# A Systematic Literature Review on Agri-Food Supply Chain Transparency

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***Abstract*— The agri-food supply chain (ASC), integral to global sustenance, faces pressing challenges related to transparency and traceability. This systematic literature review (SLR) delves into the transformative potential of emerging digital technologies, namely Blockchain, IoT, and Digital Financial Solutions, in addressing these challenges. Through a rigorous selection process, 88 papers were meticulously reviewed, revealing a growing academic interest in the domain. The review underscores the individual and combined potentials of these technologies in enhancing transparency, fostering trust, and ensuring efficiency in the ASC. The study further highlights the synergistic benefits of integrating these technologies, emphasizing their role in real-time monitoring, secure transactions, and collaborative operations. The findings illuminate a promising future for the ASC, advocating for continued research and innovation in harnessing these technologies to meet the evolving demands of consumers and stakeholders.**

***Keywords*—** *Agri-food Supply Chain (ASC), Transparency, Blockchain, Internet of Things (IoT), Digital Financial Solutions, Systematic Literature Review (SLR).*

## 1. Introduction

The global agri-food supply chain (ASC) has witnessed a paradigm shift in recent years, driven by the increasing demand for transparency and traceability. As consumers become more conscious of the origin and quality of their food, the need for a transparent supply chain becomes paramount. This heightened awareness stems from various food scandals, environmental concerns, and the desire to support ethical and sustainable practices [1]. However, achieving transparency in the ASC is a complex endeavor, given its fragmented nature, involving multiple stakeholders, each with their own set of interests and operations.

Historically, the ASC has been plagued by opacity, leading to inefficiencies, mistrust, and vulnerabilities. Researchers have consistently expressed concerns about this lack of transparency, especially up until 2012, emphasizing the need for improved governance and information sharing among stakeholders [2]. The traditional methods of ensuring transparency, primarily based on manual record-keeping and trust-based relationships, have proven inadequate in the face of growing challenges.

Enter the era of technological advancements. Post-2012, the landscape began to change with the introduction of the Internet of Things (IoT) technologies, such as RFID, sensors, quality testers, and tracking tags. These technologies promised to bridge the information gap by providing real-time data on product quality, location, and other critical parameters, thereby enhancing product quality and stakeholder trust [3]. However, while IoT provided the means to collect vast amounts of data, the challenge remained: how to store, verify, and share this data in a secure and transparent manner.

This challenge was addressed in 2016 when the academic community recognized the potential of blockchain technology as a solution for data storage and verification [4]. Originating from the world of cryptocurrencies, blockchain's decentralized, immutable, and transparent nature made it an ideal fit for the ASC. It offered a platform where data from IoT devices could be stored securely, verified by multiple parties, and

accessed by authorized stakeholders, ensuring traceability and transparency [5].

Furthermore, the integration of digital financial solutions, especially those based on bitcoin smart contracts, added another layer of transparency. These solutions facilitated transparent financial transactions, reducing fraud, and ensuring that all stakeholders, from farmers to retailers, received their fair share [6].

The convergence of IoT, blockchain, and digital financial solutions has thus paved the way for a new era of transparency in the ASC. This paper aims to systematically review 88 relevant literature in this domain, shedding light on the evolution of these technologies and their impact on the ASC.

Drawing inspiration from [7], which provides a comprehensive literature review on blockchain technology in supply chain management, this paper seeks to delve deeper into the specific context of the ASC. The importance of this study lies in its potential to guide future research, inform policymakers, and assist industry stakeholders in leveraging these technologies for a transparent, efficient, and sustainable ASC.

## 2. Literature Review

The agri-food supply chain is a complex network of processes and stakeholders that ensure the production, distribution, and consumption of agricultural products. As the global demand for food continues to rise, there is an increasing need for transparency in the agri-food supply chain to ensure food safety, reduce waste, and promote sustainable practices. With the advent of digital technologies such as Blockchain, IoT, Digital Financial Solutions, and Smart Contracts, there is a potential to revolutionize the agri-food supply chain by enhancing transparency and traceability.

### 2.1 Blockchain

Blockchain technology, often associated with cryptocurrencies, offers a decentralized and immutable ledger system. This technology has the potential to provide a transparent and tamper-proof record of transactions in the agri-food supply chain. According to Reference Paper, blockchain can ensure the authenticity of products, reduce fraud, and enhance consumer trust. Moreover, other studies such as [8] have highlighted the role of blockchain in ensuring the traceability of food products from farm to fork.

### 2.2 Internet of Things (IoT)

The Internet of Things (IoT) comprises interconnected devices that can collect and exchange data. In the context of the agri-food supply chain, IoT devices can monitor various parameters such as temperature, humidity, and location, ensuring the quality and safety of food products. The reference paper emphasizes the role of IoT in real-time monitoring and decision-making. Additionally, [9] & [10] discussed how IoT can provide insights into the supply chain, helping stakeholders make informed decisions.

### 2.3 Digital Financial Solutions

Digital financial solutions, including digital payments and financial networks, play a crucial role in ensuring transparency in financial transactions within the supply chain. As per the reference paper, these solutions can reduce the risk of fraud, ensure timely payments, and promote trust among stakeholders. A study by [11] also highlighted the significance of digital financial solutions in reducing transaction costs and enhancing efficiency in the agri-food supply chain.

### 2.4 Smart Contracts

Smart contracts, often built on blockchain platforms, are self-executing contracts with the terms of the agreement directly written into code. These contracts can automate and streamline processes in the agri-food supply chain. The reference paper suggests that smart contracts can ensure compliance, reduce disputes, and enhance transparency. Furthermore, research by [12] indicated that smart contracts could play a pivotal role in ensuring the integrity of transactions in the supply chain.

In conclusion, the integration of digital technologies in the agri-food supply chain has the potential to address the challenges of transparency and traceability. As the demand for food products continues to grow, leveraging these technologies can ensure the safety, quality, and sustainability of the global food system.

## 3. Methodology

The methodology section elucidates the systematic review process adopted in this study, based on the secondary data, ensuring a rigorous and replicable approach to identify, select, and analyze relevant literature on the factors ensuring transparency in the agri-food supply chain.

The review process was designed following [13] recommendations; later improvements by [14] and implemented in a blockchain-based Supply Chain paper by [7]. This approach guarantees a thorough and impartial examination of existing literature, pinpointing the most relevant studies in the field. SLR is a type of review that emphasizes following consistent procedures for searching, evaluating, and commenting on literature. Given that blockchain and its related technology, smart contracts, have been around for just over a decade, the associated research, technological benchmarks, and novel applications are still evolving. Our literature survey spans from 1998 to 2022 to encompass the latest applications of these technologies in SCM. To ensure a comprehensive review, we sourced papers from major academic databases like Google Scholar, IEEE Xplore, ACM, and others, using a specific search criterion depicted in Figure. 1. The steps for literature search and evaluation are detailed in Figure. 1.

### 3.1 Step 1: Inclusion/Exclusion Criteria

The initial step involved establishing clear inclusion and exclusion criteria to filter out irrelevant studies. The inclusion criteria were a) Papers discussing the role of Blockchain, IoT, Digital Financial Solutions, and Smart Contracts in the agri-food supply chain, b) Studies published in English, c) Peer-reviewed journal articles and conference proceedings. After employing these procedures, we obtained a total of 328 articles.

