Journal of Tekirdag Agricultural Faculty
Tekirdağ Ziraat Fakültesi Dergisi

Ekim/October 2025, 22(4)
Başvuru/Received: 20/01/25
Kabul/Accepted: 19/08/25
DOI: 10.33462/jotaf.1623984

http://dergipark.gov.tr/jotaf
http://jotaf.nku.edu.tr/

ARAŞTIRMA MAKALESİ **RESEARCH ARTICLE**

An Analysis on The Relationship of Organic Honey Production and The Number of Producers with Growth, Employment, and Agricultural Employment in Türkiye

Türkiye'de Organik Bal Üretimi ve Üretici Sayısı ile Büyüme, İstihdam ve Tarımsal İstihdam Arasındaki İlişkinin Tespitine Yönelik Bir Analiz

Kurtuluş MERDAN[1*]

Abstract

The growing world population has driven humanity to produce more food, potentially leading to the neglect of quality and safety in food production. Evolving life conditions and technological progress have altered the consciousness level of humanity, bringing about new demands in some communities due to high income. Organic beekeeping has developed within this structure and tends to flourish as a model in Türkiye. Organic beekeeping has increased the income from beekeeping. It is practiced in natural unspoiled areas with no conventional feeding and chemical pesticides and requires supervising all processes through inspection and certification. Besides organic honey, the most common organic beekeeping product, organic bee products include bee pollen, propolis, royal jelly, beeswax, and bee venom. This study presents the economic analysis of organic honey production volume in Türkiye. For this purpose, the short and long-term relationships of organic honey production and the number of producers with economic growth, employment, and agricultural employment were analyzed. In addition, organic honey production and the number of organic honey producers were examined as driving forces for growth, employment, and agricultural employment. In this context, annual time series data between 2004 and 2022 were used as the sample. According to the analysis, organic honey production, an independent variable, had no long-term relationship with employment and agricultural employment variables, whereas it had a long-term relationship with the growth variable. The number of organic honey producers, another independent variable, was found to have no long-run relationship with the employment variable; however, it had a long-term relationship with the growth and agricultural employment variables. The findings of the study indicated that organic honey production did not drive growth, employment, or agricultural employment. On the other hand, the number of organic honey producers led to growth, yet not to employment or agricultural employment.

Keywords: Organic honey, Employment, Economic growth, Türkiye

[1]***Sorumlu Yazar/Corresponding Author:** Kurtuluş Merdan, Gümüşhane University Social Sciences Vocational School, Gümüşhane, Türkiye. E-mail: kurtulus_m@hotmail.com OrcID: 0000-0002-4513-0920

Atıf: Merdan, K. (2025). Türkiye'de organik bal üretimi ve üretici sayısı ile büyüme, istihdam ve tarımsal istihdam arasındaki ilişkinin tespitine yönelik bir analiz. *Tekirdağ Ziraat Fakültesi Dergisi,* 22(4): 1020-1034.
Citation: Merdan, K. (2025). An analysis on the relationship of organic honey production and the number of producers with growth, employment, and agricultural employment in Türkiye. *Journal of Tekirdag Agricultural Faculty,* 22(4): 1020-1034.

Öz

Artan dünya nüfusu insanlığı daha fazla üretmeye zorlamış, gıda üretiminde kalite ve güvenlik gibi özelliklerin göz ardı edilmesi olasılığını ortaya çıkarmıştır. Değişen yaşam koşulları ve teknolojik ilerlemeler insanlığın bilinç düzeyinin değişmesine neden olmuş, gelir seviyesinin yüksek olmasına bağlı olarak bazı toplumlarda yeni talepler ortaya çıkmıştır. Bu yapı içerisinde şekillenen organik arıcılık, Türkiye'de bir model olarak gelişme eğilimindedir. Arıcılıktan elde edilen gelirin artmasını sağlayan organik arıcılık; doğal yapısı bozulmamış alanlarda konvensiyonel besleme ve kimyasal ilaçlama yapmadan, tüm aşamaların kontrol ve sertifikasyon ile denetlenmesi esasına dayanmaktadır. Organik arıcılık ürünü olarak en çok organik bal bilinmekte, balın dışında polen, propolis, arı sütü, bal mumu ve arı zehri gibi organik arı ürünleri de bulunmaktadır. Bu çalışmada Türkiye'de organik bal üretim miktarının ekonomik analizi ortaya konulmuştur. Bu amaç doğrultusunda organik bal üretiminin ve üretici sayısının ekonomik büyüme, istihdam ve tarımsal istihdam üzerindeki kısa ve uzun dönem ilişkileri tespit edilmeye çalışılmıştır. Aynı zamanda organik bal üretimi ve organik bal üretici sayısının büyüme, istihdam ve tarımsal istihdamın nedeni olma durumu da incelenmiştir. Bu kapsamda 2004-2022 yılları arası yıllık zaman serisi verileri örnek alınmıştır. Yapılan analizler neticesinde bağımsız değişken organik bal üretimi ile istihdam ve tarımsal istihdam değişkenleri arasında uzun dönemli ilişki olmadığı, büyüme değişkeni arasında ise uzun dönemli ilişki olduğu tespit edilmiştir. Diğer bir bağımsız değişken organik bal üretici sayısı ile istihdam değişkeni arasında uzun dönemli ilişki olmadığı, büyüme ve tarımsal istihdam değişkeni arasında uzun dönemli ilişki olduğu bulgusuna ulaşılmıştır. Araştırmada elde edilen bulgular organik bal üretiminin büyüme, istihdam ve tarımsal istihdamın nedeni olmadığını; organik bal üretici sayısının ise büyümenin nedeni olduğunu, istihdam ve tarımsal istihdamın nedeni olmadığını ortaya koymaktadır.

Anahtar Kelimeler: Organik bal, İstihdam, Ekonomik büyüme, Türkiye

1. Introduction

Beekeeping has always been an economic activity that generates income for people from all social segments. It is a livestock field that can be practiced as the primary occupation or a side business without much capital or landownership. It is an agricultural activity in which bees cultivate herbal resources to produce bee products such as honey, royal jelly, propolis, and bee pollen, as well as live materials such as drones and queen bees. Bees ensure the maintenance of crop production while increasing the yield and quality of crops. Flowers in nature are pollinated by bees, and the bees survive thanks to the pollen obtained from the flowers (Mesci and Esim, 2020: Yüzbaşıoğlu, 2022).

Beekeeping products have an important role in human nutrition as well as human and animal health. Honey is the most common beekeeping product. Yet, there are other products besides honey, such as bee pollen, propolis, royal jelly, beeswax, and bee venom. Honey is harvested as nectar, while pollen and propolis are collected by bees from nature. Honey and pollen are consumed while royal jelly, royal jelly, bee venom, and beeswax are extracted from bee metabolisms. These products are extensively used as foodstuffs and for treating numerous diseases. The desired benefit from bee products can only be achieved by enhancing the production and consumption of bee products (Kaftanoğlu, 2003).

