

Exploring Local Perception and Beekeeping Practices in the Honey Forests of Artvin

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Abstract

This study aims to examine the relationship between beekeepers in the Artvin region and honey forests, as well as the key factors influencing beekeeping success. Based on survey data and statistical analyses, it was found that education level, frequency of honey forest use, and the perception of honey forests' contribution to beekeeping have significant and positive effects on beekeeping success. In the regression analysis, the standardized beta coefficients for these variables were 0.45, 0.33, and 0.41 respectively, with p-values below 0.05. Additionally, strong positive correlations were observed among these factors. The findings suggest that increasing the knowledge and awareness of beekeepers, alongside the sustainable use of honey forest resources, can enhance both the productivity and sustainability of regional beekeeping activities. Therefore, expanding educational programs and encouraging active involvement of local authorities and stakeholders in the protection of honey forests are critical. This study highlights the importance of honey forests for both biodiversity conservation and economic development

Keywords: Honey forests, beekeeping practices, local community perceptions, environmental awareness

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1. Introduction

Apiculture has been a significant traditional economic activity, deeply intertwined with forest ecosystems, especially in regions rich in floral diversity such as Artvin province in northeastern Turkey. Forests designated as "bal ormanları" (honey forests) provide essential nectar and pollen resources that sustain honeybee colonies, thereby playing a crucial role in the maintenance of local biodiversity and the livelihoods of rural communities (Krell, 2011; Klein et al., 2007). These honey forests not only support apicultural productivity but also contribute to ecological services including erosion control, pollination of wild and cultivated plants, and preservation of endemic flora (Potts et al., 2016; Gallai et al., 2009).

Artvin's unique topography and climatic conditions foster rich vegetation cover dominated by diverse tree species such as pine, chestnut, and linden, which serve as vital nectar sources for bees (Dökmeci et al., 2019). This ecological suitability has rendered apiculture a prominent livelihood strategy, enhancing socio-economic resilience in rural areas (Uzun et al., 2020). Despite its recognized importance, systematic assessments of the role and potential of bal ormanları in supporting sustainable apiculture in Artvin remain limited. Existing studies often focus on honey production quantities without fully addressing the interlinked ecological and socio-economic dynamics (Demir et al., 2017; Aksoy & Yücel, 2018).

Therefore, this study aims to bridge this knowledge gap by evaluating the current status of bal ormanları in Artvin, investigating the perceptions and practices of local beekeepers, and identifying key challenges and opportunities for enhancing the contribution of these forests to regional apiculture and rural development. By integrating ecological observations and socio-economic data through surveys and field visits, this research contributes to both academic literature and practical conservation and development policies.

1.1 Literature Review

Honey forests are critical ecosystems for beekeeping, significantly contributing to biodiversity conservation and sustainable agricultural practices through pollination services (Klein et al., 2022). These forests, particularly rich in nectar-producing species such as pine, chestnut, and linden, support the nutrition of bees and thereby enhance honey production (López-Urbe et al., 2020). Moreover, the presence of honey forests helps maintain healthy bee populations, which is vital for the continuity of ecosystem functions (Smith et al., 2021).

In Turkey, honey forests are predominantly found in the Black Sea and Eastern Anatolia regions, where they provide substantial support to local beekeeping activities, as demonstrated by various studies (Yıldırım & Kaya, 2019; Çetin et al., 2021). These studies emphasize not only the economic value of regional honey forests but also highlight their cultural and ecological functions. It is noted that local communities' perceptions of honey forests and the benefits derived from these areas form a foundation for developing sustainable management strategies (Demirtaş & Özkan, 2020).

The advancement of sustainable beekeeping practices is closely linked to the protection and rehabilitation of honey forests (Zhao et al., 2022). Risks such as climate change and habitat loss pose serious threats to the

beekeeping sector. Therefore, it is essential to enhance local community participation and adopt ecosystem-based approaches in regional strategies (Wang et al., 2023). While modern management techniques and technological developments provide effective tools for monitoring and managing honey forests, the integration of local knowledge systems also plays a critical role in ensuring sustainability (González et al., 2021).

Recent studies show an increase in the number of socioeconomic analyses focusing on the relationship between honey forests and beekeeping. In this context, examining local communities' perceptions and attitudes contributes to the design of sustainable conservation and development models (Karakaya & Öztürk, 2020). Furthermore, the significance of honey forests is increasingly emphasized in regional development policies, with recommendations to collaborate with local actors to enhance their economic value (Demir & Erkan, 2023).

2. Methodology

The study was conducted within the boundaries of the Artvin Regional Forestry Directorate, focusing on 19 designated honey forests and the beekeepers operating in these areas. These honey forests represent key ecological and economic zones for local apiculture in the region.

Data were collected through direct field observations and face-to-face surveys with beekeepers. Field visits involved detailed examination of the physical characteristics of the honey forests, including species composition and habitat conditions. Multiple visits were conducted to gather comprehensive insights from the local community regarding their experiences and perceptions related to honey forests and beekeeping activities.

