



# TECHONEY

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

**WP1: HONEY INNOVATION AND LEARNING COMMUNITY LAB**  
**(HILE)**

**D1.3 Synthesis on the stakeholders' establishment in the different case of studies. Main findings, key issues, limiting factors and new opportunities identify and created.**

**(R) (PU) (CREDA, M42)**

## 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		 <b>TECHONEY</b>	
	Project acronym	<b>TECHONEY</b>			
	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	<b>D 1.3: SYNTHESIS ON THE STAKEHOLDERS' ESTABLISHMENT IN THE DIFFERENT CASE OF STUDIES</b>			
	Work Package	WP1: Honey Innovation and Learning Community Lab			
	Date of Delivery	15.10.2025			
	Nature	R (Report)	Dissemination Level	PU (Public)	
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	Reviewer	Zein Kallas (CREDA)			
	Approver	Tiziana de Magistris (CITA)			
	Filename	TECHONEY-D1.3.			
	Version	I.)			
	Abstract of the Deliverable	<p>Deliverable D1.3 (M42) of the TECHONEY project summarizes the stakeholder engagement activities in the Mediterranean beekeeping sector, developed in Task 1.3 under the leadership of CREDA and the coordination of CITA. Through participatory methodologies (mapping, prioritization, and focus groups in six countries), collaborative platforms were established to co-create technological solutions such as the blockchain system. The HILE groups served as the basis for the focus groups, which allowed for the analysis of sectoral needs and perceptions regarding digital traceability. In addition, the S1 Survey was applied to assess digital maturity and adoption readiness among different stakeholder profiles, revealing opportunities and challenges for inclusive innovation in the sector. The results show a high level of concern about honey fraud and widespread interest in digital traceability systems. Digital maturity varies across countries and profiles, with Spain, Turkey, and Luxembourg standing out as leaders in technology adoption. Consumers and hospitality industry players are willing to pay more for blockchain-certified honey, opening up strategic opportunities to scale the platform.</p>			



## VERSION TRACKER

VERSION	REVIEWER	PARTNER	DATE	STATUS
0.1	DR. SELENE ORNELAS	CREDA	October 19th	First Draft
0.2	DR. ZEIN KALLAS	CREDA	October 21th	Final Draft
0.3	DR. TIZIANA DE MAGISTRIS	CITA	October 20th	Ready for publication

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## PROJECT ABSTRACT

**TECHONEY** project's main objective is to identify strategies and establish lines of resilience to the new challenges determined by the COVID-19 pandemic for beekeepers in the Mediterranean (Med) agricultural systems through the implementation, definition, enhancement and transfer of competitive, profitable, efficient and trustful honey supply-chain alternatives that address beekeepers' capacities and attractiveness to fulfil consumer needs on unexpected food market changes.

**TECHONEY** project proposes the development of a **traceability system to guarantee the quality and safety of honey within the supply chain** for more effective communication to consumers and to strengthen access to different markets (e-commerce, direct sales, etc.). This approach will be unfolded by the joint creation of two levels of interaction: **[1]** physical: characterization of honey; **[2]** "living laboratory": creation of a Honey Community Living Lab (HCLL) and a Honey Innovation and Learning Ecosystem (HILE) that will be the arena to collect information from beekeepers, stakeholders, and consumers to transfer and apply the new optimized models.

**TECHONEY** is structured in 4 main technological pillars: **[1]** creation of a consortium IoT blockchain platform that involves various actors in the honey supply chain to ensure transparency and traceability, in addition to reducing costs and ensure the traceability in the honey supply chain; **[2]** creation of a transformative learning community to ensure a smart-short-resilient shared supply chain; **[3]** characterization of the quality of honey to guarantee its traceability within the blockchain directly by consumers; **[4]** develop ICT tools for honey supply chain participants and consumers.

**TECHONEY** will be committed not only to promote the continuation of the direct sales of honey from producers to consumers even after the COVID crisis but also develop a common methodology and clear new optimized resilience protocol to be used by small-scale beekeepers and farmers, smallholders as a new business model with a more efficient added-value chain, sustainable with fair profit, accepted by final consumers, which will be replicable to other food products and supply chains. **TECHONEY** will help beekeepers to: **[1]** generate a traceability mechanism for honey produced in the Med. Area; **[2]** diversify markets and distribution channels offers business flexibility and freedom from dependence on a single market, which will reduce risk in the event of a crisis; **[3]** cooperate and pool resources among themselves (pooling of the workforce, etc.) for logistical flexibility and solidarity in the supply chain, which will also reduce the risks in the event of a crisis.

**TECHONEY** proposes to design and develop a multidimensional framework to analyse 6 full honey supply chains (farm to table) that will integrate economic, social and environmental indicators and a traceability system, with a bottom-up approach considering the stakeholders' perspectives. A consortium Blockchain, coupled with IoT (Internet of Things), system will be created to offer real-time tracking and complete traceability of honey along the supply chain from the characterization of honey in a certified laboratory, the retailer, until the end consumer.

The characterization of the quality and safety aspects of local honey through local certified laboratories jointly with the use of e-commerce and quality labelling schemes will increase the opportunity for beekeepers to be identified locally and allow them to gain access to new markets (foreign markets). The implementation of e-commerce with the mobile application will enable local honey to be better traced by consumers who attach more value to local food and local beekeepers. **TECHONEY** contributes to increasing farm profitability and increasing flexibility and risk mitigation capabilities. A shared, short and circular supply chain will allow actors in the honey supply chain to access markets and have higher incomes, share resources and skills and save money by reducing costs (economies of scale), and increase the efficiency, sustainability and flexibility of processes to strengthen resilience and flexibility to face crises and lower risks. The learning community lab and the use of the blockchain network will secure the storing of records, will strengthen intellectual property rights, as well as bring transparency



throughout the supply chain; it will reduce frauds, enhance food safety, and improve the communication between retailers and beekeepers. The traceability system offered will also allow consumers to give direct feedback to beekeepers. **TECHONEY** commits not only to promote a continuation of direct sales but also develop a common methodology and clear new optimized resilience protocol to be used by small-scale beekeepers, farmers and smallholders as a new business model with a more efficient added-value chain, sustainable with fair profit, accepted by final consumers and replicable to other food products and supply chains.

Moreover, a **TECHONEY** web ICT tool consumer/farmer-centred will be developed, by testing and evaluating several machine and deep learning algorithms, providing small-scale beekeepers with key information on new markets and opportunities, contributing to a better decision making and to ensure the traceability of their product. Consumers will have exhaustive knowledge of the different honeys of the Med. area, knowing their traceability from the initial producer, guaranteeing the quality and safety of each product.

**TECHONEY** is a project coordinated by CITA (Spain) and funded through the PRIMA Section 2 Multitopic 2021 – Thematic Area 3 - Agrofood chain – Topic 2.3.1 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. (RIA\*[5])” under the funding scheme of “Collaborative Project” and type of Action “Research and Innovation Actions (RIA).”

## EXECUTIVE SUMMARY

- This report presents the synthesis of stakeholder engagement activities conducted within Task 1.3 “Setting up the platform: Involving the interested Stakeholders in a participatory approach” of the **TECHONEY** project. The focus is on the implementation of two rounds of Focus Groups (FG1 and FG2) across six Mediterranean case study countries: Spain, Tunisia, Turkey, Morocco, Luxembourg, and Algeria.
- The stakeholder platform was established through a participatory methodology combining mapping, prioritization, and qualitative engagement. FG1 served as the initial contact point among actors in the honey value chain, enabling the co-creation of SWOT analyses and the identification of sectoral needs and opportunities related to blockchain adoption.
- FG2 was conducted in each country to assess stakeholder perceptions of the blockchain system developed within **TECHONEY**. The sessions included structured discussions and questionnaires (S2) tailored to different roles in the honey supply chain—beekeepers, processors, retailers, hospitality actors, and consumers—allowing for targeted feedback on usability, trust, and relevance of the digital tools.
- In Spain, stakeholders emphasized the importance of ease of use, speed, customization, and data privacy in the blockchain application. Concerns were raised about honey fraud linked to international brokers and the need for regulatory alignment in digital traceability systems.
- In Tunisia, discussions highlighted the potential of blockchain and smart hive technologies to improve transparency and product quality. Key challenges identified included limited access to chemical analysis, organizational fragmentation among small-scale beekeepers, and the need for inclusive digital platforms.



- Across all case studies, the Living Lab approach proved effective in fostering collaboration and surfacing context-specific insights. Stakeholders expressed interest in continuing the co-design process and recognized the value of blockchain for enhancing traceability, consumer trust, and market access.
- The findings from FG1 and FG2 provide critical input for refining the TECHONEY blockchain ecosystem and ensuring its alignment with stakeholder expectations. They also reveal structural and cultural barriers that must be addressed to enable widespread adoption.
- These insights are essential for guiding the next phases of platform development, stakeholder training, and policy dialogue within TECHONEY and similar initiatives aimed at digital transformation and sustainability in agri-food systems
- This report presents the synthesis of stakeholder survey activities. The focus is on the implementation of Survey S1, which complemented the Focus Groups (FG1 and FG2) by capturing quantitative and perception-based data from key actors in the honey value chain across the Mediterranean case study countries: Spain, Tunisia, Turkey, Morocco, Luxembourg, and Algeria.
- Survey S1 targeted five stakeholder profiles—beekeepers, retailers, processors (industry), hospitality actors, and consumers—to assess their experiences, digital maturity, fraud awareness, and attitudes toward blockchain-based traceability. The survey provided a robust foundation for understanding stakeholder readiness and expectations, and for triangulating insights gathered through qualitative engagement.
- Among beekeepers, the survey revealed widespread concern about honey fraud and strong support for traceability systems. Luxembourg and Turkey stood out for their high digital maturity, including the use of hive-connected devices and analytics. Spain and Tunisia showed moderate readiness, while Morocco exhibited low digital integration, highlighting the need for foundational training and tailored support.
- Retailers expressed high awareness of honey fraud and strong interest in blockchain as a tool for quality assurance and market credibility. While basic digital skills were common, strategic capabilities—such as cybersecurity investment and transformation planning—were limited. Spain and Turkey led in digital readiness, positioning retailers as key enablers of blockchain adoption.
- The honey-processing industry showed high concern about fraud and strong support for traceability. Spain, Turkey, and Tunisia demonstrated the greatest familiarity with blockchain and its potential benefits. However, Luxembourg and Morocco raised concerns about cost and strategic alignment, underscoring the need for context-sensitive implementation strategies.
- The hospitality sector (restaurants, hotels, guesthouses) showed growing interest in honey traceability, with Spain and Turkey again leading in digital maturity and blockchain awareness. Many establishments reported frequent honey orders and anticipated stable or rising demand. Their openness to pilot testing digital traceability systems positions them as strategic partners in scaling blockchain adoption.
- Consumers across all countries demonstrated strong concern about honey fraud and support for traceability, even when origin awareness was low. Luxembourg and Spain showed the highest willingness to pay a premium for blockchain-secured honey, while Morocco was more price-



sensitive. Digital proficiency varied, but QR code familiarity was widespread, offering a practical entry point for blockchain-labeled products.

- The survey (S1) results confirm that stakeholders across the honey value chain are aware, engaged, and increasingly ready to adopt digital traceability tools. However, digital maturity, economic capacity, and strategic planning vary significantly across countries and stakeholder groups. These differences must be addressed through inclusive training, tailored support, and co-designed implementation pathways.
- The insights from Survey S1 are essential for refining the TECHONEY blockchain ecosystem and ensuring its alignment with stakeholder expectations. They complement the findings from FG1 and FG2, reinforcing the value of participatory approaches and multi-method engagement. Together, these activities provide a roadmap for guiding the next phases of platform development, stakeholder training, and policy dialogue within TECHONEY and similar initiatives aimed at digital transformation and sustainability in agri-food systems.



## 1. INTRODUCTION

The deliverable **D1.3 Synthesis on the stakeholders' establishment in the different case of studies**, corresponds to the **task 1.3. Setting up the platform: Involving the interested Stakeholders in a participatory approach**. CREDA as task leader, is the main responsible on executing work package 1 (WP1). This task involved the participation of all case study leaders (Algeria, Luxembourg Morocco, Spain, Tunisia and Türkiye) and the participation of CITA as coordinator and main leader of the TECHONEY project. These activities established a collaborative platform for key stakeholders in the beekeeping sector, facilitating initial assessments and the co-creation of technological solutions tailored to their needs. The participatory methodology applied in the Focus Groups was essential for fostering dialogue among stakeholders and building a solid foundation for the development of digital tools such as the blockchain system.

**The main objective of this task was to analyse the stakeholders' opinions along the added honey value chain and to start discussing the Beekeeping sector needs for the co-innovation process and acceptance of Blockchain.** To achieve this task, the Focus Group methodology was applied.

This task builds upon the outcomes of Deliverable D1.2 - Task 1.2 "Mapping and selection criteria of stakeholders" which involved:

- Identification: listing potential stakeholders,
- Analysis: evaluating their relevance,
- Prioritization: ranking them based on specific attributes.

The stakeholders for each case study in the TECHONEY project were defined and selected considering several criteria. These criteria included the Stakeholder Theory (Parmar et al., 2010), the balanced representation of the four dimensions of the quadruple helix innovation system (Government, Academia, Industry, and Citizens) and attributes such as expertise, willingness to participate, influence, and necessity. Also, the tasks carried out during the analysis and prioritization phase (Task 1.2) contributed to this selection process.

Based on these elements, the HILE (Honey Innovation and Learning Ecosystem) groups were integrated for each case study. These groups were then considered as the foundation for conducting focus groups throughout the TECHONEY project.

Initially the first Focus Group (FG1) was held in Spain, this bringing together local stakeholders to begin discussions on Blockchain and co-innovation needs. This meeting was part of the analysis and prioritization phase (Task 1.2), and CREDA, as task leader, informed project partners of its strategic importance. The FG1 and the initial interviews were used to conduct the SWOT analyses, results of these activities were included in **D1.2. Report on the stakeholder mapping and context analysis**. Subsequent Focus Groups (FG2) of all case studies, were included in the present deliverable (D1.3).



The FG2 was conducted with the aim of knowing the stakeholders' opinions along the honey value chain, regarding the Blockchain system developed in Techoney as strategy to reduce the honey fraud in Mediterranean counties participating in this project and had a collaborative design of the platform taking into account the needs and preferences of the experts involved in each living lab.

During the second focus group conduction.

Additionally, this **Deliverable D1.3** includes the results of the **Market Survey (S1)**, corresponding to the results for several questionnaires designed for the along the different stakeholders ("beekeepers", industries & processors, selling points of honey "retailers", restaurants or bakery using honey "hospitality" and finally "consumers"). The analysis made was exploratory. The structure of survey for each type of stakeholder included different aspects that allowed to know the potential **adoption of digital technologies** at farm levels. Also, this survey S1 allowed to identifying the stakeholders with a greater willingness to adopt digital innovation and with a higher likeliness to accept support of scientific and research institutions in the further development of beekeeping sector.

**The survey sections for each stakeholder type were structured according to** three main parts: i) demographic profile questions. ii) digital maturity questions, since digital maturity influences the acceptance of digital advancements, making adoption easier (Bravo et al., 2018), and iii) specific section for questions related to the constructs, where attitudinal, behavioural, and perception questions were included, based on the theoretical frameworks proposed by Ajzen (1991), identified as Theory of planned behavior (TPB). Given that the decision to adopt new technology is influenced by beliefs, perceptions, attitudes, social norms, skills, and abilities (Räsänen and Tuovinen, 2020; Concu et al., 2020).

The **Beekeepers' questionnaire** was specifically designed to understand the adaptive capacity of small-scale producers and their short- and long-term decision-making regarding blockchain adoption.

Acceptance and factors involve on Blockchain adoption were measured using statements based on the Theory of Planned Behavior (TPB) and Technology Acceptance Model (Table 1):

Table 1. Opinions, attitudes and behaviors statements - Theory of Planned Behavior (TPB) and Technology Acceptance Model (S1)

Construct	Var	Statements	Scale
intention	Int1	I intend to adopt or continue adopting blockchain technology in the future	1)Strongly Disagree
	Int2	I will always try to adopt blockchain technology in my apiary activity	2)Disagree
	Int3	I plan to adopt or continue adopting blockchain technology frequently	3)Neither agree nor disagree



attitudes BCT		<b>Att1</b>	I believe that BCT should be used in beekeeping sector	4)Agree 5)Strongly agree
		<b>Att2</b>	I believe that the BCT will be used in the beekeeping sector	
		<b>Att3</b>	It is a good idea to use BCT	
		<b>Att4</b>	In general, I have a positive attitude toward the use of BCT in the beekeeping sector	
social norm		<b>SN1</b>	The opinion and views of my friends, co-farmers are important for my decision to use BCT	
		<b>SN2</b>	People who are important to me would recommend using BTC	
		<b>SN3</b>	People who are important to me would find using BCT beneficial	
		<b>SN4</b>	People who are important to me would find using BCT a good idea	
Control perceived behaviour	ease of use	<b>CPB1</b>	I think the blockchain features are easy to use in apiary activities.	
		<b>CPB2</b>	I believe BCT is compatible with the system	
		<b>CPB3</b>	I think it would be easy to use the blockchain technology in apiary activities compared to conventional management practices	
		<b>CPB4</b>	I believe that remembering and executing tasks using BCT is easy for me	
		<b>CPB5</b>	I think that using blockchain technology needs specific knowledge	
		<b>CPB6</b>	I think that using blockchain technology needs training	
	dificultad -effort need	<b>CPB7</b>	It is easy for me to learn BCT technology	
		<b>CPB8</b>	My farm can quickly move to BCT	
		<b>CPB9</b>	For the implementation of BCT management support is essential	
	ability	<b>CPB10</b>	I could well use the BCT	
		<b>CPB11</b>	I could govern the use of BCT	
		<b>CPB12</b>	My resources, knowledge and ability to use BCT are available	
	govern	<b>CPB13</b>	I think that using blockchain technology needs government subsidy policies	
		<b>CPB14</b>	I think that using blockchain technology is affected by government regulation and punishment policies	
		<b>CPB15</b>	I think that using blockchain technology is affected by government technology extension policies	
usefulness of BCT Perception		<b>UP1</b>	I think that using blockchain technology is useful in my apiary activity	
		<b>UP2</b>	I think that using blockchain technology would make my apiary activities more effective	
		<b>UP3</b>	I think that using blockchain technology would make my apiary activities more convenient	
cost benef percepcion		<b>CostB1</b>	I think the cost of using BCT is too high.	
		<b>CostB2</b>	I think that there are not enough benefits from using digitalization tools to justify the cost.	
		<b>CostB3</b>	I think that blockchain technology require a lot of money for data subscription	
		<b>CostB4</b>	Price of blockchain technology is reasonable	
		<b>CostB5</b>	Blockchain technology is a good value for the money	
economic benefits perception		<b>EcB1</b>	I find using blockchain technology increases my productivity	
		<b>EcB2</b>	The use of blockchain technology leads to reduce the cost of beekeeping	



	<b>EcB3</b>	I find using blockchain technology helps me accomplish things more quickly the beekeeping activity	
	<b>EcB4</b>	I find using blockchain technology helps me to increase the income from my apiary activity.	
	<b>EcB5</b>	I think that using blockchain technology DT enhances the honey' quality and safety	
environmental benefits perception	<b>EnBP1</b>	In my opinion, blockchain in the beekeeping sector is an innovative solution for pending environmental issues.	
	<b>EnBP2</b>	A beekeeper that uses blockchain technology for honey traceability can be called ecofriendly.	
	<b>EnBP3</b>	The transparency of blockchain is beneficial for the beekeeping sector in terms of environmental friendliness.	
social benefits perception	<b>SBP1</b>	Due to cost savings, BCT makes beekeeping more appealing for smallholders.	
	<b>SBP2</b>	BCT will allow local and small beekeepers to enter new markets	
	<b>SBP3</b>	The implementation of BCT will decrease the amount of honey fraud	

While all stakeholder surveys addressed common themes—such as **interest in traceability and honey origin, digital engagement** (internet access, digital skills), **blockchain attitudes** (usefulness, ease of use, trust-building potential), and **support for short supply chains** (willingness to engage in direct or local sourcing)—they also presented **distinctive features**: on operational data (industry and hospitality blocks include more detailed business metrics (turnover, automation, service capacity), **type of honey interaction** (Consumers questions are more focus on taste and health; retailers on packaging and price; industry on bulk and transformation; hospitality on culinary use and guest experience), on digital maturity (industry shows highest emphasis on IoT, cybersecurity, and automation; consumers focus more on QR codes and e-commerce), and respect to the **decision-making roles** (Retailers and hospitality ask who buys the honey; consumers reflect personal choices; industry focuses on procurement systems).

The aim of the survey was focused on the Stakeholders' acceptance of the Blockchain and factors affecting the adoption decision. It also focused on measuring Digital Maturity and willingness to accept the support of scientific and research institutions in the further development of beekeeping practice.

The **several** questionnaires that integrate **Market Survey (S1)** were translated to the language of the country of each specific case study involved in the Techoney project with the help of the case study leaders. The market survey was carried out in each country with the aim of collect a representative sample of stakeholders (beekeepers, industry, retailers, hospitality, and consumers) depending on the size of the beekeeping supply chain, the final sample of stakeholders' type in each country is described in the next table (Table 2).



Table 2. Sample size for stakeholders and country (S1)

	Stakeholder				
	Beekeepers	Retailers	Industry	Hospitality	Consumers
Spain	53	20	1	5	56
Turkey	54	22	2	23	54
Tunisia	52	22	11	15	52
Luxemburg	6	1	0	0	15
Morocco	25	21	1	0	3

Additionally, in the specific case of study of Spain and Tunisia the number of applied surveys was increased. In Spain 672 additional honey consumers were surveyed to have a total of **728**, and in Tunisia 414 additional completing **466** consumers responses. In general. The total number of stakeholders along the honey value chain surveyed through the questionnaire (S1) was 1600.

The stakeholders were surveyed using the Qualtrics platform through the respective links to the questionnaire version translated according to the country' language. The links to the questionnaires designed for this task are in the next table (Table 3).

Table 3. Links to the questionnaire designed for each main stakeholder node (S1).

Techoney	Link	Shot link	QR
Beekeepers	<a href="https://creda.eu.qualtrics.com/jfe/form/SV_6XTwaFLA1b83pYi">https://creda.eu.qualtrics.com/jfe/form/SV_6XTwaFLA1b83pYi</a>	<a href="https://ja.cat/TH-Beekeeper">https://ja.cat/TH-Beekeeper</a>	
Retailers	<a href="https://creda.eu.qualtrics.com/jfe/form/SV_5tj3krzXouJw074">https://creda.eu.qualtrics.com/jfe/form/SV_5tj3krzXouJw074</a>	<a href="https://ja.cat/TH-Retailer">https://ja.cat/TH-Retailer</a>	
Hospitality, restaurant/Catering	<a href="https://creda.eu.qualtrics.com/jfe/form/SV_b9mhAFaDRvhTkfc">https://creda.eu.qualtrics.com/jfe/form/SV_b9mhAFaDRvhTkfc</a>	<a href="https://ja.cat/TH_Service">https://ja.cat/TH_Service</a>	
Industry	<a href="https://creda.eu.qualtrics.com/jfe/form/SV_6VabQ9Zg4WtY4D4">https://creda.eu.qualtrics.com/jfe/form/SV_6VabQ9Zg4WtY4D4</a>	<a href="https://ja.cat/TH_Industry">https://ja.cat/TH_Industry</a>	
Consumer	<a href="https://creda.eu.qualtrics.com/jfe/form/SV_3ws1FOOip5SEb1c">https://creda.eu.qualtrics.com/jfe/form/SV_3ws1FOOip5SEb1c</a>	<a href="https://ja.cat/TH_Consumer">https://ja.cat/TH_Consumer</a>	



*Note: As part of the results, data obtained by Beekeepers survey (from Tukey, Tunisia and Spain) was used to generate a research article titled “**Beekeepers' intentions to adopt resilience strategies for climate change: a comparative and integrated approach using the theory of planned behavior and protection motivation theory**”. This research article focuses on factors involved in beekeepers' intention to adopt Blockchain for fraud reduction. This article was published in the research journal of *Frontiers in Climate*. (<https://doi.org/10.3389/fclim.2025.1604488>).*

*Note: In the case of data obtained with the questionnaire designed for the Market Survey (S1) specifically with the **consumers section from Tunisia and Spain**, it was used to prepare a contribution shared in the XV Agri-food economics congress organized by the Spanish Association of Agri-food Economics (AEEA).*

## 2. METHODOLOGY

The analysis of stakeholders' opinions and expectations regarding the adoption of blockchain—an innovation focused on traceability—along the honey value chain was conducted using the **Focus Group (FG)** method. This qualitative approach is defined as “a carefully planned series of discussions designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment” (Krueger & Casey, 2009). It enables a deeper understanding of the origin and nature of specific phenomena, behaviors, attitudes, or beliefs.

Focus groups are typically composed of participants who share a common interest, ensuring homogeneity, but also include enough diversity to allow for contrasting viewpoints. They are particularly effective for gathering spontaneous insights through open-ended questions and dynamic discussions—information that is often missed in quantitative studies.

A distinctive feature of the FG methodology used in the TECHONEY project was the integration of an adapted version of the **Nominal Group Technique (NGT)**. This method facilitates idea generation and organization within a group setting, ensuring that all participants contribute meaningfully to the discussion (Landeta et al., 2011). It involves a structured process where individuals first respond to key questions posed by a moderator before engaging in group dialogue.

The focus groups were designed with consideration for the diverse roles of stakeholders across the honey supply chain (Bourlakis & Weightman, 2008). This includes actors involved in sourcing raw materials, production, regulatory institutions, and post-production activities such as distribution to end consumers.





The implementation of FG1 and FG2 allowed for a sequential and complementary approach. FG1 was focused on exploring initial perceptions, identifying sector needs, and constructing a participatory assessment through interviews and SWOT analysis. FG2, meanwhile, focused on validating the developed blockchain system, gathering opinions, expectations, and improvement proposals directly from stakeholders in the honey value chain.



The next scheme summarizes all steps and flow needed to the focus group 2 development (setup and conduction):

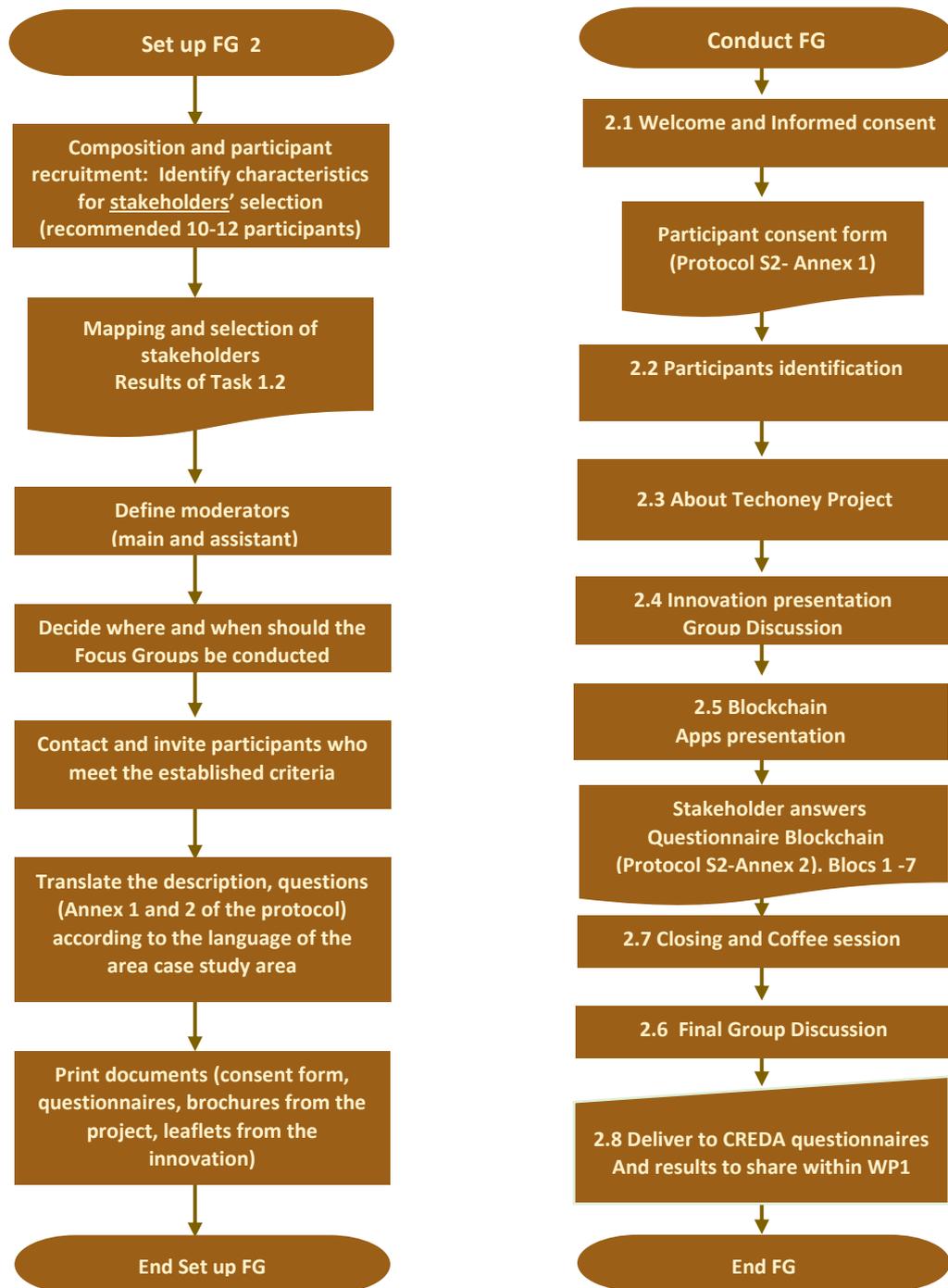


Figure 2: Activities flow for focus group 2 development



### 3. RESULTS

The first Focus Group of the Techoney project in each case of study (FG1) was held with the aim of generating a space for dynamic dialogue between the different stakeholders in the beekeeping sector. The main objective was to encourage active participation by attendees to discuss the challenges, opportunities, and expectations surrounding the digitalization of the honey value chain, as well as to explore the potential of emerging technologies such as blockchain.

One of the pillars of the session was the co-creation of a **SWOT** (Strengths, Weaknesses, Opportunities, and Threats) matrix, developed collectively by the participants. This tool allowed for analyzing the current state of the sector from multiple perspectives, ranging from production to marketing, and considering both internal and external factors affecting its development.

The Focus Group was structured into several thematic sections. First, the Techoney project was presented as part of a European initiative funded by the Next Generation funds, which seeks to introduce innovative technologies to improve product traceability, reduce fraud, and increase the local value of honey. One of the main points addressed during the first focus groups in each case study was the application of blockchain technology, highlighting its usefulness in tracking the journey of honey from the hive to the point of sale, recognizing its complexity. The necessary conditions for its implementation were analyzed, considering both technical capabilities and cultural barriers. Furthermore, the motivations that may drive beekeepers to adopt new technologies were reflected upon.

Another central focus was the concept of the "Living Lab," a participatory approach that promotes direct collaboration between researchers, beekeepers, consumers, and other relevant stakeholders, with the goal of enabling innovation to emerge from the real needs of the sector through co-creation processes. Regarding this, participants were invited to join the living labs and to introduce themselves and their role within the sector, thus strengthening the sense of community and collaboration that characterizes the Techoney project approach. The results of the first focus group were presented in **D1.2. Report on the stakeholder mapping and context analysis** final version\_CREDA\_27.04.23 (M12)





Figure 3. Focus Group 1 Spain



Figure 4. Focus Group 1 Tunisia



Figure 5. Focus Group 1 Turkey



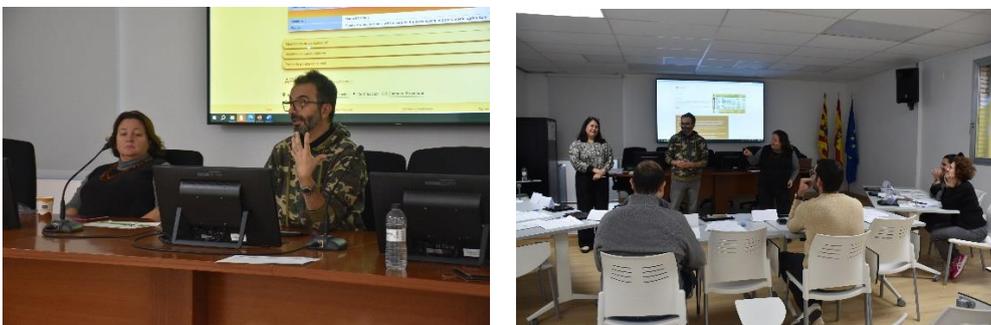
Among the common findings across the various case studies are the interest in improving product traceability, the need for training in emerging technologies, and the existence of cultural and organizational barriers to blockchain adoption. Participants positively valued the Living Lab's approach as a co-creation space and expressed their willingness to collaborate on future phases of the project.

### 3.1 SECOND FOCUS GROUP IN THE DIFFERENT CASE STUDIES (FG2)

Conducting the **second focus group (FG2)** for each case study allowed us to identify the components and attributes present in the first version of the blockchain application that, from the perspective of each type of stakeholder, were considered relevant and necessary to be included in the tool. This exercise also allowed us to identify those attributes that, although incorporated in the initial version, were not considered relevant by the participants.

#### SPAIN CASE STUDY

This report briefly describes the activities carried out during the development of the second focus group of the Spanish case study (**FG2**), held in Zaragoza, on November 28, 2024, and mainly it details the results obtained during the driving of the same (FG2). The event took place in the Centro de Investigación y Tecnología Agroalimentaria de Aragón (CITA) installations (Av. de Montañana, 930, 50193 Zaragoza, Spain, Central building - class room 60), from 10:00 to 11:30. **The Spanish FG2** was conducted by Zein Kallas as FG coordinator and WP1 leader, and Tiziana de Magistris as project coordinator. In this focus group participated 11 stakeholders in total (2 beekeepers, 1 beekeepers' association, 2 consumer associations, 1 person from the hospitality sector and 1 person in charge of a food service business, 1 food quality inspector, 1 consumer, 1 research institutions, 1 blockchain expert), all of them invited by email.



*Figure 6. Participants presentation during FG2 conduction. Case of study Spain.*



Figure 7. Participants on Spanish FG2

**Table 4.** List of participants in the living lab - Second Focus group Spain (FG2)

Name and surname	Enterprise
Alfredo Sanz.	Association of Beekeepers ARNA Beekeeping
Amparo Cuellar	General Director of Innovation and Agri-Food Promotion DGA.
David Salo Honesto	Beekeeper
José Ángel Oliván	President of the UCA Aragón – Consumer Association
José Manuel Romeo	Coordinator of the TOPI School of Hospitality
José Miguel Capape	Biobío Company
Lucía Germani	President of the ACTORA Consumer Association
Alba Rita Morella	ACTORA Consumer Association
Miguel Ángel Santisteban	Beekeeper
Miguel Lecha	Beekeeper
Monserrate Moliner	Agri-Food Quality Inspector, Provincial Service of Zaragoza
Ángel Serrano	Beekeeper
Antonio Lorente	President of Blockchain Zaragoza
David Ciprés	Head of research in digital technologies - Smart Labs (ITAINNOVA)
<b>Organizers</b>	
Zein Kallas Calot	Focal Group Coordinator (CREDA)
Tiziana de Magistris	Receiving entity, CITA Aragón
Selene Ornelas	FG Facilitator (CREDA)

This focus group was held to collect the perceptions, opinions and suggestions of potential users, to guide the development of an application that meets their needs and expectations. Using the participatory focus group approach and considering the nature of the stakeholders in the honey supply chain, a second meeting was organized with the members of the living lab of the Spanish case study.

This living lab corresponds to the group formed during the first part of the project through the process of in-depth interviews (I1) and stakeholder mapping (Task 1.1 and 1.2). This second focus group was attended by 11 actors involved in the honey value chain, as was previously mentioned. Prior to the day of the event, the members of the living lab were invited to participate in the second focus group and were briefly informed of the objective that would be pursued during the conduct of the group.

### Structure of the event

On the day of the event, according to the established program, the second focus group began with a welcome by Dr. Tiziana De Magistris, general coordinator of the Techoney project. Once the development of the second focus group was underway, participants were asked to sign the consent form to participate, and a small section was opened to introduce participants in the second focus group to break the ice and encourage their participation.

**Desarrollo de un ecosistema basado en BLOCKCHAIN que permita un mejor posicionamiento de los pequeños productores de miel en el mercado local e internacional**

**TECHONEY** 2da Jornada de Grupo Focal  
Jueves 28 de noviembre de 2024

Presentación	Programa
<p>TECHONEY un proyecto de investigación dentro del programa PRIMA financiado por la Unión Europea. Cuyo objetivo es identificar estrategias y establecer líneas de resiliencia ante los nuevos retos determinados por la pandemia COVID-19 para los apicultores en los sistemas agrícolas mediterráneos (MED).</p> <p>Dentro del proyecto se está desarrollando un sistema de trazabilidad que permita garantizar la calidad y seguridad de la miel dentro de la cadena de suministro.</p> <p>A través de esta jornada, con la participación de los distintos involucrados en la cadena de valor de la miel (2do FG), se pretende identificar los atributos relevantes que deben formar parte del sistema (aplicación móvil/web) de acuerdo a su opinión.</p>	<p>10.00 h Bienvenida Tiziana de Magistris, CITA Aragón.</p>
	<p>10.05 h Firma de consentimientos</p>
<p><b>Organización</b></p> <p>CREDA CITA GOBIERNO DE ARAGÓN</p> <p><b>Colaboración</b></p> <p>PRIMA</p>	<p>10.10 h Identificación de los participantes (Apicultores, distribuidores, pequeños y grandes comerciantes, asociaciones y autoridades participantes)</p>
	<p>10.15 h Presentación del proyecto y de los objetivos de la reunión Zein Kallas, CREDA – UPC</p>
	<p>10.20 h Breve descripción del Blockchain</p>
	<p>10.25 h Presentación de la aplicación "Techoney blockchain" y de la app "Techoney e-commerce"</p>
	<p>10.40 h Aplicación de cuestionarios</p>
	<p>11.10 h Breve discusión y preparación para el día</p>
	<p>11.20 h Coffe break</p>
	<p>11.30 h Fide de la jornada</p>
	<p>Esta jornada se realiza principalmente de forma presencial, en las Instalaciones del CITA Zaragoza.</p> <p><b>Dirección:</b> Av. de Montañana, 500, 50193 Zaragoza, España, Edificio Central-PS-Salón de actos (50) online.</p> <p>El día antes de la jornada los participantes que nos acompañarán en línea recibirán el enlace de acceso al aula virtual desde donde podrá participar, así como los cuestionarios que deberán contestar.</p>
	<p><b>Información</b></p> <p>Para más información puede contactar con el CREDA-UPC: Selenie Omías (Selenie.omias.herra@upc.edu)</p>

TECHONEY- 2do. Focus Group. Zaragoza, 2024

Figure 8. Programme of activities developed within the second focus group of the Spanish case study

Then the presentation of the specific objectives of the meeting was made, which was in charge of Dr. Kallas, who explained the project in broad strokes, as well as the objectives and later served as moderator.

Subsequently, the applications developed to put the participants in context were presented, explaining primarily the structure and characteristics of the blockchain application, emphasizing the attributes related to each of the types of stakeholders and exemplifying the type of information related to some of their attributes that would later have to be evaluated by them according to their experience



Participants were guided through a series of questions and discussions facilitated by the moderator, with the aim of exploring their experiences and preferences in relation to the mobile applications developed.

### Principal comments and findings

1. Ease of use: related to this point participants emphasized the importance of an intuitive and easy-to-navigate user interface. It was highlighted that an application with a low learning curve is crucial for adoption and continued use.

Participant remarks: "I need the app to be easy to understand from the first use" and "I don't want to spend a lot of time learning how to use it."

2. Speed and Performance: In this point participants highlighted that loading speed and overall performance of the application are essential attributes. Participants expressed frustration with slow, crash-prone applications. one participant commented "I can't stand when an app crashes or takes too long to load" and "Speed is key, especially when I'm in a hurry."

3. Customization: The ability to customize the app to individual preferences was another valued attribute. Participants mentioned that customization options improve the user experience and increase satisfaction. Participants commented "they like being able to adjust the app to their needs" and "Customizing the interface makes them feel more comfortable using it."

4. Security and privacy: Personal data protection and security were recurring themes. Participants expressed the need to feel safe when providing personal information on the app. They want to know that their data is safe" and "Privacy is a priority for them."

One additional comment that emerged to enrich the application was from a participant representing the Food Standards Agency, who commented that the application should consider that much of the honey arriving at Spanish ports has been purchased by international brokers, companies with no physical location and who only buy and sell without physically seeing the honey. It's the first link in a honey chain that enters through the port and is distributed throughout the country to wholesalers, packers, and even ends up with beekeepers. There is a lot of fraud because it enters as honey from China, Argentina, etc., but the broker sells it as Spanish honey. The only way to differentiate it is through physical laboratory analysis. In many cases, it enters adulterated and ends up mixed with domestic honey. The following links in the chain will evaluate already falsified information. I think individual beekeepers who sell their own honey production would be interested in the blockchain, but I don't think wholesalers and packers will want to collaborate. Especially if there's tracking of invoices, delivery documents, and prices. Another aspect to keep in mind: All information appearing on the



blockchain must comply with marketing regulations. It's not allowed to say anything different than what might be indicated on product labels.

## Conclusions

The main conclusions were that the focus group FG2 conducted in Spain revealed that users highly value an application's ease of use, speed and performance, customization, and security. These preferences should be considered during the development process to ensure positive acceptance and continued use of the application.

## TUNIS CASE STUDY

The Tunisian study also adopted the qualitative approach of focus group, considering the diverse nature of stakeholders throughout the honey supply chain to discuss and understand the point of view about blockchain along the honey value chain.

The Tunis second focus group (FG2) held on December 10, 2024, at INAT included activities related to raw material sourcing, production, regulation, distribution, and consumption and brought experts, researchers, beekeepers, and technology developers to exchange views on the importance of traceability and innovations in the honey value chain. During the discussions, stakeholders exposed their opinions on the proposed blockchain innovative application, offering their approval, criticisms, or suggestions. Additionally, each group of stakeholders discussed the information they would like to communicate and receive at the blockchain level, as well as the preferred methods for exchanging this information. The event lasted five hours, from 9:30 AM to 2:30 PM, with a total of 21 participants and the organizational team.

At the focus group the same stakeholders of the first living lab had been invited. 12 stakeholders were able to attend the meeting, and 7 new members were included.



*Figure 9. Welcome to the second focus group (FG2) to the Tunisia case study participants*



*Figure 10. FG2 participants from Tunisia case study*

The schedule of the focus group (FG2) was organized as follows:

- 08h30-09h00 Reception and participant registration
- 09h00-09h15 Opening remarks and presentation of the TECHONEY project - INAT
- 09h15-09h30 Roundtable introduction: Participant introductions
- 09h30-11h00 Roundtable 1: Presentation of the TECHONEY-BLOCKCHAIN prototype and discussion on improvement prospects – INAT - FST
- 11h-11h30 Coffee break and networking
- 11h30-12h15 Conduct survey filling and discussing the blockchain application.
- 12h15-13h00 Roundtable 2: Demo of the TECHONEY-Marketplace website prototype and discussion on improvement prospects – INAT - JASP
- 13h00-13h30 Demo of the Smart Hive prototype – TECHONEY - FST
- 13h30 Case study: How to interpret honey analysis results
- 14h Final recommendations and event closing
- 14h30 Lunch break

### **Structure of the event**

The session began with a Welcome Introduction (15 minutes), providing an overview of the TECHONEY project and its objectives. This was followed by a Participant Introduction segment (25 minutes) to establish rapport among attendees. Next, a Project and Blockchain Presentation (10 minutes) offered a comprehensive explanation of blockchain technology and its significance in the honey supply chain, supported by multimedia aids or technical expert involvement. The core of the session was a Discussion Session (45 minutes), where structured discussions focus on blockchain attributes,



challenges, and expectations, covering topics such as transparency, traceability, trust, data privacy, scalability, and stakeholder concerns. With participant consent, these discussions were recorded (audio only).