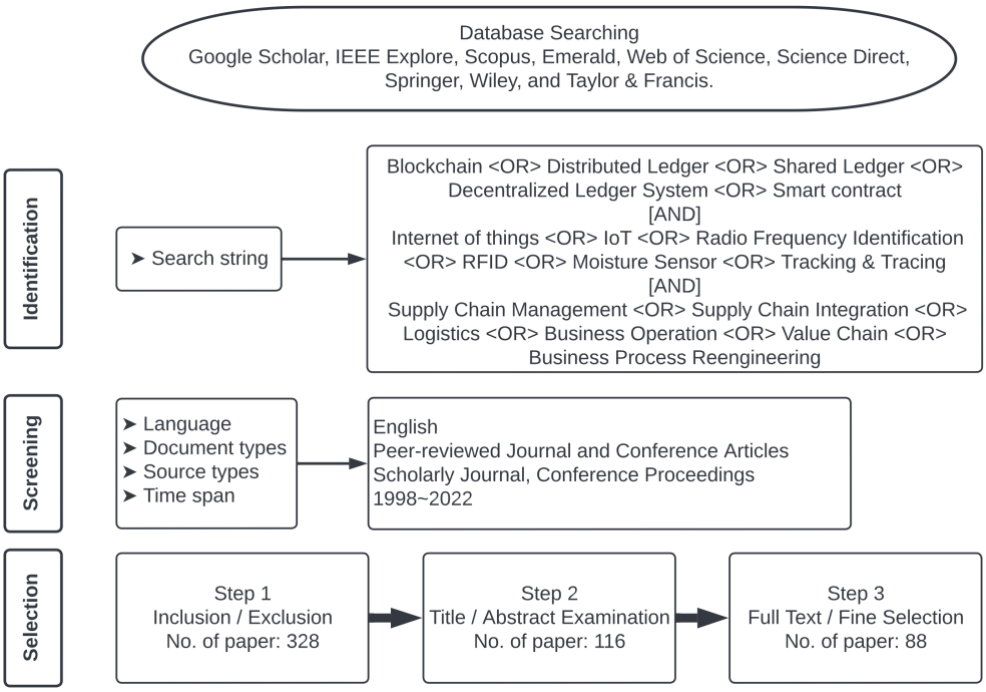


*Figure 1. Steps of the Selection Process.*

Exclusion criteria encompassed: a) Papers not directly related to the agri-food supply chain, b) Studies that did not focus on transparency, or the technologies mentioned, c) Non-English publications. Furthermore, initial research such as technical reports, comments, editorials, and consultancy papers were omitted to maintain a high standard of uniformity, quality, and scholarly integrity.

### 3.2 STEP 2: TITLE AND ABSTRACT EXAMINATION

Following the criteria, an initial screening was conducted based on the titles and abstracts of the identified papers. This step ensured that only the most relevant studies were selected for a detailed review. The process was iterative, with two independent reviewers involved to minimize bias

and ensure consistency [15]. At this phase, we discarded 212 papers that primarily concentrated on the uses of other nascent technologies that didn't emphasize transparency in the supply chain.

### 3.3 STEP 3: FULL TEXT READING AND FINER SELECTION

Upon narrowing down the list, the full texts of the shortlisted papers were thoroughly examined. This step involved a deeper analysis to ensure the studies met the research objectives and provided valuable insights into the factors ensuring transparency in the agri-food supply chain. Any discrepancies between reviewers were resolved through discussion or, if necessary, a third reviewer's intervention.

The procedural steps of the selection process are visually represented in the diagram Link to steps of the selection process Diagram in figure 1. We thoroughly read the entire content and carried out a detailed selection process for potential papers. 28 papers were removed because they didn't align closely with our primary objective. Ultimately, we settled on 88 papers for our research.

### 3.4 Data Extraction and Synthesis

Post selection, data extraction was undertaken to gather pertinent information from each study, such as the research methods used, technologies discussed, benefits, challenges, and key findings. This data was then synthesized to identify common themes and patterns, providing a holistic view of the current state of research in the domain.

### 3.4 Analysis of Publication Trends

An analysis of the distribution of papers by their year of publication was conducted to understand the evolution of research in this area over time. The results of this analysis can be viewed in the Figure 2 to Paper distribution by year of publication.

| Year of Publication | Amount of Publication |
|---|---|
| 1998 | 1 |
| 2004 | 1 |
| 2009 | 1 |
| 2012 | 1 |
| 2013 | 1 |
| 2014 | 4 |
| 2016 | 5 |
| 2017 | 5 |
| 2018 | 10 |
| 2019 | 17 |
| 2020 | 24 |
| 2021 | 11 |
| 2022 | 7 |
| **Total** | **88** |

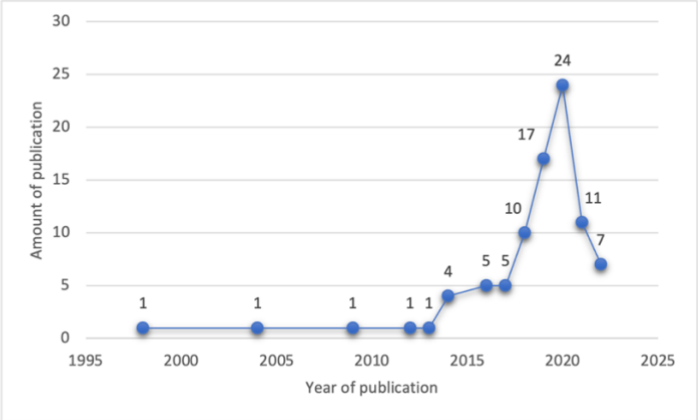


*Figure 2. Paper distribution by year of publication.*

The subsequent sections delve into a detailed breakdown of how the literature was categorized and offer insights into the associated analyses. These sections aim to clarify the criteria and rationale behind the classification, ensuring readers have a comprehensive understanding of the analytical methods employed.

## 4. Result

### 4.1 Landscape of the Reviewed Literature

In the systematic literature review, the selected studies predominantly employed two methodologies: Descriptive and Empirical. This section provides an overview of these methodologies and their significance in the context of the reviewed literature.

Descriptive research aims to provide a detailed account of a phenomenon or subject under study without manipulating any variables. It seeks to describe "what exists" in terms of variables or conditions in a situation. This methodology often employs observational methods, case studies, and surveys to gather data. Descriptive studies can offer rich insights into the characteristics, behaviors, or patterns of a particular subject, making them invaluable for establishing a foundational understanding of the topic. For instance, [16]

elucidates that descriptive research is primarily concerned with finding out "what is" and emphasizes the importance of accurate observation and description.

Empirical research, on the other hand, is based on observed and measured phenomena. It derives knowledge from actual experience rather than from theory or belief. Typically, empirical studies involve collecting primary data and analyzing it to test a hypothesis or answer a specific research question. This methodology often employs experiments, quasi-experiments, and correlational studies, making it suitable for establishing cause-and-effect relationships or understanding the relationships between variables. Empirical research as a type of research that is grounded in observation or experience, which can be verified [17]. They emphasize the systematic and rigorous nature of empirical studies.

In the context of the 88 papers selected for this SLR, 50 papers employed a descriptive methodology, providing a comprehensive understanding of the topic, while 38 papers utilized an empirical approach, offering evidence-based insights into the subject matter.