Beekeeping holds significant potential in terms of economy and sustainability in Türkiye as well as in the world. As an agricultural activity, it affects the national economy directly and plant production indirectly. Since beekeeping does not rely on land, it can be a source of livelihood for families with no land ownership. In addition, it is the only agricultural activity that provides the cheapest and easiest employment. It also protects the natural balance and the environment. Thanks to its rich flora, fauna, and genetic variation of bee material, Türkiye is a prominent country in the world in beekeeping. Climate conditions and the diversity of honey-bearing plants are key indicators of this potential. Türkiye is home to 20% of the world's bee breeds and 72% of honey-yielding plant varieties (Soysal et al., 2007; Baydemir, 2022). As an agricultural production field, beekeeping contributes approximately 160 trillion TRY directly to the national economy through honey and beeswax production and 1.6-2.4 quadrillion TRY indirectly through pollination. It also provides employment opportunities for around 150,000 people in rural areas without sufficient land resources (Prim et al., 2011; Çelik, 2015).

Technological advances and population growth have brought about increased efforts to obtain higher yields from agricultural products. The efforts to obtain higher yields have caused the deterioration of the soil's physical structure and increased risk of residues. It has also resulted in severe environmental problems such as salinization and desertification. Thus, developed countries started to question the safe food and food safety issues. These unfavorable conditions have triggered the emergence of a new production system: organic agriculture. Organic agriculture is considered a system that preserves the natural balance and ecological order, fights against diseases and pests, ensures the continuity of living things and soil fertility, and enables sustainable productivity (Gök, 2008; Akkeçeci and Özkan, 2022).

Due to its rich potential in nectar and pollen resources and natural apiary, Türkiye has a highly favorable location for organic beekeeping. In Türkiye, organic farming activities began in the 1980s under contracts concluded among European importers. The first exports in organic production were raisins and figs, and the organic agricultural product range was broadened in the 1990s (İlbaş, 2009; Rehber, 2011; Merdan, 2014). Within organic agriculture, organic livestock farming arose as a supervised and certified agricultural production activity that aims to deliver healthy and risk-free products to consumers through organic production techniques. One of these activities is organic beekeeping. Organic beekeeping requires the products to be cultivated in areas resistant to spoilage and pollutants, with no exposure to any nutrients or chemicals, and all processes under supervision. Any synthetic pesticides and chemical ingredients are prohibited in this system, which aims to increase product quality rather than quantity (Gül et al., 2005). Organic beekeeping is highly important in organic agriculture. Organic beekeeping areas yield extremely valuable bee products and the quality of crop production increases through fertilization in areas with a large number of colonies. The intended benefit from bees and bee products can be achieved through producing and consuming organic bee products. Organic bee products can only be produced through organic bee farming. Data on organic beekeeping products is shared only regarding honey production; no data is collected or shared on the production volume of organic bee products other than honey (Merdan, 2018).

This study presents the economic analysis of organic honey production in Türkiye. Accordingly, the impact of organic honey production and the number of producers on economic growth, employment, and agricultural employment was analyzed along with the role of organic honey production and the number of organic honey producers as a driver of growth, employment, and agricultural employment. This objective was achieved through a sample of annual time series data between 2004 and 2022. The study began with a review of the organic agriculture and beekeeping concepts and the studies on organic beekeeping in the literature. Subsequently, it discussed the priorities to be considered in organic beekeeping, organic agriculture in Türkiye, and its sustainability. The practical part of the study then introduced the economic methodology and the analysis results regarding the impact of organic honey production on economic growth, employment, and agricultural employment. The conclusion briefly evaluated the study findings, followed by a future assessment. The study aimed to contribute to the literature and serve as a reference for future studies concerning the effects of organic honey production on economic growth, employment, and agricultural employment. It differs from other studies in the literature because it is the first study to analyze the economics of organic beekeeping.

2. Literature Review

The literature review on beekeeping revealed that the studies on beekeeping mainly centered around the economic analysis and cost of honey production (Murphy et al., 2000; Saner et al., 2007; Ören et al., 2010; Onyekuru et al., 2010; Saner et al., 2011; Pocol, 2012; Folayan and Bifarin, 2013; Yeow at al., 2013; Emir, 2015, Kadirhanoğulları et al., 2016; Sert, 2017; Özsayın and Karaman, 2018; Bixby et al., 2020; Aydın et al., 2020, Nsekanabanzi and Nsengiyumva, 2021). Despite the large number of studies on beekeeping, only a few studies were found to be similar or correlated in local and international literature. In general, the studies in the literature were rather forecasts for the future and case assessments.

Uygur (2005) reported the development, supervision, and certification of organic beekeeping. Touching upon the rules to be complied with in organic beekeeping, he mentioned that they would have unfavorable consequences for the producers. The conclusion of the study suggested that organic producers should be offered more reasonable prices.

Gül et al. (2005) addressed the organic bee breeding in Türkiye. The study aimed to inform all citizens, particularly producers and consumers.

The study of Yücel (2008) laid out the principles of organic production. The problem statement of the study was how to meet the principles of organic production as a legal obligation. It concluded that countries producing organic honey would gain a voice once costs were reduced, yields per colony were increased, the organic honey price was raised to a more attractive level, producers were trained in organic beekeeping, and colonies were managed more effectively.

Akyol (2009) studied the practices, requirements, and rules of organic beekeeping. Organic and modern beekeeping were compared and the organic beekeeping enterprises and market networks in the world were presented within the scope of the study findings.

The joint study of Aslan et al. (2010) elaborated on the role and significance of organic beekeeping within organic farming activities. According to the findings, traditional beekeeping preserved its dominance, hindering the increase in yield. The study results suggested that organic beekeeping should be practiced under appropriate conditions by conscious and well-educated producers.

Cengiz et al. (2010) discussed the relationship between bee ecology and organic beekeeping. They examined organic beekeeping production within the framework of the mandatory codes of beekeeping. They concluded that complying with the codes of beekeeping would lead to production loss and poor yields. Finally, they advocated reducing the price difference paid for organic honey to offset production losses.

Gündüz (2012) approached organic honey production from the perspective of bee breeding in the Thrace region. According to the findings, only some parts of Kirklareli province in the Thrace region were found eligible for organic honey, while the regionwide producer characteristics failed to foster organic honey production.

Ertürk and Yılmaz (2013) examined organic beekeeping in Türkiye. They analyzed the main outlines of organic beekeeping.

