

Article

Italian Consumer Interest in Sustainability, Certifications, and Traceability in Honey

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Abstract

Honey has a long cultural tradition in Italy, valued for its sensory properties and health benefits. However, in recent years, the beekeeping sector has faced various challenges due to climate change, biodiversity loss, and economic pressures. Therefore, growing consumer awareness of sustainability, traceability, and ethical aspects is influencing food choices and putting niche-market products, such as honey, in the spotlight. This research analysed data from an online survey of Italian consumers to examine their attitudes toward honey. The analysis focused on the primary drivers of consumer behaviour, the state of sustainability efforts, and the importance of certifications and traceability in influencing preferences. The results showed that, beyond taste and health considerations, Italian consumers expressed a strong sensitivity and awareness of the beekeeping sector's needs and their high engagement in ethical issues, food quality, safety and certification standards, and environmental protection. These findings provide useful insights for producers and policymakers to promote sustainable beekeeping and enhance consumer trust by implementing targeted communication strategies and certification schemes.



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1. Introduction

The beekeeping sector is currently facing significant structural and ecological challenges. Among the most pressing are the decline in bee populations caused by climate change, habitat loss, and the widespread use of pesticides, all of which have severe consequences for bee survival. These threats are compounded by the difficulties beekeepers encounter in sustaining a sufficient production level to ensure fair remuneration. As a result, both the essential ecological service of pollination and the quality and price of beehive products are compromised. Honey, the most widely commercialised beehive product, is a natural functional food derived from the transformation of nectar or honeydew through the enzymatic activity of bees. In this context, it is crucial to investigate the impact of these challenges and transformations on honey consumers' behaviour, as it is closely connected to dietary practices associated with nutritional and health-related properties, as well as to broader concerns such as sustainability, traceability, and certifications, which have become central dimensions of contemporary food consumption. Despite this, consumers'

perceptions of honey production and beekeeping practices remain underexplored, and the difficulties faced by the sector are often insufficiently recognised. Therefore, it is essential to understand how consumers define and value sustainability in honey production to develop strategies [1] that align with their expectations and foster more responsible consumption patterns. Addressing these challenges may help to narrow the gap between producers, retailers, and consumers. Online surveys offer an effective tool for engaging and informing honey consumers in this regard. Our research focuses on Italy, a country that is a significant honey producer and currently faces challenges related to the resilience of its beekeeping sector. This study aims to provide an in-depth understanding of Italian consumers' attitudes toward honey and their broader implications, focusing on the primary drivers of consumer behaviour, the state of sustainability efforts, and the importance of certifications and traceability in influencing preferences.

Exploring the Beekeeping Sector: A Review of the Key Literature

In Italy, honey has long been regarded as an essential part of the culinary tradition. Recent studies have shown that Italian consumers are influenced by various factors when choosing honey, including its sensory appeal [2], health benefits [2], environmental impact [3], authenticity [3], and geographical origin [2]. Although its consumption is primarily linked to its use as a natural sweetener, it is also recognised for its bioactive properties. Its content of antioxidant substances such as phenolic compounds and flavonoids provides a protective therapeutic effect [3], which helps prevent chronic diseases and promote general well-being, thereby enhancing honey's reputation as a traditional health food [3,4]. As a result, honey consumption is shaped by nutritional and functional qualities as well as cultural and sensory factors [5,6]. However, purchasing honey is not solely about taste or nutrition; it also reflects broader concerns about production methods, biodiversity, and environmental impact [7]. In fact, recent research has analysed sustainability, certifications, and traceability from the beekeepers' perspective [8]. Growing environmental awareness and ethical considerations have increased consumers' focus on food production processes, supply chain transparency, and socio-economic impacts [9].

Moreover, innovative sustainable beekeeping practices, such as habitat conservation and the use of technologies for hive monitoring, are being adopted to address environmental challenges and ensure the long-term viability of honey production [10].

Honey, often seen as natural and healthy, is now also assessed based on its environmental impact, the working conditions of producers, and its role in biodiversity conservation [11]. Sustainability significantly influences consumer perceptions. Consumers increasingly link honey with sustainable rural development, ecosystem services, and pollinator protection. The rising awareness of eco-friendly practices and ecology highlights a niche-market product like honey [12]. However, the reality is more complex: climate change, land degradation, and intensive farming threaten the future and sustainability of beekeeping [13].

Several studies have shown that, closely related to sustainability, aspects such as provenance and production methods are also crucial in honey purchasing choices [14]. Indeed, consumers view traceability as essential for determining authenticity, origin, and quality. Additionally, traceability systems can assure consumers that beekeepers and the local community are supported and that floral biodiversity is preserved [15]. Increasing levels of traceability could reduce consumers' perceptions of fraud and adulteration risks, which are becoming increasingly relevant in the honey market, and strengthen the connection between consumers and producers [16,17]. Beekeepers themselves believe that improving traceability and biomonitoring tools is essential to ensure the reliability of the Italian beekeeping sector [8].

Certifications are crucial tools for conveying sustainability and traceability to consumers. Certification labels, such as PDO (Protected Designation of Origin) and PGI (Protected Geographical Indication), help beekeepers to verify the quality and origin of their products, while also allowing them to stay competitive in the marketplace. Simultaneously, these labels can reassure consumers about the high quality of products from specific locations [18]. These certifications relate to product traceability and authenticity and are connected to the unique characteristics of the geographic region where the honey is produced. Currently, only four Italian honeys have received PDO recognition [14]. Additionally, other certifications are less common, such as the fair-trade label for honey outside Europe. This label appeals to consumers because it promotes ethical practices and product traceability.