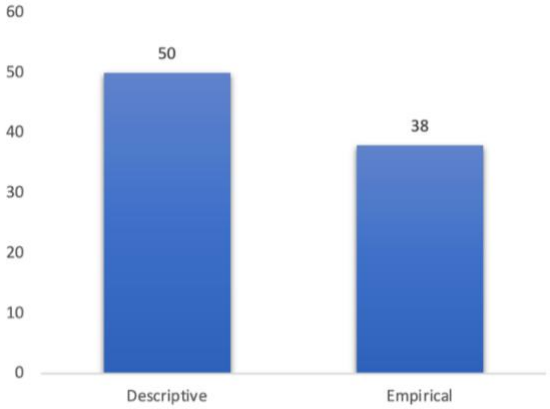


*Figure 3. Methodological Landscape of the Reviewed Literature.*

### 4.2 Descriptive Analysis of The Literatures

Table 1 is the overview of the 88 selected papers and their alignment with Blockchain, IoT, and Financial Solutions for transparent supply chain.

*Table 1: Overview of the 88 selected papers and their alignment with proposed Solutions for transparent supply chain.*

| Citation | Blockchain | Internet of Things (IoT) | Financial Network | Others | Year |
|---|---|---|---|---|---|
| [89] | | ✓ | | | 1998 |
| [84] | | | | Information Sharing | 2004 |
| [85] | | | | Governance and Information Sharing | 2009 |
| [86] | | | | Governance Mechanism | 2012 |
| [90] | | ✓ | | | 2013 |
| [91] | | ✓ | | | 2014 |
| [92] | | ✓ | | | 2014 |
| [93] | | ✓ | | | 2014 |
| [94] | | ✓ | | | 2014 |
| [95] | | ✓ | | | 2016 |
| [96] | | ✓ | | Information Sharing | 2016 |
| [97] | | ✓ | | | 2016 |
| [56] | ✓ | ✓ | | | 2016 |
| [98] | | ✓ | | | 2016 |
| [99] | | ✓ | | | 2017 |
| [20] | ✓ | | | | 2017 |
| [21] | ✓ | | | | 2017 |
| [22] | ✓ | | | | 2017 |
| [57] | ✓ | ✓ | | | 2017 |
| [40] | ✓ | ✓ | ✓ | | 2018 |
| [77] | ✓ | | ✓ | | 2018 |
| [58] | ✓ | ✓ | | | 2018 |
| [10] | | ✓ | | | 2018 |
| [41] | ✓ | ✓ | ✓ | | 2018 |
| [23] | ✓ | | | | 2018 |
| [59] | ✓ | ✓ | | | 2018 |
| [60] | ✓ | ✓ | | | 2018 |
| [100] | | ✓ | | | 2018 |

| | | | | | |
|---|---|---|---|---|---|
| [9] | | ✓ | | | 2018 |
| [39] | | | ✓ | Information Sharing | 2019 |
| [24] | ✓ | | | | 2019 |
| [25] | ✓ | | | | 2019 |
| [61] | ✓ | ✓ | | | 2019 |
| [42] | ✓ | ✓ | ✓ | | 2019 |
| [43] | ✓ | ✓ | ✓ | | 2019 |
| [44] | ✓ | ✓ | ✓ | | 2019 |
| [78] | ✓ | | ✓ | | 2019 |
| [79] | ✓ | | ✓ | | 2019 |
| [62] | ✓ | ✓ | | | 2019 |
| [63] | ✓ | ✓ | | | 2019 |
| [101] | | ✓ | | | 2019 |
| [45] | ✓ | ✓ | ✓ | | 2019 |
| [64] | ✓ | ✓ | | | 2019 |
| [26] | ✓ | | | | 2019 |
| [46] | ✓ | ✓ | ✓ | | 2019 |
| [87] | | | | Information Sharing | 2019 |
| [65] | ✓ | ✓ | | | 2020 |
| [66] | ✓ | ✓ | | | 2020 |
| [27] | ✓ | | | | 2020 |
| [28] | ✓ | | | | 2020 |
| [80] | ✓ | | ✓ | | 2020 |
| [47] | ✓ | ✓ | ✓ | | 2020 |
| [81] | ✓ | | ✓ | | 2020 |
| [29] | ✓ | | | | 2020 |
| [48] | ✓ | ✓ | ✓ | | 2020 |
| [68] | ✓ | ✓ | | | 2020 |
| [82] | ✓ | | ✓ | | 2020 |
| [49] | ✓ | ✓ | ✓ | | 2020 |
| [50] | ✓ | ✓ | ✓ | | 2020 |
| [83] | ✓ | | ✓ | | 2020 |
| [68] | ✓ | ✓ | | | 2020 |
| [30] | ✓ | | | | 2020 |
| [51] | ✓ | ✓ | ✓ | | 2020 |
| [69] | ✓ | ✓ | | Artificial Intelligence (AI) | 2020 |
| [52] | ✓ | ✓ | ✓ | | 2020 |
| [31] | ✓ | | | | 2020 |
| [53] | ✓ | ✓ | ✓ | | 2020 |
| [70] | ✓ | ✓ | | | 2020 |
| [54] | ✓ | ✓ | ✓ | | 2020 |
| [102] | | ✓ | | | 2020 |
| [32] | ✓ | | | | 2021 |
| [33] | ✓ | | | | 2021 |
| [71] | ✓ | ✓ | | | 2021 |
| [55] | ✓ | ✓ | ✓ | | 2021 |
| [72] | ✓ | ✓ | | | 2021 |
| [34] | ✓ | | | | 2021 |
| [73] | ✓ | ✓ | | | 2021 |
| [74] | ✓ | ✓ | | | 2021 |
| [12] | ✓ | ✓ | ✓ | | 2021 |
| [75] | ✓ | ✓ | | | 2021 |
| [35] | ✓ | | | | 2021 |
| [76] | ✓ | ✓ | | | 2022 |
| [8] | ✓ | | | | 2022 |
| [88] | | | | Data Sharing | 2022 |
| [36] | ✓ | | | | 2022 |
| [11] | ✓ | | ✓ | | 2022 |
| [37] | ✓ | | | | 2022 |
| [38] | ✓ | | | | 2022 |

The agri-food supply chain has historically been fraught with challenges related to transparency. Up until 2012, many researchers expressed concerns about the opaque nature of processes and transactions within this sector [93]. A common sentiment was the need for enhanced governance and improved information sharing among the myriad stakeholders involved in the agri-food supply chain [18]. This was seen as a pivotal step towards ensuring that consumers received products of the highest quality and that ethical and sustainable practices were maintained throughout the supply chain.

The period post-2012 marked a significant shift in this narrative. With the advent and proliferation of Internet of Things (IoT) technologies, the agri-food supply chain began to see transformative changes. RFID tags, sensors, quality testers, and tracking mechanisms became instrumental in monitoring and ensuring the quality of products in real time [19]. These IoT technologies not only facilitated better quality control but also played a crucial role in establishing transparency among stakeholders, ensuring that every step of the product's journey, from farm to table, was traceable and verifiable [47].

However, while IoT provided the tools to collect and transmit data, there was still a need for a secure and transparent system to store and manage this vast amount of information. This gap was addressed when the concept of integrating blockchain technology into the agri-food supply chain emerged [56]. Blockchain, with its decentralized and immutable nature, offers a robust solution to store data generated by IoT devices. This ensured that the information, once recorded, could not be tampered with, thereby providing an added layer of trust and transparency to stakeholders [18].

Furthermore, the introduction of financial transaction solutions based on smart contracts has revolutionized the way payments and transactions are conducted within the supply chain. These smart contracts automate and verify transactions, reducing the need for intermediaries and ensuring that all parties involved are held accountable [19]. This not only streamlines operations but also further bolsters transparency and trust among stakeholders.

In conclusion, the combined contributions of IoT, blockchain, and innovative financial networks have significantly enhanced transparency in the agri-food supply chain. These technologies, working in tandem, have paved the way for a more accountable, efficient, and trustworthy supply chain, ensuring that consumers receive products of the highest quality and integrity.

### 4.3 Distribution of Research Topics in Agri-food Supply Chain Transparency

In our systematic literature review, we analyzed a total of 88 papers that delve into various technological interventions aimed at enhancing transparency in the agri-food supply chain. The distribution of these papers across different research topics provides a comprehensive overview of the academic community's focus over the years.

The largest segment of the research is dedicated to the exploration of blockchain technology, with 20 papers exclusively discussing its implications and applications in the agri-food supply chain [8], [20-38]. This is closely followed by 16 papers that solely focus on the Internet of Things (IoT) and its transformative potential in ensuring transparency from farm to table.

Interestingly, while only one paper exclusively discusses the role of financial networks in the agri-food supply chain [39], the integration of multiple technologies seems to be a growing trend. A significant number of papers (17) delve into the combined potential of Blockchain, IoT, and Financial Networks [12], [40-55]. This indicates a shift towards a more holistic approach, recognizing the synergistic benefits of integrating multiple technologies.

Furthermore, the intersection of Blockchain and IoT is another prominent area of research, with 21 papers discussing the combined potential of these two technologies [56-76]. This is indicative of the growing recognition of the complementary nature of blockchain's secure data storage capabilities with IoT's real-time data collection mechanisms.

Eight papers explore the combination of Blockchain and Financial Networks, emphasizing the importance of secure and transparent financial transactions in the agri-food supply chain [11], [77-83].

Lastly, there are five papers categorized under 'Others', which encompass topics or emerging technologies covered under the main categories such as Blockchain and IoT technologies, e.g., Artificial intelligence, Cloud computing, etc. or the researchers concern regarding the lack of transparency in SC in early days [84-88].

The figure 4 of these papers is visually represented in a pie chart, offering a clear snapshot of the research landscape in this domain.

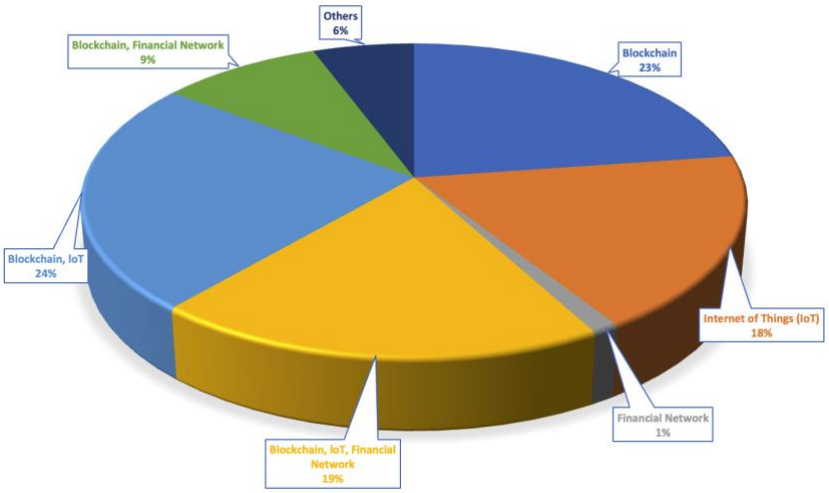


*Figure 4. Distribution of Research Topics in Agri-food Supply Chain Transparency*

In conclusion, while individual technologies like blockchain and IoT have their distinct advantages, the trend towards integrating multiple technologies underscores the academic community's recognition of the need for a multi-faceted approach to address the challenges of transparency in the agri-food supply chain.

## 5. Discussion

The global agri-food supply chain is undergoing a significant transformation, driven by the increasing demand for transparency and traceability from consumers. Historically, the supply chain has been characterized by a lack of transparency, leading to inefficiencies, mistrust, and challenges in ensuring the authenticity and quality of agri-food products. This section delves into the role of emerging technologies, namely Blockchain, IoT, and Digital Financial Solutions, in addressing these challenges and ensuring a transparent agri-food supply chain.

### 5.1 Blockchain, IoT & Digital Financial Solutions Ensuring Agri-food Supply Chain

- Traceability and Transparency: Blockchain technology stands out as a revolutionary tool in enhancing traceability in the agri-food supply chain. By offering a decentralized and transparent platform for storing and verifying data, blockchain ensures that every transaction or change is recorded and cannot be altered without the consensus of all parties involved. This immutable nature of blockchain ensures that the origin, processing, storage, and distribution of agri-food products can be traced back to their source, providing consumers with confidence in the authenticity and quality of their food [2], [9]. IoT, on the other hand, provides real-time monitoring and data collection capabilities. Sensors and smart devices can track the conditions of crops, livestock, and products throughout the supply chain, from farm to fork. This continuous monitoring ensures that any deviations from the desired conditions are immediately detected and addressed, further enhancing transparency [40], [93].

- Supply Chain Integration and Digitalization: Digital Financial Solutions, particularly those based on bitcoin smart contracts, play a pivotal role in enhancing transparency in financial transactions within the supply chain. These solutions ensure that payments are made only when predefined conditions are met, reducing the

chances of fraud and ensuring that all stakeholders are held accountable for their roles [6], [80]. Furthermore, the integration of blockchain and IoT allows for seamless data sharing across the supply chain. This integration ensures that all stakeholders, from farmers to retailers, have access to the same data, promoting collaboration and reducing inefficiencies [83], [66].

- Stakeholder Involvement and Collaboration: The transparency ensured by blockchain and IoT technologies fosters trust among stakeholders. With access to the same data and the assurance that this data is accurate and unaltered, stakeholders are more likely to collaborate and share information. This collaborative approach is crucial in addressing challenges such as food fraud and ensuring the sustainability of the agri-food supply chain [84].

- Real-time Monitoring and Decision-making: The Internet of Things (IoT) plays a pivotal role in real-time monitoring, which is crucial for decision-making in the agri-food supply chain. IoT devices, such as sensors, can provide insights into various parameters like temperature, humidity, and location. This ensures the quality and safety of food products throughout the supply chain, from production to consumption [62], [75]. By continuously monitoring these parameters, stakeholders can make informed decisions based on real-time data, ensuring optimal conditions for food products.

- Reducing Fraud and Ensuring Timely Payments: Digital financial solutions, including digital payments and financial networks, are instrumental in ensuring transparency in financial transactions within the supply chain. These solutions can significantly reduce the risk of fraud, ensure timely payments, and foster trust among stakeholders. By automating and verifying transactions, these solutions ensure that all parties involved are held accountable, further enhancing transparency [97], [101].

- Smart Contracts for Streamlined Operations: Smart contracts, often built on blockchain platforms, are self-executing contracts where the terms of the agreement are directly written into code [6]. These contracts can automate and streamline various processes in the agri-food supply chain, from payments to quality checks. By ensuring compliance and reducing disputes, smart contracts enhance transparency and trust among stakeholders. They play a pivotal role in ensuring the integrity of transactions, making sure that all conditions are met before a transaction is completed [40].

- Synergistic Benefits of Integrated Technologies: The integration of multiple technologies, such as Blockchain, IoT, and Digital Financial Solutions, offers synergistic benefits [41]. While individual technologies have their distinct advantages, their combined potential provides a holistic solution to the challenges of transparency in the agri-food supply chain. For instance, while IoT devices collect and transmit data, blockchain provides a secure and transparent system to store this vast amount of information [51]. This ensures that the data, once recorded, remains tamper-proof, adding an extra layer of trust and transparency for stakeholders [12], [20].

The agri-food supply chain, with its intricate processes and myriad stakeholders, has long grappled with challenges related to transparency and traceability. The advent of digital technologies, particularly Blockchain, IoT, and Digital Financial Solutions, has ushered in a transformative era, addressing these challenges head-on. As we've discussed, these technologies not only individually contribute to enhancing transparency but, when integrated, offer synergistic benefits that revolutionize the entire supply chain. Their combined potential ensures real-time monitoring, secure transactions, streamlined operations, and most importantly, fosters trust among all stakeholders. As the global demand for food continues to rise, leveraging these technologies will be paramount in ensuring a transparent, efficient, and sustainable agri-food supply chain for the future.

## 6. Conclusion

The agri-food supply chain, a cornerstone of global sustenance, has been under the microscope for its transparency and traceability challenges. As this systematic literature review (SLR) has highlighted, these challenges are not just logistical but also pertain to consumer trust, safety, and sustainability of food products. The initial sections of this review provided a comprehensive backdrop of the

importance of transparency in the agri-food supply chain and the potential role of emerging technologies in addressing these challenges.

Our exploration into the literature revealed a growing interest in the domain, with a significant number of studies focusing on the transformative potential of Blockchain, IoT, and Digital Financial Solutions. The methodologies employed in these studies, predominantly Descriptive and Empirical, have provided rich insights into the current state of research. The iterative selection process, involving title and abstract examination followed by full-text reading, ensured that the review was both exhaustive and focused on the most relevant studies.

The discussion in section 5 further emphasized the synergistic benefits of integrating these technologies. From real-time monitoring to tamper-proof data storage and secure transactions, the convergence of these digital solutions offers a holistic approach to enhancing transparency at every stage of the supply chain. Moreover, the collaborative potential fostered by these technologies ensures a more cohesive and efficient system, where stakeholders can trust and rely on each other.

In conclusion, this SLR has illuminated the path forward for the agri-food supply chain. The integration of Blockchain, IoT, and Digital Financial Solutions is not just a technological advancement but a paradigm shift towards a more transparent, efficient, and sustainable future. As the global demand for food products continues to rise, the insights from this review underscore the importance of continued research, collaboration, and innovation in this domain. The future of the agri-food supply chain is promising, and with the right technological interventions, it can meet the evolving demands of consumers and stakeholders alike.

## References

[1] Hatanaka, M. (2020). Beyond consuming ethically? food citizens, governance, and Sustainability. Journal of Rural Studies, 77, 55–62. https://doi.org/10.1016/j.jrurstud.2020.04.006

[2] Hasan, I., & Habib, M. (2022a). Blockchain technology to ensure traceability of Agriculture Supply Chain Management. International Supply Chain Technology Journal, 8(9). https://doi.org/10.20545/isctj.v08.i09.01

[3] Hasan, I., Habib, Md. M., Mohamed, Z., & Tewari, V. (2023). Integrated Agri-Food Supply Chain Model: An application of IOT and Blockchain. American Journal of Industrial and Business Management, 13(02), 29–45. https://doi.org/10.4236/ajibm.2023.132003

[4] Hasan, I., Habib, Md. M., & Mohamed, Z. (2023). Blockchain Database and IOT: A technology driven agri-food supply chain. International Supply Chain Technology Journal, 9(3), 40–45. https://doi.org/10.20545/isctj.v09.i03.01

[5] Hasan, I., & Habib, Md. M. (2023). The significance of Agri-Food Supply Chain transparency. International Supply Chain Technology Journal, 9(3), 46–48. https://doi.org/10.20545/isctj.v09.i03.02

[6] Hasan, I., & Habib, Md. M. (2022b). Use of mobile banking, Digital Payment Systems, and smart contracts conjunction with Blockchain-based financial system. International Supply Chain Technology Journal, 8(11). https://doi.org/10.20545/isctj.v08.i11.02

[7] Chang, S. E., &a Chen, Y. (2020). When blockchain meets Supply Chain: A systematic literature review on current development and potential applications. IEEE Access, 8, 62478–62494. https://doi.org/10.1109/access.2020.2983601

[8] Kraft, S. K., & Kellner, F. (2022). Can blockchain be a basis to ensure transparency in an agricultural supply chain? Sustainability, 14(13), 8044. doi:10.3390/su14138044

[9] Corallo, A., Paiano, R., Guido, A. L., Pandurino, A., Latino, M. E., & Menegoli, M. (2018). Intelligent Monitoring Internet of things based system for Agri-Food Value Chain Traceability and transparency: A Framework proposed. 2018 IEEE Workshop on Environmental, Energy, and Structural Monitoring Systems (EESMS). doi:10.1109/eesms.2018.8405814

[10] Corallo, A., Latino, M., & Menegoli, M. (2018). From Industry 4.0 to Agriculture 4.0: A Framework to Manage Product Data in

Agri-Food Supply Chain for Voluntary Traceability. World Academy of Science, Engineering and Technology International Journal of Nutrition and Food Engineering, 12(5), 126-130.

[11] Menon, S., & Jain, K. (2022). Blockchain technology for transparency in Agri-Food Supply Chain: Use cases, limitations, and Future Directions. IEEE Transactions on Engineering Management, 1-15. doi:10.1109/tem.2021.3110903

[12] Stranieri, S., Riccardi, F., Meuwissen, M. P., & Soregaroli, C. (2021). Exploring the impact of blockchain on the performance of Agri-Food Supply Chains. Food Control, 119, 107495. doi:10.1016/j.foodcont.2020.107495

[13] Kitchenham, B. (2004). Procedures for performing systematic reviews. Keele, UK, Keele University, 33(2004), 1-26.

[14] Petersen, K., Feldt, R., Mujtaba, S., & Mattsson, M. (2008). Systematic mapping studies in software engineering. In 12th international conference on evaluation and assessment in software engineering (Vol. 17, No. 1, pp. 68-77).

[15] Budgen, D., & Brereton, P. (2006). Performing systematic literature reviews in software engineering. In Proceedings of the 28th international conference on Software engineering (pp. 1051-1052).

[16] Babbie, E. (2010). The practice of social research. Wadsworth Cengage.

[17] Kerlinger, F. N., & Lee, H. B. (2000). Foundations of behavioral research. Harcourt College Publishers.

[18] Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain technology and its relationships to sustainable supply chain management. International Journal of Production Research, 57(7), 2117-2135.

[19] Tapscott, D., & Tapscott, A. (2016). Blockchain revolution: how the technology behind bitcoin is changing money, business, and the world. Penguin.

[20] Papa, S. F. (2017). Use of blockchain technology in agribusiness: Transparency and monitoring in Agricultural Trade. Proceedings of the 2017 International Conference on Management Science and Management Innovation (MSMI 2017). doi:10.2991/msmi-17.2017.9

[21] Ge, L., Brewster, C., Spek, J., Smeenk, A., Top, J., Van Diepen, F., . . . De Ruyter de Wildt, M. (2017). Blockchain for agriculture and food : Findings from the pilot study. Wageningen: Wageningen Economic Research, 112. doi:10.18174/426747

[22] Tse, D., Zhang, B., Yang, Y., Cheng, C., & Mu, H. (2017). Blockchain application in Food Supply Information Security. 2017 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM), 1357-1361. doi:10.1109/ieem.2017.8290114

[23] Francisco, K., & Swanson, D. (2018). The supply chain has no clothes: Technology adoption of blockchain for Supply Chain Transparency. Logistics, 2(1), 2. doi:10.3390/logistics2010002

[24] Basnayake, B. M., & Rajapakse, C. (2019). A blockchain-based decentralized system to ensure the transparency of Organic Food Supply Chain. 2019 International Research Conference on Smart Computing and Systems Engineering (SCSE), 103-107. doi:10.23919/scse.2019.8842690

[25] Kamilaris, A., Fonts, A., & Prenafeta-Boldú, F. X. (2019). The rise of blockchain technology in agriculture and food supply chains. Trends in Food Science & Technology, 91, 640-652. doi:10.1016/j.tifs.2019.07.034

[26] Jarka, S. (2019). Food safety in the supply chain using blockchain technology. Acta Scientiarum Polonorum. Oeconomia, 18(4), 41-48. doi:10.22630/aspe.2019.18.4.43

[27] Mirabelli, G., & Solina, V. (2020). Blockchain and agricultural supply chains traceability: Research trends and future challenges. *Procedia Manufacturing, 42*, 414-421. doi:10.1016/j.promfg.2020.02.054

[28] Kamble, S. S., Gunasekaran, A., & Gawankar, S. A. (2020). Achieving sustainable performance in a data-driven Agriculture Supply Chain: A review for Research and Applications. International Journal of Production Economics, 219, 179-194. doi:10.1016/j.ijpe.2019.05.022

[29] Dutta, P., Choi, T., Somani, S., & Butala, R. (2020). Blockchain technology in Supply Chain Operations: Applications, challenges and research opportunities. Transportation Research Part E: Logistics and Transportation

Review, 142, 102067. doi:10.1016/j.tre.2020.102067

[30] Katsikouli, P., Wilde, A. S., Dragoni, N., & Høgh-Jensen, H. (2020). On the benefits and challenges of blockchains for Managing Food Supply Chains. *Journal of the Science of Food and Agriculture, 101*(6), 2175-2181. doi:10.1002/jsfa.10883

[31] Rogerson, M., & Parry, G. C. (2020). Blockchain: Case studies in food supply chain visibility. Supply Chain Management: An International Journal, 25(5), 601-614. doi:10.1108/scm-08-2019-0300

[32] Mukherjee, A. A., Singh, R. K., Mishra, R., & Bag, S. (2021). Application of blockchain technology for Sustainability Development in Agricultural Supply Chain: Justification Framework. Operations Management Research, 15(1-2), 46-61. doi:10.1007/s12063-021-00180-5

[33] Gligor, D. M., Davis-Sramek, B., Tan, A., Vitale, A., Russo, I., Golgeci, I., & Wan, X. (2021). Utilizing blockchain technology for Supply Chain Transparency: A resource orchestration perspective. Journal of Business Logistics, 43(1), 140-159. doi:10.1111/jbl.12287

[34] Commandré, Y., Macombe, C., & Mignon, S. (2021). Implications for agricultural producers of using blockchain for food transparency, study of 4 food chains by cumulative approach. Sustainability, 13(17), 9843. doi:10.3390/su13179843

[35] Cocco, L., & Mannaro, K. (2021). Blockchain in Agri-food traceability systems: A model proposal for a typical Italian food product. 2021 IEEE International Conference on Software Analysis, Evolution and Reengineering (SANER). doi:10.1109/saner50967.2021.00085

[36] GUPTA, R., & Shankar, R. (2022). Mitigating risks in food security through transparency and traceability of agro-supply chain. Productivity, 62(2), 164-173. doi:10.32381/prod.2021.62.02.7

[37] Bala, K., & Kaur, P. D. (2022). Transparent subsidized agri-product distribution during pandemics with reputation based Poa blockchain. Concurrency and Computation: Practice and Experience, 34(22). doi:10.1002/cpe.6863

[38] Singh, V., & Sharma, S. K. (2022). Application of blockchain technology in shaping the future of food industry based on transparency and consumer trust. Journal of Food Science and Technology. doi:10.1007/s13197-022-05360-0

[39] Gardner, T., Benzie, M., Börner, J., Dawkins, E., Fick, S., Garrett, R., . . . Wolvekamp, P. (2019). Transparency and sustainability in global commodity supply chains. World Development, 121, 163-177. doi:10.1016/j.worlddev.2018.05.025

[40] Caro, M. P., Ali, M. S., Vecchio, M., & Giaffreda, R. (2018). Blockchain-based traceability in Agri-Food Supply Chain Management: A practical implementation. 2018 IoT Vertical and Topical Summit on Agriculture - Tuscany (IOT Tuscany). doi:10.1109/iot-tuscany.2018.8373021

[41] Kim, M., Hilton, B., Burks, Z., & Reyes, J. (2018). Integrating blockchain, Smart Contract-tokens, and IOT to design a food traceability solution. *2018 IEEE 9th Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON)*, 335-340. doi:10.1109/iemcon.2018.8615007

[42] Astill, J., Dara, R. A., Campbell, M., Farber, J. M., Fraser, E. D., Sharif, S., & Yada, R. Y. (2019). Transparency in Food Supply Chains: A review of enabling technology solutions. Trends in Food Science & Technology, 91, 240-247. doi:10.1016/j.tifs.2019.07.024

[43] Salah, K., Nizamuddin, N., Jayaraman, R., & Omar, M. (2019). Blockchain-based soybean traceability in agricultural supply chain. IEEE Access, 7, 73295-73305. doi:10.1109/access.2019.2918000

[44] Borah, M. D., Naik, V. B., Patgiri, R., Bhargav, A., Phukan, B., & Basani, S. G. (2019). Supply Chain Management in agriculture using Blockchain and IOT. Studies in Big Data, 227-242. doi:10.1007/978-981-13-8775-3_11

[45] Baralla, G., Pinna, A., & Corrias, G. (2019). Ensure traceability in European food supply chain by using a blockchain system. 2019 IEEE/ACM 2nd International Workshop on Emerging Trends in Software Engineering for Blockchain (WETSEB), 40-47. doi:10.1109/wetseb.2019.00012

[46] Zhao, G., Liu, S., Lopez, C., Lu, H., Elgueta, S., Chen, H., & Boshkoska, B. M. (2019). Blockchain technology in Agri-Food Value Chain Management: A synthesis of applications, challenges and future research directions. Computers in Industry, 109, 83-99. doi:10.1016/j.compind.2019.04.002

[47] Kamble, S. S., Gunasekaran, A., & Sharma, R. (2020). Modeling the blockchain enabled traceability in Agriculture Supply Chain. International Journal of Information Management, 52, 101967. doi:10.1016/j.ijinfomgt.2019.05.023