For Data Collection and Analysis, participants completed the questionnaires. These questionnaires captured their individual opinions and priorities. Session recordings were stored in the project's data repository in compliance with the Data Management Plan.

**Table 5.** List of participants in the living lab - Second Focus group Tunisia (FG2)

Stakeholders	Participants names
Beekeepers	Mr Radhwen Matoousi Mr Firas Ghrabi Mr Faycel Saidani Mme Rim Bedoui Mr Alaeddine Khmiri Mr Walid Naggara Mr Mourad Chammakhi
Retailers	Mr Jalel Chaabeni Mme Hadil Fraihi Mme Ines Bessaad Naggara
Consumers	Mme Jihen Khoualdi Mme Nourhene Ellouze
Laboratory	Mme.Rawdha Hlel
Agencies	Mr Faker Mekni Mr Nacer Mejri Mr Mahouachi Mokhtar

Dr. Errach introduced blockchain as a central tool for traceability and transparency in the honey value chain. She detailed the role of this technology in securing transactions, verifying product origins, and combating fraudulent practices. She also facilitated participants' first contact with the application, emphasizing the importance of adoption to enable small beekeepers to integrate into the system while raising consumer awareness of product authenticity.

The JASP team presented a marketplace dedicated to honey products, aimed at facilitating exchanges between producers, distributors, and consumers. This digital platform seeks to centralize data on offers and demands while emphasizing transaction transparency.

The marketplace includes several features:

- A user-friendly interface for managing orders.
- Real-time tracking of inventory and deliveries.
- The ability for consumers to evaluate and rate products.

JASP team also explained how this platform can encourage healthy competition and improve the visibility of local beekeepers in the market.



Finally, a group of two members from the Faculty of Sciences presented a prototype of an intelligent beehive. This innovative tool is equipped with sensors capable of measuring:

- Internal humidity.
- Temperature.
- CO2 levels.

These sensors allow beekeepers to monitor real-time conditions inside the hives, enhancing both colony management and production quality.

### **Discussions and Contributions from Participants**

Discussions focused on the practical benefits of this technology, particularly in reducing losses and optimizing beekeeping practices. The prototype generated significant interest from participants, who suggested possible improvements to tailor it to the specific needs of the Tunisian beekeeping sector. During the discussion about the adoption of blockchain, the Living Lab members participating in the FG2 highlighted several challenges that need to be addressed. These challenges were categorized into quality, organizational, economic, market, and financial issues.

1) To ensure optimal honey quality, various obstacles must be overcome. Quality concerns in beekeeping, particularly regarding honey and wax, need attention. Quality control should encompass both honey and wax, as beeswax plates are often imported from China or Algeria or produced using poor-quality naphthalene, which is discouraged. Additionally, there are issues related to medication (lack of suitable products for organic apiculture) and fumigation practices (existing methods need to be revised for better results). It was also pointed out the lack of chemical analyses on bee products.

2) Organizational challenges include barriers to participation in blockchain due to complex processes that hinder technology adoption and limited access to meetings and advanced tools. The characteristics of the beekeeping system marked by small-scale beekeepers also present an organizational challenge. In fact, 80% of beekeepers are small-scale producers, highlighting the need to organize them into groups. Living Lab members emphasized that the platform should be accessible to all beekeepers, including small-scale producers, and not just established and well-known players. However, they acknowledged that some beekeepers are hesitant, believing they can sell their products without the need for complex systems.

3) From a market and economic perspective, there is a mismatch between supply and demand. Local honey production is insufficient, leading to the importation of lower-quality honey, which can harm the reputation of locally produced honey. Additionally, seasonal production is a limiting factor, with honey production dropping by 80% during the winter months. The impact of climate change on



production was also raised. It is important to ensure market balance to avoid the introduction of honey from unknown origins, which undermines the credibility and overall quality of local products.

4) Financial challenges primarily concern production costs, particularly labeling expenses and packaging, as well as cost variability. The lack of knowledge among beekeepers regarding production costs, as well as the instability of fixed costs and loss estimates. These gaps make it difficult to establish competitive prices for honey. Additionally, Mr. Firas Gharbi, beekeeper, highlighted the unfair practices of some importers selling honey at very low prices, making it challenging for local beekeepers to access the market.

To address these challenges and overcome the obstacles that may hinder the implementation and adoption of blockchain, the Living Lab members proposed several suggestions, including improvements in organizational structure, quality monitoring, communication, and training.

5) In terms of structural and organizational aspects, they recommended launching an initiative to identify hives, starting with a sample of producers and laboratories. An existing apiculture logbook, based on a study conducted in El Kef governorate, should be expanded and applied more broadly.

6) Additionally, they suggested monthly inspections for blockchain adopters, conducted by organizations like the O.E.P. and A.V.F.A. These inspections should be accompanied by sanctions, which must be strict to prevent fraudulent practices.

7) A national digital platform, like France's honey cartography system, could be developed. This platform would enable online ordering and home delivery of products, as well as identify and list the best producers by region. The platform should also include databases of beekeepers who adhere to organic standards.

8) Involving small-scale beekeepers is essential, and this can be achieved by simplifying processes to encourage their participation, along with supporting beekeepers' development groups/associations to facilitate their integration into a traceability system.

9) Communication and training are also critical for raising awareness. Beekeepers should receive training on best practices and monitoring techniques. Awareness campaigns should leverage digital applications and knowledge-sharing tools. For example, applications like ICARDA can help improve hive management and preservation. Training should also cover beekeepers' management practices, as well as the technical, economic, and financial aspects of their projects.

10) Regarding honey quality, efforts should focus on improving the identification and preservation of honey quality. This includes promoting the use of natural inputs and prohibiting plastic materials, among other measures.

11) The living lab members insisted on the importance of a gradual approach: starting with small steps to raise awareness among beekeepers and show them the long-term benefits of traceability.



12) The full integration of the blockchain system requires financial support, as the smart hive cost is very high compared to the financial capacity of most beekeepers.

#### **Relevant Attributes and Data Sharing:**

During discussions on surveys with beekeepers, several essential attributes were identified regarding data sharing with various stakeholders. It was agreed that attributes related to inspection details, honey origin, type of honey, consumer feedback, certificates of origin, and relevant licenses or certifications should be shared with all stakeholders to ensure transparency and traceability in the honey supply chain. For consumers, pertinent information such as quantity, order details, and delivery times should be readily accessible to facilitate informed purchasing decisions.

However, certain data points, including the customer database, total sales, total production, inventory management, and delivery routes, are considered sensitive and should remain confidential to protect business interests. Additionally, it was noted that the management of documents is deemed non-relevant in this context.

#### **Key Outcomes**

There is a growing awareness of the concerns within the beekeeping sector, particularly regarding traceability issues. Through this workshop, participants identified critical challenges, including the impacts of illegal competition, packaging and commercialization difficulties, and the complexity of the honey value chain, compounded by a lack of local processing facilities. Emphasis was placed on integrating small-scale beekeepers, especially women with 10-15 hives, into a blockchain platform, ensuring that IoT devices and traceability tools are affordable and accessible.

The need for a robust traceability system emerged as essential for combating fraud and ensuring product authenticity, with a focus on consumer transparency regarding honey sources and production practices. Strategies for stakeholder inclusion involved forming associations for small-scale beekeepers and initiating sensitization campaigns to encourage participation. The filling of survey sessions revealed diverse attributes, allowing stakeholders to select the most pertinent factors and preferred sharing methods.

#### **Conclusion**

The workshop identified major challenges in the beekeeping sector while proposing concrete solutions. It also enhanced participants' understanding of technological tools, such as blockchain. The collaboration between researchers, beekeepers, and technology developers paves the way for better integration of innovations into the value chain.



In conclusion, there was a consensus among all stakeholders: a compromise and a genuine need exist to build an inclusive blockchain-based traceability system that empowers small-scale beekeepers while enhancing market access and consumer confidence.



2<sup>ème</sup> réunion LivingLab "TECHONEY"

10/12/2024 INAT-TUNISIE

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## TUKEY CASE STUDY

The second focus group study of the Techoney project in Turkey was held on Tuesday, January 21, 2025, at the Seminar Hall of the Ünye Faculty of Economics and Management Sciences in Turkey.



Figure 11. FG2 participants from Turkey case study

**Table 6.** List of participants in the living lab - Second Focus group Turkey (FG2):

Stakeholders	Participants names
Beekeepers	Kerim OLGUN Hayrullah KADİM Tevrat ATEŞ
Retailers	Oğuzhan DEMİR Onur ŞEN
Consumers	Fatih Volkan AYYILDIZ Kürşat TAŞTAN Osman IŞIK Barış KARAKUZU
Logistic manager	Şule FINDIK

### Structure of the event

To conduct the second focus group (FG2) in Turkey, two videos were prepared. The first explained the use and benefits of blockchain technology in the honey supply chain. The second video presented the goals and objectives of the Techoney project and provided a general explanation of how the blockchain system can be established.

The website (<https://techoney-web-interface.vercel.app/en/product/GB-110246Tx>) was then presented. This corresponds to the blockchain application developed within the Techoney project and involves all stakeholders in the honey value chain: farmers, distributors, industry, wholesalers, retailers, consumers, and authorities related to the food sector.



This presentation showed how information from food supply chain stakeholders is included in the blockchain system. Afterward, information forms were distributed to the focus group participants, and they were asked about the stakeholder information required for the blockchain traceability system. Interviews were conducted individually with each participant.

It is important to note that before the focus group, all the necessary forms and materials were translated into Turkish so that participants could understand them individually and express their opinions.

Finally, once the stakeholder participation was over, all completed forms were scanned for each participant separately and sent to CREDA for information gathering.

### **Conclusion**

The second focus group session in Turkey successfully engaged a diverse group of stakeholders from the honey value chain, including beekeepers, retailers, consumers, and a logistics manager. Through the use of tailored video presentations and a live demonstration of the TECHONEY blockchain platform, participants were introduced to the project's goals and the potential of digital traceability in combating honey fraud.

By conducting individual interviews and collecting stakeholder feedback via translated forms, the session enabled a deeper understanding of the types of information each actor considers essential for inclusion in the blockchain system. This approach ensured that participants could express their views clearly and confidently.

The insights gathered during this session will contribute to refining the blockchain traceability model, ensuring it reflects the real needs and expectations of Turkish stakeholders. These results strengthen TECHONEY's commitment to developing inclusive, transparent, and trustworthy digital solutions for the honey supply chain.

### **LUXEMBURG CASE STUDY**

The second focus group session in Luxembourg was held on February 22, 2025, with the participation of 11 stakeholders from the honey value chain. The group included seven beekeepers, one supplier, one laboratory technician, and one representative from the national food agency. The session was successfully conducted as part of the TECHONEY project, funded by the European Union under the PRIMA program (Project ID: 1711).



## Structure of the event

*Opening of the Session:* Participants were welcomed and provided with all necessary materials, including informed consent forms, questionnaires, and supporting documents (such as Annex 3). It was clearly stated that participation was voluntary and compliant with both European and national data protection regulations.

*Participant Identification:* Each attendee introduced themselves, fostering an atmosphere of openness and collaboration. Their interest in the session was acknowledged, and the importance of their contributions to the development of the project was emphasized.

*Presentation of the TECHONEY Project:* The session included a comprehensive overview of the TECHONEY project, which aims to combat food fraud in the honey sector through innovative digital solutions. The main objective—developing a blockchain-based traceability system to certify honey authenticity and protect quality labels in both local and international markets—was clearly presented. The discussion also highlighted the importance of resilience in the honey supply chain, particularly in response to challenges such as the COVID-19 pandemic.

*Introduction to Technological Innovation:* Dr. Christopher introduced the digital traceability solution based on Blockchain technology. He explained the core principles of Blockchain and its relevance to food traceability, emphasizing its potential to enhance transparency, trust, and data security across the supply chain.

*Exploration of Mobile Applications:* Participants were introduced to two mobile applications developed within the TECHONEY framework. The first application focuses on registering traceability data on the blockchain, while the second is designed for end consumers, enabling e-commerce and access to product traceability information.

*Group Discussion on Innovation:* A group discussion was held to identify which attributes participants considered essential for inclusion in the mobile/web interface. Stakeholders also discussed their willingness to share specific data and the types of counterpart information that would foster trust in commercial transactions. Key challenges of implementing Blockchain in the food industry—such as data privacy and scalability—were addressed. Following the discussion, participants completed the S2 questionnaire:

- Sections 1–5 captured stakeholder-specific attributes (beekeepers, distributors, wholesalers, retailers, and consumers).



- Section 6 focused on identifying relevant attributes of business partners from an external perspective.
- Section 7 gathered individual opinions on Blockchain technology and its perceived value in the honey sector.

### Conclusion

The Luxembourg focus group successfully gathered, analyzed, and interpreted the perceptions, needs, and expectations of key stakeholders in the honey supply chain regarding the implementation of a Blockchain-based digital solution.

The session achieved the following outcomes:

- Validated stakeholder interest and openness toward the proposed technological innovation.
- Identified key attributes to be integrated into the mobile/web interface, tailored to each stakeholder group.
- Assessed the degree of willingness to share data, informing the design of a transparent and user-friendly application.
- Collected insights into counterpart attributes that foster trust in commercial relationships.
- Obtained direct feedback on the applicability and potential impact of Blockchain technology in the beekeeping sector.

Together, these findings can support the refinement of the mobile applications, strengthen the traceability system, and ensure that the final solution aligns with real market needs.

As part of the activities, CREDA compiled all the results from the questionnaires administered to participants in the different country case studies. The results were sent to the designers and developers of the Techoney project's blockchain application, with the goal of implementing the suggestions, observations, and comments from honey supply chain stakeholders who collaborate through the living labs in the focus groups.

### GENERAL CONCLUSIONS

The joint results of FG2 provided concrete input for the redesign of the blockchain application, highlighting valued attributes such as ease of use, security, customization, and performance. Technical limitations, privacy concerns, and organizational barriers were also identified, particularly in relation to wholesale players. These contributions allow the tool to be tailored to the realities of the sector and strengthen its acceptance.



The implementation of focus groups FG1 and FG2 established a solid participatory foundation for the development of the blockchain platform, integrating the voices of key players in the Mediterranean beekeeping sector. These dialogue spaces helped identify real needs, validate technological solutions, and strengthen stakeholder engagement in the innovation process. The findings constitute a strategic input for the subsequent phases of the TECHONEY project.



## 3.2 RESULTS OF THE MARKET SURVEY ANALYSIS (S1)

### 3.2.1 BEEKEEPERS

#### SAMPLE CHARACTERISTICS AND BEEKEEPERS' ACTIVITIES DESCRIPTION

In the next graph are the beekeepers surveyed by country, this chart illustrates the geographic distribution of beekeepers surveyed across the five TECHONEY case study countries. A total of 190 beekeepers participated in the Market Survey (S1), providing insights into their practices, digital readiness, and attitudes toward blockchain adoption.

Spain (53 beekeepers) and Turkey (54 beekeepers) represent the largest shares, each accounting for 28% of the total sample. Tunisia (52 beekeepers) closely follows with 27%, reflecting strong engagement in North Africa. Morocco (25 beekeepers) contributes 13%, while Luxembourg (6 beekeepers) represents a smaller portion at 3%.

This distribution ensures a balanced representation across Mediterranean and European contexts, enabling comparative analysis of stakeholder perspectives and readiness for digital transformation in the apiculture sector.

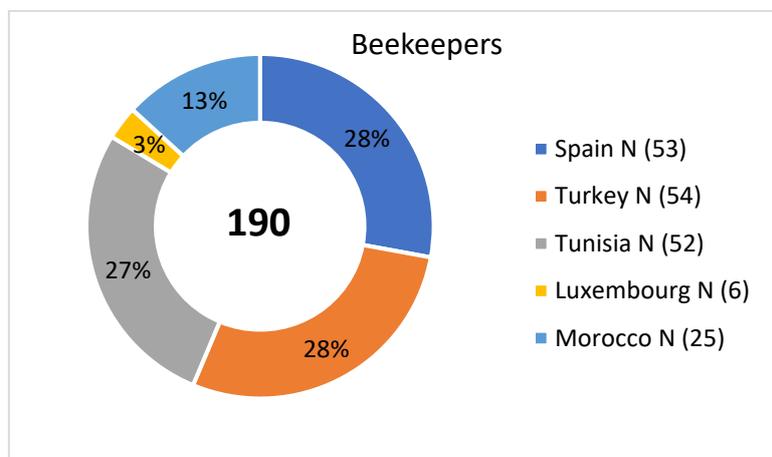


Figure 12. Beekeepers surveyed by country

Next graph corresponds to the age distribution of beekeepers by country, this bar chart presents the percentage distribution of beekeepers across five age groups (18–25, 26–35, 36–49, 50–65, and more than 65 years) in each of the five countries participating in the TECHONEY project: Spain, Turkey, Tunisia, Luxembourg, and Morocco.

As key insights we found that: The 36–49 age group is the most represented across all countries, especially in Luxembourg (66.7%), Turkey (51.9%), and Tunisia (50%), indicating that mid-career beekeepers form the backbone of the sector.



Spain shows a unique pattern, with a high proportion of older beekeepers (41.5% over 65), suggesting a more traditional or legacy-driven apiculture sector. Morocco stands out for its younger demographic, with 28% aged 26–35 and no representation in the 65+ category.

The 18–25 age group remains marginal in all countries, with the highest presence in Turkey (5.6%), pointing to limited youth engagement in beekeeping.

This demographic profile is essential for understanding digital readiness, training needs, and the potential for generational renewal in the adoption of blockchain and other innovations within the honey value chain.

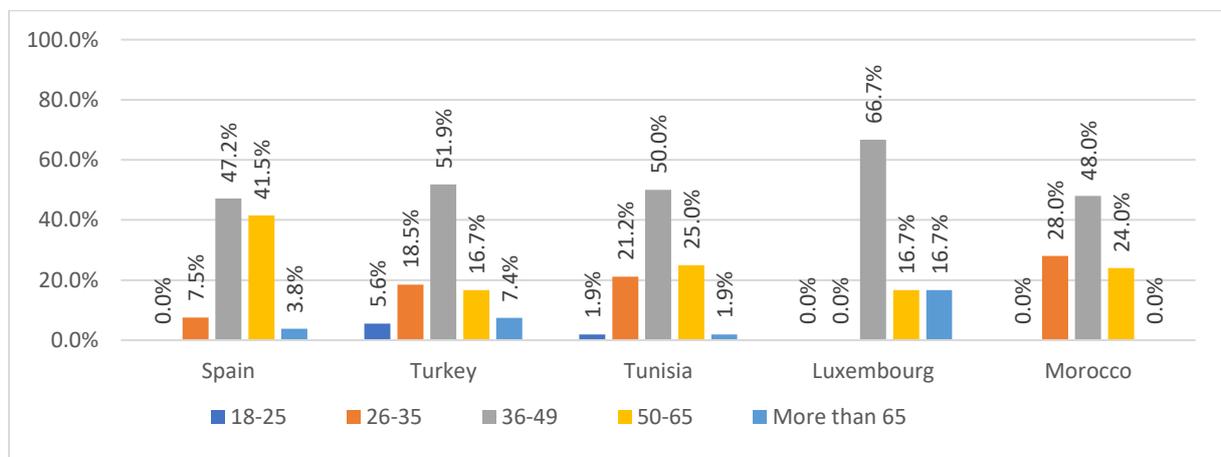


Figure 13. Beekeepers' range of age

The graph of gender composition of beekeepers surveyed (Figure 14) allowed us to observe that: The sector remains predominantly male across all countries, with Turkey (96.3%) and Luxembourg (100%) showing the highest male representation. Morocco (20%) and Tunisia (17.3%) report the highest shares of female beekeepers, suggesting relatively stronger female participation in North Africa. Spain shows a moderate level of female representation (15.1%) and the highest proportion of respondents who preferred not to disclose their gender (3.8%). No female respondents were recorded in Luxembourg, indicating either a lack of representation or limited sample size. This demographic insight is crucial for understanding gender dynamics in the beekeeping sector and identifying opportunities for inclusive innovation strategies, particularly in digital transformation and capacity-building efforts.



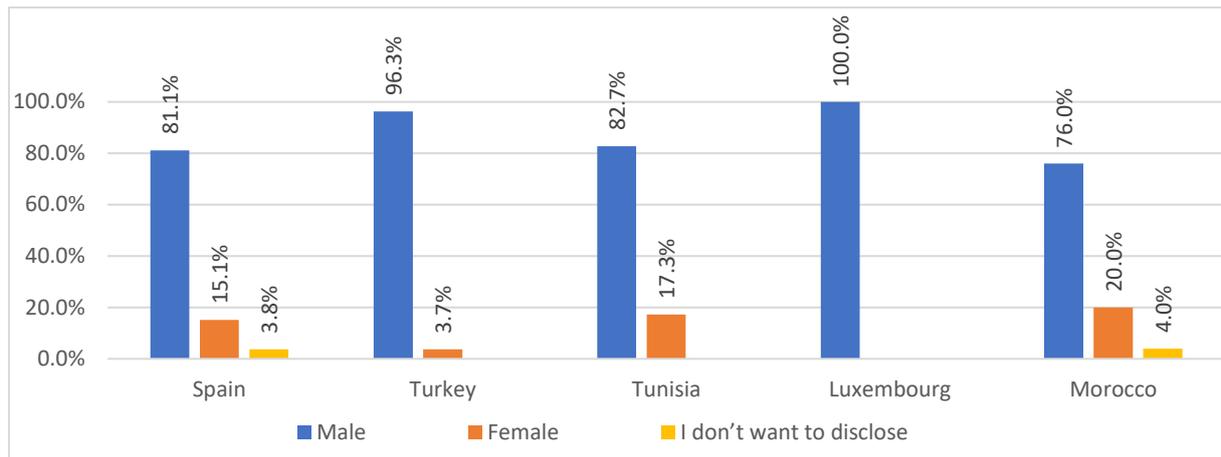


Figure 14. Beekeepers distribution according the gender

The results of the analysis of beekeepers' education levels showed that Spain and Luxembourg have the highest levels of formal education among beekeepers, with 39.6% and 83.3% respectively holding university degrees (Figure 15). Spain also has a strong representation in secondary education (50.9%), indicating a well-educated beekeeping community. Tunisia stands out with 57.7% of beekeepers having secondary education, though only 9.3% report university-level studies. Turkey presents a more diverse educational profile, with 42.6% of beekeepers having completed primary education, and smaller but equal shares (22.2%) in both secondary and university categories. Morocco shows the most limited educational attainment, with 12% of beekeepers reporting uncompleted primary studies and only 20% holding university degrees. The proportion of respondents who preferred not to disclose their education level remains low across all countries, with Turkey (9.3%) and Morocco (8%) being the highest.

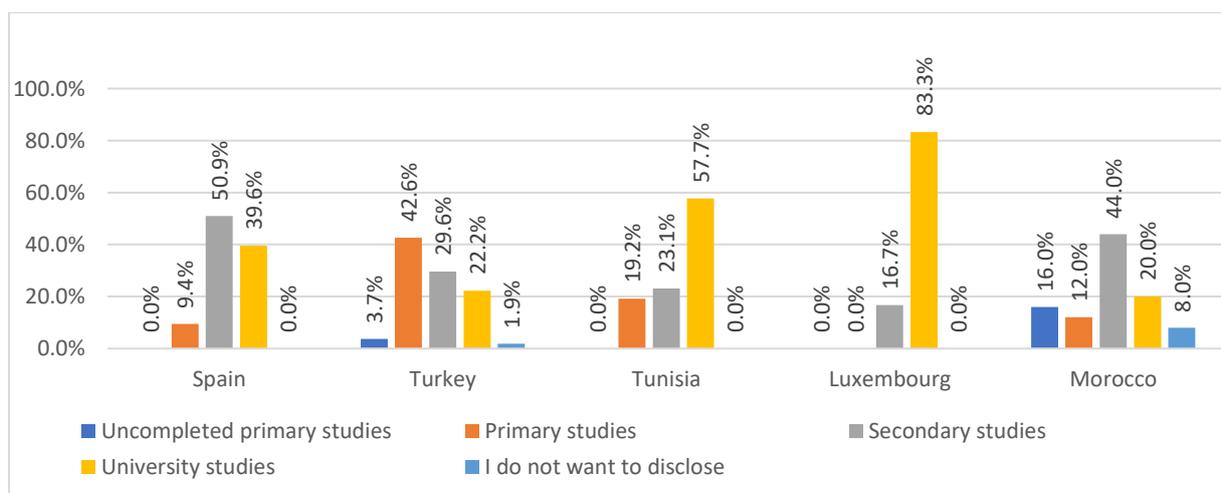


Figure 15. Beekeepers distribution according the education level



Next graph (Figure 16) allowed to see that Tunisia has the most diversified profile, with high collection rates across pollen, beeswax, propolis, royal jelly, queens, bees, and larvae. Luxembourg specializes in beeswax and pollen, with notable bee collection. Morocco leads in pollen and royal jelly, but does not collect bees or larvae. Spain has a strong focus on beeswax and propolis, with moderate diversification. And Turkey shows lower engagement across most products, with beeswax as the dominant item.

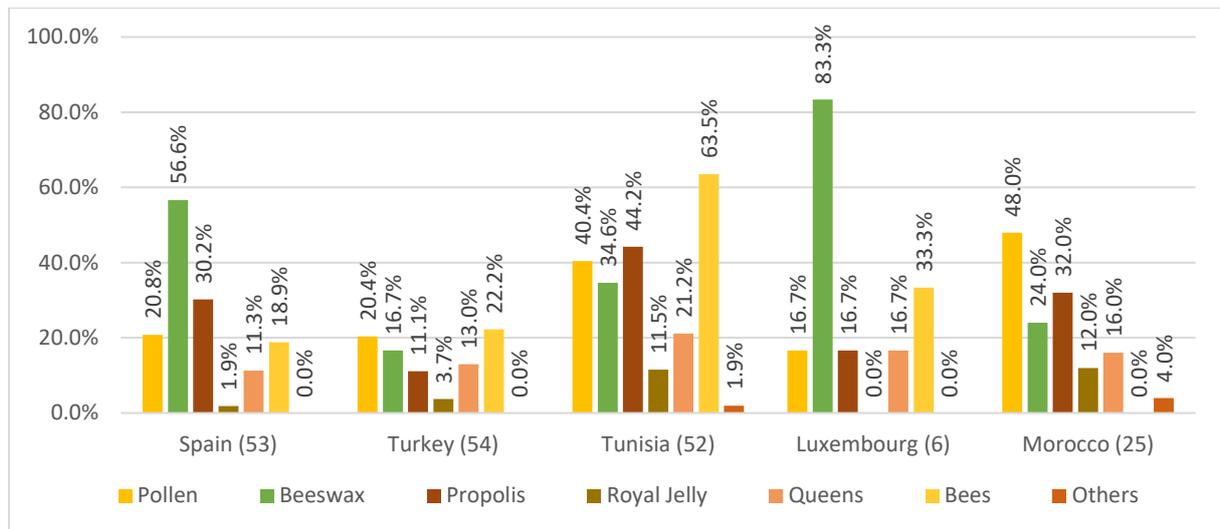


Figure 16. Additional products collected from the bees

The survey results reveal a diverse landscape of honey production across the TECHONEY case study countries, shaped by ecological conditions, floral availability, and market preferences. As can be observed on figure 17. While **Mountain Monofloral Honey** emerges as the predominant type in **Spain (83%)**, **Turkey (71.2%)**, and **Tunisia (80.8%)**, reflecting a strong emphasis on single-flower origin and high-altitude sourcing, other countries show more varied profiles. **Morocco** demonstrates the most balanced distribution, with significant shares of **Mountain Multifloral (56%)**, **Forest Honey (44%)**, and **Crop Honey (24%)**, indicating a blend of wild and cultivated floral sources. **Luxembourg**, in contrast, reports exclusively **Crop Multifloral Honey (100%)**, likely due to its limited mountainous terrain and agricultural orientation. Notably, **Forest Honey (Myelate)** is highly prevalent in **Tunisia (78.8%)**, suggesting rich forest ecosystems and consumer interest in darker, antioxidant-rich honeys. These findings underscore the importance of contextualizing honey typologies when designing traceability systems and marketing strategies, particularly in relation to blockchain-enabled labeling and consumer segmentation.



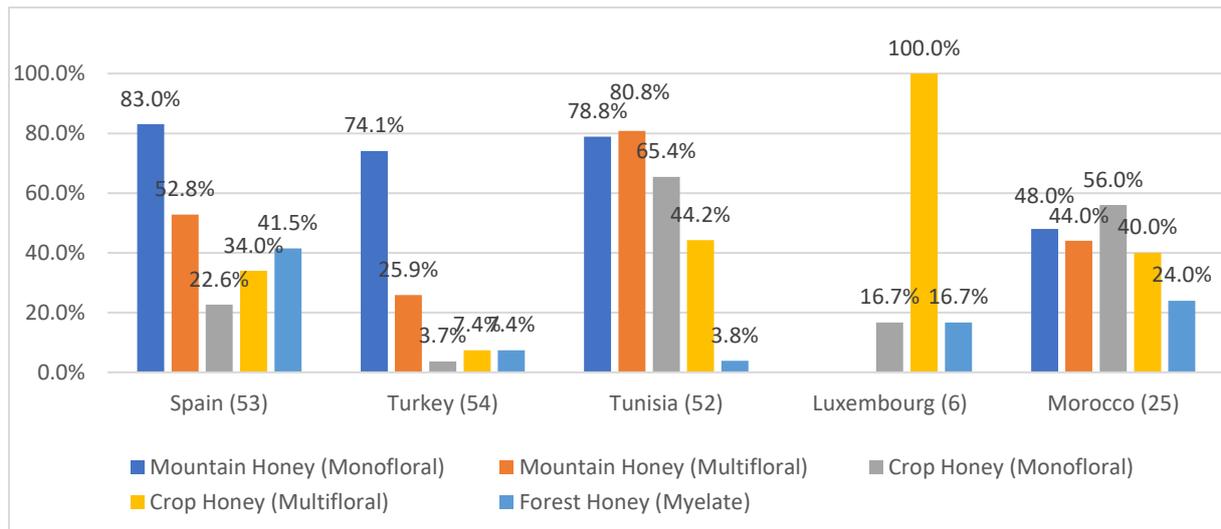


Figure 17. Type of honey production

In the next graph (Figure 18), Beekeepers were classified into three categories based on the number of hives managed: professional (>150 hives), non-professional (15–150 hives), and self-consumption (<15 hives). The data shows that Turkey (79.6%) and Morocco (72%) have the highest proportion of professional beekeepers, indicating a strong commercial orientation. In contrast, Tunisia (73.1%) and Luxembourg (83.3%) are dominated by non-professional beekeepers, suggesting a more decentralized or semi-commercial model. Spain presents a balanced profile, with nearly equal shares of professional (47.2%) and non-professional (41.5%) beekeepers, and a modest segment engaged in self-consumption (11.3%). Notably, self-consumption beekeeping is virtually absent in Tunisia and Morocco, but present in Luxembourg (16.7%) and Spain, reflecting cultural or economic differences in small-scale apiculture. These distinctions are critical for tailoring digital transformation strategies and blockchain adoption pathways, as the scale of operation directly influences technological readiness and investment capacity.

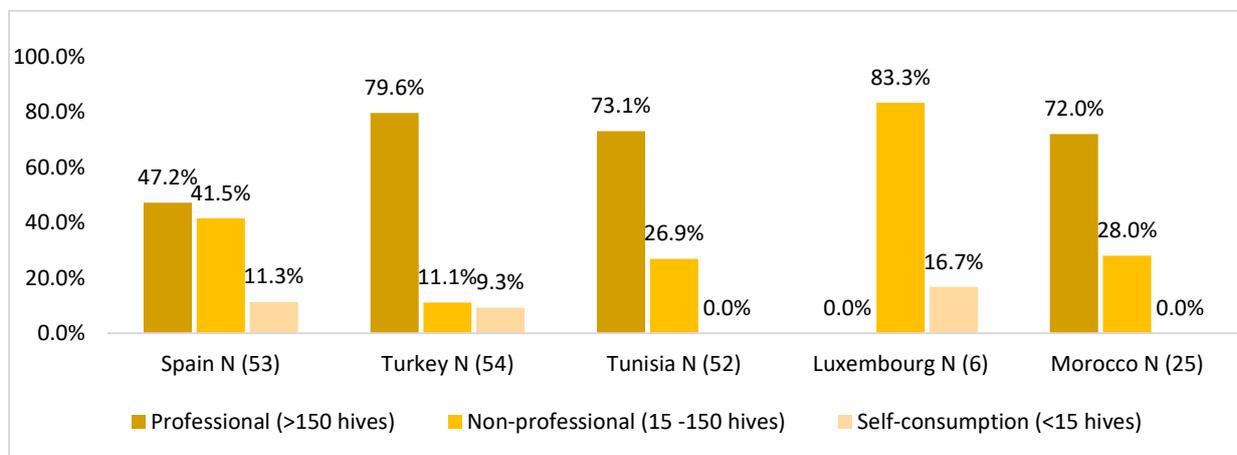
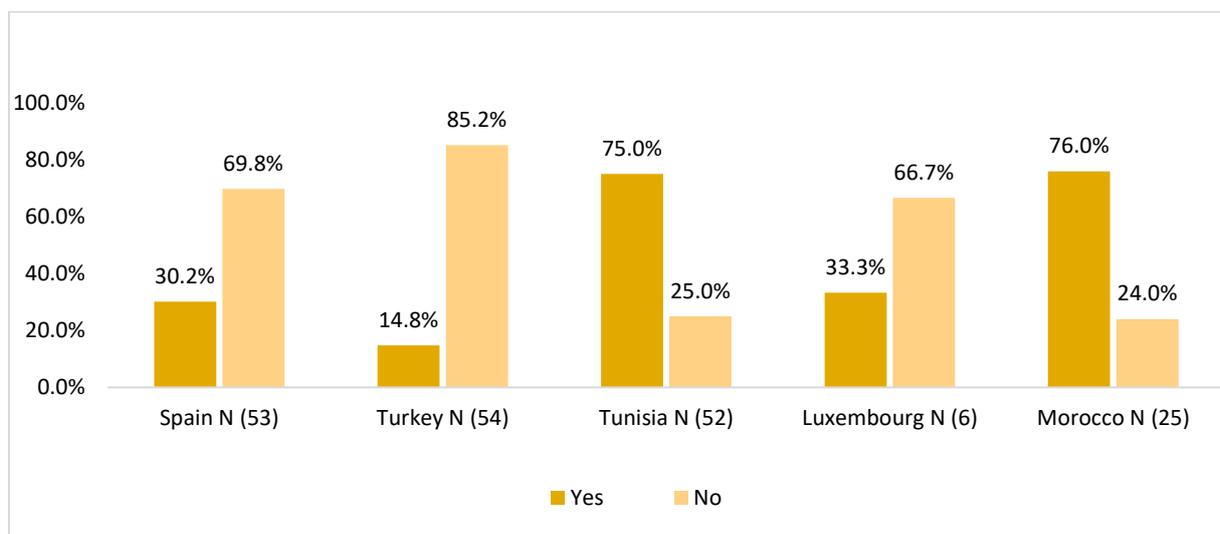


Figure 18. Distribution of beekeepers according to their type of beekeeping activity



The survey results reveal notable differences in cooperative membership among beekeepers across the TECHONEY case study countries (see Figure 19). Tunisia (75%) and Morocco (76%) report the highest levels of cooperative participation, indicating strong organizational structures and collective engagement in the apiculture sector. In contrast, Spain (30.2%) and Luxembourg (33.3%) show more limited involvement, while Turkey (14.8%) has the lowest rate of cooperative membership among surveyed beekeepers. These findings suggest that cooperative affiliation may be influenced by national policy frameworks, market access strategies, and cultural attitudes toward collaboration. Understanding these dynamics is essential for designing inclusive digital transformation initiatives and fostering stakeholder-driven innovation in the honey supply chain.



*Figure 19. % of beekeepers that are members of a cooperative*

In figure 20, results of the **beekeepers' experience** levels across the TECHONEY case study countries can be observed. These results reveal both generational depth and emerging participation. Spain and Luxembourg show a relatively balanced distribution, with a notable presence of long-term practitioners—Spain has 11.3% with 30–40 years of experience and 5.7% with more than 40 years, while Luxembourg reports 33.3% with 10–20 years and 16.7% in both the 20–30 and 30–40 year ranges. Turkey and Morocco, by contrast, are dominated by newer entrants: Turkey has 44.4% of beekeepers with 5–10 years of experience and 16.7% with less than 5 years, while Morocco shows 48% in the 5–10 year range and 28% with less than 5 years. Tunisia presents a more diverse profile, with 38.5% in the 5–10 year range, 23.1% in the 20–30 year range, and 3.8% exceeding 40 years. These findings highlight the coexistence of experienced beekeepers and newer generations, which is crucial for designing training strategies, fostering innovation, and ensuring the sustainability of apiculture practices in the Mediterranean region.



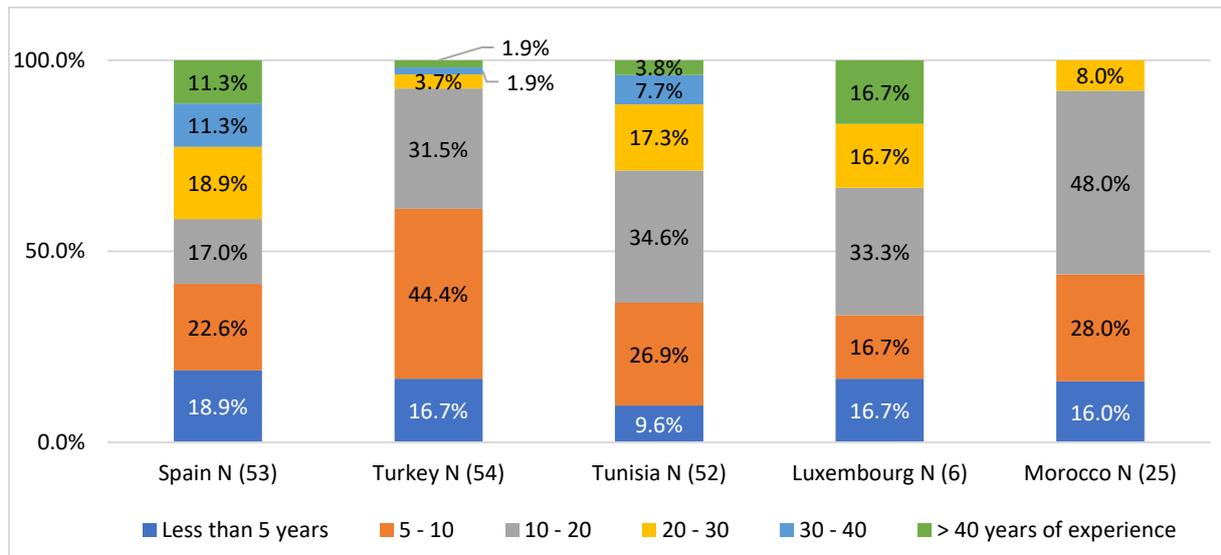


Figure 20. Years of experience in apiary/beekeeping

Next graph (Figure 21) presents the sources of agricultural education among beekeepers, offering insight into how knowledge is acquired and transferred within the sector. The data shows that practical experience is the dominant learning pathway—especially in Turkey (88.9%) and Morocco (84%)—while Spain and Luxembourg show higher engagement in courses, conferences, and informal training (43.4% and 66.7%, respectively). Formal education, such as agricultural university degrees or professional training, remains limited across all countries, with Morocco (12%) and Tunisia (7.7%) showing the highest shares. This educational profile complements the previous graph on years of experience, reinforcing the idea that beekeeping knowledge is largely built through hands-on practice rather than institutional channels. It also highlights potential gaps in formal training that could be addressed through targeted capacity-building programs—especially relevant for digital transformation and blockchain adoption, where technical literacy plays a key role.

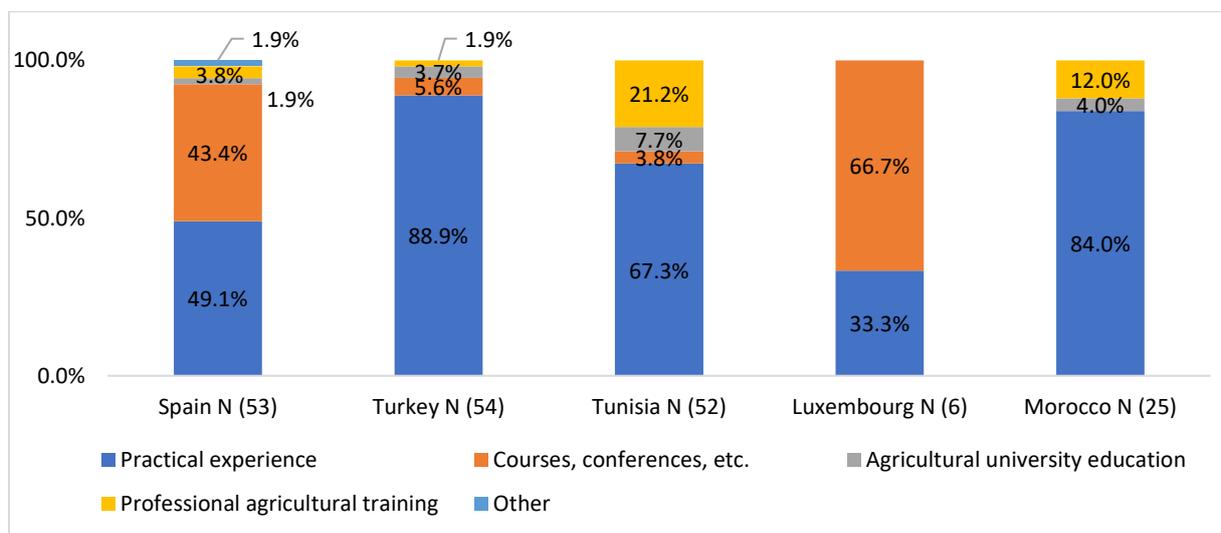


Figure 21. Origin of your apiculture knowledge



Regarding the organic certification among beekeepers, results showed that the majority of respondents in **Spain (98.1%)**, **Turkey (90.7%)**, and **Tunisia (94.2%)** reported **not having organic certification**, indicating limited integration of formal sustainability standards in these regions. In contrast, **Luxembourg (50%)** and **Morocco (24%)** show relatively higher levels of certification, suggesting more active engagement with organic labeling and potentially stronger alignment with niche or premium markets (see Figure 22). These findings highlight a gap between sustainable practices and formal certification, which may be influenced by regulatory complexity, cost barriers, or limited market incentives. Addressing these challenges could be key to expanding traceability systems and enhancing consumer trust in honey quality and origin.

