Kocatepe Veterinary Journal

Kocatepe Vet J (2025) 18(3):297-305

DOI: 10.30607/kvj.1732174

RESEARCH ARTICLE

Determination of Risk Factors in Beekeeping Enterprises in Burdur Province

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ABSTRACT

Türkiye holds a significant place in global honey production rankings; however, its yield per hive remains below the world average. According to 2022 data, there is a 3.78-fold difference in hive yield between Türkiye, which ranks third globally in the number of hives, and China, which holds the second position. This situation highlights the need to improve hive productivity to ensure the sustainability of the Turkish beekeeping sector. Numerous direct and indirect risk factors contribute to the sector's inability to achieve adequate productivity. Türkiye's diverse and varied geographical structures result in these risk factors varying from region to region. In this context, the study aims to identify the risk factors encountered by beekeeping enterprises in Burdur province, located in the Western Mediterranean Region, throughout the production to marketing process. As part of the research, beekeeping enterprises included in the 2025 sample were visited, and the "Beekeeping Risk Factor Scale" was administered. As a result of the exploratory factor analysis conducted on the applied scale, a four-factor structure was identified, explaining a total variance of 71.413%. This structure comprises 25 items. The variance explained by each factor is as follows: 21.826% by socioeconomic factors, 19.394% by technical factors, 12.767% by factors related to itinerant beekeeping, and 10.769% by factors related to marketing. As a result, it is crucial for the sustainability of the sector that both beekeeping enterprises and policymakers acknowledge the risk factors identified in Burdur province. Developing solution-oriented policies and implementing measures to mitigate these risks are of great importance.

Keywords: Beekeeping sector, Burdur province, Factor analysis, Risk factors

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Burdur İli Arıcılık İşletmelerinde Risk Faktörlerinin Belirlenmesi

ÖZ

Türkiye, bal üretim miktarı bakımından dünya sıralamasında önemli bir konuma sahiptir. Ancak, kovan başına verim düzeyi, dünya ortalamasının altında kalmaktadır. 2022 yılı verilerine göre, kovan sayısı bakımından dünya sıralamasında üçüncü sırada yer alan Türkiye ile ikinci sırada bulunan Çin arasında, kovan başına verim açısından yaklaşık 3,78 katlık bir fark bulunmaktadır. Bu durum, Türkiye arıcılık sektörünün sürdürülebilirliği açısından, kovan başına verimliliğin artırılmasının gerekliliğini ortaya koymaktadır. Sektörün yeterli verimliliğe ulaşamamasında birçok doğrudan ve dolaylı risk faktörü etkili olmaktadır. Türkiye'nin sahip olduğu geniş ve farklı coğrafi yapılar, bu risk faktörlerinin bölgelere göre değişiklik göstermesine neden olmaktadır. Bu bağlamda, çalışmanın amacı Batı Akdeniz Bölgesi'nde yer alan Burdur ilindeki arıcılık işletmelerinin, üretimden pazarlama sürecine kadar karşı karşıya kaldıkları risk faktörlerini belirlemektir. Araştırma kapsamında, 2025 yılı içerisinde belirlenen örneklem dâhilinde arıcılık işletmeleri ziyaret edilmiş ve "Arıcılık Risk Faktörü Ölçeği" uygulanmıştır. Uygulanan ölçek üzerinde gerçekleştirilen açıklayıcı faktör analizi sonucunda, dört faktörlü bir yapı elde edilmiştir. Toplamda %71,413 oranında varyans açıklanmış olup, bu yapı 25 maddeden oluşmaktadır. Faktörlerin açıklamış oldukları varyans oranları sırasıyla; sosyoekonomik faktörler için %21,826, teknik faktörler için %19,394, gezgin arıcılıkla ilgili faktörler için %12,767 ve pazarlama ile ilgili faktörler için %10,769'dur. Sonuç olarak, Burdur ili özelinde tespit edilen risk faktörlerinin hem arıcılık işletmeleri hem de politika yapıcılar tarafından dikkate alınarak çözüm odaklı politikalar geliştirilmesi ve bu risklerin azaltılmasına yönelik önlemler alınması, sektörün sürdürülebilirliği açısından büyük önem arz etmektedir.