The questionnaire used in the face-to-face interviews was designed based on literature reviews and preliminary field insights. It consisted of three main sections:

- Socio-demographic information of participants (age, gender, education, income, occupation, etc.),
- Beekeeping practices and experiences (duration of engagement, professional or hobbyist status, production volume, perceived advantages and disadvantages),
- Perceptions and attitudes towards honey forests, including their contributions to beekeeping and future expectations.

Collected data were analyzed using descriptive statistics to summarize participant characteristics and response distributions. Inferential statistical tests, including Chi-square tests, independent samples t-tests, and one-way ANOVA, were applied to explore differences between groups based on socio-demographic variables. Reliability of the Likert-scale items was assessed through Cronbach's alpha analysis. Additionally, correlation and regression analyses were conducted to examine relationships between key variables influencing beekeepers' perceptions and practices. All statistical analyses were performed using SPSS version 22 software.

3. Results

3.1 Demographic Profile of Local Beekeepers

The socio-demographic characteristics of the beekeepers participating in the study are presented in Table 1. A total of 200 individuals engaged in beekeeping activities were surveyed.

Table 1. *Demographic Profile of Local Beekeepers*

Characteristic	Category	Frequency (f)	Percentage (%)
Gender	Male	150	75
	Female	50	25
Age	18–29	40	20
	30–39	60	30
	40–49	70	35
	50+	30	15
Education Level	Primary Education	80	40
	High School or Higher	120	60
Type of Beekeeping	Hobby	60	30
	Source of Income	80	40
	Both	60	30

The majority of respondents were male (75%) and aged between 30 and 49 years (65%). Regarding educational background, 60% had completed high school or higher education, while 40% had only primary education. In terms of the nature of their beekeeping activities, 40% identified it as a source of income, 30% as a hobby, and another 30% stated that they engaged in it for both economic and personal reasons. These findings provide a foundational understanding of the beekeeping population in the study area and offer valuable insights for interpreting their practices and perceptions related to honey forests.

40% of the beekeepers reported using honey forests once a week, while 35% use them several times a month. A positive relationship was identified between frequency of use and satisfaction levels. The overall satisfaction score was measured as 3.8 on a 5-point Likert scale.

Approximately 80% of local beekeepers stated that honey forests contribute positively to their beekeeping activities. They emphasized the significant role of honey forests in enhancing biodiversity, nectar richness, and honey quality.

65% of the participants reported issues related to seasonal climate changes, 50% noted bee diseases, and 45% cited economic constraints. Additionally, lack of infrastructure and limited knowledge regarding access to honey forests were also mentioned as key challenges (Table 2).

Table 2. Main Challenges in Beekeeping

Main Challenges in Beekeeping	Percentage (%)	Notes
Seasonal climate changes	65	Reported as a significant problem by participants
Bee diseases	50	-
Economic constraints	45	-
Infrastructure deficiencies for accessing honey forests	-	Considered an important issue
Lack of knowledge about honey forest access	-	Considered an important issue

According to the Chi-square test results, there is a significant relationship between gender and the frequency of honey forest use ($p = 0.034$). The ANOVA test revealed significant differences between education level and the perception of the contribution of honey forests ($p = 0.006$). The T-test showed that female beekeepers have a significantly higher satisfaction level with honey forests compared to male beekeepers ($p = 0.037$) (Table 3).

Table 3. Significant Differences in Honey Forest Usage and Perceptions by Socio-Demographic Characteristics

Beekeeping Significant Differences Between Groups	Test Type	Result
Gender and honey forest usage frequency	Chi-square test	Significant relationship found
Education level and perception of honey forests' contribution	ANOVA	Significant differences detected
Satisfaction level with honey forests by gender	T-test	Females significantly more satisfied

In the regression analysis, education level ($\beta = 0.45$, $p < 0.01$), frequency of honey forest use ($\beta = 0.33$, $p < 0.05$), and the perception of the contribution of honey forests to beekeeping ($\beta = 0.41$, $p < 0.01$) were identified as significant factors influencing beekeeping success. Additionally, positive correlations were observed among these variables (Table 4).

Table 4. Regression and Correlation Results

Factors Affecting Beekeeping Success	Standardized Beta (β)	Significance (p)	Notes
Education level	0.45	<0.01	Significant positive effect
Frequency of honey forest use	0.33	<0.05	Significant positive effect
Perception of honey forests' contribution to beekeeping	0.41	<0.01	Significant positive effect

4. Discussion

This study provides robust evidence of the crucial role that honey forests in Artvin play in supporting sustainable beekeeping and local livelihoods. The demographic profile of beekeepers, predominantly young and educated, aligns with global trends emphasizing the role of human capital development in enhancing the sustainability of rural livelihoods (Çiftçi et al., 2021; Kaya & Yılmaz, 2022). This demographic trend supports the transformation of beekeeping from a traditional subsistence activity into a more professionalized and innovative sector, contributing to rural economic diversification (FAO, 2023).

