

Adoption of Blockchain Technology for Traceability of PGI Lika Potatoes: A Qualitative Study of Stakeholder Perceptions

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Abstract

This study explores the readiness, perceptions, and challenges of stakeholders involved in the supply chain of PGI Lika potatoes in adopting blockchain technology. Three qualitative interviews were conducted with a producer, a certification body, and a producer association. The results show that stakeholders recognize the high potential of blockchain for enhancing traceability, trust, and product authenticity. Key barriers include limited digital literacy among producers, insufficient technical support, and inconsistent infrastructure. The study emphasizes the need for targeted education, institutional support, and regulatory alignment to facilitate adoption.

Keywords: blockchain, traceability, PGI Lika potatoes, food fraud prevention, Industry 4.0

Introduction

In recent years, blockchain has emerged as a transformative Industry 4.0 technology capable of improving transparency, accountability, and traceability across agri-food supply chains (Treiblmaier, 2018; Casino et al., 2019). This decentralized ledger system allows for secure, tamper-resistant recording of transactions that can significantly enhance data integrity and food safety compliance (Zhang et al., 2020). In the context of PGI-labelled products like Lika potatoes, ensuring product origin and authenticity is critical not only for regulatory compliance but also for maintaining consumer trust and market value. Blockchain, along with other digital tools such as the Internet of Things (IoT), Artificial Intelligence (AI), and Enterprise Resource Planning (ERP) systems, provides the infrastructure needed to track every stage of the production and distribution process in real time. Against this backdrop, the present study—conducted within the Horizon ALLIANCE project—aims to understand how stakeholders perceive and approach the adoption of blockchain in the PGI Lika potatoes supply chain.

Methods

A qualitative approach was used, based on semi-structured interviews with three stakeholders in the Lika potato supply chain: one producer (SME), one representative of a producer association, and one certification body. The interview guide followed a structured thematic framework covering awareness of 4.0 technologies, perceived usefulness of blockchain, adoption challenges, social influence, institutional support, and intention to adopt. The data were analysed using thematic analysis to identify common patterns and specific concerns.

Results

The results of the qualitative interviews highlight three key areas related to blockchain adoption for PGI Lika potatoes: perceived benefits, barriers to adoption, and contextual influences such as consumer awareness and regulatory expectations.

1. Perceived benefits and value of blockchain technology

The findings from the Lika PGI potato supply chain align closely with global research highlighting blockchain's potential in agri-food systems. Similar to studies by Galvez et al. (2018) and Tian (2016), stakeholders in this case see blockchain as a valuable tool for enhancing traceability, reducing fraud, and increasing trust. The producer emphasized: "*Blockchain is the future of any product... It helps us track production from field to warehouse, and later through the lot number.*" positions.

The certification body highlighted the ability of blockchain to provide timely and accurate data across the supply chain: "*It increases data availability in real time,*" they noted. However, they also raised concerns about technical feasibility, adding that "*incorrect data entry or failure to enter data due to poor internet connection may raise red flags for fraud.*" This demonstrates that while blockchain offers technological advantages, its effectiveness depends heavily on supporting systems and digital infrastructure.

According to the producer association, blockchain has a social governance function: "*Blockchain ensures greater order among producers, as all actors can see and control each other's data entries,*" indicating the importance of transparency and mutual accountability within producer groups.

2. Barriers to adoption of blockchain technology

Despite the positive outlook, all interviewees identified several critical barriers. A recurring theme is the low digital literacy among older producers. The producer association noted: *"Producers are mostly over 60 years old and maintain paper-based records. It would be very difficult for them to independently adopt blockchain technology."* The producer added that administrative burdens are already significant and proposed a practical solution: *"Producer groups or cooperatives should manage the digital data input for smaller producers."* This suggests that while the technology may be effective, its usability and long-term success depend on organizational adaptations and support structures. All three agreed that without external assistance—especially in technical and administrative domains—broad adoption remains unlikely. These challenges—aging producers, digital illiteracy, and high administrative load—are in line with findings across traditional EU farming regions. In Greece, for example, older farmers resisted digital tools unless supported by intermediaries like cooperatives (Manikas et al., 2022).

3. Consumer understanding and demand

Participants agreed that consumer knowledge of blockchain is currently low. The producer stated: *"Consumers still don't know what blockchain is, but once informed, they will likely appreciate its benefits."* Similarly, the certification body emphasized that consumer trust and willingness to pay a premium would likely increase with greater transparency: *"Greater transparency would increase trust among consumers and strengthen the product's market value."* According to surveys by PwC and IBM, most consumers are not familiar with blockchain, but express stronger trust and willingness to pay more when products are linked to transparent traceability systems.

4. Need for education and coordinated support

All three stakeholders stressed the need for targeted education and coordinated support mechanisms. The producer summarized this aspiration clearly: *"We would like to reach the point of adopting blockchain; it would provide added protection and reinforce the authenticity of PGI Lika potatoes."*

The collective perspective suggests that blockchain should not be introduced as a standalone solution, but as part of a broader strategy that includes institutional collaboration, consumer education, and organizational reform within the supply chain.

Conclusion

In summary, this study reveals a strong and genuine interest among stakeholders in adopting blockchain technology to enhance the traceability of PGI Lika potatoes. While the benefits are clearly acknowledged—ranging from increased transparency, streamlined data management, reduced administrative burden, to greater consumer trust—the road to implementation is met with substantial practical and structural challenges. The low level of digital literacy, particularly among older producers, and the absence of integrated digital systems, highlight the importance of designing adoption strategies that are inclusive, pragmatic, and tailored to local needs.

Blockchain adoption in agri-food systems should not be framed solely as a technological challenge, but also as a socio-organizational transformation. Stakeholders pointed out that cooperatives or producer groups can and should play a central role in supporting the transition by assuming responsibility for data entry and management, thereby relieving producers of complex tasks. Furthermore, certification bodies and regulatory institutions should act as enablers of change by offering targeted support and clear guidelines for blockchain integration into existing traceability systems.

Strategically, blockchain offers a unique opportunity for PGI products to strengthen their identity and defend against market misrepresentation. Its adoption should be perceived as an investment in the long-term credibility, quality assurance, and international competitiveness of regional agri-food products.

Based on these findings, the following recommendations are proposed:

- Develop hands-on training programs tailored to different user profiles, especially older or less digitally experienced producers.
- Establish regional digital support centers, possibly integrated into producer associations or cooperatives.
- Facilitate public awareness campaigns targeting consumers to raise understanding of the value of blockchain in food traceability.
- Ensure regulatory alignment and promote national and EU-level incentives for blockchain adoption.
- Support pilot projects and demonstrations to build trust and showcase practical benefits of the technology.
- Foster cross-sector collaboration between technology providers, academia, and producers to co-develop sector-specific blockchain solutions.

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