Yalçın and Büyükbay (2015) examined the organic production potential of enterprises engaged in beekeeping activities at the scale of Tokat provincial center. The study scale comprised 114 enterprises engaged in beekeeping. Data were obtained using a questionnaire. The statistical analysis showed that approximately 57% of the producers were interested in organic production and that variables such as the number of hives, beekeeping location, and membership to the beekeeping association significantly affected organic production.

This joint study by Külekçi and Aksoy (2015) examined the current condition and future of organic livestock farming in Türkiye. The study ranked livestock farming in chronological order, revealing that livestock farming did not develop as much as crop farming. In conclusion, it highlighted the need for improving organic livestock farming.

Cengiz (2018) studied the honey-bearing plant potential in nature for organic honey production in Erzurum. The study was conducted in the Narman district of Erzurum and revealed the substantial potential of the region for organic honey production. The study results demonstrated the high quality of the organic honey produced in the region, with continuous demand throughout the country generating considerable income for the honey producers.

Çelik et al. (2018) conducted a study with a focus on Turkey and explored the yearly change in organic honey production through regression analysis. The study utilized annual data between 2004 and 2016. Based on the findings, the amount of organic honey production was estimated to reach 693 tons in 2017 and 891 tons in 2018. The authors also reported that the amounts of organic and conventional honey production could be predicted using alternative regression models.

Merdan (2018) discussed the development potential of organic beekeeping in Gumushane. According to the information obtained, the province had a nearly unspoiled and rich flora free from chemical residues. All these findings suggested that organic beekeeping could serve as a viable alternative for the economic growth of Gumushane.

The joint study of Demir et al. (2023) focused on organic beekeeping in Türkiye within the framework of the relevant legislation. The study emphasized the increase in the number of colonies and suggested the efficient use of the country's resources.

The literature revealed the significant potential of Türkiye in organic beekeeping and honey production. It reported that efficient use of the country's resources could result in organic beekeeping being an alternative economic resource for several regions. The study results suggested an increase in the amount of organic honey production over the years, yet several problems remained to be solved.

3. Factors to Consider in Organic Beekeeping

There are certain rules to be followed and certain elements to be considered by organic beekeeping farmers. These include the transition period, the bees' origin, location, feeding patterns, hive characteristics, disease prevention, and supervision and certification procedures. All required processes must be fulfilled completely to obtain an economic gain from organic beekeeping

3.1. Transition period

The first process in organic beekeeping involves deciding on organic production and preparing for it. The transition period refers to the period until the organic product is produced and certified. The transition period from conventional to organic beekeeping is 1 year. The only exception is areas with no agricultural activities. These areas do not require a transition period. All honeycombs used in colonies must be replaced with ecological beeswax during the transition period. When using ecological beeswax, residue analysis must be performed, and the residue-free status must be certified. Products obtained during the transition period are not considered organic products (Demir et al., 2023).

3.2. Race Selection

The capacity to adapt to the conditions of the region and high resistance to diseases are among the priorities in selecting bee strains. A bee colony is obtained by collecting artificial swarms from organic beekeeping enterprises or transferring bee colonies from conventional beekeeping farms to organic honeycomb frames. The regulation on organic beekeeping stipulates that queen bees can be obtained by artificial insemination or from conventional beekeeping farms up to 10% of the colonies. According to the regulation, the queen bee must be killed for replacement. It is prohibited to clip the wings of queens in this system (Ertürk and Yılmaz, 2013).

3.3. Feeding the Bees

This system requires plentiful honey and pollen to ensure colonies overwinter in good health after the honey harvest. Colonies can be artificially fed with honey from an organic beekeeping facility during severe climatic conditions. Should climatic conditions accelerate the crystallization of organic honey, the colonies may also be fed with organic sugar molasses or organically produced sugar syrup. Artificial feeding can only be performed starting from the last honey harvest period to 15 days before the nectar or honeydew period (Köseoğlu et al., 2018).

3.4. Region and Location Selection

The organic beekeeping field should be 3 km away from urban centers, industrial zones, waste centers, mining facilities, hydraulic and thermal power plants, and waste incineration centers, and 1 km from the main roads under the General Directorate of Highways. The fields allocated to the colonies should contain sufficient sources of nectar, pollen, and water. Organic beekeeping is not allowed in areas under quarantine measures or with synthetic chemicals. The organic beekeeping field should fall under control one year in advance and its location should be marked on the map, with a minimum flight radius of 3 km (Ertürk and Yılmaz, 2013).

3.5. Equipment and Cleaning

Hives must be made of wood or other natural materials. Natural products such as beeswax, propolis, and plant oils should be preferred instead of chemical dyes. Beeswax for frames must be sourced from organic farms. There is one exception to this procedure. In case organically produced beeswax is not available in the market, the inspection and certification body may authorize the use of beeswax not obtained from organic beekeeping farms, particularly in newly established farms. Capped honeycombs must be preserved in cold storage to prevent moth pests. Organic products must be stored without any chemical pesticides. They must be packaged under strict hygienic measures to preserve their quality. Packaging must be made of wood, glass, or special organic coating materials. Organic bee products must not be allowed on the sides of highways, and they must be sold in organic markets. The materials used must be disinfected using organic methods (Döner et al., 2021).

3.6. Disease and Parasite Control

Disease-resistant strains must be preferred, queen bees must be replaced regularly, and hives must be constantly checked for diseases and pests in organic beekeeping. Antibiotics and chemical compound drugs as preventive measures against foulbrood are prohibited in organic beekeeping. Should the colonies get affected despite the protective measures, they must be treated immediately and the diseased colonies must be isolated.

4. Organic Beekeeping in Türkiye

In Türkiye, genuine honey has become increasingly difficult to obtain, and the residue content of export honey has become more and more frequent. The adverse effects of pesticides and chemicals beekeepers use in beekeeping on the environment and humans have led to the residue problem. Therefore, organic beekeeping has become a priority to minimize the residue problem and raise awareness of the producers. In Türkiye, organic beekeeping started in 2003; however, relevant data started to be recorded in 2004 (Köseoğlu et al., 2008). Organic beekeeping began in 7 provinces in 2004, reaching 35 provinces in 2022. The number of producers, which was 159 in 2004, increased to 360 in 2022. The same pattern applies to the number of hives and production volume. Organic beekeeping started in 2004 with 27.829 hives and the number of organic hives reached 72.937 in 2022, with a fluctuating trend over the years. Organic honey production started with 737.26 tons in 2004, and the production volume reached 1352.18 tons in 2022, despite the upward and downward fluctuations in the following years (*Table 1*).