Thus, honey consumption is strictly connected to the several changes that society, the environment, and dietary choices have recently undergone due to climate change and events like the COVID-19 pandemic that shaped consumers' behaviour [19]. Therefore, exploring how consumers prioritise all of these aspects and are involved in traceability and certifications would give valuable insight into the honey choosing process.

Although several studies have examined consumer preferences related to honey, highlighting the importance of health-related attributes and the influence of origin on consumers' choices, considering also sociodemographic factors [6,15,20,21], the literature remains fragmented and largely focused on individual aspects of consumer behaviour. Furthermore, little attention has been given to how Italian consumers interpret and value the three dimensions of sustainability, traceability, and certifications together.

2. Materials and Methods

2.1. Study Design and Population

Data collection was carried out in Italy in October–November 2024. Participants were randomly recruited through social networks (advertisements) and participated voluntarily in the survey. A total of 1047 Italian adult consumers, over 18 years old, from different Nielsen Italian geographic areas (Northeast (NE) 19%; Northwest (NW) 29%; Centre (CN) 21%; South and Islands (SI) 31%), filled out the questionnaire. Participants were informed of the main research outcomes and gave consent for their data to be used. The right to privacy and data protection was respected following current legislation (GDPR 2016/679). The data collection procedures and the questionnaire administered to participants were approved by the Ethics Committee of the University of Turin, with favourable opinion no. 0565149, dated 27 September 2024.

2.2. Survey Measures

The questionnaire was structured into different sections (Table 1) to collect information about honey consumption (Q1), factors influencing honey choice (Q2), consumer knowledge about honey production (Q3), and consumer interest in issues related to honey: sustainability (Q4), traceability (Q5), and certification (Q6). The questionnaire items were selected in accordance with previous research on the beekeeping sector [8].

A CATA questionnaire was adopted to determine factors influencing honey choice (Q2). A 7-point Likert scale was used to evaluate interest in beekeeping sustainability and new certifications (questions Q4, Q6), agreement with chosen statements about beekeeping and honey production (Q3), and the importance of honey-consuming motivations and traceability issues (Q1, Q5).

Table 1. Questions and topics proposed to honey consumers.

Topic	Question	Options
(Q1) Reasons for consuming honey	How important are the following reasons for your consumption of honey?	<ul style="list-style-type: none"> • I consume honey because it is good • I consume honey because it is nutritious • I consume because it has fewer calories than sugar • I consume honey because it is healthy • I consume honey because it is a product that respects the environment • I consume honey because it is a natural product • I consume honey because it is a local product • I consume honey because it has many uses
(Q2) Factors determining honey choice	Indicate which of these factors determines your choice of a specific honey type	<ul style="list-style-type: none"> • My choice is based on price convenience • Randomness • I buy local products • I choose flavours and essences I know (“monofloral” such as acacia, chestnut. . .) • I’m interested in discovering new types of honey • I buy from the producer • I check the information on the label • I evaluate origin and quality certifications • I prefer to choose well-known commercial brands • I buy organic honey • I observe the visual appearance (colour, crystallisation) • I prefer multifloral honey (wildflower) • I check the geographical origin.
(Q3) Consumer point of view on beekeeping and honey production	How much do you agree with the following statements?	<ul style="list-style-type: none"> • Biodiversity is threatened by climate change • Intensive farming reduces flower varieties useful for bees • Bee diseases and mortality are on the rise • Bees respond well to rising temperatures and climate change • Invasion of alien and invasive plants is detrimental to bee habitat and survival • Beekeepers manage to ensure the survival of bees with nomadism • The climate change is not a threat • Imports of foreign honey threaten the activity of local beekeepers and honey quality. • Bees are the most resistant to new diseases among pollinating insects • Intensive agriculture is beneficial for bee production
(Q4) Consumer interest in beekeeping sustainability	How interested would you be in the following aspects of the social and economic sustainability of beekeeping?	<ul style="list-style-type: none"> • Support of beekeepers for the importance of their activity • Respect for workers’ conditions • Fair remuneration of labour • Education and information programmes on the importance of bees for the environment • Shorten supply chain • Involvement of local communities • Strengthening consumer protection rules against fraud
(Q5) Traceability issues	How important are the following aspects of honey traceability?	<ul style="list-style-type: none"> • Transparent information on the production process • Product origin and quality certifications (PDO, PGI, TSG) • Organic Production Certification • Indication of local origin • Botanical origin indication • Easily readable labels • Link to detailed QR code information

Table 1. Cont.

Topic	Question	Options
(Q6) Certification issues	How interested would you be in new honey certifications?	<ul style="list-style-type: none"> • Environmental biomonitoring certifications • Certification of origin • Certification of bees' health and wellness • Certifications guaranteeing the pollen composition of honey • Certification ensuring the protection of workers and communities

2.3. Statistical Analysis

Statistical data analysis was performed with the R Software package, version 4.3.1. Descriptive statistics were used for sociodemographic data.

Cronbach's alpha was applied to test the questionnaire's reliability, on the questions including a scale comprising multiple Likert questions [22].

ANOVA was chosen, treating the Likert scale data as interval data, under the assumption that the distances between response options are equal. Moreover, all the assumptions of ANOVA were met (independence, normality, and homogeneity of variance). Based on this, ANOVA can be performed on Likert scale data instead of non-parametric alternatives such as the Kruskal–Wallis test [20].