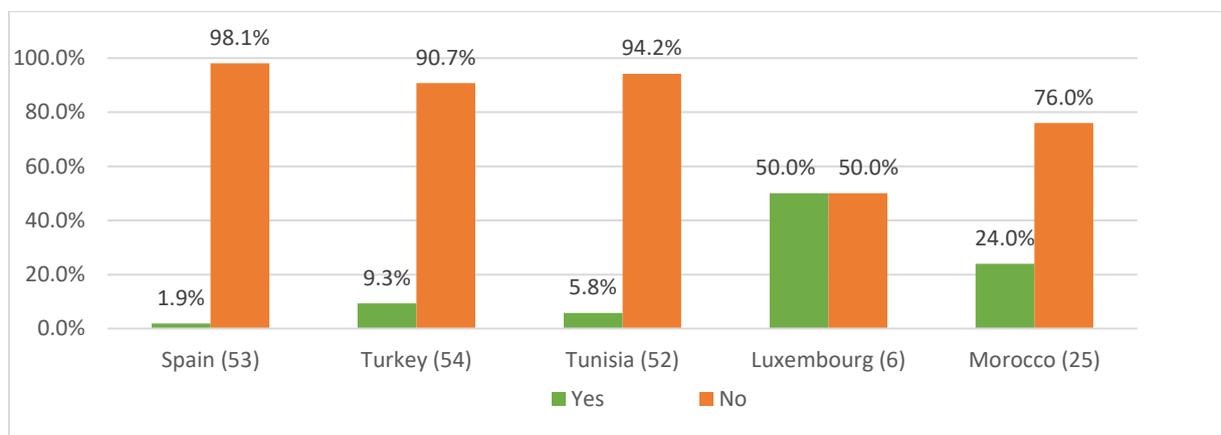


Figure 22. Beekeepers with an organic certification

The following graph (Figure 23) shows that **Morocco (52%)** and **Luxembourg (66.7%)** have the highest share of beekeepers with their own honey label, followed by **Tunisia (40.4%)** and **Spain (35.8%)**. In contrast, **Turkey (14.8%)** reports the lowest individual branding, relying more heavily on collective labeling. This reflects varying levels of market autonomy and branding strategies across countries.

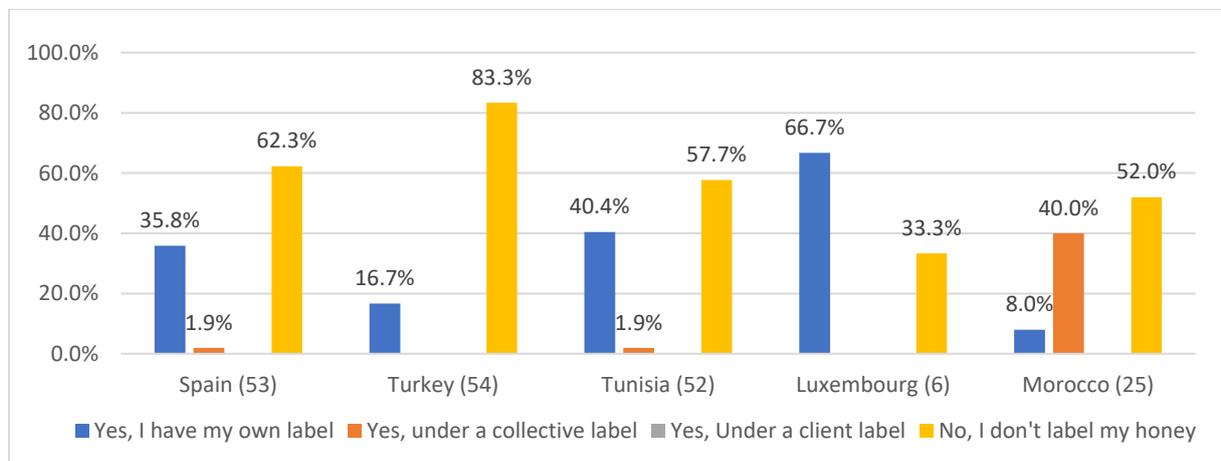
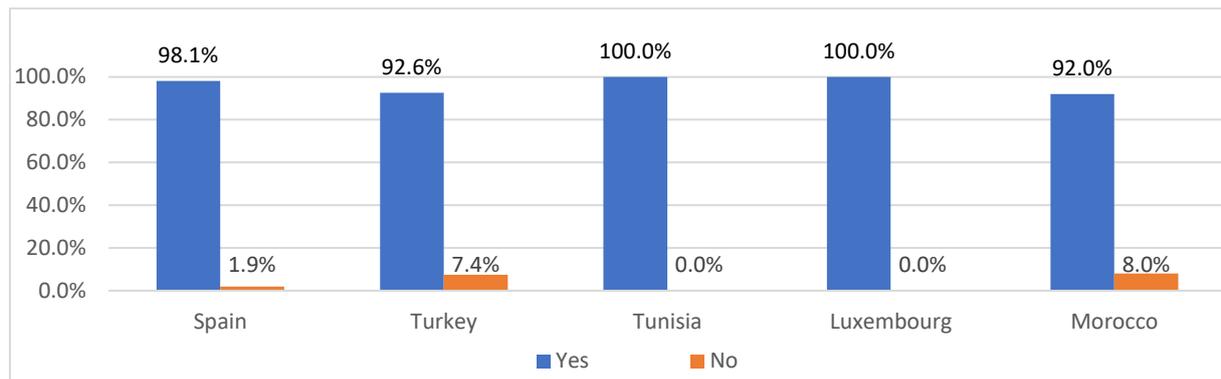


Figure 23. Beekeepers with their own brand/label



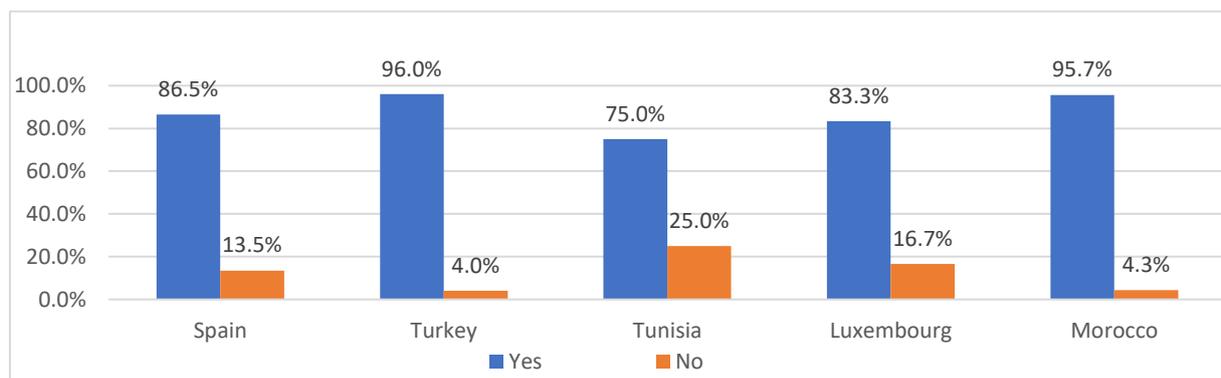
**FRAUD**

As can be seen on Figure 24, awareness of honey fraud is widespread across all countries. Nearly all respondents in **Spain (98.1%)**, **Tunisia (100%)**, **Luxembourg (100%)**, **Turkey (92.6%)**, and **Morocco (92%)** reported having heard about fraudulent honey, indicating that the issue is well-known and part of the sector's collective concern.



*Figure 24. Beekeepers that ever heard about fraudulent honey*

The next graph (Figure 25) allows to observe that perceptions of honey fraud as a sector-wide issue vary. While **Turkey (96%)**, **Morocco (95.7%)**, and **Spain (86.5%)** show strong concern, **Tunisia (75%)** and **Luxembourg (83.3%)** report slightly lower levels of perceived impact. This suggests that while awareness is high, the perceived severity may differ based on local market dynamics or regulatory enforcement.



*Figure 25. Fraudulent honey an issue among their colleagues*

A majority of beekeepers believe that honey fraud has increased over time (see Figure 26). Results show that **Turkey (100%)**, **Luxembourg (100%)**, **Morocco (95.7%)**, and **Spain (88.5%)** express strong agreement, while **Tunisia (84.6%)** also reflects a high level of concern. This trend perception underscores the urgency for improved monitoring and control mechanisms.



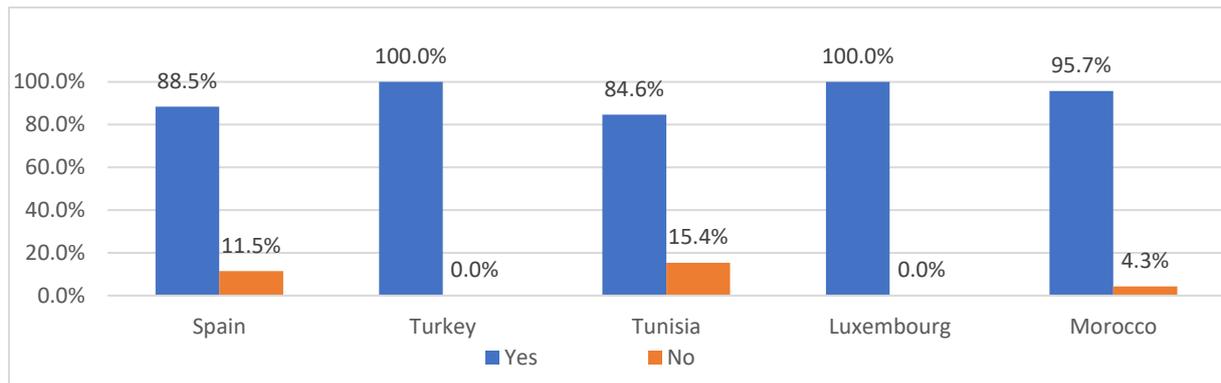


Figure 26. Identification of more fraudulent honey compared to earlier years

Support for traceability as a solution is nearly unanimous. In the next figure (Figure 27) can be observe that **Luxembourg (100%), Morocco (100%), Spain (98.1%), Turkey (98%), and Tunisia (94.2%)** all show overwhelming agreement that traceability systems are essential to combat honey fraud. This consensus provides a strong foundation for introducing blockchain or digital traceability tools within the TECHONEY framework.

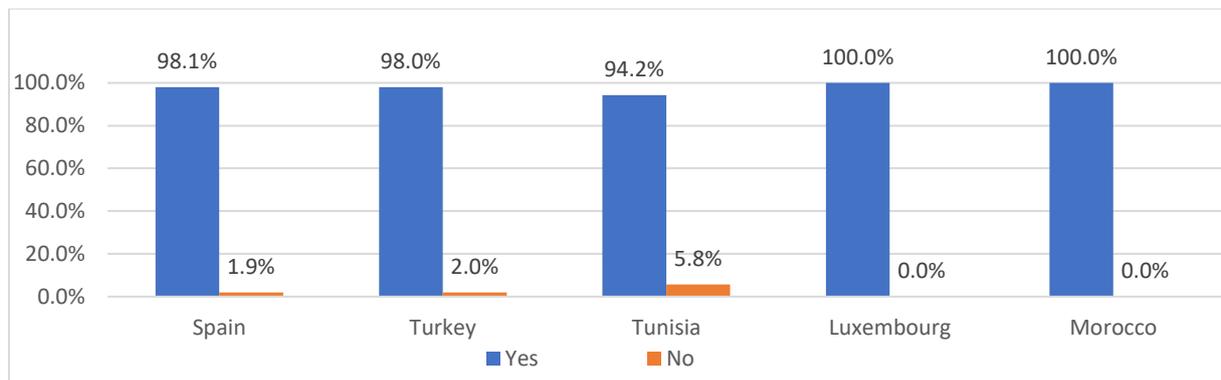


Figure 27. Beekeepers opinion about traceability need for avoid honey fraud.

Previous findings about fraud clearly demonstrate that **honey fraud is a widely recognized and increasingly perceived threat** across all surveyed countries. While awareness and concern levels vary slightly, there is **near-universal agreement on the need for traceability** as a preventive measure. These insights validate the strategic direction of the TECHONEY project and highlight the importance of implementing robust, transparent systems that can restore trust and integrity in the honey value chain.



**DIGITAL SKILLS**

Beekeepers in Spain show a high overall level of digital literacy, with strong familiarity across most tools and platforms. While some areas like social media and email account setup show room for improvement, the majority demonstrate competence in cloud services, e-commerce, and digital certification.

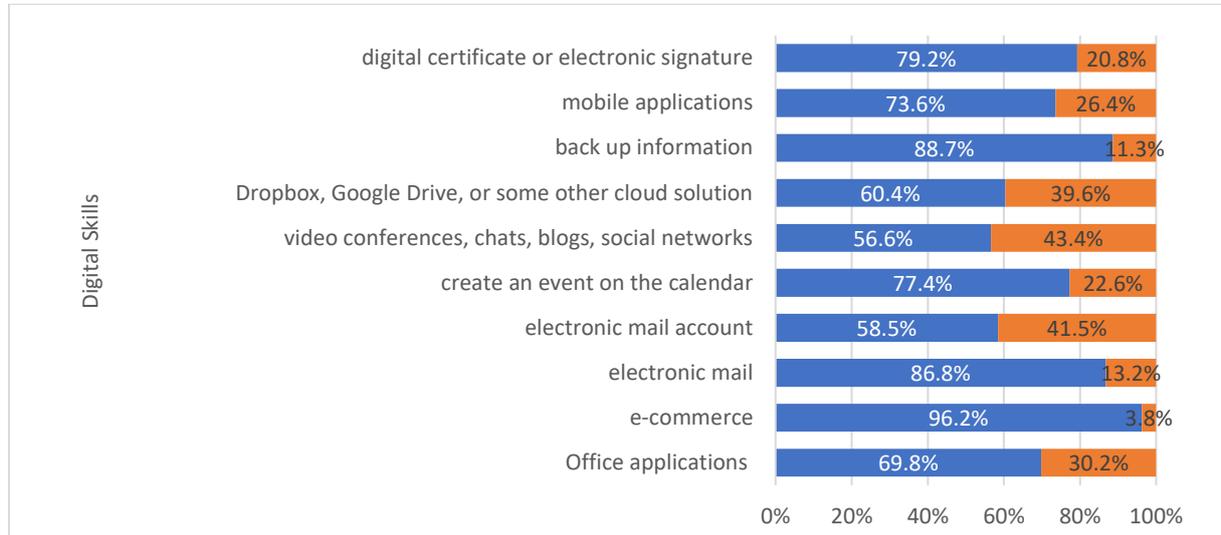


Figure 28. Spain Beekeepers' digital Skills levels.

Digital skills among Turkish beekeepers are **mixed**. While mobile applications and calendar use are relatively strong, knowledge in areas like cloud storage, backup, and e-commerce is more limited. This suggests uneven exposure to digital tools across the sector.

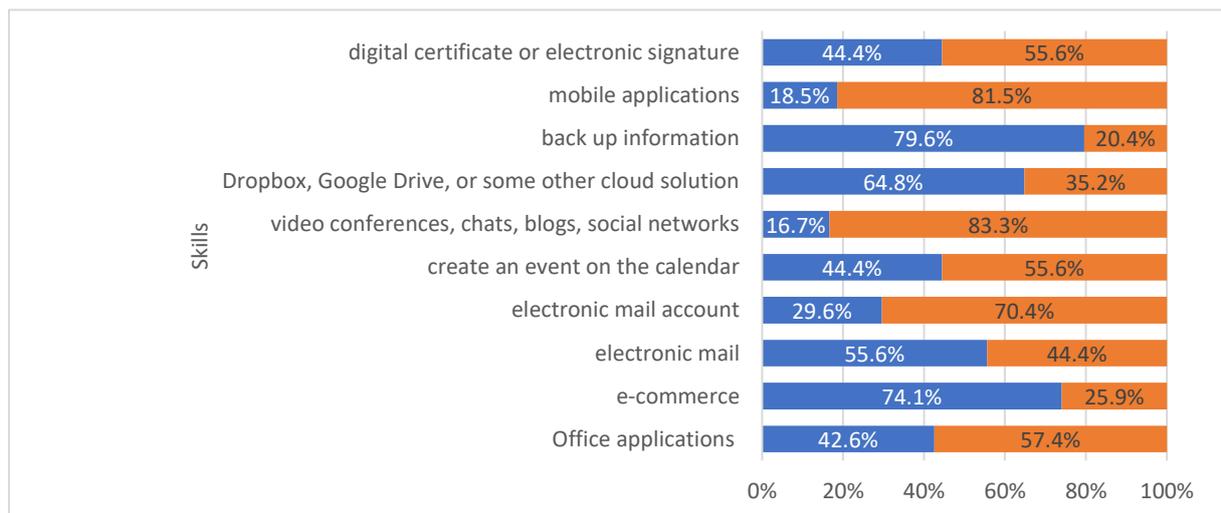


Figure 29. Turkish Beekeepers' digital Skills levels.

Tunisia presents a **fragmented digital profile**. While some beekeepers are familiar with cloud tools and calendar functions, others lack basic competencies in mobile apps, backup, and email. The overall digital readiness is moderate, with clear gaps in foundational skills.



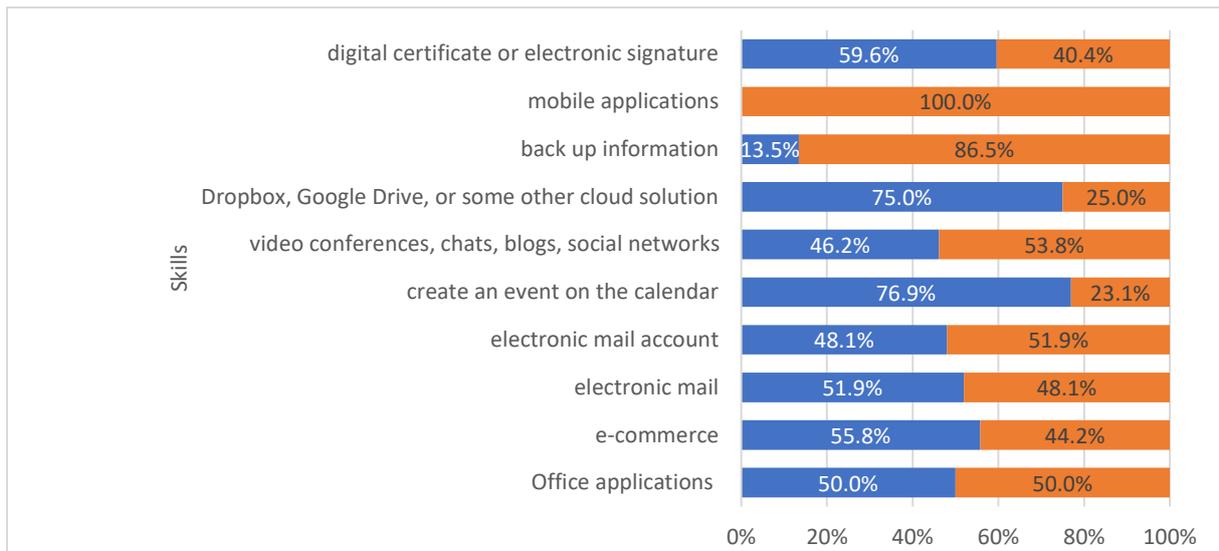


Figure 30. Turkish Beekeepers' digital Skills levels.

Beekeepers in Luxembourg demonstrate exceptionally high digital proficiency, with nearly universal knowledge across all listed skills. This positions them well for adopting advanced traceability and data management systems.

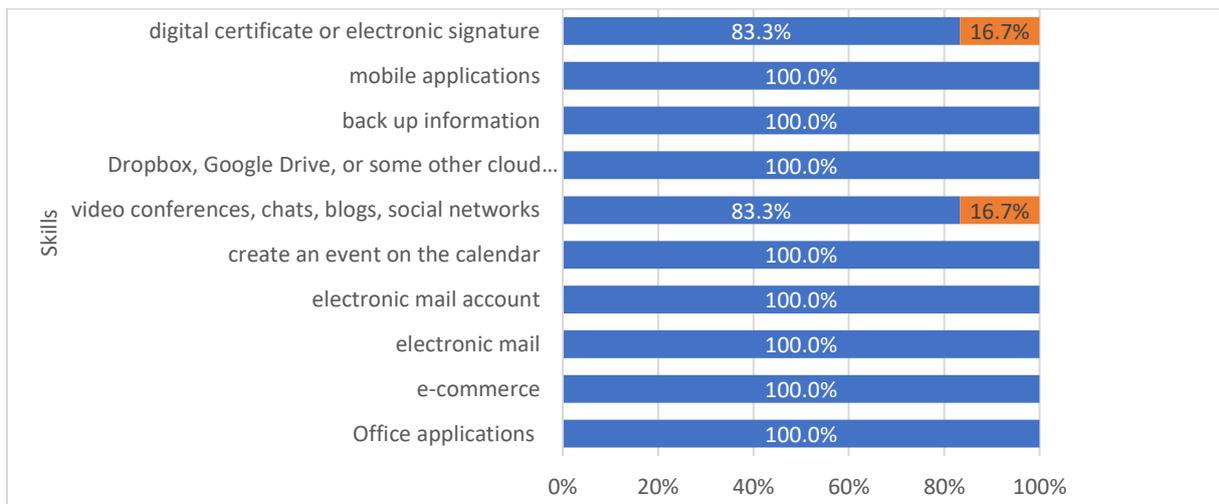


Figure 31. Luxembourg Beekeepers' digital Skills levels.

Digital literacy in Morocco is **highly variable**. While mobile app and e-commerce knowledge are strong, other areas—such as backup, office tools, and digital certification—show significant gaps. This uneven skillset may affect the scalability of digital solutions.



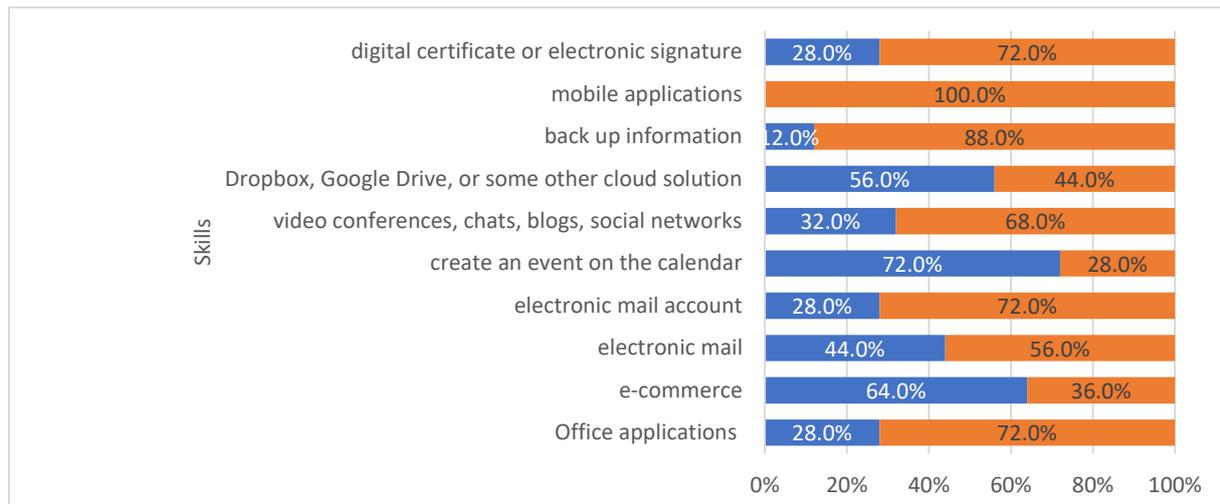


Figure 32. Morocco Beekeepers' digital Skills levels.

The digital skill levels among beekeepers vary widely across countries, reflecting differences in infrastructure, education, and exposure to technology. **Luxembourg and Spain** lead in overall readiness, while **Tunisia and Morocco** show more fragmented profiles. These insights are crucial for tailoring digital transformation strategies, ensuring that training programs are adapted to local capacities, and identifying where support is most needed for implementing traceability and blockchain-based systems.

## DIGITAL MATURITY

Understanding the digital maturity of beekeepers is essential for designing effective strategies that support traceability, fraud prevention, and sustainable innovation in the apiculture sector. While basic digital literacy provides a foundation, it is the ability to **integrate digital tools into daily operations**—from hive monitoring to online marketing—that truly defines readiness for transformation. This section focuses on the level of digital maturity across the TECHONEY case study countries, highlighting how beekeepers engage with both conventional and advanced technologies in their professional activities. The findings reveal not only disparities in access and adoption but also opportunities to tailor capacity-building efforts to local realities

Beekeepers in Spain show **moderate digital maturity**, with relatively good awareness of basic tools like email and social media, but limited integration of advanced technologies such as hive monitoring systems or SEO. The adoption of digital platforms to support apiary activities remains uneven.



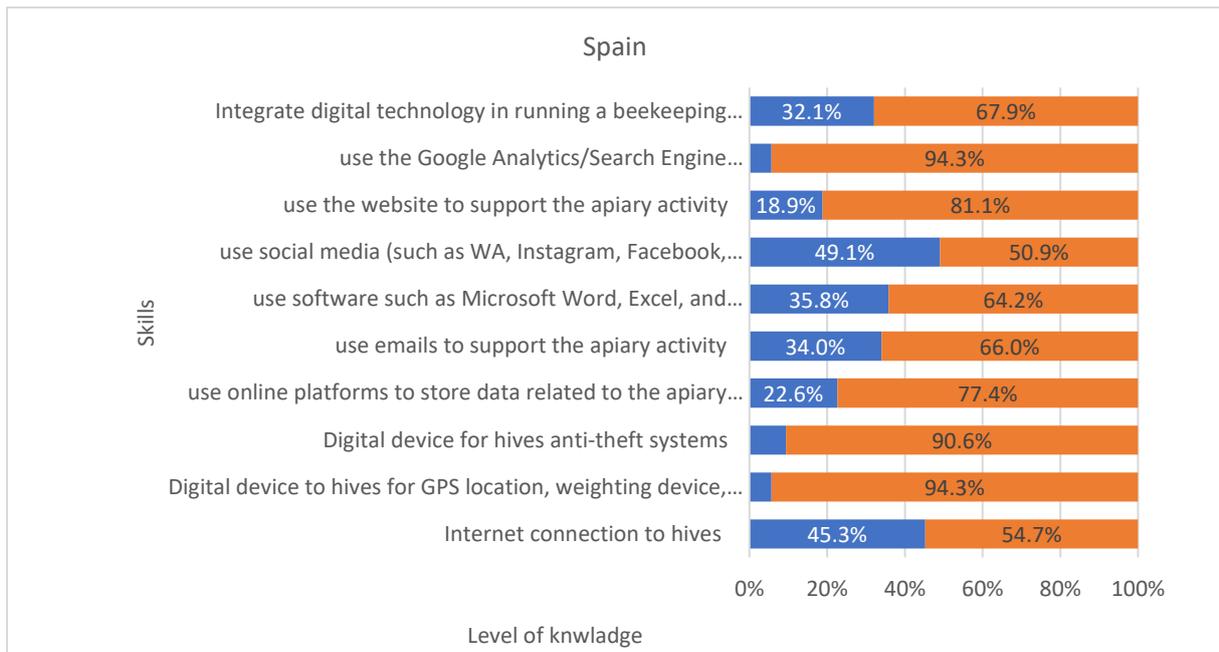


Figure 33. Digital maturity of Spanish beekeepers

Digital maturity in Turkey is **comparatively high**, with strong familiarity across most digital tools, including websites, analytics, and hive-connected devices. Beekeepers demonstrate readiness to integrate technology into business operations, suggesting strong potential for digital transformation.

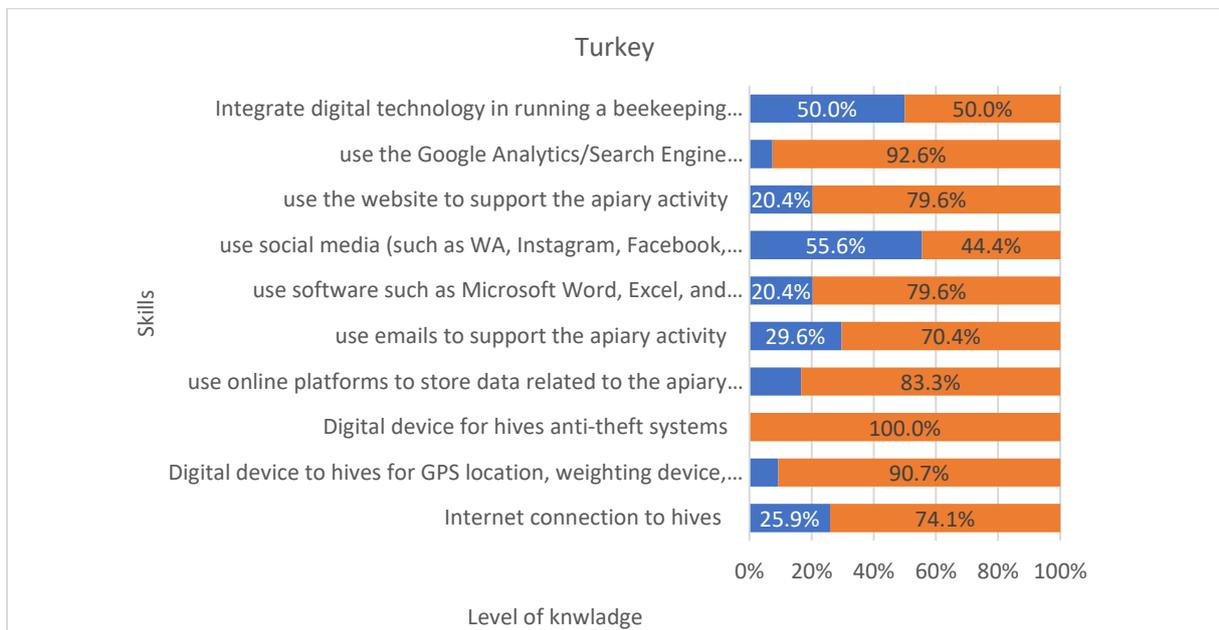


Figure 34. Digital maturity of Turkish beekeepers

Tunisia presents a **mixed digital maturity profile**. While beekeepers show strong knowledge of advanced tools like GPS-enabled hive devices and online data platforms, basic digital functions such as email and social media are less consistently adopted. This reflects a leapfrogging pattern in tech uptake.



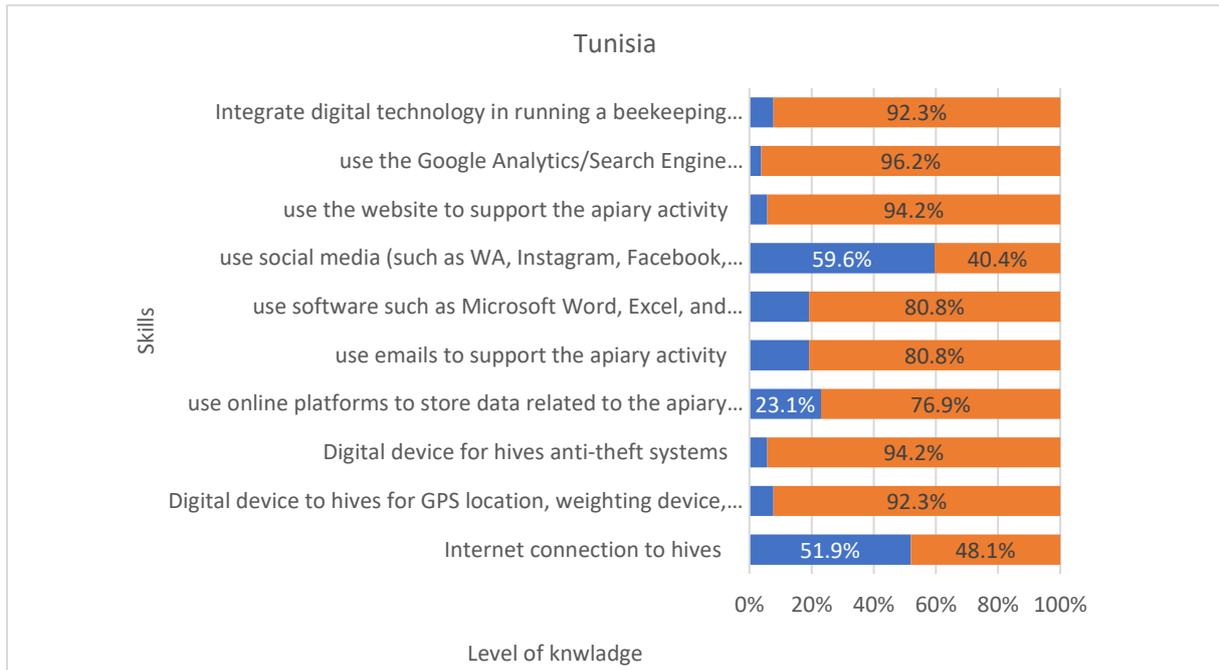


Figure 35. Digital maturity of Tunisian beekeepers

Beekeepers in Luxembourg exhibit high digital maturity, with solid knowledge across both basic and advanced tools. The use of websites, analytics, and hive monitoring technologies is well established, positioning them as early adopters in the Mediterranean context.

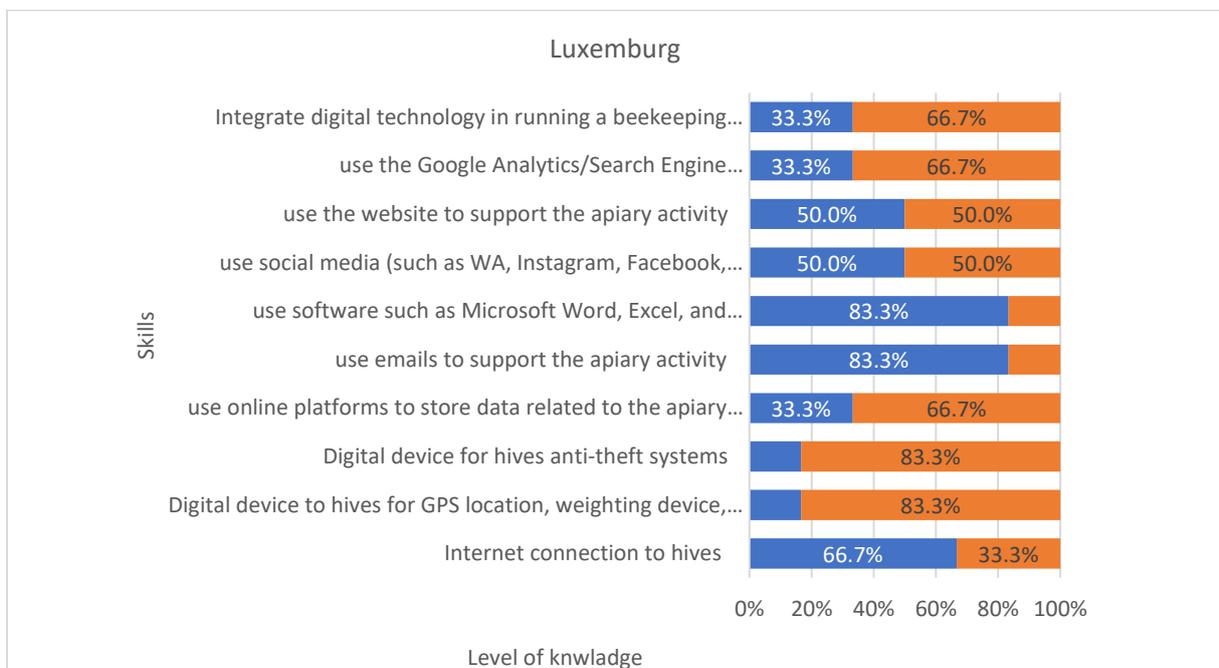


Figure 36. Digital maturity of beekeepers from Luxemburg



Digital maturity in Morocco is **limited and uneven**. While some beekeepers are familiar with social media and internet-connected hives, most lack exposure to data platforms, websites, and hive-level digital devices. This suggests a need for targeted training and infrastructure support.

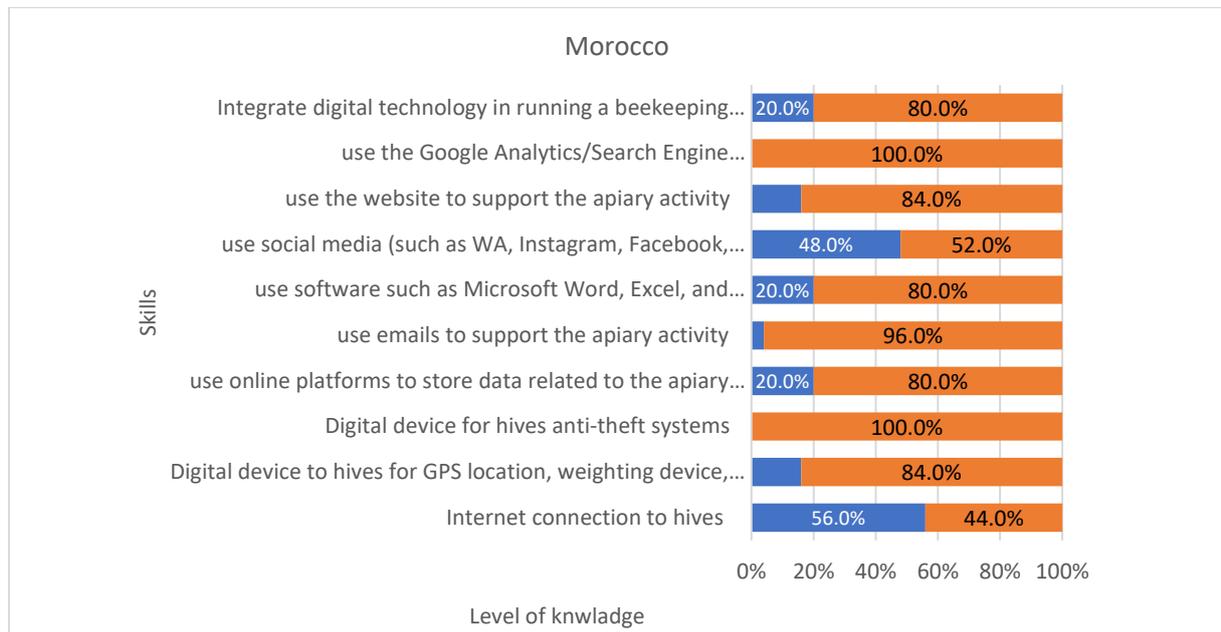


Figure 37. Digital maturity of beekeepers from Morocco

The analysis between the countries allowed to observe that Luxembourg and Turkey stand out for their high digital maturity, with widespread use of websites, analytics, and hive-connected devices. These beekeepers are well-positioned to adopt blockchain-based traceability systems and advanced data platforms. Spain and Tunisia show moderate digital integration, with some familiarity in business-oriented tools but limited uptake of hive-level technologies. These profiles suggest potential for growth through targeted training and infrastructure support. Morocco presents a low and uneven digital maturity, with minimal exposure to most digital tools beyond basic communication platforms. This highlights the need for foundational digital education and tailored support to ensure inclusive participation in future innovations.



**BLOCKCHAIN**

Awareness of blockchain technology among beekeepers is **generally low**, with significant variation across countries. While **Luxembourg (83.3%)** shows high familiarity, most other countries report limited exposure—**Spain (39.6%)**, **Tunisia (19.2%)**, **Morocco (20%)**, and **Turkey (5.6%)**. This suggests that blockchain remains a relatively unfamiliar concept within the apiculture sector, especially outside of more digitally mature contexts.

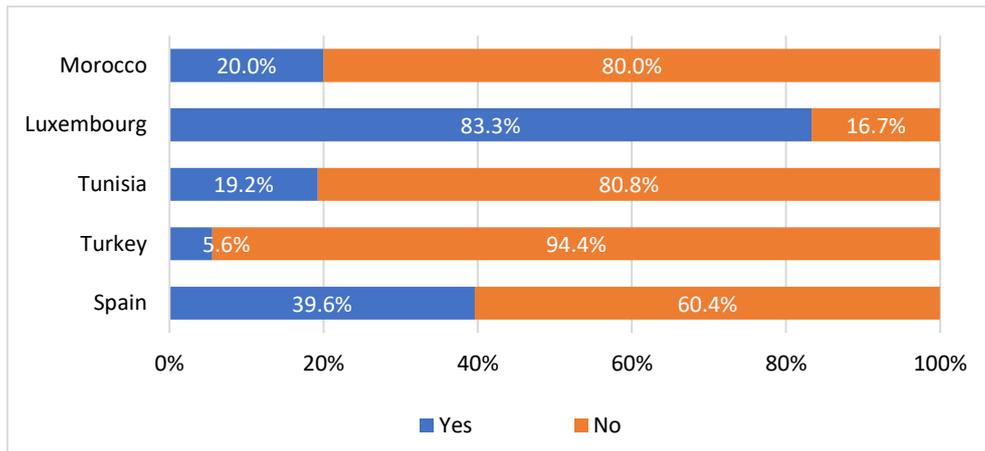


Figure 38. Beekeepers' that previously heard about blockchain

The next three graphs explore beekeepers' intentions toward blockchain adoption through the lens of the Theory of Planned Behavior. Across all countries, the majority of respondents express **positive views** on blockchain's relevance and future use:

Regarding if **"BCT should be used"** figure 39 allow to see: Strong agreement is highest in **Morocco (55.8%)**, **Italy (46.2%)**, and **Spain (46.5%)**, with most other countries also showing favorable responses.

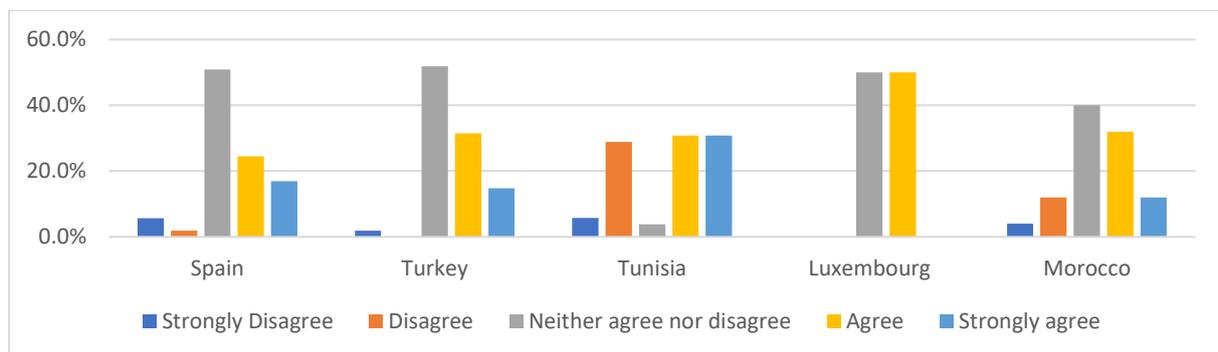


Figure 39. Beekeepers' opinion about if BCT should be used

In the graph related to opinion about if **"BCT will be used"** (Figure 40): Similar trends persist, with strong agreement again led by Morocco (55.8%), followed by Italy (46.2%) and Spain (45.6%).



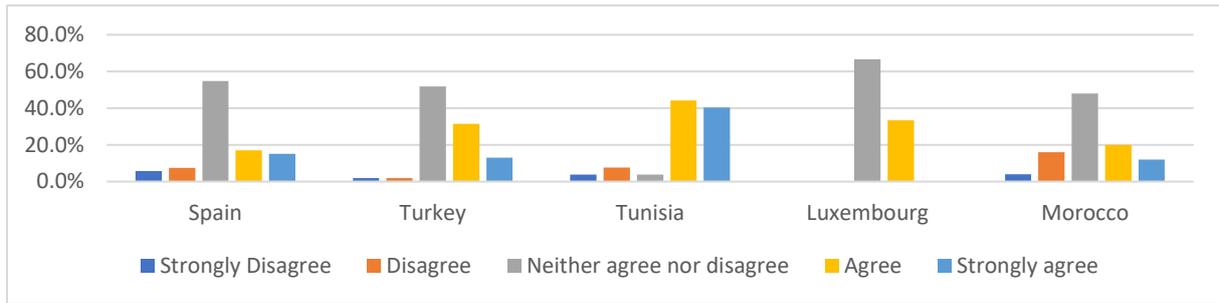


Figure 40. Beekeepers' opinion about if BCT will be used

For The beekeepers' opinion about if "It is a good idea to use BCT" figure 41 let us see that responses mirror the previous two, reinforcing a generally optimistic outlook across regions.

