In Turkey, beekeeping is a socio-economic activity that has been traditionally performed in every region of Anatolia and has become a part of the culture. Turkey is the homeland of approximately 70% of honey-giving plant species and 22% of bee breeds. In Turkey, more than 100 000 families have a total of 6.6 million bee colonies. 10% of these families earn a livelihood solely from beekeeping, and 30% of them continue beekeeping as a side income activity. The remaining 60% are engaged in beekeeping activities as a hobby (TUIK, 2018).

According to the data of TÜİK (Turkish Statistical Institute) (2017), 114 thousand tons of honey is produced annually in Turkey. Twenty thousand tons of this amount are pine honey, and 100% of it is produced in forest areas. When it is considered that such varieties of honey as chestnut honey, linden honey, acacia honey, rhododendron honey, thyme honey are also produced in our forests besides pine honey, honey can be stated to be a significant "non-wood forest product." The first ten provinces in Turkey in terms of honey production are Muğla, Ordu, Adana, Aydın, Sivas, Antalya, İzmir, İçel, Erzinçan and Samsun provinces, respectively, and about half of the honey production is provided from these provinces (Sıralı, 2018).

In Turkey, to increase the sources of income of forest villagers by encouraging them to perform beekeeping, the General Directorate of Forestry has put 270 "honey production forest" lands into the service of beekeepers across the country. Moreover, with the protocol signed between the Ministry and the Beekeepers Association, it was decided to make water ponds in forest areas and to plant fire-resistant plants that give honey in fire lanes and forest roads. While 85% of honey production takes place in forest areas, only 15% takes place in agricultural areas (OGM-1, 2015).

Beekeeping contributes to the economies of countries directly as an agricultural activity and indirectly by contributing to plant production. Beekeeping is also important as a not land-dependent activity because in rural areas it can alone be a livelihood source for families without land (Kuvancı et al., 2016).

According to the 2017 data of TÜİK, 114, 471 tons of honey was produced in Turkey, and the revenue of US\$ 24,720,000 was obtained with the exportation of 1,236 tons of this production. If the honey remaining in the country is considered to be sold at a minimum sales price of US\$ 20 per kilogram, the total value will be about US\$ 2,264,700.000, and the total contribution of the produced honey to the country's economy will be about US\$ 2 billion 289 million. When this figure, which is obtained only with the honey data from beekeeping products, includes products such as pollen, beeswax, and royal jelly, the contribution of beekeeping products to the country's

economy is determined to be approximately US\$ 3 billion in a year. Considering that the contribution of beekeeping to the economy by pollination is at least 10-12 times of the income obtained from beekeeping products, it can be stated that beekeeping makes an essential contribution to Turkey's economy annually at about US\$ 30-35 billion (TUIK, 2018).

The objective of this study is to determine whether the support of government policies, such as ORKOY credits, establishing honey forests and providing education on beekeeping, helps villagers to improve their social, cultural, and economic welfare.

Materials and methods

Within the scope of the activities carried out by Kastamonu Regional Directorate of Forestry ORKÖY Branch to support forest villagers, the social and economic individual project types that can be applied in forest villages were determined pursuant to the regulations with regard to “providing support for the social and economic development of forest villagers for the protection, development, and expansion of forests”, and the study program was created. Within this context, in the years 2015 and 2016, in the areas with the stand area of pure and mixed chestnut (*Castanea sativa* Mill.) within the borders of Kastamonu Regional Directorate of Forestry, face-to-face surveys, interviews, and observational studies were conducted with 80 individuals benefiting from the support of “scientific beekeeping.” While determining the beekeepers to be included in the study, attention was paid to the fact that they were forest villagers who had not received ORKÖY support before, had a certificate of beekeeping, and resided in the region. To analyze the socio-economic structure of chestnut honey producers and to determine honey and other beekeeping products' contributions to the social and cultural life of local people and their effects on the welfare level, the survey questions were asked to the people of the region.