[48] Demestichas, K., Peppes, N., Alexakis, T., & Adamopoulou, E. (2020). Blockchain in agriculture traceability systems: A Review. Applied Sciences, 10(12), 4113. doi:10.3390/app10124113

[49] Duan, J., Zhang, C., Gong, Y., Brown, S., & Li, Z. (2020). A content-analysis based literature review in blockchain adoption within food supply chain. International Journal of Environmental Research and Public Health, 17(5), 1784. doi:10.3390/ijerph17051784

[50] Kayikci, Y., Subramanian, N., Dora, M., & Bhatia, M. S. (2020). Food supply chain in the era of industry 4.0: Blockchain technology implementation opportunities and impediments from the perspective of people, process, performance, and Technology. Production Planning & Control, 33(2-3), 301-321. doi:10.1080/09537287.2020.1810757

[51] Khan, P. W., Byun, Y., & Park, N. (2020). IOT-blockchain enabled optimized provenance system for food industry 4.0 using Advanced Deep Learning. Sensors, 20(10), 2990. doi:10.3390/s20102990

[52] Bodkhe, U., Tanwar, S., Bhattacharya, P., & Kumar, N. (2020). Blockchain for precision irrigation: Opportunities and challenges. Transactions on Emerging Telecommunications Technologies, 33(10). doi:10.1002/ett.4059

[53] Bumblauskas, D., Mann, A., Dugan, B., & Rittmer, J. (2020). A blockchain use case in food distribution: Do you know where your food has been? *International Journal of Information Management, 52*, 102008. doi:10.1016/j.ijinfomgt.2019.09.004

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

[55] Hellani, H., Sliman, L., Samhat, A. E., & Exposito, E. (2021). On blockchain integration with supply chain: Overview on data transparency. Logistics, 5(3), 46. doi:10.3390/logistics5030046

[56] Tian, F. (2016). An agri-food supply chain traceability system for China based on RFID & Blockchain Technology. 2016 13th International Conference on Service Systems and Service Management (ICSSSM). doi:10.1109/icsssm.2016.7538424

[57] Lin, Y., Petway, J., Anthony, J., Mukhtar, H., Liao, S., Chou, C., & Ho, Y. (2017). Blockchain: The Evolutionary Next Step for ICT E-agriculture. Environments, 4(3), 50. doi:10.3390/environments4030050

[58] Bermeo-Almeida, O., Cardenas-Rodriguez, M., Samaniego-Cobo, T., Ferruzola-Gómez, E., Cabezas-Cabezas, R., & Bazán-Vera, W. (2018). Blockchain in agriculture: A systematic literature review. Communications in Computer and Information Science, 44-56. doi:10.1007/978-3-030-00940-3_4

[59] Dancho, D., Kocarev, L., Carbone, A., Stankovski, V., & Mitreski, K. (2018). Blockchain-based distributed cloud/fog platform for IoT supply chain management. Eighth International Conference on Advances in Computing, Electronics and Electrical Technology (CEET), 51-58.

[60] Galvez, J. F., Mejuto, J., & Simal-Gandara, J. (2018). Future challenges on the use of blockchain for food traceability analysis. TrAC Trends in Analytical Chemistry, 107, 222-232. doi:10.1016/j.trac.2018.08.011

[61] Jahanbin, P., Wingreen, S., & Sharma, R. (2019). A BLOCKCHAIN TRACEABILITY INFORMATION SYSTEM FOR TRUST IMPROVEMENT IN AGRICULTURAL SUPPLY CHAIN. In The 27th European Conference on Information Systems (ECIS). Stockholm & Uppsala, Sweden: AIS Electronic Library (AISeL).

[62] Madumidha, S., Ranjani, P. S., Varsinee, S. S., & Sundari, P. (2019). Transparency and traceability: In food supply chain system using blockchain technology with internet of things. 2019 3rd International Conference on

Trends in Electronics and Informatics (ICOEI), 983-987. doi:10.1109/icoei.2019.8862726

[63] Antonucci, F., Figorilli, S., Costa, C., Pallottino, F., Raso, L., & Menesatti, P. (2019). A review on Blockchain applications in the agri-food sector. Journal of the Science of Food and Agriculture, 99(14), 6129-6138. doi:10.1002/jsfa.9912

[64] Haroon, A., Basharat, M., Khattak, A. M., & Ejaz, W. (2019). Internet of things platform for transparency and traceability of Food Supply Chain. 2019 IEEE 10th Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON), 13-19. doi:10.1109/iemcon.2019.8936158

[65] Sunny, J., Undralla, N., & Madhusudanan Pillai, V. (2020). Supply chain transparency through blockchain-based traceability: An overview with demonstration. Computers & Industrial Engineering, 150. doi:10.1016/j.cie.2020.106895

[66] Iqbal, R., & Butt, T. A. (2020). Safe farming as a service of blockchain-based supply chain management for improved transparency. Cluster Computing, 23(3), 2139-2150. doi:10.1007/s10586-020-03092-4

[67] Sharma, R., Kamble, S. S., Gunasekaran, A., Kumar, V., & Kumar, A. (2020). A systematic literature review on machine learning applications for Sustainable Agriculture Supply Chain Performance. Computers & Operations Research, 119, 104926. doi:10.1016/j.cor.2020.104926

[68] Torky, M., & Hassanein, A. E. (2020). Integrating blockchain and the internet of things in Precision Agriculture: Analysis, opportunities, and challenges. Computers and Electronics in Agriculture, 178, 105476. doi:10.1016/j.compag.2020.105476

[69] Singh, P., & Singh, N. (2020). Blockchain with IOT and ai. International Journal of Applied Evolutionary Computation, 11(4), 13-27. doi:10.4018/ijaec.2020100102

[70] Feng, H., Wang, X., Duan, Y., Zhang, J., & Zhang, X. (2020). Applying blockchain technology to improve agri-food traceability: A review of development methods, benefits and challenges. Journal of Cleaner Production, 260, 121031. doi:10.1016/j.jclepro.2020.121031

[71] Saurabh, S., & Dey, K. (2021). Blockchain technology adoption, architecture, and sustainable agri-food supply chains. Journal of Cleaner Production, 284, 124731. doi:10.1016/j.jclepro.2020.124731

[72] Rana, R. L., Tricase, C., & De Cesare, L. (2021). Blockchain technology for a sustainable agri-food supply chain. British Food Journal, 123(11), 3471-3485. doi:10.1108/bfj-09-2020-0832

[73] Liu, W., Shao, X., Wu, C., & Qiao, P. (2021). A systematic literature review on applications of information and communication technologies and Blockchain Technologies for Precision Agriculture Development. Journal of Cleaner Production, 298, 126763. doi:10.1016/j.jclepro.2021.126763

[74] Niknejad, N., Ismail, W., Bahari, M., Hendradi, R., & Salleh, A. Z. (2021). Mapping the research trends on blockchain technology in Food and Agriculture Industry: A Bibliometric analysis. Environmental Technology & Innovation, 21, 101272. doi:10.1016/j.eti.2020.101272

[75] Ali, M. H., Chung, L., Kumar, A., Zailani, S., & Tan, K. H. (2021). A sustainable blockchain framework for the Halal Food Supply Chain: Lessons from Malaysia. Technological Forecasting and Social Change, 170, 120870. doi:10.1016/j.techfore.2021.120870

[76] Bai, C., Quayson, M., & Sarkis, J. (2022). Analysis of Blockchain's enablers for improving sustainable supply chain transparency in Africa Cocoa Industry. Journal of Cleaner Production, 358, 131896. doi:10.1016/j.jclepro.2022.131896

[77] Leng, K., Bi, Y., Jing, L., Fu, H., & Van Nieuwenhuyse, I. (2018). Research on agricultural supply chain system with double chain architecture based on Blockchain Technology. Future Generation Computer Systems, 86, 641-649. doi:10.1016/j.future.2018.04.061

[78] Yuan, H., Qiu, H., Bi, Y., Chang, S., & Lam, A. (2019). Analysis of Coordination Mechanism of Supply Chain Management Information System from the perspective of block chain. Information Systems and E-Business Management, 18(4), 681-703. doi:10.1007/s10257-018-0391-1

[79] Kandeeban, M., & Nivetha, T. (2019). Blockchain: A tool for a secure, safe and transparent way of food and Agricultural Supply Chain. International Journal of Farm Sciences, 9(1), 97. doi:10.5958/2250-0499.2019.00025.9

[80] Chod, J., Trichakis, N., Tsoukalas, G., Aspegren, H., & Weber, M. (2020). On the financing benefits of supply chain transparency and blockchain adoption. Management Science, 66(10), 4378-4396. doi:10.1287/mnsc.2019.3434

[81] Xiong, H., Dalhaus, T., Wang, P., & Huang, J. (2020). Blockchain technology for agriculture: Applications and rationale. Frontiers in Blockchain, 3. doi:10.3389/fbloc.2020.00007

[82] Shahid, A., Almogren, A., Javaid, N., Al-Zahrani, F. A., Zuair, M., & Alam, M. (2020). Blockchain-based Agri-Food Supply Chain: A complete solution. IEEE Access, 8, 69230-69243. doi:10.1109/access.2020.2986257

[83] Prashar, D., Jha, N., Jha, S., Lee, Y., & Joshi, G. P. (2020). Blockchain-based traceability and visibility for agricultural products: A decentralized way of ensuring food safety in India. Sustainability, 12(8), 3497. doi:10.3390/su12083497

[84] Dijk, van, S. J., Duysters, G. M., & Beulens, A. J. M. (2004). Transparency dilemmas, information technology and alliances in agriculture and food industry. (ECIS working paper series; Vol. 200323). Technische Universiteit Eindhoven.

[85] Barling, D., Sharpe, R., & Lang, T. (2009). Traceability and ethical concerns in the UK wheat—bread chain: From food safety to provenance to transparency. International Journal of Agricultural Sustainability, 7(4), 261-278. doi:10.3763/ijas.2009.0331

[86] Trienekens, J., Wognum, P., Beulens, A., & Van der Vorst, J. (2012). Transparency in complex dynamic food supply chains. Advanced Engineering Informatics, 26(1), 55-65. doi:10.1016/j.aei.2011.07.007

[87] Yu, M., Wang, Q., Yi, Z., & Zhang, Z. (2019). Impacts of vertical information transparency on an agricultural supply chain. 2019 International Conference on Industrial Engineering and Systems Management (IESM). doi:10.1109/iesm45758.2019.8948127

[88] Linsner, S., Steinbrink, E., Kuntke, F., Franken, J., & Reuter, C. (2022). Supporting users in data disclosure scenarios in agriculture through transparency. Behaviour & Information Technology, 41(10), 2151-2173. doi:10.1080/0144929x.2022.2068070

[89] Wilson, T., & Clarke, W. (1998). Food Safety and traceability in the agricultural supply chain: Using the internet to deliver traceability. *Supply Chain Management: An International Journal*, *3*(3), 127-133. doi:10.1108/13598549810230831

[90] Kaloxylos, A., Wolfert, J., Verwaart, T., Terol, C. M., Brewster, C., Robbemond, R., & Sundmaker, H. (2013). The use of future internet technologies in the agriculture and food sectors: Integrating the supply chain. Procedia Technology, 8, 51-60. doi:10.1016/j.protcy.2013.11.009

[91] Kassahun, A., Hartog, R., Sadowski, T., Scholten, H., Bartram, T., Wolfert, S., & Beulens, A. (2014). Enabling chain-wide transparency in meat supply chains based on the EPCIS Global Standard and cloud-based services. *Computers and Electronics in Agriculture*, *109*, 179-190. doi:10.1016/j.compag.2014.10.002

[92] Lianguang, M. (2014). Study on supply-chain of agricultural products based on IOT. 2014 Sixth International Conference on Measuring Technology and Mechatronics Automation, 627-631. doi:10.1109/icmtma.2014.153

[93] Aung, M. M., & Chang, Y. S. (2014). Traceability in a food supply chain: Safety and Quality Perspectives. Food Control, 39, 172-184. doi:10.1016/j.foodcont.2013.11.007

[94] Yan, B., Shi, S., Ye, B., Zhou, X., & Shi, P. (2014). Sustainable development of the fresh agricultural products supply chain through the application of RFID technology. Information Technology and Management, 16(1), 67-78. doi:10.1007/s10799-014-0196-y

[95] Godar, J., Suavet, C., Gardner, T. A., Dawkins, E., & Meyfroidt, P. (2016). Balancing detail and scale in assessing transparency to improve the governance of agricultural commodity supply chains. Environmental Research Letters, 11(3), 1-12. doi:10.1088/1748-9326/11/3/035015

[96] Seminar, K. (2016). Food Chain Transparency for Food Loss and Waste Surveillance. Journal of Developments in Sustainable Agriculture, 11, 17-22. doi:https://doi.org/10.11178/jdsa.11.17

[97] Yan, B., Yan, C., Ke, C., & Tan, X. (2016). Information sharing in supply chain of agricultural products based on the internet of things. Industrial Management & Data Systems, 116(7), 1397-1416. doi:10.1108/imds-12-2015-0512

[98] Liu, Y., Han, W., Zhang, Y., Li, L., Wang, J., & Zheng, L. (2016). An internet-of-things solution for food safety and quality control: A pilot project in China. Journal of Industrial Information Integration, 3, 1-7. doi:10.1016/j.jii.2016.06.001

[99] Srinivasan, S., Shanthi, D. S., & Anand, A. V. (2017). Inventory transparency for agricultural produce through IOT. IOP Conference Series: Materials Science and Engineering, 211, 012009. doi:10.1088/1757-899x/211/1/012009

[100] El Bilali, H., & Allahyari, M. S. (2018). Transition towards sustainability in agriculture and food systems: Role of Information and Communication Technologies. Information Processing in Agriculture, 5(4), 456-464. doi:10.1016/j.inpa.2018.06.006

[101] Purwandoko, P., Seminar, K., Sutrisno, S., & Sugiyanta, S. (2019). Development of a smart traceability system for the rice agroindustry supply chain in Indonesia. Information, 10(10), 288. doi:10.3390/info10100288

[102] Yadav, S., Luthra, S., & Garg, D. (2020). Internet of things (IOT) based coordination system in Agri-Food Supply Chain: Development of an efficient framework using DEMATEL-ism. Operations Management Research, 15(1-2), 1-27. doi:10.1007/s12063-020-00164-x