Anahtar Kelimeler: Arıcılık sektörü, Burdur ili, Faktör analizi, Risk faktörleri

To cite this article: Akın AC. Determination of Risk Factors in Beekeeping Enterprises in Burdur Province. Kocatepe Vet J (2025) 18(3):297-305

Submission: 01.07.2025 **Accepted**: 09.09.2025 **Published Online**: 11.09.2025

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INTRODUCTION

The beekeeping sector plays several vital roles globally due to its production structure. Its most important functions include directly and indirectly meeting humanity's nutritional needs, supporting pollination essential for the continuity of nature and vegetation, and enabling individuals with limited resources in rural areas to sustain their livelihoods through production. Although beekeeping yields various products, honey production remains the primary focus of beekeeping. According to FAO data from 2023, total global honey production reached 1,893,805.48 tons (FAO 2025). China holds the top position in production, followed by Türkiye in second place (TAB 2025).

In this context, beekeeping holds a significant position within Türkiye's livestock sector due to its potential and status as an alternative production branch. The relatively low investment costs and shorter depreciation periods of beekeeping enterprises compared to other agricultural activities, along with the rapid conversion of investments into income, make this sector strategically important for rural development in Türkiye (Apimondia 2025; Bingöl Beekeeping Report 2011; Uzun et al. 2022).

According to TURKSTAT data for 2024, there are 97,984 beekeeping enterprises in Türkiye, with 4,580 located in the TR61 region and 481 in Burdur province. In the same year, Türkiye had 8,717,162 new-type hives and 244,813 old-type hives. In the TR61 region, the number of new-type hives was 315,277, and the number of old-type hives was 470; in Burdur province, these figures were 36,213 and 160, respectively. Honey production in 2024 totalled 95,492.311 tons nationwide, 2,465.114 tons in the TR61 region, and 185.45 tons in Burdur province (TÜİK 2025). Analysis of the 2004–2024 period shows that honey production in Türkiye increased by 29.17%, whereas it decreased by 19.53% in the TR61 region and by 67.05% in Burdur province (TÜİK 2025).

While honey production in Türkiye increased by approximately 30% between 2004 and 2024, it decreased by 67% in Burdur province. This significant decline suggests the presence of substantial risks that are affecting production in the region. Many factors influence these production levels, and it is important to recognize that these factors may pose risks to beekeeping enterprises. According to Varalan (2023), risk factors impacting beekeeping activities include global climate change (Rai and Ravuiwasa 2019; Giannini et al. 2020; Vercelli et al. 2021), diseases and harmful organisms (Higes et al. 2010; Çukur 2014), the biological condition of the queen in colonies (Van Engelsdorp et al. 2013; Çakmak and Seven Çakmak 2016), invasive species (Rai and Ravuiwasa 2019), nomadic beekeeping practices (Pilati and Prestamburgo 2016; Simone-Finstrom et al. 2016), economic, financial, and marketing challenges (Seven and Akkılıç 2005; Öztürk et al. 2014; Çevrimli and Sakarya 2018), as well as various technical problems (Van Engelsdorp et al. 2008; Van der Zee et al. 2014; Söğüt et al. 2019).

This study aims to identify the risk factors affecting beekeeping products in enterprises located in Burdur province throughout the production-to-marketing process. The research aims to analyze the impact of these risks on beekeeping activities and their influence on the sector's sustainability.

MATERIAL and METHODS

The research focuses on beekeeping enterprises operating in the central district of Burdur province and the districts of Ağlasun, Altınyayla, Bucak, Çavdır, Çeltikçi, Gölhisar, Karamanlı, Kemer, Tefenni, and Yeşilova in 2025. The beekeeping enterprises included in the study comprise those registered with the Burdur Provincial Directorate of Agriculture and Forestry, as well as the Burdur Bee Breeding Union, and those that volunteered to participate.

Within the scope of the research, the main mass constituting the universe is 330 beekeeping enterprises. Based on a 90% confidence level in the research, the minimum sample size, considered statistically sufficient, was determined to be 56. This sample size was determined through calculations designed to achieve reliable results. The formulas for the calculation methods used are presented below. [Table value corresponding to the confidence level (z=1.64); Observation rate in the population (p=0.5) (in cases where this rate is unknown, the highest value was taken as 0.5); Acceptable deviation tolerance (d=0.01); N: Population size, n: Sample size].

$$n_0 = \frac{z^2 \times p \times (1-p)}{d^2} = \frac{1.96^2 \times 0.5 \times 0.5}{(0.01)^2} = 67.24$$

$$n = \frac{n_0}{1 + \frac{n_0}{N}} = \frac{67}{1 + \frac{67}{330}} \approx 56$$

In addition to determining the minimum sample size, potential issues that could arise during data collection were considered. Accordingly, nine additional enterprises were included, bringing the total number of participants to 65. However, two of these enterprises were excluded from the study due to incomplete data, resulting in the analysis being conducted on 63 enterprises.