Chestnut, which is called *Castanea* (*Castanea sativa* Mill.) in Latin, is from the family of Fagaceae. It grows in all temperate regions of the North Hemisphere. Although 10-12 species of chestnut are known to be in the world, the species that grows naturally in Turkey is Anatolian chestnut (*Castanea sativa* Mill) (Conedera et al., 2016). Chestnut tree, as a valuable species with its fruit and wood, is of great importance for its region from ecological, economic, social and cultural aspects (Doğanay, 2007).

In this study, to analyze the socio-economic structures of chestnut honey producers in Kastamonu, the contribution of chestnut honey production and beekeeping activities to the local people was determined by face-to-face surveys and interviews. First of all, the participants' demographic characteristics, product mix, production quantities, sales price, and obtained revenues and perceptions and opinions about beekeeping were attempted to be determined with the questions prepared for this purpose. While preparing the questions, a literature survey was conducted on the subject, and the opinions of the participants were obtained with 30 closed and open-ended questions. In the survey, apart from the questions regarding the study, questions related to the demographic characteristics of participants such as age, gender, education, etc. were also included. After the questionnaires were transferred to the computer in Excel format, in the analyses of the collected data, straight and cross-analyses were performed using SPSS (Statistical Package for Social Sciences) statistical program, and the results were presented and interpreted with the help of graphs (Orhunbilge, 2014).

Results

About 85% of the local people who deal with beekeeping in the study area are aged between 31 and 60 years. Beekeeping activities are mostly conducted by men in the region, and although women are involved in these activities together with men, they prefer to remain in the background. Furthermore, most of the people engaged in beekeeping (75%) are primary school graduates.

40% of the beekeepers, who participated in the study, stated that their total annual income is between US\$ 4,000-5,000, and 45% stated that it is over US\$ 5,000. According to the land amount owned by the beekeepers to whom the survey was applied, while 80% have 0-15 acres of land, only 8.5% have 26 acres of land and more.

Of the participants benefiting from beekeeping-related support, 32.5% have been engaged in beekeeping for 6-10 years, 21.3% for 11-15 years, and 25% for over 16 years. It was found out that almost all of the beekeepers were performing the beekeeping activity with one or two people, and these people were mostly their spouses or children, in other words, their family members.

Upon examining the ownership status of lands where beekeeping activities were carried out, 90% of the participants stated that they carried out beekeeping activities on their land, 10% in forest area or honey forests. 65% of the beekeepers participating in the study stated that beekeeping education was insufficient and that the relevant ministries and NGOs should attach importance to the subject of training.

Upon examining the number of hives owned by beekeepers including 30 hives provided by ORKÖY, it was found out that 50% of the beekeepers have 1-50 hives, 33.7% have 51-80 hives, 5% have 81-100 hives, 6.3% have 101-130 hives, and 5% have 130 hives and more. In 80% of the hives, there are 9 and more frames. In the region where half of the beekeepers have a maximum of 50 hives, before increasing the number of hives, the number of colonies under controlling and registration can be increased by determining the flora of the region. Thus, studies not only on yield but also on quality will be useful for beekeeping and will increase the amount of production.

Within the scope of the study, the beekeepers were asked about their seasonal expenses per hive, and 75% of the participants stated that their expenses were US\$ 20-35, and 15% stated that the expenses were US\$ 40 and above.

It was stated that the maximum amount of harvest received (*Fig. 1*) by the beekeepers participating in the survey from one hive was between 7-10 kg with a rate of 80%, in case the meteorological conditions in the region were good and the chestnut tree nectar at the end of May and the beginning of June was optimal. In the case of adverse climate conditions, the minimum amount of harvest from one hive was recorded to be between 1 and 3 kg at a rate of 95%.

80% of the 80 beekeepers who received hives stated the sale price of the produced honey as US\$ 20-25 and 17.5% stated it as US\$ 25-40. Regarding the marketing method of the produced beekeeping products, 98.8% of the participants stated that they sell the produced honey directly to consumers, and very few of them stated that they sell it to intermediaries. Beekeepers (96%), who did not experience any problem with the marketing of produced beekeeping products, stated that the customer was ready in the market.