The number of organic beekeepers and the quantity of honey produced have significantly increased in Türkiye. Nevertheless, these figures remain extremely small considering Türkiye's potential. The development of organic beekeeping has slowed down because organic beekeeping is relatively new, the products obtained from organic beekeeping are limited, and the consumers' level of awareness is insufficient. Continuity and sustainability in organic beekeeping can be achieved by adopting a production strategy that complies with evolving market

Table 1. Organic beekeeping data of Türkiye

Year	Number of Provinces	Number of Producers	Number of Hives	Amount of Honey Produced (Tons)
2004	7	159	27.839	737.26
2005	11	127	24.475	572.71
2006	16	110	25.706	636.48
2007	12	143	23.308	497.38
2008	17	93	11.207	180.11
2009	17	147	14.917	201.13
2010	21	191	14.699	204.61
2011	25	190	19.177	216.18
2012	31	355	47.065	513.08
2013	33	279	32.342	335.53
2014	38	321	36.391	277.00
2015	34	322	38.296	667.08
2016	34	276	40.371	349.00
2017	30	305	45.848	391.08
2018	37	334	51.742	494.90
2019	31	249	50.100	576.76
2020	36	387	70.385	1028.39
2021	38	412	82.262	1220.45
2022	35	360	72.937	1352.18
Total	**503**	**4760**	**729.067**	**10451.31**

conditions without undermining conventional production. Establishing production basins and marketing networks, training producers, supporting trained and qualified producers, using visual and electronic communication tools for promoting organic beekeeping, and strengthening organization are among the priorities to ensure sustainability in organic beekeeping. Despite the favorable conditions for organic beekeeping in Türkiye, new production fields should be determined based on colony density, and these fields should be classified according to their purpose by identifying colony capacities to prevent losses in productivity. Thus, new production fields can be allocated to producers who face environmental constraints (Demir et al., 2023).

5. Research Methodology

The data set of the study was obtained from the General Directorate of Meteorology. The study sample comprised the annual time series data between 2004 and 2022. The year 2004 was selected as the baseline year of the study because organic beekeeping started in Türkiye in 2003. Accordingly, the short and long-run relationships of organic honey production and the number of organic honey producers with growth, employment, and agricultural employment were analyzed specifically for Türkiye. In line with the objective of the study, cointegration and causality analyses were utilized. The normality of the series was tested before co-integration analyses, and logarithmic transformations were made to ensure single normal distributions.

The Augmented Dickey-Fuller (ADF) unit root test (Dickey and Fuller, 1979) was conducted to test the stationarity of the series at the same level (cointegration), and the variables were found to contain unit roots at the level, yet they were stationary when first differences were taken. VEC Lag Exclusion Wald Tests were utilized to determine the appropriate lag length in the cointegration analysis. Since the null hypothesis in the test suggested that "the relevant lag should be excluded", the hypothesis was accepted when $p>0.05$ and the relevant lags were excluded, whereas the null hypothesis was rejected when $p<0.05$, indicating that the relevant lag was accepted.

The validity of the model test required heteroskedasticity, autocorrelation, and multiple normal distribution; therefore, the White VEC Residual Heteroskedasticity test was performed for heteroskedasticity, the VEC Residual Serial Correlation LM Test for autocorrelation, and the Cholesky (Lutkepohl) multiple normal distribution test for the multiple normal distribution condition. The White VEC Residual Heteroskedasticity tests the null hypothesis that "the series have common variance," and it is accepted when p>0.05 for the chi-square test statistic. The VEC Residual Serial Correlation LM tests the null hypothesis that "there is no serial correlation" for each lag in the specified lag interval, and it is accepted when p>0.05 for the LM test value. Cholesky (Lutkepohl) decomposition is used in mathematics to decompose the Hermit matrix and in statistics to solve normal equations in linear least squares problems. The null hypothesis that "the residuals of the series are normally distributed" is tested separately for each component using the Jarque Berra test statistic; however, the multiple normal distribution is confirmed when the joint test result is p>0.05.

Johansen cointegration test was performed to determine the number of cointegration equations, and Trace and Max-Eigen test results were considered to identify the number of vectors. Johansen (1988) recommends trace and maximum eigenvalue tests to forecast the number of cointegration vectors, stressing that these statistics should be compared with the obtained critical values or p-values should be taken into account. Besides determining the cointegration numbers for models without the constant term, with the constant term, and with the constant term and trend, the tests also test the null hypothesis of "no cointegration." The null hypothesis is tested separately for Trace and Max-Eigen statistics. When the critical values are exceeded (p<0.05), the null hypothesis of no cointegration relationship is rejected.

In the study, the forecasting model was finally tested based on the linear vector error-corrected (VECM) cointegration model. Accordingly, the vector error corrected (VEC) Granger causality/Block Exogeneity Wald test was conducted.

6. Results

Table 2 presents descriptive statistics of organic honey production, the number of organic honey producers, growth rate, employment, and agricultural employment series included in the model. Each series has been logarithmically transformed.

Table 2. Descriptive statistics of the series

Series	Log	Min.	Max.	Mean	SD	J-B(p)[1]
GR	LNGR	-4.70	11.00	4.70	3.94	0.415 (0.812)
TE	LNTE	19.63	30.75	24.62	3.58	1.407 (0.494)
AE	LNAE	15.72	29.10	21.41	3.53	0.517 (0.772)
OHP	LNOHP	180.11	1352.18	550.07	338.46	3.645 (0.161)
NOHP	LNNOHP	93.00	412.00	250.53	101.86	1.516 (0.468)

GR: Growth rate %; TE: Total Employment %; AE: Agricultural Employment %; OHP: Organic honey production (tons); NOHP: Number of organic honey producers. [a]: After the logarithmic transformation J-B: Jarque-Bera.

The Augmented Dickey-Fuller (ADF) unit root test was applied for the stationarity of the logarithmically transformed series. *Table* 3 presents the unit root test results.

Table 3. Unit root statistics of the series

Series	Level and with Constant	1. Different and with Constant
LNGR	-4.166**	-4.201**
LNTE	0.160	-3.093*
LNAE	-1.276	-5.503**
LNOHP	-1.277	-4.744**
LNNOHP	-1.654	-6.297**

*: Significant at 5% **:Significant at 1%

The ADF unit root test results in *Table 3* demonstrate the non-stationarity of the variables at the same level in both models with and without constant term, yet they become co-stationary when the first differences of the variables are taken [I(1)]. Thus, the cointegration vector should be sought among the variables. *Table 4* presents the lag order selection results to determine the appropriate lag length for the cointegration model.

The AIC, SC, and HQ criteria in *Table 4* indicate the first lag as the most appropriate lag. Accordingly, the most appropriate lag length is the maximum first lag.

