TECHONEY

Development of a blockchain-based ecosystem that allows an improved positioning of small producers of honey on local and international markets

WP5: NEW OPTIMIZED AND SUSTAINABLE BUSINESS MODELS

D5.2: Market studies and marketing strategies (Ordu University)

CHARTER

PROJECT	Project full title	Development of a blockchain-based ecosystem that allows an improved positioning of small producers of honey on local and international markets		
	Project acronym	TECHONEY		
	EC programme	Grant Agreement	National Founding Prima Sec. 2	
		Programme	Partnership on Research and Innovation in the Mediterranean Area (PRIMA)	
		Section 2	Multitopic 2021	
		Thematic Area 3	Agro-food chain	
		Topic	Increasing the resilience of small-scale farms to global challenges and COVID-like crisis by using adapted technologies, smart agri-food supply chain and crisis management tools	
		Funding scheme	Collaborative Project	
		Type of Action	Research and Innovation Actions (RIA)	
	Coordinator	Tiziana de Magistris · Principal Investigator Centro de Investigaciones Técnicas Agrolimentarias (CITA) · Zaragoza (Spain)		
	Start date	01.May.2022	Duration	42 months
	Project URL	http://www.techoney.org		
DELIVERABLE	Deliverable	**D5.2: Market studies and marketing strategies. Definition of marketing strategies based on market studies for the scaled-up case studies**		
	Work Package	WP5: NEW OPTIMIZED AND SUSTAINABLE BUSINESS MODELS		
	Date of Delivery	09/10/2025		
	Nature	R (Report)	Dissemination Level	PU (Public)
	Lead Beneficiary	Prof. Dr. Seval MUTLU ÇAMOĞLU (Ordu University)		
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	Approver	Tiziana de Magistris (CITA)		
	Filename	TECHONEY- D5.2: Market studies and marketing strategies		
	Version	I.)		
	Abstract of the Deliverable	This study focuses on identifying marketing strategies that can be implemented with the use of blockchain technology in the honey supply chain. A literature review was conducted by considering blockchain technology, marketing strategies, food supply chain and traceability. In these studies, the recommended marketing strategies were examined. A questionnaire was prepared to determine the marketing strategies for the experts involved in the Techoney Project. Upon reviewing the data, the most applicable three marketing strategies were determined: firstly, "food safety and crisis management strategy", secondly, "storytelling and emotional connection", thirdly, "positioning strategies based on consumer preferences". As a result, the food safety advantage provided by the blockchain system developed based on traceability, the integration of honey production processes and producers' narratives into the system, and consumer-specific communication strategies should be emphasized.		

VERSION TRACKER

Version	Reviewer	Partner	Date	Status
0.1	Prof. Dr. Seval MUTLU ÇAMOĞLU	Ordu University	09/10/2025	First Draft

DISCLAIMER

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EXECUTIVE SUMMARY

- This report focuses on identifying marketing strategies that can be implemented with the use of blockchain technology in the honey supply chain.
- First, scientific articles dealing with blockchain technology, marketing strategies and food supply chain and traceability were examined. With this literature review, the marketing strategies recommended in these studies were tried to be determined.
- In these studies, blockchain systems were evaluated through different countries and product examples, and marketing strategies were put forward based on research findings.
- Strategies have been analysed and classified by considering the basic strategy in marketing science. Thus, within the scope of the Techoney project, blockchain-based marketing strategies that can be applied in the honey supply chain have been compiled based on theoretical foundations.
- In the next stage, the feasibility of these strategies was evaluated in the five countries involved in the Techoney project (Tunisia, Turkey, Spain, Luxembourg and Italy).
- For this purpose, a questionnaire has been prepared for project experts in the relevant countries. They were asked to evaluate the applicability of each marketing strategy in their own countries. The averages of the scores given by each participant were calculated and presented in tables.
- Based on the country-specific evaluations of the Techoney Project experts, it was analysed whether the blockchain-based traceability system could be implemented more effectively for the honey industry.
- According to the results of the research, the most applicable marketing strategies were determined in comparative analysis based on expert opinions. As a result, the strategy with the highest average score is the "Food Safety and Crisis Management" strategy (mean: 8.18). The second strategy is "Storytelling and Emotional Connection" (mean: 7.25). In third place is the "Positioning Based on Consumer Preferences" strategy (mean: 7.22).
- These results show that the emphasis on food safety should be at the forefront in the blockchain system, and the fast and supportive role of blockchain should be emphasized. On the other hand, transparency in production processes is one of the most important features of blockchain. In terms of strengthening the bond between producers and consumers, storytelling through the blockchain system will be very useful for strategies. Moreover, it should not be ignored how much consumer preferences should be prioritized.

1. INTRODUCTION

This Task 5.2 focuses on identifying marketing strategies that can be implemented with the use of blockchain technology in the honey supply chain. First, within a conceptual framework, scientific articles dealing with blockchain technology, marketing strategies and traceability in the food products supply chain were scanned using the bibliometric method. Until June 2025, articles published in journals indexed in the Web of Science database were examined and 15 main studies were identified. In these articles, different countries and product examples related to the blockchain system are examined. Marketing strategies for the system were determined by using the research findings.

In these articles, the proposed marketing strategies are analysed and classified under the basic strategy headings of marketing science. Thus, within the scope of the Techoney project, blockchain-based marketing strategies that can be applied in the honey supply chain have been compiled in line with the theoretical foundations of marketing science.

In another stage of the study, the applicability of these strategies was evaluated in the case of five countries "Tunisia, Turkey, Spain, Luxembourg and Italy", which are included in the Techoney project. For this purpose, a questionnaire has been prepared for project representatives in the relevant countries. In the form, they were asked to score the applicability of each strategy in their own countries, and it was analysed which strategies could be implemented more effectively in which countries in line with the data obtained.

2. Bibliometric Literature Review

As a result of the search conducted with the keywords blockchain, marketing strategy, food supply chain and traceability system in the journals published in Web of Science, 15 articles were identified as of June 2025. When these articles are examined, they are examined in terms of recommended marketing strategies for blockchain.

Sun, Song, Jiang and Guo (2023) analyse the strategies of businesses operating in the fresh agricultural products sector to use blockchain technology in a competitive environment. Traditional and blockchain-based traceability systems were compared using mathematical models based on game theory, effects on pricing, profitability and demand

Although the marketing strategy in the article is not presented directly under the heading of "marketing", it indirectly offers a marketing strategy suggestion. These strategies are shaped by considering consumer behaviour and the competitive environment.

In this study, suggestions such as positioning based on consumer preferences, emphasizing the benefits of blockchain technology, increasing value perception through pricing, turning demand shift into advantage, and compensating for high costs with brand value were identified based on the results of the study (Sun et al., 2023).

Frigerio, Campone, Giustra, Buzzelli, Piccoli, Galimberti, Cannavacciuolo, Ouled Larbi, Colombo, Ciocca and Labra (2024) examine the verification technologies used in the fight against modern food fraud and examines how chemical, biochemical, and genetic markers can be integrated with new technologies such as nanotechnology, computer vision, and artificial intelligence. Discusses. In the study, supported by literature review and case examples, technologies such as chemical analysis, DNA barcoding, spectroscopy, metabolomics, nanotechnology and computer vision were compared; examples of technological convergence are presented in four sectors that are vulnerable to counterfeiting, such as seafood, spices, olive oil and wine. The goal is to improve reliability and prevent counterfeiting in the food supply chain.

While the article does not directly present a marketing strategy, strategic implications can be drawn regarding the role of blockchain technology in food verification. Blockchain provides a positioning based on transparency and trust by recording the process from production to consumption in an immutable way; This feature can be especially evaluated in marketing aimed at consumers who are sensitive to sustainability and ethical production. Technology-enabled traceability in high-value products such as olive oil, wine, and spices can enhance brand differentiation and value perception. Consumers' access to product history through QR codes can increase engagement, encourage loyalty and repeat purchase behaviours. Additionally, blockchain technology can provide a common verification infrastructure between regulatory bodies in international markets, providing trust and competitive advantage in export processes. However, it is emphasized that this technology alone is not sufficient and must be integrated with chemical and biological markers (Frigerio et al., 2024)

Balzarova, Dyer and Falta (2022) evaluate the potential contributions of blockchain technology (BCT) in achieving the key objectives of Fairtrade (FT) programs, such as transparency, traceability, and fair profit distribution. The opinions of FT representatives and blockchain experts in New Zealand and Australia were consulted to analyse their perceptions and technology readiness levels regarding the integration of BCT into the FT system. Semi-structured interviews and analysis within the framework of the Technology Readiness Index (TRI) revealed that while there are positive views that BCT can contribute to the FT goals, there are still serious obstacles to implementation. These barriers include cost,

lack of information, data security concerns, and the reluctance of actors in the supply chain to collaborate.

While the article does not provide a direct marketing strategy, strategic implications can be drawn regarding the integration of blockchain technology into the FT system. Blockchain technology offers transparency and trust-based positioning for Fairtrade brands; It enhances consumer confidence in ethical production. Information access provided by QR codes strengthens consumer engagement and loyalty. Through digital document management, operational efficiency increases and costs decrease. Manufacturers gain bargaining power through visibility into the supply chain. Lastly, it shows consumers the social impact of their products, encouraging conscious consumption and repeat purchases. (Balzarova et al., 2022).

Dionysis, Chesney and McAuley (2022) examine consumer purchasing intentions for coffee products with blockchain-based traceability systems and the psychosocial determinants of these intentions. The research was conducted within the framework of the Theory of Planned Behaviour (TPB) and expanded by including additional variables such as trust, habits, and environmental protection in the model. An online survey was conducted with 123 participants. Participants were offered organic coffee with two different traceability systems, one with traditional UTZ certification and the other with blockchain-based. Three key components of TPB (attitude, subjective norms, perceived behavioural control) and additional variables (habits, trust, environmental protection) were measured.

With the findings obtained, some strategic approaches can be drawn in the marketing of products with blockchain traceability. Blockchain-powered marketing strategies can increase consumer interest with an emphasis on environmental sustainability. Transparent information about the origin of products, especially supported by QR codes, builds trust. Presenting information with simple, understandable, and mobile-friendly interfaces strengthens the user experience. Consumers' willingness to pay more presents the opportunity for premium pricing. Finally, in response to the low level of awareness, awareness campaigns involving scientists and credible actors can support the adoption of traceability systems (Dionysis et al., 2022).

Li, Liu, Li, Xiong and Lu (2023) analyse the encroachment strategies of manufacturers in the e-commerce environment and the timing of these decisions, considering consumers' preferences for product traceability. For this purpose, the Stackelberg game theory model was developed for a two-tier supply chain consisting of a producer and a retailer; Equilibrium analyses were performed under different channel structures (single channel, dual channel), product types (traceable and ordinary products) and decision timings (early,

simultaneous, late). In the model, the profits, order quantities and strategic decisions of the manufacturer and retailer were evaluated by considering parameters such as consumer traceability preference, traceability cost and channel competition intensity.

Based on the study's findings, marketing strategies for blockchain technology can be proposed. By differentiating products based on consumer traceability preferences, trust can be increased, and higher pricing can be applied. Manufacturers can gain a timing advantage by waiting for the retailer's order decision; This increases profitability, especially in a dual-channel structure. Strategy should be determined according to the channel structure; Direct sales are more advantageous in low traceability preferences, and dual channels are more advantageous in high preferences. Cost-sharing is recommended because charging traceability costs only to the manufacturer can reduce the willingness to invest. In addition, when channel competition intensifies, the manufacturer and retailer can reduce competition by offering different products; for example, one can be traceable, while the other can sell standard products (Li et al., 2023).

Dehghani, Popova and Gheitanchi (2022) elaborate on the factors influencing the adoption of blockchain technology in the food industry and how this technology can be used for marketing strategies. The marketing strategies proposed in the study aim to add value to brands by focusing on the transparency and trust elements offered by blockchain technology. Providing information about the production process of products with QR codes increases consumer trust and provides a competitive advantage against counterfeiting. By establishing an emotional connection with producer stories and visuals, the customer experience can be enriched, especially in premium products. While the integration of blockchain with artificial intelligence and biometric data offers personalized marketing opportunities; Its emphasis on social responsibility and sustainability creates a strong message for environmentally conscious consumers. Furthermore, blockchain-enabled traceability can be an important differentiation tool when entering specialized market segments such as organic (Dehghani et al., 2022).

Tan, Huang and Li (2023) examine whether blockchain-based traceability systems guarantee information accuracy through evolutionary game theory. While the article does not directly provide recommendations under the heading of "marketing strategy," strategic implications can be drawn towards enhancing the adoption and reliability of blockchain-based traceability systems. First, it is recommended that farmers upload product information to the blockchain with technologies such as RFID (Radio Frequency Identification) and buyers can rate farmers against counterfeiting by auditing this data. To increase consumer trust, transparency should be ensured on sensitive issues such as product freshness and origin,

and this information should be accessible through blockchain. Additionally, industry standards should be established in areas such as RFID compatibility, data entry processes, and auditing mechanisms. Agribusiness should view blockchain not only as a monitoring tool but also as an opportunity to create credibility and health-focused brand equity. Lastly, the state's strengthening of regulations against information falsification and supporting the oversight of blockchain systems will facilitate the widespread adoption of the technology (Tan, Huang, & Li, 2023).