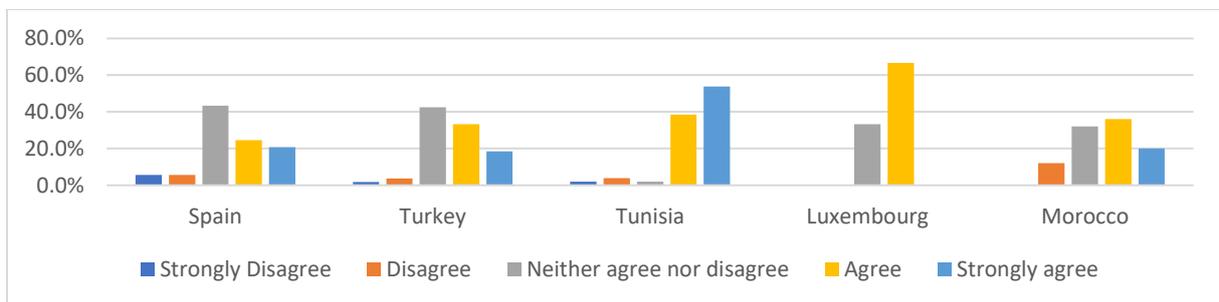


Figure 41. Beekeepers' opinion about if It is a good idea to use BCT

Despite varying levels of prior exposure to blockchain, results on figure 42 suggest that beekeepers are open to its adoption, especially when framed as a solution to traceability and fraud prevention.

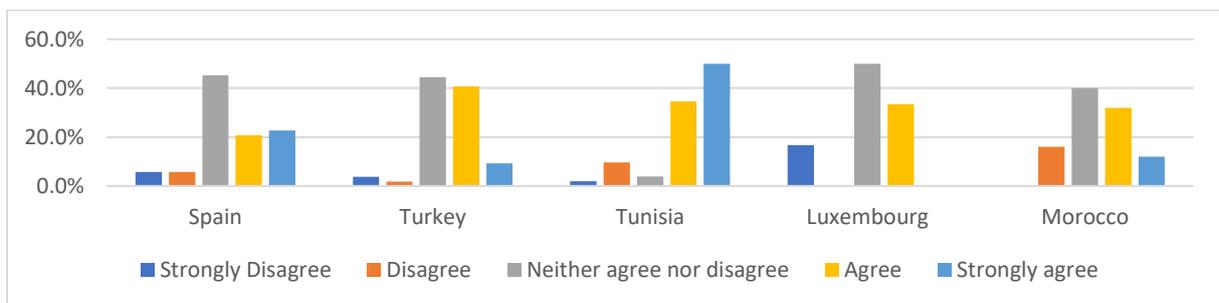


Figure 42. Beekeepers with a positive attitude toward the use of BCT

As can be observe on Figure 43, most beekeepers across countries perceive blockchain technology as **useful** for their apiary operations. Strong agreement is highest in **Italy, Spain, and Morocco**, while **Luxembourg and Tunisia** show moderate support. Even in countries with lower prior exposure, such as **Turkey**, the majority still lean toward agreement, suggesting that the perceived value of blockchain is broadly recognized.



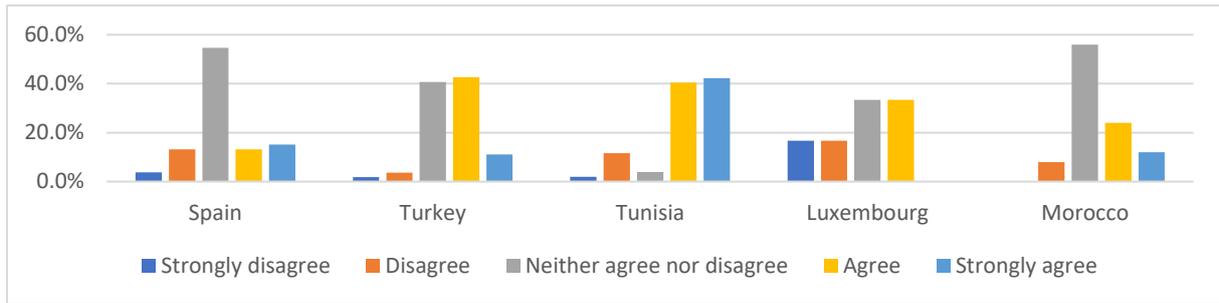


Figure 43. Beekeepers opinion about if BCT is useful in their apiary activity

Perceptions of ease of use are more varied. **Italy** and **Luxembourg** show the highest confidence in blockchain’s usability, while **Spain**, **Tunisia**, and **Turkey** reflect more cautious or neutral views. This indicates that while beekeepers may see blockchain as beneficial, **usability remains a potential barrier** to adoption in some regions (Figure 44).

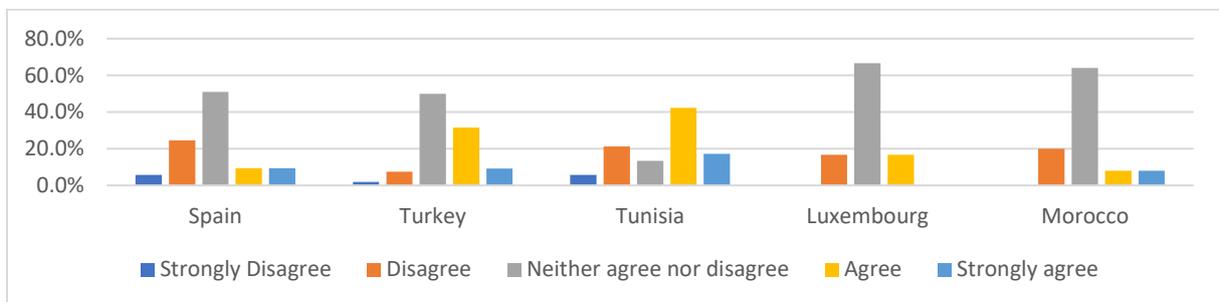


Figure 44. Beekeepers opinion about if BCT features are easy to use

Next figure in about BCT impact (Figure 45). And the results on the graph allows us to observe that perceptions of blockchain’s impact on productivity are mixed. While **Italy** and **Morocco** show moderate agreement, most respondents in **Spain**, **Luxembourg**, and **Tunisia** remain neutral or skeptical. This suggests that productivity gains are not yet clearly associated with blockchain in the beekeeping context.

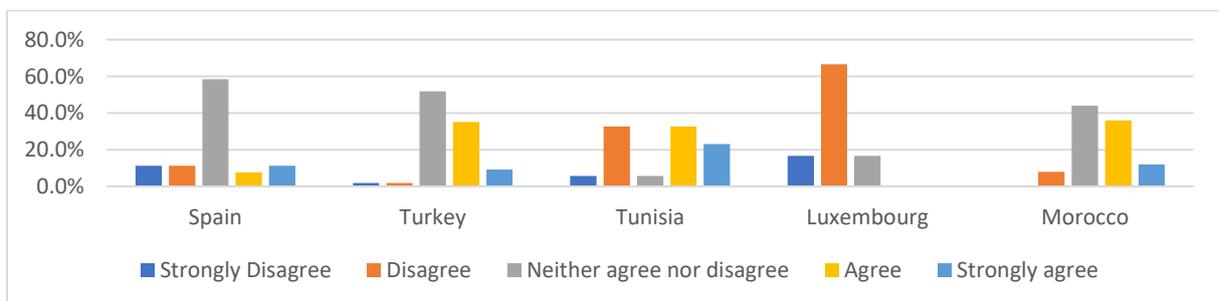


Figure 45. Beekeepers opinion about if BCT increases their productivity

Regarding the income in the following graph (figure 46), most countries show **neutral or cautious responses** regarding blockchain’s potential to increase income. **Turkey** and **Tunisia** lean slightly more



optimistic, while **Spain** and **Luxembourg** express higher levels of disagreement. This reflects uncertainty about the economic benefits of blockchain adoption.

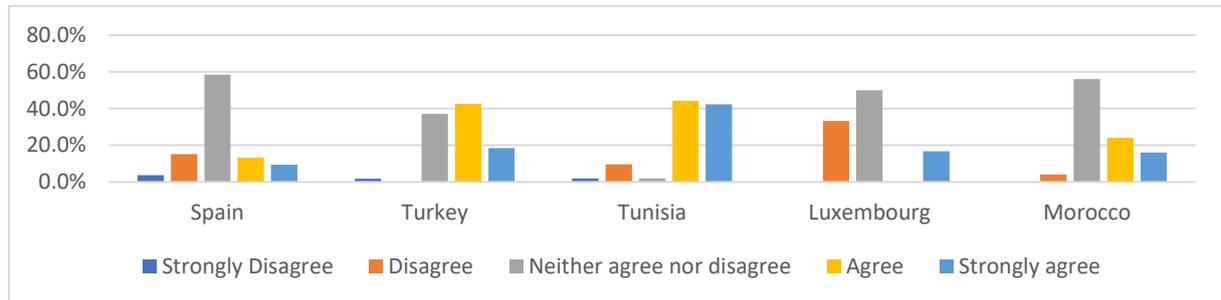


Figure 46. Beekeepers opinion about if BCT helps to increase the income

Beekeepers across countries generally **agree** that blockchain can improve honey quality and safety. As can be observe in figure 47, **Italy**, **Spain**, and **Morocco** show strong support, while **Tunisia** and **Turkey** are more reserved. This aligns with blockchain’s perceived value in traceability and consumer trust.

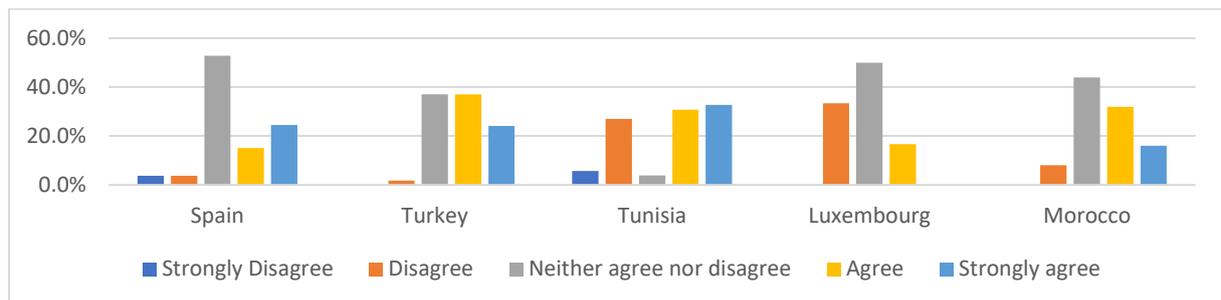


Figure 47. Beekeepers opinion - BCT enhances the honey quality and safety

On the beekeepers’ response to the question about if the transparency of BCT is beneficial for the beekeeping sector in terms of environmental friendliness, most countries show positive perceptions of blockchain’s environmental benefits. Morocco, Turkey, and Italy lead in agreement, while Luxembourg and Tunisia show more neutral responses (figure 48). This suggests that transparency is increasingly linked to sustainability in the sector.

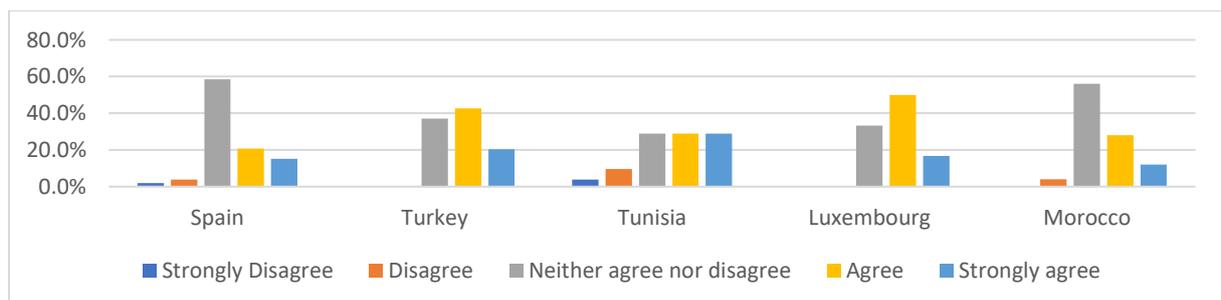


Figure 48. Beekeepers opinion - BCT transparency and environmental friendliness



The beekeepers' opinion about if BCT will allow local and small beekeepers to enter new markets are **divided** (figure 49). **Tunisia** and **Luxembourg** show strong optimism, while **Spain** and **Turkey** express skepticism. This reflects differing views on whether blockchain can democratize market access for small-scale producers.

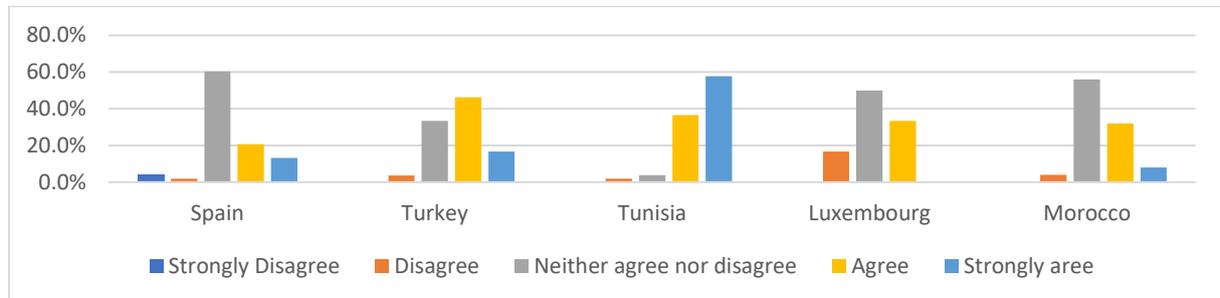


Figure 49. Beekeepers opinion - BCT will allow local and small beekeepers to enter new markets

Regarding the fraud, figure 50 shows that agreement is **moderate to strong** in most countries, especially **Tunisia**, **Luxembourg**, and **Italy**. However, **Spain** and **Morocco** show more neutral responses, and **Turkey** includes notable disagreement. These highlights varying levels of trust in blockchain's effectiveness against fraud.

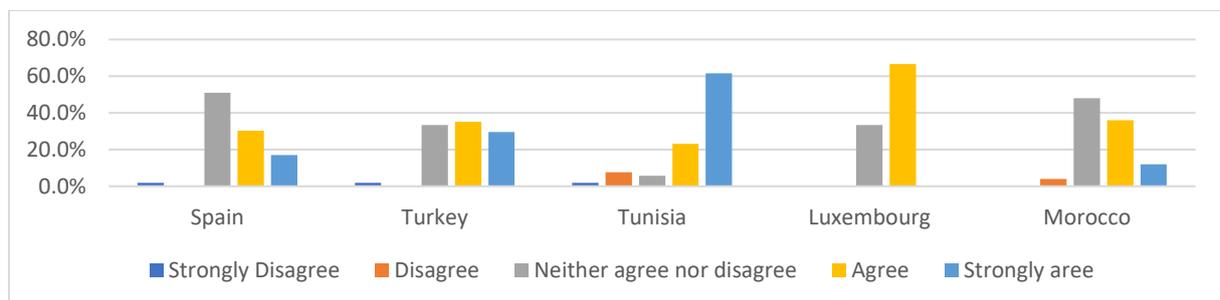


Figure 50. Beekeepers opinion - BCT implementation will decrease the amount of honey fraud

Social influence appears **limited but cautiously positive** (figure 51). According to the answer to the question about if people that are important to the beekeepers would recommend using BTC. Most respondents across countries lean toward neutrality, especially in **Luxembourg**, **Italy**, and **Morocco**. **Spain** and **Tunisia** show slightly higher agreement, suggesting that peer endorsement may play a modest role in shaping attitudes toward blockchain adoption.



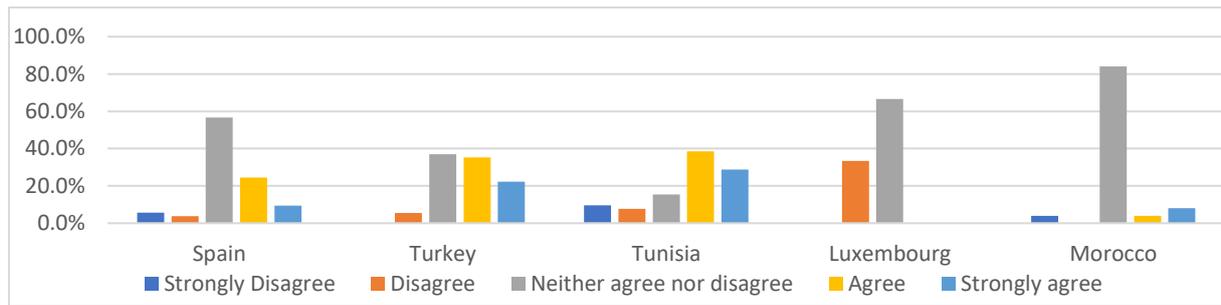


Figure 51. Beekeepers with a social influence on use of BCT

Figure 52 shows that there is **broad uncertainty** about whether blockchain adoption should be supported through public subsidies. Most countries—especially **Tunisia, Luxembourg, and Morocco**—show high neutrality, while **Spain and Turkey** lean more toward agreement. This indicates that while beekeepers may see value in blockchain, they are unsure about its financial viability without institutional support.

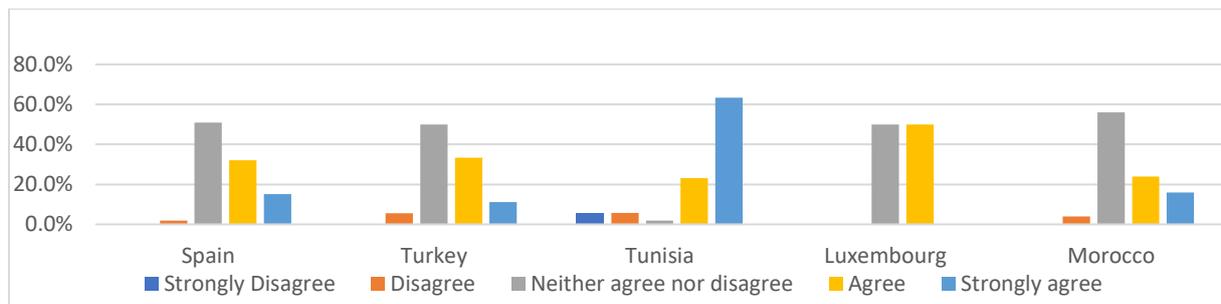


Figure 52. Beekeepers opinion - BCT needs government subsidy policies

The full set of findings reveals a **complex but promising landscape** for blockchain and digitalization in Mediterranean apiculture. While **awareness and technical familiarity remain uneven**, beekeepers across countries express **positive attitudes, strong intentions**, and a growing recognition of blockchain’s potential to improve **traceability, quality, and transparency**. However, concerns about **usability, economic impact, and market access** persist—especially among smaller producers. Social influence and institutional support are not yet decisive factors, but they could become catalysts if paired with targeted training and pilot initiatives. Overall, the data supports a strategic rollout of blockchain tools that is **inclusive, context-sensitive**, and aligned with beekeepers’ expectations.

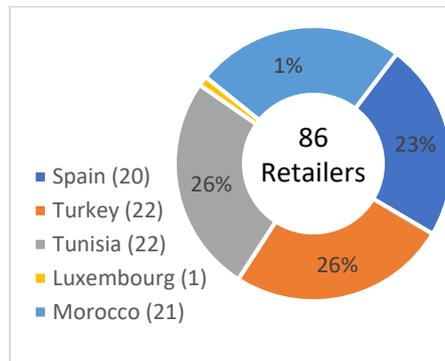
**3.2.2 RETAILERS**

**RETAILERS SAMPLE CHARACTERISTICS AND ACTIVITIES DESCRIPTION**

The next figure (Figure 53) presents the geographic distribution of **86 honey retailers** across five countries participating in the TECHONEY project. The sample is well-balanced, with **Turkey (26%)**,

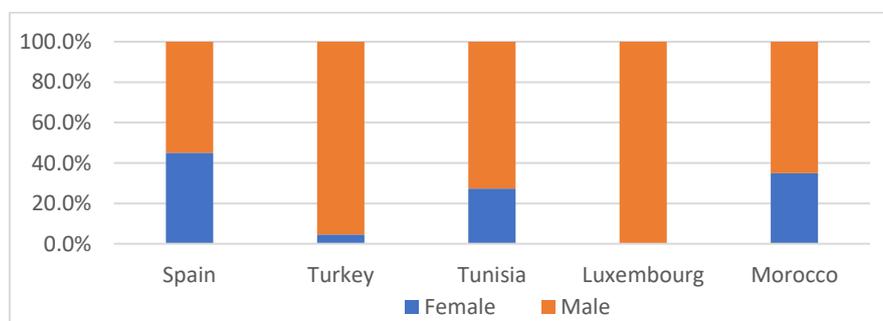


**Tunisia (26%), Morocco (24%), and Spain (23%)** contributing nearly equal shares. **Luxembourg**, with only **1%**, is minimally represented. This distribution ensures a diverse perspective on retail practices and perceptions across the Mediterranean honey supply chain.



*Figure 53. Honey retailers surveyed by case study*

The gender distribution among honey retailers is **predominantly male** across all five countries. While the chart does not provide exact percentages, visual comparison shows that **men consistently outnumber women** in each national sample. This suggests a gender imbalance in the retail segment of the honey supply chain, which may reflect broader structural patterns in agri-food entrepreneurship and market access.



*Figure 54. Honey retailers by gender*

The age distribution of honey retailers shows a **predominance of mid-career profiles**, particularly in the **35–54 age range** across all countries. Younger retailers (18–24) are minimally represented, while older age groups (55–70) vary by country, with **Spain** and **Luxembourg** showing slightly higher shares. This demographic profile suggests that honey retailing is largely driven by experienced professionals, with limited generational renewal.

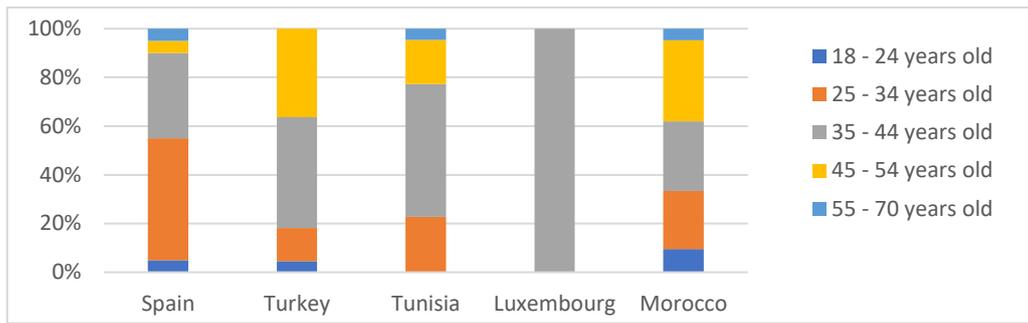


Figure 55. Honey retailers by range of age

The educational profile of honey retailers varies across countries, but **secondary and university education levels dominate** the sample. **Spain, Luxembourg, and Turkey** show higher shares of university-educated respondents, while **Tunisia and Morocco** include more individuals with primary or incomplete education. This diversity suggests differing entry pathways into the honey retail sector, shaped by national education systems and market structures.

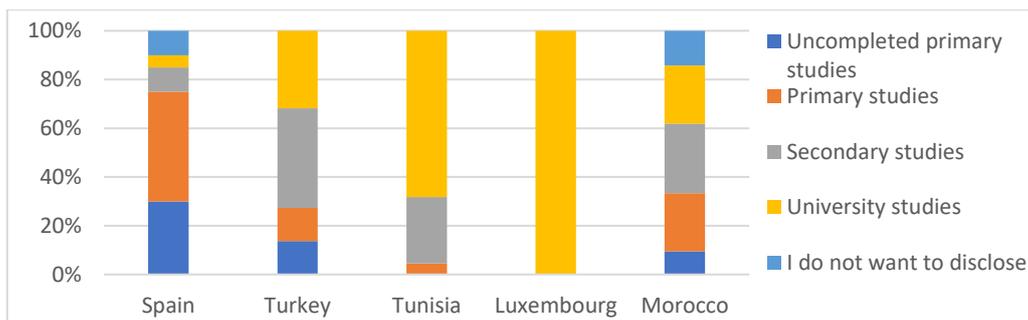


Figure 56. Honey retailers by education level

Retailers across the five countries show **diverse specialization patterns**. In **Spain and Turkey**, most retailers operate in **both honey and food sectors**, while **Luxembourg and Morocco** are dominated by **honey-only retailers**. **Tunisia** presents a balanced mix between honey-only and dual-sector retailers. These differences reflect varying market structures and integration levels within local food systems.

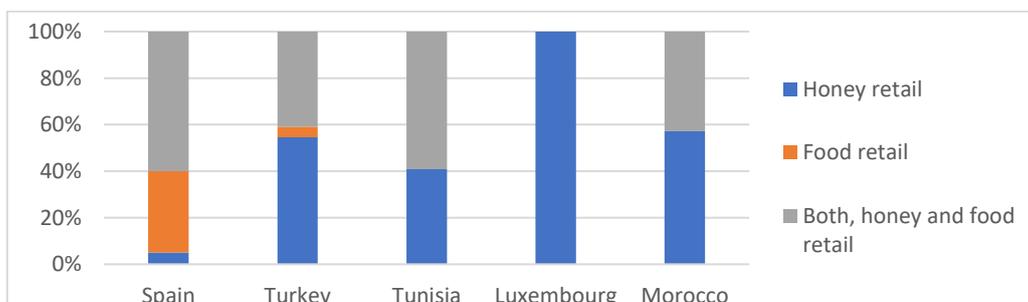


Figure 57. Retailers specialization



Branding practices among honey retailers vary widely across countries. **Spain** and **Turkey** show a strong presence of retailers with **their own label**, while **Tunisia** and **Morocco** include a mix of **individual and collective branding**. **Luxembourg** stands out with a high share of **collective label participation**. These patterns reflect different levels of market formalization and identity-building strategies within the honey retail sector.

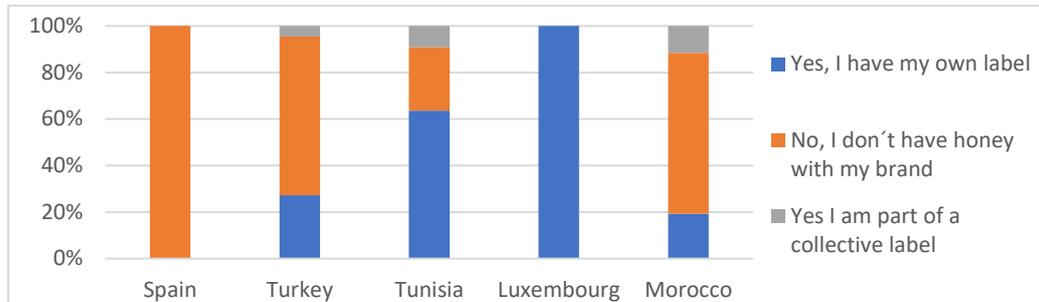


Figure 58. Retailers with their own brand

**FRAUD PERCEPTION**

Awareness of honey fraud is **widespread** among retailers across all countries. Most respondents report having heard about fraudulent practices, indicating that the issue is well-known within the retail segment of the honey supply chain.

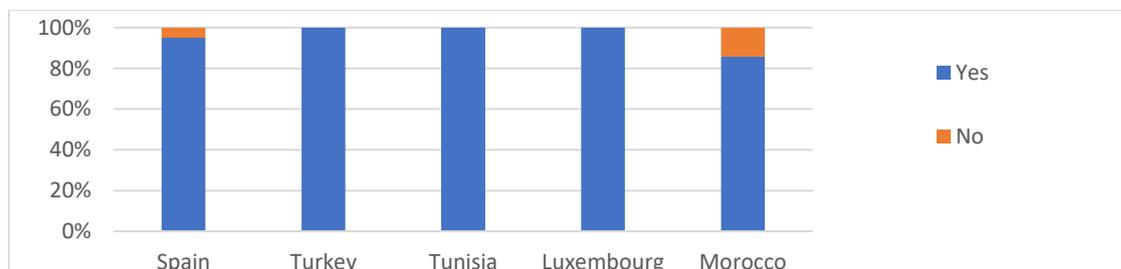


Figure 59. Retailers who have heard about honey fraud

A majority of retailers believe that **fraudulent honey is more prevalent today** than in previous years. This perception is consistent across countries and reflects growing concern about authenticity and market integrity.

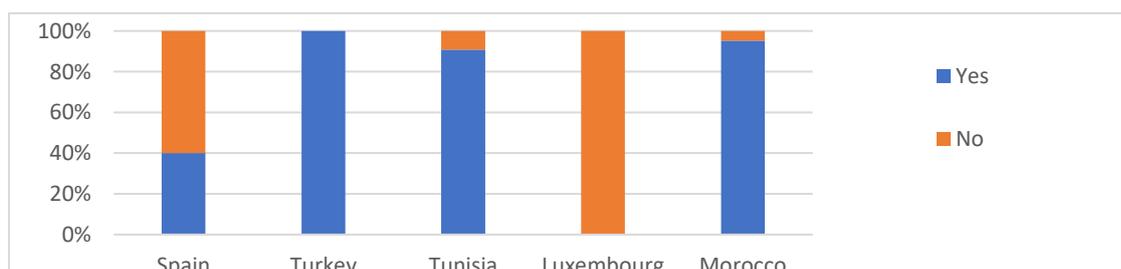


Figure 60. Retailers' opinion about if there are more fraudulent honey around compared to earlier years

Many retailers report having **encountered fraudulent honey directly or through peers**, suggesting that honey fraud is not just a theoretical concern but a **tangible reality** in the market.

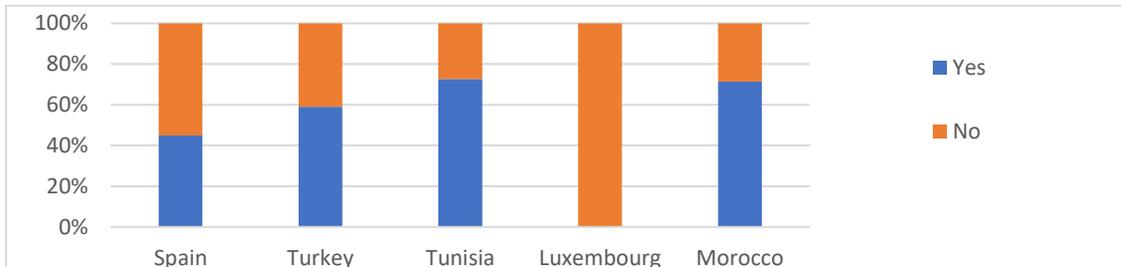


Figure 61. Retailers with contact with fraudulent honey or know somebody who was

There is **strong consensus** that traceability systems are **essential** to prevent unfair practices and honey fraud. Retailers across countries recognize traceability as a key safeguard for product integrity.

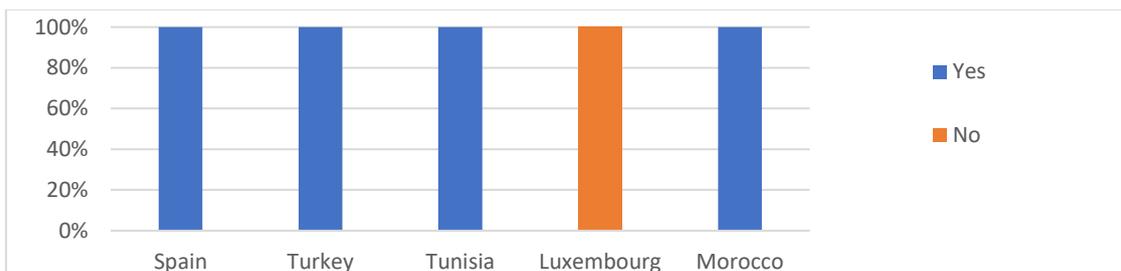


Figure 62. Retailers' opinion about traceability is needed to avoid unfair practices and honey fraud.

Retailers widely perceive that **increased honey imports** are creating **market pressure**, potentially contributing to price instability and quality concerns. This sentiment is particularly strong in countries with high import exposure.

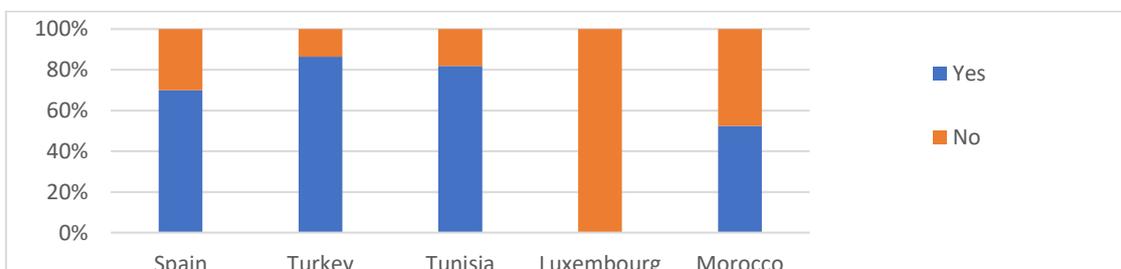


Figure 63. Retailers' opinion about existing pressure on the honey market caused by more imports



Most retailers claim to have **ongoing knowledge of the origin** of the honey they sell, though the depth and reliability of this knowledge may vary. This reflects a growing emphasis on transparency in sourcing.

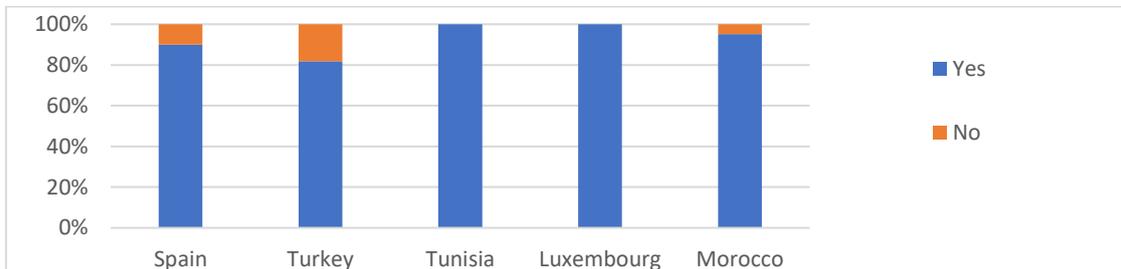


Figure 64. Retailers with continuous knowledge about the origin of honey

Retailers generally agree that **traceability systems like blockchain** can enhance **honey quality**, reinforcing the link between digital tools and product assurance.

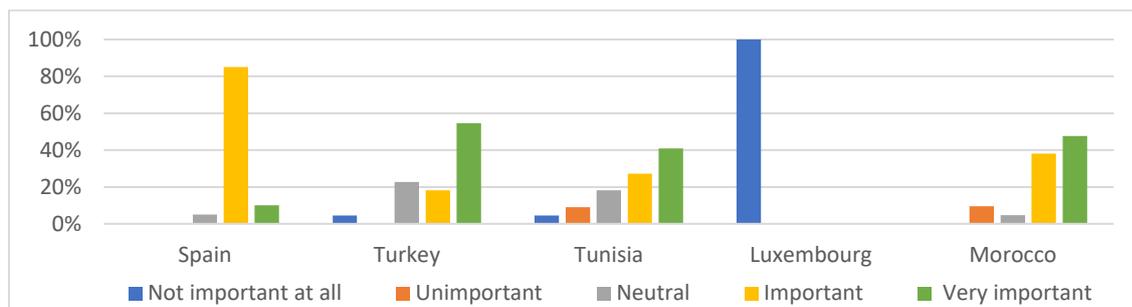


Figure 65. Retailers opinion about importance of traceability systems (such as Blockchain), on honey quality.

There is **broad agreement** that the **origin of honey is a critical factor** for the retail market. Retailers see provenance as central to consumer trust, branding, and market differentiation.

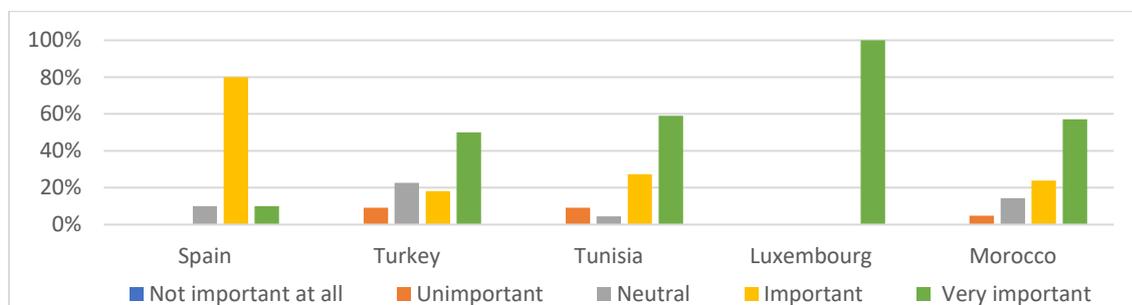


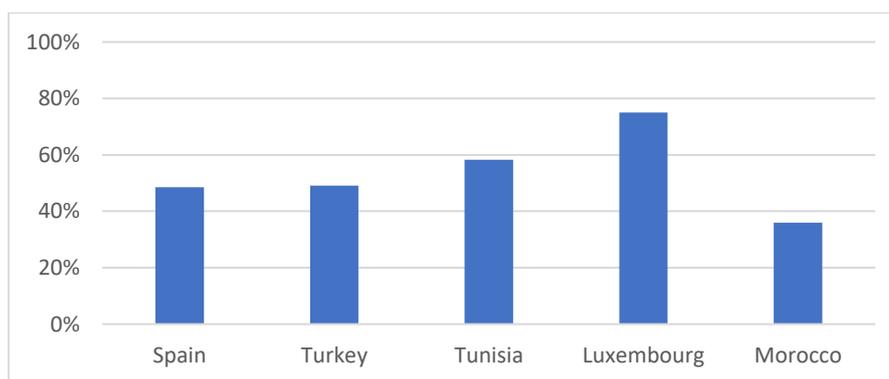
Figure 66. Retailers opinion about importance of origin of the honey for the retail market in general



Retailers across the Mediterranean honey supply chain express **high awareness and concern** about honey fraud, coupled with **strong support for traceability systems** as a solution. The perceived rise in fraudulent practices, pressure from imports, and the importance of origin all point to a market in need of **greater transparency and technological safeguards**. Blockchain and other digital tools are viewed not only as innovations but as **necessary instruments** to protect quality, ensure fairness, and reinforce consumer confidence.

### DIGITAL MATURITY

The figure 67 assesses the **breadth of digital competencies** among honey retailers, ranging from basic tasks (e.g., email, calendar use, cloud storage) to strategic capabilities (e.g., digital transformation planning, cybersecurity investment). The results show **wide variability across countries**, with some retailers demonstrating strong operational skills but limited strategic readiness. This suggests that while many are digitally active, few are fully prepared for **systemic digital transformation**.



*Figure 67. Retailers digital maturity (general skills level)*

The next figure complements the previous one by quantifying the **depth of digital skills** among retailers (Figure 68). It highlights disparities in proficiency, particularly in areas like **e-commerce, electronic signatures, and data management**. Countries with higher digital maturity—such as Spain and Turkey—tend to score better across multiple skill categories, while others show more fragmented profiles.



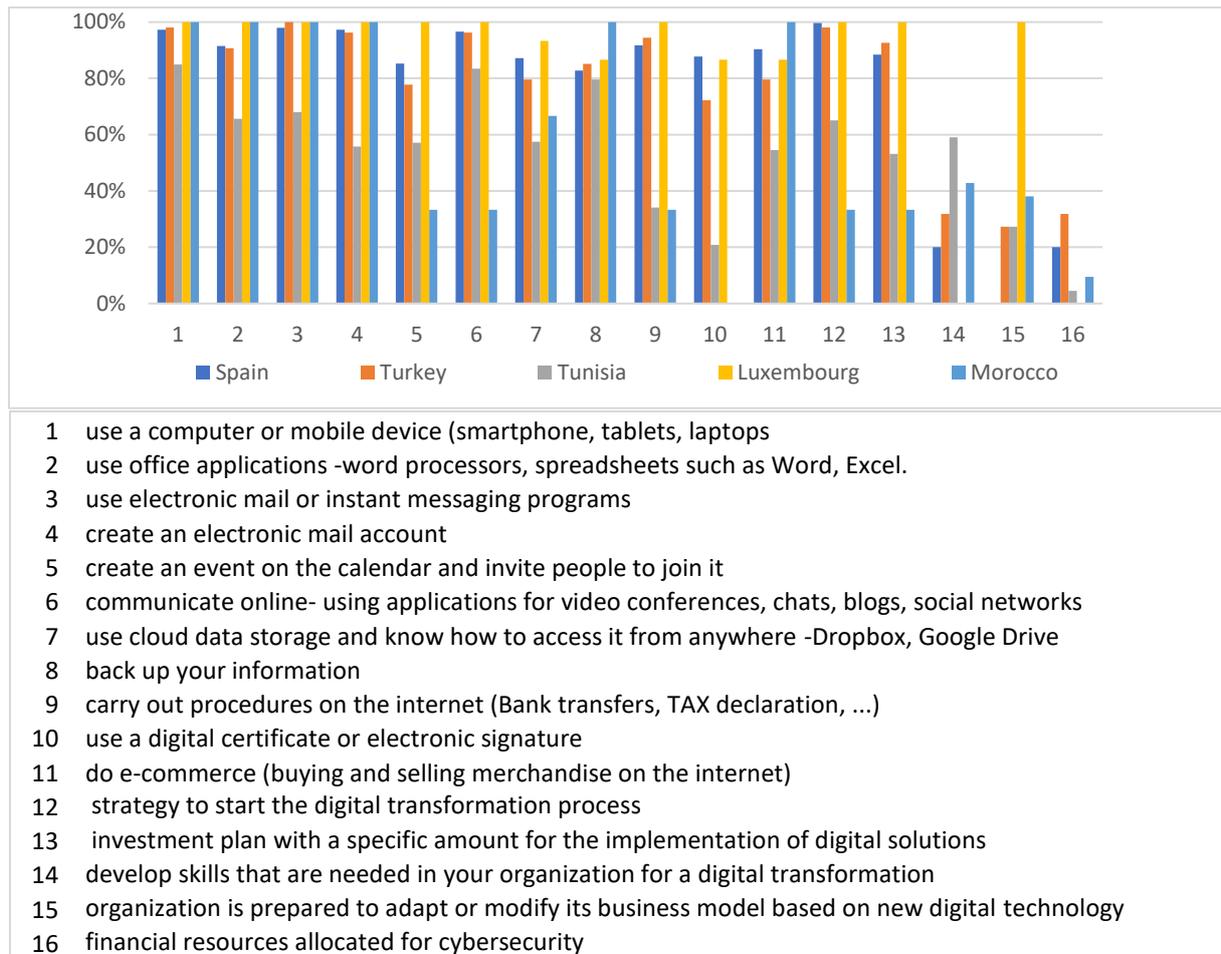


Figure 68. Retailers skills levels

Retailers across the Mediterranean honey supply chain exhibit **moderate digital maturity**, with strong basic skills but limited strategic capacity for transformation. While many are comfortable with everyday digital tools, fewer have the infrastructure, planning, or cybersecurity resources needed to adopt **advanced systems like blockchain**. This gap underscores the need for **targeted training and support**, especially in aligning digital competencies with traceability goals. Strengthening retailers' digital foundations will be key to unlocking blockchain's full potential in enhancing transparency, quality assurance, and market access.

**BLOCKCHAIN RETAILERS OPINIONS**

The next five figures explore retailers' perceptions of blockchain technology across various dimensions—general attitude, perceived usefulness, future adoption, and relevance to the honey sector. Across all countries, the responses show a predominantly positive outlook:

- Most retailers agree or strongly agree that blockchain is a valuable tool for improving transparency and trust.



