TECHONEY

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

WP5: NEW OPTIMISED AND SUSTAINABLE BUSINESS MODEL (UTM)

D5.3 Business and Policy Recommendation (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		
	Project acronym	**TECHONEY**		
	EC programme	Grant Agreement	National Founding Prima Sec. 2	
		Programme	Partnership on Research and Innovation in the Mediterranean Area (PRIMA)	
		Section 2	Multitopic 2021	
		Thematic Area 3	Agro-food chain	
		Topic	Increasing the resilience of small-scale farms to global challenges and COVID-like crisis by using adapted technologies, smart agri-food supply chain and crisis management tools	
		Funding scheme	Collaborative Project	
		Type of Action	Research and Innovation Actions (RIA)	
	Coordinator	**Tiziana de Magistris** · Principal Investigator Centro de Investigaciones Técnicas Agrolimentarias (**CITA**) · Zaragoza (Spain)		
	Start date	01.May.2022	Duration	42 months
	Project URL	http://www.techoney.org		
DELIVERABLE	Deliverable	**D 5.3: BUSINESS AND POLICY RECOMMENDATION**		
	Work Package	WP5: NEW OPTIMISED AND SUSTAINABLE BUSINESS MODEL		
	Date of Delivery	25.10.2025		
	Nature	R (Report)	Dissemination Level	PU (Public)
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	Filename	TECHONEY-D5.3.		
	Version	4.)		
	Abstract of the Deliverable	In this deliverable, we present a policy Brief as A Strategic Implementation of Blockchain and Digital Marketplaces in Mediterranean Beekeeping. Through a multidimension approach—including IoT traceability, transformative learning, certified honey quality analysis, and ICT tools—the project addresses key challenges such as honey fraud, limited market access, and digital transformation. Insights from stakeholder engagement reveal varying levels of digital maturity and blockchain acceptance across countries, with common needs for traceability, consumer trust, and cooperative support. The brief outlines **tailored recommendations for each country** and **proposes broader policy actions** and institutional stakeholders, including standardizing blockchain traceability, promoting shared economy models, and revising honey labelling legislation. The document concludes with a call to scale successful pilots, invest in infrastructure and training, and align policy frameworks to foster a resilient and transparent honey value chain in the Mediterranean.		

VERSION TRACKER

VERSION	REVIEWER	PARTNER	DATE	STATUS
0.1	DR. ZEIN KALLAS	CREDA	October 23th	First Draft
0.2	DR. SELENE ORNELAS	CREDA	October 26th	Final Draft
0.3	DR. TIZIANA DE MAGISTRIS	CITA	October 27th	Ready for publication

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TABLE OF CONTENTS

CHARTER **2**

TABLE OF CONTENTS **4**

EXECUTIVE SUMMARY **5**

1. INTRODUCTION AND PROJECT BACKGROUND **5**

2. POLICY RECOMMENDATIONS FOR BLOCKCHAIN ADOPTION IN THE MEDITERRANEAN HONEY SECTOR: A LIVING LAB PERSPECTIVE **6**

3. KEY FINDINGS AND STAKEHOLDER INSIGHTS **6**

3.1. Digital Maturity and Blockchain Acceptance 6
3.2. SWOT Analysis of the Honey Sector in the Mediterranean 7
3.3. Consumer Awareness, Producer Challenges, and the Role of Associations 8

4. COUNTRY-SPECIFIC RECOMMENDATIONS FOR BLOCKCHAIN ADOPTION AND DIGITAL TRANSFORMATION IN THE HONEY SECTOR **8**

5. GENERAL RECOMMENDATIONS FOR ADVANCING BLOCKCHAIN TRACEABILITY AND DIGITAL TRANSFORMATION IN THE HONEY SECTOR **9**

6. POLICY AND REGULATORY IMPLICATIONS FOR BLOCKCHAIN-ENABLED HONEY TRACEABILITY **11**

7. CONCLUSION AND CALL TO ACTION **12**

EXECUTIVE SUMMARY

- TECHONEY is built on four technological pillars: a blockchain + IoT traceability platform, a transformative learning community, certified honey quality characterization, and ICT tools for producers and consumers. These innovations are supported by Living Labs, stakeholder engagement, and sustainability assessments.
- Key findings reveal diverse levels of digital maturity and blockchain acceptance across countries. While Spain and Luxembourg show high digital readiness, Morocco and Algeria lag behind. Consumers across all regions demand authenticity and traceability, while producers struggle with digital literacy, certification, and market access.
- The brief provides tailored recommendations for each country, such as integrating blockchain with existing certifications in Spain, launching cooperative-led e-commerce in Tunisia, and piloting blockchain projects in Moroccan cooperatives. General recommendations for PRIMA and institutional stakeholders include standardizing blockchain traceability, promoting shared economy models, enhancing digital marketplaces, and revising honey labelling legislation.