While 37.5% of the participants who carry out beekeeping activities and benefit from ORKÖY support are members of beekeeping cooperatives, 62.5% do not have cooperative membership. 53.8% of the beekeepers benefited from the support granted

for two years in 2015, and 46.2% benefited from it in 2016, and the number of applications for support in the second year was higher than in the previous year.

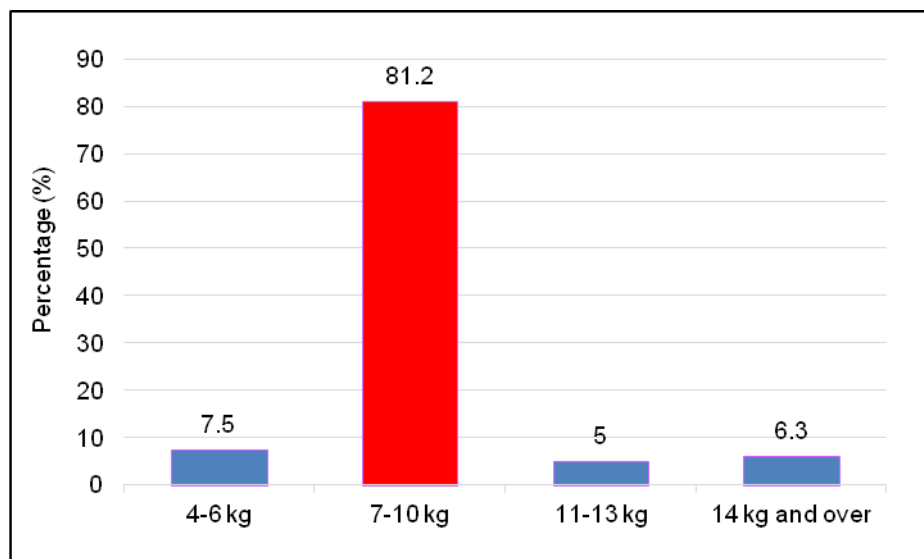


Figure 1. Maximum honey harvest under good meteorological conditions (kg)

76.2% of the beekeepers benefiting from the ORKÖY support stated that they generated profit and 20% stated that they did not make any profit or loss. The beekeepers were asked whether they wanted to use the ORKÖY support again, and 81.2% of them stated that they wanted to take advantage of it again and 18.8% stated that they did not want to take advantage of it again. When the participants were asked whether they had heard the term “honey forest,” 51.2% stated that they had not heard it and 48.8% stated that they knew it. When the beekeepers were asked about the “future of beekeeping,” 81.2% stated that they were hopeful about the future, 10% stated they were hopeless, and 8.8% stated that they did not have a positive or negative opinion.

In the comparison of the land amount owned by the beekeepers with their annual income, an increase was observed in the income levels as the amount of the land they owned increased (*Fig. 2*). As the land amount owned by the beekeepers increased, the number of their hives also increased.

When the relationship between the educational level of the beekeepers participating in the study and their cooperative memberships was examined, it was observed that while 22 primary school graduates and 7 secondary school graduates were not members of cooperatives, 38 primary school graduates and 7 secondary school graduates had cooperative membership. Accordingly, no relationship was determined between educational level and cooperative membership.

Upon examining the desire of the participants who carry out beekeeping activities and have benefited from the ORKÖY support to reuse the support according to their profit/loss status, it was determined that 53 individuals generated profit and could reuse the support, 8 individuals did not want to reuse the support although they generated profit, and 11 individuals did not make any profit or loss but could reuse the support. Therefore, any relationship between making profit or loss and ORKÖY support was not determined.