A three-way analysis of variance was employed to identify the main effects of gender (male, female), age groups (18–29, 30–44, 45–54, 55–64, 65–75), consumption frequency (daily, 2–3 times per week, weekly, monthly), and their interaction on the issues analysed. Multiple correspondence analysis (MCA) was used to create a bi-dimensional representation of the consumer profile (gender, age group, and consumption frequency) and to explore the relationship between the consumer profile and terms from the CATA questionnaire (factors influencing honey choice). This analysis was conducted on the frequency table with the consumer profile in rows and the terms from the CATA questionnaire in columns.

3. Results

3.1. Sociodemographic Data

The original database was composed of 1100 consumers, and the data cleaning process was executed, excluding incomplete responses.

A total of 1047 consumers answered the survey with valid responses, equally distributed between females (50.3%, $n = 527$) and males (49.7%, $n = 520$).

The most represented age class was 30–44 ($n = 288$), followed by 45–54 ($n = 232$), and 55–64 ($n = 219$), while the least represented classes were the youngest (18–29) and the oldest (65–75) consumers both including 154 individuals. A total of 33.4% of participants consumed honey 2–3 times per week, while other respondents were equally distributed among the other consumption classes (24.4% consumed it daily, 20.2% weekly, and 22% monthly).

Characteristics of the sample analysed are summarised in Table 2.

Table 2. Sociodemographic data of the sample.

Category	Class	n	%
Gender	Female	527	50.3
	Male	520	49.7
Age Class	18–29	154	14.7
	30–44	288	27.5
	45–54	232	22.2
	55–64	219	20.9
	65–75	154	14.7

Table 2. Cont.

Category	Class	n	%
Consumption Frequency	Daily	255	24.4
	2–3 per Week	350	33.4
	Weekly	212	20.2
	Monthly	230	22.0

3.2. Reasons for Consuming Honey (Q1)

Tables 3 and 4 summarise the importance (rated from 1 to 7) that consumers attributed to different factors that may influence honey consumption.

Table 3. Anova table of the main factors and interactions related to motivations for honey consumption. Statistical differences are marked by *** $p < 0.001$.

Factors	Mean Sq	F Value	Pr(>F)
Motivations	170.91	88.531	$<2.00 \times 10^{-16}$ ***
Gender	108.62	56.261	7.00×10^{-14} ***
Age	179.64	93.049	$<2.00 \times 10^{-16}$ ***
Consumption	101.61	52.633	$<2.00 \times 10^{-16}$ ***
Motivations \times Gender	3.71	1.92	0.0622
Motivations \times Age	5.04	2.609	7.35×10^{-6} ***
Motivations \times Consumption	0.97	0.502	0.9709

Table 4. Variance analysis on the motivations for honey consumption across gender, age, and consumption frequency. Statistical differences recorded in responses by using one-way, two-way, and three-way Anova. Likert scale: 1 (not important)–7 (highly important). Different uppercase letters in columns correspond to different means among ratings of importance. Different letters in rows correspond to different means among motivations. If there were no significant differences, this is indicated with “ns”.

Motivations	All	Gender		Age Class					Consumption Frequency			
		Female	Male	18–29	30–44	45–54	55–64	65–75	Daily	2–3 per Week	Weekly	Monthly
Tasty	5.79 B	5.86 ns	5.73	5.41 c	5.69 bc	5.93 ab	6.06 a	5.78 abc	6.06 a	5.85 ab	5.66 bc	5.54 c
Nutrient	5.73 BC	5.82 a	5.65 b	5.27 b	5.68 a	5.92 a	5.90 a	5.77 a	5.98 a	5.94 a	5.57 b	5.29 b
Ipcaloric sweetener	4.71 D	4.73 ns	4.69	4.07 c	4.56 bc	4.99 ab	5.13 a	4.60 bc	4.95 a	4.78 ab	4.60 ab	4.43 b
Healthy	5.88 AB	6.00 a	5.76 b	4.92 c	5.73 b	6.10 a	6.24 a	6.31 a	6.25 a	5.97 b	5.73 bc	5.48 c
Environmentally friendly	5.58 C	5.71 a	5.46 b	4.71 c	5.41 b	5.75 a	5.96 a	5.99 a	5.90 a	5.66 ab	5.42 bc	5.27 c
Natural	6.06 A	6.19 a	5.93 b	5.29 c	5.94 b	6.21 ab	6.35 a	6.44 a	6.28 a	6.14 ab	5.92 bc	5.82 c
Local product	5.57 C	5.79 a	5.35 b	5.02 b	5.56 a	5.64 a	5.70 a	5.84 a	5.86 a	5.65 ab	5.49 bc	5.20 c
Multipurpose ingredient	5.55 C	5.70 a	5.40 b	5.13 b	5.59 a	5.67 a	5.72 a	5.46 ab	5.79 a	5.63 ab	5.39 bc	5.32 c

The questionnaire, consisting of eight items, showed a value for Cronbach’s alpha of 0.87 (highly reliable).

Most consumers choose honey because it is a natural and healthy product; other important factors were taste and nutritional values. Little importance was given to honey use as an ipocaloric sweetener. No differences were related to the interactions Motivations * Gender or Motivations * Consumption. This means that consumers’ behaviour was the same for all motivations. Females gave higher importance to all motivations compared to males; daily honey consumers gave higher importance to all motivations, and the importance given decreased according to the consumption frequency. Differences in consumption

reasons were recorded for different age classes (Motivations * Age). Consumers between 55 and 64 years old showed high sensitivity to all the factors proposed, followed by the classes 65–75 and 45–54, which were both less interested in the taste and the ipocaloric factor. Moreover, class 45–54 was also less sensitive to the “natural” motivation, while class 65–75 was less interested in the “multipurpose ingredient” motivation. Young consumers showed low sensitivity to all the motivations, but were generally more interested in the “tasty”, “natural”, and “nutrient” motivations.