- There is growing belief that blockchain will be used in the future, even among those with limited current exposure.
- Retailers recognize blockchain's potential to enhance honey quality, support traceability, and combat fraud.
- While some countries show more neutral or cautious responses, the overall sentiment is one of curiosity and openness, rather than resistance.

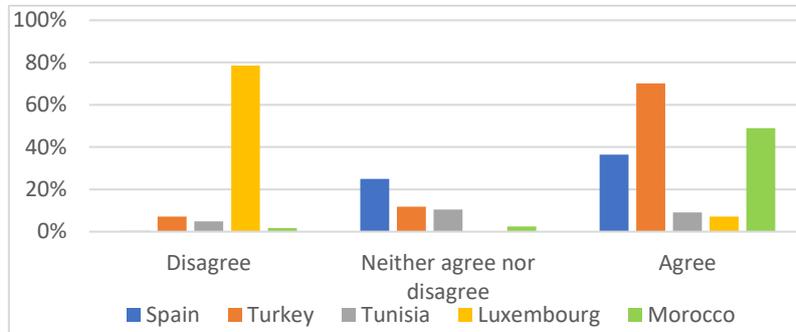


Figure 69. Retailers general opinion about blockchain

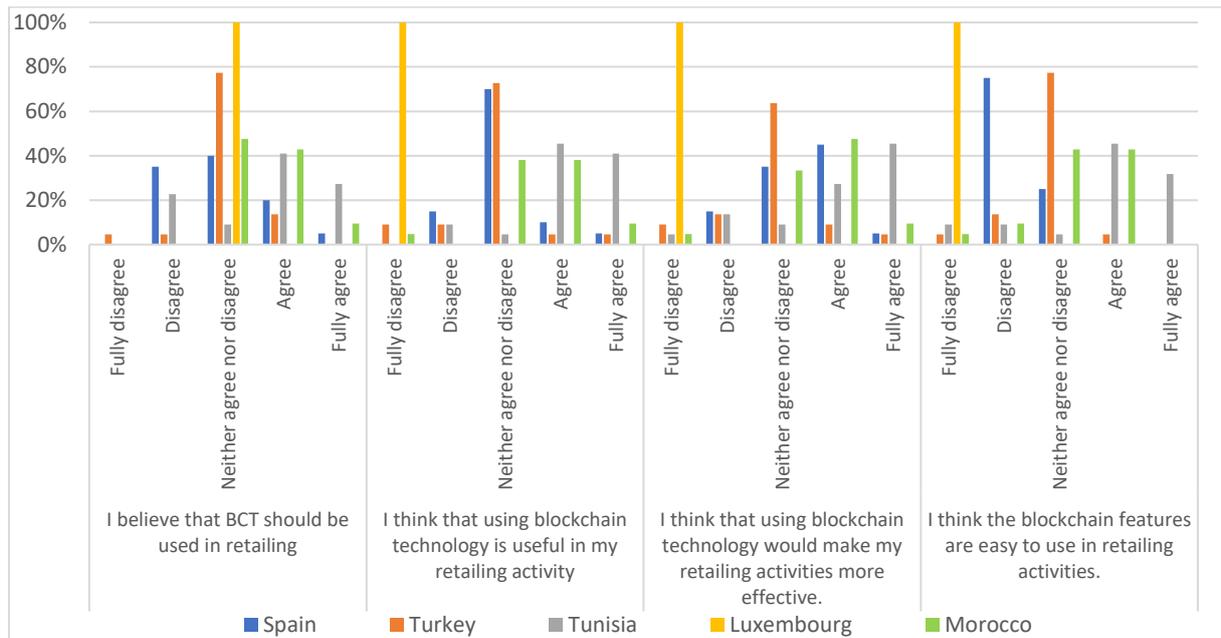


Figure 70. Retailers opinion about blockchain use



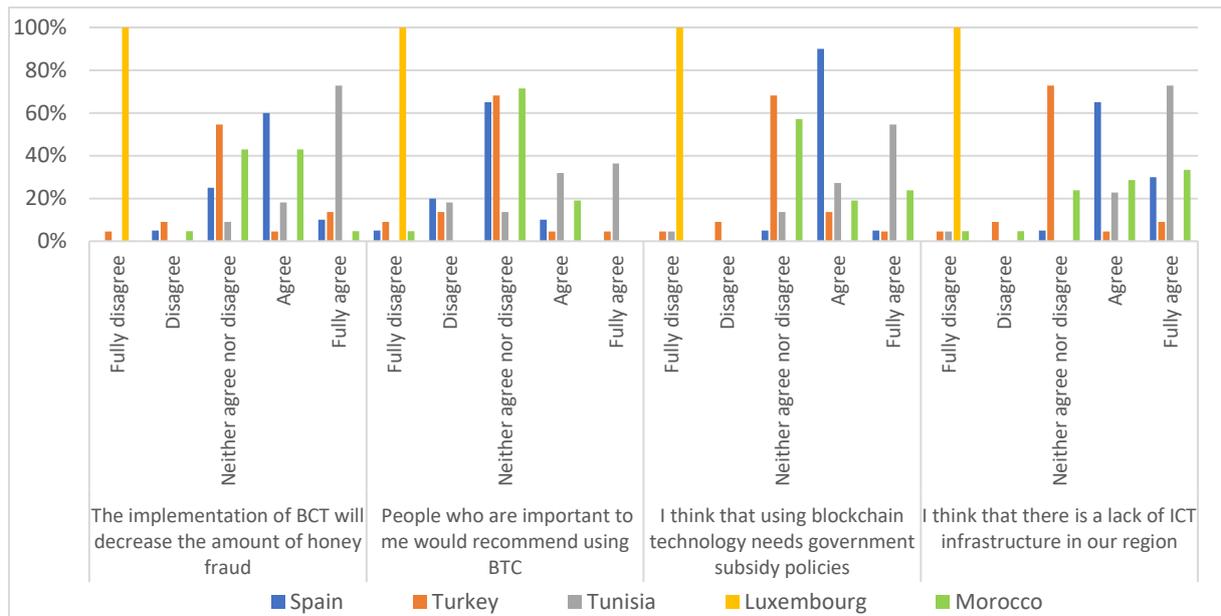


Figure 71. Retailers opinion about blockchain

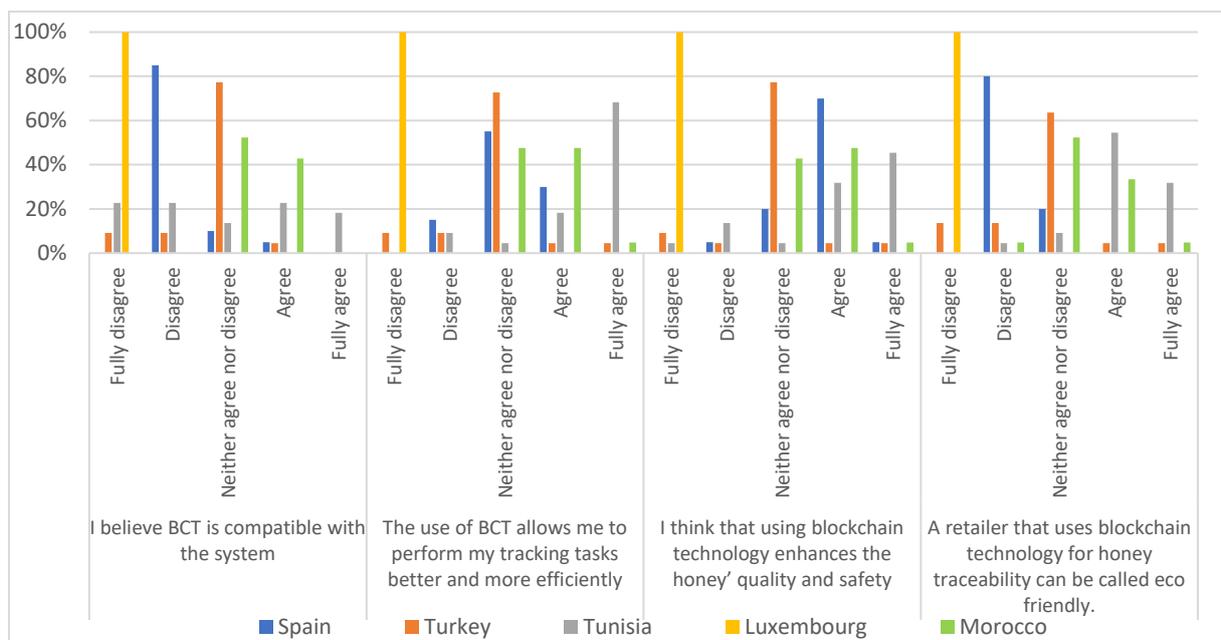


Figure 72. Retailers opinion about blockchain



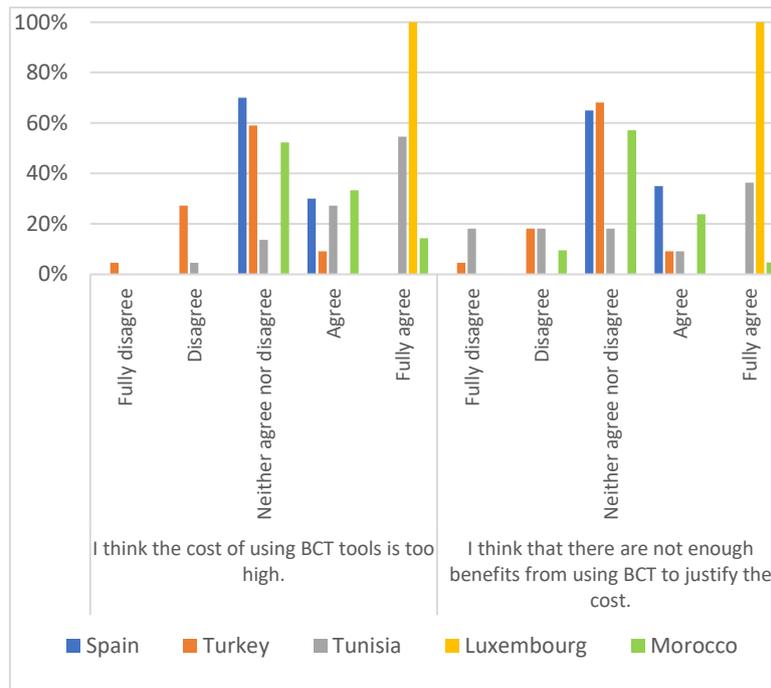


Figure 73. Retailers opinion about blockchain

As we observed, retailers across the Mediterranean honey supply chain express **increasing interest and optimism** toward blockchain technology. Despite varying levels of digital maturity and technical familiarity, they consistently associate blockchain with **quality assurance, traceability, and market credibility**. This positive perception—especially when combined with their concern about honey fraud and market pressure—positions retailers as **key enablers** of blockchain adoption. Their support reinforces the strategic relevance of blockchain within TECHONEY's traceability framework and highlights the importance of **inclusive, practical implementation pathways** that align with retailer capacities and expectations.

3.2.3 INDUSTRY

INDUSTRY SAMPLE CHARACTERISTICS AND ACTIVITIES DESCRIPTION

The geographic distribution of surveyed honey-processing industries across TECHONEY countries in in the figure 74. The sample includes **Spain, Turkey, Tunisia, Luxembourg, and Morocco**, ensuring a **diverse representation** of industrial actors within the Mediterranean honey supply chain.

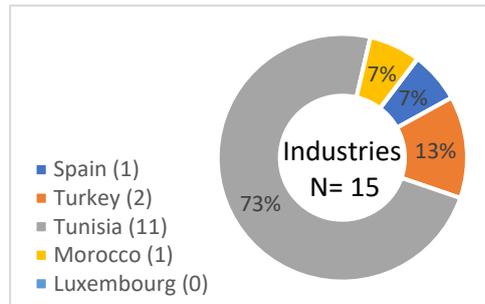


Figure 74. Industries surveyed by case study

The gender profile of industry administrators is **predominantly male** across all countries. This reflects a broader trend of male leadership in agri-food processing sectors and highlights potential gender gaps in decision-making roles.

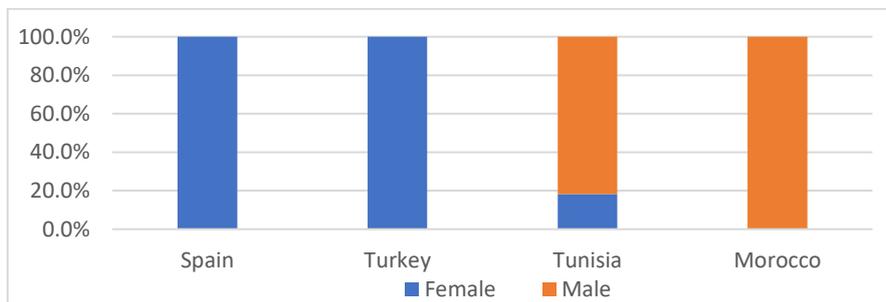


Figure 75. Administrators' gender

Most industry administrators fall within the **35–54 age range**, indicating a **mid-career demographic** with substantial experience. Younger and older age groups are less represented, suggesting limited generational turnover in leadership positions.

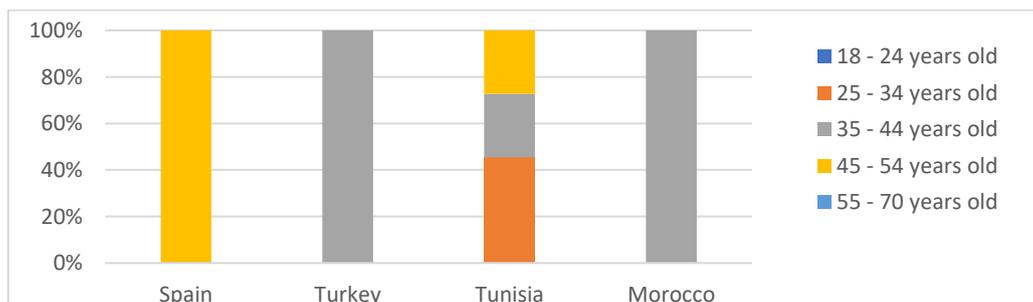


Figure 76. Administrators' age



Educational attainment among administrators is generally high, with most holding secondary or university degrees. This suggests that honey-processing industries are led by individuals with formal training, which may facilitate the adoption of technical innovations like blockchain.

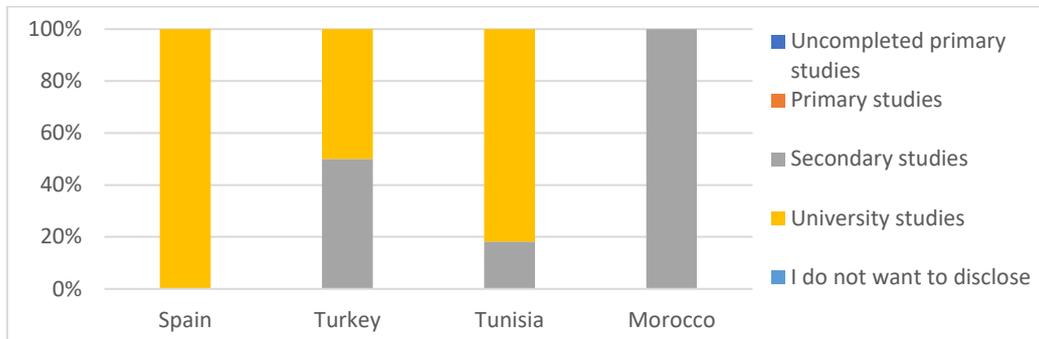


Figure 77. Administrators' educational level

**FRAUD PERCEPTION IN THE HONEY INDUSTRY**

Most industry respondents report that their customers do **want more information** about honey origin. This reflects growing consumer demand for transparency and traceability in food products.

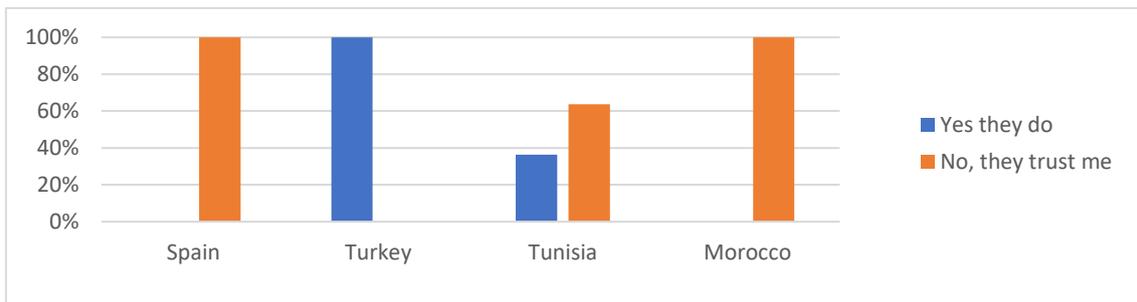


Figure 78. Do your customers want to have additional information on origin of honey?

In the industry there is strong agreement across countries that a digital tool (e.g., blockchain) would be useful to guarantee honey origin. This indicates high receptivity to technological solutions for traceability.

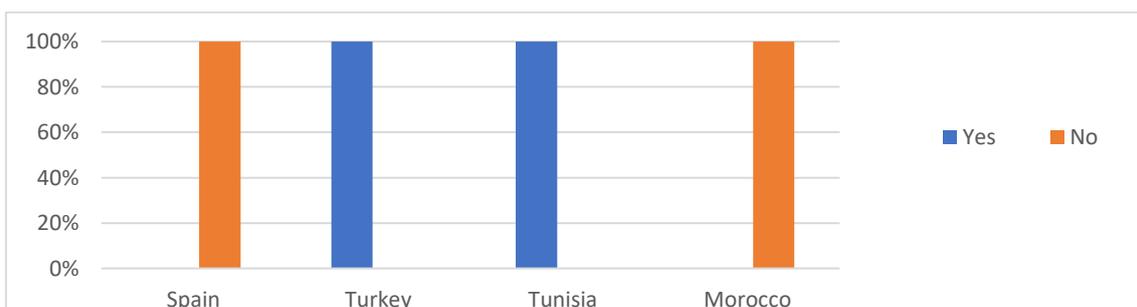


Figure 79. Do you think it would be useful to have a transparent digital tool to guarantee the origin of the honey you use?



The **origin of honey** is considered **highly important** by industry actors. It plays a central role in **quality assurance, branding, and market positioning**, especially in premium segments.

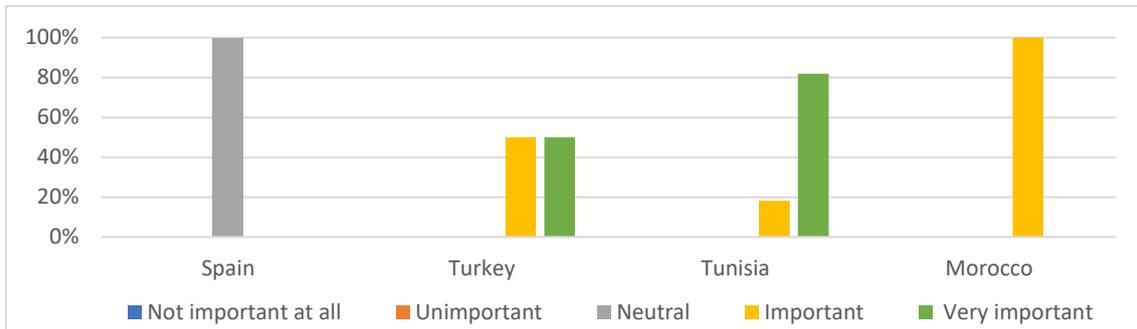


Figure 80. Importance of origin of the honey for the industry

Awareness of honey fraud is **widespread** among industry stakeholders. Most respondents are familiar with the issue, confirming its relevance and urgency within the sector.

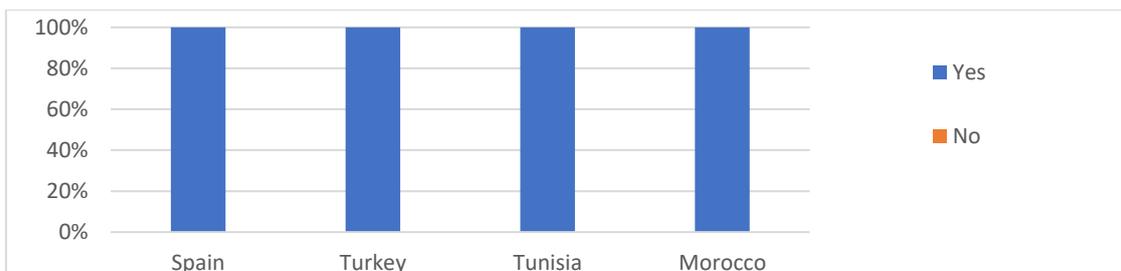


Figure 81. Industries who have heard about honey fraud

A majority of industry actors believe that **fraudulent honey is more common today** than in the past. This perception reinforces the need for robust traceability systems.

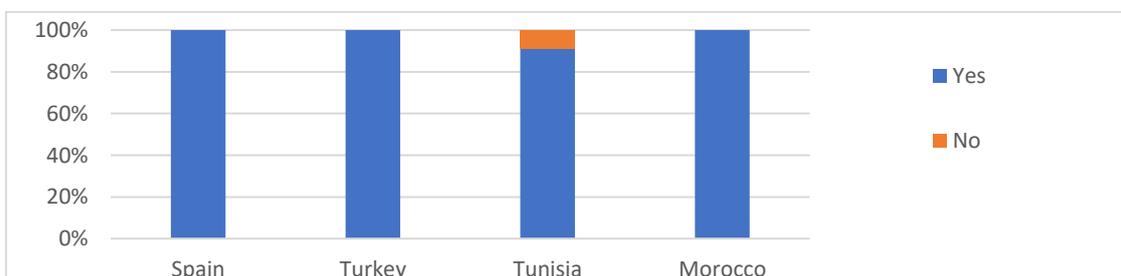


Figure 82. Today there is more fraudulent honey around compared to earlier years? - Industry opinion

Many respondents report **personal or peer contact** with fraudulent honey, suggesting that the problem is **not abstract but experienced** within the supply chain.



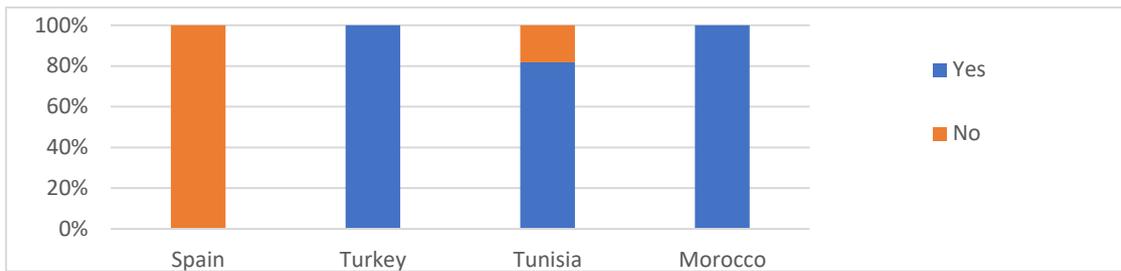


Figure 83. Industry with contact with fraudulent honey or know somebody who was

There is **near-unanimous agreement** that traceability is **essential** to prevent unfair practices and honey fraud. Industry actors see it as a **strategic necessity**.

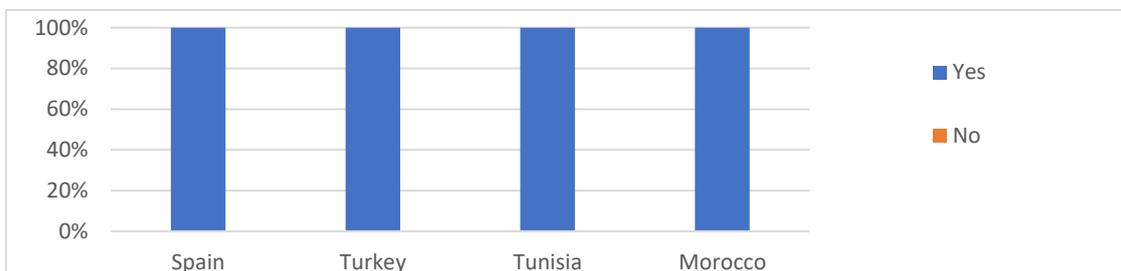


Figure 84. Industry opinion about traceability is needed to avoid unfair practices and honey fraud.

Industry respondents widely perceive that **increased honey imports** are creating **market pressure**, potentially affecting prices, quality standards, and competitiveness.

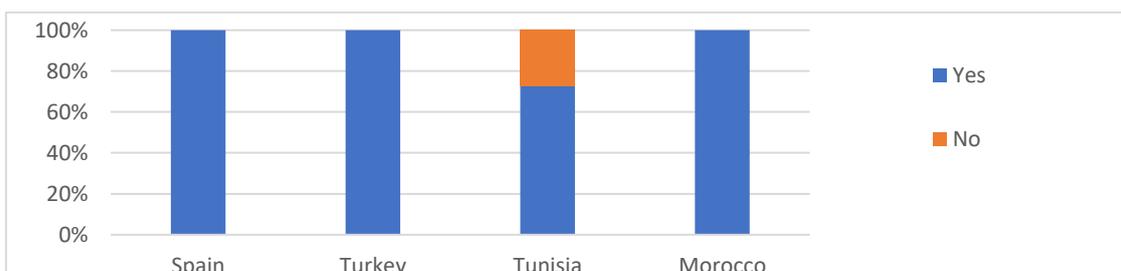


Figure 85. Industries opinion about existing pressure on the honey market caused by more imports

The honey-processing industry shows **high awareness and concern** about fraud, coupled with **strong support for traceability solutions**. Stakeholders recognize that consumer trust hinges on **origin transparency**, and they view digital tools like blockchain as **valuable enablers**. The perceived rise in fraudulent honey and pressure from imports further underscore the urgency of implementing **systemic safeguards**.



DIGITAL SKILLS - DIGITAL MATURITY

The next figure allows us to evaluate the **breadth of digital capabilities** across 15 key areas, from basic operations (e.g., email, cloud storage, e-commerce) to strategic readiness (e.g., transformation planning, cybersecurity investment). Most industries demonstrate **strong foundational skills**, such as using devices, office software, and online communication tools. However, fewer have developed **strategic frameworks** for digital transformation, including investment plans, skill development, and cybersecurity budgeting. This suggests a gap between operational proficiency and long-term digital planning.

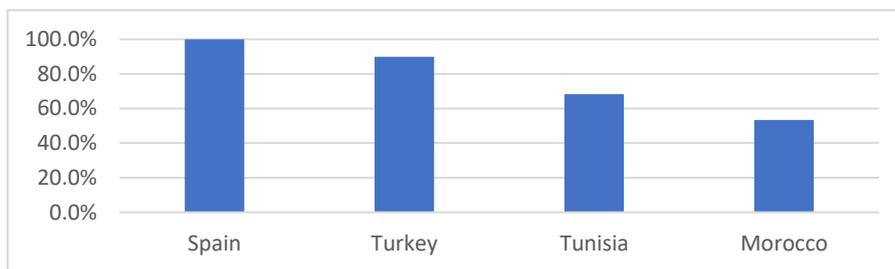
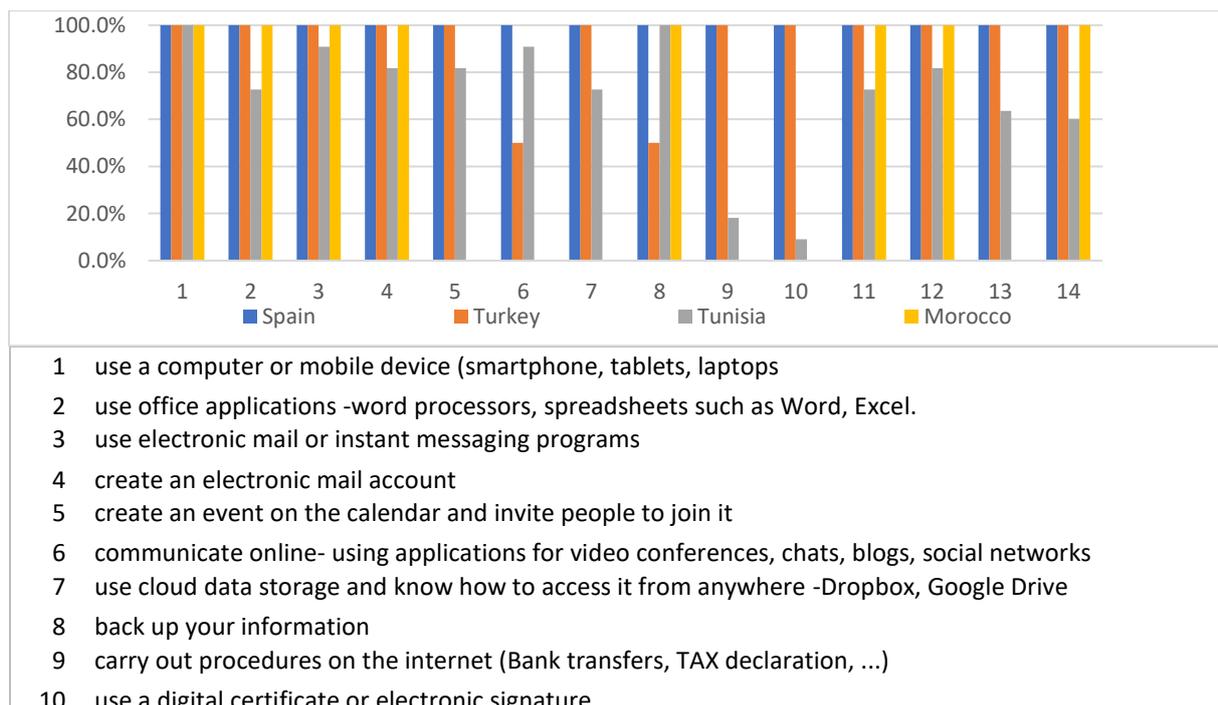


Figure 86. Industry - Digital maturity

The next figure complements the maturity assessment by quantifying **skill depth** across countries. While some industries—particularly in Spain and Turkey—show high proficiency in advanced digital tasks, others lag in areas like **electronic signatures, cloud access, and e-commerce**. The variation highlights the need for **tailored capacity-building** to ensure all industry actors can engage with emerging technologies like blockchain.



- 1 use a computer or mobile device (smartphone, tablets, laptops)
- 2 use office applications -word processors, spreadsheets such as Word, Excel.
- 3 use electronic mail or instant messaging programs
- 4 create an electronic mail account
- 5 create an event on the calendar and invite people to join it
- 6 communicate online- using applications for video conferences, chats, blogs, social networks
- 7 use cloud data storage and know how to access it from anywhere -Dropbox, Google Drive
- 8 back up your information
- 9 carry out procedures on the internet (Bank transfers, TAX declaration, ...)
- 10 use a digital certificate or electronic signature



- 11 do e-commerce (buying and selling merchandise on the internet)
- 12 strategy to start the digital transformation process
- 13 investment plan with a specific amount for the implementation of digital solutions
- 14 develop skills that are needed in your organization for a digital transformation
- 15 financial resources allocated for cybersecurity

Figure 87. Industry skills levels

**BLOCKCHAIN OPINIONS**

Awareness of blockchain varies significantly across countries. **Spain, Turkey, and Tunisia** show **high levels of familiarity**, with most respondents having heard of the technology. In contrast, **Luxembourg and Morocco** report **lower awareness**, suggesting a need for targeted outreach and education in these contexts.

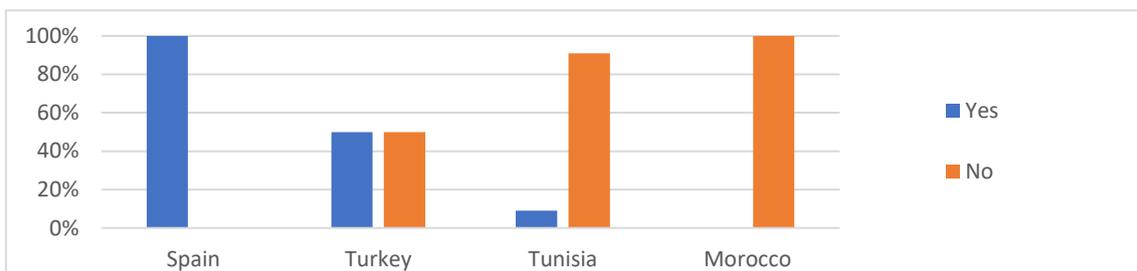


Figure 88. Have you ever heard about blockchain technology (BCT)?

When asked about the **usefulness of blockchain**, industries in **Spain and Turkey** express **strong agreement**, viewing it as a valuable tool for traceability and quality assurance. **Tunisia** shows moderate support, while **Luxembourg and Morocco** remain more neutral or uncertain.

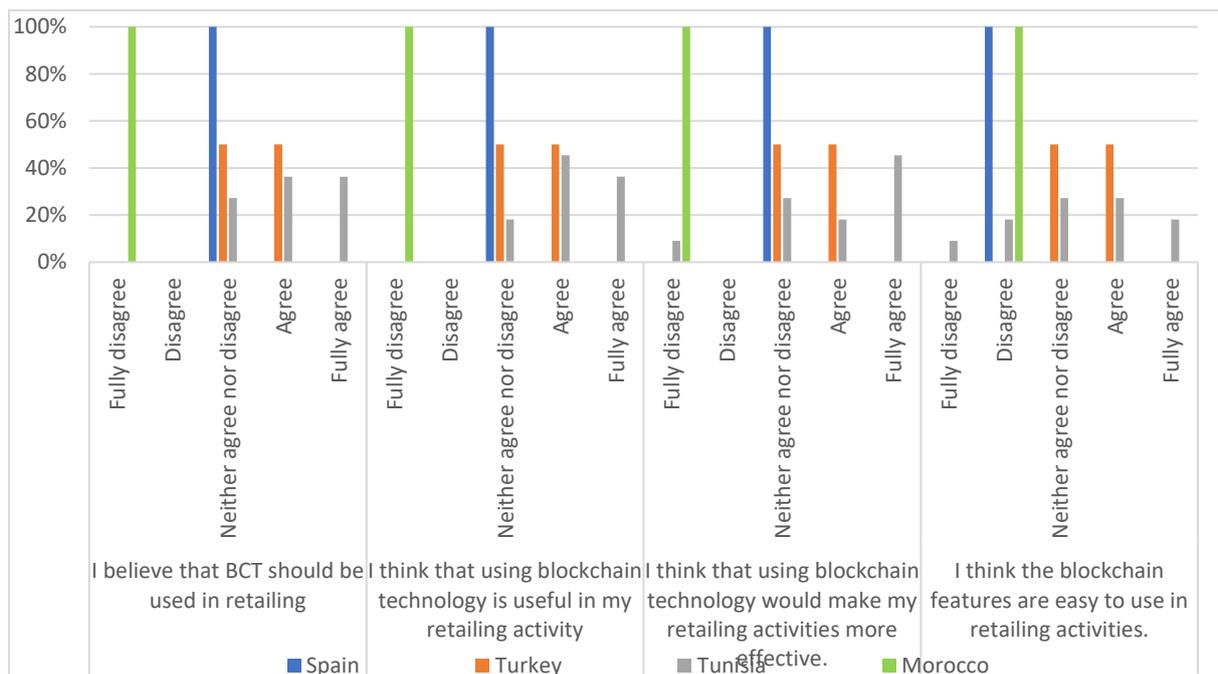


Figure 89. Industry opinions on use of Blockchain

Most respondents in **Spain, Turkey, and Tunisia** believe blockchain can **enhance honey quality**, especially through improved traceability. **Luxembourg and Morocco** are more reserved, possibly due to limited exposure to blockchain applications in agri-food contexts.

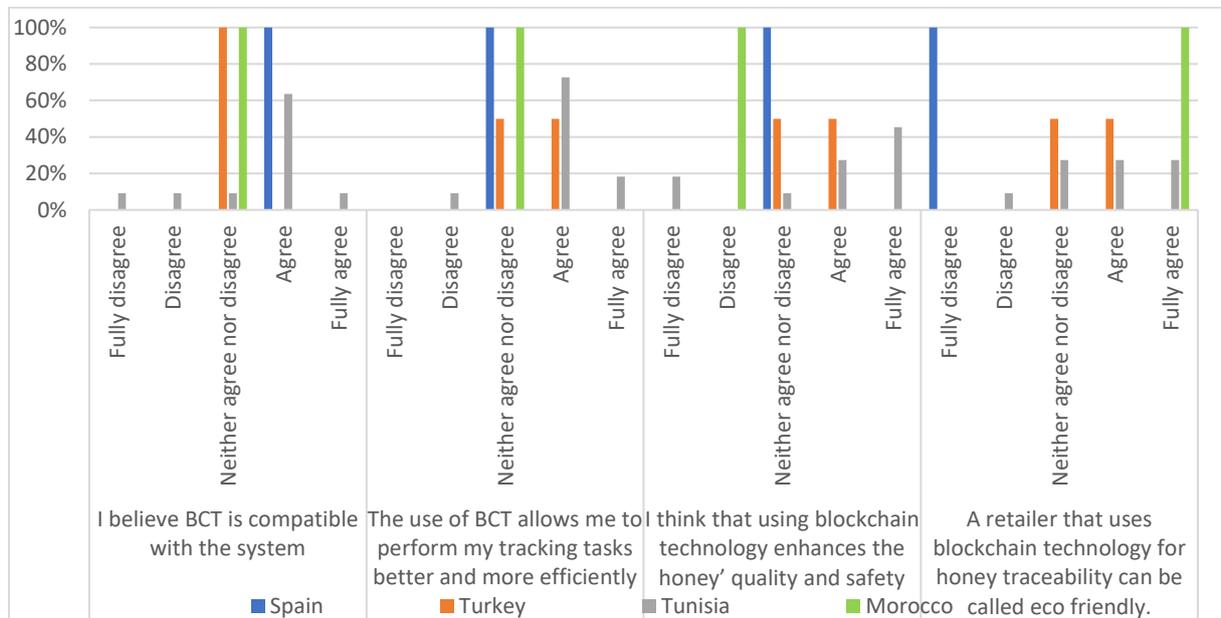


Figure 90. Industry opinions on Blockchain

Opinions diverge more sharply here. **Turkey and Tunisia** show optimism about blockchain's potential to **open new markets**, while **Spain, Luxembourg, and Morocco** are more cautious. This suggests that while blockchain is seen as a quality tool, its commercial benefits are still debated.

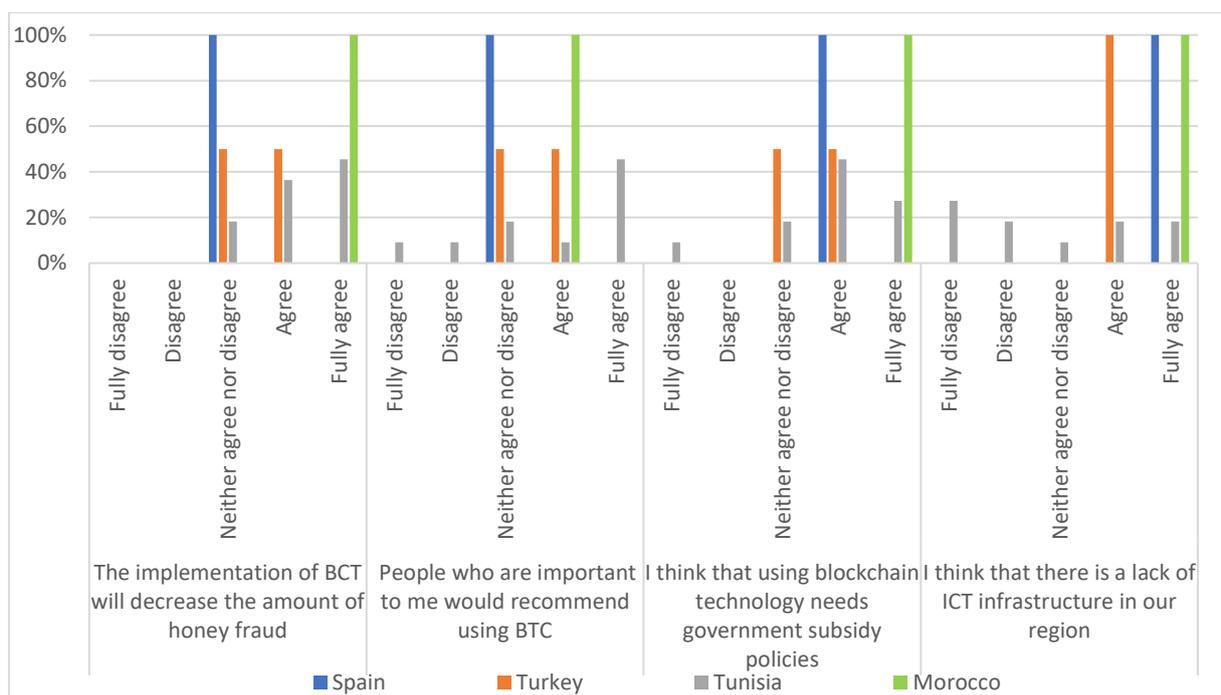


Figure 91. Industry opinions on Blockchain

Cost is a **major concern** across all countries, but especially in **Morocco** and **Luxembourg**, where skepticism is highest. **Spain** and **Turkey** show more willingness to invest, indicating that perceived value may outweigh cost barriers in more digitally advanced contexts. **Tunisia** remains in the middle, reflecting a balance between interest and resource constraints.

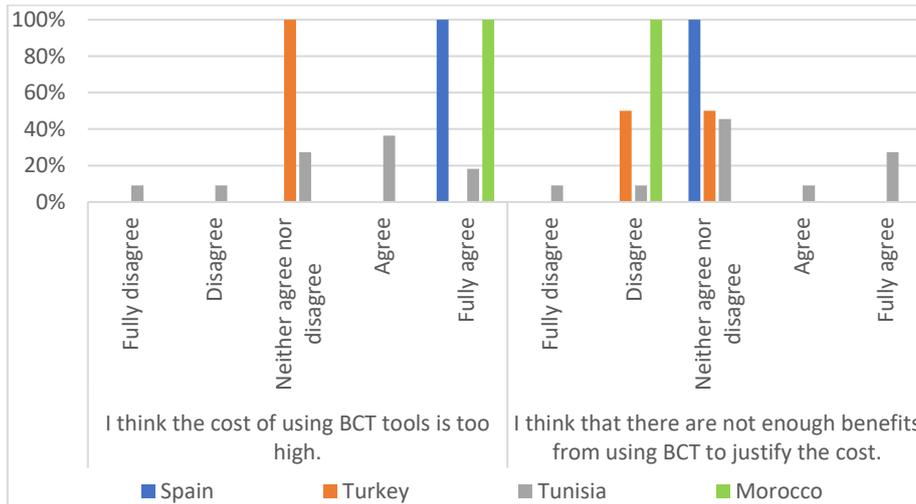


Figure 92. Industry opinions on Blockchain cost

The honey-processing industry shows **growing awareness and cautious optimism** toward blockchain, with notable differences across countries. **Spain, Turkey, and Tunisia** lead in both familiarity and perceived usefulness, especially regarding **quality assurance** and **traceability**. However, concerns about **cost** and **market impact** persist, particularly in **Luxembourg** and **Morocco**, where digital maturity and strategic readiness are lower. These insights highlight the need for **context-sensitive implementation strategies**, combining technical support, financial incentives, and stakeholder engagement to ensure inclusive adoption. Blockchain is not just a technological upgrade—it’s a **trust-building tool** that must align with local capacities and priorities.