Safeer and Pulvento (2024) discuss how blockchain technology can be leveraged to ensure the sustainability of the tomato processing industry in Italy. The integration of blockchain technology into marketing strategies to enhance the sustainability of the tomato processing industry in Italy can be evaluated from various aspects. Transparency-based brand value can be created by ensuring the traceability of products from production to consumption; This increases consumer confidence, especially in organic and local products. By reducing intermediaries, farmers can reach the consumer directly and ethical marketing based on fair trade can be done. With smart contracts, dynamic pricing and token-based loyalty programs can be implemented. Consumer engagement can be increased through mobile applications (DApps); Users can see the product history, make comments. Blockchain supports premium pricing by acting as a "certificate of trust" in export markets. Thanks to IoT integration, quality data is transferred to the blockchain, and marketing can be done with messages such as "cold chain guaranteed". Additionally, eco-friendly strategies can be developed with carbon footprint tracking, emphasizing sustainability with labels like "low-carbon tomatoes" (Safeer & Pulvento, 2024)

Rejeb, Keogh, Zailani, Treiblmaier and Rejeb (2020) systematically examine the potential benefits and challenges faced by blockchain technology in food supply chains (FSC). He used Systematic Literature Review (SLR) and bibliometric analysis methods.

This study reveals the strategic opportunities offered by blockchain technology in terms of marketing in food supply chains. First, thanks to Trust and Transparency-Based Brand Positioning, product history is shared with confidence, while brands could differentiate. Consumer Visibility Apps make it easier to connect with the product and increase loyalty. Counterfeiting Assurance Labelling certifies the authenticity of products, providing trust, especially in foreign markets. Turning Supply Chain Collaboration into a Marketing Advantage supports a "farmer-to-fork" approach with transparent data sharing among stakeholders. While environmental awareness is emphasized with the Sustainability-Oriented Marketing approach, quality-based pricing and loyalty rewards are possible with the

Dynamic Pricing and Loyalty system with Smart Contracts. Finally, Food Safety and Rapid Recall Capability give brands credibility, creating a strong image even in times of crisis.

Hassini, Ben-Daya and Bahroun (2025) evaluate the impact of Internet of Things (IoT) technology on the food supply chain (FSC) by modelling. The paper develops mathematical models that analyse the effects of IoT on pricing, profit, food waste, and supply chain coordination.

IoT and blockchain technologies offer many strategic opportunities in terms of marketing as well as operational benefits in food supply chains. Quality Responsive Pricing and Premium Product Positioning strategies with IoT support differentiation with pricing based on the real-time quality of the product and high-quality message, while Brand Image Reducing Food Waste and IoT-Supported Security and Traceability practices provide sustainability and trust-based communication. While Educational Content and Co-Branding Campaigns are important for transferring these technologies to the consumer, the increasing costs can be explained by Justifying the Price Increase with Quality. Blockchain-based strategies, on the other hand, offer approaches such as Trust-Based Value Proposition, Traceability-Focused Labelling, and Green Brand Image and Pricing to gain consumer trust. Additionally, Informative Content, Supplier Collaborations, Certification systems, and Technology Investment Storytelling contribute significantly to brand reputation and consumer loyalty. These strategies are redefining modern food marketing with digitalization and transparency.

Behnke and Janssen (2020) determine the boundary conditions necessary for the use of blockchain technology to increase traceability in food supply chains. In particular, the social and technical conditions affecting the sharing of quality assurance information in the dairy sector were investigated.

According to the paper's findings, blockchain technology offers significant strategic advantages for marketing in the food supply chain. While Trust-Based Brand Positioning increases consumer trust; Transparency-Focused Labelling ensures product traceability from farm to table. The Regulation-Compliant Communication strategy creates an export advantage by documenting compliance with regulations in international markets. Consumer Education and Information support informed consumer behaviour with content that explains the benefits of blockchain. Additionally, Industry Collaborations and Consortiums can build collective brand strength through shared platforms. Finally, blockchain's rapid recall capability, with its Crisis Management and Food Safety Emphasis strategy, makes it possible to maintain brand security even in times of crisis.

Tao and Chao (2024) examine the impact of blockchain-based food traceability systems on consumers' intentions to purchase organic agricultural products online. It also investigates

the mediating roles of product quality perceptions, product trust, and environmental information transparency perceptions on this effect. A model developed based on markup theory was analysed using structural equation modelling to examine the effect of consumers on the intention of purchasing organic agricultural products online.

According to the paper's findings, blockchain technology supports marketing strategies based on trust and transparency in the food supply chain. While consumer trust can be increased by emphasizing the accuracy of products with Trust-Based Marketing, purchasing intention can be positively affected by presenting the production process and source information transparently thanks to Strengthening Quality Perception. At the same time, it is possible to reach consumers with high environmental awareness with Emphasis on Environmental Transparency. Informative Labelling and QR Code Usage make data about the product's history accessible. While Education and Awareness Campaigns are important to raise awareness about this technology, trust can be built, especially for new brands, with the Brand Trust Building strategy. These approaches can provide a competitive advantage by establishing a strong connection with the consumer.

Bonetti, Bartoli and Mattiacci (2024) analyse the opportunities and challenges faced by blockchain (BC) technology in terms of marketing in quality food products with geographical indications (GIs) to provide a holistic framework for integrating BC into marketing strategies. The study adopted a qualitative research design, used cognitive mapping, and conducted in-depth interviews with farmers, producers, distributors, consulting firms, and consortium managers involved in blockchain projects related to GI products in Italy.

This article reveals the strategic opportunities that blockchain technology presents in terms of marketing. With the Strengthening Brand Positioning strategy, blockchain increases brand value by transparently presenting the authenticity and quality assurance of geographically indicated products. Increasing Consumer Trust reinforces consumer trust in the brand by providing reliable information about the product's history and production process. Product Storytelling adds depth to the brand narrative through traditional production methods and the digitization of local cultural context. Additionally, the traceability and reliability provided by blockchain with Access to International Markets create a competitive advantage in export markets. Finally, with the Strengthening Supply Chain Collaboration strategy, blockchain facilitates data sharing among stakeholders, creating a transparent and integrated structure that will enhance corporate reputation.

3. Classification of Blockchain-Based Marketing Strategies

The marketing strategies proposed in the reviewed articles were examined based on various market studies. Drawing from these proposals, the strategies were analysed within the framework of fundamental principles of marketing science. Through a conceptual analysis, these marketing strategies were classified as part of this study.

Accordingly, the blockchain-based marketing strategies suggested in the articles can be categorized under the core strategic approaches of marketing science as outlined below. In this table, the first column presents the marketing strategies identified from the reviewed articles. The second column aims to conceptually align the identified marketing strategies with established theoretical constructs and strategic frameworks within the discipline of marketing science. This mapping facilitates a deeper understanding of how blockchain-based approaches correspond to foundational marketing principles. The third column provides explanatory notes, and the fourth column cites the relevant sources.

Table 1. Classification of Blockchain-Based Marketing Strategies in Line with Marketing Science

Recommended Marketing Strategy	Equivalent in Marketing Science	Explanation	Source
Positioning according to consumer preferences	Targeting and Positioning Strategy (Kotler & Keller, 2016)	Special communication for consumers with high traceability sensitivity	Sun et al., 2023
Emphasis on transparency and trust	Value-Based Marketing / Brand Positioning (Kotler, & Keller, 2016).	Building trust with product history and manufacturing process knowledge, Product traceability and transparency	Frigerio et al., 2024; Balzarova et al., 2022
Creating a sense of value with pricing	Premium Pricing Strategy	High pricing with a perception of reliability and quality	Dionysis et al., 2022
Storytelling and emotional connection	Experiential Marketing / Storytelling	Connecting with the consumer through producer stories	Dehghani et al., 2022; Bonetti et al., 2024
Social responsibility and sustainability	Social Responsibility Marketing	Emphasis on ethical production, environmental awareness and fair trade	Safeer & Pulvento, 2024; Liu, 2024
Entry into new market segments	Ansoff Matrix – Product Development	Reaching new segments with blockchain-certified products	Dehghani et al., 2022
Digital transformation and CRM	Digital Marketing / CRM	Loyalty programs, personalization, DApps	Tan et al., 2023; Safeer

			& Pulvento, 2024
Crisis management and trust	Food Safety Strategy	Emphasis on quick recall, safe production	Rejeb et al., 2020; Behnke & Janssen, 2020

3.1. Positioning and Differentiation strategy according to consumer preferences

Positioning strategy according to consumer preferences is evaluated within the scope of Targeting and Positioning Strategy (STP model: Segmentation, Targeting, Positioning) in marketing science.

According to Kotler and Keller, positioning is to ensure that a product or brand has a specific and distinctive place in the minds of the target consumer audience. This process is shaped by consumer needs, preferences, and perceptions (Kotler & Keller, 2016). Positioning towards consumers, especially those sensitive to trust-based attributes such as traceability, ensures that the product is perceived as "transparent", "trustworthy" and "ethical".

In this context, communication strategies specific to consumers with high traceability sensitivity are considered as part of the targeting and positioning process. This strategy involves developing customized marketing messages based on the behavioural and psychographic characteristics of consumer segments.

A differentiation strategy aims for a business to gain a competitive advantage by offering unique features that set its product or service apart from competitors. This difference: It can be based on elements such as quality, design, brand reputation, technology, customer service, or reliability. According to Porter (1980), firms that implement a differentiation strategy can create a unique value in the eyes of customers, move away from price competition and create a loyal customer base. Blockchain technology supports this strategy by documenting whether products are counterfeit or not. For example, transparent documentation of the difference between real honey and glucose syrup mixed products increases the credibility of the brand and differentiates the product.

3.2. Value-Based Marketing and Brand Positioning strategy

Blockchain technology overlaps with value-based marketing and brand positioning strategies by increasing consumer trust. The strategy of emphasizing transparency and trust is evaluated under the headings of "Value-Based Marketing and Brand Positioning" in marketing science. This strategy aims to build trust by providing the consumer with transparent information about the product's history, manufacturing process, and quality

assurance. This approach is critical for consumer loyalty and brand reputation, especially in sensitive industries like food (Frigerio et al., 2024; Balzarova et al., 2022). It is a strategy that prioritizes the value offered to the customer (Kotler, & Keller, 2016).

Value-Based Marketing focuses on the value provided to the customer. Kotler and Keller (2016) define this approach as "gaining a competitive advantage by increasing customer value". This strategy encompasses not only the functional but also the emotional and symbolic values of the product. It is a strategy that prioritizes the value offered to the customer (Kotler, & Keller, 2016).

Brand Positioning aims to gain a brand-specific place in the consumer's mind. Transparency and trust are powerful positioning tools, especially for ethical and sustainability-focused brands. According to Kotler and Keller, effective positioning requires clear and distinctive communication of the value that the brand offers to the consumer. For example, with the QR code, the consumer can see from which beehive, and which flower the honey is produced.

3.3. Premium Pricing Strategy

The strategy of creating a perception of value through pricing is known as the Premium Pricing Strategy in marketing science. This strategy involves creating the perception that the product offers high quality, reliability, prestige, or unique features, offering it at a higher price point compared to competing products.

Premium pricing aims to get consumers to accept the high price of the product with the perception that it is of high value or superior quality. This strategy is often used in products that are luxury, organic, sustainable, or powered by technology. Confidence-boosting elements such as blockchain-powered traceability are crucial factors underpinning this strategy.

Pricing strategies aim to create value perception through premium pricing in blockchain-powered products (Dionysis et al., 2022).

3.4. Experiential Marketing and Storytelling strategies

These strategies aim to create an emotional connection with the brand, remember the brand, and develop loyalty.

Experiential marketing enables consumers to engage with the brand and have sensory, emotional, cognitive, and behavioural experiences. This strategy emphasizes not only the functional aspects of the product or service but also the experience it provides to the consumer (Schmitt, 1999).

Storytelling aims to establish an emotional connection with the consumer through narratives that tell the brand's values, origin, or the story of its manufacturer. Research shows that storytelling influences consumer behaviour, increasing brand identification and purchase intent (Júnior, et al. 2023; Marques, et al. 2023). Story-based communication is used to provide experience by establishing an emotional and sensory connection with the consumer and to strengthen the brand narrative (Fog, K., Budtz, C., & Yakaboylu, B. (2005). For example, the consumer can see the story of the beekeeper who produces the honey and the nature where the bees live.

3.5. Social responsibility and sustainability strategy

Transparent presentation of product history aligns with socially responsible marketing, especially for consumers with ethical production sensitivities. This strategy is based on the understanding that businesses must fulfil not only their economic but also their social and environmental responsibilities. Social responsibility marketing is an approach that aims to increase the welfare of society, protect the environment, and act in accordance with ethical values while marketing the products and services of businesses. Kotler and Lee (2005) define this strategy as "a marketing approach that enables companies to both achieve their business goals and produce solutions to social problems". It emphasizes social benefit and environmental awareness. This strategy appeals to consumers who are particularly sensitive to issues such as environmental sustainability, fair trade, ethical production, and social contribution. Transparency of production processes through blockchain technology increases the feasibility of this strategy (Safeer & Pulvento, 2024; Liu, 2024). For example, Organic certified production processes are documented with blockchain and presented to the consumer.