3.3. Factors Determining Honey Choice (Q2)

The MCA plot illustrates the relationship between consumers’ profiles and honey consumption habits (Figure 1). Dimension 1 discriminated the population according to consumption frequency, which increased from right to left, and according to gender, with women reporting higher honey consumption than men. Age effects were also captured, with Dimension 1 separating the youngest group (18–29 years) from the others, while Dimension 2 further differentiated the remaining three classes. The lowest consumption frequency was observed in the 18–29 age group, whose choices appeared to be influenced by price and oriented toward well-known brands. Conversely, the highest consumption frequencies were associated with a stronger interest in origin, certification, proximity, and organic production. Regarding age-related differences, the 45–54 group showed a marked interest in label information, whereas consumers over 65 were more attentive to geographic origin.

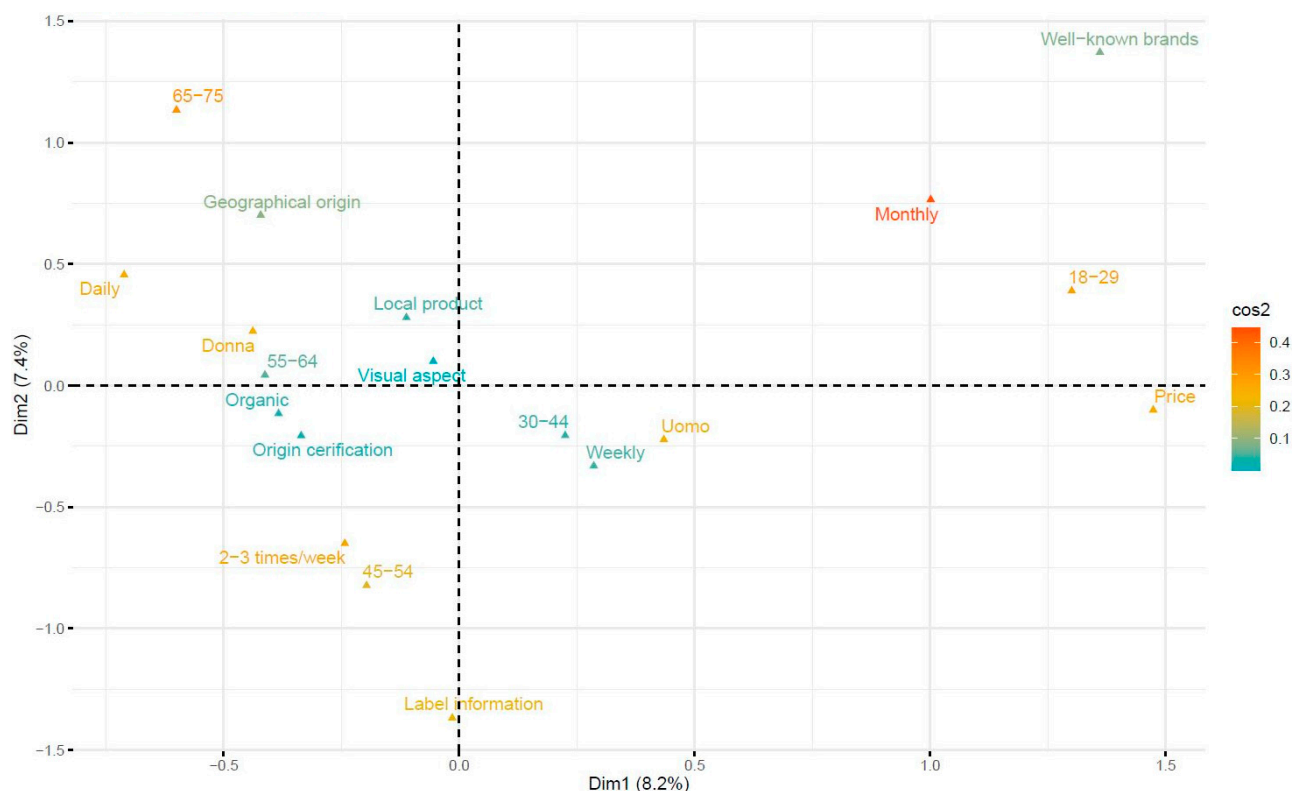


Figure 1. Multiple correspondence analysis on the factors influencing honey choice. Cos2 values, in different colours, indicate how well each factor is represented in the dimensions shown.

3.4. Consumer Point of View on Beekeeping and Honey Production (Q3)

Tables 5 and 6 present consumers’ levels of agreement, rated from 1 to 7, on various honey beekeeping and production issues.

Table 5. ANOVA table of the main factors and interactions related to the agreement on statements about beekeeping and honey production. Statistical differences are marked by * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Factors	Mean Sq	F Value	Pr(>F)
Statements	1343.9	552.808	$<2.00 \times 10^{-16}$ ***
Gender	17.6	7.225	0.007202 **
Age	18.2	7.503	4.96×10^{-6} ***
Consumption	14.3	5.898	0.000512 ***
Statements \times Gender	5.6	2.284	0.014853 *
Statements \times Age	6.2	2.553	9.53×10^{-7} ***
Statements \times Consumption	3.4	1.392	0.08504

Table 6. Level of agreement for beekeeping and honey production statements across gender, age, and consumption frequency. Statistical differences recorded in responses by using one-way, two-way, and three-way Anova. Likert scale: 1 (not in agreement)—7 (highly in agreement). Different uppercase letters in columns correspond to different means among the agreement scores. Different letters in rows correspond to different means among statements. If there were no significant differences, this was indicated with “ns”.