**3.2.4 HOSPITALITY**

**RESTAURANT/HOTEL/GUESTHOUSE SAMPLE CHARACTERISTICS**

In the next figure (Figure 93) are the number of hospitality establishments surveyed by case of study. The sample includes restaurants, hotels, and guesthouses from **Spain, Turkey, Tunisia, Luxembourg, and Morocco**, ensuring geographic diversity. **Spain and Turkey** have the largest representation, suggesting stronger engagement or larger hospitality sectors



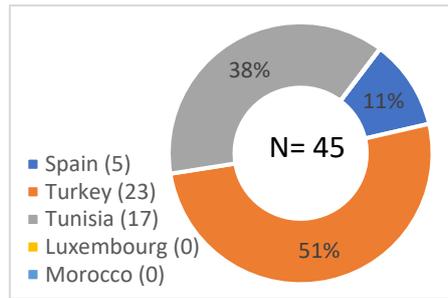


Figure 93. hotel/restaurant/guesthouse surveyed by case study

The sector is **predominantly male**, especially in **Tunisia and Morocco**, where male administrators exceed 80%. **Spain and Luxembourg** show slightly more gender balance, though women remain underrepresented.

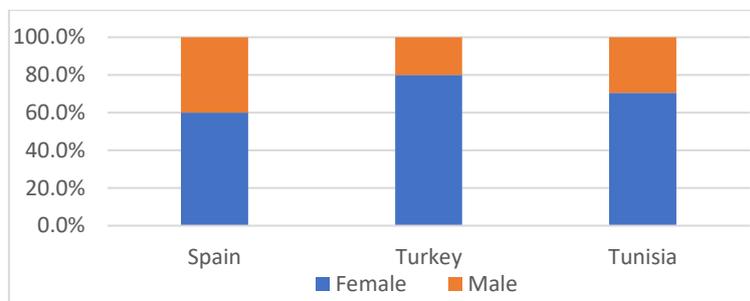


Figure 94. Gender distribution

Most respondents fall within the **35–54 age range**, with **Spain and Turkey** showing higher shares of younger professionals (25–34), while **Tunisia and Morocco** lean toward older age groups (55+). This may reflect generational differences in digital adoption.

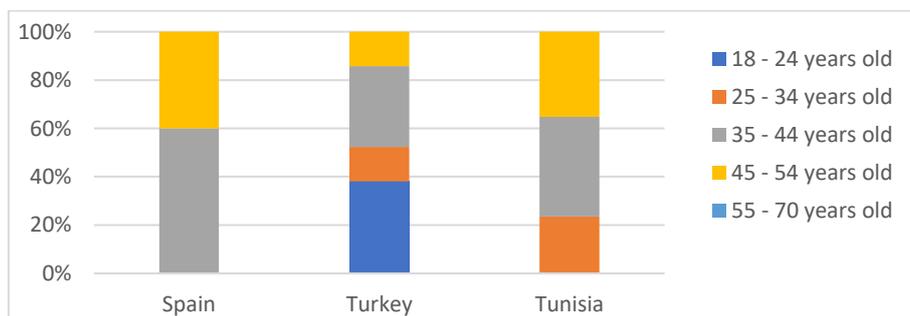


Figure 95. Age distribution

Spain and Luxembourg have the highest proportion of university-educated respondents, while Tunisia and Morocco show more individuals with secondary or primary education. This disparity may influence digital readiness and openness to innovation.



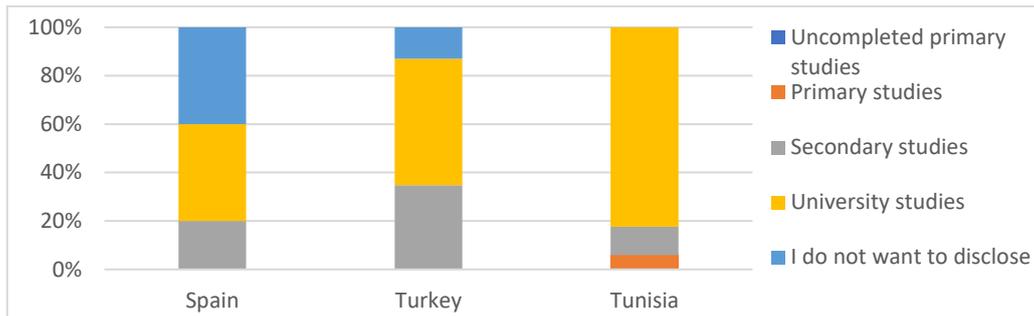


Figure 96. Educational level

Spain and Turkey report higher ordering frequency, with many establishments ordering honey monthly or quarterly. In contrast, Tunisia and Morocco show more sporadic purchasing, often once or twice a year, indicating lower integration of honey in their menus.

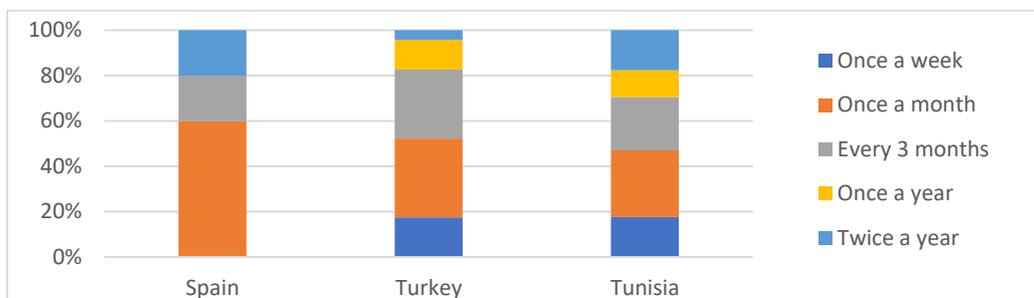


Figure 97. Restaurant/hotel/guesthouse - Frequency of honey order in a year

Most countries anticipate stable or increasing demand, especially Spain and Turkey, where optimism is strongest. Tunisia and Morocco show more uncertainty, possibly due to market volatility or limited consumer awareness.

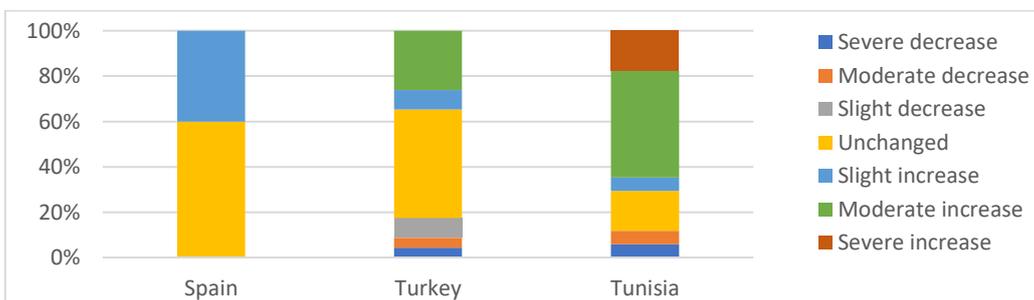


Figure 98. Restaurant/hotel/guesthouse - perception about variation of honey demand in the next 2-3 years

FRAUD PERCEPTION

Across all countries, customers increasingly want to know the origin of honey. This is especially pronounced in Spain and Turkey, where over 70% of respondents confirm this trend.



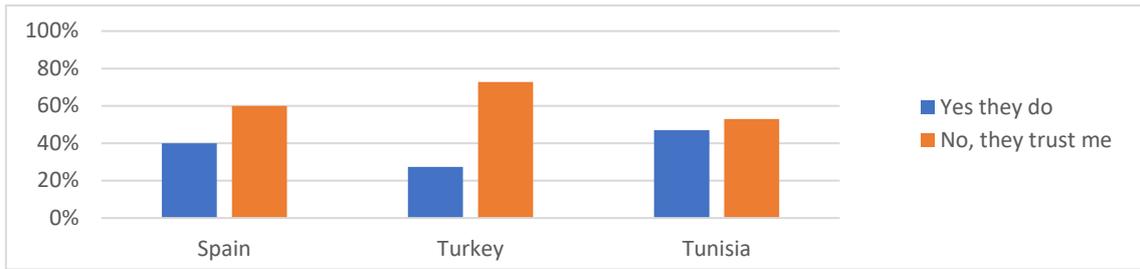


Figure 99. Do your customers want to have additional information on origin of honey?

There is strong support for digital traceability tools, particularly in Spain, Turkey, and Tunisia, where over 60–70% agree they would be useful. Luxembourg and Morocco show more neutral responses.

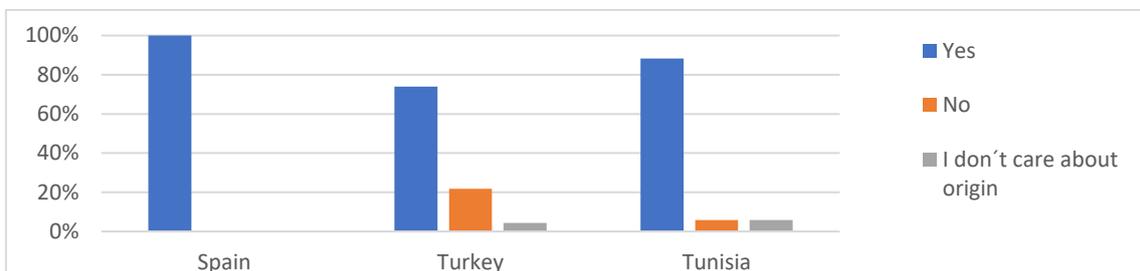


Figure 100. Do you think it would be useful to have a transparent digital tool to guarantee the origin of the honey you use?

All countries recognize the strategic importance of origin, with Spain and Turkey again leading in agreement. This aligns with broader consumer trends toward authenticity and provenance.

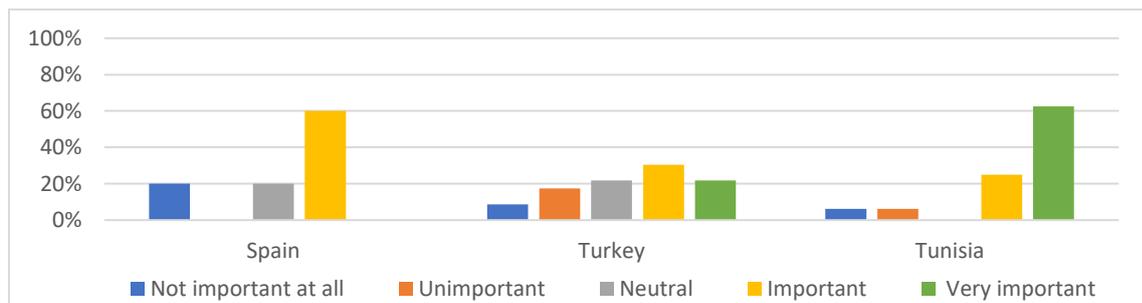


Figure 101. Importance of origin of the honey for the retail market in general

Spain and Turkey show the highest willingness to participate in pilot tests, suggesting readiness to engage with blockchain-based traceability. Tunisia and Morocco are more hesitant, indicating the need for capacity-building.



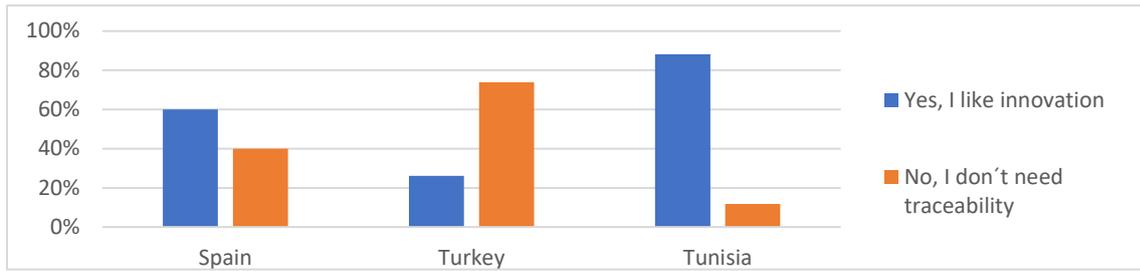


Figure 102. Would you like to join a test on a digital traceability system for your purchased honey?

DIGITAL MATURITY - SKILLS LEVEL

Basic digital skills (email, devices, cloud storage) are **widely present** across countries. However, strategic capabilities—like **cybersecurity investment** and **digital transformation planning**—are **limited**, especially in **Tunisia and Morocco**.

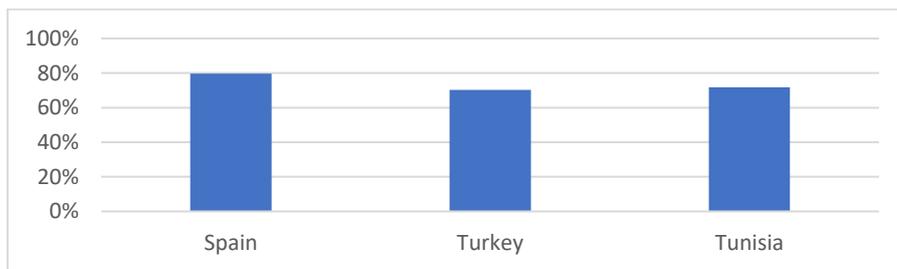
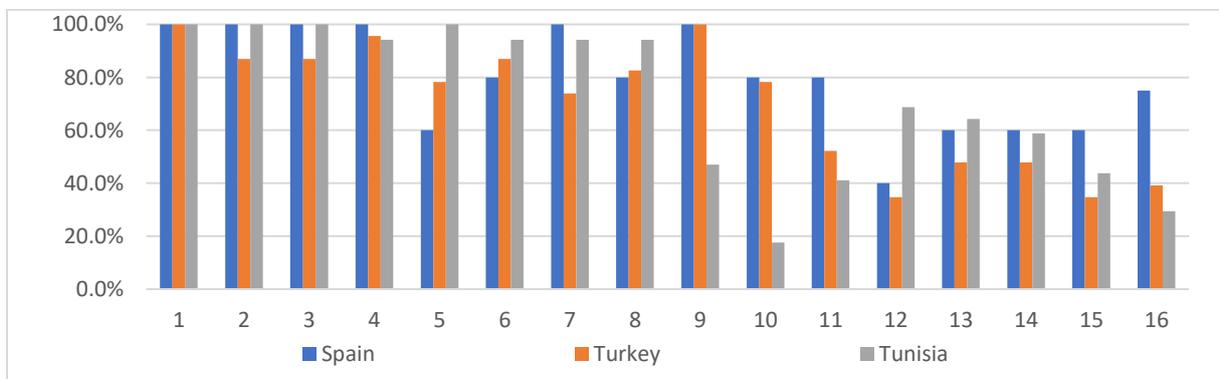


Figure 103. Restaurant/hotel/guesthouse - Digital maturity

Spain and Turkey show higher proficiency in advanced tasks like e-commerce, digital certificates, and online procedures. Luxembourg performs well in cloud and backup tasks. Tunisia and Morocco lag in strategic and security-related skills.



- 1 use a computer or mobile device (smartphone, tablets, laptops)
- 2 use office applications -word processors, spreadsheets such as Word, Excel.
- 3 use electronic mail or instant messaging programs
- 4 create an electronic mail account
- 5 create an event on the calendar and invite people to join it



- 6 communicate online- using applications for video conferences, chats, blogs, social networks
- 7 use cloud data storage and know how to access it from anywhere -Dropbox, Google Drive
- 8 back up your information
- 9 carry out procedures on the internet (Bank transfers, TAX declaration, ...)
- 10 use a digital certificate or electronic signature
- 11 do e-commerce (buying and selling merchandise on the internet)
- 12 strategy to start the digital transformation process
- 13 investment plan with a specific amount for the implementation of digital solutions
- 14 develop skills that are needed in your organization for a digital transformation
- 15 organization is prepared to adapt or modify its business model based on new digital technology
- 16 financial resources allocated for cybersecurity

Figure 104. Restaurant/hotel/guesthouse - skills levels

**BLOCKCHAIN OPINIONS**

Awareness is **highest in Spain and Turkey**, where over **70%** have heard of blockchain. **Tunisia** follows closely. **Luxembourg and Morocco** show lower awareness, indicating a need for outreach.

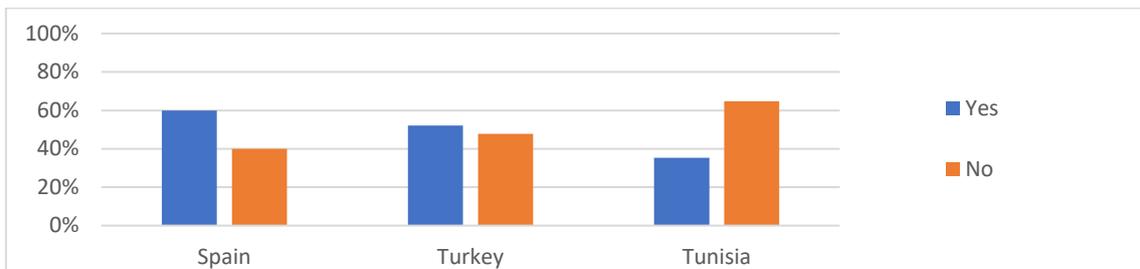


Figure 105. Have you ever heard about blockchain technology (BCT)?

**Spain and Turkey** express **strong support** for blockchain use in honey traceability. **Tunisia** is moderately positive. **Luxembourg and Morocco** remain cautious or neutral.

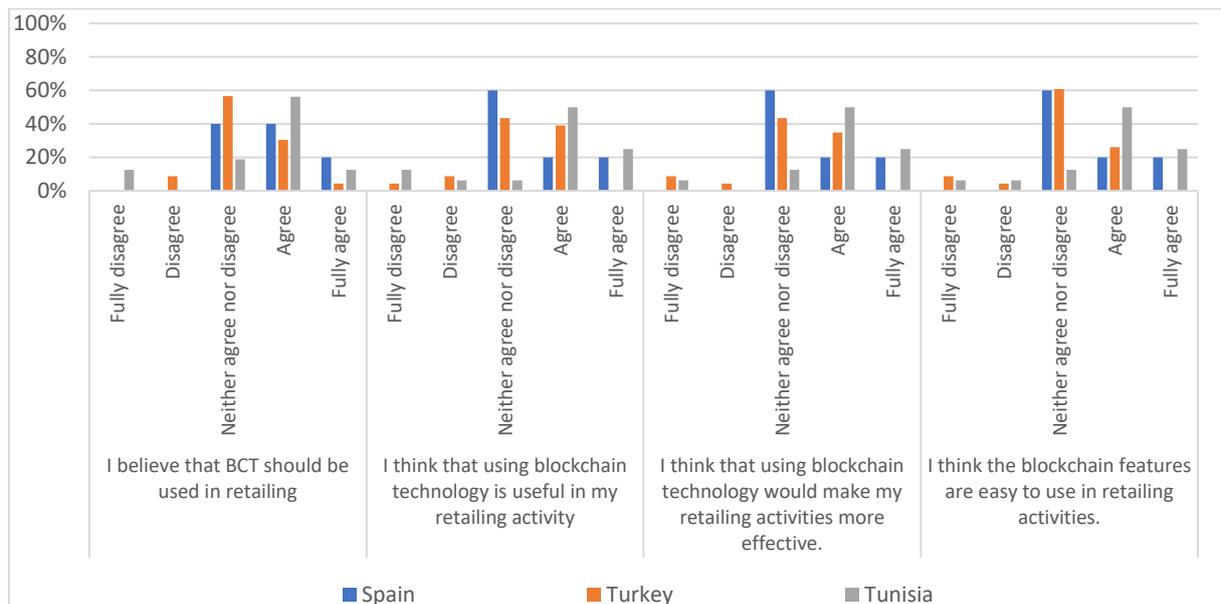


Figure 106. Restaurant/hotel/guesthouse opinion on use of Blockchain



**Respondents in Spain and Turkey believe blockchain can enhance quality and trust. Tunisia agrees but with less intensity. Luxembourg and Morocco show skepticism, possibly due to unfamiliarity or cost concerns.**

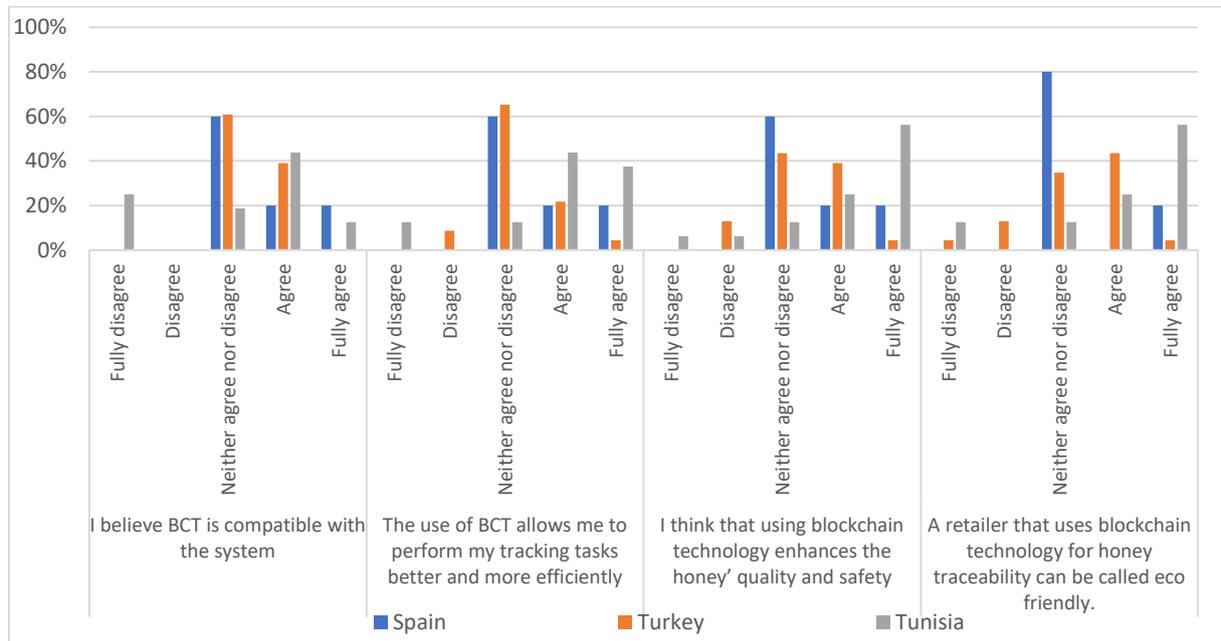


Figure 107. Restaurant/hotel/guesthouse opinion on Blockchain benefits

**Attributes like transparency, security, and traceability are valued most in Spain and Turkey. Tunisia shows moderate appreciation. Luxembourg and Morocco are less convinced, suggesting a need for clearer communication of benefits.**

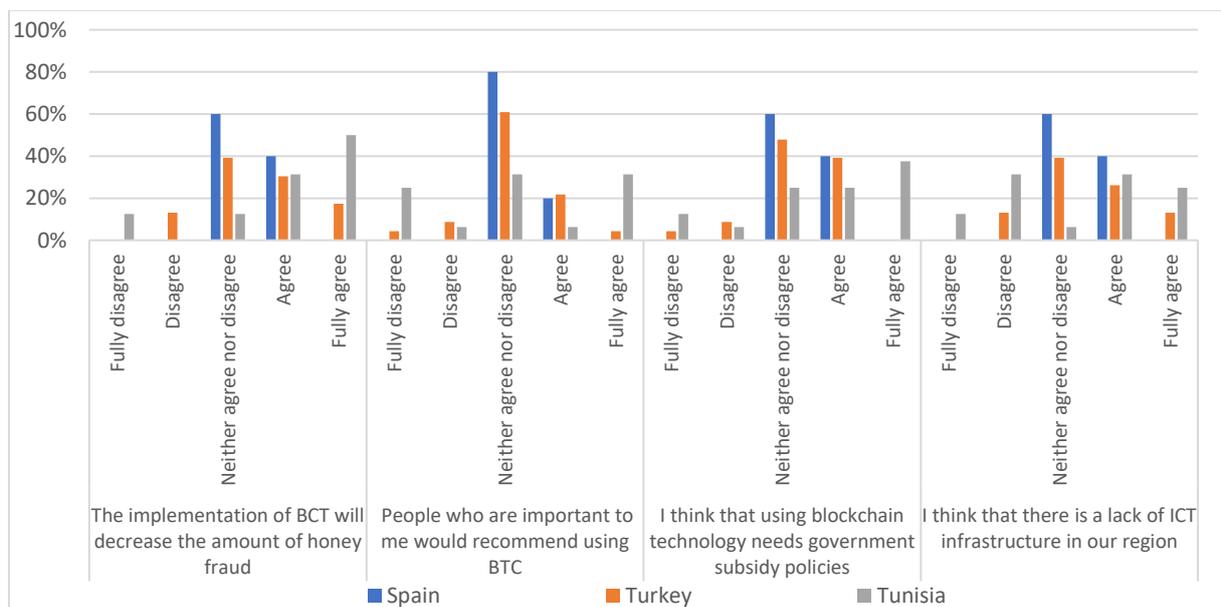


Figure 108. Restaurant/hotel/guesthouse opinion on Blockchain attributes



**Cost is a major barrier, especially in Morocco and Luxembourg, where concerns are highest. Spain and Turkey show more willingness to invest, indicating perceived value outweighs cost.**

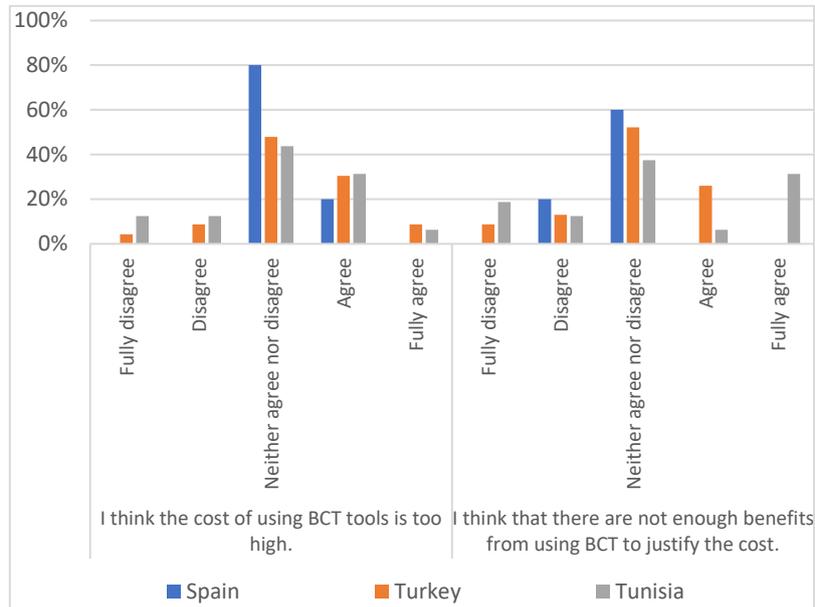


Figure 109. Restaurant/hotel/guesthouse opinion on Blockchain cost

**The hospitality sector across TECHONEY countries shows growing interest in honey traceability, with Spain and Turkey leading in digital maturity, blockchain awareness, and willingness to innovate. Tunisia is emerging as a receptive context, while Luxembourg and Morocco require more engagement and support. The sector values origin transparency, sees potential in digital tools, and is increasingly aware of fraud risks. However, gaps in strategic digital planning and cost concerns must be addressed to ensure inclusive blockchain adoption and sector-wide transformation.**



3.2.5 CONSUMERS

CONSUMERS SAMPLE CHARACTERISTICS AND ACTIVITIES DESCRIPTION

Next graph (figure 110) illustrates the geographic distribution of surveyed honey consumers across the different case study regions. This geographic diversity provides a rich basis for comparing consumer behaviors and perceptions in different cultural and market contexts.

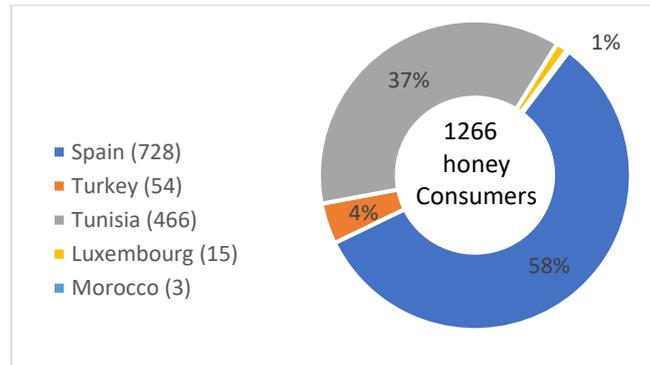


Figure 110. Honey consumers distribution by case study

On following (Figure 111), the chart compares the gender composition of surveyed honey consumers across five countries. While Spain shows a nearly equal split between female (50.2%) and male (49.8%) respondents, other countries display more pronounced differences. Tunisia and Luxembourg have notably higher female representation (68.8% and 60.0%, respectively), whereas Morocco stands out with a majority of male consumers (66.7%). These variations may reflect cultural, social, or sampling dynamics and are relevant for understanding demographic influences on consumer behavior and attitudes toward traceability innovations.

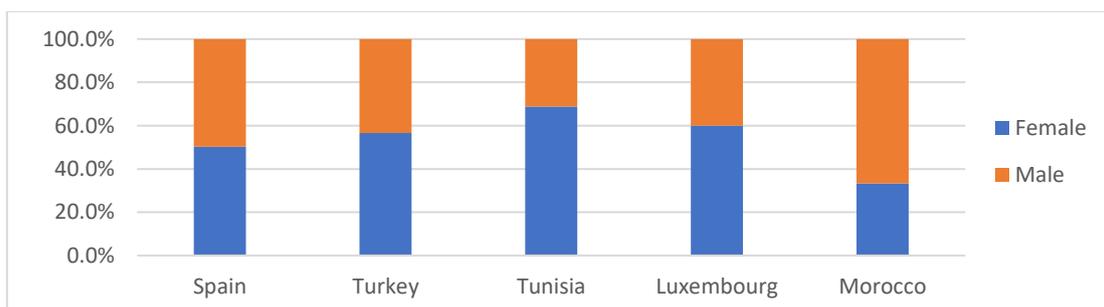


Figure 111. Gender distribution

The age profile of surveyed honey consumers reveals a predominance of middle-aged adults. The largest group falls within the 36–50 age range, representing approximately 34% of respondents, followed closely by the 26–35 age group at around 28%. Consumers aged 51–65 account for roughly 22%, while younger participants (18–25) make up about 10%. The smallest segment is the 66+ age group, with only 6% of the sample. This distribution suggests that honey consumption is most common



among working-age adults, who may be more health-conscious and financially capable of supporting premium products. Their purchasing habits and openness to innovations like blockchain labeling are likely to be shaped by both lifestyle and digital literacy, making this demographic particularly relevant for traceability initiatives.

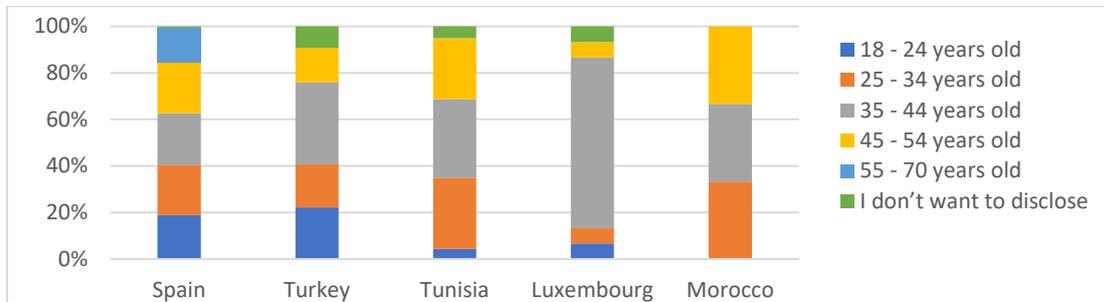


Figure 112. Age distribution

The educational profile of honey consumers varies notably across the five countries surveyed. In Spain and Luxembourg, a majority of respondents hold university degrees—around 52% and 60% respectively—suggesting a highly educated consumer base that may be more receptive to traceability innovations like blockchain. Turkey also shows a strong representation of higher education, with approximately 48% of consumers having completed university studies. In contrast, Tunisia and Morocco present a more diverse educational landscape. Tunisia has a balanced distribution, with 40% of respondents reporting secondary education and 35% university-level, while Morocco shows the lowest proportion of university-educated consumers at just 28%, and a higher share with only primary or vocational training. These differences may influence how consumers perceive product labeling, supply chain transparency, and their willingness to pay a premium for certified honey. Understanding these educational dynamics is crucial for tailoring communication strategies and engagement efforts across regions

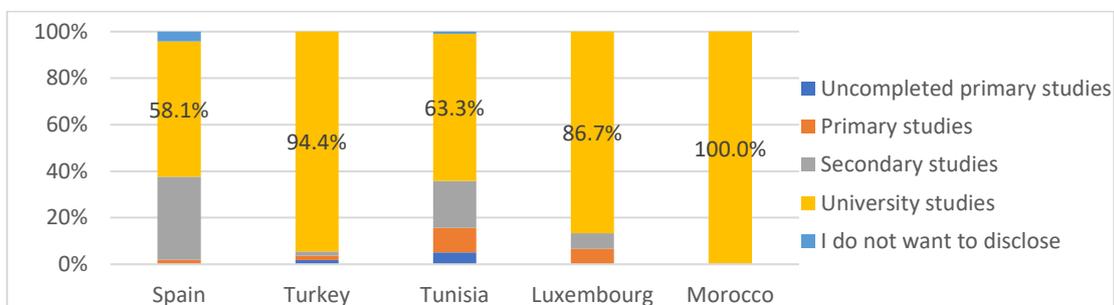


Figure 113. Educational level distribution

The frequency of honey consumption varies across countries, revealing distinct consumer habits. In Spain and Luxembourg, weekly consumption is most common, with 42% and 45% of respondents



respectively reporting regular use. Turkey shows a similar pattern, with 40% consuming honey weekly and another 35% monthly. Tunisia stands out with the highest share of daily consumers at 18%, suggesting a strong cultural integration of honey into daily diets. In contrast, Morocco has the lowest rate of frequent consumption, with only 25% consuming honey weekly and a notable 30% indicating occasional or rare use. These differences suggest that while honey is widely appreciated, its role in daily routines and purchasing behavior varies significantly across regions—an important consideration when evaluating willingness to pay for premium, traceable products.

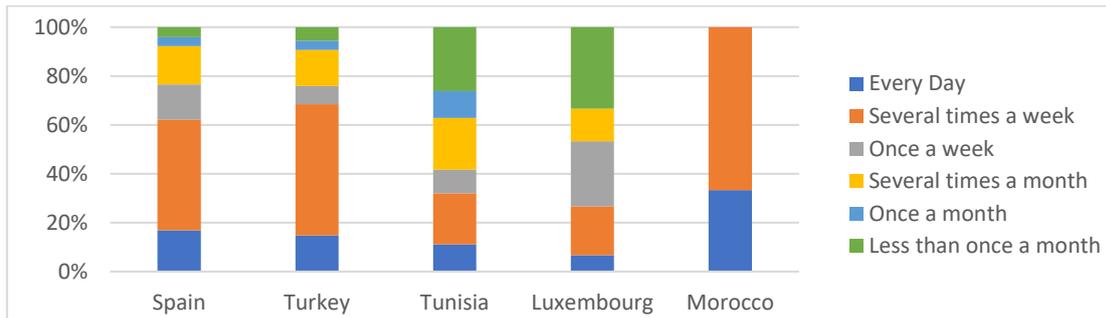


Figure 114. Frequency of consumption

Honey purchasing habits differ across countries. In Spain and Luxembourg, over 40% of consumers buy honey monthly, while Turkey shows a slightly higher weekly purchase rate at 35%. Tunisia has the highest share of frequent buyers, with 20% purchasing honey weekly or more. Morocco, however, has a larger proportion of occasional buyers, with 30% purchasing honey only a few times per year. These patterns reflect varying levels of market engagement and may influence interest in premium traceable products.

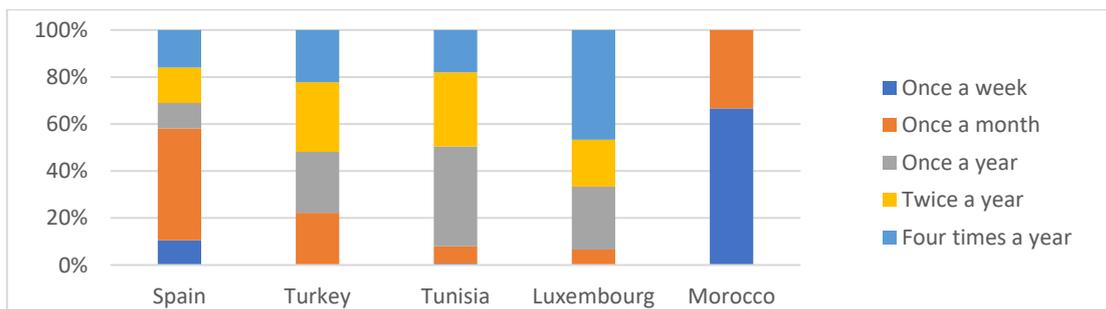


Figure 115. Frequency of honey purchase

Across all countries, a strong majority of consumers believe honey has health benefits. In Tunisia and Turkey, this perception is especially pronounced, with 88% and 85% of respondents agreeing. Spain and Luxembourg follow closely, with 80% and 78% respectively. Morocco shows slightly lower agreement at 70%, though still a clear majority. These results highlight honey's positive image as a



natural and functional food, which may support consumer interest in quality assurance and willingness to pay for traceable, certified products

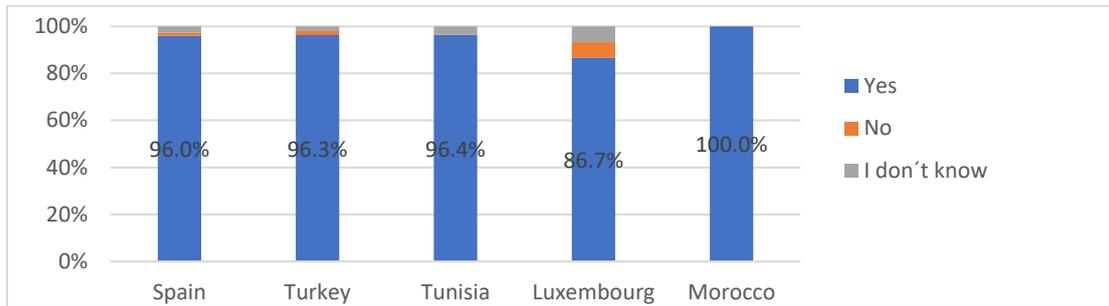


Figure 116. Consumers' opinion - honey is benefiting health

Perceptions of honey pricing vary across countries. In Spain and Luxembourg, around 55% of consumers consider honey to be fairly priced, while in Turkey and Tunisia, only 40% share that view, with many perceiving it as expensive. Morocco shows the highest level of price dissatisfaction, with 65% of respondents believing honey is overpriced. These differences suggest that while some markets accept current pricing, others may be more sensitive to cost—an important factor when introducing premium blockchain-labeled honey.

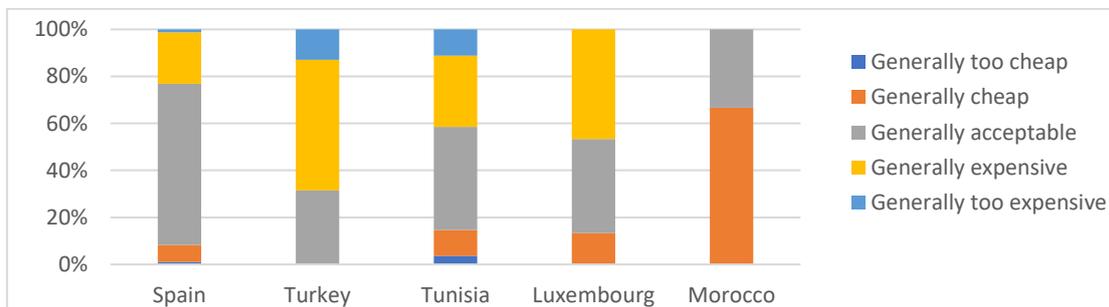


Figure 117. Consumers' opinion - honey price

Label awareness and preference vary across countries. In Luxembourg and Spain, over 60% of consumers report buying honey with a specific label, indicating strong trust in certification schemes. Turkey and Tunisia follow with 55% and 50% respectively, showing moderate engagement. Morocco has the lowest label recognition, with only 35% of respondents actively seeking labeled honey. These differences suggest that while labeling is valued in most regions, its influence on purchasing decisions may depend on local market dynamics and consumer education—factors that will shape acceptance of blockchain-based traceability.



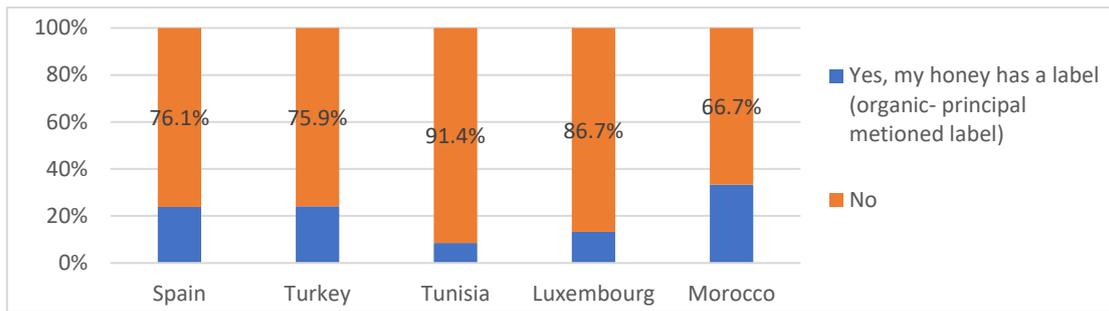


Figure 118. Consumers that buy honey under a specific label

CONSUMERS' PERCEPTION OF CURRENT SUPPLY CHAIN

Consumer perceptions of fairness toward beekeepers vary across countries. In Tunisia and Turkey, only about 30% of respondents believe beekeepers receive a fair price, indicating widespread concern over producer compensation. Spain and Luxembourg show slightly more optimism, with 45% and 50% agreement respectively. Morocco stands out with the highest perceived fairness at 58%, though still leaving a significant portion unconvinced. These findings suggest that many consumers recognize imbalances in the supply chain, which may strengthen support for transparent systems like blockchain to ensure equitable pricing.

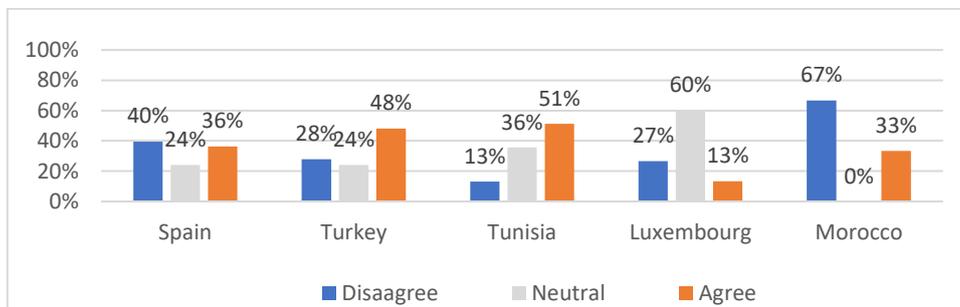


Figure 119. Beekeepers receive a fair price for their honey

Consumer trust in intermediaries varies across regions. In Spain and Luxembourg, around 50% of respondents believe intermediaries contribute to an efficient honey supply. Turkey and Tunisia show lower confidence, with only 35% and 30% agreement respectively. Morocco presents the most skepticism, with just 25% of consumers expressing trust in intermediaries. These results suggest that in several countries, consumers perceive the supply chain as inefficient or opaque—an issue that blockchain-based traceability could help address by improving transparency and accountability.