3.6. Entry into new market segments

The strategy of entering new market segments is evaluated within the scope of Product Development strategy in the Ansoff Matrix in marketing science. This strategy aims to grow by introducing new products to existing markets. Innovative solutions such as blockchain-certified products can be given as examples of this strategy.

The Ansoff Matrix (1957) classifies the growth strategies of businesses under four main headings:

1. Market Penetration (existing product – current market)
2. Market Development (existing product – new market)
3. Product Development (new product – existing market)

4. Diversification (new product – new market)

The Product Development strategy aims to grow by developing new products for the existing customer base. Products like blockchain-certified honey serve as a successful example of this strategy, providing differentiation in the current market. For example, new product categories such as "Blockchain certified honey" can be created.

3.7. Digital transformation and CRM strategy

Applications such as digital transformation, CRM, and loyalty programs are integrated with digital marketing strategies. Digital marketing is a strategic approach that aims to reach and engage with consumers through digital technologies. Technologies such as social media, mobile applications, e-mail, search engine optimization (SEO) and blockchain are considered in this context (Kotler, P., Kartajaya, H., & Setiawan, 2017).

CRM (Customer Relationship Management) aims to develop more effective marketing strategies, increase customer loyalty, and provide personalized experiences by analysing customer data. CRM systems optimize campaigns by tracking customer behaviour and increase customer lifetime value (Buttle, 2004).

These strategies aim to enhance customer experience, particularly through personalization, loyalty programs, data-driven campaigns, and blockchain-powered applications (e.g., DApps) (Tan et al., 2023; Safeer & Pulvento, 2024). For example, suggestions can be made according to consumer preference (e.g. chestnut honey, flower honey), loyalty programs can be integrated with blockchain.

3.8. Food Safety Strategy

Crisis management and trust strategy are evaluated within the scope of Food Safety Strategy in marketing. This strategy aims to protect brand reputation and increase consumer trust, especially through the effectiveness of product recall processes, transparency, and reliability. A food safety strategy aims to protect brand reputation and consumer trust by ensuring that products comply with health and safety standards from production to consumption. In this context, rapid recall mechanisms supported by blockchain technology, transparent communication and regulatory compliance ensure reliability in possible crises and make long-term reputation sustainable.

Blockchain technology plays a critical role in food safety strategy, enhancing the speed and accuracy of product recalls, particularly in crisis management processes. Blockchain-based traceability systems can provide confidence to the consumer by recording the product history in an unchangeable way and enable recall processes. Li, Zhang, and Chen (2023)

highlight the contributions of blockchain in terms of quality and safety in the food and beverage industry; It also states that technology is compatible with sustainability goals. Transparent data sharing and facilitating regulatory compliance through blockchain stand out as a competitive advantage for brands in Behnke and Janssen's (2025) digital transformation analyses, particularly in international markets.

4. Applicability of Blockchain-Based Marketing Strategies in Techoney Project

Each proposed marketing strategy was evaluated through scaled closed-ended questions directed to experts of the research teams in each country. These experts worked for three years within the Techoney project and therefore were considered to possess the highest level of expertise in the honey sector, blockchain technology, and traceability systems. The responses to these questions provided insights into the applicability and effectiveness of blockchain-based marketing strategies in the respective countries.

Researchers representing each country (Italy, Spain, Tunisia, Türkiye and Luxembourg) were asked about applicable marketing strategies in blockchain based honey market, and responses were collected. The following tables and charts compile expert opinions on the applicability of blockchain-based traceability systems in relation to prominent marketing strategies within the honey sector. This assessment is based on the projected impacts identified by experts participating in the Techoney Project, drawing on their insights from their respective countries. Participants rated the contribution of blockchain technology to sectoral marketing strategies on a scale from 1 to 10. This scale is structured such that a score of 10 reflects the highest level of agreement with the idea of applicability, while a score of 1 indicates disagreement. The average values of each participant's responses have been calculated and presented in the following Tables.

4.1 Positioning Based on Consumer Preferences (Targeting and Positioning Strategy)

Blockchain technology directly provides consumers with transparent access to information regarding a product’s origin, producer identity, and traceability data. This functionality has become a key decision-making factor for consumer segments in relevant countries that are increasingly attentive to food safety and authenticity. For instance, consumers seeking certified organic honey, the transparency afforded by blockchain can significantly influence purchasing decisions.

Table 2. Impact of Blockchain-Based Traceability on Consumer Trust and Strategic Targeting in the Honey Sector

	Italy	Spain_2	Spain_1	Tunisia_2	Tunisia_1	TR_1	TR_2	TR_3	TR_4	Lux_1	Lux_2	Mean
Blockchain-supported traceability enhances consumer trust in honey products in the relevant country.	8	8	9	9	8	8	9	8	8	8	6	8,1
Honey producers in the relevant country can effectively implement targeting and positioning strategies using blockchain technology.	7	8	4	8	6	8	7	8	5	7	5	6,6
Intermediaries in the honey sector of the relevant country can effectively implement targeting and positioning strategies using blockchain technology.	8	8	5	7	5	8	8	8	6	n.a.	n.a.	7,0
Mean	7,7	8,0	6,0	8,0	6,3	8,0	8,0	8,0	6,3	7,5	5,5	7,2

Note: Closed-Ended Questions (Likert Scale; 1 = Strongly Disagree, 10 = Strongly Agree)

In Table 2, the average response to the question "What is the potential of blockchain-based traceability systems to enhance consumer trust?" posed in the context of positioning strategies based on consumer preferences was calculated as 8.1. This result indicates that blockchain technology is generally perceived to have a strong positive impact on consumer trust within the honey sector.

On the other hand, the average score regarding the extent to which honey producers can implement targeting and positioning strategies through blockchain systems was 6.6. Notably, the applicability of the same strategic approach by intermediaries in the sector was rated slightly higher, with an average score of 7.0.

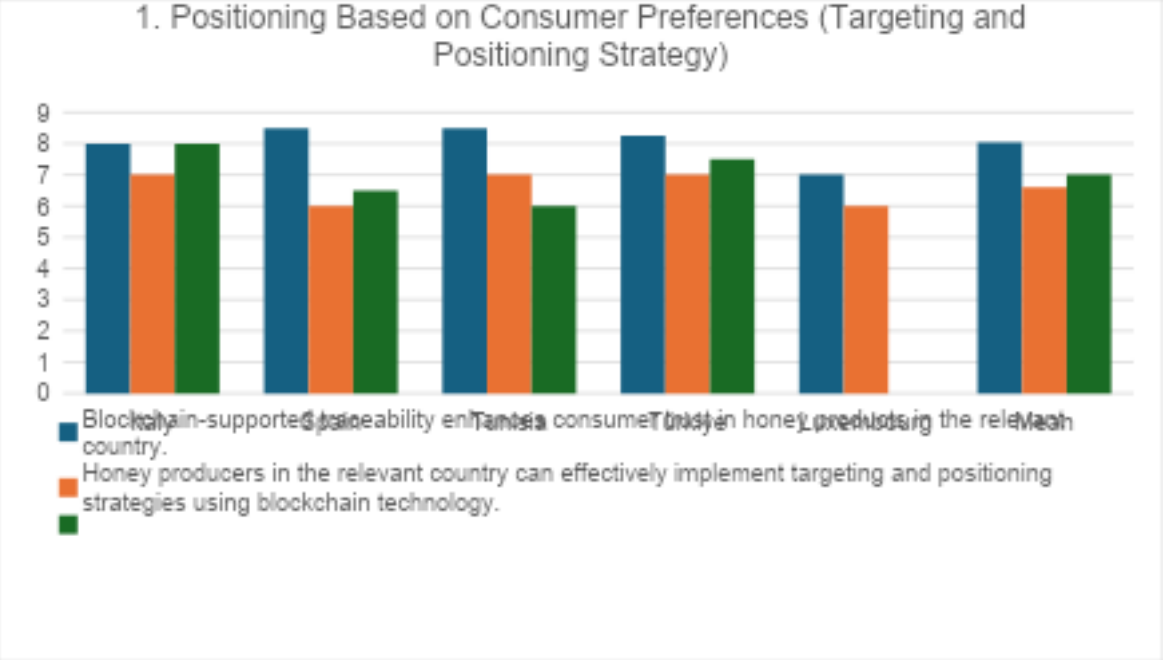

Figure 1. Applicability of Targeting and Positioning Strategies Based on Consumer Preferences by Country

An examination of Figure 1 reveals that Italy, Türkiye, Tunisia, and Spain each received an average score above 7, indicating that experts consider the implementation of this strategy to be feasible in these countries. The overall average score across all countries is 7.22.

The following section summarizes expert assessments regarding the applicability of blockchain-based traceability systems as a strategic tool for positioning honey products in selected countries.

Italy: Blockchain-based traceability has the potential to shift positioning strategies in Italy from being mainly claim-driven to being evidence-driven. Instead of simply telling consumers that honey is local, organic, or pure, producers can actually show the proof in real time. This creates a stronger alignment with consumer expectations, particularly in markets where authenticity and transparency have become central to purchase choices. For Italian honey, which competes both with mass imports and with high-value artisanal products, blockchain can act as a differentiator by connecting quality signals to verifiable data. Its strength lies less in creating completely new consumer segments than in deepening the trust and loyalty of those already inclined to value provenance and safety.

Türkiye: In recent years, Turkish consumers have become increasingly sensitive to issues of product safety and origin. Consequently, blockchain-based traceability offers a compelling strategic opportunity for honey brands. Stakeholders adopting this technology can position themselves as innovative, transparent, and trustworthy, thereby enhancing perceived quality and enabling price differentiation. However, given the limited public awareness of

blockchain in Türkiye, brands must actively associate the technology with trust and quality in their positioning efforts. While younger, tech-savvy consumers may adopt such innovations more readily, traditional consumer segments may require targeted education and awareness campaigns. Additionally, cost-related and structural constraints may limit short-term scalability.

Tunisia: 1. Blockchain-based traceability can improve consumer trust, but in Tunisia the majority of consumers still buy honey through informal channels without certification. Producers with stronger organization and market presence may use blockchain to differentiate, but many small-scale beekeepers lack resources and knowledge to integrate such tools effectively.

2. Blockchain-based traceability strengthens consumer confidence by providing transparent and verifiable information on the honey's origin, production process, and certification. This transparency responds directly to the growing demand for authentic and safe products among Tunisian consumers, particularly those interested in organic or high-quality honey.

Spain: 1. Blockchain technology can serve as a differentiation strategy by enhancing the reputation of beekeepers.

2. Blockchain is a technological solution that increases transparency, security, and efficiency in product tracking processes, significantly impacting the perception of value, trust, and brand differentiation. It allows consumers to verify the origin, production processes, and sustainability of the product, reinforcing brand credibility. This results in increased willingness to pay more for the product and increased loyalty.

Luxembourg: The honey market in Luxembourg faces significant challenges related to counterfeit products in retail channels. Blockchain's traceability features such as reliable laboratory results and verified origin data may offer a critical advantage in distinguishing authentic honey. However, the key consideration remains the cost of implementing such systems and the extent to which consumers are willing to pay for the added assurance of quality and authenticity.

4.2. Emphasis on Transparency and Trust (Value-Based Marketing / Brand Positioning)

Blockchain technology ensures transparency by securely recording and verifying all stages of the production process. This contributes to building consumer trust in markets where honey fraud and counterfeit products are common. For instance, A blockchain-based system designed to verify the authenticity of specialty honeys produced in specific regions in relevant country.