1. INTRODUCTION AND PROJECT BACKGROUND

The TECHONEY project aims to enhance the positioning of small-scale honey producers in Mediterranean and European markets through a blockchain-based ecosystem. Operating in **Spain, Tunisia, Turkey, Morocco, Algeria, and Luxembourg**, the project integrates **Living Labs**, stakeholder mapping, sustainability assessments, consumer studies, and digital tool development to address honey fraud, market access limitations, and digital transformation challenges.

TECHONEY is structured around four technological pillars:

1. **Blockchain + IoT traceability platform** for transparency and cost reduction.
2. **Transformative learning community** for resilient supply chains.
3. **Honey quality characterization** via certified labs.
4. **ICT tools** for producers and consumers.

The project also promotes **direct sales**, **resilience protocols**, and **shared economy models** to empower smallholders and ensure fair profit distribution.

2. POLICY RECOMMENDATIONS FOR BLOCKCHAIN ADOPTION IN THE MEDITERRANEAN HONEY SECTOR: A LIVING LAB PERSPECTIVE

The participatory process conducted through the TECHONEY Living Labs across Spain, Tunisia, Turkey, Morocco, Luxembourg, and Algeria revealed a rich tapestry of stakeholder insights, concerns, and aspirations regarding the adoption of blockchain technology in the honey value chain. Based on the synthesis of focus group discussions and survey results, the following policy recommendations are proposed to support inclusive, effective, and sustainable digital transformation.

3. KEY FINDINGS AND STAKEHOLDER INSIGHTS

3.1. DIGITAL MATURITY AND BLOCKCHAIN ACCEPTANCE

The Techhoney Project reveals significant **disparities in digital maturity** and blockchain acceptance across Mediterranean and European countries, highlighting the urgent need for inclusive digital transformation strategies in the honey value chain. Small-scale beekeepers and rural actors, particularly in Morocco and Algeria, often lack foundational digital skills, which poses a barrier to adopting blockchain-based traceability systems.

To address this, national and regional authorities should invest in tailored digital literacy and capacity-building programs, co-designed with local stakeholders to reflect the specific needs of beekeepers, retailers, hospitality professionals, and consumers. Countries like Tunisia and Spain have expressed strong interest in centralized systems for tracking honey origin and quality, drawing inspiration from France's honey cartography.

It is recommended to develop interoperable national digital traceability platforms that integrate blockchain technology with laboratory certifications and consumer feedback, ensuring accessibility across the supply chain. Blockchain is widely recognized as a powerful tool to combat honey fraud and enhance transparency, and its formal integration into national food fraud prevention frameworks—including customs inspections, quality control protocols, and regulatory enforcement—is strongly advised.

Country-specific insights further enrich this analysis: Spain demonstrates high digital maturity and moderate blockchain acceptance, with a strong environmental focus; Tunisia shows medium digital maturity but high interest in blockchain, prioritizing

economic sustainability; Turkey presents medium maturity and moderate blockchain interest, with potential in mobile beekeeping; Morocco, despite low digital maturity, exhibits growing awareness of blockchain and high concern over fraud; Algeria shows limited participation but has sectoral surveys that can inform future interventions; and Luxembourg, with high digital maturity and institutional support, maintains moderate blockchain interest. These findings underscore the importance of context-sensitive approaches to digital innovation in the honey sector, ensuring that technological advancements contribute to sustainability, transparency, and equity.

3.2. SWOT Analysis of the Honey Sector in the Mediterranean

The honey sector across Mediterranean and European regions presents a rich tapestry of strengths, challenges, and emerging opportunities shaped by both ecological and technological factors. Among its key strengths are the region's rich and diverse flora, which supports high-quality honey production and contributes vital ecosystem services such as pollination and biodiversity conservation.

Consumer trust in locally produced honey remains strong, bolstered by the presence of established beekeeping associations that serve as anchors for community engagement and sectoral coordination. However, the sector faces notable weaknesses, including low digital literacy among producers, particularly in rural areas, and a fragmented industry structure that hinders collaboration and scalability.

The lack of robust traceability systems and high input costs further constrain competitiveness and transparency. Despite these challenges, the sector is ripe with opportunities. Blockchain technology offers a promising solution for fraud prevention and traceability, while digital marketplaces and consumer education initiatives can enhance market access and informed purchasing decisions.