Table 4. Results of lag length determination

Dependent Variable	Independent variable	Lag	AIC	SC	HQ
LNGR	LNOHP	0	1.065	1.164	1.079
		1	0.848*	1.145*	0.889*
LNTE	LNOHP	0	-0.686	-0.587	-0.673
		1	-3.988*	-3.619*	-3.947*
LNAE	LNOHP	0	-0.978	-0.880	-0.965
		1	-3.253*	-2.956*	-3.212*
LNGR	LNNOHP	0	0.497	0.595	0.511
		1	-0.275	0.021*	-0.234*
LNTE	LNNOHP	0	-2.759	-2.661	-2.746
		1	-5.508*	-5.211*	-5.467*
LNAE	LNNOHP	0	-2.182	-2.083	-2.168
		1	-4.594*	-4.298*	-4.554*

* Indicates the lag order selected by the relevant criterion.

Table 5 presents the results of heteroscedasticity, autocorrelation, and multiple normal distribution in the vector error correction (VECM) cointegration model.

No problems with heteroskedasticity, autocorrelation, or normal distribution were found in any of the models with organic honey production and the number of organic honey producers as independent variables (*Table 5*).

Table 6 presents the Johansen cointegration test performed to determine the number of cointegration equations, and the Trace and Max-Eigen test results have been considered to determine the number of vectors. Johansen (1988) recommends trace and maximum eigenvalue tests to forecast the number of cointegration vectors, stressing that these statistics should be compared with the obtained critical values or p-values should be taken into account. *Table 6* presents the results of the Trace and Max-Eigen tests conducted to determine the number of Johansen cointegration vectors and rank the unconstrained cointegration.

The Johansen cointegration test results revealed that the null hypothesis of no cointegration was rejected in both models ($p<0.05$). In other words, it was determined that there was a cointegration vector in both models including organic honey production and the number of organic honey producers as independent variables. As the study sought a linear relationship, the linear vector error-corrected cointegration model (VECM) with constant term and maximum first lags was employed.

Table 7 presents the vector error corrected short and long-term estimation results regarding the relationship of organic honey production with growth, employment, and agricultural employment.

A negative (between 0 and -2) and significant error correction coefficient (COINTEQ) indicates cointegration and the inverse of the coefficient (1/coefficient) indicates the length of time required for the short-term effect to stabilize.

The error correction coefficient of the model estimated in the model with growth as the dependent variable and organic honey production as the independent variable was found to be negative and statistically significant (Cointeg=-1.383; t=-4.39; $p<0.05$). In other words, there was a long-term relationship between organic honey production and growth. Nevertheless, the cointegration coefficient showed that the increases and shocks in organic honey production were balanced in the long term (approximately 9 years later) (1/1.383=0.723). The long-term equations revealed that a 1% increase in organic honey production led to an approximately 0.09% increase in growth in the long term, although this increase was not statistically significant ($p>0.05$).

The error correction coefficient of the model forecasted in the model with employment as the dependent variable and organic honey production as the independent variable turned out negative yet statistically insignificant (Cointeg=-0.025; t=-0.432; $p>0.05$). In other words, no long-term relationship was found between organic honey production and employment, and no equilibrium element was observed within the analyzed period.

The error correction coefficient of the model forecasted in the model with agricultural employment as the dependent variable and organic honey production as the independent variable was negative yet not statistically significant (Cointeg=-0.070; t=-0.712; $p>0.05$). This indicates that no long-term relationship existed between organic honey production and agricultural employment and there was no equilibrium within the analyzed period.

Table 5. Heteroskedasticity, autocorrelation, and multiple normal distribution results

Dependent Variable	Independent Variable	Test	Statistics	p	Result
LNGR	LNOHP	Heteroskedasticity (White VEC Residual Heteroskedasticity)	15.404	0.908	No heteroskedasticity problem
		Autocorrelation (VEC Residual Serial Correlation LM Test)	6.607	0.158	No autocorrelation problem
		Multiple normal distributions (VEC Residual Normality Test/Cholesky (Lutkepohl)	0.325	0.988	Residuals show normal distribution
LNTE	LNOHP	Heteroskedasticity (White VEC Residual Heteroskedasticity)	26.253	0.340	No heteroskedasticity problem
		Autocorrelation (VEC Residual Serial Correlation LM Test)	5.506	0.239	No autocorrelation problem
		Multiple normal distributions (VEC Residual Normality Test/Cholesky (Lutkepohl)	8.316	0.081	Residuals show normal distribution
LNAE	LNOHP	Heteroskedasticity (White VEC Residual Heteroskedasticity)	19.769	0.709	No heteroskedasticity problem
		Autocorrelation (VEC Residual Serial Correlation LM Test)	5.242	0.263	No autocorrelation problem
		Multiple normal distributions (VEC Residual Normality Test/Cholesky (Lutkepohl)	1.773	0.777	Residuals show normal distribution
LNGR	LNNOHP	Heteroskedasticity (White VEC Residual Heteroskedasticity)	33.482	0.094	No heteroskedasticity problem
		Autocorrelation (VEC Residual Serial Correlation LM Test)	3.873	0.423	No autocorrelation problem
		Multiple normal distributions (VEC Residual Normality Test/Cholesky (Lutkepohl)	5.489	0.241	Residuals show normal distribution
LNTE	LNNOHP	Heteroskedasticity (White VEC Residual Heteroskedasticity)	21.565	0.605	No heteroskedasticity problem
		Autocorrelation (VEC Residual Serial Correlation LM Test)	2.847	0.584	No autocorrelation problem
		Multiple normal distributions (VEC Residual Normality Test/Cholesky (Lutkepohl)	4.660	0.324	Residuals show normal distribution
LNAE	LNNOHP	Heteroskedasticity (White VEC Residual Heteroskedasticity)	19.098	0.747	No heteroskedasticity problem
		Autocorrelation (VEC Residual Serial Correlation LM Test)	1.615	0.806	No autocorrelation problem
		Multiple normal distributions (VEC Residual Normality Test/Cholesky (Lutkepohl)	2.442	0.655	Residuals show normal distribution

Table 6. Test results of cointegration vector numbers and orders

Independent Variable	H0 Hypothesis	Eigenvalue	Trace	p	H0 Result	MaxEigen	p	H0 Result
LNOHP	No cointegration	0.826	55.533	0.013	*Rejected*	29.732	0.026	*Rejected*
LNNOHP	No cointegration	0.885	73.044	0.006	*Rejected*	36.903	0.012	*Rejected*

Table 8 presents the vector error corrected short and long-run forecast results for the relationship of the number of organic honey producers with growth, employment, and agricultural employment.

The error correction coefficient of the model forecasted in the model with growth and the number of organic honey producers as the independent variable was found to be negative and statistically significant (Cointeg=-1.171; t=-3.39; p<0.05). The cointegration coefficient revealed that the increase and shocks in the number of organic honey producers equalized in the long term (after approximately 8 months) (1/1.171=0.853). Looking at the long-term equations, a 1% increase in the number of organic honey producers resulted in an approximately 0.29% increase in long-term growth.