Table 3. Impact of Blockchain-Based Traceability on Value-Based Marketing Strategy in the Honey Sector

	Italy	Spain_2	Spain_1	Tunisia_2	Tunisia_1	TR_1	TR_2	TR_3	TR_4	Lux_1	Lux_2	Mean
The use of blockchain in the honey sector of the relevant country positively influences consumer trust by enhancing transparency.	8	9	9	9	7	7	9	8	9	7	6	8,0
Honey producers in the relevant country can effectively share reliable information about the production process through blockchain technology.	7	8	4	8	7	6	7	8	4	9	9	7,0
Intermediaries in the honey sector of the relevant country can effectively share reliable information about the production process through blockchain technology.	6	8	4	7	5	7	7	8	4	n.a.	n.a.	6,2
Mean	7,0	8,3	5,7	8,0	6,3	6,7	7,7	8,0	5,7	8,0	7,5	7,1

Note: Closed-Ended Questions (Likert Scale; 1 = Strongly Disagree, 10 = Strongly Agree)

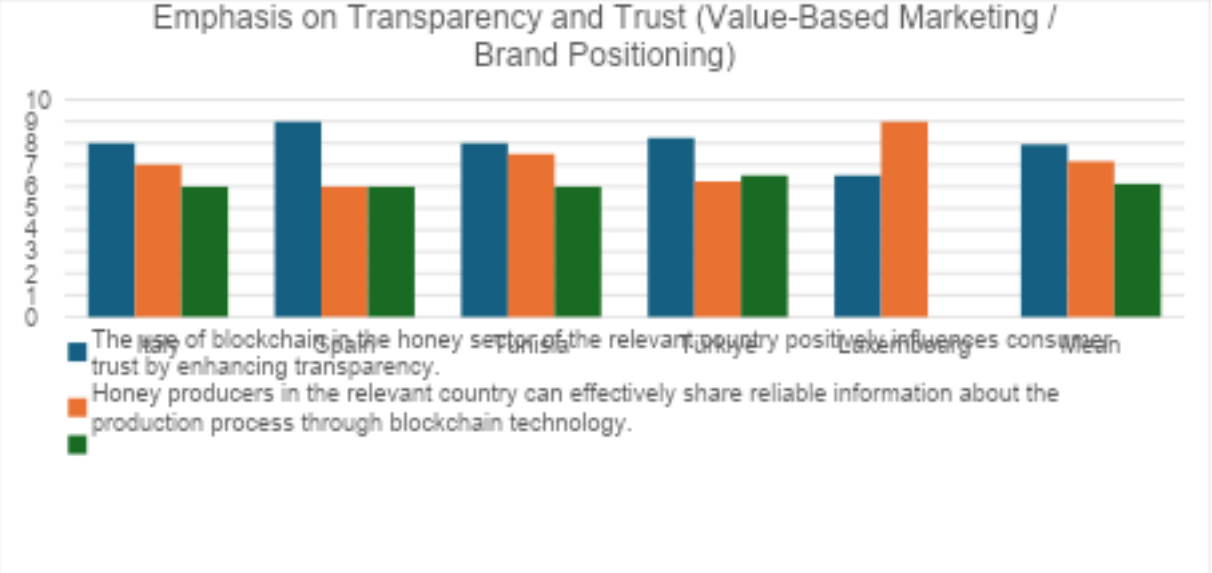

Figure 2. Applicability of Value-Based Marketing Strategies by Country

Table 3 presents the results of a closed-ended survey evaluating the impact of blockchain-based traceability on value-based marketing strategies in the honey sector

across different countries and regions. Overall, blockchain technology demonstrates a strong potential to enhance consumer trust through increased transparency, with an average score of 8.0. This effect is particularly pronounced in Spain and Türkiye, while Luxembourg shows relatively lower perceived impact. The ability of honey producers to share reliable information via blockchain varies across countries. Luxembourg stands out with high perceived competence in this regard, whereas Spain and Türkiye score comparatively lower.

Intermediaries received lower scores than producers in terms of their ability to share reliable information through blockchain. This may suggest that the role of intermediaries within the blockchain-enabled system remains less clearly defined. On average, the perceived contribution of blockchain to value-based marketing strategies is 7.1, indicating a moderately strong alignment. Transparency and trust emerge as the most prominently perceived benefits of blockchain technology in this context. Regional differences in the perceived ability of producers and intermediaries to share information may be attributed to variations in education, infrastructure, and levels of digitalization.

Expert opinions regarding this strategy have been stated as follows.

Türkiye: Türkiye is a significant beekeeping country; however, consumers are occasionally misled regarding the quality and origin of honey. In this context, blockchain technology can foster trust by ensuring transparency. By recording every stage of honey production from hive to table on the blockchain, full traceability can be achieved. Immutable records prevent the manipulation of certificates, laboratory results, and geographic data. Moreover, direct consumer access via QR codes allows individuals to verify the specific hive, date, and producer of the honey they purchase. Nevertheless, widespread adoption may take time due to infrastructure and cost constraints, particularly for small-scale producers. Legal regulations may also be required to support implementation. If supported through incentives and policy measures, these applications could enhance product quality and strengthen consumer trust in the honey sector.

Spain: 1. Immutable audit trail from hive to jar. A shared ledger can bind key events -harvest, extraction, filtration/thermal treatment, blending, lot creation, lab results, and logistics- into a tamper-evident chain. That helps retailers, regulators, and co-ops verify claims quickly. Labelling compliance with design. Smart forms can force packers to record blend percentages and origins before a lot can be "closed," making Spain's 2025 origin-percentage rule easier to enforce and audit. QR codes can surface verifiable batch data (origin % list, lab certificate hash, beekeeper co-op, harvest date). In markets where fraud has been widely reported that transparency can support a price premium for Spanish monoflorals.

2. Blockchain is effective in improving transparency and fostering trust in the honey sector by increasing consumer confidence by providing verifiable and accessible information. However, its effectiveness depends on factors such as producer adoption, consumer education, and integration with European regulations.

Italy: Blockchain can be quite effective in enhancing transparency and building trust in the Italian honey sector, especially given the widespread concern about fraud and adulteration. By recording key information such as origin, production practices, and laboratory tests, in an immutable system, it reassures consumers that the product's story is not just marketing but backed by verifiable data. Its impact is strongest when combined with familiar certifications like organic or PDO, since blockchain alone can seem abstract. Clear communication is also essential: if the technology is explained in simple, accessible terms, it can genuinely strengthen consumer confidence and differentiate high-quality Italian honey.

Tunisia: 1. Transparency is critical given the prevalence of adulterated honey in Tunisia. Blockchain can help, but its effectiveness depends on whether consumers understand and value the information provided. Many Tunisian consumers are price-sensitive, and awareness campaigns would be needed before blockchain truly fosters widespread trust.

2. Blockchain technology provides a secure and tamper-proof platform for recording and sharing data throughout the honey supply chain. By making details such as origin, harvest date, quality certifications, and processing methods accessible and verifiable, it directly addresses consumer concerns about authenticity, fraud, and adulteration.

Luxembourg: 1. Luxembourg has two types of honey producers. The majority are small beekeepers that usually sell directly to their clients in a trusted relationship. Blockchain could strengthen trust even more but is not considered as a pressing issue at the moment. Professional beekeepers have their own brands and might become more affected by declining trust in honey products, as more imported honeys are identified as low quality products based on novel DNA testing methods in Germany. Yet, they are not actively seeking for technological solutions. Blockchain technology can't prevent data manipulation during the extraction process and distribution. These stages must be monitored by a trusted person. Luxembourg has a short supply chain with no intermediate processing steps, and no relevant industrial use of honey.

2. One can assume that the blockchain efficiently enhances the transparency of information surrounding the quality and supply chain of honey.

But a customer might need technical understanding about how it works to understand the impact on trust in information provided via such a system. At the end information is provided via barcode and shown on portal that a customer needs to trust.

And while the information in the blockchain might be treated in the best possible way, one cannot guarantee that the initial information that is uploaded to the system matches the honey that is delivered to the customer.

4.3. Creating Perceived Value Through Pricing (Premium Pricing Strategy)

Consumers may be willing to pay higher prices for products that are certified and verifiably high in quality. In markets where honey fraud is prevalent, blockchain-based certification solutions can provide a legitimate foundation for premium pricing. For example, verifying the authenticity of a geographically protected honey variety, such as regional honeys, through blockchain could enhance its perceived value in the market.

Table 4. Impact of Blockchain-Based Traceability on Premium Pricing Strategy in the Honey Sector

	Italy	Spain_2	Spain_1	Tunisia_2	Tunisia_1	TR_1	TR_2	TR_3	TR_4	Lux_1	Lux_2	Mean
Blockchain-certified honey products in the relevant country are perceived by consumers as more valuable and of higher quality.	6	8	10	9	5	8	8	7	8	5	5	7,2
Premium pricing is applicable in the honey market of the relevant country for products supported by blockchain technology.	6	9	10	8	5	8	8	8	8	9	5	7,6
Mean	6,0	8,5	10	8,5	5,0	8,0	8,0	7,5	8,0	7,0	5,0	7,4

Note: Closed-Ended Questions (Likert Scale; 1 = Strongly Disagree, 10 = Strongly Agree)

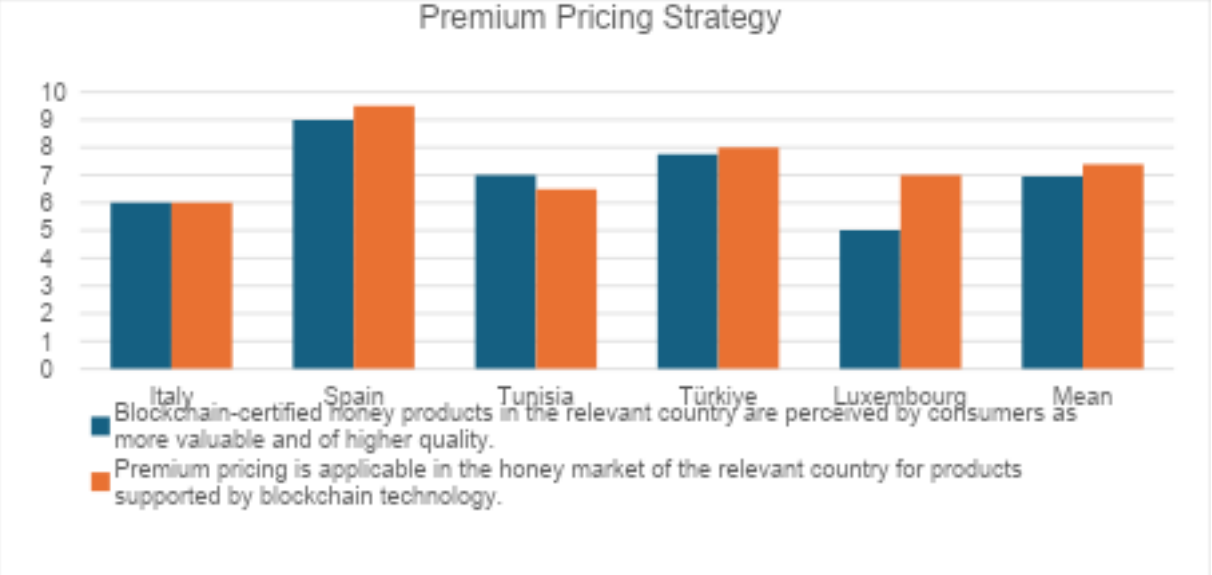

Figure 3. Applicability of Premium Pricing Strategy by Country

Table 4 and Figure 3 assess the impact of blockchain-based traceability on premium pricing strategies in the honey sector across countries. The evaluation is based on two key dimensions:

- Consumer perception (Mean: 7.2): Blockchain-certified honey products are generally perceived as more valuable and of higher quality. This perception is particularly strong in Spain and Türkiye, while it is comparatively lower in Luxembourg and Tunisia.
- Applicability of premium pricing (Mean: 7.6): Premium pricing strategies for blockchain-supported products are broadly considered feasible. There is strong endorsement of this strategy in Spain and Türkiye, whereas perceptions in Luxembourg vary depending on expert opinion.

Spain stands out with the highest overall perception, and in Türkiye, all experts rated the applicability of premium pricing at 7.5 or above, indicating strong alignment. In contrast, Luxembourg and Tunisia appear more reserved toward the implementation of such strategies. On average, the perceived contribution of blockchain to premium pricing strategies is 7.4, indicating Blockchain certification enhances consumers' perception of product quality and legitimizes premium pricing.

Expert opinions regarding the contribution of blockchain-based traceability to this strategy in the honey sector across countries are presented below.

Türkiye: Blockchain technology can foster trust by making the origin and supply chain of products transparent. In Türkiye, where concerns about counterfeiting are particularly high in sectors such as food, cosmetics, and luxury goods, this technology may contribute to a stronger perception of reliability among consumers. Consumers, especially those in the upper-middle income bracket and those who are more conscious may be willing to pay a

premium for transparency and quality assurance. Export-oriented brands may implement premium pricing strategies more effectively in international markets. However, if the price differential becomes too large, a mismatch between perceived value and cost may negatively influence consumer behaviour.

Spain: 1. Spanish consumers usually pay more just because honey is "blockchain-verified." What matters is trust, authenticity, and compliance with new origin-labelling rules. Blockchain can reinforce these claims, but buyers respond more strongly to familiar cues like PDO, organic, or monofloral origin. Any premium is likely modest, concentrated in urban niche or export markets, and tied to how the story is framed ("lab-tested and digitally certified") rather than the word blockchain itself.

2. Spanish consumers' perception of the premium prices for blockchain-backed honey is positive in terms of perceived value. This is because Spanish consumers associate the use of blockchain with transparency (certificates, beekeeper history, purity testing), which ensures higher-quality products, especially in conscious segments (eco, gourmet, health).

However, if the price differential is too high and the value is not well communicated, it can generate resistance or scepticism.

Italy: Consumer perceptions of blockchain-supported honey in Italy suggest that while the technology can increase a product's credibility, it does not automatically justify a higher price on its own. Italian consumers tend to see greater value when blockchain is combined with established signals such as organic certification, PDO/PGI labels, or strong regional branding. In those cases, blockchain acts as an extra layer of assurance that can reinforce the premium positioning. On its own, however, "blockchain-certified" may feel too abstract, meaning willingness to pay more remains limited unless the added trust is clearly tied to qualities consumers already recognize and value.

Tunisia: 1. Some niche consumers (urban, middle-income, health-conscious) may accept higher prices for certified blockchain-backed honey. However, the broader market remains highly sensitive to price, and informal/unverified honey still dominates.

2. In the Tunisian honey market, consumers who are aware of the risks of adulteration and mislabelling tend to associate blockchain certification with authenticity, quality, and safety. This creates a perception of added value, especially for regional or geographically protected honey varieties.