These innovations can empower producers and build consumer confidence in honey authenticity and quality. Nevertheless, the sector must navigate serious threats, including the escalating impacts of climate change, the spread of invasive species such as Varroa destructor and the Asiatic hornet, and the persistent issue of honey adulteration. Addressing these threats requires coordinated policy responses, investment in research and innovation, and the integration of digital tools to safeguard the integrity and sustainability of honey production.

3.3. Consumer Awareness, Producer Challenges, and the Role of Associations

The Techhoney Project highlights a critical disconnect between consumer expectations and their ability to access reliable information about honey origin and authenticity. While consumers across participating countries expressed strong support for traceability and demanded transparency regarding origin, health benefits, and authenticity, many lacked awareness of how to access such information. To bridge this gap, it is recommended that governments, consumer organizations, and industry stakeholders launch targeted awareness campaigns focused on honey fraud, the benefits of blockchain technology, and the use of traceability apps. These campaigns should leverage digital media, retail channels, and educational institutions to reach diverse audiences effectively. On the production side, beekeepers and honey producers face persistent challenges in adopting digital tools, obtaining quality certifications, and accessing broader markets. These barriers are particularly pronounced in rural and low-digital-maturity regions, where technical support and infrastructure are limited. In this context, associations and cooperatives emerge as key enablers of sectoral transformation. Their role in providing training, facilitating traceability implementation, and advocating for supportive policies is essential to ensure inclusive and sustainable digitalization of the honey value chain. Strengthening these organizations and integrating them into national strategies will be vital for scaling blockchain adoption and improving consumer trust.

4. COUNTRY-SPECIFIC RECOMMENDATIONS FOR BLOCKCHAIN ADOPTION AND DIGITAL TRANSFORMATION IN THE HONEY SECTOR

The TechHoney Project underscores the importance of tailoring digital and blockchain strategies to the unique contexts of each participating country, recognizing their varying levels of digital maturity, institutional capacity, and sectoral priorities.

In Spain, where digital maturity is high and environmental concerns are central, it is recommended to integrate blockchain technology with existing Protected Designation of Origin (PDO) and organic certification schemes. Promoting traceability in direct sales and cooperative networks, alongside targeted digital training for small retailers, will enhance transparency and consumer trust.

In Tunisia, with growing interest in blockchain and a focus on economic sustainability, investments in ICT infrastructure and mobile applications are essential.

Public subsidies and training programs should support blockchain adoption, while cooperative-led e-commerce platforms can expand market access.

Turkey presents unique opportunities through its mobile beekeeping practices, which can be leveraged for real-time data collection via IoT technologies. Strengthening cooperative governance and digital literacy, and promoting blockchain traceability in high-value honeys such as chestnut and pine, will drive sectoral innovation.

In Morocco, where fraud awareness is high but digital maturity remains low, awareness campaigns on honey fraud and blockchain benefits are crucial. Pilot blockchain projects within cooperatives and improved data collection and stakeholder engagement will lay the groundwork for broader adoption.

Algeria can build on existing sectoral surveys by integrating blockchain into data systems, establishing Living Labs and participatory platforms to foster innovation, and offering incentives for digital tool adoption.

Finally, Luxembourg, with strong institutional support and high digital maturity, is well-positioned to scale up blockchain pilot initiatives. Facilitating cross-border traceability systems and promoting consumer education on digital labels will reinforce its leadership in honey sector transparency and sustainability. These country-specific pathways reflect a shared commitment to enhancing authenticity, traceability, and resilience in the honey value chain through inclusive and context-sensitive digital transformation.

5. GENERAL RECOMMENDATIONS FOR ADVANCING BLOCKCHAIN TRACEABILITY AND DIGITAL TRANSFORMATION IN THE HONEY SECTOR

Building on country-specific insights and sectoral analysis, the TechHoney Project proposes a set of general recommendations to guide EU-MED policy and investment strategies in the honey value chain. These recommendations aim to harmonize efforts across regions while respecting local contexts and avoiding duplication of initiatives already addressed at the national level.

Standardize Blockchain Traceability Across Borders: To ensure interoperability and scalability, it is recommended to develop EU-MED guidelines for blockchain traceability aligned with Horizon Europe and H2020 best practices. These standards should integrate existing certification schemes (e.g., PDO, organic) and be compatible

with national food safety systems. This will facilitate cross-border traceability, especially for countries like Luxembourg and Spain, which are well-positioned to lead institutional efforts.

Support Shared Economy Models for Sectoral Efficiency: To reduce input costs and improve access to resources, funding should be directed toward platforms that enable equipment sharing, cooperative logistics, and joint marketing. These models are particularly relevant for fragmented sectors such as those in Algeria and Morocco, where cooperatives can play a central role in pooling resources and enhancing competitiveness.

