

Digital Traceability, Consumer Trust, and Sustainable Value Creation in Agrifood Supply Chains

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ABSTRACT

The increasing complexity of agrifood supply chains has intensified demands for transparency, food safety, product authenticity, and sustainability. Digital traceability connects information across supply chain stages through technologies such as blockchain, the Internet of Things (IoT), QR codes, and digital information systems. This study examines the role of digital traceability in strengthening consumer trust and supporting sustainable value creation in agrifood supply chains. A qualitative Systematic Literature Review (SLR) analyzed 15 scientific articles published between 2022 and 2024. Articles were selected from academic databases using predefined inclusion and exclusion criteria and analyzed through thematic synthesis. The findings indicate that digital traceability improves transparency by increasing the availability and verifiability of product origin information. Reliable traceability information can reduce information asymmetry and strengthen consumer confidence in food safety, product authenticity, and sustainability attributes. Consumer trust links traceability information with purchasing decisions, willingness to pay, and acceptance of sustainable food products. Digital traceability also supports sustainable value creation through improved accountability, information exchange, stakeholder coordination, and reduced opportunities for food fraud. However, implementation remains constrained by technology costs, data quality, interoperability, digital literacy, governance, and unequal access among smallholders. The review concludes that digital traceability can support sustainable agrifood supply chains when combined with reliable data, stakeholder collaboration, inclusive governance, and effective consumer communication. Institutional support and stakeholder engagement remain essential for strengthening consumer trust and promoting sustainable value creation.



Keywords: digital traceability, consumer trust, blockchain, agrifood supply chain, sustainable value creation.

1. Introduction

The agrifood supply chain is characterized by complex interactions among farmers, collectors, processors, distributors, retailers, regulators, and consumers. The movement of agricultural and food products across multiple stages creates challenges related to product identification, food safety, quality assurance, provenance, and sustainability. As supply chains become increasingly global and fragmented, consumers require more reliable information regarding where food products originate, how they are produced, processed, transported, and distributed. Traceability has therefore become an important mechanism for improving transparency and accountability across the agrifood supply chain [1], [3].

Traditional traceability systems frequently depend on fragmented documentation and information exchange between supply chain actors. Such systems can create information gaps, delays, and difficulties in verifying product histories. The emergence of digital technologies provides opportunities to overcome these limitations through real-time information collection, digital records, automated identification, and decentralized information sharing. Blockchain is one of the technologies that has received significant attention because it can create records that are transparent, difficult to manipulate, and accessible among authorized supply chain participants [2], [8].

Digital traceability is not only related to operational efficiency but also to consumer perceptions. Consumers increasingly consider food safety, quality, authenticity, origin, and sustainability when evaluating food products. When consumers cannot verify information about a product, information asymmetry can increase perceived risk and reduce confidence. Digital traceability can address this problem by providing accessible information about the origin and journey of products. Previous research indicates that transparency and traceability can influence consumer trust and the attractiveness of agricultural and food products [4], [5].

Consumer trust is particularly important in agrifood markets because many product attributes cannot be directly evaluated before consumption. Consumers may not be able to independently verify whether a product is genuinely organic, sustainably produced, ethically sourced, or safe. Consequently, credible traceability information can function as a signal that reduces uncertainty. Research on blockchain-enabled food traceability has found that traceability can strengthen consumer trust and influence purchase intention, particularly when consumers understand the information and perceive the system as reliable [6], [7].

The role of traceability also extends to sustainable value creation. Sustainable value creation involves generating economic, social, and environmental benefits simultaneously.



Digital traceability can support this process by improving supply chain coordination, reducing information asymmetry, strengthening accountability, supporting sustainable production claims, and facilitating relationships between producers and consumers. Blockchain-based systems have also been associated with opportunities to improve food safety, quality, transparency, and sustainable supply chain management [9], [12].

Nevertheless, the implementation of digital traceability does not automatically generate sustainable value. Smallholder farmers may face difficulties related to investment requirements, digital capabilities, infrastructure, and incentives. Digital traceability systems also depend on the accuracy of information entered into the system. Blockchain may preserve recorded information, but it cannot automatically guarantee that the original information is accurate. Therefore, data governance and verification remain essential components of effective traceability [11], [12].