Within the scope of the research, 'Beekeeping Risk Factor Scale' questions were asked of the business owners to determine the risk perceptions of the enterprises. The 'Beekeeping Risk Factor Scale' used

in the research was developed by Varalan and Çevrimli (2024). In the beekeeping risk factor scale, there are 51 questions under four headings (socioeconomic factors, technical factors, environmental and climatic factors, and factors related to itinerant beekeeping) to identify risk factors. These 51 items in the scale form consist of a 5-point Likert-type scale (Very risky, Risky, Neither Risky nor No Risk, No Risk, No Risk at all). These scale questions, prepared by Varalan and Çevrimli, were reduced to 27 items as a result of their factor analysis (Varalan and Çevrimli 2024). In our study, due to the nature of the sample groups, the responses to two items (31, 34) were not evaluated, and the scale questions were reduced to 25 items in total.

In this study, the dataset collected from beekeeping enterprises in Burdur province was analysed using IBM SPSS Statistics Standard Concurrent User Version 27 (IBM Corp., Armonk, New York, USA) for exploratory factor analysis. In this analysis, factors are defined as dimensions derived from linear combinations of observed variables, representing hypothetical constructs formed by these observed variables. To determine whether the data is suitable for factor analysis, the correlation matrix is examined. If many correlation coefficients are below 0.30, factor analysis may not be the most suitable approach. Bartlett's test of sphericity is applied to statistically assess whether correlations among variables exist by testing if the correlation matrix is an identity matrix. Additionally, the Kaiser-Meyer-Olkin (KMO) measure, which is based on correlation and partial correlation coefficients, is used as an essential indicator of data adequacy for factor analysis. In this study, the principal components method was employed to extract the factors.

In determining the optimal number of factors, the selection was guided by the criterion that retained factors should have eigenvalues greater than one. To enhance interpretability, a rotation procedure was employed, and the Varimax method was utilized to identify the specific variables associated with each factor. Subsequently, a confirmatory factor analysis (CFA) was conducted to evaluate the adequacy of the factor structure derived from the exploratory factor analysis (EFA) in relation to theoretical or hypothesized models. It is widely acknowledged that EFA is generally conducted as a preliminary step in scale construction and in evaluating construct validity (Karahan, 2014; Durutürk, 2015; Çınar Özdemir, 2015).

While exploratory factor analysis determines the optimal number of factors based on the data, confirmatory factor analysis is used to verify a known or hypothesized factor structure. In this study, the open-source statistical software JAMOVI (Version 2.3.28) was used for confirmatory factor analysis (Lachin 2000; Obuchowski 2002).

RESULTS

Within the scope of the study, the initial findings related to the application of the Beekeeping Risk Factor Scale in Burdur province, along with the distribution of the factors and corresponding items, are presented in Table 1.

As shown in Table 1, the Burdur Beekeeping Risk Factor Scale comprises 25 items distributed across four factors: Socioeconomic Factors, Technical Factors, Factors Related to Migratory Beekeeping, and Factors Related to Marketing. The findings related to the validity and reliability of the Beekeeping Risk Factor Scale are presented in Table 2.

To evaluate the suitability of the dataset for factor analysis, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were applied. The KMO value was calculated as 0.656, indicating a borderline level of suitability according to Kaiser's (1974) classification. Additionally, Bartlett's test of sphericity was significant (χ^2=731.700; $p<0.001$), confirming that the data meet the assumption of multivariate normality and supporting the appropriateness of factor analysis.

The exploratory factor analysis revealed a four-factor structure for the scale, explaining a total variance of 71.413%. This indicates acceptable construct validity, as explained variance between 60% and 80% is generally considered sufficient in the social sciences. Examining the variance explained by each factor separately: socioeconomic factors accounted for 21.826%, technical factors for 19.394%, itinerant beekeeping factors for 12.767%, and marketing-related factors for 10.769% of the variance.