Table 7. VEC short and long-term forecast results (The relationship of organic honey production with growth, employment, and agricultural employment)

	D(LNGR)			D(LNTE)			D(LNAE)		
Forecast Period	**Coefficient**	**SH**	**t**	**Coefficient**	**SH**	**t**	**Coefficient**	**SH**	**t**
Long Term									
LNOHP(-1)	-0.042	0.060	-0.692	-0.119	0.070	-1.696	0.123	0.043	2.853*
C	-2.925			-3.064			-4.474		
Short Term									
COINTEQ	-1.383	0.315	-4.389**	-0.025	0.057	-0.432	-0.070	0.098	-0.712
D(LNGR [-1])	0.421	0.231	1.824	0.345	0.287	1.201	-0.218	0.227	-0.958
D(LNOHP [-1])	0.090	0.084	1.080	-0.007	0.009	-0.835	-0.009	0.014	-0.688
C	-0.012	0.037	-0.335	0.010	0.005	1.952	0.017	0.007	-2.483
R^2	0.653			0.125			0.133		
ΔR^2	0.573			0.076			0.066		
F	8.169			0.622			0.665		

*:Significant at 5% **:Significant at 1%

Table 8. VEC short and long-term forecast results (The relationship of the number of organic honey producers with growth, employment, and agricultural employment)

	D(LNGR)			D(LNTE)			D(LNAE)		
Forecast Period	**Coefficient**	**SH**	**t**	**Coefficient**	**SH**	**t**	**Coefficient**	**SH**	**t**
Long Term									
LNOHP(-1)	0.011	0.079	0.142	-0.167	0.024	-7.944**	0.198	0.037	5.259**
C	-3.244			-2.704			-4.813		
Short Term									
COINTEQ	-1.171	0.300	-3.894**	-0.149	0.167	-0.898	-0.326	0.141	-2.312*
D(LNGR [-1])	0.341	0.223	1.524	0.298	0.305	0.975	-0.177	0.212	-0.837
D(LNOHP [-1])	0.295	0.146	**2.031***	-0.016	0.023	-0.711	0.037	0.027	1.378
C	-0.024	0.036	-0.683	0.011	0.005	2.155	-0.019	0.007	-2.866
R^2	0.678			0.126			0.328		
ΔR^2	0.605			0.074			0.173		
F	10.688			0.629			2.116		

*:Significant at 5% **:Significant at 1%

The error correction coefficient of the model forecasted in the model with employment as the dependent variable and the number of organic honey producers as the independent variable turned out negative yet statistically insignificant (Cointeg=-0.149; t=-0.898; p>0.05). This indicates that no long-term relationship existed between the number of organic honey producers and employment and there was no equilibrium within the analyzed period.

The error correction coefficient of the model forecasted in the model with agricultural employment as the dependent and the number of organic honey producers as the independent variable was found to be negative and statistically significant (Cointeg=-0.326; t=-2.31; p<0.05). In other words, there was a long-term relationship between the number of organic honey producers and agricultural employment. Nevertheless, the cointegration coefficient indicated that the increases and shocks in the number of organic honey producers equalized in the long term (approximately 9 years later) (1/1.326=3.067). The long-term equations revealed that a 1% increase in the number of organic honey producers led to an approximately 0.04% increase in agricultural employment in the long term, albeit not statistically significant (p>0.05).

Table 9 presents the results of the vector error corrected (VEC) Granger causality/Block Exogeneity Wald test conducted for the causality/exogeneity relationship between the variables. In the test statistics, the null hypothesis (H0) is "Variable X is not the cause of Y/should be excluded." Therefore, whenever the p-value of the X2 statistics is less than 0.05 (p<0.05), the independent variable is considered the cause of the dependent variable and can be included in the model.

According to the exogeneity tests, the null hypothesis that organic honey production was not a cause of growth, employment, and agricultural employment was not rejected (p>0.05) in the models including organic honey production as the independent variable, which indicated that organic honey production did not cause growth, employment, or agricultural employment.

Table 9. VEC Granger causality/block exogeneity Wald test results

	X^2	sd	p
LNGR dependent variable LNOHP independent variable	1.167	1	0.280
LNTE dependent variable LNOHP independent variable	0.698	1	0.403
LNAE dependent variable LNOHP independent variable	0.474	1	0.491
LNGR dependent variable LNNOHP independent variable	4.126	1	**0.042**
LNTE dependent variable LNNOHP independent variable	0.519	1	0.474
LNAE dependent variable LNNOHP independent variable	1.899	1	0.168

According to the exogeneity tests of the models including the number of organic honey producers as the independent variable, the null hypothesis that the number of organic honey producers did not cause employment and agricultural employment was not rejected (p>0.05), meaning that the number of organic honey producers did not cause employment or agricultural employment. Looking at the exogeneity tests in the model with the number of organic honey producers as the independent variable and growth as the dependent variable, the null hypothesis that the number of organic honey producers was not the cause of growth was rejected (p<0.05); therefore, the number of organic honey producers was the cause of growth. In other words, the increased number of organic honey producers accounted for the change in growth.

7. Conclusion and Discussion

In Türkiye, organic beekeeping is a newly emerging sector shaped by the demand for "clean and healthy food, honey" from an increasingly aware society. Suitable honey plant flora and climatic conditions constitute the principal factors in organic honey production. Having 72% of the world's honey-bearing plant varieties and 20% of the world's bee strains in Türkiye is a significant natural wealth. The suitability of Turkish lands for organic beekeeping brings substantial economic opportunities.

Organic beekeeping, which aims to yield honey with better health and quality, has recently gained momentum in Türkiye. Türkiye will become one of the leading countries in the world in organic honey production as well as in conventional honey production by implementing more effective colony management, offering more attractive prices for organic honey, and reducing costs by increasing unit production per colony.

This study examined the short and long-term relationships of organic honey production and the number of organic honey producers with economic growth, employment, and agricultural employment. In addition, the causality of organic honey production and the number of organic honey producers on growth, employment, and agricultural employment was investigated. Accordingly, cointegration and causality analyses were conducted for the study. The normality of the series was tested before the cointegration analyses, and single normal distributions were achieved by logarithmic transformations. Subsequently, none of the models with organic honey production and the number of organic honey producers as independent variables were found to have problems related to heteroskedasticity, autocorrelation, or normal distribution. The results of the analysis performed to determine the short and long-term relationship revealed that organic honey production had no long-term relationship with employment and agricultural employment variables, albeit a long-term relationship with growth. The 1% increase in organic honey production led to a 0.09% increase in long-term growth in the analyzed period; however, it was not found to be statistically significant. The number of organic honey producers, another independent variable, was found to have a long-term relationship with agricultural employment, albeit not statistically significant. On the other hand, it had a long-term and significant relationship with growth, yet no long-term relationship with employment. Organic honey production was not the cause of growth, employment, and agricultural employment in models with organic honey production as the independent variable. In models with the number of organic honey producers as the independent variable, organic honey producers were not the cause of employment and agricultural employment, yet they were found to be the cause of growth. The increased number of organic honey producers in the analyzed period was considered a cause of the change in growth.