Statements	All	Gender		Age Class					Consumption Frequency			
		Female	Male	18–29	30–44	45–54	55–64	65–75	Daily	2–3 per Week	Weekly	Monthly
Biodiversity is threatened by climate change	5.85 A	5.95 a	5.75 b	5.65 ns	5.84	5.89	5.95	5.87	5.97 ns	5.89	5.80	5.70
Intensive farming reduces flower varieties useful for bees	5.87 A	5.94 ns	5.81	5.59 b	5.80 ab	5.90 ab	5.96 a	6.12 a	6.11 a	5.88 ab	5.80 b	5.67 b
Bee diseases and mortality are on the rise	6.03 A	6.15 a	5.90 b	5.67 c	5.87 bc	6.15 ab	6.14 ab	6.33 a	6.11 ns	6.07	5.91	5.98
Bees respond well to rising temperatures and climate change	3.69 E	3.65 ns	3.73	3.69 ns	3.84	3.56	3.72	3.58	3.61 ns	3.68	3.87	3.64
Invasion of alien and invasive plants is detrimental to bee habitat and survival	5.19 B	5.31 a	5.07 b	5.07 ns	5.24	5.19	5.27	5.12	5.14 ab	5.36 a	5.21 ab	4.98 b
Beekeepers manage to ensure the survival of bees with nomadism	4.96 C	5.01 ns	4.92	4.65 c	4.86 bc	4.93 abc	5.16 ab	5.22 a	5.04 a	5.02 ab	5.03 ab	4.73 b
The climate change is not a threat	3.09 F	2.99 ns	3.19	3.16 ab	3.23 a	3.23 a	3.01 ab	2.66 ab	2.96 ns	3.09	3.33	3.02
Imports of foreign honey threaten the activity of local beekeepers and honey quality.	5.35 B	5.43 ns	5.27	4.79 b	5.28 a	5.50 a	5.63 a	5.44 a	5.50 ns	5.29	5.36	5.29
Bees are the most resistant to new diseases among pollinating insects	4.14 D	4.17 ns	4.11	3.94 ns	4.28	4.07	4.10	4.22	4.04 b	4.11 ab	4.41 a	4.04 ab
Intensive agriculture is beneficial for bee production	3.14 F	3.12 ns	3.15	3.15 ab	3.37 a	3.16 ab	3.04 ab	2.80 b	ns	3.13	3.37	3.07

The questionnaire, consisting of 10 items, showed a value for Cronbach’s alpha of 0.71 (reliable).

Most consumers agreed on the rise of bee disease and mortality, the reduction in flower varieties due to intensive farming, and the threat to biodiversity posed by climate change. A high level of agreement was also noted for “invasion of alien and invasive plants is detrimental to bee habitat and survival” and “imports of foreign honey threaten the activity of local beekeepers and honey quality”. A moderate level of agreement was recorded regarding the notion that “beekeepers manage to ensure the survival of bees with nomadism”. The lowest level of agreement was found for “bees respond well to rising temperatures and climate change” and “climate change is not a threat”.

No differences were related to consumption frequency (Statements * Consumption), while age (Statements * Age) and gender (Statements * Gender) influenced the agreement

reached on the different issues. The biggest differences were recorded for opposite age classes; older consumers, differently from younger ones, gave higher importance to issues such as “Intensive farming reduces flower varieties useful for bees” and “beekeepers manage to ensure the survival of bees with nomadism”, followed by “imports of foreign honey threaten the activity of local beekeepers and honey quality”. As for gender, males agreed less with “biodiversity is threatened by climate change”, “bee diseases and mortality are on the rise”, and “invasion of alien and invasive plants is detrimental to bee habitat and survival”.

3.5. Consumer Interest in the Social and Economical Sustainability of Beekeeping (Q4)

Tables 7 and 8 record consumers’ interest, from 1 to 7, in aspects regarding beekeeping sustainability.

Table 7. ANOVA table of the main factors and interactions related to interest in aspects of beekeeping sustainability. Statistical differences are marked by *** $p < 0.001$.

Factors	Mean Sq	F value	Pr(>F)
Aspects	20.55	16.085	$<2.00 \times 10^{-16}$ ***
Gender	112.47	88.023	$<2.00 \times 10^{-16}$ ***
Age	96.91	75.843	$<2.00 \times 10^{-16}$ ***
Consumption	25.15	19.682	1.06×10^{-12} ***
Aspects \times Gender	0.51	0.402	0.878
Aspects \times Age	1.3	1.018	4.38×10^{-1}
Aspects \times Consumption	0.86	0.675	0.84

Table 8. Consumers’ interest in aspects regarding beekeeping sustainability across age, gender, and consumption frequency. Statistical differences recorded in responses by using one-way, two-way, and three-way Anova. Likert scale: 1 (not interesting)–7 (highly interesting). Different uppercase letters in columns correspond to different means among interests. Different letters in rows correspond to different means among sustainability aspects.

