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Socio-Economic Determinants on The Profitability of Beekeeping Enterprises in Turkey: A Case Study in The Kelkit District of Gümüşhane

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E R R A T U M

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MELLIFERA RESEARCH ARTICLE

Socio-Economic Determinants on The Profitability of Beekeeping Enterprises in Turkey: A Case Study in The Kelkit District of Gümüşhane

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A B S T R A C T

The aim of this study is to determine the effects of socio-economic factors on the profitability of the beekeeping enterprises in the province of Gümüşhane in Turkey. The relationship between gross profit and some socio-economic characteristics was investigated, and the effects of socio-economic factors on profitability were analyzed by the decision tree method. The results showed that the socio-economic factors affecting the gross profit of beekeepers were the non-beekeeping income, the production of the other bee products except honey, the beekeeping experience, the number of the hives and the years of education. Additionally, if the beekeeping is performed as a second source of income and with more experience, more education and working with fewer beehives will produce positive results on profitability. For producers who did not have any other income, other bee products provided more gross margin per hive. Therefore, other bee products besides the honey production would increase their profitability. The low amount of the other bee products such as propolis, royal jelly, bee pollen, bee bread (perga), apilarnil, bee venom, etc. were result from some socio-economic factors that had been identified in the research area and lack of training. Interventions should aim at trainings that overcome production, management practices and marketing constraints in the value chain.

Keywords: Beekeeping, decision tree, profitability, socio-economic factors, Turkey

Introduction

Beekeeping is a branch of production that can be carried out with other agricultural activities in rural areas, and it is also one of the most important agricultural activities because of the importance of bee products in the human diet, their use in the pharmaceutical, traditional medicine usage in treatment and the role of bees in improving product quality in crop production.

According to FAO's data on the number of bee colonies, with 9 million 148 thousand colonies, China is in the first place, while the second place is occupied by Turkey with 8 million 331 thousand colonies. China takes part in the first place in the world in terms of the number of colonies with 502 thousand tons in honey production, and it is followed by Turkey (114 thousand tons), the United States (73 thousand tons) and Russia (69 thousand tons) [8]. Although Turkey, both in the number of hives

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and in the production of honey in the world, comes after China, the value of its exports remains relatively low in comparison to other countries.

Although beekeeping may be practiced almost anywhere around the country, the honey yield per hive is still low in Turkey. According to the 2018 data from Republic of Turkey Ministry of Agriculture and Forestry [21], the yield is only 14 kg per hive in Turkey. Despite the increase in the number of beehives over the years in Turkey, the yield per hive has decreased. The yield per hive decreased from 17 kg in 2005 to 13 kg in 2016 [30]. Productivity is closely related to the production technique applied in beekeeping. Due to the lack of technical methods, serious financial losses occur in beekeeping. Achieving technical beekeeping increases the economic value of the activity of beekeeping and ensures that it becomes profitable for the beekeeper.

In the world and Turkey, several studies examining the economic aspects of beekeeping have been carried out so far. Beekeeping techniques in various provinces of Turkey have aimed at solving economic problems, and there are many studies about the significance of beekeeping [2, 5, 6, 7, 10, 11, 13, 14, 17, 20, 25, 26, 27, 28-31].

Despite the significance of the beekeeping enterprises, there was any empirical evidence on potentials and challenges of the beekeeping enterprises in the research area. Republic of Turkey Ministry of Agriculture and Forestry is currently focusing attention on how to increase agricultural production with providing employment opportunities for the local people in rural areas. So, production of the honey and the other bee products in Gümüşhane is important for the national honey market, and this affects a profitable enterprise in this context.

The aim of this study is to determine the effects of socio-economic factors on the profitability of beekeeping farms in the province of Gümüşhane and the relationship between gross profit and some socio-economic characteristics by Decision Tree-CRT algorithm. The socio-economic factors that have an effect on profitability will be identified in this study, and this information will fill the gap in the literature. Furthermore, introducing the optimum type of beekeeping enterprise in Gümüşhane will be a guide for decision-makers and beekeeping enterprises that need such information.

Research Questions

a.What are the socio-economic characteristics of the beekeepers?
b.What are the production characteristics of the beekeeping enterprises?
c.What is the contribution of beekeeping to beekeepers' household income?
d.What is the contribution of beekeeping enterprises to poverty alleviation?

Research Hypothesis

i.There is no significant relationship between selected socio-economic characteristics and poverty status.
ii.There is no significant relationship between beekeeping enterprises' production characteristics and present status
iii.There is no significant relationship between the contribution of beekeeping enterprises and poverty status.

Materials and Methods

The main material of this study was obtained from a survey conducted with beekeeping enterprises. The secondary sources of the study were previous national and international studies and research reports.

Gümüşhane was chosen as the research area where the survey was conducted. There were about 41 thousand hives and approximately 615 tons of honey production in 2018 [21]. When the number of hives and honey production in

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the province of Gümüşhane were analyzed based on the district, the Kelkit district had the largest share of production in the province with approximately 17 thousand hives and 441 tons of honey production (Table 1). Therefore, the Kelkit district was included in this study.