The results suggested a long-term relationship between the organic honey production volume, the number of producers, and economic growth. The increase in the number of organic honey producers in the analyzed period was considered a cause of economic growth. Therefore, economic growth was positively affected by the increase in the number of organic honey producers within the analyzed period.

In Türkiye, the support per hive is 10 TRY more for organic beekeeping than for conventional beekeeping within the current practice. A study by Francisco et al. (2006) demonstrated that the production cost of organic honey was nearly 70% higher than conventional honey. Another study determined that organic honey was sold for only 10% above the price of conventional honey in the European market (Pocol et al., 2021). Despite the absence of comparable studies, this unfavorable picture also reflects Türkiye. International market orientation is adversely affected by the steep cost of organic production. Therefore, organic honey is largely consumed in the domestic market due to the high cost of production in Türkiye. Hence, organic production can be sustained through developing novel techniques, establishing an effective market network, and increasing the amount of support.

Organic beekeeping, the number of organic producers, and the production volume should be increased by adopting the correct organizational model in marketing and providing inputs. A brand should be developed for Turkish organic honey and export potentials should be increased. Organic beekeeping and products should be promoted using visual and electronic communication tools. Such promotion will facilitate the consumer's access to certified products bearing the desired characteristics and contribute to the producer's rewards for their labor. The demand for organic honey and other bee products in the growing world honey market will increase; therefore, Turkish beekeepers should produce organic honey and other organic bee products by closely monitoring the global progress.

Studying only organic honey among organic products was the limitation of this study. As organic beekeeping activities flourish in the future, the economic impacts of organic bee products such as organic beeswax, royal jelly, propolis, and bee pollen can be studied in addition to organic honey. This study aimed to guide researchers interested in studying the economic impacts of organic beekeeping in the future. It differs from the other studies in being the first study to examine organic agriculture in Türkiye from an economic perspective.

Ethical Statement

There is no need to obtain permission from the ethics committee for this study.

Conflicts of Interest

There is no conflict of interest between the article authors.

Authorship Contribution Statement

Concept: Kurtuluş, M.; Design: Kurtuluş, M.; Data Collection or Processing: Kurtuluş, M.; Statistical Analyses: Kurtuluş, M.; Literature Search: Kurtuluş, M.; Writing, Review and Editing: Kurtuluş, M.

References

Akkeçeci, Ş. and Özkan, Ç. Ö. (2022). The importance and sustainability of green manure application in organic agriculture. *ADYUTAYAM Journal*, 10(2): 161-174.

Akyol, M. T. (2009). Organic beekeeping. *Standard Journal of Beekeeping*, 48(567): 85-91.

Aslan, F. A., Konanç, K. and Güney, Ş. (2010). The place of organic beekeeping in organic farming, *Journal of Beekeeping Research*, 2(4): 13-16.

Aydın, B., Aktürk, D. and Arsoy, D. (2020). Economic and efficiency analysis of beekeeping activity in Turkey: case of Çanakkale province. *Ankara University Faculty of Veterinary Medicine Journal*, 67: 23-32. https://doi.org/10.33988/auvfd.571371

Baydemir, M. (2022). A socio-economic study for beekeeping activity: The case of Malatya province. *Journal of Erciyes University Faculty of Veterinary Medicine,* 19(1): 11-17. https://doi.org/10.32707/ercivet.1085213

Bixby, M., Hoover, S. E., McCallum, R., Ibrahim, A., Ovinge, L., Olmstead, S. and Guarna, M. M. (2020). Honey bee queen production: Canadian costing case study and profitability analysis. *Journal of Economic Entomology,* 113(4): 1618-1627.

Çelik, S. (2015). Modeling of honey production in Turkey with time series. *Sakarya University Journal of Science*, 19(3): 377-382. https://doi.org/10.16984/saufenbilder.86152

Çelik, Ş., Şengül, T., Söğüt, B. and Şengül, Y. A. (2018). A Study on the Investigation of the Change of Organic Honey Production in Turkey by Years by Regression Analysis. *Turkish Journal of Agriculture – Food Science and Technology*, 6(11): 1507-1510. https://doi.org/10.24925/turjaf.v6i11.1507-1510.1559

Cengiz, M. M. (2018). Honey plant potential in Narman (Erzurum, Turkey) natural pastures for beekeeping and organic honey production. *Gümüşhane University Journal of Science*, 8(2): 358-364 https://doi.org/10.17714/gumusfenbil.371886

Cengiz, M. M., Genç, F. and Dodoloğlu, A. (2010). Bee Ecology relationship and Organic Beekeeping. *Turkey I. Organic Livestock Congress*, 1-4 July, Kelkit, Gümüşhane, Türkiye.

Demir, F., Sandalcıoğlu, Z. S. and Erkan, C. (2023). Organic beekeeping in Turkey. *Journal of Animal Science and Products,* 6(1): 64-71. https://doi.org/10.51970/jasp.1259089

Dickey, D. A. and Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association,* 74: 427-431.

Döner, Ö., Yavuz, Ç., İnci, H. and Ayasan, T (2021). Sustainable Strategies in Organic Beekeeping. In: Organic Agriculture and AGRO-Ecological Developments in Turkey. Ed(s): Kökten K., İnci, H., İksad Publications, Ankara, Türkiye.

Emir, M. (2015). *Socio-economic structure and production efficiency of beekeepers in Turkey*. (PhD Thesis) Ondokuz Mayıs University Institute of Natural and Applied Sciences, Samsun, Türkiye.

Ertürk, Y. E. and Yılmaz, O. (2013). Organic beekeeping in Turkey. *COMU Journal of Agriculture Faculty*, 1(1): 35-42.

Folayan, J. and Bifarin, J. (2013). Profitability analysis of honey production in Edo North local government area of Edo state, Nigeria. *Journal of Agricultural Economics and Development,* 2(2): 60-64.

Francisco, J. G. R., Rogel, V. G., Carlos, E. G., Regino, G. A. and Juan M. P. F. (2006). Production costs of conventional and organic honey in the Yucatán Peninsula of Mexico. *Journal of Apicultural Research*, 45 (3): 106–111.

Gök, S. A. (2008). *Evaluation of Turkey in terms of trade of organic agricultural products in the expanding European Union market.* (EU Specialization Thesis) Ministry of Food, Agriculture and Livestock, Institute of Agricultural Economics and Policy Development, Ankara, Türkiye.