Sustainability Aspects	All	Gender		Age Class					Consumption Frequency			
		Female	Male	18–29	30–44	45–54	55–64	65–75	Daily	2–3 per Week	Weekly	Monthly
Support of beekeepers for the importance of their activity	5.68 C	5.82 a	5.54 b	5.27 b	5.61 a	5.75 a	5.85 a	5.86 a	5.91 a	5.75 ab	5.54 bc	5.44 c
Respect for workers’ conditions	5.99 AB	6.12 a	5.86 b	5.66 b	5.94 ab	6.03 a	6.17 a	6.10 a	6.13 a	5.98 ab	5.84 b	5.99 ab
Fair remuneration of labour	6.04 AB	6.16 a	5.92 b	5.59 c	5.94 b	6.14 ab	6.28 a	6.20 ab	6.22 a	6.01 ab	5.86 b	6.06 ab
Education and information programmes on the importance of bees for the environment	6.04 AB	6.19 a	5.89 b	5.51 c	5.95 b	6.18 ab	6.26 a	6.21 ab	6.24 a	6.07 ab	5.89 b	5.93 b
Shorten supply chain	5.92 B	6.03 a	5.80 b	5.44 c	5.75 bc	5.79 ab	6.20 a	6.21 a	6.12 a	5.91 ab	5.78 b	5.83 b
Involvement of local communities	5.95 B	6.08 a	5.82 b	5.53 c	5.84 b	6.02 ab	6.14 a	6.21 a	6.11 a	5.97 ab	5.86 ab	5.82 b
Strengthening consumer protection rules against fraud	6.11 A	6.19 a	6.03 b	5.51 c	5.89 b	6.26 a	6.35 a	6.56 a	6.36 a	6.10 b	5.96 b	5.98 b

The questionnaire, consisting of seven items, showed a value for Cronbach’s alpha of 0.91 (very high reliability).

Most consumers were interested in the strengthening of protection rules against fraud, followed by “education and information programmes on the importance of bees for the environment”, “fair remuneration of labour”, and “respect for workers’ conditions”. Consumers showed low interest in supporting beekeepers for the importance of their activity. There was no influence of age (Aspects * Age), gender (Aspects * Gender), or consumption frequency (Aspects * Consumption) on the aspects analysed.

3.6. Traceability Issues (Q5)

The importance of honey traceability issues from 1 to 7 is analysed in Tables 9 and 10.

Table 9. ANOVA table of the main factors and interactions related to issues about honey traceability. Statistical differences are marked by * $p < 0.05$; *** $p < 0.001$.

Factors	Mean Sq	F Value	Pr(>F)
Issue	110.54	76.95	$<2.00 \times 10^{-16}$ ***
Gender	167.04	116.28	$<2.00 \times 10^{-16}$ ***
Age	95.15	66.238	$<2.00 \times 10^{-16}$ ***
Consumption	19,47	13.556	8.12×10^{-9} ***
Issue \times Gender	3.47	2.6	0.0161 *
Issue \times Age	1.05	0.733	8.22×10^{-1}
Issue \times Consumption	1.22	0.849	0.6419

Table 10. Importance given to honey traceability issues across gender, age, and consumption frequency. Statistical differences recorded in responses by using one-way, two-way, and three-way Anova. Likert scale: 1 (not important)–7 (highly important). Different uppercase letters in columns correspond to different means among ratings of importance. Different letters in rows correspond to different means among traceability issues. If there were no significant differences, this was indicated with “ns”.

Traceability Issues	All	Gender		Age Class					Consumption Frequency			
		Female	Male	18–29	30–44	45–54	55–64	65–75	Daily	2–3 \times per Week	Weekly	Monthly
Transparent information on the production process	6.02 B	6.20 a	5.83 b	5.51 c	5.90 b	6.17 a	6.22 a	6.22 a	6.25 a	6.04 ab	5.83 b	5.89 b
Product origin and quality certifications (PDO, PGI, TSG)	5.99 BC	6.20 a	5.79 b	5.46 c	5.82 b	6.18 a	6.16 a	6.35 a	6.21 a	6.00 ab	5.97 ab	5.77 b
Organic Production Certification	5.84 C	6.06 a	5.63 b	5.42 b	5.82 a	5.94 a	5.95 a	6.01 a	5.99 a	5.91 a	5.81 ab	5.61 b
Indication of local origin	6.20 A	6.38 a	6.02 b	5.84 c	6.06 bc	6.25 ab	6.37 a	6.51 a	6.32 a	6.24 ab	6.17 ab	6.03 b
Botanical origin indication	5.86 C	5.96 a	5.75 b	5.39 c	5.79 b	5.90 ab	6.02 ab	6.17 a	5.96 a	5.88 ab	5.91 ab	5.67 b
Easily readable labels	6.21 A	6.33 a	6.08 b	5.66 c	6.07 b	6.40 a	6.34 a	6.53 a	6.29 ns	6.21	6.14	6.17
Link to detailed QR code information	5.25 D	5.30 ns	5.20	4.79 b	5.19 ab	5.37 a	5.46 a	5.34 a	5.43 a	5.25 ab	5.31 ab	5.00 b

The questionnaire, consisting of seven items, showed a value for Cronbach’s alpha of 0.87 (highly reliable).

The most important factors in terms of traceability were the presence of easily readable labels and the indication of local origin. Transparent information on the production process was also of interest. A link to detailed QR code information, the botanical origin indication, and the Organic Production Certification were considered less interesting. No differences were related to consumers’ age (Issue \times Age) or consumption frequency (Issue \times Consumption), while gender (Issue \times Gender) influenced the importance given to the traceability issues. Females considered all the proposed issues important, while males gave more importance only to the detailed QR code information.