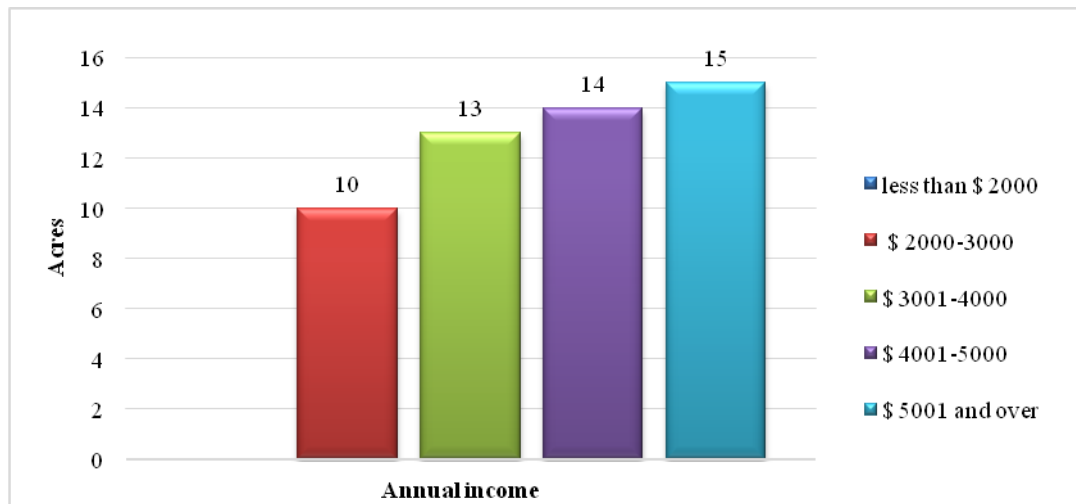


Figure 2. The relationship between the amount of the land owned and total income

Beekeepers who carry out beekeeping activities with the ORKÖY support sell honey directly to consumers at an average price of US\$ 21-25 (Fig. 3). There is no sale of honey to intermediaries, factories or on export markets in the region.

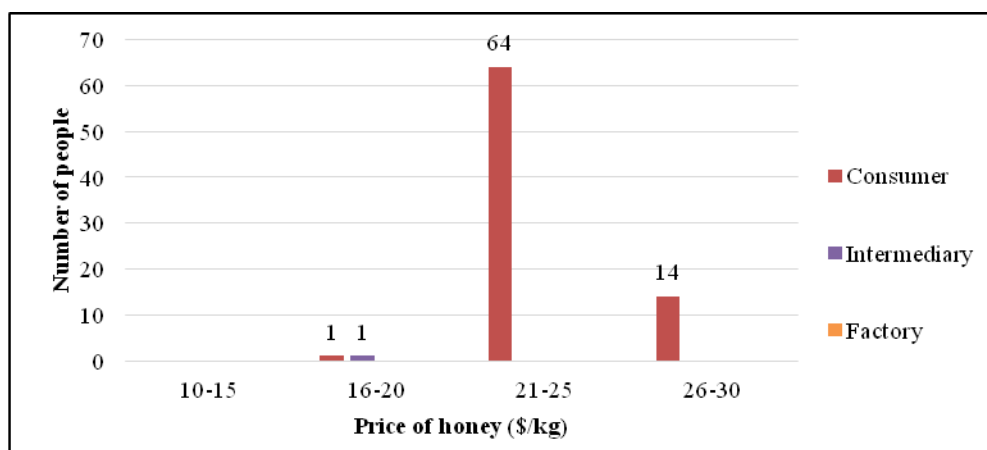


Figure 3. The relationship between the sale price of honey and the marketing method

Of the beekeepers who said that beekeeping-related training was sufficient, 17 beekeepers said that they learned beekeeping from the family, four beekeepers said that they learned it from other beekeepers, and four beekeepers said that they learned it in the course. Of the beekeepers who stated that the training was insufficient, 22 beekeepers stated that they learned beekeeping from the family, 16 beekeepers stated that they learned it in the course, and 14 beekeepers stated that they learned it from other beekeepers (Fig. 4). In general, the participants stated that they learned beekeeping from their families that beekeeping training was insufficient, and that beekeeping could not be learned from sources such as TV, books, and brochures, and that productivity could be increased through more visual and practical training.

Upon examining the relationship between the beekeeping activity and the total annual income, it was observed that the individuals who participated in the study did not

produce beekeeping products such as propolis, pollen, beeswax, royal jelly, and bee venom, but produced only honey. Providing the necessary support, carrying out studies, and attaching importance to educational activities related to the subject to produce other beekeeping products in addition to honey in the study area will be effective in increasing the income and welfare of the people in the region.

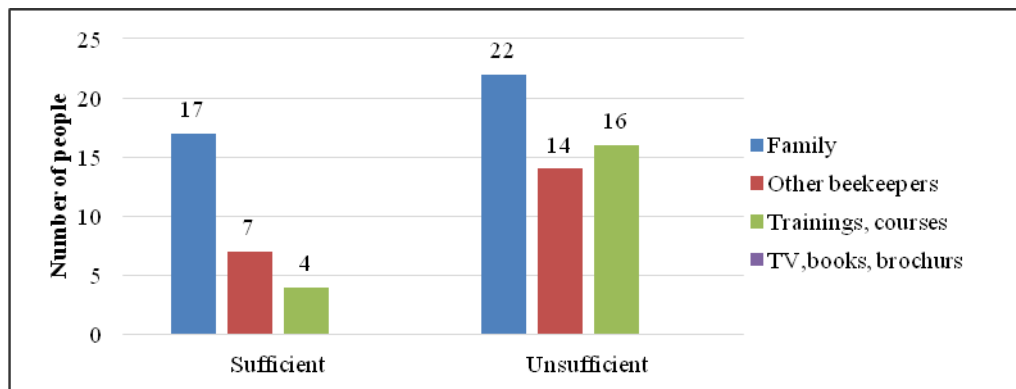


Figure 4. Sufficiency of beekeeping training according to the beekeeping learning style

Discussion

The production power of the honey bee, which offers valuable products for human life and health, has become much more critical with the increase in the world population. Besides its importance in the universal dimension, beekeeping also offers essential opportunities concerning the local development of forest villagers, since it is a field that provides middle or high-income opportunities with low investment and labor force. As Ayan et al. concluded in a study (2014), beekeepers/forest villagers have to have organic, brand name and certified bee products to increase their income.

In a study conducted by Önal and Bekiroğlu in 2011, the participants stated that they found the support provided by ORKÖY positive and that the economic and social village development projects implemented in the region increased the welfare level of the villages (82). Similarly, in this study, the villagers dealing with beekeeping stated that they were satisfied with ORKÖY support (96%), that their welfare level increased with the received support, and that they wanted the support to be repeated. In the same study by Önal and Bekiroğlu (2011) who emphasized the importance of being organized as a cooperative in rural areas, it was stated that the fact that villagers have a say in their works and the sales of products in the market and an increase in their efficiency should be provided through cooperatives. In this study, the ratio of becoming a member of a cooperative was determined as low as 37.5%, and it was stated that by increasing this ratio beekeepers would receive a say on the regional and national scale. Although in Turkey there are Provincial Unions established in the provinces and TAB (Turkey Beekeepers Association) that was established at the national level; locally, the memberships of beekeepers to these associations are inadequate.

Training of beekeepers/villagers on sustainable beekeeping is very important to improve their income level and sustainable usage of forest resources, in addition to providing food security (FAO-1, 2018). In our study, 52 (65%) out of 80 beekeepers stated that practical training and experience are important for sustainable beekeeping and sustainable usage of natural resources.

In the study conducted by Kuvancı et al. in the Eastern Black Sea Region (2017), it was stated that the average age of beekeepers was high, and to give momentum to this sector, the entrepreneurship and dynamism of the young people were needed. Similar results were also obtained in the study conducted in Kastamonu, and it was determined that 61% of the participants performing beekeeping activities were in the 40-60 age range. This result also indicates that the young population in villages migrates to cities due to unemployment. Again, the opinions in the same study which argued that the mix of goods related to beekeeping products should be diversified and that the level of income in the region should be increased by producing high value-added products show parallelism with the results of our study.

In another study conducted in the Netherlands, it was determined that producers, who perform plant production, pay beekeepers bee rent to provide pollination in plants and that they generate 3.5 times more of yield from bees' contribution to plant production in return (Hilmi et al., 2011). In Turkey, there is no study carried on this subject. The subject of making payment to beekeepers by determining the contribution of beekeeping to plant production should be put on the agenda by both the Ministry of Agriculture and Forestry and the Beekeepers Association.

Because of the low yield in the production of honey per hive, Turkey could not reach its beekeeping potential and the desired position in the world honey trade yet. Although the colony presence has increased by 41% over the last decade, the prices of bee products remain high due to reasons such as insufficient bee product variety, the lack of added value, unorganized marketing, and consumer demand. Although Turkey is in the second rank in the world in the amount of honey production, it could not reach the deserved position in the export of honey products due to imbalances in prices and supply amount (TUIK, 2018).

As it is stated by Seijo and Jato (2001), chestnut trees are a very important nectar and pollen resource to produce bee products both by quality and quantity. That is why *Castanea Sativa* Miller trees are important for beekeepers in northern Turkey economically, ecologically, and socially.

Conclusions

The fact that beekeeping activities have reached the targeted level will provide benefits such as the continuation of biodiversity, the development of citizens living in rural areas and the increase in their welfare level, the increase in the economic input to the region, the decrease in migration from the village to the city, the development of the relationship between forests and public, the decrease in illegal activities in forests, and many other ecological, social and economic aspects.

Since beekeeping is not a land-dependent branch of agriculture, it can solely be a source of income for farmers with little or no land. It is possible to state the main reasons which make beekeeping activities attractive as the opportunity to carry out beekeeping activities with limited resources in budget and capital, low maintenance and management costs, opportunity to generate income in a short time, opportunity of the easy sale of bee products due to the high demand in the market, and chance to procure materials that are necessary for beekeeping such as hives, bees, breeding bees, etc. within the country.

The forest ecosystem is not just areas which provide the industrial wood product. The products and services provided by forest ecosystems are more needed nowadays

than in the past due to reasons such as population growth, quality of life, changes in consumer preferences, and the decrease in natural resources. To meet the people's increasing expectations from forests in a sustainable manner, each element of forests should be operated within the framework of efficiency principles.

Due to its rich plant diversity, Turkey has a great potential for the production and export of quality honey and other bee products obtained as a result of beekeeping activities. Although Turkey takes the second place in honey production in the world, we do not produce and export value-added honey products such as wax, pollen, propolis, and bee milk. It is necessary to conduct studies on how to produce those products and how we can market them worldwide instead of consuming them locally or nationally. To contribute more to the economy and environment, studies should be carried out on beekeeping activities to develop joint action plans with the Ministry of Food, Agriculture and Livestock, the Ministry of Forestry, universities, producer unions, cooperatives and exporting companies according to the results of these studies.

For the purpose of the national and international recognition of “chestnut honey,” which is produced with great devotion by the local people in Kastamonu, has its unique aroma and taste, and determination of its standards, the process of branding was initiated by the local government, and an application for “geographical sign” registration was made.

REFERENCES

- [1] Al-Ghamdi, A. A., Adgaba, N., Herab, A. H., Ansari, M. J. (2017): Comparative Analysis of profitability of honey production using traditional and box hives. – *Saudi Journal of Biological Sciences* 24: 1075-1080.
- [2] Ayan, S., Ayan, Ö., Altunel, T., Yer, E. N. (2009): Honey forests as an example of agroforestry practices in Turkey. – *Forestry Ideas* 20(48): 141-150.
- [3] Bakan, A. (2009): The mystery of honey. – *Journal of Science and Technology, TUBITAK* 10: 8-11.
- [4] Conedera, M., Tinner, W., Krebs, P., de Rigo, D., Caudullo, G. (2016): *Castanea sativa* in Europe: distribution, habitat, usage and threats. – *European Atlas of Forest Tree Species*. Publication office of EU: 78-79.
- [5] DPT (State Planning Organization). Onuncu beş yıllık Kalkınma Planı, Bitkisel Üretim Özel İhtisas Komisyonu Raporu. – http://www.sbb.gov.tr/wp-content/uploads/2018/10/10_BitkiselUretim-2.pdf. Accessed on: 22.07.2018.
- [6] Doğanay, H. (2007): *Ekonomik Coğrafya 3 – Ziraat Coğrafyası*. Aktif Yayınları.
- [7] FAO and FDA (Forest Development Authority of Liberia). (2013): *Farmer Level Tech-Note for: Beginner Beekeeping*. – FAO, Liberia.
- [8] FAO-1: Agroforestry. <http://www.fao.org/forestry/agroforestry/80338/en/>. – Accessed on: 23.08.2018.
- [9] FAO-2: Food and agricultural data. <http://www.fao.org/faostat/en/#home>. – Accessed on: 25.10.2018.
- [10] Farkas, A., Zajacz, E. (2007): Nectar production for the Hungarian honey Industry. – *The European Journal of Plant Science and Biotechnology* 1(2): 125-151.
- [11] Genç, F. (2003): *Basic Principles of Beekeeping*. – Atatürk University Faculty of Agriculture Press, Erzurum.
- [12] Hilmi, M., Bradbear, N., Mejia, D. (2011): *Beekeeping and Sustainable Livelihoods*. – FAO, Rural Infrastructures and Agro-Industries Division, Diversification Booklet Number 1: 62.

- [13] Islam, A., Khalil, I., Islam, N., Moniruzzaman, M., Mottalib, A., Sulaiman, S. A., Gan, S. H. (2012): Physicochemical and antioxidant properties of Bangladeshi honeys stored for more than one year. – *BMC Complementary and Alternative Medicine* 12(1): 177.
- [14] Karabagias, I. K., Badeka, A., V., Kontakos, S., Karabournioti, S., Kontominas, M. G. (2014): Botanical discrimination of Greek unifloral honeys with physico-chemical and chemometric analyses. – *Food Chemistry* 165: 181-190.
- [15] Karasin, K., Kaptan, A. (2015): Dünyada bal üretimi ve kovan sayıları. – *Journal of KA* 1(3): 34-37.
- [16] Kohsaka, R., Park, M., S., Uchiyama, Y. (2017): Beekeeping and honey production in Japan and South Korea: past and present. – *Journal of Ethnic Foods* 4(2): 72-79.
- [17] Kuvanci, A., Güler, A., Aksoy, F., Karaoglan, Y. (2016): Bal arasının kivi bitkisinin polenlerinden yararlanma düzeyleri. – *Journal of Beekeeping Research, Arıcılık Araştırma Enstitüsü Müdürlüğü* 8(1): 15-21.
- [18] Kuvanci, A., Yılmaz, F., Öztürk, S., Konak, F., Buldağ, M. (2017): Doğu Karadeniz Bölgesi Arıcılığına Genel Bakış. – *Journal of Beekeeping Research, Arıcılık Araştırma Enstitüsü Müdürlüğü* 9(2): 47-55.
- [19] Michener, C., D. (2007): *The Bees of the World*. – The Johns Hopkins University Press, Baltimore, Maryland.
- [20] Miguel, M. G., Antunes, M. D., Faleiro, M. L. (2017): Honey as a complementary medicine. – *Integrative Medicine Insights* 12: 1-15.
- [21] Nakamura, J. (2009): *Apiculture. Development of Beekeeping in Developing Countries and Practical Procedures*. – JAICAF (Japan Association for International Collaboration of Agriculture and Forestry), Tokyo.
- [22] OGM-1 (General Directorate of Forestry) Workshop (2015): Ormanlarımız ve arıcılık çalıştayı. – Department of Non-Wood Forest Products Publications, Ankara.
- [23] OGM-2: Ministry of Agriculture and Forestry. Action Plan of Honey Forest. – <https://www.ogm.gov.tr/ekutuphane/Yayinlar/Orman>. Accessed on: 12.06.2018.
- [24] OGM-3 (General Directorate of Forestry): ORKÖY (Forest–Village Relations) Introductory Booklet. – <https://www.ogm.gov.tr/Baskanliklar/OrmanveKoyIliskileri/>. Accessed on: 22.08.2018.
- [25] Önal, P., Bekiroğlu, S. (2011): Orman Köylerinde ORKÖY tarafından gerçekleştirilen Köy Kalkındırma Projelerinin Uygulama Sonuçlarının Araştırılması (Şile-İstanbul). – *Journal of the Faculty of Forestry, İstanbul University* 61(2): 53-66.
- [26] Orhunbilge, N. (2014): *Tanımsal İstatistik, olasılık ve olasılık dağılımları*. – Nobel Academic Publishing, Ankara.
- [27] Ozkirim, A. (2018): Beekeeping in Turkey: Bridging Asia and Europe. – In: Chantawannakul, P. et al. (eds.) *Asian Beekeeping in the 21st Century*. Springer, Singapore, pp. 41-70.
- [28] Ozkok, A., Sorkun, K. (2001): Important bee products used in apitherapy: honey, pollen and propolis. – *Journal of Technical Beekeeping* 2001: 4-10.
- [29] Ozmen, N., Alkin, E. (2006): Balın antimikrobiyal özellikleri ve insan sağlığına etkileri. – *Uludağ Beekeeping Journal* 4: 155-160.
- [30] Phillips, C. (2014): Following beekeeping: more-than-human practice in agrifood. – *Journal of Rural Studies* 36: 149-159.
- [31] Seijo, M. C., Jato, M. V. (2001): Distribution of castanea pollen in Galician honeys (NW Spain). – *Aerobiologia* 17(3): 255-259.
- [32] Sirali, R. (2015): Arıcılığın Ordu yöresi için ekonomik önemi. – *Journal of Beekeeping Research, Arıcılık Araştırma Enstitüsü Müdürlüğü* 7(2): 18-20.
- [33] Sirali, R., Cinbirtoglu, S. (2018): Bal arılarının tozlaşmada ve bitkisel üretimdeki önemi. *Journal of Beekeeping Research*. – *Arıcılık Araştırma Enstitüsü Müdürlüğü* 10(1): 28-33.
- [34] Spilioti, E., Jaakkola, M., Tolonen, T., Lipponen, M., Virtanen, V., Chinou, I., Kassi, E., Karabournioti, S., Moutsatsou, P. (2014): Phenolic acid composition, anthiatherogenic

- and anticancer potential of honeys derived from various regions in Greece. – PloS One 9(4): e94860.
- [35] Subasi, B. (2004): Kestane sektör profili. – ITO (İstanbul Ticaret Odası), Etüt ve Araştırma Şubesi, İstanbul.
- [36] TAB-1 (Turkish Association of Beekeepers): Göçer arıcılık ve konaklamalar. – <http://www.tab.org.tr/apimondia>. Accessed on: 25.06.2018.
- [37] TAB-2 (Turkish Association of Beekeepers): Apiterapi çalıştay sonuç raporu. – <http://www.tab.org.tr/apiterapi-calistayi-sonuc-raporu.html>. Accessed on: 15.11.2018.
- [38] TUIK (Turkish Standards Institute): Beekeeping statistics. – http://www.tuik.gov.tr/PreTablo.do?alt_id=1001. Accessed on: 17.04.2018.