According to Table 2, the factor loadings for items in the first dimension range from 0.456 to 0.681, in the second dimension from 0.403 to 0.762, in the third dimension from 0.525 to 0.810, and in the fourth dimension from 0.484 to 0.519. Based on the $\alpha \geq 0.70$ threshold suggested by Nunnally and Bernstein (1994), the technical factors and marketing dimensions demonstrate sufficient internal consistency, while the socioeconomic factors and itinerant beekeeping dimensions are borderline. However, since the overall Cronbach's Alpha (α) exceeds 0.70, the scale's reliability is considered adequate.

Therefore, it can be concluded that the four dimensions effectively measure their respective sub-features, indicating that the questionnaire is a reliable measurement tool.

Table 1. Factors and Items Related to the Beekeeping Risk Factor Scale

Factors	Name of the Factor	Item Number	Question Items
Factor 1	*Socioeconomic Factors*	4	Low income from the beekeeping sector
		7	Inadequate tool-equipment assets of the enterprise
		9	Failure to keep records in the enterprise
		10	Changes in the country's economy
		11	Rise in exchange rates
		12	Inadequate credit facilities
		13	Changes in the interest rates of loans that can be obtained
		15	Increase in indebtedness of enterprises
		16	Inadequate organization among producers
Factor 2	*Technical Factors*	18	The productivity/adaptation level of the bee breed you breed in the region
		19	Prevalence of bee diseases and pests
		20	Insufficient knowledge in the fight against bee diseases and pests
		22	Use of old queen bees in hives
		23	The problem of obtaining quality queens for hives
		26	Inadequate care and feeding conditions of bees
		27	Neglect of autumn feeding and spraying
		28	Insufficient technical knowledge on beekeeping
Factor 3	*Factors Related to Migratory Beekeeping*	37	Too close proximity of apiaries to each other in accommodation during migratory beekeeping
		38	Exclusion from village land during migratory beekeeping
		39	Demand for high land prices in the hospitality region
		40	Colony losses during transport of beehives
		41	Inadequate labour supply related to beekeeping
Factor 4	*Factors Related to Marketing*	44	Insufficient product marketing opportunities for enterprises or beekeepers
		45	Products cannot be sold at the desired time
		46	Inadequate quality/price relationship in products

Table 2. Validity and Reliability Results of the Beekeeping Risk Factor Scale

Item Number	Socioeconomic Factors	Technical Factors	Factors Related to Migratory Beekeeping	Factors Related to Marketing
4	0.482			
7	0.512			
9	0.519			
10	0.639			
11	0.632			
12	0.592			
13	0.642			
15	0.681			
16	0.456			
18		0.403		
19		0.762		
20		0.674		
22		0.567		
23		0.460		
26		0.505		
27		0.608		
28		0.495		
37			0.671	
38			0.810	
39			0.591	
40			0.576	
41			0.525	
44				0.484
45				0.440
46				0.519
Explained Variance %	21.826	19.394	12.767	10.769
Cronbach's Alpha (α)	0.612	0.716	0.612	0.759
Total Disclosed Variance Rate=71.413				
Kaiser Meyer Olkin (KMO)=0.656				
Bartlett test value=731.700; ***p*<0.001**				
Cronbach's Alpha (α)=0.753				

The scale model (χ^2=290, df=242) consists of four dimensions (see Table 3). The fit indices indicate that the model demonstrates an acceptable level of fit. According to the threshold values suggested by Hu and Bentler (1999) -where CFI and TLI≥0.90 indicate good fit- both indices meet the acceptable criteria. Specifically, the CFI value of 0.92 suggests a good fit between the model and the data. Additionally, the RMSEA value of 0.056, with the upper limit of its confidence interval not exceeding 0.079, further supports a good model fit. Since RMSEA values≤0.05 are considered a perfect fit and values≤0.08 an acceptable fit in the literature, these results confirm that the model provides an acceptable fit to the data (see Table 3). Confirmatory factor analysis was conducted on the beekeeping risk factor scale, which includes twenty-five (25) items and four (4) sub-dimensions. The model is visually presented in Figure 1.

Table 3. Statistical Values Regarding the Fit of the Structural Equation Model

						RMSEA 90% CI	
χ^2	df	p	CFI	TLI	RMSEA	Lower	Upper
290	242	0.018	0.920	0.901	0.056	0.025	0.079

RMSEA= Root Mean Square Error of Approximation; CFI= Comparative Fit Index; TLI= Tucker- Lewis Index

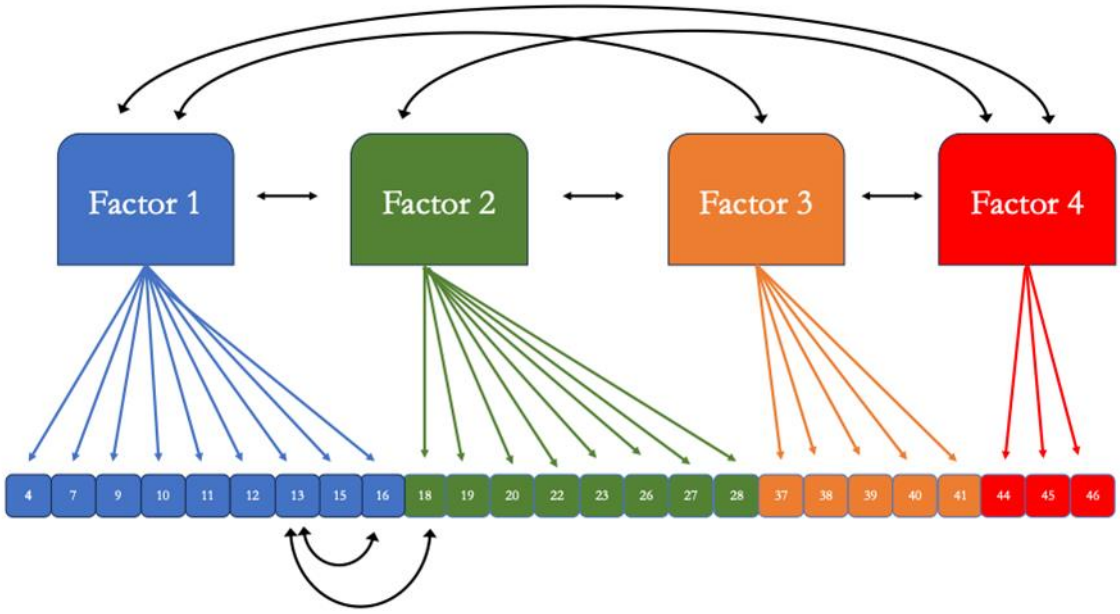

Figure 1: Confirmatory Factor Analysis Model Illustrating the Relationships Among the Subscales of the Scale

DISCUSSION

In beekeeping enterprises in Burdur province, the "Beekeeping Risk Factor Scale" was initially developed by Varalan and Çevrimli (2024) as a 51-item questionnaire. However, a total of 24 items (1, 2, 3, 5, 6, 8, 14, 17, 21, 24, 25, 29, 30, 32, 33, 35, 36, 42, 43, 47, 48, 49, 50, and 51) were subsequently removed from the scale as they were not compatible with the factor structure. When we administered the "Beekeeping Risk Factor Scale" to beekeeping enterprises in Burdur province, in addition to the 24 items that Varalan and Çevrimli (2024) had already excluded, the responses to two more items were not evaluated due to the characteristics of the sample group. This situation is consistent with the study conducted in Kars province, where the necessity of removing items from the scale was associated with the sample size. It has been noted that the total number of questions is relatively high compared to the minimum sample size recommended for factor analysis (Varalan and Çevrimli 2024). In other words, it has been suggested that studies with smaller sample sizes are better conducted using scales with fewer items (Büyüköztürk 2002).

When the percentages of the total variance explained by factors in studies addressing risk factors in the Turkish beekeeping sector are examined, it is observed that the studies conducted in different provinces produce varying results. For example, in a study conducted among migratory beekeeping enterprises in Türkiye, this value was found to be 74.48% (Aksoy et al. 2022). In Kars province, the explained variance was 73.96% (Varalan and Çevrimli 2024), whereas in Ordu province it was 64.57% (Öztürk 2013). Two studies conducted in Iğdır province reported 69% (Karadaş and Birinci 2018) and 74.80% (Kaya and Kılıç Topuz 2023), respectively. Our study, conducted in Burdur province, explained 71.413% of the total variance.

An examination of the scales used in these studies shows that the study conducted in migratory beekeeping enterprises involved 30 items and 10 risk factors (Aksoy et al. 2022); the study in Kars province used 27 items and 8 risk factors (Varalan and Çevrimli 2024); the study in Ordu province had 24 items and 8 risk factors (Öztürk 2013); and the two studies in Iğdır province included 25 items and 8 risk

factors (Karadaş and Birinci 2018) and 27 items and 7 risk factors (Kaya and Kılıç Topuz 2023), respectively. Although our study in Burdur province used the same scale items as the study in Kars, it ultimately consisted of 25 items and four risk factors.

When the Cronbach's alpha and KMO (Kaiser-Meyer-Olkin) values reported in studies conducted in Türkiye are examined sequentially, it is observed that the study conducted by Varalan and Çevrimli (2024) in Kars reported values of 0.857 and 0.648, respectively, while Öztürk (2013) reported 0.657 and 0.617. Similarly, Aksoy et al. (2022) indicated these values as 0.534 and 0.573. According to the study by Kaya and Kılıç Topuz (2023), these values were reported as 0.608 and 0.544. In our study, the corresponding values were found to be 0.753 and 0.656.

It is observed that numerous risk factors are present in beekeeping activities in Türkiye, and the relative importance of these risk factors varies across regions and provinces. In a study conducted in Muğla province, the most critical risk factors in beekeeping activities were reported as "high input costs," followed by "losses due to diseases" and "nutritional/feeding deficiencies" (Akbağ et al. 2025). In a study conducted in İzmir province, the top three risks faced by beekeepers were identified as "adulteration and imitation of honey," "input costs," and "climatic conditions-drought" (Onuç et al. 2019). In a study conducted in Erzincan province, the three most significant issues identified were "bear attacks," "adverse climatic conditions," and "marketing problems," respectively (Alkaya and Candemir 2025).

In a study conducted in Muğla province, the most significant source of risk faced by beekeepers participating in the research was reported to be the high cost of inputs (Akbağ et al. 2025). In this context, when examining the impact values of factors that could affect economic indicators in the beekeeping sector, it is observed that the results vary and that related items can appear under different factor headings. In our study conducted in Burdur province, Item 15 (increase in the indebtedness of enterprises), which falls under "socioeconomic factors," had the highest value within this factor group at 0.681. This was followed by Item 13 (changes in interest rates of available loans) at 0.642 and Item 10 (changes in the national economy) at 0.639. These items are similar to those in the study conducted in Kars, where Items 15 and 13 were included under "financing-related risk factors," with values of 0.793 and 0.814, respectively. In Kars, both items had higher values compared to Burdur. Item 10, on the other hand, was classified under "economic, organizational, and global risk factors" in Kars and received a value of 0.911, which was higher than its corresponding value in Burdur (Varalan and Çevrimli 2024). In a study conducted in Iğdır, the items receiving the lowest scores under "social sustainability factors" were "investment using income from beekeeping and the role of women in honey production," with a value of 0.195, and the "satisfaction factor," with a value of 0.682. It is observed that most items under the headings of investment and satisfaction are, directly or indirectly, associated with the economic structure and indicators (Kaya and Kılıç Topuz 2023). In a study on migratory beekeeping enterprises in Türkiye, under the "marketing factor," the items with the highest values were "increase in debt amount" at 0.830 and "instability in interest rates" at 0.794. Under the heading of "economic structure and natural conditions factor," "increase in input costs" at 0.819 and "inability to obtain loans" at 0.607 were the items with the highest values in this group (Aksoy et al. 2022). In the study conducted in Iğdır, "changes in government policies regarding beekeeping" (0.682) and "changes in the country's economic conditions" (0.670) were identified as economic and political risk factors (Karadaş and Birinci 2018). In a study conducted in Ordu, the items under the "economic and natural conditions factor" that explained risk were "changes in product prices" with a value of 0.790 and "changes in the country's economic situation" with a value of 0.594 (Öztürk 2013).

In a study conducted in Muğla province on the risks faced by beekeeping enterprises, "losses caused by diseases" were identified as the second most significant risk factor, after "high input costs" (Akbağ et al. 2025). In our study on beekeeping enterprises in Burdur province, under the risk category associated with "technical factors," Item 19 (prevalence of bee diseases and pests) ranked first with a value of 0.762. It was followed by Item 20 (insufficient knowledge in combating bee diseases and pests) with 0.674, and Item 27 (neglecting autumn feeding and treatment) with 0.608. When comparing these items to the results from Kars province, Item 19 was classified under the "disease monitoring and control" factor with a value of 0.800, Item 20 under "queen bee and knowledge-related risk factors" with 0.783, and Item 27 under "insufficient care and feeding conditions for bees" with 0.822 (Varalan and Çevrimli 2024). In a study conducted among migratory beekeepers in Türkiye, the "disease factor" included "disease and wintering losses," which had a value of 0.755. Under the "climatic conditions factor," the "nutritional deficiency in hives" item scored 0.800. Under the "operator characteristics factor," the items "inability to combat diseases" and "lack of technical knowledge" scored 0.860 and 0.475, respectively (Aksoy et al. 2022). In another study conducted in Iğdır province, the two items most closely related to our focus -"diseases and losses during wintering" and "nutritional deficiency"- received values of 0.517 and 0.583, respectively (Karadaş and Birinci 2018). In the study conducted in Ordu province, the "disease and wintering losses" within the disease factor had a value of 0.798, and "inability to combat diseases and pests" had a value of 0.738, while the item "food