3.7. Certification Issues (Q6)

The interest from 1 to 7 in the actual tools used for certification is analysed in Tables 11 and 12.

The questionnaire, consisting of five items, showed a value for Cronbach’s alpha of 0.88 (highly reliable).

The most interesting tools were the certification of origin and the certification of bee wellness and health, followed by certifications guaranteeing the pollen composition of honey and certification ensuring the protection of workers and communities. Environmen-

tal biomonitoring certifications were of less interest. No differences of interest were related to the consumer profile categories: gender (Tools * Gender), age class (Tools * Age), and consumption frequency (Tools * Consumption).

Table 11. ANOVA table of the main factors and interactions related to the certification tools. Statistical differences are marked by *** $p < 0.001$.

Factors	Mean Sq	F Value	Pr(>F)
Tools	56.61	36.698	$<2.00 \times 10^{-16}$ ***
Gender	150.43	97.509	$<2.00 \times 10^{-16}$ ***
Age	27.83	18.04	1.00×10^{-14} ***
Consumption	14.38	9.324	3.81×10^{-6} ***
Tools \times Gender	0.34	0.221	0.927
Tools \times Age	1.81	1.174	0.281
Tools \times Consumption	1.07	0.696	0.756

Table 12. Consumers' interest in certification tools across gender, age, and consumption frequency. Statistical differences recorded in responses by using one-way, two-way, and three-way ANOVA. Likert scale: 1 (not interesting)–7 (highly interesting). Different uppercase letters in columns correspond to different means among interests. Different letters in rows correspond to different means among certification tools. If there were no significant differences, this was indicated with "ns".

Certification Tools		Gender		Age Class					Consumption Frequency			
		Female	Male	18–29	30–44	45–54	55–64	65–75	Daily	2–3 \times per Week	Weekly	Monthly
Environmental biomonitoring certifications	5.48 C	5.66 a	5.29 b	5.27 ns	5.55	5.53	5.45	5.51	5.69 a	5.52 ab	5.40 ab	5.25 b
Certification of origin	6.07 A	6.23 a	5.90 b	5.57 c	5.97 b	6.12 b	6.23 ab	6.44 a	6.17 a	6.13 ab	6.00 ab	5.91 b
Certification of bees' health and wellness	5.96 A	6.14 a	5.79 b	5.66 b	5.94 ab	5.99 ab	6.08 a	6.10 a	6.09 ns	5.99	5.93	5.82
Certifications guaranteeing the pollen composition of honey	5.70 B	5.84 a	5.56 b	5.38 b	5.68 ab	5.72 ab	5.78 a	5.93 a	5.85 a	5.76 a	5.72 ab	5.45 b
Certification ensuring the protection of workers and communities	5.74 B	5.92 a	5.55 b	5.51 b	5.62 ab	5.76 ab	5.89 a	5.94 a	5.89 ns	5.66	5.75	5.66

4. Discussion

This study explored Italian consumers' behaviour toward honey to understand the key drivers of honey consumption, their perspectives on honey production and beekeeping, and their involvement in sustainability issues, traceability, and honey certifications, highlighting the growing attention given to this niche food product. The choice of an online survey allowed the selection of a specific consumer segment, interested in a niche product such as honey, overcoming the self-selection and representativeness bias.

As confirmed by Mascarello et al. (2024) [15], honey, produced by bees through a wholly natural process, is regarded as authentic, and this quality is the main reason for its preference. Although this concept can have multiple meanings, consumers mainly associate it with health, safety, and environmental considerations [23], confirming the symbolic and ecological value linked to beekeeping practices [24]. Other relevant motivations highlight the importance of health-related attributes for honey, as noted by Purnomo et al. (2021) [21]. Sensorial characteristics and taste have been recognised as significant [25] and influential factors in honey consumption, as documented in the previous literature [2,26]. Interestingly, no significant differences were observed based on gender or frequency of honey consumption; however, notable differences appeared among age groups. Generally, older individuals seem to have more motivations to consume honey compared to younger people, emphasising how honey is a well-known product among seniors and their capacity to appreciate it [27]. Younger consumers highlighted their concern for lifestyle and ecology [28],

placing greater importance on the “natural” motivation, whereas older individuals were less interested in honey’s attributes as “hypocaloric,” which may be because it has been shown that declining chemosensory abilities in the elderly can lead to unhealthy eating habits [29]. Indeed, the reduction in chemical senses results in maladaptive eating behaviours, with increased addition of sugar and salt to achieve the same taste intensity [29]. According to the relation between consumer profiles and honey choice determinants, women, generally more focused on a healthy diet and healthy food [19,30], such as honey, showed higher honey consumption rates, as confirmed by Kowalczuk et al. (2017) [31], and more attention to honey’s intrinsic quality attributes like organic status, origin, and origin certification, confirming their involvement with environmental and ethical aspects [28,32]. Young people were more influenced by extrinsic quality traits such as the brand and the price; indeed, lower purchase frequency was generally coupled with higher levels of price attention [32], and young people were shown to be less interested in high-priced food [33]. Moreover, recent studies showed young people were more sensitive to brands perceived as a guarantee of quality [34,35].

Label information was a universally relevant factor for all consumers, highlighting its important role in influencing honey selection regardless of age, gender, or consumption frequency and suggesting that transparent, detailed, and well-designed labels could be an important tool to communicate product quality and enhance trust in the beekeeping sector [15]. Unlike what was recently observed in the United States [36], Italian consumers demonstrated a high level of awareness of the ecological and structural challenges currently facing the beekeeping sector. This aligns with previous findings by Predieri et al. [37] and suggests heightened consumer sensitivity toward bee-related ecological issues. Italian consumers tend to recognise the critical ecological role of bees and understand the broader implications of unsustainable agricultural practices and environmental degradation. These findings are situated within the broader context of global concerns arising from ecological disasters and climate change, which increasingly affect populations worldwide [38].

From a sociodemographic perspective, older consumers and women were more aware of the issues faced by beekeepers. This confirms the gender-based sensitivity to environmental and ethical issues observed in previous studies [37] and suggests specific actions in future education policy development. Researchers have found that women tend to show relatively stronger environmental concern and behaviour than men [39]. Explanations of this have been linked to insights from sociological theories of gender that posit differences in the early socialisation process, roles, and statuses of each gender [39,40].

Beyond environmental and beekeeping production concerns, consumers expressed a strong interest in the key pillars of economic and social sustainability, such as fair labour practices and a transparent supply chain. There was high interest in fraud prevention regulations, educational initiatives regarding the role of bees in the environment, and fair remuneration and protection for beekeepers. These findings suggest that consumers are concerned not only with the intrinsic honey quality but also with the social and ethical dimensions of its production. Indeed, as already observed by Tomsa et al. [41], consumers also expressed concern about the impact of foreign honey imports on local beekeeping activities, price competition, and honey quality, echoing debates already present in other countries [42,43], and suggesting the need for strategic regulatory interventions [44].

Traceability emerged as a major concern for Italian consumers, consistent with previous studies [15,45], reflecting both a strong demand for openness in food supply chains and a willingness to pay for products with verified provenance. Mascarello et al. [15] observed that consumers particularly value clear labelling, indication of local origin, and accessible information on production methods. These elements are seen not only as guarantees of quality and authenticity, but also as tools to foster responsible practices and to

counter phenomena such as honey fraud and unfair competition, concerns already raised by Italian beekeepers [8]. Gender differences also emerged: women, who generally consume honey more frequently [46], paid greater attention to most indicators, though they showed less interest in QR code details, likely due to generally lower familiarity with such technologies [47].

The importance attributed to certifications further confirms consumer interest, especially in those concerning provenance, bee welfare, and ethical standards. This finding supports earlier research showing that certifications are trusted to ensure food integrity, sustainability, and fairness throughout the supply chain [15]. Although environmental biomonitoring attracted slightly less attention, the overall positive perception suggests that honey is now assessed within a broader framework of environmental and social responsibility, rather than being judged solely on its nutritional or sensory qualities [8].

This research provided a comprehensive understanding of consumers' attitudes toward honey. Its main contribution lies in highlighting consumers' awareness of the honey sector's needs and the strong connection between honey quality perceptions, sustainability, traceability, and certification. Indeed, our study highlighted the significant importance Italian consumers attribute to honey traceability, coupled with certifications, which are viewed as instruments to guarantee the origin, the production process, the well-being of honeybees, and the protection of workers. Italian consumers are highly engaged in ethical issues and food quality and safety standards. Thus, improving traceability could be a key factor in the sustainability of the entire honey sector. Furthermore, our findings, aligned with the needs and demands of beekeepers [10], provide a comprehensive overview of the sector's priorities. Although the study was limited to a specific geographic area, this constraint could be addressed by adapting the methodological framework to national or international contexts, thereby enabling a broader understanding of the interplay between consumer behaviour and sectoral challenges.

5. Conclusions

This study provides a comprehensive overview of Italian consumers' attitudes toward honey, emphasising their growing awareness of the vital role of bees and hive products. The primary contribution of this research lies in revealing the strong interconnection between consumers' perception of honey quality and key factors such as sustainability, supply chain transparency, and certification schemes.

Generational differences emerged clearly: older consumers place greater importance on traceability, show heightened sensitivity to environmental challenges, and value certifications that ensure sustainability, product quality, animal welfare, and adherence to social and ethical standards. Female consumers, who generally consume honey more frequently, demonstrated particular attention to ethical considerations, food safety, and environmental responsibility.

Transparency was a central concern across all groups, with participants valuing legible labels, indication of local origin, and accessible information about production methods. These attributes were seen not only as markers of honey quality but also as guarantees of responsible practices, including the protection of bee welfare and fair labour conditions. The alignment between consumer expectations and beekeepers' needs underscores the practical relevance of these findings, pointing to opportunities for targeted interventions along the supply chain. The prominence of ecological, environmental, and social sustainability issues indicates that beekeepers should integrate consumer preferences into their communication strategies. Companies, in turn, should emphasise transparency, product safety, and the natural sustainability associated with honey, while policymakers should strengthen support systems to ensure the sector's economic and local viability.

Educational initiatives developed in collaboration with schools and institutions could foster awareness among younger generations, encouraging honey consumption by highlighting its nutritional value and environmental credentials. Promoting knowledge of certification schemes as reliable tools for informed decision-making and fraud prevention can further enhance supply chain traceability and benefit all stakeholders, from bees to beekeepers. The sector faces additional challenges due to climate change, making institutional support through protective projects and awareness campaigns particularly valuable. Consumers' concerns regarding the effects of climate change on apiculture further reinforce the need for educational initiatives and public engagement at multiple levels.

This research takes a multidimensional approach to capture the complex set of motivations, concerns, and informational needs influencing honey consumption. It demonstrates that consumers' awareness of production practices, interest in certified and traceable products, and attitudes toward sustainable beekeeping collectively shape ethical and informed choices in the honey market.

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