Luxembourg: 1. Luxembourgish consumers have a high purchasing power compared to other EU countries and can afford to pay premium prices compared to imported honey. Many Luxembourgish products with the national label "Made in Luxembourg" already have

a premium price, e.g. meat from local farmers, or drinks, like beer or gin. However, small beekeepers are reluctant to raise prices due to high internal competition.

2. While honey made in Luxembourg already has higher price, one cannot assume that customers are willing pay for even higher prices only on base of blockchain-based transparency.

4.4. Storytelling and Emotional Connection (Experiential Marketing / Storytelling)

Consumers tend to connect with the human stories behind the products they purchase. Blockchain technology enables the secure transmission of information such as producer identity, production processes, and even geographical characteristics. For example, sharing the verified stories behind honey produced by small family beekeepers can help build strong, loyal customer relationships.

Table 5. Impact of Blockchain-Based Traceability on Experiential Marketing Strategy in the Honey Sector

	Italy	Spain_2	Spain_1	Tunisia_2	Tunisia_1	TR_1	TR_2	TR_3	TR_4	Lux_1	Lux_2	Mean
In the honey market of the relevant country, producer stories verified through blockchain are effective in creating emotional connections with consumers.	8	9	9	9	6	9	9	7	7	5	7	7,7
Honey producers in the relevant country can successfully integrate blockchain-supported storytelling into their marketing strategies.	7	8	8	8	6	9	9	7	8	5	5	7,3
Intermediaries in the honey sector of the relevant country can successfully integrate blockchain-supported storytelling into their marketing strategies.	6	9	7	8	4	9	9	7	7	n.a.	n.a.	7,3
Mean	7,0	8,7	8,0	8,3	5,3	9,0	9,0	7,0	7,3	5,0	6,0	7,4

Note: Closed-Ended Questions (Likert Scale; 1 = Strongly Disagree, 10 = Strongly Agree)

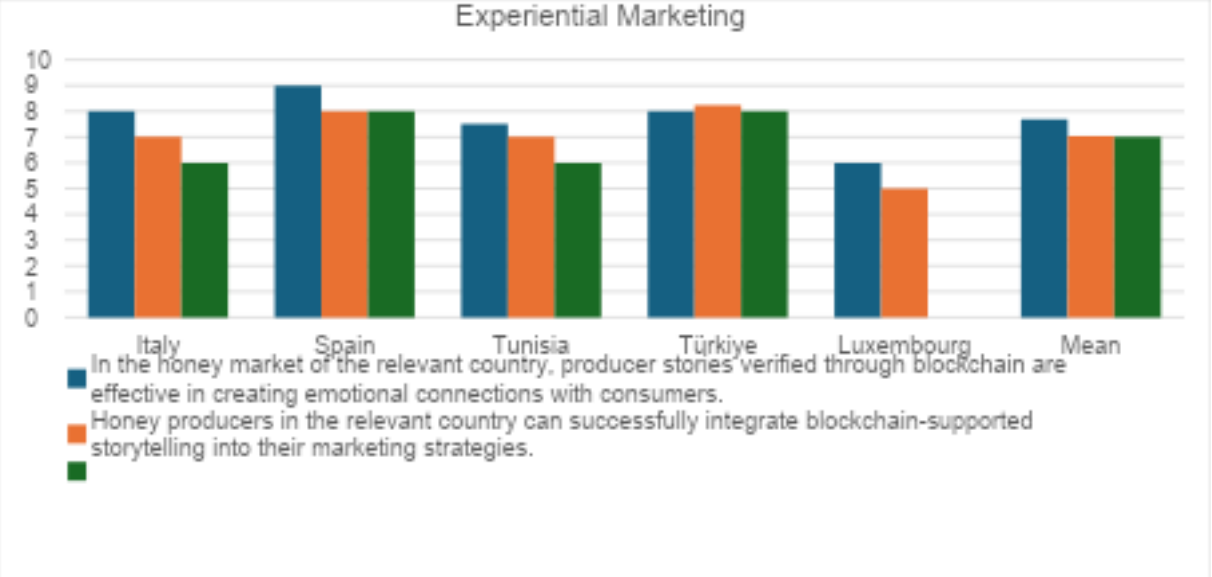

Figure 4. Applicability of Experiential Marketing Strategy by Country

According to Table 5 and Figure 4, experts in Türkiye and Spain express high confidence in the emotional engagement potential of blockchain applications. This suggests that blockchain-verified storytelling is perceived as a powerful tool in local honey markets. In contrast, the perceived impact appears more limited in Luxembourg and Tunisia. Producers in Spain, Italy, and Türkiye are viewed as more receptive to adopting this strategy. The lower scores observed in Luxembourg may indicate that the approach has not yet been embraced or that sectoral awareness remains limited. Intermediaries in Türkiye demonstrate strong potential for integrating blockchain-supported storytelling into their marketing strategies. However, confidence in this potential is notably lower in Tunisia and Italy. With an overall mean score of 7.4, Türkiye and Spain emerge as the countries with the highest potential for implementing blockchain-based experiential marketing strategies in the honey sector.

Expert insights on the contribution of these strategies to blockchain-based traceability in the honey sector across these countries are presented below.

Türkiye: Consumers tend to form emotional connections with the human stories behind the products they purchase. Blockchain technology can strengthen the trust element by making these narratives verifiable. This fosters a perception among consumers that "the brand is not lying to me." Particularly in the premium segment, this strategy can enhance brand loyalty and encourage repeat purchasing behaviour. If these stories are supported through digital platforms such as videos, interactive maps, and producer interviews consumer engagement can be further amplified.

Spain: 1. Blockchain storytelling in the Spanish honey sector can be evaluated by measuring how it boosts consumer trust, engagement, and loyalty compared to traditional marketing.

2. Blockchain-enabled storytelling strategies are beginning to have a significant impact on consumer engagement in the honey sector in Spain, particularly in terms of trust, emotional connection, and purchasing decisions. Blockchain-based storytelling strategies don't just inform they transform the consumer into the protagonist of the shopping experience.

Italy: I would evaluate the impact of blockchain-enabled storytelling in the Italian honey sector as quite positive, since it allows producers to combine authenticity with emotion. Verified stories about the beekeeper, the region, or the production process carry more weight because consumers know they are grounded in reliable data. This credibility makes the narrative more engaging and helps build a stronger bond between consumers and producers. Still, the effect depends on how the story is communicated: when it is simple, visual, and human-centered, it can deepen engagement and loyalty, whereas overly technical use of blockchain risks making the story feel distant.

Tunisia:1. The idea of sharing beekeepers' stories is appealing, but in Tunisia most producers are small, scattered, and not marketing-oriented. Blockchain-enabled storytelling could be powerful for cooperatives and larger-scale producers selling to urban markets, but it requires training and digital marketing support.

2. Blockchain-enabled storytelling has a strong potential to deepen consumer engagement in Tunisia's honey sector. Verified information about the beekeeper's identity, the production process, and the unique geographical environment adds an authentic human dimension to the product.

Luxembourg: 1. Small beekeepers already have personal contact with their clients. For medium and large beekeepers, blockchain technology is not suitable to validate their claims compared to a normal website. It would require a validation process by experts.

2. Would only help for small beekeepers that produce more honey than that they can sell via personal contacts.

4.5. Social Responsibility and Sustainability (Cause-Related Marketing)

Consumers today value not only high-quality products but also environmentally conscious and ethically sound production practices. Blockchain technology enables transparent documentation of compliance with sustainability criteria in honey production. For example, recording the carbon footprint data of an organic beekeeper in Italy on the blockchain can be particularly meaningful for environmentally aware consumers.

Table 6. Impact of Blockchain-Based Traceability on Social Responsibility and Sustainability Marketing Strategy in the Honey Sector

	Italy	Spain_2	Spain_1	Tunisia_2	Tunisia_1	TR_1	TR_2	TR_3	TR_4	Lux_1	Lux_2	Mean
Blockchain-based traceability in the relevant country increases consumer trust in ethical and sustainable production.	7	8	6	9	6	8	8	8	8	3	1	6,5
Honey producers in the relevant country can successfully integrate sustainability values into their marketing strategies with the support of blockchain technology.	7	8	9	8	6	9	7	8	5	3	1	6,5
Intermediaries in the honey sector of the relevant country can successfully integrate sustainability values into their marketing strategies with the support of blockchain technology.	6	8	8	8	3	9	7	8	6	n.a.	n.a.	7,0
Mean	6,7	8,0	7,7	8,3	5,0	8,7	7,3	8,0	6,3	3,0	1,0	6,7

Note: Closed-Ended Questions (Likert Scale; 1 = Strongly Disagree, 10 = Strongly Agree)

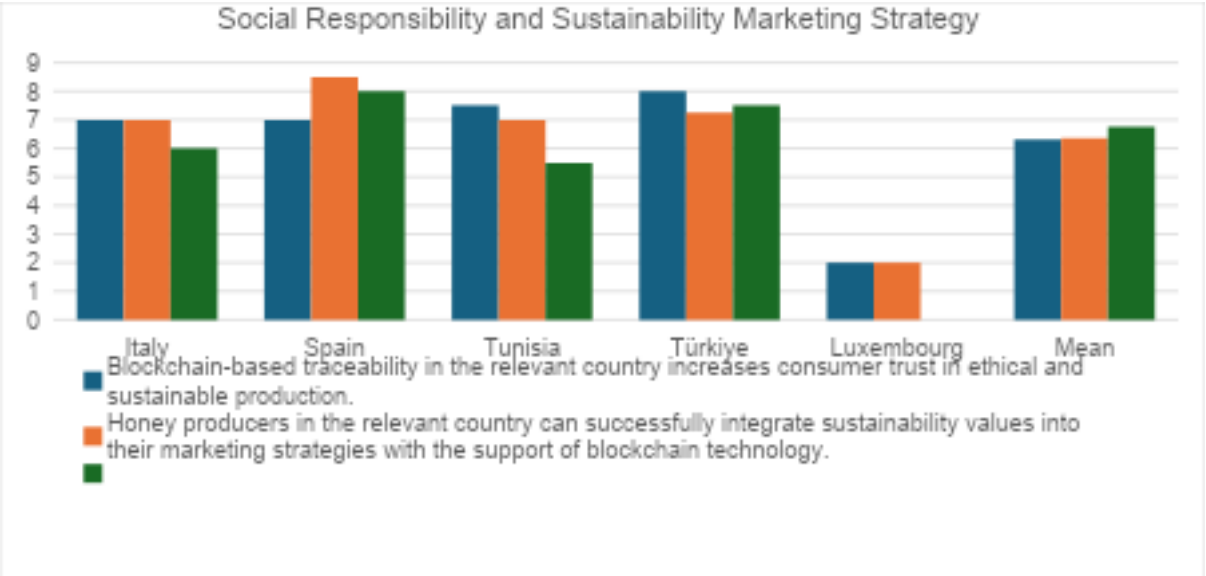

Figure 5. Applicability of Social Responsibility and Sustainability Marketing Strategy by Country

The data presented in Table 6 and Figure 5 reflect closed-ended survey results evaluating the impact of blockchain-based traceability on social responsibility and

sustainability-oriented marketing strategies in the honey sector across different countries. Blockchain is perceived to enhance consumer trust in ethical production particularly in Türkiye and Tunisia. In contrast, this effect is rated significantly lower in Luxembourg, which may indicate limited technological confidence or sectoral awareness. Experts in Spain and Türkiye consider both honey producers and intermediaries to have strong potential for adopting these strategies. In other countries, confidence in such adoption appears comparatively lower. The overall mean score for blockchain-supported sustainability strategies is 6.7, suggesting moderate but promising applicability across the sector.

Expert opinions regarding this strategy have been stated as follows.

Türkiye: Blockchain technology enables the immutable recording of sustainability criteria throughout the production process, including organic certifications, carbon footprint data, and bee health indicators. Through QR code access, consumers can verify, and audit producers' claims directly. In Türkiye, environmental awareness is steadily increasing, particularly among younger and more conscious consumer segments, for whom ethical and eco-friendly production serves as a strong purchasing motivation. Blockchain allows brands not only to make declarations but also to provide verifiable evidence, thereby enhancing the credibility of their claims. In conclusion, blockchain can render social responsibility and sustainability claims in the honey sector transparent, verifiable, and strategically powerful from a marketing perspective. This may offer brands a significant competitive advantage in both domestic and export markets.

Spain: 1. Blockchain can enhance the visibility of social responsibility, sustainability, and environmentally friendly practices in the Spanish honey sector by creating immutable, verifiable records of each stage of the value chain (beekeeping methods, pesticide use, fair-trade certification, carbon footprint, packaging choices). Consumers access this information via QR codes or digital traceability platforms, which strengthens trust in sustainability claims.

2. Including information that describes and validates the ethical and environmental commitment of honey producers in Spain. Such as sustainable practices (use of organic hives, natural bee nutrition, or absence of pesticides), fair working conditions (fair trade certifications or local cooperatives), or environmental footprint (data on transportation, emissions, or biodegradable packaging). Blockchain can transform invisible values into visible and verifiable assets, strengthening the connection between conscious producer and consumer.