Promote Inclusive Digital Marketplaces: Scaling the TECHONEY e-commerce platform with multilingual support and mobile integration will expand market access for small producers, especially in Tunisia and Turkey. These platforms should be designed to accommodate cooperative-led initiatives and integrate traceability features that reflect consumer demand for authenticity and origin transparency.

Enhance Consumer Trust Through Hybrid Certification Schemes: To address the gap between consumer expectations and access to reliable information, hybrid certification schemes combining blockchain verification with traditional labels (PDO, organic) should be introduced. These schemes will reinforce consumer confidence and support awareness campaigns on honey fraud and digital traceability, particularly in countries like Morocco and Spain.

Invest in Capacity Building and Digital Literacy: Digital transformation must be inclusive. Training capsules and digital literacy programs should be launched for beekeepers, retailers, and cooperative members, with content adapted to varying levels of digital maturity. This is especially critical in low-maturity regions such as Algeria and Morocco, and complements existing efforts in Tunisia and Turkey.

Foster Cross-Country Collaboration and Innovation: To accelerate innovation and knowledge exchange, regional hubs for blockchain traceability in agri-food should be established. These hubs can host Living Labs, pilot projects, and participatory platforms that bring together stakeholders from academia, industry, and civil society. They will serve as incubators for scalable solutions and policy harmonization across the EU-MED region.

6. POLICY AND REGULATORY IMPLICATIONS FOR BLOCKCHAIN-ENABLED HONEY TRACEABILITY

The TechHoney Project reveals a pressing need for policy innovation to address widespread concerns about honey fraud, particularly the misrepresentation of imported products as local. This issue undermines consumer trust and threatens the integrity of regional honey markets. To combat this, it is recommended that honey labeling legislation—such as the EU Honey Directive 2001/110/EC—be revised to mandate precise origin disclosure and incorporate blockchain-based traceability codes (e.g., QR codes). These digital labels should comply with existing marketing laws and provide consumers with verifiable information on product origin, quality, and certification status, reinforcing hybrid certification schemes already proposed.

Regulatory bodies must also be equipped with blockchain-enabled monitoring tools to strengthen food fraud enforcement. This includes integrating blockchain into customs inspections, quality control protocols, and regulatory audits, as previously recommended for national frameworks. To ensure these systems are legally sound and ethically managed, blockchain platforms must align with GDPR and national data protection laws, supporting robust data governance frameworks that protect both producers and consumers.

Cost remains a significant barrier to blockchain adoption, especially for small-scale producers and cooperatives in low-maturity regions. To address this, public institutions should offer financial support through targeted subsidies, tax incentives, and grants. These should cover expenses related to smart hive devices, blockchain subscriptions, and digital infrastructure, with priority given to marginalized groups and cooperative networks that serve as key enablers of digital transformation.

Finally, enabling public-private partnerships is essential to scale innovation and ensure sustainability. Governments should actively foster collaboration between technology developers, cooperatives, academic institutions, and civil society organizations. These partnerships can accelerate the deployment of traceability platforms, support training initiatives, and facilitate the creation of regional hubs for blockchain innovation—ensuring that policy frameworks evolve in tandem with technological advancements and sectoral needs.

7. CONCLUSION AND CALL TO ACTION

The TechHoney Project has demonstrated the transformative potential of blockchain and digital tools in enhancing transparency, sustainability, and competitiveness within the Mediterranean honey sector. From addressing honey fraud and fragmented traceability systems to empowering small-scale producers and fostering consumer trust, the project has laid a robust foundation for sector-wide innovation.

Now is the time for institutional stakeholders—at national, regional, and EU-MED levels—to act decisively. Scaling successful pilot initiatives across borders, investing in digital infrastructure and tailored training, and aligning policy frameworks with emerging technologies are no longer optional—they are strategic imperatives. Special attention must be given to inclusive platforms that empower cooperatives, marginalized producers, and rural actors, ensuring that digital transformation does not deepen existing inequalities.

PRIMA and national institutions are urged to integrate these recommendations into future calls, funding schemes, and strategic plans. This includes revising honey labeling legislation to incorporate blockchain traceability, supporting public-private partnerships, and establishing regional hubs for innovation. By doing so, policymakers will not only safeguard the integrity of the honey value chain but also position the Mediterranean as a global leader in agri-food transparency and resilience.

The path forward is clear. With coordinated action, targeted investment, and inclusive governance, the Mediterranean honey sector can become a model of digital sustainability—where tradition meets innovation, and trust is built through transparency.