The frequent use and high satisfaction rates with honey forest resources reported by beekeepers indicate a strong connection between local communities and their natural environment. This local attachment is vital for the long-term conservation and sustainable use of forest resources (Pretty & Smith, 2004; Berkes, 2009). Honey forests provide a range of critical ecosystem services, especially pollination and biodiversity support, which are increasingly recognized as essential for maintaining ecological resilience in the face of environmental change (Güler et al., 2020; Smith & Jones, 2019; IPBES, 2023). These ecological benefits also contribute directly to

agricultural productivity and food security, reinforcing the multifunctional value of honey forests beyond honey production (Kremen et al., 2007).

Despite the positive contributions, this study also highlights significant challenges faced by beekeepers in Artvin, including inadequate infrastructure, limited knowledge dissemination, and difficulties in marketing bee products. These barriers are common in many rural beekeeping contexts worldwide and represent major constraints to scaling up sustainable apiculture (Demir & Aydın, 2021; Brown et al., 2018). Infrastructure gaps such as poor access roads, inadequate storage facilities, and lack of modern processing technologies restrict beekeepers' ability to add value and compete in broader markets. Additionally, knowledge gaps limit adoption of best practices for hive management, disease control, and sustainable harvesting, which can affect productivity and ecological sustainability (Gallai et al., 2009; FAO, 2023).

The statistical findings indicating significant differences in perceptions and participation based on gender and education are consistent with the broader literature recognizing the role of social factors in shaping natural resource management outcomes (Yilmaz, 2022; Rao & Kelleher, 2021). Women's increased participation in beekeeping activities offers opportunities for enhancing household incomes, promoting gender equity, and fostering community resilience (UN Women, 2022; Agarwal, 2010). Supporting female beekeepers through targeted training and access to resources can thus be an effective strategy for inclusive rural development.

Moreover, the impact of climate change and land-use dynamics on beekeeping and honey forest ecosystems cannot be overlooked. Climate variability affects flowering phenology, nectar availability, and the health of bee populations, potentially undermining honey yields and ecosystem stability (IPCC, 2022; Öztürk et al., 2023). Land conversion and fragmentation reduce forest habitats and connectivity, threatening biodiversity and the pollination services that underpin both natural ecosystems and agriculture (Potts et al., 2016; IPBES, 2023). Therefore, integrated landscape management approaches that incorporate climate adaptation and conservation measures are essential to safeguard the future of Artvin's honey forests and the livelihoods they support.

This research underscores the importance of policy interventions at multiple levels. Strengthening institutional frameworks, enhancing extension services, and fostering public-private partnerships can create an enabling environment for sustainable apiculture (FAO, 2023). Cooperative models and local networks may facilitate better knowledge exchange, collective marketing, and advocacy, addressing many of the socio-economic challenges identified in this study (Klein et al., 2019).

In conclusion, the reciprocal relationship between Artvin's honey forests and local beekeepers represents a microcosm of broader sustainability challenges and opportunities in rural forest-dependent communities. This study contributes to filling critical knowledge gaps by combining ecological assessments with socio-economic analyses, offering actionable insights for practitioners, policymakers, and researchers alike. Ensuring the sustainability of honey forests and apiculture in Artvin requires a holistic approach that balances ecological conservation, economic viability, and social inclusiveness, ultimately supporting resilient rural livelihoods and healthy ecosystems.

5. Conclusion and Recommendations

This study comprehensively examined the current status of 19 pine honey forests in Artvin, the profile of local beekeepers, the state of beekeeping activities, and the impacts of honey forests on beekeeping. The findings highlight the critical ecological and economic importance of honey forests for the development of beekeeping in the region. The vast majority of beekeepers regularly utilize these forests, express high satisfaction levels, and maintain positive perceptions toward sustainable beekeeping.

However, basic challenges such as infrastructure deficiencies, marketing problems, and insufficient knowledge sharing limit beekeeping activities and hinder sustainable development. Differences in perceptions and participation according to gender and education levels call for consideration of gender roles and educational factors in regional beekeeping.

Accordingly, the following recommendations are proposed for the sustainable management of Artvin's honey forests and beekeeping:

- **Education and Capacity Building:** Technical trainings for local beekeepers on modern beekeeping methods and sustainability should be organized. Active participation of women in beekeeping activities should be encouraged.
- **Infrastructure Improvements:** Investments in transportation, storage, and marketing infrastructure in honey forest areas should be increased to enhance product quality and market access.
- **Policies and Support Mechanisms:** Legislation and support programs aimed at protecting beekeeping and honey forests at the regional level should be strengthened. Cooperation among local governments, civil society, and the private sector should be enhanced.
- **Knowledge Sharing and Collaboration:** Information exchange, experience sharing, and cooperative formation among beekeepers should be promoted to strengthen sustainable beekeeping.

Future research is recommended to focus on the effects of seasonal variations on beekeeping, the role of

honey forests in biodiversity, and climate change adaptation strategies. Additionally, qualitative studies exploring the in-depth experiences of local beekeepers and socio-cultural dynamics will broaden the scope of this work.

In summary, adopting multi-stakeholder and holistic approaches to sustain Artvin's honey forests and beekeeping is vital for the region's ecological and economic future.

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