Guide, E. (2011). The Economics of Organic Farming. Ekin Printing Publication Distribution, Bursa, Türkiye.

Gül, A., Şahinler, N., Akyol, E. and Şahin, A. (2005). Organic bee breeding. *MKU Journal of the Faculty of Agriculture*, 10(1-2): 63-70.

Gündüz, A. (2012). *The current status of bee breeding in the thrace region in terms of organic honey production.* (MSc. Thesis) Namık Kemal University Institute of Science, Tekirdağ, Türkiye.

İlbas, A. I. (2009). Organic Farming. Principles and National Legislation. Eflatun Publishing House, Ankara, Türkiye.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12: 231-254.

Kadirhanoğulları, İ. H., Karadaş, K. and Külekçi, M. (2016). A study on the determination of the cost of honey production in Iğdır province. *Iğdır University Journal of Science and Technology*, 6(4): 115-120.

Kaftanoğlu, O. (2003). Production of Ecological and Organic Bee Products. *2nd Marmara Beekeeping Congress,* 28-30 April. Yalova, Türkiye.

Köseoğlu, M., Yücel, B., Saner, G. and Dogaroğlu, M. (2008). Current situation analysis of beekeeping in Turkey. *Journal of Harvest Livestock* 201: 52-61.

Köseoğlu, M., Karaca, Ü., Yücel, B., Topal, E. and Yıldızdal, İ. (2018). Performance comparison of constituted colonies by artificial swarm and packaged bees in different conditions. *Journal of Animal Production,* 59(2): 27-34. https://doi.org/10.29185/hayuretim.460593

Külekçi, M. and Aksoy, A. (2015). Organic Animal Production in Turkey; Current Situation and Future. *Eastern Black Sea Second Organic Agriculture Congress*. 6-9 October, Rize, Türkiye.

Merdan, K. (2014*). Economic analysis of organic agriculture in Turkey: The Eastern Black Sea Region practice* (PhD Thesis). Atatürk University Institute of Social Sciences, Erzurum, Türkiye.

Merdan, K. (2018). Development potential of organic beekeeping in Gümüşhane province. *Journal of Social Research and Behavioral Sciences,* 4(7): 68-82.

Mesci, E. and Esim, N. (2020). A new approach to the shelf life of foods: edible coatings with bee products. *Turkish Journal of Nature and Science,* 9(2): 211-220.

Murphy, M., Cowan, C., Henchion, M. and Reilly. S. O. (2000). Irish consumer preferences for honey: a conjoint approach. *British Food Journal,* 102(8): 585–598.

Nsekanabanzi, S. and Nsengiyumva, J. N. (2021). Analysis of the profitability of honey production in Nyamagabe District in Rwanda. SSRN Electronic Journal. DOI:10.2139/ssrn.3956624

Onyekuru, A. N., Okorji, E. C. and Machebe. N. S. (2010). Profitability analysis of honey production in Nsukka local government area of EnuguState, Nigeria. *Asian Journal of Experimental and Biological Sciences,* 1(1):166-169.

Oren, N., Alemdar, T., Parlakay, O., Yılmaz, H., Seç, A., Güngör, C., Yaşar, B. and Gürer, B. (2010). Economic Analysis of Beekeeping Activity in Adana Province. Agricultural Economics Research Institute, Edition No: 78, Ankara, Türkiye.

Özsayın D. and Karaman, S. (2018). Determination of Honey Production Costs in Beekeeping Enterprises. *2nd International Congress of Scientific and Professional Studies*, 5-7 July, Nevsehir, Türkiye.

Pocol, C. B. (2012). Consumer preferences for different honey varieties in the North West Region of Romania. *Agronomy Series of Scientific Research,* 55(2):263-266.

Pocol, C. B., Šedík, P., Brumă, S. I., Amuza, A. and Chirsanova, A. (2021). Organic beekeeping practices in Romania: status and perspectives towards a sustainable development. *Agriculture*, 11(4): 281.

Prim, L., Çan, M. F. and Sonmez, M. M. (2011). Bingöl Beekeeping Report, Sectoral Research Series-4. http://www.fka.org.tr/SayfaDownload/Bingöl%20Arıcılık%20Raporu.pdf (Access Date: 13.01.2025).

Rehber, E. (2011). Organic Farming Economics, Ekin Printing Publishing Distribution, Bursa, Türkiye.

Saner, G., Yercan, M., Engindeniz, S., Karaturhan, B.and Cukur. F. (2007). Alternative marketing strategies for honey and other bee products in Turkey. *Journal of Agricultural & Food Information* 8(4): 65–74. https://doi.org/10.1080/10496500802083690

Saner, G., Yücel, B., Yercan, M., Karaturhan, B., Engindeniz, S., Çukur, F. and Köseoğlu, M. (2011). A Research on The Technical and Economic Development of Organic and Conventional Honey Production and The Determination of Alternative Market Opportunities: The Case of Kemalpaşa District of Izmir Province. Ministry of Food, Agriculture and Livestock, Institute for Agricultural Economics and Policy Development, No: 195, Ankara, Türkiye.

Sert, D. (2017). *Economic analysis of beekeeping activity: The case of Isparta province*. (MSc. Thesis). Süleyman Demirel University Institute of Natural and Applied Sciences, Isparta, Türkiye.

Soysal, M., Kekeçoğlu E. K. and Gürcan M. İ. (2007). Türkiye arı yetiştiriciliğinin bal üretimi bakımından durumu. *Tekirdağ Ziraat Fakültesi Dergisi*, 4(2): 227-236.

Uygur, Ş. Ö. (2005). Organic beekeeping. *Uludag Journal of Beekeeping,* (5): 103-106.

Yalçın, F. Ç. and Büyükbay, E. O. (2015). Organic Production potential of honey and other bee products in beekeeping enterprises in the central district of Tokat province. *Journal of Gaziosmanpaşa University Faculty of Agriculture*, 32(2): 14-23.

Yeow, S.H.C., Chun, S.T.S., Yeow, J.A. and Tan, K.S. (2013). Consumer purchase intentions and honey related products. *Journal of Marketing Research & Case Studies*, vol. 2013, p. 1-15.

Yücel, B. (2008). What are the principles of organic production in beekeeping? Ege University Faculty of Agriculture Department of Animal Science, http://www.mellifera.blogcu.com/organik-tarim-doc-dr-banu-yucel-incalismasi-eline-saglik-h/3240545 (Access Date: 19.12.2024).

Yüzbaşıoğlu, R. (2022). Honey consumption of individuals and reasons for preferring Zara honey, a local product (Sivas province central district sample). *Journal of Tekirdağ Agricultural Faculty,* 19 (1): 16-27.