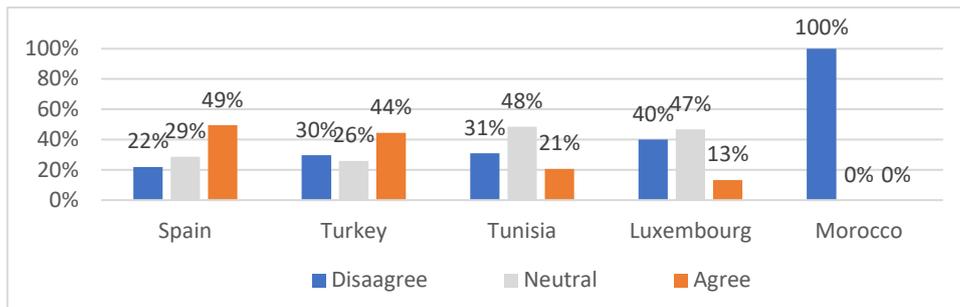


Figure 120. Intermediaries ensure an adequate and efficient honey supply

Concern over the decline of local beekeeping is widespread. In Tunisia and Turkey, over 70% of consumers agree that local apiculture is struggling to compete with imported honey. Spain and Luxembourg show moderate concern, with 55% and 50% agreement respectively. Morocco presents the lowest level of concern, with only 40% of respondents perceiving a decline. These results suggest that in most regions, consumers are aware of the pressures facing domestic producers—an issue that blockchain traceability could help address by reinforcing the value and origin of local honey.

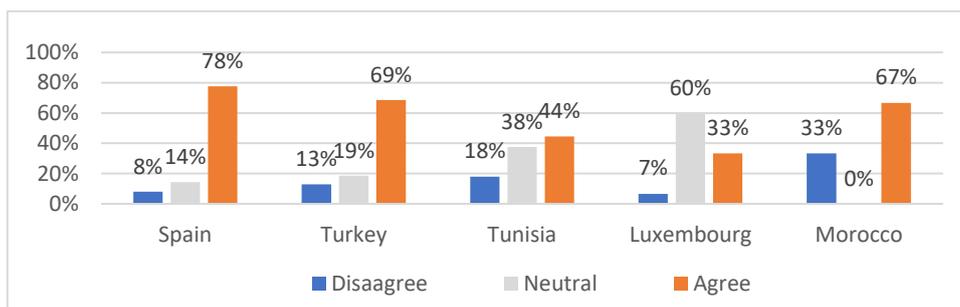


Figure 121. Local apiculture is losing importance because it cannot compete with imported honey

Regarding the price perceptions we observe that in Luxembourg and Spain, around 50% of consumers believe they pay a fair price, suggesting moderate satisfaction. In contrast, only 35% of respondents in Turkey and 30% in Tunisia share this view, indicating greater skepticism. Morocco shows the lowest agreement, with just 25% of consumers feeling the price they pay is fair. These insights suggest that in several regions, consumers question the value they receive—an issue that transparent pricing through blockchain traceability could help address.



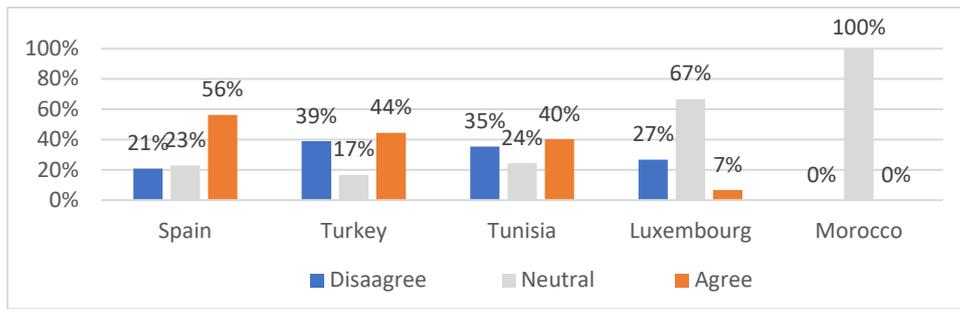


Figure 122. Consumers pay a fair price for honey

Perceptions of price transparency in the honey market vary across countries. In Luxembourg and Spain, around 45% of consumers believe price information is accessible and clear. Turkey and Tunisia show lower confidence, with only 30% and 28% agreement respectively. Morocco has the lowest perceived transparency, with just 25% of respondents affirming that price details are readily available. These results suggest that many consumers feel disconnected from pricing mechanisms—an issue that blockchain traceability could help resolve by offering verified, real-time cost information.

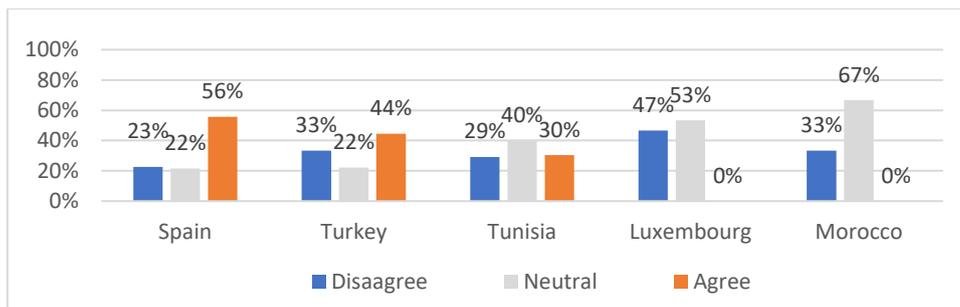


Figure 123. Price information is transparent and available.

According to the consumers' opinion, results show that support for shortening the honey supply chain is strong across all countries. In Tunisia and Turkey, over 70% of consumers agree that removing intermediaries would reduce prices and improve efficiency. Spain and Luxembourg show similar support, with 65% and 60% agreement respectively. Morocco, while slightly lower, still shows majority support at 55%. These results suggest widespread consumer interest in more direct and transparent supply models—an approach that blockchain traceability could help facilitate.

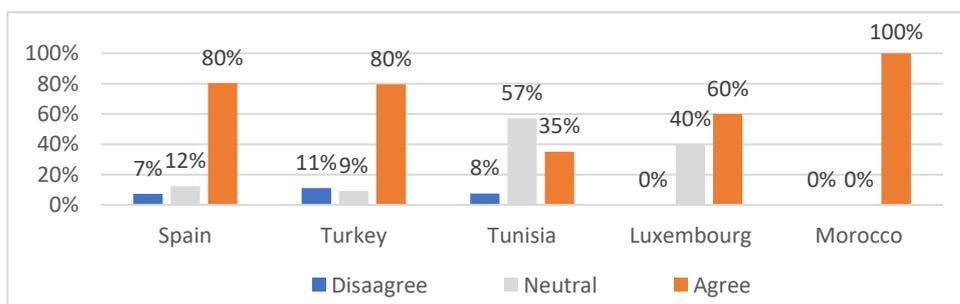


Figure 124. The elimination of intermediate marketing steps and direct access to the customer would simplify the chain and lower prices

Also, opinions on regulatory burden vary across countries. In Turkey and Tunisia, 60% and 58% of consumers respectively believe that excessive regulation hampers the honey supply chain’s efficiency. Spain and Luxembourg show more moderate concern, with 45% and 40% agreement. Morocco has the lowest level of perceived over-regulation, with only 35% of respondents expressing this view. These results suggest that in several regions, consumers see regulation as a barrier to agility and fairness—an issue that blockchain systems could help mitigate by streamlining verification and compliance.

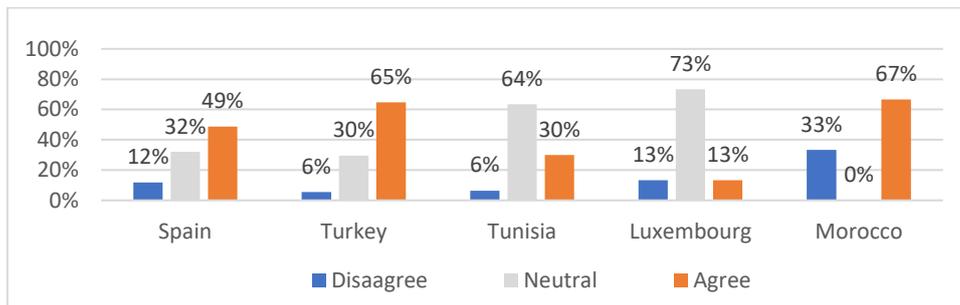


Figure 125. Over-regulation hinders the efficient functioning of the honey supply chain

Concerns about honey authenticity are widespread across all surveyed countries. In Turkey and Tunisia, over 75% of consumers believe fake honey is common, while Spain and Luxembourg show slightly lower but still significant concern at around 65%. Morocco reports the highest skepticism, with 80% of respondents perceiving a high presence of counterfeit honey. These findings underscore a strong demand for reliable verification systems—making blockchain-based traceability a timely and potentially transformative solution for restoring consumer trust.

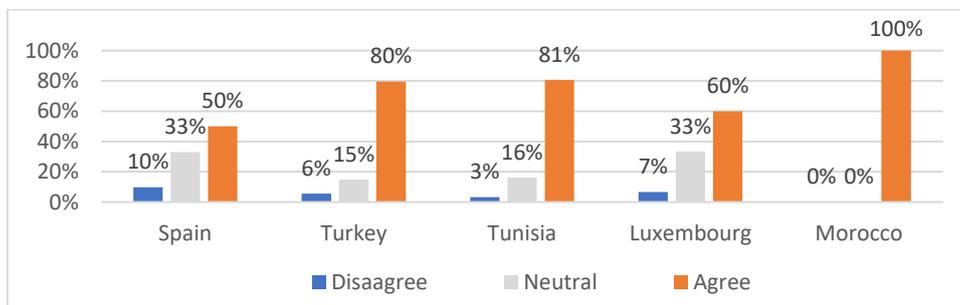


Figure 126. There is much fake honey on the market

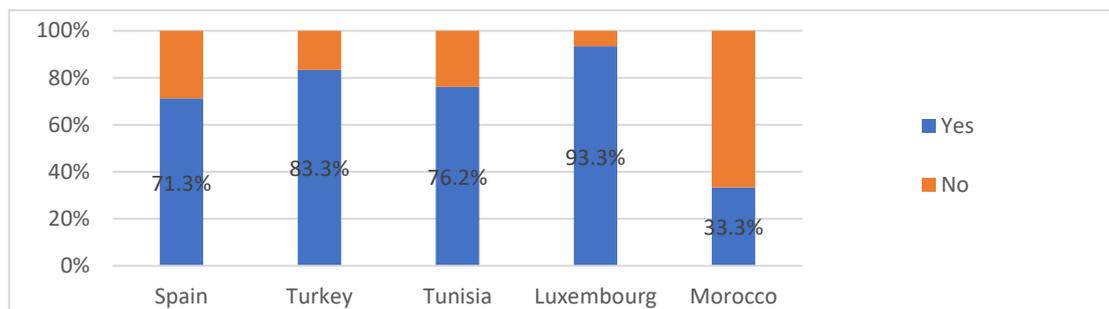
Across the five countries surveyed, honey consumers generally show high educational levels, especially in Spain, Luxembourg, and Turkey, which may support interest in traceability and blockchain labeling.



Honey is widely perceived as healthy, with strong agreement in Tunisia and Turkey, and most consumers buy it monthly or weekly, though frequency varies by region. Label awareness is highest in Europe, while Morocco shows lower engagement. Many respondents believe beekeepers are underpaid and that intermediaries complicate the supply chain, especially in North Africa. Concerns about fake honey are widespread, particularly in Morocco and Turkey, and price transparency is often lacking. Overall, consumers support direct sales and simplified chains, suggesting blockchain could address trust, fairness, and authenticity gaps across diverse markets.

### FRAUD PERCEPTION

Consumer awareness of honey origin varies widely. Luxembourg leads with 93.3% of respondents claiming knowledge, followed by Turkey (83.3%) and Tunisia (76.2%). Spain shows moderate awareness at 71.3%, while Morocco lags significantly with only 33.3%. These differences suggest that educational campaigns and labeling practices may be more established in some regions, influencing consumer confidence and traceability expectations.



*Figure 127. Consumers with knowledge about honey origin*

Perceived importance of honey origin is surprisingly low in most countries. In Spain, Turkey, Tunisia, and Luxembourg, over 80% of respondents rate it as “unimportant” or “not important at all.” Morocco stands out, with 33% rating it as “important” and none selecting “not important.” This contrast suggests that while origin is undervalued in some regions, others—like Morocco—may be more receptive to origin-based traceability initiatives.

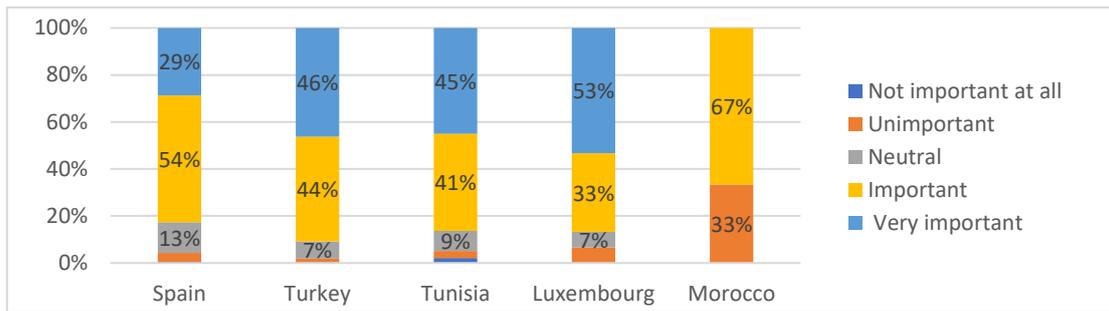


Figure 128. Level of importance of honey origin - consumer opinion

Awareness of honey fraud is high in most countries. Morocco shows universal awareness (100%), followed closely by Turkey (90.7%) and Tunisia (82.0%). Luxembourg and Spain report lower levels at 73.3% and 53.8% respectively. These results indicate that fraud is a recognized issue, especially in North Africa and Turkey, which may drive stronger demand for verification systems.

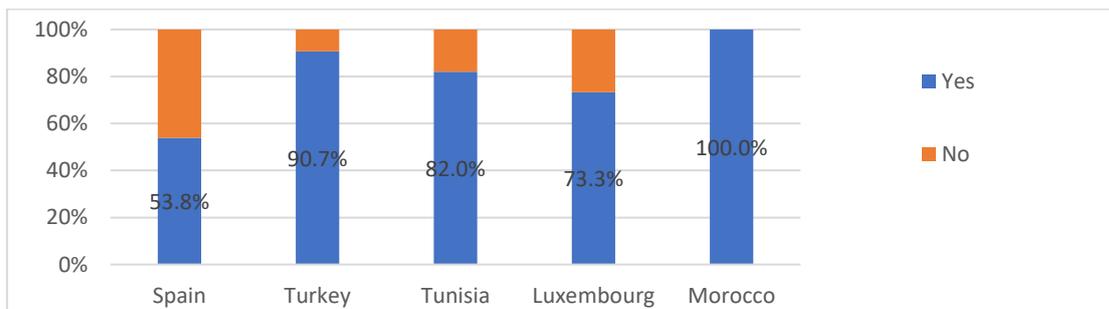


Figure 129. Consumers who have heard about honey fraud

Most consumers believe honey fraud has increased over time. Morocco again shows unanimous agreement (100%), with Turkey (98.1%) and Tunisia (82.2%) also expressing strong concern. Spain and Luxembourg are more cautious, with 63.0% and 66.7% agreement respectively. This perception of rising fraud reinforces the urgency for robust traceability tools across all markets.

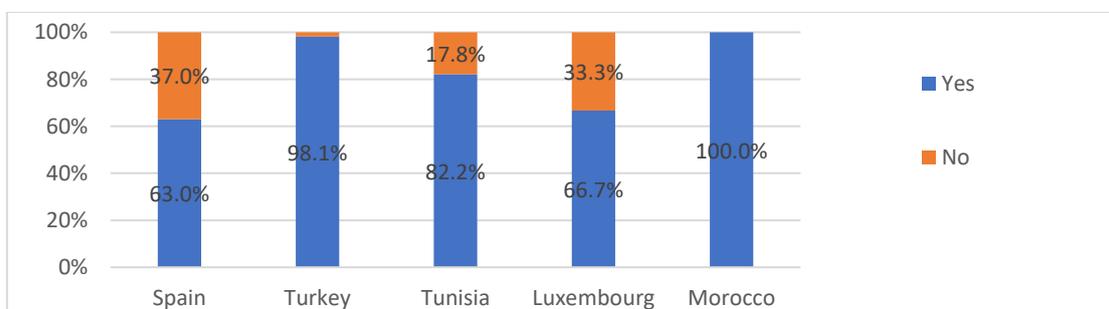
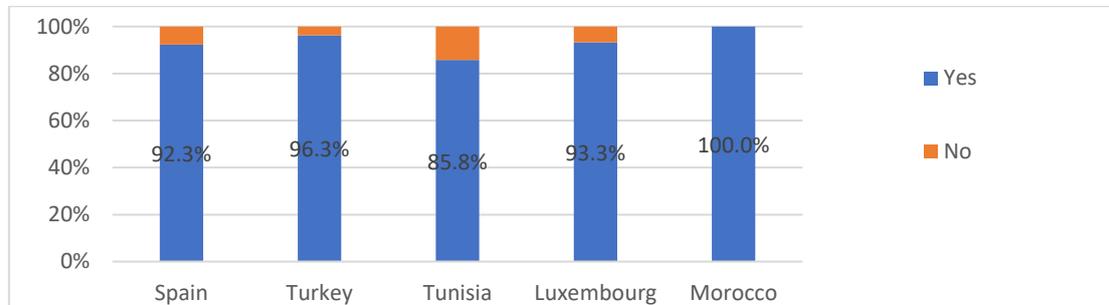


Figure 130. Today there is more fraudulent honey compared to earlier years? - consumer opinion



Support for traceability is nearly universal. Morocco leads with 100% agreement, followed by Turkey (95.3%), Luxembourg (94.3%), Spain (92.3%), and Tunisia (85.8%). These results show overwhelming consensus that traceability is essential to combat fraud and ensure fairness—making blockchain-based systems highly relevant and potentially well-received across diverse regions.



*Figure 131. Consumers' opinion about traceability is needed to avoid unfair practices and honey fraud.*

All previous results show that consumer awareness of honey origin and fraud is generally high, especially in Luxembourg, Turkey, and Tunisia. Morocco stands out with lower origin awareness but the highest concern about fraud, suggesting strong sensitivity despite limited traceability knowledge. Most respondents believe fraudulent honey is more prevalent today than in the past, with near-universal agreement in Turkey and Morocco. While the perceived importance of honey origin is surprisingly low in most countries, support for traceability as a solution is overwhelmingly strong—over 85% in all regions. These findings highlight a clear gap between consumer concern and current labeling practices, reinforcing the relevance of blockchain systems to restore trust and ensure fairness in honey markets.

#### DIGITAL MATURITY - CONSUMERS PERSONAL SKILLS

The results of the next graph allow us to observe that most consumers report strong proficiency in basic digital tasks (Figure 132):

- Over 80% can use smartphones, email, and office applications.
- Around 70–75% are familiar with online communication tools and cloud storage.
- 60–65% can perform online procedures like banking or tax declarations.
- QR code literacy is high, with over 70% knowing how to scan and interpret them.

These results suggest a solid foundation for engaging with digital traceability tools, especially if they are mobile-friendly and intuitive.



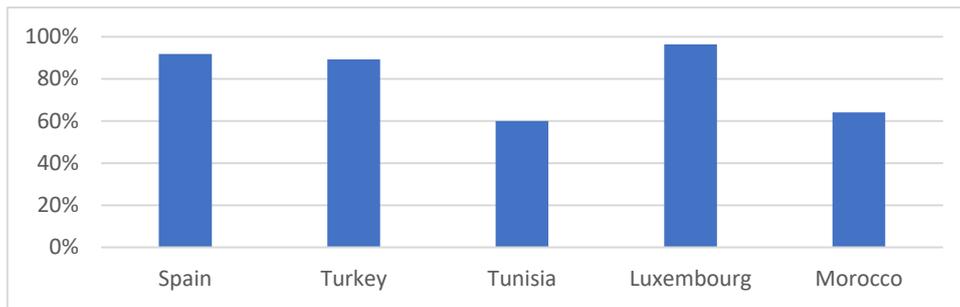


Figure 132. Consumers' level of skills

The results of consumers Skill Levels by Country (Figure 133) show us that: Luxembourg and Spain have the highest overall digital proficiency. Over 85% of respondents are confident in using cloud services, e-commerce platforms, and digital certificates. This positions them as strong candidates for early blockchain adoption and premium product engagement. Turkey also demonstrates high digital literacy, especially in mobile use, email, and online procedures. However, slightly lower familiarity with cloud storage and digital signatures may require targeted education for full blockchain engagement. Tunisia shows moderate proficiency. While basic skills like email and device use are common, advanced tasks like backing up data or using digital certificates are less widespread. This could affect trust in blockchain unless supported by user-friendly interfaces and awareness campaigns. Morocco presents the most uneven skill distribution. While QR code recognition and mobile use are relatively high, fewer consumers report confidence in cloud access, e-commerce, or digital signatures. This suggests that blockchain adoption may require more foundational digital literacy support in this region.

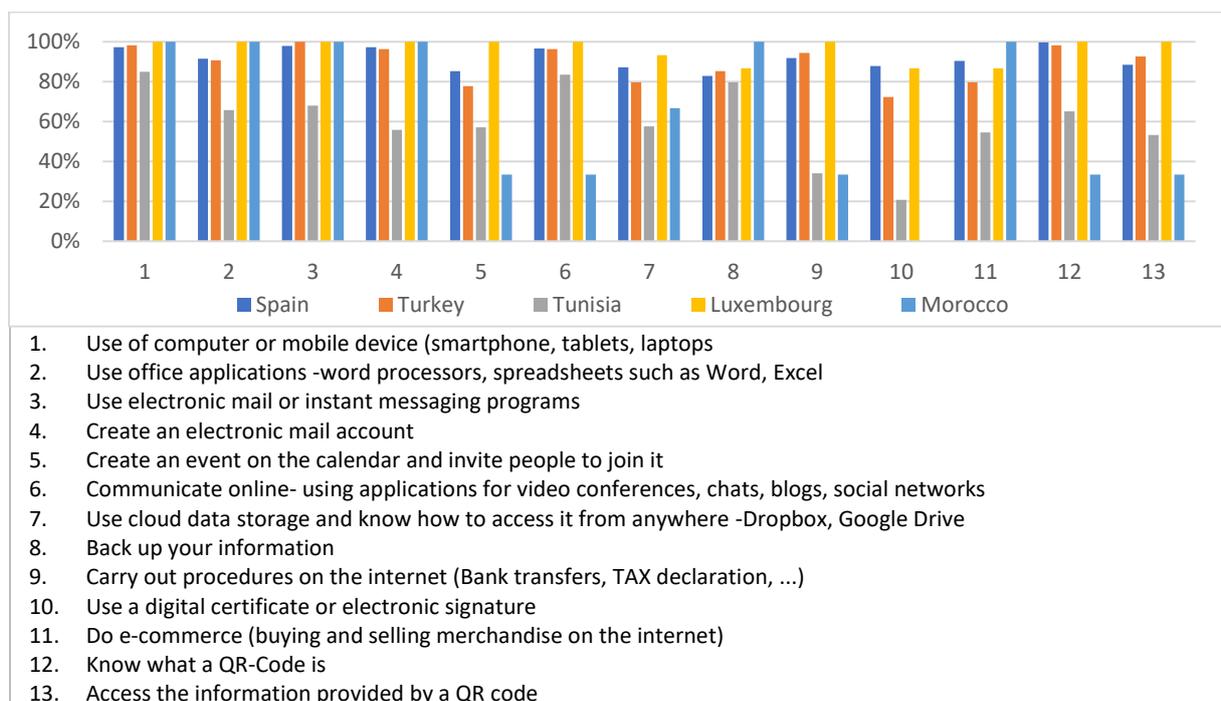


Figure 133. Level of each skill by country

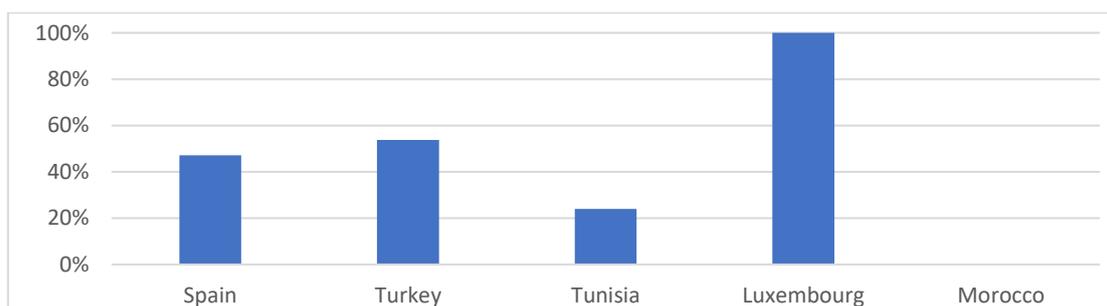


Previous results reflect that consumers across countries show varying levels of digital proficiency, which may influence their acceptance of blockchain-based honey traceability and willingness to pay for it. European countries lead in most skills, while North African countries show more uneven digital readiness. Five countries demonstrate solid digital literacy, especially in basic tasks like using smartphones, email, and QR codes. European respondents—particularly in Luxembourg and Spain—show the highest proficiency across advanced skills such as cloud storage, e-commerce, and digital certificates, suggesting strong readiness for blockchain adoption. Turkey also shows high competence, while Tunisia and Morocco display more uneven skill levels, especially in tasks requiring secure digital tools. Importantly, QR code familiarity is widespread, offering a practical entry point for blockchain-labeled honey. These results suggest that while technical readiness varies, most consumers have the foundational skills needed to engage with digital traceability—especially if the system is intuitive, mobile-accessible, and supported by clear communication.

### BLOCKCHAIN OPINIONS

In the next set of graphs, we can observe that consumers have a growing awareness and support for blockchain in honey traceability, with notable differences across countries in familiarity, perceived benefits, and willingness to pay.

Regarding the previous knowledge about Blockchain, the next figure shows that Blockchain awareness varies significantly. Luxembourg leads with over 60% of consumers familiar with the concept, followed by Spain and Turkey with around 50%. Tunisia and Morocco show lower awareness, below 35%, suggesting that targeted education may be needed to build trust and understanding in these regions.



*Figure 134. Consumers with previous knowledge about Blockchain*

Figure 135 shows the level of the most common benefits associated with blockchain such as transparency, traceability, and fraud prevention. In Spain and Luxembourg, over 70% of respondents recognize these benefits. Turkey and Tunisia show moderate recognition, while Morocco lags slightly, with fewer consumers identifying specific advantages. This suggests that while the concept is gaining traction, its practical implications may need clearer communication in some markets.



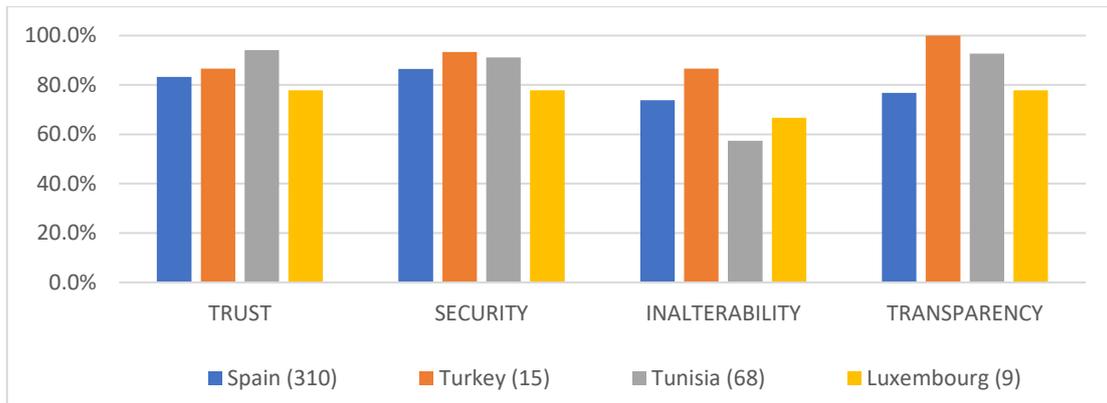


Figure 135. Level of Blockchain benefits identified by consumers

Regarding the Blockchain benefits along the honey value chain. Figure 136 shows that Support for blockchain’s role in improving the honey supply chain is strong. In Luxembourg and Spain, over 65% of consumers believe it enhances quality control, pricing fairness, and producer protection. Turkey and Tunisia show similar trends, though slightly lower. Morocco again shows more skepticism, with less than half of respondents seeing value chain benefits. These results highlight the importance of linking blockchain to tangible improvements in product integrity and producer equity.

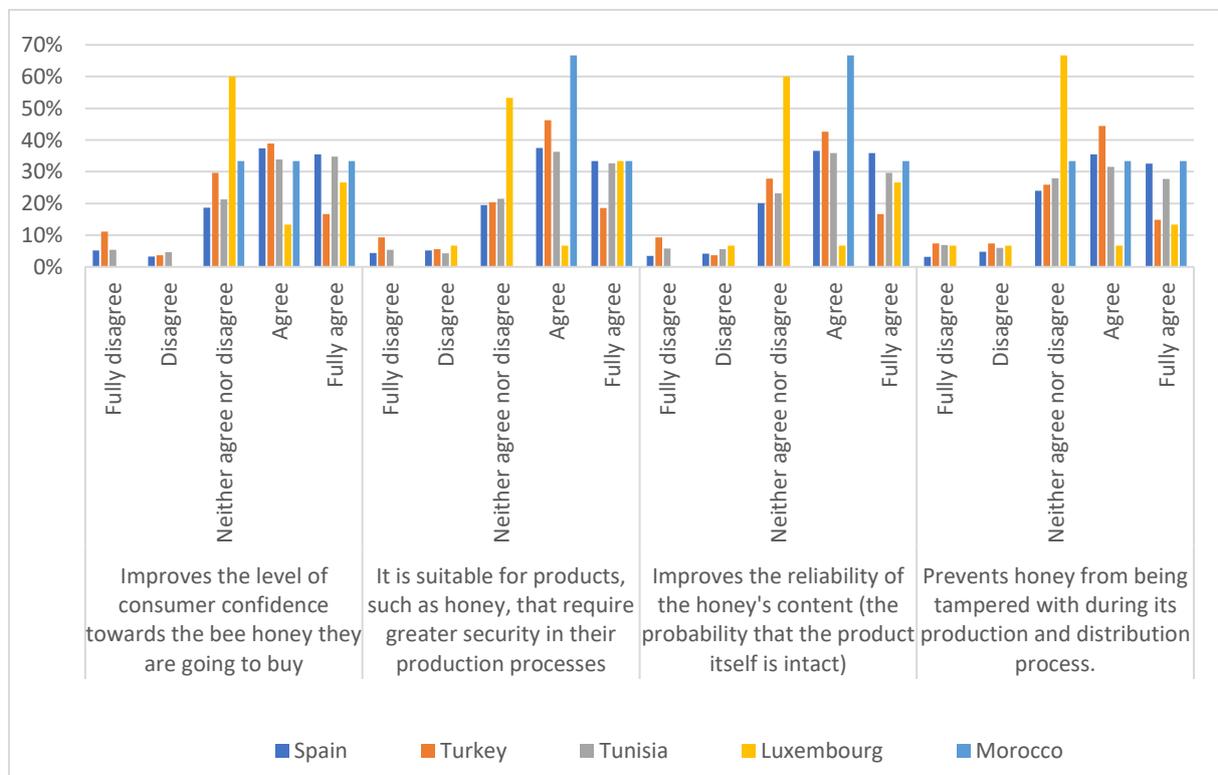


Figure 136. Consumers opinions on Blockchain benefits along the honey value chain



Traceability is widely seen as essential for honey quality, as can be observed in Figure 137. In all countries except Morocco, over 75% of consumers agree that systems like blockchain are important. Luxembourg and Turkey show the strongest support, nearing 90%. This consensus reinforces the relevance of blockchain as a quality assurance tool.

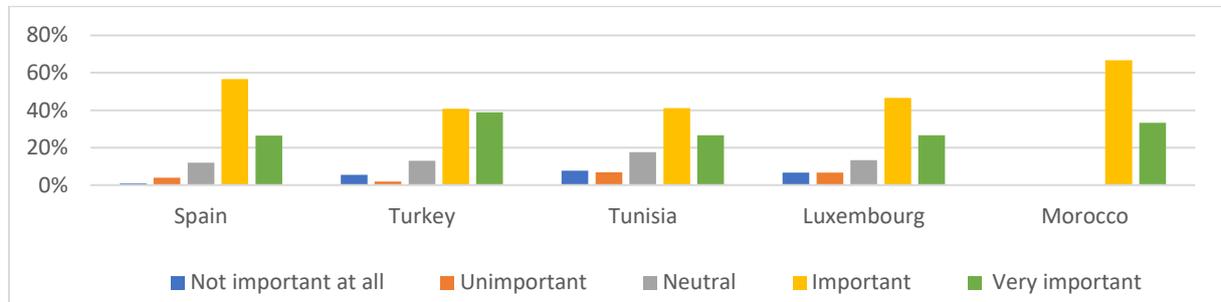


Figure 137. Importance of **traceability** systems (such as Blockchain), on honey **quality**.

Importance of transparent and detailed information exchange via Blockchain is analyzed in Figure 138. In it, consumers overwhelmingly value blockchain’s ability to provide clear, secure, and accessible information. Spain, Luxembourg, and Turkey show over 80% agreement, while Tunisia and Morocco are slightly lower but still above 60%. These results suggest that transparency is a universally appreciated feature, and blockchain’s role in delivering it is widely recognized.

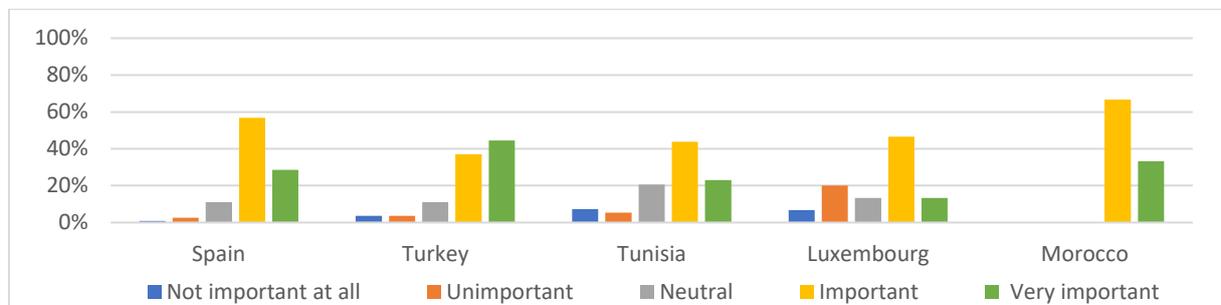
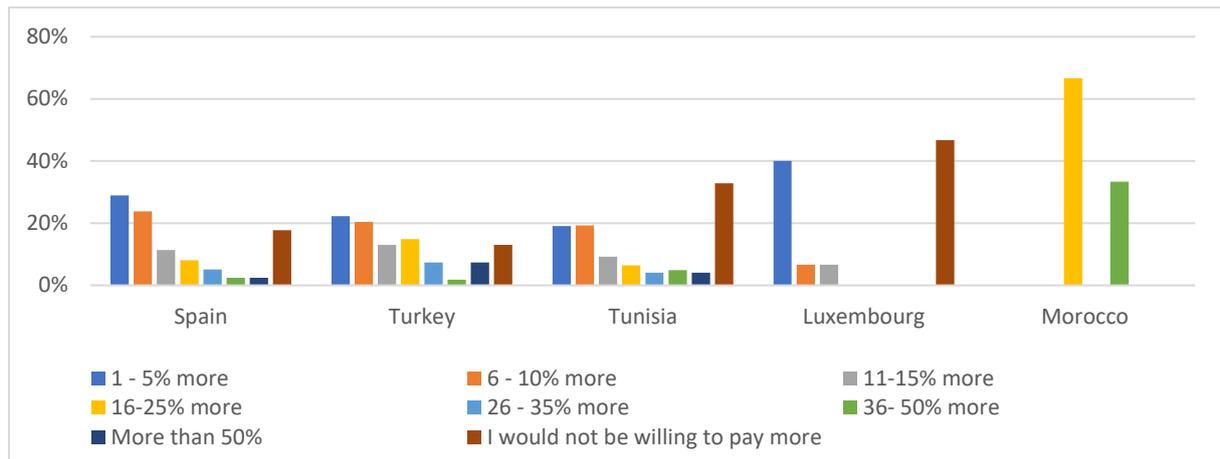


Figure 138. Importance that the blockchain provides a **transparent and detailed exchange of information**

In the next figure we observe that the willing percentage of price increase (willing to pay an extra prima-WTP) varies by country. In Luxembourg and Spain, over 50% of consumers are willing to pay a 10–20% premium for blockchain-labeled honey. Turkey and Tunisia show moderate willingness, with 30–40% accepting a small overprice. Morocco shows the lowest WTP, with most consumers unwilling to pay extra. These findings suggest that while blockchain adds perceived value, pricing strategies must be adapted to local market sensitivities.





*Figure 139. Amount that consumers are willing to pay for honey secured by Blockchain. (WTP- % of overprice)*

As a resume of this section, we observed that: Consumer perceptions of blockchain in the honey sector are increasingly positive, though awareness levels vary. Luxembourg and Spain show the highest familiarity and recognition of blockchain's benefits—especially in enhancing transparency, traceability, and fairness along the value chain. Most consumers across countries agree that blockchain improves honey quality and ensures secure information exchange. Crucially, Figure 122 reveals that willingness to pay (WTP) for blockchain-secured honey is strongest in Luxembourg and Spain, where over 50% of consumers are open to paying a 10–20% premium. Turkey and Tunisia show moderate WTP, while Moroccan consumers are more price-sensitive, with limited acceptance of overpricing. These insights suggest that while blockchain is broadly valued, pricing strategies must be tailored to local economic contexts and perceived value.

### CONCLUSIONS OF S1 RESULTS

The TECHONEY study offers a comprehensive, multi-country analysis of stakeholder perceptions, digital maturity, and blockchain readiness across the Mediterranean honey value chain. Drawing on insights from beekeepers, retailers, honey-processing industries, hospitality actors, and consumers, the findings reveal a landscape marked by **high awareness of fraud**, **growing demand for transparency**, and **emerging digital capabilities**—but also **uneven readiness** and **context-specific challenges**.

Across all stakeholder groups, there is **near-universal recognition of honey fraud** as a growing threat. Beekeepers, retailers, and industry actors report **direct or indirect contact with fraudulent honey**, while consumers—especially in Turkey and Morocco—express strong concern despite limited traceability knowledge. The perceived rise in fraud, coupled with **pressure from imports**, reinforces the urgency of implementing **systemic safeguards**.



Stakeholders consistently emphasize the **importance of honey origin** and the need for **transparent traceability systems**. Retailers and industry actors see traceability as essential for **quality assurance and market credibility**, while hospitality professionals report that **customers increasingly demand origin information**. Consumers across countries support traceability as a solution, with over **85% agreement**, even when origin awareness is low. These insights validate TECHONEY's strategic focus on traceability and highlight **broad stakeholder alignment**.

Digital skill levels vary widely:

- **Luxembourg, Spain, and Turkey** lead in digital proficiency, especially in advanced tasks like e-commerce, cloud storage, and digital certificates.
- **Tunisia** shows emerging potential, with moderate skills and openness to innovation.
- **Morocco** presents fragmented digital maturity, requiring foundational training and infrastructure support.

Beekeepers in Luxembourg and Turkey are already using **connected hive devices and analytics**, while retailers and hospitality actors show strong basic skills but **limited strategic planning**. Industries demonstrate operational competence but lack cybersecurity investment and transformation strategies. These gaps must be addressed to ensure **inclusive blockchain adoption**.

Restaurants, hotels, and guesthouses **show growing interest** in honey traceability, with Spain and Turkey leading in digital maturity and blockchain awareness. Many establishments report frequent honey orders and **anticipate stable or rising demand**. Their openness to testing digital traceability systems positions them as key partners in scaling blockchain adoption to end-consumers.

The Mediterranean honey supply chain is ready for transformation, but success depends on:

- Tailored capacity-building to bridge digital gaps
- Financial and technical support for small and medium actors
- Inclusive pilot programs that reflect local realities
- Clear communication strategies to engage consumers and build trust

Blockchain is not just a technological upgrade—it's a strategic enabler of transparency, fairness, and resilience. The TECHONEY project is uniquely positioned to lead this transition, fostering collaboration across sectors and countries to build a traceable, trustworthy, and sustainable honey market.



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**ANNEX 1 - SECOND FOCUS GROUP PROTOCOL**





# TECHONEY

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

**WP1: HONEY INNOVATION AND LEARNING COMMUNITY LAB (HILE)**

**Second Focus Group Protocol (R) (PU) (CREDA)**

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# 1. INTRODUCTION

## SUMMARY: DESCRIPTION OF THE WORK

This protocol contains the main actions and partners' responsibilities within focus group activity as part of the **Task 1.3. Setting up the platform: Involving the interested Stakeholders in a participatory approach**. The main objective of this task is to analyze along the added value chain the stakeholders' opinions and to start discussing the Beekeeping sector needs for the co-innovation process and acceptance of Blockchain.

A qualitative method using the Focus group approach will be conducted considering the nature of the stakeholders along the Honey supply chain. The Honey supply chain includes all activities related to those stakeholders that source raw material inputs, produce, and institutions responsible of regulating the course of production actions. Also, refers to post-producing activities, as distribution of the beekeeping products to the final consumers.

In this context, different focus groups will be organized in different times on the project life for each case study from **TECHONEY** project, considering the abovementioned objective.

The identification of the stakeholders' types that are suitable to participate in the Focus groups **were done In Task 1.2 "Mapping and Selection criteria of stakeholders"** included on deliverable D1.2 Mapping of stakeholders and context analysis; led by CREDA with the participation of all case study leaders (Algeria, Luxembourg Morocco, Spain, Tunisia and Turkey). At the beginning of the Focus groups, the stakeholders are invited to sign a consent form that clearly set what and why they were selected to participate in the Focus groups and how the data and information generated during the debate will be used.

During the conduction of the Focus Groups, a designed questionnaire about specific characteristics regarding the blockchain innovative tool is applied, through the discussion' sessions, using the stakeholders (**S2**) presented in Annex 2. This questionnaire is answered by the participants of the focus groups during the discussion session in order to set up their opinions and expectations and as prioritization tool. Finally, main result from the discussion session in each case study will be prepared and main conclusions and recommendations will be drawn.

## RESPONSIBILITIES OF PARTNERS LEADING THE CASE STUDIES FOR THE FOCUS GROUP DEVELOPMENT

According to the DoA, participants leading the different case studies are responsible for:

1. **Identify suitable stakeholders** to join the focus groups in their regions, taking into consideration project goals and availabilities (**Task 1.2: Mapping and Selection criteria of stakeholders**). For this, a list of criteria is defined to identify the relevant stakeholders and a quota assigned to each criterion to populate the Honey Innovation and Learning Ecosystem (HILE) with the organizations and individuals that will be invited to be part of the HILE.
2. **Recruiting** 8 to 12 eligible stakeholders for the Focus group (FG) based on the criteria identified in the **Task 1.2: Mapping and Selection criteria of stakeholders** that ensure the suitability of the



potential users or adopters invited to participate in the Focus groups. If it is possible and needed, participants of the focus groups are compensated (economically or in Kind) to cover their participation costs and time, and to motivate their participation. The resources to conduct the focus groups in each case study will be under the responsibilities of partners who lead the case studies.

3. **Translating into the local language** the consent form (**Annex 1**) and questionnaire (**S2**) that should be answered by participants during the focus groups conduction. The questionnaire (**S2**) can be consulted in **Annex 2**. Imagines of **Annex 3** can be downloaded from the blockchain application.

4. **Conducting the focus groups** under the guidance and support of CREDA. CREDA designed the guide (main topics and questions) of the discussion sessions. CREDA could participate (if needed) to give support and ensure a homogenizing procedure in organizing and conducting the focus groups. The discussion session will be recorded (only audio recording using a recording device or mobile phone). A copy of the voice files of the focus groups will be saved in data repository according to the Data Management Plan in **TECHONEY** project.