Table 1. Colonies, honey production and honey yield by districts in Gümüşhane

District name	Number of Beekeeper	Number of Hives (piece)	Honey Production (kg)	Honey yield (kg/ colony)
Kelkit	110	17395	441,570	25.38
Şiran	43	5002	37,065	7.41
Centre	161	11803	72,546	6.14
Köse	32	2699	35,838	13.27
Torul	39	2232	15,435	6.91
Kürtün	33	1783	12,230	6.85

Source: Ministry of Agriculture and Forestry, 2018

Although beekeeping was common in the Kelkit district of Gümüşhane, where the survey was conducted, reliable data on the number of hives could not be obtained. For this reason, it was found appropriate to use proportional sampling method in the study. In addition, the fact that this study was carried out with the own financial resources of the researchers and that there was a time constraint in choosing this method.

The sample size was calculated by using the proportional sampling method. In terms of this method, the sample according to the predicted ratio (p) of the population size N is given below [22].

$$n = \frac{Np(1-p)}{(N-1)\sigma^2_{\hat{p}_x} + p(1-p)}$$

n= Sample size

N= Number of beekeepers in the Kelkit district

p= Proportion of beekeepers on an adequate level (0.50 for maximum sample volume)

σ^2_{px} = Variance of rate

There were 110 registered beekeepers in the Kelkit district in the Bee Registration System (BRS) of the Ministry of Agriculture and Forestry. Beekeepers in the Beekeepers' Association, producers who were not in BRS, beekeepers with fewer than 30 hives and beekeepers who came to Kelkit from outside (migratory) were also included in the study, and as a result, the population size was calculated as 190 producers. According to the proportional sampling method, the sample size was calculated as 60 with a 90% confidence interval and a 10.5% error rate the beekeeping enterprises surveyed were selected randomly. In this study, the effects of socio-economic factors on the profitability of the enterprises were analyzed by the decision tree method in this study. The explanatory variables were the level of education of the producer, age, the beekeeping experience, non-beekeeping income, the size of the producer's household, the type of beekeeping production, bee breeds, number of hives, status, use of consultancy and production of other bee products except honey. Gross profit per hive was used as the dependent (continuous) variable (Table 2).

The gross margin for a beekeeping enterprise is one measure of profitability that is useful for enterprise planning. Calculation of gross margins may be the starting point for construction of cash flow budgets and assessment of the whole farm's profitability. Gross margin profit is the difference between the annual gross income and the variable costs directly associated with the enterprise [9].

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Table 2. Variables used in CRT analysis

The dependent variable	Abbreviation	Explanation
Gross profit per hive (TRY/hive)	gmargin	It was obtained by subtracting the variable costs from the gross production value per hive.
Independent Variables		
Beekeeper's years of education	edu	Illiterate (0), literate (1), Primary school (2), Secondary school (3), High school (4), Pre-degree (5), University (6)
Beekeeper age	age	Number of years
Beekeeping experience	bexp	Number of years
Non-beekeeping income	nbi	1) available, 0) not available
Size of household	hsize	Number of persons
Types of beekeeping	btype	1) migratory, 0) constant
Bee breed in the production	race	1) Caucasian, 0) if not
Number of hives owned	nhive	Number of hives
Produced honey type	honeytype	1) If both pine and flower honey are produced; 0) If only flower honey is produced
Beekeeping training situation	training	1)Yes, 0) No
Counseling situation	advise	if the beekeeper receives counseling from a specialist institution…etc.; 1) Yes, 0) No
Production of other bee products except honey	otherprod	1) yes, 0) no

The Classification and Regression Trees (CRT) algorithm is used to construct decision trees. A decision tree is a classification method consisting of decision nodes and leaf nodes in the form of a tree structure. A decision tree algorithm develops a dataset consisting of categorical and/or numerical data by dividing it into small pieces. In a decision tree, the first node is called the root node, and the other branches are called the decision nodes. A decision node may include one or more branches. According to the contributions of the independent variables in classification of the dependent variable, child nodes are formed. Various algorithms are used to construct the tree. The CRT (Classification and Regression Tree) algorithm is widely used among these algorithms that have been developed. In the CRT algorithm, the contribution of the independent variables to classification of the dependent variable is determined by their importance [3].

Results and Discussion

Socio-Economic Characteristics of Beekeeping Enterprises

The socio-economic characteristics of the beekeeping enterprises were given in Table 3. The average age of the beekeepers was 52 years, their mean years of education were 8.5 years and the period of beekeeping experience was 19 years. This age result explained that beekeeping was maintained by an older generation and did not attract young people enough in Kelkit area. A similar result on the age factor was obtained in the beekeeping study of Affognon et al. [1]. The average age of beekeepers was found as 51. Makri et al. [18] found the mean year of education of the beekeepers was 10 years, and the beekeeper age changed from 40 to 50 years. In the study of Öztürk [26], the average period of education of beekeepers were found to be only 5.35 years that was the lower finding from this study.

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Table 3. Socioeconomic characteristics of beekeeping farms

Items	Min.	Max.	Mean	Standard Dev.
Age of beekeeper (yrs)	28.00	71.00	52.03	12.037
Years of education (yrs)	1.00	15.00	8.50	3.753
Farming experience (yrs)	3.00	50.00	25.00	14.679
Beekeeping experience (yrs)	1.00	50.00	19.28	12.192
Household size (person)	1.00	10.00	4.30	2.036
Number of Family Labors (person)	0.00	4.00	1.18	1.127
Number of hives (number)	22.00	470.00	145.88	134.922
Value of sales of bee products (US$)*	61.50	69.322	13.930	15424, 044

**The average exchange rates between Turkish Lira (TRY) and the US dollar (USD) for 2018 was $1= TRY4.813 (BÜMKO, 2018).*

Approximately 42% of the beekeeping enterprises (25 enterprises) took part in the animal breeding or the crop production other than the beekeeping, the period of their average agricultural experience was 25 years, and the average period of the beekeeping experience was found as 19 years. This average beekeeping experience value was less than 21 years determined by Ceyhan and Canan [35]. On the other hand, in the study performed by Kalanzi et al. [12], 56.3% of the surveyed beekeepers had less than 10 years of beekeeping experience. In this study, the average household size was found as 4 people. However, in the study that was published by Mbah [19]on the topic of the profitability of honey production, the average size of the households was found as 12 persons.

The average number of hives per farm was 146. The mean sales value obtained from bee products in the production period was calculated as US$13930.

The majority of the beekeeping enterprises (66.70%) did not produce other bee products. Only 33.30% of the investigated enterprises produced 1 to 2 other bee products including honey (Table 4). Similar result was obtained in Kebede and Tadesse's [15] study, and the beekeepers (86.4%) reported that they did not produce any bee products apart from honey.

The interviewed producers (66.70%) stated that they did beekeeping as additional activity. On the other hand in the study by Okpokiri et al. [23], 70% of the beekeepers who participated in the survey reported that they took part in honey production as their main source of livelihood. To the study of Ceyhan and Canan [35]; 64% of Turkish beekeepers do the beekeeping as the main source of income. But this result was obtained different in this study. The main reasons for the beekeeping as a second job by the majority of Kelkit beekeepers were that it was easier to produce in comparison to other production activities (crop and animal), they aimed to provide the employment opportunities for the family members, and it was seen as a profitable activity. When we considered the mean age of the beekeepers in the research area, this finding was an expected result. As a result, it was understood that the training activities could be carried out continuously in order to encourage the beekeeping to the target group of the young or middle age groups.

In order to ensure the economic feasibility of beekeeping, it was necessary to defuse the missing technical knowledge of the producers about this production activity. In this context, it

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was important that beekeepers receive basic training in apiculture and seek consultancy from experts during their activities. The findings obtained from this study showed that the level of technical knowledge about beekeeping of the interviewed beekeepers was generally good. As a matter of fact, 83.30% of the beekeepers stated that they participated in a course or a training program on beekeeping in the past. The percentage of the beekeepers receiving consultancy or assistance to obtain technical information on beekeeping was 43.30% at present. However, Kebede and Tadesse [15] showed that the most important problem faced by beekeepers was lack of adequate training on beekeeping.

According to the results, 78.30% of the interviewed producers were members of the Beekeepers Association as it is shown in Table 4. This was a positive result that shows that the producers depended on producer organizations.

Gross Margin Analysis

The variable costs of the beekeeping enterprises were firstly determined in this section. The variable costs associated with honey production per colony were given in Table 5.

The total variable costs included subsequently feed costs (sugar and cake), medication (parasite and disease control), wax foundation, transportation of hives, labor, location rental fees, and packaging of honey, repairs and maintenance, interest on variable costs. The total variable cost per hive was determined US$69.14. Labor cost and feed cost were identified as the significant cost items among the variable costs in this study. In a similar study conducted by Vaziritabar and Esmaeilzade [32] on the profitability of apiculture in the Karaj region of Iran, the variable cost per hive was found as about US$60.10. Variable costs were obtained as US$18.53 per hive in the study by Aydın et al. [34] and as US$94.25 in the study by Adanacıoğlu et al. [33]. These results showed that the beekeeping enterprises' operating costs was higher in the research area. According to these results in order to increase the economic performance of the beekeeping enterprises, the feed and the labor cost had to be reduced.

Table 4. Beekeeping activities, knowledge and skills of the producers

Items	Frequency	Percentage
Do you produce other products apart from honey?		
Yes	20	33.30
No	40	66.70
Is beekeeping your main job?		
Yes	23	38.30
No	37	61.70
Have you received any training on beekeeping?		
Yes	50	83.30
No	10	16.70
Do you receive consultancy assistance to get technical information on beekeeping?		
Yes	26	43.30
No	34	56.70
Are you a member of the Beekeepers Association?		
Yes	47	78.30
No	13	21.70

The gross revenue and variable costs associated with honey production are given in Table 6. While the gross revenue per hive was US$124.22, the total variable costs per hive was calculated as US$69.14 in the beekeeping enterprises. Therefore, the gross margin was calculated to be US$55.08 per hive.

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Table 5. Variable costs of beekeeping farms (US$ per hive)

Items	Cost	%
Feed costs (sugar and cake)	21.65	31.31
Medication (Parasite and disease control)	0.99	1.43
Wax foundation	6.95	10.05
Transportation of hives	7.53	10.89
Labor costs	26.60	38.47
Location rental fees	1.20	1.73
Repairs and maintenance	0.70	1.01
Packaging of honey (jar)	1.19	1.72
Interest on variable costs	2.33	3.36
Total Variable Costs	**69.14**	100.00

*The average exchange rate between Turkish Lira (TRY) and the US dollar (USD) for 2018 was US$1= TRY4.813 (BÜMKO, 2018).

Table 6. Gross margin in beekeeping farms (2018)

	Value (US$ **per hive)**
Gross Revenue (1)	124.22
Total Variable Costs (2)	69.14
Gross Margin (1-2) (3)	55.08

Analysis of The Effects of Socio-Economic Factors on The Profitability

In this section, the effects of socio-economic variables on the gross profit obtained by beekeeping enterprises were shown by the decision tree method. In this context, the effects of the producer's education years, age, beekeeping experience, non-beekeeping income, the size of the producer's household, the type of beekeeping, the bee breed used in production, the number of hives, the type of honey produced, the status of receiving training on beekeeping and the effects of the production of other bee products except honey on the gross profit were analyzed. As a result of the CRT algorithm that was used, the non-beekeeping income of the beekeeper, the beekeeping experience of the producer, the production of other bee products except honey and the number of hives were found to be more effective than the other factors. Whereas among the evaluated predictors, only two ones "age of enterprise" and "non-beekeeping income" were effective in the study of Aksoy et al. [2].

The non-beekeeping income of the beekeepers was found to be the most effective. The mean gross profit per hive for the producers who had non-beekeeping income was found to be higher (Node 1= US$58.28 (TRY280.54) than the producers who did not have non-beekeeping income (Node 2= US$23.92 (TRY115.17). On the other hand, it was seen that beekeeping experience was important for beekeepers with non-beekeeping income.

According to a single beekeeper with less than 1.5 years of experience in beekeeping, the experience variable was subdivided into sub-categories, and the gross profit was found to be lower among the beekeepers with little experience. The gross profit of the producer was found as US$61.05 (TRY293.86) (Node 4). According to the results of Kutlu [17] on determination of socio-demographic and economic factors that affect honey production, an increase in the beekeeping experience of beekeepers had a positive effect on honey production. The same finding was reached in the study by Onuç et al. [24]. They found that the professional experience of the beekeeper was an important factor. In our study, in addition to honey, production of other bee products was found to be a significant factor for the producer. The mean gross profit per hive for the producers who produced other bee products was US$53.99 (TRY259.89) (Node 6), while the mean was US$4.60 (TRY22.14) (Node 5) for the producers who did not.

As another variable, the number of hives was found to be effective on the producers with more beekeeping experience. The gross profit for the producers with less than 98 hives was US$70.59 (TRY339.77) (Node 7), and for those with more than 98, this was US$36.25 (TRY174.50) (Node 8). The years of education was an effective factor for the producers with a low number of hives. The producers with more

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education years had more gross profit per hive. The gross profit for producers who had more than 5 years of education was US$129.16 (TRY621.67) (Node 10), whereas, for those who had less than 5 years of education, it was US$62.95 (TRY303) (Node 9) (Figure 1-Table 7).

Table 7. Descriptives of Regression Tree

Node	Mean	Std. Deviation	N	Percent (%)	Predicted Mean	Parent Node	Primary Independent Variable		
							Variable	Improvement	Split Values
0	217.15	246.11	60	100.0	217.15				
1	280.54	258.94	37	61.7	280.54	0	nbi	6464.319	Yes
2	115.17	187.33	23	38.3	115.17	0	nbi	6464.319	No
3	-199.00	0	1	1.7	-199.00	1	bexp	3939.115	<=1.5
4	293.86	249.43	36	60.0	293.86	1	bexp	3939.115	>1.5
5	22.14	121.36	14	23.3	22.14	2	otherprod	5160.812	No
6	259.89	184.02	9	15.0	259.89	2	otherprod	5160.812	Yes
7	339.77	245.23	26	43.3	339.77	4	nhive	3287.787	<=97.50
8	174.50	230.17	10	16.7	174.50	4	nhive	3287.787	>97.50
9	303.00	230.49	23	38.3	303.00	7	edu	4491.566	<=5.0
10	621.67	180.49	3	5.0	621.67	7	edu	4491.566	>5.0

The factors that affected gross profit per hive and their importance values were shown in Table 8 and Fig. 2 (importance and normalized importance values of the independent variables). Among these factors, the non-beekeeping income of the producer was determined as the first and 100% effective factor on gross profit. In a similar study by Aksoy et al. [2], the age indicator was a 100% effective factor. Production of other bee products than honey (79.8%), the producer's beekeeping experience (76.7%), number of hives (75.2%), the producer's education years (69.5%), the producer's age (34.8%), the size of household (18.6%), beekeeping type (15.6%) and honey type (13.6%) followed these. However, the variables on the producer's age, size of household, beekeeping type and honey type were not included in the decision tree diagram.The results showed that the socio-economic factors affecting the gross profit of the beekeeping farms were the income of other bee products except honey, the beekeeping experience of the beekeeper, the number of hives and the education year.

In the regression tree analysis, it was found that the beekeepers who had non-beekeeping income had more gross profit per hive than the beekeepers who did not. However, it was determined that the beekeepers who had non-beekeeping income, those with fewer hives, and those with high education levels made higher gross profits. The results of this study showed that, if beekeeping was performed as a second job, it was expected that more experience, high education and fewer beehives would have positive results on profitability. In this situation, we might state that, as the activity of beekeeping was carried out as a second job by the majority of beekeeping enterprises, a high number of beehives would limit the effective management of the hives.

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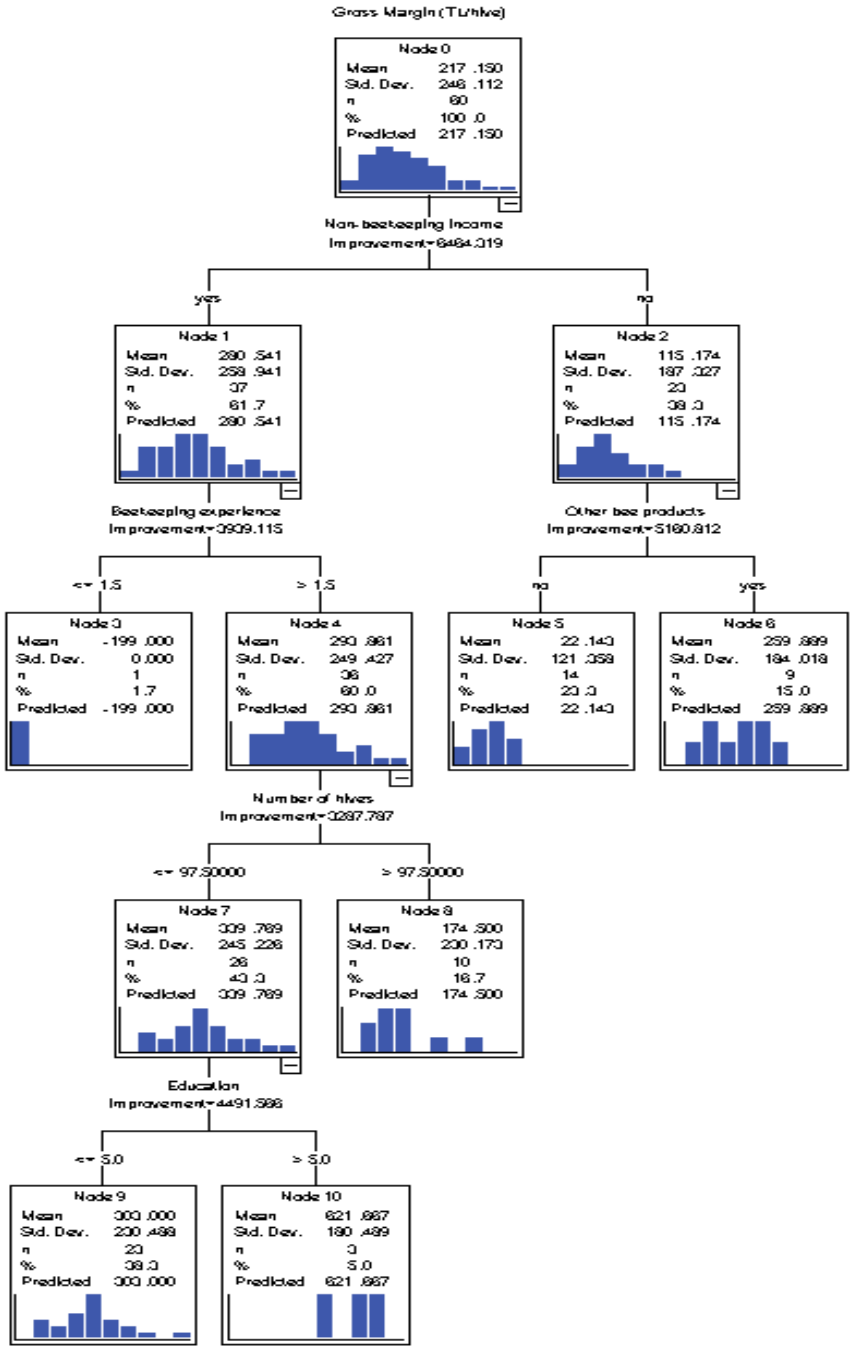

Figure 1. The Regression Tree diagram for factors affecting gross margin

According to the findings, non-beekeeping income beekeepers who produced other bee products than honey had more gross profit per hive. Unfortunately, other bee products than honey were not widely known. There are many products such as propolis, royal jelly, bee pollen, bee bread (perga), apilarnil, and bee venom. All these products may be used

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effectively in the world in apitherapy and alternative medicine. Without doubt, all the bee products could be used effectively to make more profit by the beekeeping enterprises in the research area. Therefore, production of the other bee products as a side activity to the primary honey production in Gümüşhane would increase the profitability of the beekeeping enterprises.

Table 8. Importance values of independent variables

Independent Variable	Importance	Normalized Importance
Non-beekeeping income	6464.319	100.0%
Other bee products	5160.812	79.8%
Beekeeping experience	4957.838	76.7%
Number of hives	4863.936	75.2%
Education	4491.566	69.5%
Age	2248.444	34.8%
Household size	1201.132	18.6%
Types of beekeeping	1006.818	15.6%
Honey type	881.405	13.6%

*Growing Method: CRT, Dependent Variable: Gross Margin (TRY/hive)

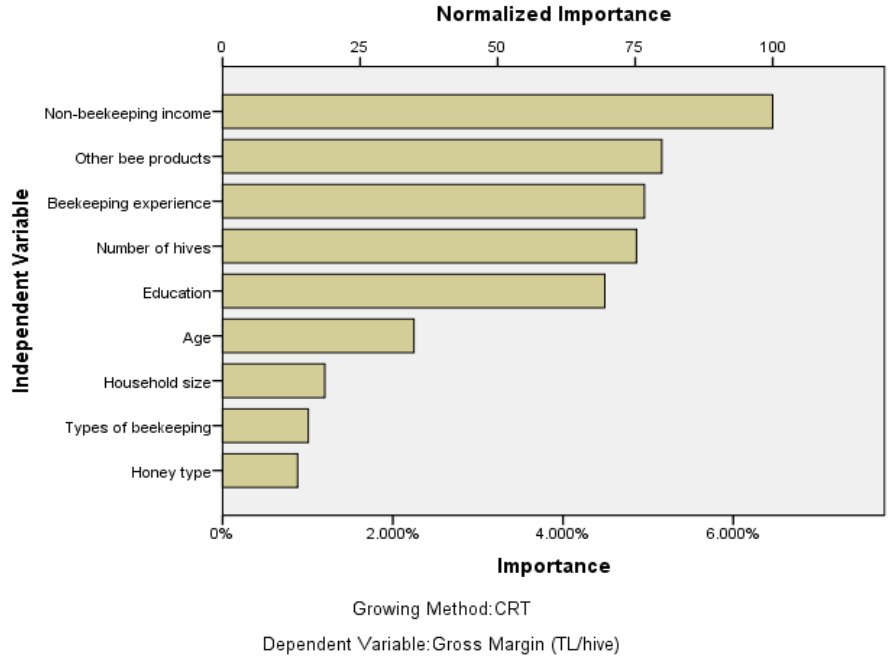

Figure 2. Importance and normalized importance of independent variables

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Conclusion

In conclusion, despite having adequate advantages such as the natural resources, the gross profit, and the yield in the research area, the number of beekeeping enterprises are still low. This is due to some insufficient management practices and lack of adequate training. In this context, aiming to improve the beekeeping management and the increasing profitability through identifying the socio-economic factors, providing the training courses, improving the marketing bee products except honey will be very vital to all the governmental and non-governmental organizations. Organizations are essential areas of intervention to utilize the management practices and the training.

Beekeeping in Kelkit area should be promoted to improve the employment and as a main income with the young/middle aged local people. Additionally, further study need to be conducted for improving the technical efficiency of the beekeeping enterprises.

Türkiye'de Arıcılık İşletmelerinin Karlılığına İlişkin Sosyo-Ekonomik Belirleyiciler: Gümüşhane'nin Kelkit İlçesinde Uygulamalı Bir Çalışma

Öz: Bu çalışmanın amacı, Gümüşhane ilinde arıcılık işletmelerinin karlılığına etki eden sosyo-ekonomik faktörleri belirlemektir. Brüt kar ile bazı sosyo-ekonomik özellikler arasındaki ilişki araştırılmış ve sosyo-ekonomik faktörlerin karlılık üzerindeki etkileri karar ağacı yöntemi ile analiz edilmiştir. Elde edilen sonuçlar göstermiştir ki, arıcıların brüt kârını etkileyen sosyo-ekonomik faktörler sırasıyla arıcılık dışı gelir, bal hariç diğer arı ürünlerinin üretimi, arıcılık deneyimi, kovan sayısı ve eğitim yılıdır. Ayrıca, yüksek arıcılık deneyimi, yüksek eğitim seviyesi, az kovan sayısı ve arıcılığın ek gelir olarak yapılması faktörlerinin arıcılık işletmelerinin karlılığını olumlu etkileyeceği saptanmıştır.
Bal hariç propolis, arı sütü, arı poleni, arı ekmeği (perga), apilarnil, arı zehiri,...gibi diğer arı ürünlerinin düşük miktarda üretilmesinin nedeni, araştırma alanında tespit edilen bazı sosyo-ekonomik faktörlerden ve yetersiz eğitim etkinliklerinden kaynaklandığı anlaşılmaktadır. Bundan dolayı, bal üretim değer zincirinde yapılması gereken müdahaleler; üretim, yönetim uygulamaları ve pazarlama kısıtlamalarının üstesinden gelecek şekilde hedeflenmelidir.
Anahtar Kelimeler: Arıcılık, Karlılık, Karar ağacı, Sosyo-ekonomik faktörler, Türkiye

REFERENCES

[1] AFFOGNON, H; KINGORI, W S; OMONDI, A I; et al (2015), Adoption of Modern Beekeeping and Its Impact on Honey Production in the Former Mwingi District of Kenya. Inter J of Tropical Insect Sci., 35: 96-102.

[2] AKSOY, A; ERTÜRK, Y E; EYTURAN, E; ERDOĞAN, S; TARIQ, M M (2018), Estimation of Honey Production in Beekeeping Enterprises from Eastern Part of Turkey Through Some Data Mining Algorithms. Pakistan J of Zoo., 50: 2200-2207.

[3] BREIMAN, L; FRIEDMAN, J; OLSHEN, R; STONE, C (1984), Classification and regression trees. Chapman and Hall. Wadsworth Inc.; New York pp.216-228.

[4] BÜMKO **(**2018), Average Exchange Rates. Available at http://www.bumko.gov.tr/TR,147/ekonomik-gostergeler.html. (20.02.2019)

Cite as: DOĞAN, N; ADANACIOĞLU, H; SANER, G; TAKMA, Ç (2020), Socio-Economic Determinants on The Profitability of Beekeeping Enterprises in Turkey: A Case Study in The Kelkit District of Gümüşhane, Mellifera, 20(1):28-40.

[5] ÇEVRİMLİ, M B; SAKARYA, E (2018), Structural Characteristics and Problems of Beekeeping Enterprises in Aegean Region Example. Eurasian Journal of Veterinary Sciences, 34: 83-91, 2018.

[6] DEMEN, H; KARACAOĞLU, M; KOÇ, A (2015**),** Beekeeping structure and problems in Diyarbakir province. Available from http://dergi.adu.edu.tr//tralleis, (10.10.2018) [in Turkish with English abstract]

[7] ENGİNDENİZ, S.; UÇAR, K.; BAŞARAN, C. 2014 Economic Aspects and Problems of Beekeeping in Izmir Province. J of Agric. Econ., 20: 113-120 [in Turkish with English abstract]

[8] FAO (Food and agriculture organization of the United Nations). Retrieved from: http://www.fao.org/countryprofiles/en/ (14.12.2018)

[9] GRDC: Farm Gross Margin and Enterprise Planning Guide (2018), Available at https://grdc.com.au/data/assets/pdf_file/0038/294959/Farm-Gross-Margin-and- İnterprise-Planning-Guide-2018.pdf. (Accessed Nov 10, 2018)

[10] GÜRER, B; AKYOL, E (2018), An Empirical Analysis of Technical Efficiency Determinants in Beekeeping Farms: Evidence and Policy Implications from Nigde, Province, Turkey. J of Agric. Environ for Intern Develop., 112: 343-359. [in Turkish with English abstract]

[11] KADİRHANOĞULLARI, İH; KARADAŞ, K; KÜLEKÇİ, M. (2016), Socio-Economic Status of Beekeepers in Iğdır Province. Bee J., 16: 2-11. [in Turkish with English abstract]

[12] KALANZİ, F; NANSEREKO, S; BUYİNZA, J; KIWUSO, P; TURINAVO, Y. et al (2015), Socio-Economic Analysis of Beekeeping Enterprise in Communities Adjacent to Kalinzu Forest, Western Uganda. International Journal of Research on Land-Use Sustainability, 2: 81-90. ISSN:2200-5978.

[13] KARLIDAĞ, S; KÖSEMAN, S (2015), The Role and Importance of Beekeeping in Turkey and Malatya. Ministry of Food, Agric. Econ and Livestock J., 28-40. [in Turkish with English abstract]

[14] KARAKAYA, E; KIZILOĞLU, S (2015), Honey Production in Bingöl. Igdır Univ. Sci&Tech., 5:25-31. [in Turkish with English abstract]

[15] KEBEDE, H; TADESSE, G (2014), Survey on Honey Production System, Challenges and Opportunities in Selected Areas of Hadya Zone Ethiopia. J Agric. Biotech Sustainable Development, 6: 60-66.

[16] KEKEÇOĞLU, M; RASGELE, P; ACAR, F; Kaya, S (2014), Structure of Beekeeping in Düzce Province and a Research on Beekeeping Activities. Düzce Univ. Sci. and Tech J., 2: 1-15. [in Turkish with English abstract]

[17] KUTLU, MA (2014), Determination of Beekeeping in Gaziantep Province, Problems and Solutions. Turkish J of Agricultural and Natural Sci., 1: 481-484.[in Turkish with English abstract]

[18] MAKRI, P; PAPANAGİOTOU, P; PAPANAGİOTOU, E (2014), Efficiency and Economic Analysis of Greek Beekeeping Farms. Bulgarian Journal of Agricultural Science, 21: 479-484.

[19] MBAH, S O (2012), Profitability of Honey Production Enterprise in Umuahia Agric. Zone of Abia State Nigeria. J of Agric and Rural Development, 15: 1268-1274.

[20] MERDAN, K (2017), Economic and Social Aspects of Beekeeping in Gumushane. Gumushane Univ. Social Sci. Institute J., 8: 184-202. [in Turkish with English abstract]

[21] MINISTRY of AGRICULTURE and FORESTRY DATA Available from https://www.tarimorman.gov.tr/sgb/Belgeler/SagMenuVeriler (05.12.2018)

[22] NEWBOLD, P. (1995),: Statistics for business and economics. England: Prentice Hall International Editions.

[23] OKPOKIRI, C I; NWACHUKWU, I N; ONWUSIRIBE, C N (2015), Determinants and Profitability of Honey Production in Ikwuano Local Government Area, Abia State, Nigeria. Scientific Papers Series Management, Economic Engineering in Agric Rural Development, 15:211-216.

[24] ONUÇ, Z; YANAR, A; SANER, G; GÜLER, D (2018), An Analysis on Economical Aspect of the Beekeeping Enterprise: A Case of Kemalpasa District-Izmir/Turkey.[in Turkish with English abstract]

[25] ÖZBAKIR, G; DOĞAN, Z; ÖZTOKMAK, A (2016), Examination of Beekeeping Activities in Adıyaman Province. Harran Agric. and Food Sci. J., 20: 119-126. [in Turkish with English abstract]

[26] ÖZTÜRK, A İ (2017), Determination of Some Technical Properties of Beekeeping in Ula District of Mugla Province. Animal Production, 58: 52-57. [in Turkish with English abstract]

[27] SEZGİN, A; KARA, M (2011), A Research on Determining the Factors Effecting Yield Increase in Beekeeping: The Example of TRA2 Region. J Agric. Faculty, 15: 31-38. [in Turkish with English abstract]

[28] SIRALI, R (2017), Major Problems of Ordu Apiculture and Solutions. Beekeeping J., 17: 35-43. [in Turkish with English abstract]

[29] STEINBERG, D.; COLLA, P. CART–Classification and regression trees. Salford Systems. San Diego: California, 1997.

[30] TURKSTAT. (Turkey Statistic Institution) Database (2017),. Available at from http://www.turkstat.gov.tr/PreTablo. (Accessed November 20, 2018)

[31] UZUNDUMLU, A S; AKSOY, A; IŞIK, H B (2011), The Existing Structure and Fundamental Problems in Beekeeping enterprises; A Case Bingöl. J Agric. Faculty of Ataturk Univ., 42: 49-55. [in Turkish with English abstract]

Cite as: DOĞAN, N; ADANACIOĞLU, H; SANER, G; TAKMA, Ç (2020), Socio-Economic Determinants on The Profitability of Beekeeping Enterprises in Turkey: A Case Study in The Kelkit District of Gümüşhane, Mellifera, 20(1):28-40.

[32] VAZIRITABAR, S; ESMAEILZADE, S (2016), Profitability and Socio-Economic Analysis of Beekeeping and Honey Production in Karaj State Iran. J Entomology and Zoo Studies, 4: 1341-1350.

[33] ADANACIOĞLU, H; KOSOĞLU, M; SANER, G; TOPAL, E; YÜCEL, B (2019), Economic Feasibility of Package Beekeeping Application in Turkey: A Case Study of Edirne Province. Kafkas Univ Vet Fak Derg. 25(5): 651-658.

[34] AYDIN, B; AKTÜRK, D; ARSOY, D (2020), Economic and Efficiency Analysis of Beekeeping Activity in Turkey: Case of Çanakkale Province. Ankara Üniv Vet Fak Derg, 67, 23-32.

[35] CEYHAN, V; CANAN, S (2017), Economic Performance of Beekeepers under Different Colony Management System in Turkey. Turkish Journal of Agricultural and Natural Sciences. 4(4): 516-522. [in Turkish with English abstract]

Cite as: DOĞAN, N; ADANACIOĞLU, H; SANER, G; TAKMA, Ç (2020), Socio-Economic Determinants on The Profitability of Beekeeping Enterprises in Turkey: A Case Study in The Kelkit District of Gümüşhane, Mellifera, 20(1):28-40.