Italy: Blockchain can make social responsibility and sustainability more visible in the Italian honey sector by giving consumers direct access to verified information about how honey is

produced. For example, data on practices such as pollinator protection, limits on antibiotic use, or reductions in carbon footprint can be securely recorded and linked to each jar. This transforms sustainability from a vague promise into concrete, traceable evidence. When communicated clearly, it allows environmentally conscious consumers to see and trust the producer's commitment, making ethical and eco-friendly production a visible and credible part of the product's identity.

Tunisia:1. While sustainability is a growing global trend, Tunisian honey consumers are not yet highly motivated by environmental claims. Blockchain can record sustainable practices, but very few beekeepers currently measure or communicate such data.

2. Blockchain technology can make social responsibility, sustainability, and environmentally friendly practices far more visible in the Tunisian honey sector by offering verifiable and tamper-proof records of each step in the production chain. For example, data related to organic certification, carbon footprint reduction, biodiversity protection, and fair labor practices can be stored on the blockchain and easily shared with consumers via accessible tools such as QR codes. This transparency not only builds trust but also differentiates Tunisian honey in competitive markets.

Luxembourg: 1. Sustainability and environmentally friendly production are already regulated by organic honey ("Bio" label). Producers must keep a log of all treatments of the bees. Publishing this data digitally would be possible but won't prevent wrong claims.

2. It is not clear how this would add an additional layer of trust compared to the existing bio labels.

4.6. Strategy for Entering New Market Segments

Innovative technologies such as blockchain can be particularly appealing to digitally literate, conscious, and younger consumer segments. These technologies enable the Italian honey sector to move beyond traditional beekeeping and reach urban, informed consumers. For example, blockchain-certified honey products can be marketed in major cities like Milan or Rome under the concept of "safe consumption."

Table 7. Impact of Blockchain-Based Traceability on New Market Segments Strategy in the Honey Sector

	Italy	Spain_2	Spain_1	Tunisia_2	Tunisia_1	TR_1	TR_2	TR_3	TR_4	Lux_1	Lux_2	Mean
Blockchain-supported honey products in the relevant country attract strong interest from innovative consumer segments.	7	9	10	9	5	7	8	7	5	9	6	7,5
Honey producers in the relevant country can effectively reach new market segments by using blockchain technology.	6	9	9	8	6	8	6	8	6	9	5	7,3
Intermediaries in the honey sector of the relevant country can effectively reach new market segments by using blockchain technology.	6	8	9	8	3	9	6	8	7	n.a.	n.a.	7,1
Mean	6,3	8,7	9,3	8,3	4,7	8,0	6,7	7,7	6,0	9,0	5,5	7,3

Note: Closed-Ended Questions (Likert Scale; 1 = Strongly Disagree, 10 = Strongly Agree)

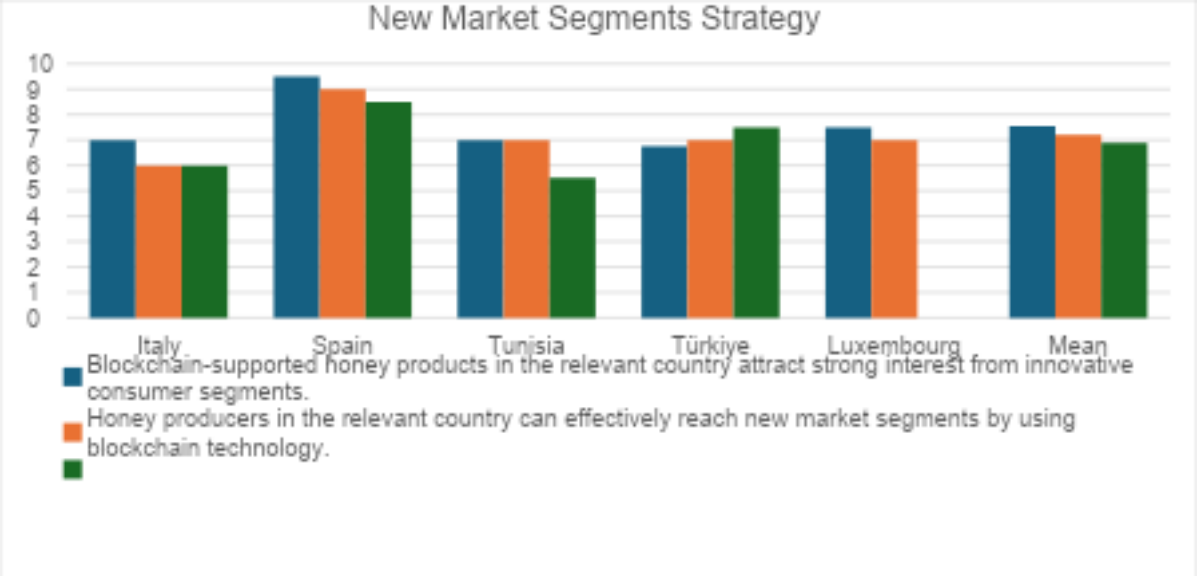

Figure 6. Applicability of New Market Segments Strategy by Country

The data presented in Table 7 and Figure 6 illustrate the perceived impact of blockchain-based traceability on strategies aimed at accessing new market segments within the honey sector. In Spain and Tunisia, blockchain-supported honey products are considered attractive to innovative consumer segments. In Luxembourg, expert opinions appear divided, while in Türkiye, interest in this strategy is perceived as moderate. Experts suggest that producers and intermediaries in Spain and Türkiye are relatively well-positioned to adopt this approach. In contrast, confidence in its applicability remains more limited in Italy,

Tunisia, and Luxembourg. The overall mean score for the New Market Segments Strategy stands at 7.3, indicating a generally positive outlook across the evaluated regions.

Expert opinions regarding this strategy have been stated as follows.

Türkiye: Blockchain technology has the potential to move beyond traditional boundaries in Türkiye's honey sector by reaching urban, informed, and digitally engaged consumer segments. With appropriate positioning, effective digital communication, and strategic partnerships, this potential can be harnessed efficiently. However, the concept of blockchain is still not widely known, understood, or accessible in Türkiye. Therefore, it must be communicated clearly, simply, and with a focus on tangible benefits. On the other hand, premium pricing may limit access to broader consumer groups. Support mechanisms may also be necessary to facilitate the integration of small-scale producers into blockchain-based systems.

Spain: 1. You can evaluate the potential of blockchain for reaching new consumer segments in the Spanish honey sector by analyzing whether traceability and transparency features appeal to health-conscious, environmentally aware, and premium-product buyers, and then measuring uptake through market segmentation studies, pilot projects, and willingness-to-pay analysis compared to conventional honey products.

2. The potential of blockchain technology to attract new consumer segments in the Spanish honey sector is very promising, especially when combined with digital marketing, sustainability and product differentiation strategies, as it not only improves traceability: it activates new forms of segmentation and emotional connection, allowing Spanish honey producers to access more demanding, digital and engaged consumers.

Italy: Younger and more digitally engaged consumers are the natural entry point, since they are accustomed to scanning QR codes and exploring online information. This makes blockchain particularly relevant for e-commerce, gourmet food boxes, or premium gifts. At the same time, it is important not to present it as something only for tech enthusiasts, because those risks narrow the audience. The real challenge is to translate technology into a value proposition that feels accessible to a wider public.

Tunisia:1. Blockchain has potential to appeal to young, urban consumers who are digitally literate and concerned with authenticity. However, for the majority of consumers, blockchain remains an abstract concept and unlikely to influence purchasing decisions without education and promotion.

2. Blockchain technology offers significant potential for targeting new consumer segments in the Tunisian honey sector, particularly among digitally literate, environmentally conscious, and younger urban consumers. By ensuring product authenticity, safety, and ethical

sourcing, blockchain appeals to individuals who prioritize transparency and informed purchasing decisions.

Luxembourg: 1. We confirm that young beekeepers are open to use new technology such as blockchain, to grow their business, and interested to target new clients that usually don't buy at small grocery markets where beekeepers usually sell their products.

2. Such a technological background increases the interest in honey by this group of people, and if they care about the "safe" label. It's more a matter about whether you like honey or not.

4.7. Digital Transformation and CRM (Customer Relationship Management)

Blockchain technology offers honey producers the potential to deliver personalized services based on consumer data and behavior. With the increasing digitalization in Italy, CRM applications are gaining importance in the food sector. For example, by recording past purchases on the blockchain, producers can develop customized promotional campaigns tailored to individual consumers.

Table 8. Impact of Blockchain-Based Traceability on Customer Relationship Management Strategy in the Honey Sector

	Italy	Spain_2	Spain_1	Tunisia_2	Tunisia_1	TR_1	TR_2	TR_3	TR_4	Lux_1	Lux_2	Mean
Honey producers in the relevant country can effectively integrate blockchain technology into digital marketing and CRM processes.	6	9	8	9	6	9	6	8	4	7	5	7,0
Intermediaries in the honey sector of the relevant country can effectively integrate blockchain technology into digital marketing and CRM processes.	6	9	8	8	5	9	6	8	4	n.a.	n.a.	7,0
Blockchain-supported personalized digital applications increase consumer loyalty in the honey market of the relevant country.	6	9	7	9	6	9	8	7	7	7	6	7,4
Mean	6,0	9,0	7,7	8,7	5,7	9,0	6,7	7,7	5,0	7,0	5,5	7,1

Note: Closed-Ended Questions (Likert Scale; 1 = Strongly Disagree, 10 = Strongly Agree)

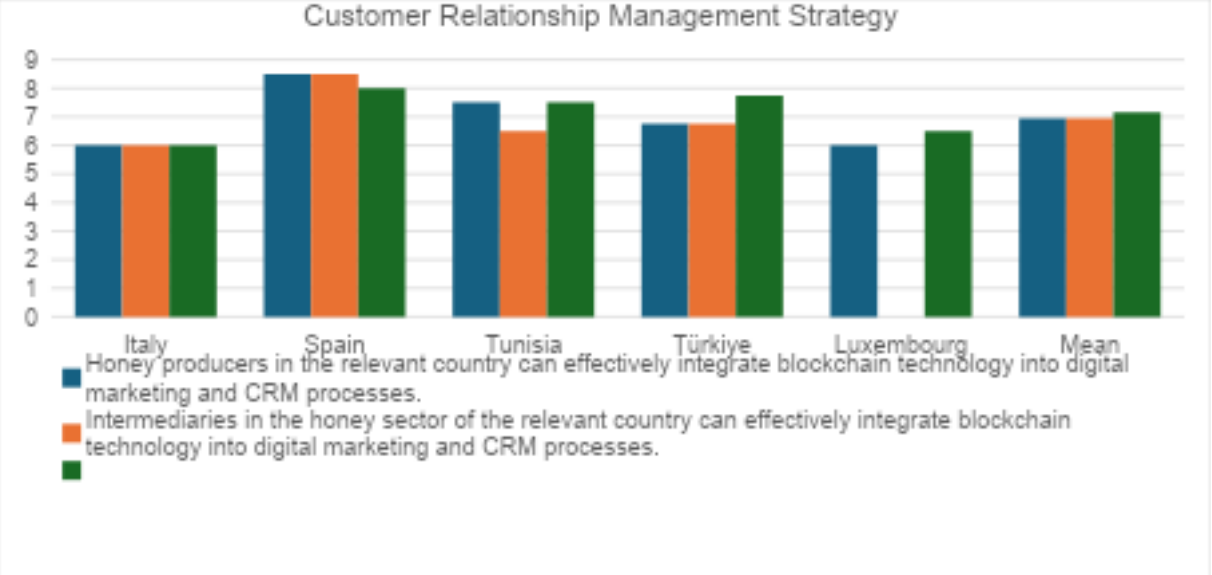

Figure 7. Applicability of Customer Relationship Management Strategy by Country

The data presented in Table 8 and Figure 7 assess the perceived impact of blockchain-based traceability on customer relationship management (CRM) strategies within the honey sector. Expert opinion suggests that producers in Spain, Tunisia, and Türkiye appear highly receptive to this strategy, while confidence in Luxembourg remains moderate. According to experts, intermediaries in Türkiye and Spain demonstrate strong potential for adopting blockchain-supported CRM approaches. In contrast, trust in this strategy is more limited in Tunisia and Italy. Blockchain-enabled digital applications are perceived to have a strong effect on enhancing consumer loyalty in Türkiye, Tunisia, and Spain. This effect is viewed as more constrained in Luxembourg. The overall mean score for the Customer Relationship Management Strategy is 7.1, indicating a generally positive outlook across the evaluated regions.

Expert insights on the contribution of these strategies to blockchain-based traceability in the honey sector across these countries are presented below.

Türkiye: Blockchain technology can securely and immutably store consumers' past purchasing data. This enables the development of personalized campaigns, preference-based product recommendations, and loyalty programs. By eliminating the risk of data manipulation, blockchain enhances consumers' perceptions of privacy and trust. Moreover, it allows producers to engage directly with consumers, facilitating activities such as new product announcements and feedback collection. For small-scale producers in particular, these systems offer significant advantages in building customer loyalty and implementing direct marketing strategies.

Spain: 1. You can evaluate the impact of blockchain on CRM in the Spanish honey sector by measuring how transparent, traceable data improves consumer trust, loyalty, and personalization -for example through repeat purchases, engagement with blockchain-enabled platforms, and customer satisfaction surveys compared to traditional CRM tools.