deficiency," under the operational conditions factor, was identified with a value of 0.703 (Öztürk 2013). In a study conducted in Muğla, the insufficiency in combating diseases and pests was identified as the sixth most significant risk factor among twelve (Akbağ et al. 2025).

Regarding "migratory beekeeping" in Burdur, the highest-scoring item was Item 38 (being denied access to villages or land during migratory beekeeping) with a value of 0.810, followed by Item 37 (apiaries being located too close to each other during migration or lodging) with 0.671, and Item 39 (high land rental fees in the lodging area) with 0.591. In Kars, the corresponding values were 0.841, 0.568, and 0.825, respectively. The first two items fell under the category of "risks arising from migratory beekeeping," while the last one was classified under "risks arising from enterprises and the region" (Varalan and Çevrimli 2024). In a study conducted among migratory beekeepers in Türkiye, the "attitudes toward beekeepers" factor identified "charging fees to beekeepers" (0.928) and "transportation fees" (0.891) as major risks (Aksoy et al. 2022). In Muğla, the item "lack of guidance in selecting suitable beekeeping locations," associated with migratory beekeeping, was identified as the least significant risk factor among all risk items (Akbağ et al. 2025).

Within the category of risk factors related to marketing, the item with the highest value is item 46, which refers to the inadequacy of the quality/price relationship in products, with a value of 0.519. In the study conducted in Kars province, the same item was recorded as 0.621, representing the lowest value among the three items constituting the marketing-related risk factor. In Burdur province, the order from the highest to the lowest value was item 46 (inadequacy of the quality/price relationship in products), item 44 (insufficient marketing opportunities for enterprises and beekeepers), and item 45 (inability to sell products at the desired time), whereas in Kars the order was 45, 44, and 46 respectively (Varalan and Çevrimli 2024). Another study reported that the item concerning marketing problems under the marketing factor had a value of 0.816, while the item reflecting the instability of product prices under the policies factor was recorded as 0.510 (Aksoy et al. 2022). In the study conducted in Iğdır province, insufficient marketing opportunities received a value of 0.481 (Karadaş and Birinci 2018). In contrast, in Ordu province, the item reflecting low marketing opportunities under the operating conditions factor had a value of 0.500 (Öztürk 2013). In the sector, the marketing of products is negatively affected by counterfeiting and adulteration. A study conducted in Muğla province identified counterfeiting and adulteration as a medium-level risk factor for unfair competition (Akbağ et al. 2025).

CONCLUSION

Beyond honey production, which meets a fundamental nutritional need for humanity, the beekeeping sector offers numerous important benefits, including supporting plant pollination, fostering rural development, and generating employment with relatively low investment costs. However, despite these multifaceted advantages, beekeeping is subject to various risks throughout the entire production process, from flower to table. It is therefore crucial to assess these risk factors within the context of elements that directly or indirectly impact the sector and to develop appropriate solutions—or at least mitigate their effects.

In this context, Türkiye's geographical features, climatic conditions, and socioeconomic factors must be carefully considered in risk assessments. Regional classifications should be made based on production structures, geographic characteristics, and development levels. For the beekeeping sector to contribute effectively to rural development in Türkiye, it is essential that support policies are designed with attention to regional risk factors, ensuring sustainable production and the implementation of effective strategies.

Conflict of interest: The author has no conflicts of interest to report

Authors' Contributions: ACA contributed to the project idea, design, and execution of the study. ACA contributed to the acquisition of data. ACA analyzed the data. ACA drafted and wrote the manuscript. ACA reviewed the manuscript critically. ACA has read and approved the finalized manuscript.

Ethical approval: This study was approved by the decision of Burdur Mehmet Akif Ersoy University Non-Interventional Ethics Committee GO 2024/811.

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