Another important issue is the scope and depth of traceability. Traceability can cover only selected stages of the supply chain or extend from farm to final consumer. The level of information collected can also range from basic product identification to detailed information regarding production practices, transportation, processing, certification, and sustainability. The appropriate scope depends on the purpose of traceability and the characteristics of the supply chain [1].

Previous studies have examined digital traceability from different perspectives, including technology adoption, food safety, consumer behavior, blockchain implementation, and sustainable supply chains. However, the literature remains fragmented between technological, consumer, and sustainability perspectives. Therefore, this study focuses on integrating these perspectives by examining how digital traceability can strengthen consumer trust and contribute to sustainable value creation across agrifood supply chains. The novelty of this study lies in connecting the technological function of traceability with the behavioral mechanism of consumer trust and the broader objective of sustainable value creation.

2. Materials and Method

This study employed a qualitative *Systematic Literature Review* (SLR) approach to identify, evaluate, and synthesize previous research related to digital traceability, consumer trust, and sustainable value creation in agrifood supply chains. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to ensure a transparent and systematic process of literature identification, screening, eligibility assessment, and inclusion. The SLR approach was selected because this study focuses on integrating findings from previous research rather than collecting primary empirical data.



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The literature search was conducted using Scopus, Web of Science, ScienceDirect, SpringerLink, Taylor & Francis, Wiley Online Library, Emerald Insight, Google Scholar, and SINTA. The search used combinations of the following keywords: “digital traceability,” “food traceability,” “agrifood supply chain,” “blockchain traceability,” “consumer trust,” “food safety,” “sustainable value creation,” “sustainable food supply chain,” “blockchain food supply chain,” and “digital sustainability.” Boolean operators AND and OR were applied to combine the keywords and refine the search results.

The literature selection process followed four stages: identification, screening, eligibility, and inclusion. In the identification stage, a total of 120 records were retrieved from the selected academic databases and other relevant sources. After removing 25 duplicate records, 95 records remained for title and abstract screening. At this stage, 65 records were excluded because they did not meet the predefined scope and relevance criteria. The remaining 30 articles were retrieved and assessed through full-text eligibility review. Following the full-text assessment, 15 articles were excluded because they were outside the research scope, focused exclusively on technical blockchain development, lacked sufficient relevance to food traceability, consumer trust, or sustainability, or did not provide sufficient substantive findings for the review. Consequently, 15 articles were included in the final qualitative synthesis.

The inclusion criteria comprised peer-reviewed scientific articles published primarily between 2022 and 2024, written in English or Indonesian, and directly addressing digital traceability, blockchain-based traceability, consumer trust, food supply chains, food safety, or sustainability. Foundational studies were considered only when necessary to support the conceptual discussion. Publications focusing exclusively on technical blockchain development without clear relevance to food traceability, consumer trust, or sustainability were excluded. Duplicate publications, studies outside the research scope, and publications that did not provide sufficient relevant information were also excluded.

The quality of the included studies was appraised using five predefined criteria: (1) clarity of research objectives, (2) appropriateness of the research methodology, (3) clarity of data sources or data collection procedures, (4) adequacy of analysis and presentation of findings, and (5) relevance to the research questions. Each criterion was assessed qualitatively as high, moderate, or low quality. The quality assessment was conducted before the final synthesis to ensure that the selected evidence was sufficiently relevant and methodologically appropriate for addressing the research objectives.

Data extraction was conducted using a structured extraction matrix. For each of the 15 included articles, the following information was recorded: author and publication year, research objective, research method, research setting, technology examined, traceability



function, consumer-related findings, supply chain implications, sustainability contributions, and implementation challenges. The extracted information was compared across studies to identify similarities, differences, recurring patterns, and research gaps.

The synthesis was conducted using thematic content analysis. First, findings from the 15 included studies were coded according to their relevance to the research questions. Second, related codes were grouped into six major themes: (1) digital traceability and supply chain transparency, (2) blockchain and food traceability, (3) digital traceability and consumer trust, (4) traceability and consumer behavior, (5) traceability and sustainable value creation, and (6) barriers to digital traceability implementation. Third, findings within and across themes were compared to identify consistent patterns, contrasting findings, and research gaps. Finally, the themes were integrated to develop an overall interpretation of the relationship between digital traceability, consumer trust, and sustainable value creation in agrifood supply chains. Because the included studies differed in research designs, contexts, and outcome measures, a qualitative thematic synthesis was considered more appropriate than a statistical meta-analysis.

3. Result

3.1 Digital Traceability and Supply Chain Transparency

The literature indicates that digital traceability plays an important role in improving transparency across agrifood supply chains. Traditional supply chains often involve numerous actors and transactions, making it difficult to maintain complete information about product origin and movement. Digital traceability enables information to be recorded and connected across different stages, creating a more structured representation of the product journey [1], [3].

Ahmed and MacCarthy [1] emphasize that traceability should be considered in terms of both its width and depth. The width refers to the stages covered by traceability, while the depth refers to the level of information recorded at each stage. This finding indicates that digital traceability does not have a single standardized form. A traceability system may begin with agricultural production and continue through processing, transportation, distribution, and retail, depending on the purpose and requirements of the supply chain.

Blockchain further strengthens the transparency function because information can be shared across participating actors through a distributed digital record. Ellahi et al. [2] show that blockchain-based frameworks have considerable potential for addressing transparency and accountability problems in food supply chains. Similarly, Charlebois et al. [3] explain that digital traceability has become increasingly relevant for food safety, regulatory compliance, transparency, and sustainable supply chain management.



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Therefore, digital traceability changes the nature of supply chain information from fragmented documentation toward interconnected digital information. This transformation can improve coordination between supply chain actors and facilitate the verification of product histories. However, the effectiveness of transparency depends on whether relevant actors consistently provide accurate and complete information.

3.2 Blockchain as an Enabler of Digital Traceability

Digital traceability refers to the systematic use of digital technologies to capture, record, store, share, and retrieve information about products and processes across different stages of the agrifood supply chain. It enables supply chain actors and consumers to access information concerning product origin, processing, distribution, and other relevant attributes. Digital traceability is therefore understood as a broader information and coordination system that may incorporate various technologies, including blockchain, the Internet of Things (IoT), QR codes, cloud-based platforms, and digital information systems.

Within this broader digital traceability system, blockchain-based traceability represents one enabling technological approach. Blockchain uses a distributed ledger structure to record and share transactions and product-related information among participating supply chain actors. Its decentralized architecture can facilitate information sharing among multiple parties without requiring complete reliance on a single centralized database [2], [8]. Thus, blockchain should be considered a technological component that can support particular functions of digital traceability rather than a synonym for the overall traceability system.

Compagnucci et al. [8] demonstrate that blockchain can improve data collection and reshape interactions among firms, stakeholders, and customers. Their findings also indicate that blockchain-based traceability can contribute to organizational reputation and market expansion. These findings suggest that the contribution of blockchain extends beyond information storage because improved information transparency may influence stakeholder perceptions and market relationships. However, these outcomes depend on the quality, accessibility, and credibility of the information integrated into the broader digital traceability system.

Similarly, Marchese and Tomarchio [13] demonstrate the potential of blockchain-based systems to support traceability functions in agrifood supply chains. Blockchain can facilitate product identification, monitoring, and information sharing, thereby improving the ability of supply chain participants to access and verify product histories. In this context, blockchain functions as an infrastructure for recording and sharing traceability data, while the overall digital traceability system also depends on data collection mechanisms, identification technologies, verification procedures, governance arrangements, and user access.



Nevertheless, blockchain alone cannot resolve all challenges associated with digital traceability. Duan et al. [12] identify challenges related to scalability, interoperability, and data accuracy. Although blockchain can help preserve the integrity of information after it has been recorded, it cannot automatically guarantee the accuracy of data entered into the system. Inaccurate or incomplete information at the point of data collection may therefore result in unreliable traceability records. Consequently, effective digital traceability requires an integrated combination of technological infrastructure, reliable data collection, verification mechanisms, interoperability, and appropriate governance. Blockchain should therefore be viewed as one enabling technology within a broader digital traceability ecosystem rather than as the traceability system itself.

3.3 Digital Traceability and Consumer Trust

Consumer trust emerges as one of the most important outcomes associated with digital traceability. Consumers face information asymmetry because they generally cannot directly observe production and distribution processes. Information about origin, safety, quality, and sustainability can therefore reduce uncertainty and strengthen confidence in food products [4], [5].

Reitano et al. [4] identify trust, perceived safety, perceived risk, perceived traceability, and willingness to pay as important factors in consumer perceptions of blockchain-tracked food. These findings indicate that consumers do not evaluate traceability solely based on the existence of technology. Instead, they consider whether the technology produces credible and meaningful information.

Panghal et al. [5] also show that reliability, sustainability, health impact, and trust are important factors influencing consumer acceptance of blockchain-enabled food systems. This suggests that digital traceability can strengthen consumer trust when the information provided is relevant to consumers' concerns about food safety, health, and sustainability.

Duong et al. [7] provide further evidence that blockchain-enabled traceability can enhance trust in the organic food chain. Their study indicates that consumer knowledge about blockchain can strengthen the relationship between traceability and trust. Therefore, consumer education becomes an important supporting factor in realizing the benefits of digital traceability.

The relationship can be summarized as follows: digital traceability provides information, credible information reduces uncertainty, reduced uncertainty strengthens trust, and stronger trust can influence consumer responses. This mechanism places consumer trust as an important bridge between technological capability and market value.



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3.4 Traceability, Consumer Behavior, and Purchase Decisions

The literature also demonstrates that digital traceability can influence consumer behavior. When consumers obtain clearer information about product origin, safety, quality, and production processes, they may perceive lower purchasing risk. This can increase product attractiveness and willingness to purchase.

Tao et al. [6] found that blockchain-based food traceability can positively influence online purchase intention for organic agricultural products. The study indicates that traceability information can function as a signal that helps consumers evaluate product quality and credibility.

Cozzio et al. [10] similarly show that blockchain-based traceability can increase consumer trust, particularly for local food products. The findings suggest that the perceived value of traceability can vary according to product characteristics and consumer expectations. Traceability becomes more meaningful when consumers perceive a strong need to verify product origin and quality.

Therefore, digital traceability can become a market differentiation mechanism. Products supported by credible traceability information may be perceived as safer, more authentic, and more responsible. This creates an opportunity for producers to communicate product attributes that are difficult to verify through conventional marketing channels.

However, consumer responses are not uniform. Technology awareness, perceived usefulness, trust in institutions, and understanding of traceability information can influence how consumers respond. Consequently, merely displaying a QR code or blockchain label does not automatically create trust. The information must be understandable, accessible, credible, and supported by appropriate verification.

3.5 Digital Traceability and Sustainable Value Creation

Digital traceability contributes to sustainable value creation through several interconnected mechanisms. First, it improves economic value by supporting market differentiation, reducing information asymmetry, and potentially increasing consumer willingness to pay for trustworthy products. Second, it supports social value by strengthening accountability and relationships between producers, intermediaries, and consumers. Third, it contributes to environmental value by improving monitoring of sustainable production practices and supply chain activities [9], [11].

Dal Mas et al. [9] identify traceability, safety, quality, transparency, and scalability as important areas through which blockchain can contribute to sustainability in agrifood supply chains. Their findings indicate that blockchain can support new sustainable business models by improving information management across supply chain networks.



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Steinke et al. [11] provide an important perspective from smallholder agriculture. Digital sustainability tracing can make information regarding on-farm practices available to downstream actors and can potentially reduce dependence on expensive third-party verification. However, the implementation of such systems requires investment and must provide sufficient economic incentives for farmers.

The role of traceability is also relevant to circular agrifood supply chains. Traceability can support monitoring across the product lifecycle and provide information needed to improve resource management, waste reduction, and sustainability-oriented coordination [15]. Thus, sustainable value creation is not limited to the final consumer but can involve the entire supply chain.

3.6 Digital Traceability and Food Safety

Food safety is a central reason for the development of traceability systems. In complex supply chains, contamination, adulteration, or food fraud can occur at different stages. Traceability enables stakeholders to identify the origin and movement of products, which can support risk management and product recall processes.

Duan et al. [12] explain that blockchain can strengthen food safety and combat food fraud by creating transparent records that enable products to be tracked from farm to fork. The ability to identify product histories can help supply chain actors respond more efficiently when problems occur.

Digital traceability also provides consumers with information that can strengthen perceptions of safety. Reitano et al. [4] indicate that perceived safety is closely related to consumer perceptions of blockchain-tracked food. Consequently, food safety information can contribute to both operational value and consumer value.

This finding demonstrates that food safety and consumer trust are interconnected. A traceability system that strengthens the ability to verify food safety can simultaneously reduce operational risks and improve consumer confidence.

3.7 Digital Traceability and Smallholder Inclusion

Although digital traceability provides significant opportunities, the benefits may not be distributed equally among supply chain participants. Smallholder farmers often have limited financial resources, digital infrastructure, technical capabilities, and bargaining power. These factors can create barriers to participation in sophisticated traceability systems [11].

Steinke et al. [11] show that the establishment of digital sustainability tracing systems in smallholder cocoa supply chains can require substantial investment. The benefits must therefore be sufficiently visible to justify participation. If digital traceability creates



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additional reporting responsibilities without providing economic or market benefits to farmers, adoption may remain limited.

Compagnucci et al. [8] also identify technical and economic challenges in persuading actors to participate in blockchain-based networks. This indicates that successful digital traceability requires cooperation across supply chain actors rather than unilateral technology adoption.

Inclusive implementation therefore requires affordable technology, training, simple data-entry mechanisms, appropriate incentives, and institutional support. Cooperatives and farmer organizations may play an important role by aggregating smallholder participation and reducing individual implementation costs.

3.8 Data Quality, Interoperability, and Governance

The effectiveness of digital traceability depends strongly on data quality. A technically advanced system cannot create trustworthy traceability if the information entered into the system is incomplete, inaccurate, or intentionally manipulated before registration.

Duan et al. [12] identify data accuracy, interoperability, and scalability as important challenges. Different supply chain actors may use different information systems, formats, and standards. Without interoperability, information can remain fragmented even when individual actors have adopted digital technologies.

Ahmed and MacCarthy [1] emphasize the importance of defining the scope and granularity of traceability. Excessive data collection can increase implementation costs and complexity, while insufficient data may fail to satisfy consumer or regulatory requirements.

Therefore, sustainable digital traceability requires effective data governance. Governance should define who collects information, who can access it, how information is verified, and how data are protected. Trust in the traceability system depends not only on technological characteristics but also on the institutional arrangements surrounding the technology.

3.9 Integration of Digital Traceability, Consumer Trust, and Sustainable Value Creation

The synthesis of the literature indicates that digital traceability, consumer trust, and sustainable value creation form an interconnected mechanism rather than independent dimensions.

Digital traceability functions as the technological foundation for collecting and sharing product information. The availability of reliable information can reduce information asymmetry and perceived risk. When consumers perceive the information as credible, consumer trust increases. Increased trust can influence purchase intention, willingness to pay, product acceptance, and long-term relationships with producers and brands [4], [6], [7].



At the supply chain level, traceability also improves accountability and coordination. Producers can demonstrate production practices, processors can document processing activities, distributors can provide transportation information, and retailers can communicate product histories to consumers. This creates value not only for consumers but also for supply chain participants.

Sustainable value creation emerges when these technological and behavioral benefits are connected to economic, social, and environmental objectives. Digital traceability can support premium market positioning, strengthen producer reputation, improve food safety, facilitate sustainability verification, reduce fraud, and enhance supply chain resilience [9], [15].

However, digital traceability may fail to generate consumer trust when the information provided is inaccurate, incomplete, difficult to understand, inaccessible, or perceived as unreliable. Trust may also remain limited when consumers lack awareness of traceability systems or cannot verify the authenticity of the information presented. In addition, the existence of sophisticated technologies such as blockchain does not automatically guarantee trustworthy information because inaccurate data entered at the initial point of collection may remain inaccurate even when securely recorded. Institutional assurance, certification, governance, and effective communication are therefore important conditions for converting traceability information into consumer trust.

Digital traceability may also fail to generate sustainable value when implementation costs are disproportionately high, particularly for smallholder farmers and small enterprises. Unequal access to digital infrastructure, limited digital literacy, poor interoperability between systems, weak governance, and inadequate data quality may reduce the effectiveness of traceability investments. Furthermore, if the costs of implementation are concentrated among producers while the economic benefits are captured primarily by downstream actors, traceability may increase operational burdens without creating equitable value across the supply chain. Consumer trust may also fail to translate into positive market responses when traceability information is not sufficiently differentiated, when consumers are unwilling to pay for additional attributes, or when price and convenience remain more important purchasing considerations.

Therefore, the conceptual framework proposed in this study views digital traceability as an enabling mechanism rather than a guaranteed driver of sustainable value creation. Its effectiveness depends on the credibility and quality of information, consumer understanding and trust, market responsiveness, technological and institutional capabilities, and the equitable distribution of implementation costs and benefits. This conditional perspective provides a more comprehensive explanation of how and under what circumstances digital traceability contributes to sustainable agrifood supply chains.



4. Discussion

The findings demonstrate that digital traceability should be understood as a strategic component of agrifood supply chain management rather than merely a technological system. The main contribution of digital traceability lies in its ability to connect information between different actors and make product histories more visible.

The relationship between traceability and consumer trust is particularly important. Consumers cannot directly observe most agricultural production and food processing activities. Therefore, accessible and credible traceability information can reduce uncertainty. When consumers believe that the information is reliable, traceability can become an important basis for trust and purchasing decisions [4], [6], [7].

Blockchain strengthens this mechanism by providing a shared and relatively tamper-resistant digital record. However, blockchain itself should not be equated with trust. Trust depends on the entire information system, including data collection, verification, governance, accessibility, and communication. Consequently, organizations should avoid treating blockchain adoption as a standalone solution.

From the sustainability perspective, digital traceability creates opportunities to connect consumer demand for sustainable products with producer efforts to demonstrate sustainable practices. Sustainability claims concerning organic production, ethical sourcing, environmental management, or responsible farming can become more credible when supported by traceable information [11].

The findings also indicate that sustainable value creation should involve multiple stakeholders. Farmers need economic incentives to participate, processors need reliable information for quality management, distributors require traceability for logistics and risk management, retailers need credible product information, and consumers require understandable evidence regarding product quality and sustainability.

Therefore, organizations implementing digital traceability should prioritize interoperability and inclusiveness. Systems that are technologically advanced but difficult for smallholder farmers to use may increase inequality within the supply chain. Similarly, systems that provide excessive technical information without clear consumer communication may fail to generate trust.

The literature further indicates that the future of digital traceability will likely involve integration with other technologies such as Internet of Things devices, artificial intelligence, QR codes, and data analytics. Such integration can improve the ability to automatically collect information and identify anomalies. Nevertheless, technological integration should remain oriented toward improving transparency, food safety, sustainability, and stakeholder value rather than simply increasing technological complexity.



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5. Conclusions

5.1 Conclusion

This study concludes that digital traceability has an important role in strengthening transparency, consumer trust, and sustainable value creation in agrifood supply chains. Digital traceability enables product information to be collected and communicated across supply chain stages, allowing stakeholders to verify product origin, production processes, quality, safety, and sustainability-related attributes.

The literature demonstrates that blockchain is one of the important technologies supporting digital traceability because it enables shared and relatively tamper-resistant records. However, technological adoption alone is insufficient. The effectiveness of digital traceability depends on data quality, interoperability, governance, stakeholder participation, infrastructure, and the ability of consumers to understand the information provided.

Consumer trust represents an important mechanism connecting digital traceability with market value. Reliable and transparent traceability information can reduce information asymmetry and perceived risk, thereby strengthening consumer confidence and influencing purchase intention and willingness to accept traceable products.

At the supply chain level, digital traceability can contribute to sustainable value creation by improving accountability, food safety, coordination, fraud prevention, sustainability monitoring, and market differentiation. Therefore, digital traceability should be developed as an integrated supply chain capability that connects technological infrastructure, stakeholder collaboration, trustworthy information, and consumer needs.

5.2 Limitations and Suggestions

This study has several limitations. First, the research uses secondary literature and therefore does not directly test consumer perceptions or the performance of digital traceability systems in a specific agrifood supply chain. Second, the reviewed studies differ in commodities, countries, technologies, research methods, and stakeholder perspectives, which creates differences in findings and implementation conditions. Third, the literature on digital traceability continues to develop rapidly, particularly in relation to blockchain, artificial intelligence, Internet of Things, and digital sustainability monitoring.

Future research should conduct empirical studies involving farmers, processors, retailers, regulators, and consumers to examine how digital traceability creates value across different supply chain stages. Comparative research across agricultural commodities and countries is also needed to identify differences in adoption barriers and consumer responses.

Future studies should also examine the role of data governance, privacy, interoperability, digital literacy, and institutional trust in determining the effectiveness of digital traceability.



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Particular attention should be given to smallholder farmers because their participation is essential for achieving inclusive and sustainable agrifood supply chains.

From a managerial perspective, organizations should design traceability systems based on the information needs of supply chain actors and consumers. From a policy perspective, governments and industry associations should support digital infrastructure, interoperability standards, farmer training, data governance, and affordable access to digital traceability systems. Through these measures, digital traceability can move beyond technological innovation and become an instrument for creating economic, social, and environmental value throughout agrifood supply chains.

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