2. Blockchain transforms Customer Relationship Management (CRM) into a more human, transparent, and strategic tool, capable of transforming the relationship between beekeepers and consumers into an experience of trust and shared value. Through the use of a QR code, consumers can access a personalized story about the product (hive, beekeeper, laboratory analysis), which strengthens the emotional connection.

Italy: Many producers are not fully ready to integrate blockchain into CRM, yet the potential is there. By linking traceability events, like the date of harvest or the type of flora, with consumer purchase patterns, companies could build closer relationships with their customers. This works best if cooperatives or consortia provide shared digital infrastructures, lowering costs and making the system more accessible for small producers. However, challenges around data protection, ownership, and digital skills remain significant and cannot be ignored.

Tunisia:1. Digital marketing and CRM are still in their early stages in Tunisia's beekeeping sector. Most producers lack the infrastructure or technical skills to use blockchain for personalized marketing.

2. Blockchain technology can serve as a powerful enabler of advanced CRM applications in the Tunisian honey sector. By securely storing and managing consumer data, including purchase history and product preferences, blockchain allows honey producers to design tailored marketing strategies and personalized loyalty programs.

Luxembourg: It is not clear what advantages blockchain has over other CRM tools. Further, GDPR data protection rules might prevent the collection of customer behaviour.

4.8. Crisis Management and Trust (Food Safety Strategy)

Food safety and potential crisis scenarios are priority concerns in large-scale agricultural regions such as Italy. Since blockchain technology stores records of a product's history in an immutable manner, it facilitates the identification of problematic batches and enables rapid recall processes. For example, if pesticide residues are detected in a honey product, its origin can be quickly traced and addressed.

Table 9. Impact of Blockchain-Based Traceability on Food Safety Strategy in the Honey Sector

	Italy	Spain_2	Spain_1	Tunisia_2	Tunisia_1	TR_1	TR_2	TR_3	TR_4	Lux_1	Lux_2	Mean
Blockchain technology enables rapid response and secure communication during crises in the honey sector of the relevant country.	8	10	9	9	8	10	8	9	5	9	9	8,5
Food safety strategies for honey producers in the relevant country can be implemented more effectively through blockchain technology.	7	10	9	9	8	9	7	8	4	8	8	7,9
Food safety strategies for intermediaries in the honey sector of the relevant country can be implemented more effectively through blockchain technology	7	10	9	8	8	9	7	8	5	n.a.	n.a.	7,9
Mean	7,3	10,0	9,0	8,7	8,0	9,3	7,3	8,3	4,7	8,5	8,5	8,1

Note: Closed-Ended Questions (Likert Scale; 1 = Strongly Disagree, 10 = Strongly Agree)

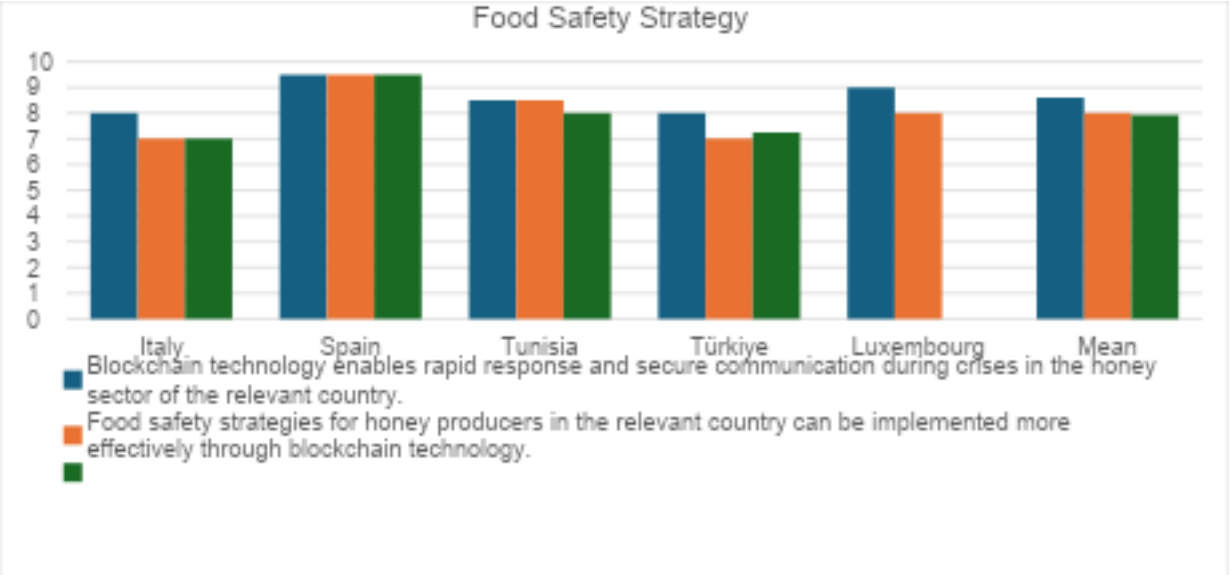

Figure 8. Applicability of Food Safety Strategy by Country

The data presented in Table 9 and Figure 8 evaluate the perceived impact of blockchain-based traceability on food safety strategies within the honey sector. Blockchain is

considered an effective tool for crisis management in Spain, Türkiye, and Tunisia, with similarly high levels of confidence reported in Luxembourg. Producers in Spain, Türkiye, and Tunisia are perceived to have strong potential for implementing food safety strategies through blockchain technology. A positive perception is also evident in Luxembourg. Intermediaries in Türkiye and Spain are viewed as well-positioned to adopt these strategies, with Tunisia also demonstrating a favorable outlook. The overall mean score for the Food Safety Strategy is 8.1, indicating a high level of confidence across the evaluated countries.

Expert opinions regarding this strategy have been stated as follows.

Türkiye: In traditional processes, identifying and responding to issues in production or the final product can be time-consuming due to information gaps between producers, intermediaries, packaging, and distribution chains. Such delays increase risks to consumer health and result in losses of time and financial resources. In the honey sector, blockchain technology offers speed, transparency, and reliability in managing crises such as residue detection or regulatory non-compliance. Given Türkiye's export ambitions and public health priorities, this technology may serve as a strategic tool for the sector.

Spain: It allows for the integration of multiple platforms. Blockchain can be a powerful tool in crisis management within the honey sector, as it allows for the prevention and rapid response to food crises by immutably recording each batch of honey from the hive to the end consumer. In the event of a health alert (for example, contamination or adulteration), the CRM can quickly identify affected customers and activate communication and selective recall protocols, minimizing reputational and economic damage. As a traceability channel, it can keep stakeholders informed, generating automatic notifications when there are new certifications, harvests, or changes in product traceability. This transforms consumers into informed stakeholders, strengthening loyalty and the perception of food safety.

Italy: Food safety is perhaps the area where blockchain can provide the most tangible benefits. With batch-specific records, a producer can quickly identify and recall only the jars that are actually affected, rather than issuing a broad and costly recall. This protects both consumers and brand reputation. To make it work in practice, every jar must be linked to its batch, and the data must be complete and reliable. It would also be wise to run regular recall simulations to ensure that the system responds as expected when problems occur.

Tunisia:1. Blockchain could be useful for managing crises like pesticide contamination, but most small-scale beekeepers are not formally integrated into traceability systems. This tool would work mainly for organized actors (exporters, certified producers), while small and medium producers remain outside such frameworks.

2. Blockchain technology plays a critical role in enhancing food safety protocols and crisis management in Tunisia's honey sector. Its immutable record-keeping allows for the precise tracing of a product's journey from hive to consumer, ensuring that any contaminated or non-compliant batch can be quickly identified and removed from the supply chain. For example, in the event of pesticide residue detection, blockchain enables stakeholders to pinpoint the exact origin and production stage of the affected honey, minimizing public health risks and economic losses.

Luxembourg: A statement was made expressing agreement with the rationale presented in this section regarding food safety and crisis management.

5. Overall Assessment and Conclusion

Based on expert insights, the most applicable marketing strategy was identified through a comparative analysis of average scores. The strategies were ranked in Table 10 and their overall level of acceptance was systematically evaluated.

Table 10. Applicability Ranking of Marketing Strategies Based on Blockchain-Based Traceability in the Honey Sector

Rank	Marketing Strategies	Mean
1	Crisis Management and Trust (Food Safety Strategy)	8,179
2	Storytelling and Emotional Connection (Experiential Marketing / Storytelling)	7,250
3	Positioning Based on Consumer Preferences (Targeting and Positioning Strategy)	7,217
4	Strategy for Entering New Market Segments	7,208
5	Creating Perceived Value Through Pricing (Premium Pricing Strategy)	7,175
6	Emphasis on Transparency and Trust (Value-Based Marketing / Brand Positioning)	7,075
7	Digital Transformation and CRM (Customer Relationship Management)	7,013
8	Social Responsibility and Sustainability (Cause-Related Marketing)	6,467

The Food Safety and Crisis Management strategy stands out with the highest average score of 8.18. Across all countries, expert researchers have rated the contribution of blockchain technology to food safety strategies highly. Particularly during crisis scenarios, blockchain's capacity for rapid intervention and secure communication in response to product-related issues provides operational benefits to economic activities within the sector. This functionality positions the strategy as a critical advantage for both producers and intermediaries, contributing to its prominence among blockchain-based marketing approaches.

The Storytelling and Emotional Connection strategy ranks second with an average score of 7.25. In particular, the narratives of small-scale producers highlighting their production processes, geographic context, and lived experiences can play a significant role in fostering emotional with consumers.

According to expert opinions, the Positioning Based on Consumer Preferences strategy ranks third with an average score of 7.22. This strategy primarily involves presenting honey through blockchain technology in alignment with consumer preferences, emphasizing transparency, origin, and traceability as key decision-making factors.

Subsequently, the strategy of entering new market segments was identified by experts as the fourth most significant, with an average score of 7.21. Blockchain is considered a valuable tool for reaching consumer groups in emerging markets who prioritize digital technologies and traceability processes.

Creating Perceived Value Through Pricing (Premium Pricing Strategy) ranks fifth with an average score of 7.175. By leveraging blockchain technology, it is possible to enhance the perceived quality of honey products, thereby enabling higher price positioning particularly for honey produced by small-scale producers.

Value-Based Marketing (Customer Trust) ranks seventh with an average score of 7.075, followed by Customer Relationship Management in eighth place with a score of 7.013. The Social Responsibility and Sustainability strategy, with an average score of 6.47, ranks last. However, when these values are examined collectively, all strategies score above six and are still considered important by experts in the context of blockchain-based marketing in the honey sector.

Annex: **Case Study in Spain: Blockchain Traceability, PDO Certification, and Supply-Chain Context in Honey Markets**

Background and Objective

Quality signals such as geographical indications and digital traceability are increasingly used to address information asymmetries in credence goods like honey, a category prone to fraud and authenticity concerns. While prior work shows positive WTP effects of certification and traceability, there is limited experimental evidence on how supply-chain context conditions these effects and whether technological and institutional signals act as substitutes or complements. This study addresses these gaps by testing (i) the individual and joint effects of PDO and blockchain labels on WTP and (ii) the moderating role of perceived short vs. long supply chains.

Methodology

Ethics, Setting, and Participants

The protocol received Institutional Review Board approval (CEISH_2024_8; November 2024). The study was implemented in Zaragoza (Spain) over six weeks (Nov–Dec 2024). We recruited N = 180 adult, regular honey consumers via civic centres, neighbourhood associations, and the University of Zaragoza's channels. Sessions were scheduled across mornings, afternoons, and evenings to enhance heterogeneity and external validity consistent with experimental standards in food economics.

Experimental Design and Identification Strategy

We implemented a between-subjects information intervention combined with within-subject repeated elicitation under the BDM mechanism (Becker et al., 1964; Lusk & Shogren, 2007). The identification strategy follows a DiD design: each participant bids before and after receiving context information; across participants, and between groups (SSC vs. LSC vs. control), thus isolating the effect of supply chain context on willingness to pay (WTP) for labelled products.

, context is randomized into three arms:

- Control group (no context): Received no contextual information.

- Short Supply Chain (SSC) group: They were informed that the honey was sourced directly from local producers with minimal intermediaries.
- Long Supply Chain (LSC) group: Informed that the honey passed through a long, complex chain involving multiple intermediaries.

The experiment consisted of two bidding rounds:

Round 1 (Baseline): Participants placed bids without any contextual information.

Round 2 (Information Treatment): Participants received supply chain information and label explanations (depending on group assignment), then repeated the bidding process.

The difference-in-differences (DiD) framework enabled comparisons to be made both within subjects (before vs. after receiving information)

Stimuli and Label Manipulations

The auctioned product was an identical 500g multifloral honey from Granada. Physical stimuli were standardized across sessions; only labelling varied. Four label conditions were created by crossing two binary attributes:

- PDO certification (geographical specificity, traditional practices),
- Blockchain traceability (QR code to a realistic traceability page).

The resulting jars were A (no label), B (PDO only), C (Blockchain only), D (PDO + Blockchain). To enhance credibility, the blockchain QR code opened a functioning mock interface illustrating supply-chain steps.

Procedure and Incentives

Each session began with scripted instructions and a comprehension/practice BDM round using a neutral good (potato chips). Participants received a €15 endowment. In Round 1 (baseline), they inspected the four honey jars and submitted maximum WTP for each (four bids). A brief interlude followed, during which context information was delivered according to randomized assignment and plain-language explanations of PDO and blockchain were provided to all arms. In Round 2 (informed), participants re-bid on the same four jars (four additional bids). To implement BDM, one of the eight bids per person was randomly selected as binding; a market price was drawn uniformly between €5 and €15; the purchase occurred if bid $\geq$ price, otherwise the endowment was retained. This design maintains incentive compatibility while enabling within-person and between-group comparisons. A short post-auction survey captured demographics, honey habits, and attitudes.

Analytic Approach

The primary outcome is WTP (€/jar). We analyze:

- Within-subject changes (post − pre) by label condition.
- Between-group differences across Control, SSC, and LSC.
- DiD contrasts that attribute WTP shifts to context information interacted with label presence.

This strategy strengthens internal validity by controlling for individual baseline heterogeneity and isolating the causal contribution of context × label interactions.

Summary of Results

The analysis examined how labeling schemes, supply chain length, and information disclosure influence consumers' willingness to pay (WTP) for honey. Results are based on regression models with random effects and Difference-in-Differences specifications.

The findings clearly show that **both Blockchain and PDO labels significantly increase consumers' valuation**. Across all models, honey with a blockchain-based traceability label attracted a premium of around **€1.40**, while PDO-certified honey commanded an average premium of **€1.57** compared to unlabeled products. These results confirm that both technological transparency and institutional certification act as credible signals of trust, quality, and authenticity.

The role of **supply chain length** is more nuanced. The interaction between Blockchain labeling and long supply chains is positive but not statistically significant, suggesting only limited additional value in that context. In contrast, the interaction between PDO certification and long supply chains is positive and marginally significant, indicating that **PDO labels become particularly valued when the supply chain is more complex or less transparent**. This provides partial support for the idea that label effectiveness depends on the perceived risk or opacity of the supply chain.

When both Blockchain and PDO labels are present, consumers exhibit the **highest willingness to pay**, with a combined premium of **€2.41**. Although this value is slightly below the sum of the two individual effects, it confirms that the two schemes are **complementary**, reinforcing each other rather than substituting for one another.

The **information treatment** also plays a significant role. After participants received detailed information about the honey supply chains, their bids increased overall, especially for products from long supply chains. However, bids for short supply chain honey decreased slightly, suggesting that additional information may shift attention toward certification and traceability features rather than the simplicity of the chain itself. In this sense, **informed consumers appear to value transparency tools more when dealing with complex supply networks**.

Among individual characteristics, **income** emerges as the main determinant of WTP. Both middle- and high-income participants show a significantly higher propensity to pay for labeled products, reflecting greater purchasing capacity and a stronger preference for certified quality.

In summary, the results highlight that **labeling and information strategies play a decisive role in shaping consumer preferences**. Products carrying Blockchain or PDO labels – especially when combined – consistently attract higher bids. Supply chain context and information provision further modulate these effects, showing that **consumer trust and willingness to pay are co-determined by both product signals and contextual understanding of the production system**.

Interpretation and Contribution

The study demonstrates that the economic value of quality signals is context-dependent and that institutional (PDO) and technological (blockchain) signals are complements in credence markets. Importantly, the "blockchain" treatment was operationalized via a QR-linked traceability interface; thus, observed premiums likely reflect digital traceability writ large, moderated by the clarity and credibility of the information provided. By integrating real monetary incentives with randomized context and repeated measurement, the design provides a rigorous test of how supply-chain narratives shape the returns to certification and digital transparency.

Policy and Managerial Implications

The study reveals that consumers value traceability systems more when they perceive supply chains as long, complicated, and challenging to understand. Blockchain doesn't add much

value in short chains, where consumers rely on relational trust, but in long chains with many middlemen and a large area, consumers appreciate the extra transparency provided by digital traceability. This suggests that policymakers should focus on making globalized and long agri-food supply chains more open. The study also highlights the uneven capacity of different actors to adopt blockchain-backed systems, with SMEs and cooperatives often facing barriers such as technical expertise and financial constraints. The findings suggest that public policy should lower the barriers to adoption for SMEs, including targeted subsidies, technical assistance, and standard-setting initiatives. This will ensure that PDO producers remain competitive in digitalized markets and prevent monopolization of consumer trust by large players.

Limitations

The evidence reflects Spanish honey consumers and a single product specification; generalizability beyond this context remains to be established. The blockchain treatment used a QR interface, potentially capturing responses to digital transparency more broadly. Finally, BDM captures short-run valuations in a controlled environment; longer-term market behaviour may differ.

Directions for Future Research

Replication with representative samples and multiple product categories (local vs. imported; mono- vs. multifloral) will clarify external validity. Experimental contrasts that separate blockchain from non-blockchain digital traceability can identify technology-specific value. Field experiments and panel designs can test the persistence of premiums and real-world adoption barriers over time.

Conclusion

Using an incentive-compatible BDM auction and a DiD identification strategy, this study demonstrates that, whilst consumers place a premium on authenticity and transparency, the supply chain complexity can have a significant impact on their value. The optimum outcomes are achieved by combining the blockchain with PDO labels, notably in longer chains with substantial levels of information asymmetry. The findings emphasise the importance of context-aware digitalisation strategies that focus traceability initiatives on areas where they will truly benefit consumers.

In terms of market practice, producers can sustain price premiums and differentiate their products by integrating recognised certification with credible digital traceability interfaces. In terms of public policy, targeted support for SMEs and cooperatives — via capacity building, investment incentives and interoperable standards — is essential to ensure that digitalisation enhances trust and equity across European agri-food chains. Any blockchain claims should be accompanied by clear, standardised consumer-facing communication (including QR-linked records) to prevent credibility dilution.

These findings underscore the case for context-aware digitalisation strategies that prioritise traceability investments in high-risk, information-asymmetric chains. While the evidence stems from a single country and product and operationalises "blockchain" through a QR-linked interface, the results provide actionable guidance for targeted policy, SME enablement, and standardised communication within the EU's broader sustainability agenda.

Bibliography

Li, Y., Zhang, W., & Chen, H. (2023). Blockchain's role in enhancing quality and safety and promoting sustainability: Evidence from the food and beverage industry. *Sustainability*, *15*(23), 16223. https://doi.org/10.3390/su152316223

Janssen, M., & Behnke, K. (2025). Digital transformation of food supply chain management using blockchain: A systematic literature review. *Business & Information Systems Engineering*, *67*(1), 45–62. https://doi.org/10.1007/s12599-025-00948-0

Allsopp, J. (2005). Premium pricing: Understanding the value of premium. *Journal of Revenue and Pricing Management,* *4*(2), 185–194. https://doi.org/10.1057/palgrave.rpm.5170138

Ang, L., & Buttle, F. (2006). CRM software applications and business performance. *Database Marketing & Customer Strategy Management, 14*(1), 4–16.

Ansoff, H. I. (1957). Strategies for diversification. *Harvard Business Review*, 35(5), 113–124.

Balzarova, M., Dyer, C., & Falta, M. (2022). Perceptions of blockchain readiness for fairtrade programmes. *Technological Forecasting and Social Change, 185*, 122086. https://doi.org/10.1016/j.techfore.2022.122086

Behnke, K., & Janssen, M. F. W. H. A. (2020). Boundary conditions for traceability in food supply chains using blockchain technology. International Journal of Information Management, 52, 101969. https://doi.org/10.1016/j.ijinfomgt.2019.05.025

Bonetti, E., Bartoli, C., & Mattiacci, A. (2024). Applying blockchain to quality food products: A marketing perspective. *British Food Journal,* *126*(5), 2004–2026. https://doi.org/10.1108/BFJ-12-2022-1085

Buttle, F. (2004). *Customer relationship management: Concepts and tools*. Elsevier Butterworth-Heinemann.

Corporate Finance Institute. (n.d.). *Ansoff Matrix – Overview, Strategies and Practical Examples*. Retrieved from https://corporatefinanceinstitute.com/resources/management/ansoff-matrix/

Dehghani, M., Popova, A., & Gheitanchi, S. (2022). Factors impacting digital transformations of the food industry by adoption of blockchain technology. *Journal of Business & Industrial Marketing, 37*(9), 1818–1834. https://doi.org/10.1108/JBIM-12-2020-0540

Dionysis, S., Chesney, T., & McAuley, D. (2022). Examining the influential factors of consumer purchase intentions for blockchain traceable coffee using the theory of planned behaviour. British Food Journal, 124(12), 4304–4322. https://doi.org/10.1108/BFJ-05-2021-0541

Fog, K., Budtz, C., & Yakaboylu, B. (2005). *Storytelling: Branding in practice*. Springer.

Frigerio, J., Campone, L., Giustra, M. D., Buzzelli, M., Piccoli, F., Galimberti, A., Cannavacciuolo, C., Ouled Larbi, M., Colombo, M., Ciocca, G., & Labra, M. (2024). Convergent technologies to tackle challenges of modern food authentication. *Helion, 10*, e32297. https://doi.org/10.1016/j.heliyon.2024.e32297

Hassini, E., Ben-Daya, M., & Bahroun, Z. (2025). Modeling the impact of IoT technology on food supply chain operations. *Annals of Operations Research, 348*(1), 1619–1648. https://doi.org/10.1007/s10479-023-05464-6

Júnior, J. R. d. O., Limongi, R., Lim, W. M., Eastman, J. K., & Kumar, S. (2023). A story to sell: The influence of storytelling on consumers' purchasing behavior. Psychology & Marketing, 40(2), 239–261. https://doi.org/10.1002/mar.21758

Kotler, P., & Keller, K. L. (2016). *Marketing management* (15th ed.). Pearson Education.

Kotler, P., & Lee, N. (2005). *Corporate social responsibility: Doing the most good for your company and your cause*. Wiley.

Kotler, P., Kartajaya, H., & Setiawan, I. (2017). *Marketing 4.0: Moving from traditional to digital*. Wiley.

Li, Z., Liu, A., Li, J., Xiong, J., & Lu, H. (2023). Manufacturer encroachment strategies and decision timing considering the product traceability preferences under e-commerce. *Managerial and Decision Economics, 44*(7), 4041–4067. https://doi.org/10.1002/mde.3933

Liu, P. (2024). Investment strategies and coordination for green food supply chain: A further research considering the inputs of the blockchain-based traceability system. *Kybernetes, 53*(3), 901–934. https://doi.org/10.1108/K-08-2022-1183

Liu, Y., Shankar, V., & Yun, W. (2016). Crisis management strategies and the long-term effects of product recalls on firm value. *Journal of Marketing*, 80(5), 131–151. https://doi.org/10.1509/jm.15.0535[1](https://www.jstor.org/stable/44879168)

Manning, L., & Kowalska, A. (2023). The role of technology in crisis management and product recalls in food supply chains. In *Food Governance and Safety*. Royal Agricultural
University. https://rau.repository.guildhe.ac.uk/id/eprint/16458/1/CHAPTER_LM_AK_accepted.pdf[2](https://rau.repository.guildhe.ac.uk/id/eprint/16458/1/CHAPTER_LM_AK_accepted.pdf)

Marques, H., Almeida, J. P., Bastos, A. F. V., & Martins, O. M. D. (2023). What do #storytelling and #marketing have in common? A comprehensive literature review from the Web of Science. In Communication Design and Branding (pp. 159–173). Springer. https://doi.org/10.1007/978-3-031-35385-7_9

Porter, M. E. (1980). *Competitive strategy: Techniques for analyzing industries and competitors*. Free Press.

Rejeb, A., Keogh, J. G., Zailani, S., Treiblmaier, H., & Rejeb, K. (2020). Blockchain technology in the food industry: A review of potentials, challenges and future research directions. *Logistics, 4*(4), 27. https://doi.org/10.3390/logistics4040027

Safeer, S., & Pulvento, C. (2024). Blockchain-backed sustainable management of Italian tomato processing industry. Agriculture, 14(7), 1120. https://doi.org/10.3390/agriculture14071120

Schmitt, B. (1999). *Experiential marketing: How to get customers to sense, feel, think, act, and relate to your company and brands*. Free Press.

Sun, Y., Song, X., Jiang, Y., & Guo, J. (2023). Strategy analysis of fresh agricultural enterprises in a competitive circumstance: The impact of blockchain and consumer traceability preferences. *Mathematics, 11*(5), 1090. https://doi.org/10.3390/math11051090

Tan, Y., Huang, X., & Li, W. (2023). Does blockchain-based traceability system guarantee information authenticity? An evolutionary game approach. *International Journal of Production Economics, 264*, 108974. https://doi.org/10.1016/j.ijpe.2023.108974

Tao, Z., & Chao, J. (2024). The impact of a blockchain-based food traceability system on the online purchase intention of organic agricultural products. *Innovative Food Science and Emerging Technologies, 92*, 103598. https://doi.org/10.1016/j.ifset.2024.103598

Treacy, M., & Wiersema, F. (1995). *The discipline of market leaders: Choose your customers, narrow your focus, dominate your market*. Basic Books.