5. **Preparing a short summary** of the main results of the focus groups. An example of the result format will be shared with the partners involved in organizing their focus groups (The complete transcript of the focus groups to English is not needed).

CREDA **will collect the results** from the case studies leaders and share with the WP4 leader to be used as part of the design and structure configuration of the Blockchain prototype (app), also results will be used to develop the deliverable report (D1.3). For the above-mentioned tasks, CREDA will provide all the material and the technical advice that is needed.

## 2. FOCUS GROUP DISCUSSION GUIDE

### NOTE TO THE MODERATORS:

This focus group discussion guide includes the main topics to be covered during the session. All the questions and comments from the discussion guide should be used by the moderators as close as possible as they are stated here. Those comments that are only for the moderators (and not for participants), are marked with italic text and enclosed in square brackets – e.g. [*Only for the moderators*]. We recommend printing all the material and deliver a folder with all the necessary documents (consent form, questionnaire, brochures from the project, leaflets from the innovation) at the beginning of the session.

#### 2.1. WELCOME AND INFORMED CONSENT [5 MIN]

Welcome all. Today you are going to participate in a discussion about a digital Innovation that may probably become a reality in the future. The main goal of this innovative solution is to certify **authentic honey products along the supply chain** and protect quality labels in local and international markets. This study is part of a Mediterranean research project called **TECHONEY** within the PRIMA program



(Project ID: 1711, Call: 2021, Topic ID: 2.3.1) that is funded by the European Union. We will give you later more details about the research carried out in this project.

It is important to specify that your participation in the FG is voluntary and accomplish data treatment regulations at European and national levels. As you may know, we need to record the session for further analysis since it is almost impossible to collect all the information that arise from the discussion session in a written way. The records from today will be not made public and will be only used by researchers to complete the investigation and to carry out the analysis. For this reason, we need you to declare your consent to participate and record this session. Please, fill in the Consent Form delivered [*Consent form (Annex 1) should be print and delivered on tables*].

[*Start audio recording*].

## 2.2. PARTICIPANTS IDENTIFICATION [5 MIN]

Firstly, we want to thank you all for your interest in this session. Your opinions are extremely valuable for us and they will be very useful for our current and further research. There are no right nor wrong answers and your information will be kept confidential. The focus group discussion is estimated to last about 1 hour and 30 minutes.

To get to know each other a bit, we will start the session by a introducing ourselves openly. As an example, I will introduce myself [*the moderators introduce themselves providing their names, the organization in which they work for, and their role. It is important to have a paper (A4 folded or similar) in front of each person with his/her name so it may allow the moderators to state the name of the participants during the discussion session and motivate them to the debate by directly addressing them with questions*].



Figure 1: Folded paper for the name of participants

## 2.3. ABOUT THE PROJECT. WHY WERE YOU INVITED? [5 MIN]

[*Explain the TECHONEY project, using information available on the drive repository of the TECHONEY that can be find in this link: <https://www.techoney.org>*]

[*For the Challenge this common text could be used:*]

Food fraud with adulterated honey of low quality is a serious problem for beekeepers, since they have to sell their authentic products for lower prices. The economic damage is estimated at \$1 billion. For



consumers it is difficult to recognize fraud. **TECHONEY** is an EU research project that develops innovative IT solutions to **certify authentic honey** products along the supply chain and protect quality labels in local and international markets.

**TECHONEY's** main objective is to **identify strategies and establish lines of resilience to the new challenges** determined by the COVID-19 pandemic for beekeepers in the Mediterranean (Med) agricultural systems through the implementation, definition, enhancement and transfer of competitive, profitable, efficient and **trustful honey supply-chain alternatives** that address beekeepers' capacities and attractiveness to fulfil consumer needs on unexpected food market changes.

To fulfil the main objective, the project proposes the development of a **traceability system to guarantee the quality and safety of honey within the supply chain** for more effective communication to consumers and to strengthen access to different markets (e-commerce, direct sales, etc.).

Stakeholders participation in the **TECHONEY** focus groups, help us create solutions that meet their needs. In this context, it is important to highlight that the innovation that will be presented and discussed today is **focused on honey traceability to avoid fraud**.

#### 2.4. INNOVATION PRESENTATION [5 MIN]

As a next block of this session, we would like to introduce the digital solution of traceability that is in development in our project.

*[For the presentation of the innovation, if the moderator is not familiar with the technical part of the innovation, he/she can invite any member from the team to better explain the innovation and be able to answer technical questions from partners. It is important in this part to use a written document (flyer, scheme or similar) that describe the innovation to be delivered to participants. A short video presentation can be also used but always respecting the schedule timing. It is recommended that the video link (preferably uploaded on YouTube platform) can be previously sent to participants].*

To do this, we will provide a briefing about this technology and will be able to attend to your doubts. After the explanation we will explore 2 apps designed with in the **TECHONEY** project.

BLOCKCHAIN Presentation:

As we have previously commented, the "**Blockchain**" is a decentralized and network-shared digital record of transactions (block) of which synchronized copies are generated, making it impossible to alter the recorded data once the block has been validated and accepted (it cannot be deleted or modified).

Blockchain allows the connection of all actors involved in the supply chain "producers, distributors and consumers", enabling the flow of information.

It is key in food traceability, since it allows us to know, track and follow each stage of the supply chain, from the acquisition of raw materials for production, to receipt by the final consumer (What, where, when and why), through the physical marking of each product (labeling), data collection (sensors, barcode readers), use of management applications (software) and tracking systems.

Blockchain helps gain credibility and build trust.



In recent years, multiple blockchain based food production system have been proposed to offer high level of transparency, traceability, trust and lower level of fraud. Deploying a blockchain system in the food industry is still at an early stage and facing two main challenges:

- 1) Data privacy of stakeholders in the supply chain
- 2) Scalability due to the increasing number of peers, transactions and channels in blockchain

## 2.5. CONCERNING BLOCKCHAIN INNOVATION [GROUP DISCUSSION]

The blockchain platform oversees the authentication, validation, management and storage of traceable data related to honey production/transport/consumption through smart contracts.

A smart contract is an automated and secure computer program, deployed on the blockchain, that guarantees compliance with contractual obligations without requiring a centralized legal authority during the execution of the contract.

IoT devices will be deployed throughout the honey chain, from producers to consumers, to monitor and track the status of honey and its environment as it moves through the supply chain and share this information with the blockchain. In this project, we will use a consortium blockchain to control the network through a limited number of control nodes (beekeepers, wholesalers, retailers and consumers). Each control node is under the responsibility of an accredited authority. Thanks to networked operational management, in case of lack of integrity of honey data, it is possible to intervene by exchanging data (for example, physical-chemical analyzes of honey related to food safety and commercial quality and verifying all operators). With this procedure, each action of each operator will be documented, made public and known by all participants.

As we commented previously in the project will be developed and implemented the distributed blockchain system. And will be also developed two smartphone applications. The first is responsible for the certified registration of traceability data in the blockchain. (See the traceability application in your cellular phone using the next link or the QR code (Figure 2) [15 MINUTES]

<https://techoney-web-interface.vercel.app/en/product/GB-110246Tx>



Figure 3: QR for access to the traceability app



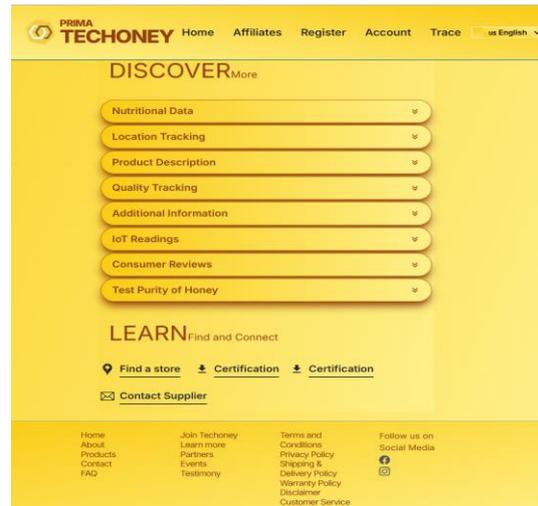
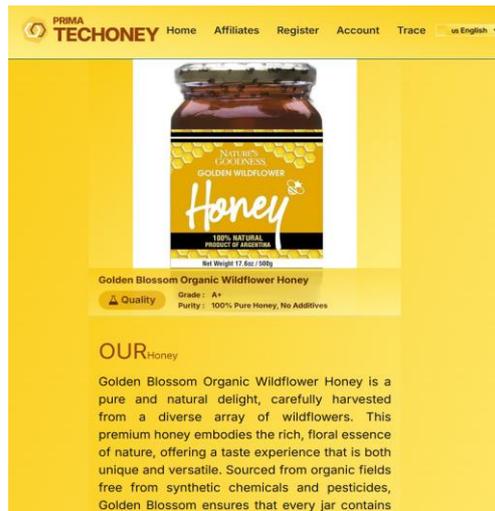


Figure 4: Example of some of the screen that you will find on the traceability app

[In this part use de app to increase the interest the stakeholder's participation. Use Annex 3 which contains images of the years of the developed applications, to identify some of the attributes that will be analyzed in the questionnaires].



The second app is for the final consumers of honey. It allows you to consult the traceability of honey on the blockchain. You can access using the next link:

<http://mgsnixv.cluster031.hosting.ovh.net/dev/techoney/>

### End-to-End Consumer Experience



#### How It Works

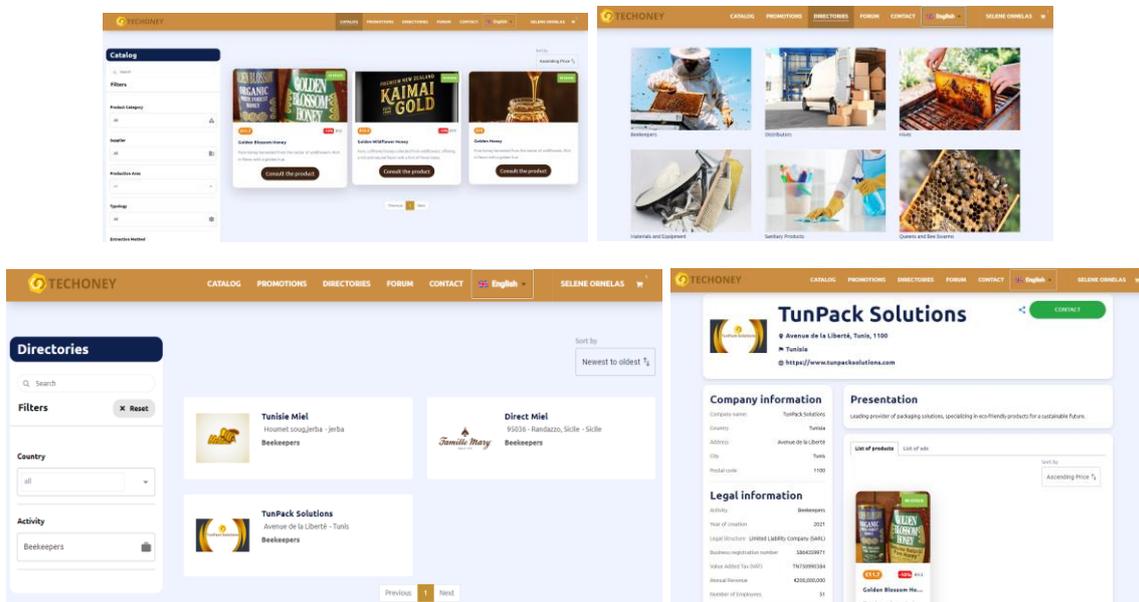


Figure 5: Example of some of the screen that you will find on the Techoney market shop app

The blockchain traceability system will be integrated into the “Multichannel Distribution” e-commerce platform and will allow honey producers to access direct sales markets and new markets based on short supply chains.

Now that you have been briefed about this new technology in development, we would like you to discuss a few topics, related to:

- General information details (attributes) related to your activity, which are of interest to you and you would like to be part of the mobile/web interface.
- With whom you would be willing to share the details of the information described (tendency to exchange information, transparency and the degree of visibility that is friendly to all participants).
- Information from the counterparty that is of interest to you at the time of establishing business relationships



To do that we need that you, grouped by type of stakeholder, respond to the next questions.

Insert QUESTIONNAIRE "S2" (Annex 2) **Blocs 1-5** for each stakeholder group (**Blocs 1** for Beekeeper, **Blocs 2** for Distributor (logistic), **Blocs 3** for Wholesaler, **Blocs 4** for Retailer and **Blocs 5** for customer) that contain the **Blockchain** attributes according to each stakeholder type, to identify the willingness to upload specific Information on the app and **level of info that want to share with other stakeholders** (written). [10 MINUTES]

Insert QUESTIONNAIRE "S2" (Annex 2) **Block 6** for all group of stakeholders (Beekeeper, Distributor (logistic), Wholesaler, Retailer and customer) that contain the **Blockchain** attributes according each stakeholder type, to identify relevant **attributes needed to build trust and do business transactions** with the corresponding business partner (written). [15 MINUTES]

Insert the QUESTIONNAIRE "S2" (Annex 2) **Block 7** for each of the participants. [5 MINUTES]

## 2.6. FINAL DISCUSSION [10 MIN]

Once the Blocs 1-7 are answered, a specific discussion will focus on the innovation using the proposed topics:

1. **Which would be the perfect innovation to sort out this topic "Fraud, trust, tradability"?**  
(you can use your imagination)
2. **What is your perception about Blockchain now?**
3. **What would encourage you/sector to adopt the Blockchain technology?**
4. **How would you approach the different actors (institutions, farmers, end-users) to convince to adopt the new technology?**
5. **What will be the role and the importance of each stakeholder´ characteristics in the decision of adoption? [determinant factors]**

## 2.7. CLOSING AND COFFEE SESSION

Thank you very much for your time. We hope that you have enjoyed the session as much as us. It has been very fruitful for our research. We will only ask you one more thing so you can receive a small gratification for the time spend with us (if applicable). Thank you again and see you next time.

[Stop recording]

At the end, it is recommended to organize a coffee break so informal discussion can also continue and additional information might be obtained.

## 2.8. DOCUMENTS TO BE DELIVERED TO CREDA, AFTER CARRYING OUT THE FOCUS GROUPS

Once the Focus groups are carried out, CREDA is expected to receive from the partners the following information and documents:

- The signed consent forms should be saved by partners. They could be required by the project reviewers or coordinator. There is no need to send them to CREDA



- Please send scanned the answered questionnaires (Annex 2, blocks 1 – 7)
- Short summary of the main results generated during the focus group conduction. An example of the result format will be shared with the partners involved in organizing their focus groups (The complete transcript of the focus groups to English is not needed).



### 3. ANNEX 1

#### CONSENT FORM

  
TECHONEY

### Consent Form

This activity in which you will participate is part of a European research project called **TECHONEY** ([www.techoney.org](http://www.techoney.org)). This project is an **academic research** where the introduction of a Blockchain-based ecosystem **that allows a better positioning of small honey producers in local and international markets** will be analyzed.

In our case study, we want to analyze the impact that this technology may have on the sector as a whole and the **factors that affect the adoption** of this type of **innovation** in the beekeeping sector. From a Focus Group following an approach based on **collaboration between all the agents of the honey value chain** (producers, industry, institutions, research centers, points of sale, society, consumer, etc.) we want to understand since your point of view the barriers, limitations, opportunities, identified on the Blockchain technology. **The Focus Group will last one hour and forty minutes** and will consist of different blocks related to the topics mentioned above.

The information requested in this Focus Group will be **used exclusively for research** and its **confidentiality is absolutely guaranteed** and all information collected will be anonymous. You do not need to provide us with information that you do not wish to provide. The conversation will be recorded (audio) and photographs of the Focus Group will be taken that can be published for dissemination of the activity

Thank you in advance for participating in our research.

Date: \_\_\_\_\_ 2024

Name and surname(s):

Signature:

  
PRIMA  
IN THE MEDITERRANEAN AREA

  
EUROPEAN UNION

  
©TECHONEY



## 4. ANNEX 2

### INSTRUCTION FOR QUESTIONNAIRE S2 BLOCKS 1 -5

Please perform the following steps with each attribute in the table, according to the respective block corresponding to the type of stakeholder you represent (Tables: S2.Block 1 – beekeepers, S2.Block 2 – distributors, S2.Block 3 – wholesalers, S2.Block 4 – Retailers, and S2.Block 5 – Customer).

#### Step 1:

Discus with the group of stakeholders you belong to, **if you consider relevant and are willing to provide the information** related to the analyzed **attribute**, so that it becomes part of the Blockchain application.

Example:

Considering you are a beekeeper:

Do you consider **personal beekeeper information** (as name, mission, address ...) is relevant to be part of the blockchain application?

If yes, then you should mark the column **“Is it relevant? (Yes = √) or (No = x).” with √**

4.1 BEEKEEPERS (S2, BLOCK 1)		Data Interest	Attribute	Is it Relevant? (Yes = √ / No = x)	Data should be: A= Public / B= Private	With whom do you want to share your data with?											
Stakeholders						All	Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency			
A. Only for Beekeepers												Mark with √ to whom					
	Personal	1	Beekeeper Info (e.g. name, background, mission, values, ethics, business approach, address, personal description, etc.) (Fig 3.4 and 3.5)	√													
			Contact Info (e.g. phone, mail, social network acc, etc.) (Fig 3)														
			Location / Map (Fig 4)														
			Other?														

Or if that information is not relevant mark with X the respective column

4.1 BEEKEEPERS (S2, BLOCK 1)		Data Interest	Attribute	Is it Relevant? (Yes = √ / No = x)	Data should be: A= Public / B= Private	With whom do you want to share your data with?											
Stakeholders						All	Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency			
A. Only for Beekeepers												Mark with √ to whom					
	Personal	1	Beekeeper Info (e.g. name, background, mission, values, ethics, business approach, address, personal description, etc.) (Fig 3.4 and 3.5)	X													
		2	Contact Info (e.g. phone, mail, social network acc, etc.) (Fig 3)														
		3	Location / Map (Fig 4)														
		4	Other?														

Then, if your answer to the previous question was:

- **Negative** (No= x): then perform step 1 again with the following attribute.
- **Affirmative** (Yes = √): perform step 2

#### Step 2:

Answer to the question: **Are willing to share** the information related to this attribute?

Indicate with "A" if you are willing to share that information with any other stakeholder in the honey value chain (A= Public)

4.1 BEEKEEPERS (S2, BLOCK 1)		Data Interest	Attribute	Is it Relevant? (Yes = √ / No = x)	Data should be: A= Public / B= Private	With whom do you want to share your data with?											
Stakeholders						All	Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency			
A. Only for Beekeepers												Mark with √ to whom					
	Personal	1	Beekeeper Info (e.g. name, background, mission, values, ethics, business approach, address, personal description, etc.) (Fig 3.4 and 3.5)	√	A												
		2	Contact Info (e.g. phone, mail, social network acc, etc.) (Fig 3)														



or indicate with "B" if you prefer to keep that information private (B= Private).

4.1 BEEKEEPERS (SP. BLOCK 1)

Stakeholders	Data Interest		Is it Relevant? (Yes = / / No = x)	Data should be: A= Public / B= Private	All
	Attribute				
<b>A. Only for Beekeepers</b>					
Personal	1	Beekeeper Info (i.e. name, background, mission, values, ethics, business approach, address, personal description, etc.) (Fig 3, 4 and 7)	/	B	
	2	Contact Info (i.e. phone, mail, social network acc, etc.) (Fig 8)	/	B	

If your answer to the previous question was:

- **A (Public):** perform step 3
- **B (Private):** Then go back to step 1 and analyze the next attribute.

**Step 3:**

indicate **with whom** do you want to share the data of this attribute.

If your answer to this question is:

- That you are willing to **share** the information of this attribute **with all** type of stakeholders, mark with **/** the cell of the column titled **All** corresponding to the attribute that is being analyzed. And go back to step 1 and analyze the next attribute.

Stakeholders	Data Interest		Is it Relevant? (Yes = / / No = x)	Data should be: A= Public / B= Private	With whom do you want to share your data with?									
	Attribute				All	Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency	
<b>A. Only for Beekeepers</b>														
<b>Mark with / to whom</b>														
Personal	1	Beekeeper Info (i.e. name, background, mission, values, ethics, business approach, address, personal description, etc.) (Fig 3, 4 and 7)	/	A	/									
	2	Contact Info (i.e. phone, mail, social												

- **Otherwise, specific with whom** are you willing to **share** this information, **writing /** in the all cells of selected **stakeholders** for the respective **attribute** that is being analyzed.

Stakeholders	Data Interest		Is it Relevant? (Yes = / / No = x)	Data should be: A= Public / B= Private	With whom do you want to share your data with?									
	Attribute				All	Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency	
<b>A. Only for Beekeepers</b>														
<b>Mark with / to whom</b>														
Personal	1	Beekeeper Info (i.e. name, background, mission, values, ethics, business approach, address, personal description, etc.) (Fig 3, 4 and 7)	/	A	/	/	/	/						
	2	Contact Info (i.e. phone, mail, social												

Repeat steps 1 to 3 until completing the analysis of all the attributes of the corresponding block.



4.1. BEEKEEPERS (S2. BLOCK 1)

Stakeholders	Data Interest		Is it Relevant? (Yes = ✓ / No = x)	Data should be: A = Public / B = Private	With whom do you want to share your data with?									
	Attribute				All	Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency	
A. Only for Beekeepers														
A. Beekeeper	1. Profile	1. Personal	1	Beekeeper Info (i.e name, background, mission, values, ethics, business approach, address, personal description, etc.) (Fig 3,4 and 7)										
			2	Contact Info (i.e phone, mail, social network acc, etc.) (Fig 5)										
			3	Location / Map (Fig 4)										
			4	Other?										
			5											
	2. Shop	1	Name & logo (Fig 4)											
		2	Legal & Regulatory Info (i.e registration, certification, license, permits, etc.)											
		3	Services Content (Fig 4)											
		4	Schedules (Fig 5)											
		5	other Data?											
		6												
	2. IoT devices	1. Device type and characteristics	1	Temp (Fig 8)										
			2	Gaz (Fig 8)										
			3	Humidity (Fig 8)										
			4	Luminosity (Fig 8)										
5			Particle Electron Asset Tracker											
6			Sound (Fig 8)											
7			Weight											
8			Camera											
9			Other?											
10														
3. Production Management	1. Hive/bees management and Harvest tracking	1	Hives type, number, etc.											
		2	Bee type (i.e Apis mellifera, Apis cerna, Apis dorsata, Apis koschevnikovi, Apis florea)											
		3	Health status of Hives/bees											
		4	Hive location											
		5	Types of bee flowers											
		6	Hive Inspection records											
		7	Harvest record (Fig 7)											
		8	Harvest Inventory (Fig 7)											
		9	Honey production metrics (i.e volume, quality, etc.)											
		10	Other?											
		11												
2. Tools	1	Honey extractors												
	2	Filtering equipment												
	3	Bottling equipment												
	4	Safety gears (i.e suits, gloves, veils, etc.)												
	5	suppliers												
	6	Other?												



Stakeholders	Data Interest		Is it Relevant? (Yes = ✓ / No = x)	Data should be: A= Public / B= Private	With whom do you want to share your data with?																				
	Attribute				All	Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency												
A. Only for Beekeepers																									
A. Beekeeper	3. Production Management	3. Monitoring	1	Bee tracking																					
			2	Hive tracking																					
			3	Instruments tracking																					
			4	Hive activity/alert notification																					
			5	Environment monitoring																					
			6	Other?																					
			7																						
		4. Process	1	Honey production process (i.e harvesting, extraction, packaging etc.) (Fig 6)																					
			2	Quality (Fig 1 and 6)																					
			3	Type																					
			4	Other?																					
			5																						
		5. Planning	1	Work assignment schedule																					
			2	Inspection Schedule																					
			3	Harvest Schedule																					
			4	Resource acquisition																					
			5	Other?																					
			6																						
		4. Marketing	1. Product Quality and Description	1	Bee type (i.e Apis mellifera, Apis cerna, Apis dorsata, Apis koschevnikovi, Apis florea)																				
				2	Honey type (i.e processed / raw, Forest, Blossom, creamed, herb, mountain honey,    Acacia, Arbutus, Buckwheat, Chestnut, Lavender honey, etc. (Fig 2)																				
				3	Origin (Fig 6)																				
	4			Quality (Fig 1)																					
	5			Certification (i.e organic Vs fertiliser, pesticides, etc.)																					
	6			Packaging (Fig 2)																					
	7			Price																					
	8			Shipping & Logistic (i.e shipping address, carrier details, tracking number, expected time of arrival, etc.)																					
	9			Derivative products (i.e wax, candel, beauty & health (i.e honey bee pollen, lipstics, skin creams, soap, soap, etc.)																					
	10			Other?																					
	11																								



Stakeholders	Data Interest		Is it Relevant? (Yes = ✓ / No = x)	Data should be: A= Public / B= Private	With whom do you want to share your data with?										
	Attribute				All	Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency		
A. Only for Beekeepers															
A. Beekeeper	4. Marketing	2. Market place	1	Order											
			2	Expected arrival & dispatch time											
			3	Quantity											
			4	Reviews											
			5	Customer information (i.e contact detail, shipping address & shipping preferences, etc.)											
			6	Support (i.e discounts, shipping polices, return policies, privacy policies, etc.)											
			7	Shoppe contact info (Fig 5)											
			8	Other?											
			9												
	3. Market Analytics and Reporting	1	Total sell												
		2	Total product												
		3	Inventory Management (i.e Inventory levels, low stock, product stockpiling, etc.)												
		4	Real time order tracking (i.e location, delivery status, etc.)												
		5	Delivery schedule												
		6	Transportation routes												
		7	Inventory management (i.e Shipped products, Shipment to be dispatched, etc.)												
		8	Cost Analysis												
		9	Dashboard / key performance Indicators												
		10	sell forecast												
		11	Other?												
		12													
	4. Document management	1	Invoices												
		2	Shipping manifests												
		3	Certificates of origin (Fig 11)												
		4	Quality assurance report												
		5	License												
		6	L/C												
		7	Other?												
8															



Stakeholders	Data Interest		Is it Relevant? (Yes = ✓ / No = x)	Data should be: A= Public / B= Private	With whom do you want to share your data with?															
	Attribute				All	Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency							
Mark with ✓ to whom																				
A. Only for Beekeepers																				
A. Beekeeper	5. Blog	1. Guide (i.e all about bees and	1	Beekeeping guide																
			2	Trainings																
			3	Best practices																
			4	Our story																
			5	Other Data?																
			6																	
	2. Collaboration	1	Farmers to Farmers																	
		2	Farmers to Other stakeholders																	
		3	Discussion Forums																	
		4	Affiliations																	
		5	Other?																	
6																				



4.2. LOGISTIC -DISTRIBUTORS (S2. BLOCK 2)

Stakeholders	Data Interest		Is it Relevant? (Yes = ✓ / No = x)	Data should be: A = Public / B = Private	With whom do you want to share your data with?																				
	Attribute				All	Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency												
					Mark with ✓ to whom																				
<b>B. Only for Distributors</b>																									
B. Logistic	1. Profile	1. Personal	1	Distributor info (i.e business name, background, mission, values, ethics, service description, etc.) (Fig 3)																					
			2	Contact Info (i.e phone, mail, social network acc, etc.)																					
			3	Location / Map (Fig 12)																					
			4	Other?																					
			5																						
		2. Shop	1	Name & logo (Fig 12)																					
			2	Intro. Content																					
			3	Service Content (Fig 12)																					
			4	Contact Info (Fig 12)																					
			5	Location / Map																					
	1. Market place	1. Market place	1	Order																					
			2	Delivery time																					
			3	Quantity																					
			4	Reviews																					
			5	Transportation route & fee																					
			6	Customer information (i.e contact detail, shipping address & shipping preferences, etc.)																					
			7	Other?																					
			8																						
			2. Marketing	2. Market Analytics and Reporting	1	Real time order tracking (i.e location, route status, honey quality status, etc.)																			
					2	Delivery schedule																			
	3	Transportation routes																							
	4	Inventory management (i.e Shipped products, Shipment to be dispatched, etc.)																							
	5	Vehicle Management & Monitoring																							
	6	Other?																							
	7																								



Stakeholders	Data Interest		Is it Relevant? (Yes = ✓ / No = x)	Data should be: A = Public / B = Private	With whom do you want to share your data with?																	
	Attribute				All	Beekkeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency									
					Mark with ✓ to whom																	
B. Only for Distributors																						
B. Logistic	3. Document management	1	License																			
		2	L/C																			
		3	Bill of Lading																			
		4	Packing List																			
		5	Invoice																			
		6	Shipping manifests																			
		7	Certificates of origin																			
		8	Quality assurance report																			
		9	Other?																			
		10																				
	3. IOT device	1	Temp	(Fig 9)																		
		2	Humidity	(Fig 9)																		
		3	GPS, beacons, Assisted GPS using (sigFox, Wi-Fi, 4G etc.)																			
		4	Vibration	(Fig 9)																		
		5	Luminosity	(Fig 9)																		
		6	Particle Electron Asset Tracker																			
		7	Other?																			
8																						



4.3. WHOLESALERS (S2. BLOCK 3)

Stakeholders	Data Interest		Is it Relevant? (Yes = ✓ / No = x)	Data should be: A= Public / B= Private	With whom do you want to share your data with?										
	Attribute				All	Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency		
C. Only for Wholesalers															
C. Wholesalers	1. Profile	1. Personal	1	Wholesalers Info (i.e name, background, mission, values, ethics, branches, business approach, address, personal description, etc.) (Fig 3)											
			2	Contact Info (i.e phone, mail, social network acc, etc.) (Fig 13)											
			3	Location / Map.) (Fig 13)											
			4	Other?											
			5												
		2. Shop	1	Name & logo.) (Fig 13)											
			2	Intro. Content.)											
			3	Service Content.) (Fig 13)											
			4	Contact Info											
			5	Location / Map.) (Fig 13)											
	6	Schedules.) (Fig 13)													
	7	Legal & Regulatory info (i.e registration, certification, license, permits, etc.)													
	8	Reviews													
	9	Other?													
	10														
	2. Marketing	1. Product Quality and Description	1	Farm											
			2	Bee type											
			3	Honey type											
			4	Origin											
			5	Quality											
6			Quantity												
7			Certification												
8			Packaging												
9			Price												
10			Shipping & Logistic (i.e shipping address, carrier details, tracking number, expected time of arrival, etc.)												
11	Other?														
12															



Stakeholders	Data Interest		Is it Relevant? (Yes = ✓ / No = x)	Data should be: A = Public / B = Private	With whom do you want to share your data with?								
	Attribute				All	Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency
					Mark with ✓ to whom								
C. Only for Wholesalers													
	2. Market place	1	Order										
		2	Delivery time										
		3	Quantity										
		4	Reviews										
		5	Transportation route & fee										
		6	Customer information (i.e contact detail, shipping address & shipping preferences, etc.)										
		7	Other?										
		8											
	3. Market Analytics and Reporting	1	Total sell										
		2	Total product										
		3	Inventory Management (i.e Inventory levels, low stock, product stockpiling, etc.)										
		4	Real time order tracking (i.e location, delivery status, etc.)										
		5	Delivery schedule										
		6	Transportation routes										
		7	Inventory management (i.e Shipped products, Shipment to be dispatched, etc.)										
		8	Other?										
		9											
	4. Document management	1	Invoices										
		2	Shipping manifests										
		3	Certificates of origin										
		4	Quality assurance report										
		5	Certification & Inspection doc										
		6	License										
		7	L/C										
		8	Other?										
		9											





Stakeholders	Data Interest		Is it Relevant? (Yes = ✓ / No = x)	Data should be: A = Public / B = Private	With whom do you want to share your data with?								
	Attribute				All	Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency
D. Only for Retailer													
		4.Document management											
		1	Invoices										
		2	Quality assurance report										
		3	Certification & Inspection doc										
		4	License										
		5	L/C										
		6	Other?										
		7											



4.5. CUSTOMERS (S2. BLOCK 5)

Stakeholders	Data Interest		Is it Relevant? (Yes = ✓ / No = x)	Data should be: A= Public / B= Private	With whom do you want to share your data with?																
	Attribute				All	Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency								
					Mark with ✓ to whom																
<b>E. Only for Customers</b>																					
E. Customer	1. Profile	1. Personal	1	Customer Info																	
			2	Contact Info (i.e phone, mail, social network acc, etc.)																	
			3	Other?																	
			4																		
	2. Marketing	1. Market place	1	Order																	
			2	Quantity																	
			3	Delivery time																	
			4	Transportation route & fee																	
			5	Supplier information (i.e contact detail, shipping address & shipping preferences, etc.)																	
			6	Real time order tracking (i.e location, delivery status, etc.)																	
			7																		
			8	Product authentication																	
			9	Other?																	
			10																		
	2. Document management	1	Purchase history (i.e product, delivery date, etc.)																		
		2	Invoices																		
		3	L/C																		
		4	Other?																		
		5																			



4.6. ALL STAKEHOLDERS (S2. BLOCK 6) INSTRUCTIONS

Please fulfill the cells of the column that correspond to **your stakeholder type** (column 1 to 8), leaving empty the gray cells, and **indicating with ✓** if the data interest (i.e. **A. Beekeeper-1. Profile -1. Personal**) from your **counterpart** is relevant to build trust and do business transactions with the corresponding business partner.

Stakeholders	Data Interest		Business Partners								
	Attribute (For all, except beekeepers)		Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency	
			1	2	3	4	5	6	7	8	
Is this attribute relevant to you for building trust and do business transactions with the BEEKEEPERS?											
A. Beekeeper	1. Profile	1. Personal	Beekeeper Info (i.e name, background, mission, values, ethics, business approach, address, personal description, etc.) Contact Info (i.e phone, mail, social network acc, etc.) Location / Map Other?								
		2. Shop	Name & logo Legal & Regulatory Info (i.e registration, certification, license, permits, etc.) Services Content Schedules other Data?								
	2. IoT devices	1. Device type and characteristics	Temp Gaz Humidity Luminosity Particle Electron Asset Tracker Sound Weight Camera Other?								
	3. Production Management	1. Hive/bees management and Harvest tracking	Hives type, number, etc. Bee type (i.e Apis mellifera, Apis cerna, Apis dorsata, Apis koschevnikovi, Apis florea) Health status of Hives/bees Hive location Types of bee flowers Hive Inspection records Harvest record Harvest Inventory Honey production metrics (i.e volume, quality, etc.) Other?								

Stakeholders	Data Interest		Business Partners								
	Attribute (For all, except beekeepers)		Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency	
			1	2	3	4	5	6	7	8	
Is this attribute relevant to you for building trust and do business transactions with the BEEKEEPERS?											
A. Beekeeper		2.Tools	Honey extractors Filtering equipment Bottling equipment Safety gears (i.e suits, gloves, veils, etc.) suppliers Other?								
	3.Production Management	3.Monitoring	Bee tracking Hive tracking Instruments tracking Hive activity/alert notification Environment monitoring Other?								
		4.Process	Honey production process (i.e harvesting, extraction, packaging etc.) Quality Type Other?								
		5.Planning	Work assignment schedule Inspection Schedule Harvest Schedule Resource acquisition Other?								
4.Marketing	1.Product Quality and Description	Bee type (i.e Apis mellifera, Apis cerna, Apis dorsata, Apis koschevnikovi, Apis florea ) Honey type (i.e processed / raw, Forest, Blossom, creamed, herb, mountain honey,    Acacia, Arbutus, Buckwheat, Chestnut, Lavender honey, etc. Origin Quality Certification (i.e organic Vs fertiliser, pesticides, etc.) Packaging Price Shipping & Logistic (i.e shipping address, carrier details, tracking number, expected time of arrival, etc.)									

Stakeholders	Data Interest		Business Partners							
	Attribute (For all, except beekeepers)		Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency
			1	2	3	4	5	6	7	8
Is this attribute relevant to you for building trust and do business transactions with the BEEKEEPERS?										
A. Beekeeper	4. Marketing		Derivative products (i.e wax, candel, beauty & health (i.e honey bee pollen, lipstics, skin creams, soap, soap, etc.) Other?							
		2. Market place	Order Expected arrival & dispatch time Quantity Reviews Customer information (i.e contact detail, shipping address & shipping preferences, etc.) Support (i.e discounts, shipping polices, return policies, privacy policies, etc.) Shoppe contact info Other?							
		3. Market Analytics and Reporting	Total sell Total product Inventory Management (i.e Inventory levels, low stock, product stockpiling, etc.) Real time order tracking (i.e location, delivery status, etc.) Delivery schedule Transportation routes Inventory management (i.e Shipped products, Shipment to be dispatched, etc.) Cost Analysis Dashboard / key performance Indicators sell forecast Other?							
		4. Document management	Invoices Shipping manifests Certificates of origin Quality assurance report License L/C Other?							

Stakeholders		Data Interest		Business Partners							
		Attribute (For all, except beekeepers)		Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency
				1	2	3	4	5	6	7	8
Is this attribute relevant to you for building trust and do business transactions with the BEEKEEPERS?											
A. Beekeeper	5. Blog	1. Guide (i.e all about bees and honeys)	Beekeeping guide Trainings Best practices Our story Other Data?								
		2. Collaboration	Farmers to Farmers Farmers to Other stakeholders Discussion Forums Affiliations Other?								

Stakeholders	Data Interest		Business Partners							
	Attribute (For all, except distributors)		Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency
			1	2	3	4	5	6	7	8
Is this attribute relevant to you for building trust and do business transactions with the DISTRIBUTORS?										
B. Logistic / Distributors	1.Profile	1. Personal	Distributor info (i.e business name, background, mission, values, ethics, service description, etc.) Contact Info (i.e phone, mail, social network acc, etc.) Location / Map Other?							
		2.Shop	Name & logo Intro. Content Service Content Contact Info Location / Map Schedules Legal & Regulatory info (i.e registration, certification, license, permits, etc.) Reviews Other?							
	2.Marketing	1. Market place	Order Delivery time Quantity Reviews Transportation route & fee Customer information (i.e contact detail, shipping address & shipping preferences, etc.) Other?							
		2. Market Analytics and Reporting	Real time order tracking (i.e location, route status, honey quality status, etc.) Delivery schedule Transportation routes Inventory management (i.e Shipped products, Shipment to be dispatched, etc.) Vehicle Management & Monitoring Other?							

Stakeholders	Data Interest		Business Partners							
	Attribute (For all, except distributors)		Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency
			1	2	3	4	5	6	7	8
Is this attribute relevant to you for building trust and do business transactions with the DISTRIBUTORS?										
B. Logistic	2. Marketing	3. Document management	License L/C Bill of Lading Packing List Invoice Shipping manifests Certificates of origin Quality assurance report Other?							
	3. IOT device		Temp Humidity GPS, beacons, Assisted GPS using (sigFox, Wi-Fi, 4G etc.) Vibration Luminosity Particle Electron Asset Tracker Other?							

Stakeholders	Data Interest		Business Partners							
	Attribute (For all, except wholesalers)		Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency
			1	2	3	4	5	6	7	8
Is this attribute relevant to you for building trust and do business transactions with the WHOLESALERS?										
C. Wholesalers	1.Profile	1.Personal	Wholesalers Info (i.e name, background, mission, values, ethics, branches, business approach, address, personal description, etc.) Contact Info (i.e phone, mail, social network acc, etc.) Location / Map Other?							
		2.Shop	Name & logo Intro. Content Service Content Contact Info Location / Map Schedules Legal & Regulatory info (i.e registration, certification, license, permits, etc.) Reviews Other?							
	2.Marketing	1.Product Quality and Description	Farm Bee type Honey type Origin Quality Quantity Certification Packaging Price Shipping & Logistic (i.e shipping address, carrier details, tracking number, expected time of arrival, etc.) Other?							

Stakeholders	Data Interest		Business Partners								
	Attribute (For all, except wholesalers)		Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency	
			1	2	3	4	5	6	7	8	
Is this attribute relevant to you for building trust and do business transactions with the WHOLESALERS?											
C. Wholesalers	2. Marketing	2. Market place	Order								
		3. Market Analytics and Reporting	Delivery time								
		4. Document management	Quantity								
			Reviews								
			Transportation route & fee								
			Customer information (i.e contact detail, shipping address & shipping preferences, etc.)								
			Other?								
			Total sell								
			Total product								
			Inventory Management (i.e Inventory levels, low stock, product stockpiling, etc.)								
			Real time order tracking (i.e location, delivery status, etc.)								
			Delivery schedule								
			Transportation routes								
			Inventory management (i.e Shipped products, Shipment to be dispatched, etc.)								
			Other?								
			Invoices								
			Shipping manifests								
			Certificates of origin								
			Quality assurance report								
			Certification & Inspection doc								
			License								
			L/C								
			Other?								

Stakeholders	Data Interest		Business Partners							
	Attribute (For all, except retailers)		Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency
			1	2	3	4	5	6	7	8
<b>Is this attribute relevant to you for building trust and do business transactions with the RETAILERS?</b>										
D. Retailer	1.Profile	1. Personal								
		2. Shop								
	2. Marketing	1. Product Quality and Description								
		2. Market place								
		3. Market Analytics and								
			Retailer Info (i.e name, background, mission, values, ethics, branches, business approach, address, personal description, etc.) Contact Info (i.e phone, mail, social network acc, etc.) Location / Map Other?							
			Name & logo Intro. Content Service Content Contact Info Location / Map Schedules Legal & Regulatory info (i.e registration, certification, license, permits, etc.) Reviews Other?							
			Supplier Farm Bee type Honey type Origin Quality Quantity Certification Packaging Price Other?							
			Order Quantity Reviews Return & refund policies Help center Other?							
		Total sell Total product Inventory Management (i.e Inventory levels, low stock, product stockpiling, etc.) Other?								

Stakeholders		Data Interest		Business Partners							
		Attribute (For all, except retailers)		Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency
				1	2	3	4	5	6	7	8
<b>Is this attribute relevant to you for building trust and do business transactions with the RETAILERS?</b>											
D. Retailer	2. Marketing	4. Document management	Invoices Quality assurance report Certification & Inspection doc License L/C Other?								

Stakeholders		Data Interest		Business Partners							
		Attribute		Beekeepers	Distributors	Wholesalers	Retailers	Consumers	Suppliers	Laboratories	Food Standard Agency
				1	2	3	4	5	6	7	8
<b>Is this attribute relevant to you for building trust and do business transactions with the CUSTOMER?</b>											
E. Customer	1. Profile	1. Personal	Customer Info Contact Info (i.e phone, mail, social network acc, etc.) Other?								
	2. Marketing	1. Market place	Order Quantity Delivery time Transportation route & fee Supplier information (i.e contact detail, shipping address & shipping preferences, etc.) Real time order tracking (i.e location, delivery status, etc.)  Product authentication Other?								
		2. Document management		Purchase history (i.e product, delivery date, etc.) Invoices L/C Other?							

## 4.7. ALL STAKEHOLDERS (S2. BLOCK 7) INSTRUCTIONS

Please indicate the type of stakeholder you are.

Beekeeper	Distributor	Wholesaler	Retailer	Consumer	Supplier	Laboratory	Food Standard Agency
1	2	3	4	5	6	7	8

Please indicate the degree to which you agree with each statement related to your perception of usefulness of Blockchain

1) The blockchain **is useful** because improves the level of confidence towards the bee honey that I offer or consume

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

2) The use of blockchain **enhances** the honey' **quality and safety**

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

3) The use of blockchain will **increases** the **productivity**

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

4) The blockchain **is beneficial** for the beekeeping sector in **terms of environmental** friendliness.

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

5) The implementation of blockchain will **decrease** the amount of honey **fraud**

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

6) I think it would **be easy to use** the blockchain in my activities compared to conventional management practises

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

7) I have the **intention to adopt** the Blockchain on my activity.

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree