Journal of Scientometric Research, 2026; 15(2):570-582.
https://www.jscires.org

Research Article

Circular Economy for Supply Chain in Agriculture with Technology: A Review

Luis Oswaldo Rodríguez Mañay*

Posdoctoral Program in Law, Economics, and Plural Society, Universidad Andina Simón Bolívar, SEDE ECUADOR.

ABSTRACT

This study examines the role of digital technologies in enabling the transition to a Circular Economy (CE) within Agricultural Supply Chains (ASCs), identifying research trends, collaboration networks, and systemic barriers. A scientometric review of 277 publications from Scopus and Web of Science (WoS) (2009-2024) was conducted, using text mining and the Tree of Science (ToS) algorithm to map scientific production and disruptive innovations. The results indicate that Italy, the UK, and India lead research output in this field. Technologies such as blockchain, IoT (Internet of Things), and artificial intelligence emerge as key enablers for enhancing traceability, reducing waste, and optimizing resources. However, significant barriers persist, including scalabity issues, regulatory fragmentation, and limited cross-sector collaboration. The study concludes that effective implementation of circular models in ASCs requires integrated policies, longitudinal studies, and global partnerships to foster technological adoption and adaptive governance. This work synthesizes fragmented literature, highlights divergent hypotheses, and provides actionable insights for aligning CE strategies with the Sustainable Development Goals (SDGs).

Keywords: Agricultural Supply Chains, Circular Economy, Industry 4.0, Scientometrics Tree of Science.

Correspondence:
Luis Oswaldo Rodríguez Mañay
Posdoctoral Program in Law, Economics, and Plural Society, Universidad Andina Simón Bolívar, SEDE ECUADOR.
Email: lorodriguez@uce.edu.ec

Received: 09-02-2026;
Revised: 24-04-2026;
Accepted: 19-06-2026.

INTRODUCTION

The transition to a Circular Economy (CE) has emerged as a pivotal paradigm for achieving sustainability, driven by the urgent need to decouple economic growth from environmental degradation (Geissdoerfer *et al.*, 2017; Ghisellini *et al.*, 2016). CE principles -eliminating waste through design, maintaining products in use, and regenerating natural systems-offer transformative potential across sectors, particularly in agriculture, where supply chains face escalating challenges from climate change, resource scarcity, and inefficiencies (FAO, 2019; Kirchherr *et al.*, 2017). Despite its promise, CE implementation encounters significant barriers, including technological gaps, regulatory fragmentation, and cultural resistance (Korhonen *et al.*, 2018; A. Kumar *et al.*, 2024).

These challenges in CE implementation are particularly evident in Agricultural Supply Chains (ASCs), which are especially critical yet vulnerable. ASCs contribute significantly to global greenhouse gas emissions while simultaneously facing persistent inefficiencies, post-harvest losses, and fragmented coordination among stakeholders (Gokarn and Kuthambalayan, 2017; Vermeulen *et al.*, 2012). Although emerging technologies such as blockchain, Internet of Things (IoT), and artificial intelligence are increasingly recognized as enablers of circular practices -enhancing traceability, optimizing resource use, and reducing waste- their adoption remains uneven due to high costs, limited infrastructure and insufficient policy support (Kamble *et al.*, 2020; Rejeb *et al.*, 2021; Nayal *et al.*, 2021; Sharma *et al.*, 2021).

While previous studies have identified multiple gaps, including fragmented research streams, limited cross-sector collaboration, and a lack of longitudinal perspectives, a central gap remains insufficiently addressed: the absence of a comprehensive and integrated mapping of how digital technologies enable the implementation of CE within ASCs (Barbosa *et al.*, 2025). This limitation restricts a systemic understanding of how technological innovations can effectively support circular transformation in agricultural systems (Ellahi *et al.*, 2024; Marku *et al.*, 2024).

To address this issue, this study adopts a scientometric approach. Scientometric analysis is particularly suitable for examining more than 15 years of dispersed literature, as it enables the identification of research evolution, thematic clusters, and collaboration networks. Compared to traditional narrative reviews, this method provides a more systematic and objective mapping of an emerging and fragmented research field.

DOI: 10.5530/jscires.20260260

Accordingly, this study aims to systematically analyze the intersection of CE, ASCs, and digital technologies through a scientometric review of publications indexed in Scopus and Web of Science (WoS) between 2009 and 2024. Specifically, it seeks to identify key drivers and barriers, examine the role of emerging technologies in enabling circular supply chains, and provide a structured overview of research trends and future directions. This work contributes by synthesizing fragmented literature, highlighting divergent perspectives (Korhonen *et al*., 2018), and advancing a more integrated understanding of technology-driven circularity in agricultural supply chains.

LITERATURE REVIEW

Circular Economy Principles

CE has emerged as a key paradigm for sustainability, founded on three core principles: eliminating waste and pollution through design, keeping products and materials in use via reuse, repair, and recycling, and regenerating natural systems to restore ecosystems. Research indexed in Scopus and WoS highlights that these principles not only reduce pressure on natural resources and lower greenhouse gas emissions but also create economic opportunities and jobs in sectors such as remanufacturing and recycling (Geissdoerfer *et al*., 2017; Ghisellini *et al*., 2016). However, its implementation faces significant challenges, including technological limitations, regulatory barriers, and cultural resistance, which demand innovation, coherent policies, and shifts in consumption behaviors (Kirchherr *et al*., 2017; Korhonen *et al*., 2018). Despite these obstacles, CE represents a crucial pathway for achieving the SDGs, fostering a balance between economic growth, environmental protection, and social equity-provided that multisectorial collaboration is strengthened and comprehensive strategies are promoted for large-scale adoption. Within this context, agricultural supply chains represent a critical domain where CE principles can be operationalized, given their complex material flowes and high levels of waste generation.

Agricultural Supply Chain (ASC) Challenges

Challenges in ASCs are multifaceted and influenced by factors such as globalization, climate change, price volatility, and sustainability demand. Research indexed in Scopus and WoS highlights that logistical inefficiencies, inadequate infrastructure, and fragmentation among supply chain actors lead to significant post-harvest losses, particularly in developing countries (FAO, 2019; Gokarn and Kuthambalayan, 2017). Furthermore, climate change exacerbates these issues by disrupting production patterns and increasing the frecuency of extreme weather events, which affects food availability and quality (Vermeulen *et al*., 2012). The growing demand for sustainable practices and traceability also pressures producers and distributors to adopt innovative technologies -such as blockchain and precision agriculture - to enhance transparency and reduce environmental impact (Kamilaris *et al*., 2019). However, implementing these solutions faces barriers such as high costs, lack of training, and resistance to change, underscoring the need for integrated policies, infrastructure investment, and public-private collaboration to build more resilient, efficient, and sustainable ASCs. Theses challenges highlight the need for innovative solutions, particularly technological ones, to operationalize CE principles is ASCs, enabling improved traceability, efficiency, and waste reduction.

Role of Emerging Technologies in CE

Emerging technologies are crucial in advancing the CE, particularly within ASCs, where they enable the operationalization of circular practices suchs as waste reducions, resource optimization, and enhanced traceability. The IoT enables real-time resource tracking and optimization, with Rajput and Singh (2019) highlighting its role in smart supply chains and efficient resource management. AI enhances decision-making by analyzing data to optimize resource use and improve recycling processes, as noted by Acerbi *et al*. (2021). Blockchain ensures transparency and traceability in supply chains, fostering trust and accountability, as discussed by Saberi *et al*. (2019). Additionally, advanced recycling technologies, such as chemical recycling and biodegradable materials, are essential for closing material loops, with Garcia and Robertson (2017) emphasizing their role in achieving a CE for plastics. Together, these technologies support the transition from linear to circular models specifically within agricultural supply chains.

METHODOLOGY

Search strategy

The scientific databases Scopus and WoS were systematically reviewed to collect data and conduct the necessary analysis. These databases were selected due to their broader coverage compared to Google Scholar, providing more comprehensive results for the targeted content (Rajit *et al*., 2025). Furthermore, Scopus and WoS demonstrate greater precision and reliability than Google Scholar (Adriaanse and Rensleigh, 2013). The data collection timeframe spanned from 2009 to 2024. The year 2009 was chosen as the starting point due to the unavailability of relevant data prior to this date.

The keywords were selected based on a literature analysis, topic brainstorming, and the "snowball sampling" method (Culot *et al*., 2020). As detailed in Table 1, Group I include terms related to the "Circular Economy" as the central focus of the search, while Group II encompasses keywords associated with the supply chain. To connect these terms, the Boolean operators "AND" and "OR" were used.

This study applied an adapted PRISMA methodology Figure 1 to review the literature on the CE in ASCs enabled by technology. The search string combined key terms such as "circular economy", "supply chain", and "technolo" with the filter "agr", retrieving

368 initial records (101 from WoS and 267 from Scopus). After removing 91 duplicates, 277 unique articles were selected. Academic documents such as journal articles, books, and conference proceedings were prioritized for their scholarly rigor and thematic relevance.

The search string was specifically designed to capture studies linking the CE with ASCs through key technologies. The combination of terms- "circular economy", "supply chain", and "technolo" (along with variants such as "IoT" and "digitalization") -ensures the results address the intersection of these three thematic areas. The "agr" filter scopes the search to agriculture, preventing deviations into other sectors. Thus, the search strategy reflects the core objective of this review: to analyze how technology drives circular models in ASCs, from resource optimization to digital traceability.

The final selection of 277 documents resulted from requiring articles to simultaneously meet these criteria, balancing breadth (using OR operators for synonyms) and focus (combining concept blocks with AND operators). This approach guarantees that the reviewed literature is relevant for exploring both bibliometric trends and the practical implications of the topic.

During the processing phase, text mining and web scraping techniques were employed to extract metada, keywords, and supplementary data. This information was organized into 22 spreadsheets, one of which contains the results of the Tree of Science (ToS) analysis, which classifies articles into Roots, Trunk, and Branches. Inclusion criteria (focus on CE, technology, and agriculture) and exclusion criteria (duplicates and non-academic documents) were systematically applied.

To complement the PRISMA flow diagram, a scientometric analysis was conducted to map production by country, author, and journal. Furthermore, the Tree of Science methodology was used to identify foundational contributions (Roots), consolidated studies (Trunk), and recent advancements (Branches). Together, these methods provide a comprehensive mapping of the state of the art.

Scientific Mapping

Scientific mapping has become a well-established scientometric tool for analyzing academic literature, as evidenced by numerous recent studies. This methodology relies on bibliometric indicators related to authors and sources, facilitating the identification of patterns and trends in scientific output. A notable example of its utility is the detection of disruptive innovations, where scientometric analysis has emerged as an indispensable resource for exploring significant advances across various disciplines (Moral-Muñoz *et al*., 2020).

This study focuses on four key dimensions: scientific output, country, journal, and author analysis. This approach provides readers with a comprehensive overview of a research topic, starting from a broad perspective and culminating in a detailed examination of collaboration networks. To optimize citation analysis, we employed a method that constructs a collaboration network from references (Bornmann and Marx, 2014), enabling a more precise identification of underlying network structures within the scientometric data.

All procedures were conducted using the statiscal software RStudio (version 2023.12.0+369), along with its Bibliometrix extension (version 4.1.0), while visualizations were generated using the R packages ggraph (version 2.1.0) and Gephi (version 0.10.1).

Tree of science

The digital era has catalyzed exponential growth in the production and accessibility of academic, posing the challenge of efficiently managing the vast and continuously expanding volume of research. In this context, the Tree of Science (ToS) methodology has emerged as a pivotal tool for optimizing the identification of relevant publications within this academic landscape (Eggers *et al*., 2022). Based on graph theory, the ToS algorithm organizes articles into a tree-like structure, where classical or seminal works represent the roots, foundational studies form the trunk, and the most recent research occupies the leaves (Robledo *et al*., 2022; Zuluaga *et al*., 2022).

An advanced version of this algorithm, termed SAP, has significantly enhanced the precision of results, particularly in identifying recent studies (Valencia-Hernández *et al*., 2020). To facilitate its application, the Tosr package automates the SAP algorithm and streamlines data integration from Scopus and WoS.

Table 1: Parameters used in Circular Economy for supply chain in agriculture with technology.

Parameter	Web of Science	Scopus
Range	2008-2024	
Date	January, 2025	
Document Type	Paper, book, chapter, conference proceedings	
Words	("circular economy" OR "circular economies" OR "circular supply chain" OR "circularity") AND ("supply chain" OR "supply chains" OR "value chain" OR "logistics") AND ("technolo*" OR "digitalization" OR "smart technology" OR "IoT" OR "big data" OR "automation") AND ("agr*")	
Results	101	267
Total (Wos+Scopus)		277

Source: own elaboration.

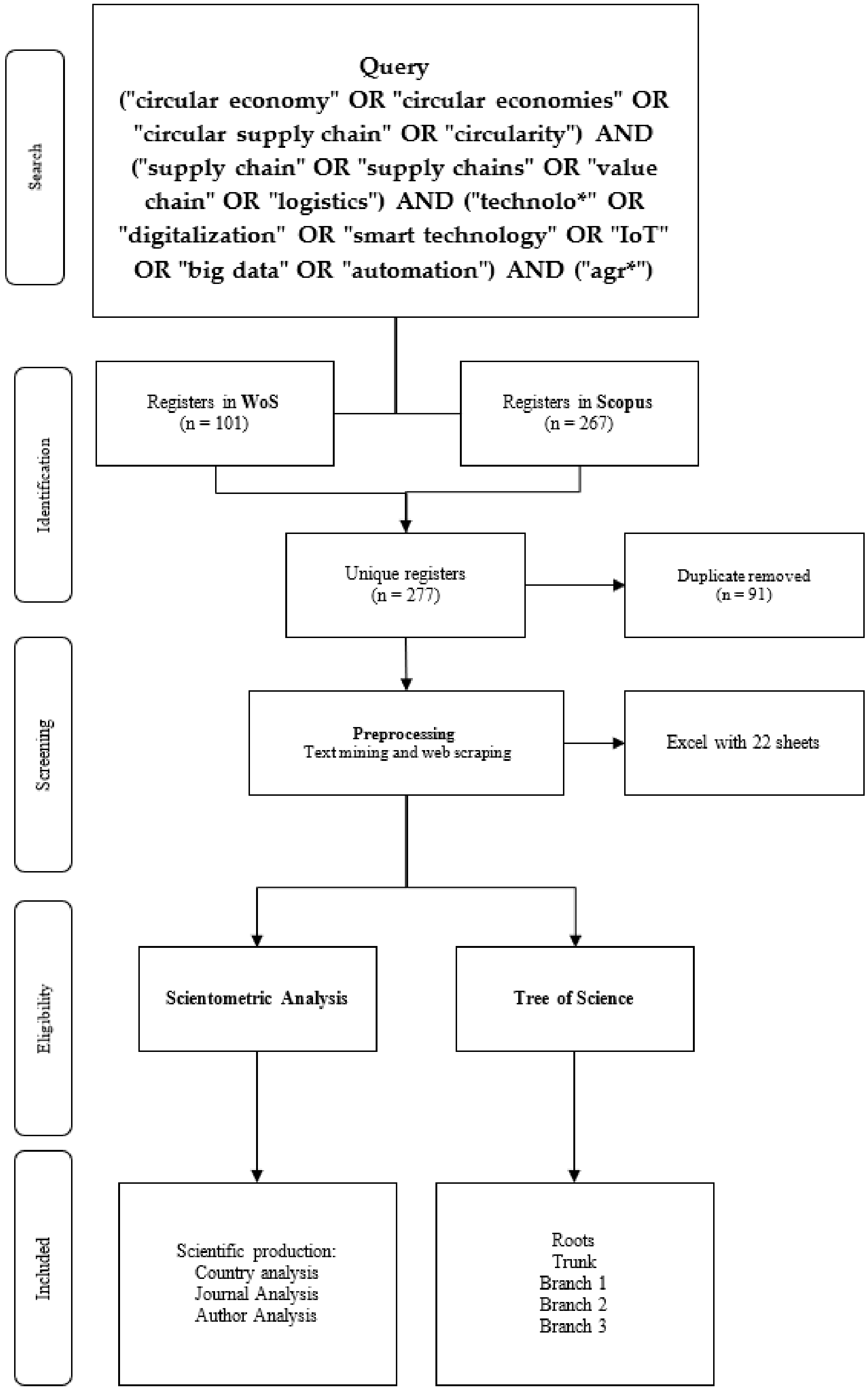

Figure 1: PRISMA diagram for preprocessing data. Source: own elaboration.

Constructing a ToS requires users to download two files: a Scopus. bib file and a WoS.txt file, both containing article references. Next, users must initiate an RStudio Cloud session and load the Tosr, bibliometrix (Aria and Cuccurullo, 2017) and tidyverse (Wickham *et al*., 2019) libraries to process and analyze the data efficiently.

RESULTS AND DISCUSSION

Scientometric Analysis

Scientific Production

The graph titled Total Scientific Production vs Total Citations provides a comparative analysis of scientific output and total citations collected in Scopus and WoS, two of the most prominent bibliographic databases. Total scientific production represents the number of publications recorded in both platforms between 2018 and 2024, while total citations reflect references received by these publications during the same period (Figure 2).

Between 2018 and 2020, both indicators show gradual growth, attributable to research consolidation and increased digital visibility. The 2020-2021 period marks an inflection point, with a significant surge in scientific output (particularly in COVID-19 related fields) and a notable citation increase, reflecting the relevance of pandemic-era research. From 2021 to 2023, publication rates stabilized while citations continued growing, indicating sustained impact of prior work. For 2023-2024, a slight production decline is projected (potentially due to post-pandemic normalization), while citations keep rising, demostrating the enduring relevance of earlier research.

Regarding database comparisons, Scopus exhibits higher publication volumen due to its broader coverage, though its citations don´t consistently surpass WoS´s-suggesting differences in perceived quality or impact. Conversely, WoS, with fewer publications, shows higher citation counts, likely attributable to its journals' greater impact factors or influence. This analysis highlights dynamic trends in scientific research and its temporal impact patterns.

Country Analysis

Table 2 reveals Italy and the United Kingdom as the countries with the highest citation counts. The most cited Italian study (De Corato, 2020) critically analyzes and compares the most promising technologies for on-site recycling of residual biomass into high-value soil amendments (compost) and plant treatments (compost tea). From the UK, a highly influential study by Maina *et al.* (2017) provides a comprehensive overview of current bioconversion methods for waste and by-product streams to advance biorefinery concepts.

Figure 3 highlights a key finding from U.S. China collaborations: the impact of The Coca-Cola Company´s PlantBottle technology. Data indicate that since 2009, the distribution of over 30 billion units has resulted in an annual reduction of 315.000 metric tons of CO_2 emissions. To expand this initiative, the company is collaborating with the Yangtze River Delta Circular Economy Technology Institute to convert agricultural waste into bioPET. The establishment of viable local production and supply chains for bio-MEG in China not only strengthens this partnership but could also catalyze the global transition toward recyclable plastics (Ren *et al*., 2015).

Journal Analysis

As shown in Table 3, the journal "Science of the Total Environment" exhibits the highest H-index. Its most cited article on this topic (De Corato, 2020) reports that the use of compost derived from

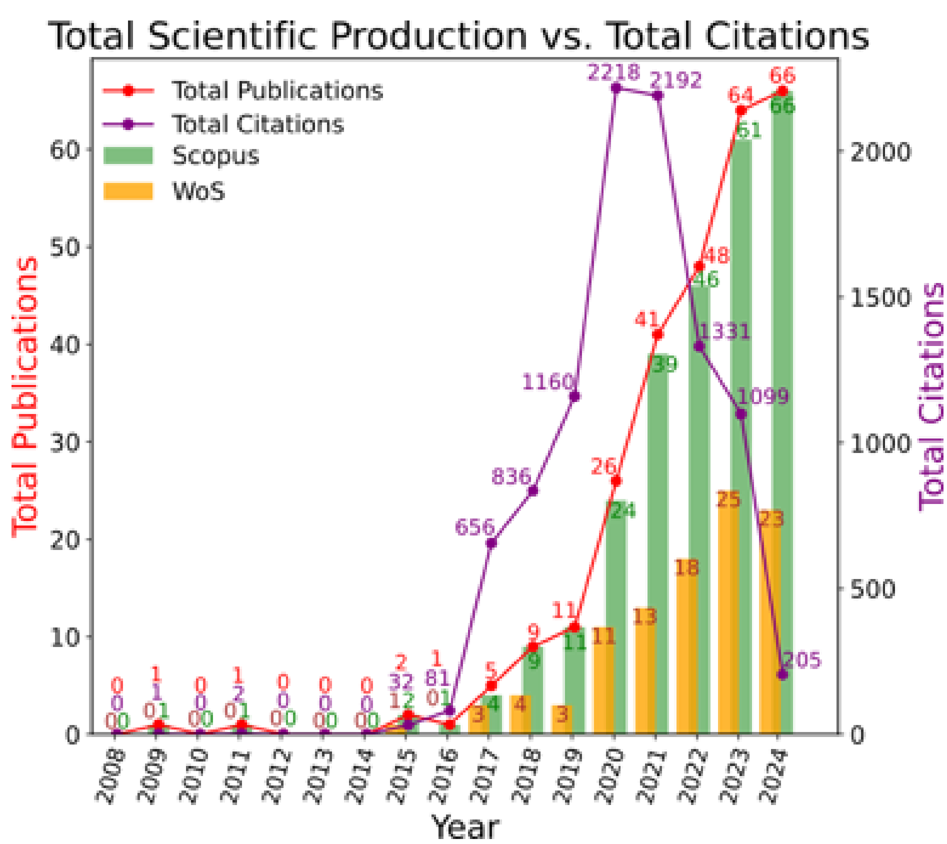

Figure 2: Total Scientific Production vs Total Citations. Source: own elaboration.

Table 2: Top 10 most productive countries.

Country	Production		Citation		Q1	Q2	Q3	Q4
	Count	Percentage	Count	Percentage				
India	28	10.18%	460	6.9%	6	0	2	5
Italy	26	9.45%	713	10.7%	10	2	3	1
China	19	6.91%	217	3.26%	8	0	1	1
United Kingdom	15	5.45%	647	9.71%	8	0	1	1
Brazil	14	5.09%	157	2.36%	3	0	2	0
Usa	12	4.36%	72	1.08%	6	1	0	0
Germany	11	4%	87	1.31%	1	2	0	1
Spain	11	4%	253	3.8%	5	1	1	0
France	10	3.64%	596	8.95%	6	1	1	1
Australia	8	2.91%	300	4.5%	3	2	0	0

Source: own elaboration.

agricultural waste-particularly as compost tea-offers significant benefits for soil and plant health by acting as a biological control agent against soil pathogens. However, the study also identifies barriers to its adoption, including high costs and complex regulatory frameworks within the European Union. Meanwhile, “Resources, Conservation and Recycling” ranks highest in terms of Impact Factor. Its most cited paper in this domain (Watari *et al*., 2020) presents a comprehensive assessment of demand projections and material dynamics for 48 critical metals up to 2050. The findings underscore an urgent need to improve demand forecasting -especially for emerging industries such as medical devices, robotics, and drones- and to address the social and environmental implications across the full metal lifecycle. The authors emphasize circular economy strategies, including reuse and recycling, as essential to mitigating these challenges.

As shown in Figure 4, the journals “Chemosphere”, “Desalination”, and “Environmental Research” (Community 1) are highly pertinent to this research. Their relevance lies in their collective focus on specific aspects of the circular economy-such as nutrient recovery and anaerobic digestion-and their integration with technology applied to agricultural supply chains. Together, these publications provide a robust scholarly foundation for analyzing both the challenges and opportunities of implementing technology-driven circular economy models in agriculture (Soo and Shon, 2024; Subbarao *et al*., 2023).

In Community 2, the journals “Journal of Environmental Management”, “Environmental Science and Pollution Research”, and “Frontiers in Energy Research”, align closely with the scope of this research. These journals consistently publish studies integrating circular economy principles, sustainability, and advanced technologies-such as Industry 4.0 and blockchain-into supply chain management, particularly within the agricultural sector (Munir *et al*., 2022; Perçin, 2022; Yontar, 2023). While “the Journal of Environmental Management and Environmental Science” and “Pollution Research” emphasize environmental management and sustainability, “Frontiers in Energy Research” focuses on innovative technologies like blockchain to enhance sustainable practices. Collectively, these publications cover environmental, social, and technological dimensions of circular economy applications in agricultural supply chains, forming a robust foundation for a systematic literature review on this topic. The highly cited articles within these journals demonstrate their direct engagement with both the challenges and opportunities of implementing technological solutions to achieve sustainable and circular agricultural supply chains.

Within Community 3, the journals “International Journal of Molecular Sciences” and “Molecules” are highly relevant to this research topic. They consistently publish studies on the valorization of agricultural waste, the application of advanced technologies such as ultrasound-and microwave-assisted extraction, and sustainable business models that integrate CE principles into agriculture. These publications address both the transformation of by-products into bioactive compounds, biomaterials, and bioenergy, as well as the optimization of supply chains through technological innovations. Their focus on bridging molecular science, resource efficiency, and circular business models makes them key sources for a comprehensive literature review on this subject (Di Maro *et al*., 2024; Nosratabadi *et al*., 2019).

Author Collaboration Network

Table 4 presents the most prolific authors. Researcher Shon, with the highest H-index among the authors analyzed, focuses his research on the applicaton of machine learning for nutrient recovery in the context of the urban CE, with an emphasis on waste management and its reuse in agriculture. This makes his work highly relevant to the research topic. His contribution lies in detailing how advanced technologies, such as drones and monitoring systems, optimize nutrient recovery and application within the agricultural supply chain, promoting sustainability and efficiency within a circular economy framework. For a literature review, this article is a key source for exploring the intersection between Smart technologies, waste management, and sustainable agricultural supply chains (Soo *et al*., 2023).

Research Ghosh, with an H-index of 78, focuses his research on providing a robust framework for understanding how the circular economy catalyzes decarbonization, with direct applications in agriculture. His emphasis on emission reduction, waste management, and multi-stakeholder collaboration is highly relevant to the proposed research topic, serving as a foundation for exploring how technologies can transform agricultural supply chains towards more circular and sustainable models (Ghosh and Ghosh, 2023).

Research Raut, with an H-index of 51, centers his research on the adoption of Industry 4.0 and the CE in industrial contexts, focusing on literature review and the analysis of factors that facilitate this adoption. Although not specifically focused on agriculture, it shares common ground with the proposed topic, particularly in the use of advanced technologies to promote CE practices. To relate it directly to the agricultural supply chain, it would be necessary to explore how the principles and technologies discussed in the document (such as IoT, big data, or automation) can be applied to specific agricultural challenges, such as waste management, resource optimization, or product traceability. A literature review focused on agriculture could use the document´s framework as a basis but should be complemented with studies specific to the agricultural sector to address its particularities (Kumar *et al*., 2021).

As identified in Figure 5 (Community 1), the research of Kumar P. focuses on the digitalization and sustainability of agri-food supply chains. His work highlights the application of emerging technologies-such as blockchain, IoT, artificial intelligence, and big data-to drive the CE, improve traceability, reduce food waste, and increase resilience against disruptions (Darshan *et al*., 2022). These themes are directly aligned with the proposed research topic, as the studies address barriers, opportunities, and technological applications for sustainable agricultural supply chains. The proposed review can leverage these works to map existing knowledge, identify gaps, and apply bibliometric approaches, providing a solid foundation for exploring the integration of technologies into the agricultural circular economy.

In Community 2, Al Ansari T and Menezes stand out. Their research on the CE in AFSC highlights the integration of Industry 4.0 technologies (IoT, Big Data, Blockchain) to improve traceability, transparency, and waste reduction, positioning them as key enablers of circularity. Emphasis is placed on waste management, transforming it into resources through processes like fermentation or anaerobic digestion, and on Life Cycle Assessment (LCA) to measure sustainability (Mohamed *et al*., 2021; Yaqot *et al*., 2023). Furthermore, technical, economic, and social barriers to the adoption of these technologies are identified, along with the need for optimization models and regulatory policies to drive circularity. This approach converges on practical applications, impact assessment, and the identification of gaps for future research, thereby strengthening sustainability in the agri-food sector.

In Community 3, Sehnem S stands out. Her research on the circular economy within the agri-food sector emphasizes the valorization of agro-industrial by-products, such as the conversion of waste (lactose, milk permeate, wheat by-products) into animal feed, and the use of advanced technologies (biorefineries, blockchain, machine learning, IoT) to optimize nutrient management, waste handling, and logistics, promoting Smart and sustainable supply chains (Manganda *et al*., 2024). These practices, supported by regulatory frameworks such as sustainability laws and international standards, along with initiatives like urban agriculture and phytoremediation, reinforce waste reduction, the integration of small farmers into sustainable

Figure 3: Country collaboration network. Source: own elaboration.

Table 3: Top 10 most productive journals.

Journal	WoS	Scopus	Impact Factor	Quartile	H Index
Sustainability (Switzerland)	0	11	0.672	Q1	169
Journal of Cleaner Production	8	10	2.058	Q1	309
Resources, Conservation and Recycling	0	8	2.77	Q1	196
Science of the Total Environment	5	6	1.998	Q1	353
Circular Economy And Sustainability	0	5	0.931	Q1	21
Computer Aided Chemical Engineering	0	4	0.103	Q4	32
Energies	2	4	0.651	Q1	152
Environmental Science and Pollution Research	3	4	1.006	Q1	179
Journal of Enterprise Information Management	3	3	1.648	Q1	82
Journal of Environmental Management	1	3	1.771	Q1	243

Source: own elaboration.

markets, and soil decontamination. This work aligns with the SDGs 2,12, 13 and demonstrates practical applications in diverse global contexts (Provensi *et al*., 2025).

Tree of Science

Figure 6 presents a word network map visualizing key themes in sustainability, circular economy, and bioeconomy, grouped into orange clusters (production, technology, traceability), green (sustainable agriculture, circular development), and purple (bioeconomy, food security). Nodes such as "SUSTAINABLE", "FOOD", and "CIRCULAR" reflect interdisciplinary connections, highlighting trends in digitalization, agriculture, and bioenergy. However, the absence of terms related to public policies or climate change suggests research gaps. Future studies should employ quantitative analyses to explore these patterns and align priorities with the SDGs.

Root

The analyzed documents explore diverse approaches and challenges of the CE across different contexts Kirchherr *et al*. (2017) identify that CE is commonly defined around the "3Rs" (reduce, reuse, recycle), but caution that its systemic change requirements and connections to social equity and future generations are rarely emphasized Ghisellini *et al*. (2016) highlight that CE aims to decouple economic growth from environmental pressure, citing successful waste management cases in developed countries. Meanwhile, Korhonen *et al*. (2018) argue that CE is an "essentially contested concept", with research predominantly focused on technical aspects while neglecting social and cultural dimensions.

In practical applications, Kamble *et al*. (2020) highlight the potential of blockchain technology to enhance traceability in ASCs, particularly in India, where it can reduce intermediaries and ensure food security Genovese *et al*. (2017) demonstrate, through case studies in the chemical and food industries, that integrating the CE into supply chains reduces emissions and the use of virgin resources. Finally, Barros *et al*. (2020) emphasize the role of bioenergy in agriculture for cutting emissions, though they note that only 9% of the global economy is circular, with Europe leading research in this field. These studies agree on the need for interdisciplinary approaches, clear policies, and collaboration among stakeholders to advance toward truly circular and sustainable systems.

Trunk

The analyzed literature highlights the impact of digitalization and blockchain technology on Food Supply Chain (FSCs) and their contribution to sustainability Rejeb *et al*. (2021). conducted a bibliometric analysis of 2.140 articles, identifying technologies such as blockchain, artificial intelligence, and the IoT as pivotal for enhancing FSC resilience and efficiency, with a focus on food security, waste reduction, and CE practices. Meanwhile, Munir *et al*. (2022) explored blockchain´s potential to transform sustainable supply chains, emphasizing its ability to improve traceability, transparency, and resource efficiency in sectors like agriculture, manufacturing, and pharmaceuticals-though they noted persistent adoption challenges. Both studies emphasize that these technologies not only optimize economic processes but also promote environmental and social sustainability, providing researchers and professionals with tools to advance toward more circular and efficient systems.

Branch 1

The reviewed articles address the application of CE principles in food production systems and waste management, highlighting critical insights from diverse studies. Gkountani and Tsoulfas (2021) emphasize how CE can mitigate environmental and economic impacts in food processing and manufacturing stages, contrasting with traditional linear models. Danya *et al*. (2024) explore biorefineries as a solution to food waste, converting residues into bioproducts through microbial and enzymatic technologies-though they note challenges such as feedstock variability and industrial scalability.

Jemili *et al*. (2024) optimize Tunisia´s biogas supply chain, demonstrating its viability with levelized electricity costs of 14.2-19 cents/kWh, while Subbarao *et al*. (2023) underscore the potential of anaerobic digestion to reduce carbon emissions, particulary in India, where it could cut 3.5-3.8 kg of CO_2 per capita annually.

Further, Ranjbari *et al*. (2022) identify four key themes in biomass and organic waste valorization, including conversion technologies and lifecycle assessments. Stempfle *et al*. (2021) map strategies for implementing CE in olive oil supply chains, and Lampridi *et al*. (2021) propose precision agriculture systems to optimize dairy value chains Sun and Fan (2020) review optimization methods for biomass supply chains, highlighting challenges like sustainability trade-offs and operational uncertainties. Finally, Chauhan (2020) stresses the role of digital platforms in reducing food waste in India, demonstrating their potential to enhance supply chain efficiency. These studies converge on the need for technological innovation, cross-sector collaboration, and robust policy frameworks to transition toward sustainable and circular systems.

Branch 2

The reviewed articles demonstrate blockchain´s transformative potential in integrating CE principles into agri-food supply chains Ellahi *et al*. (2024) highlight its ability to ensure transparency, traceability, and fraud reduction through immutable records and smart contracts, while identifying underexplored applications such as food redistribution and animal welfare ("Blockchain enhances data integrity and optimizes humanitarian initiatives").

Santos *et al*. (2024) emphasize blockchain's utility in reverse logistics for managing pesticide waste and prioritizing critical factors like food waste prevention and lifecycle traceability, supported by methods such as ANP-MAIRCA. Conversely, Pakseresht *et al*. (2023) underscore how blockchain mitigates information asymmetrics and promotes and promotes eco-efficiency, though the note gaps in empirical evidence regarding waste valorization ("Its capacity to monitor risks in recycled biomass remains understudied").

Furthermore, barriers and facilitators are identified (Kumar *et al*., 2021; Sharma *et al*., 2021) highlight obstacles such as lack of government support and inconsistent policies, while proposing frameworks like the "12 R's" for circularity, where traceability emerges as a key factor dependent on connectivity and information flow. Finally, Pandey *et al*. (2022) summarize blockchain´s global impact on authentication and logistics but warn of technical challenges (scalability, costs). Collectively, these studies demonstrate that blockchain not only optimizes sustainable supply chains but also requires regulatory frameworks and integrated technical solutions to overcome current limitations.

Branch 3

The reviewed articles reveal key consensuses and significant contributions on integrating CE principles into agricultural supply chains through disruptive technologies Manganda *et al*. (2024) highlight the role of Brazilian agtechs in adopting

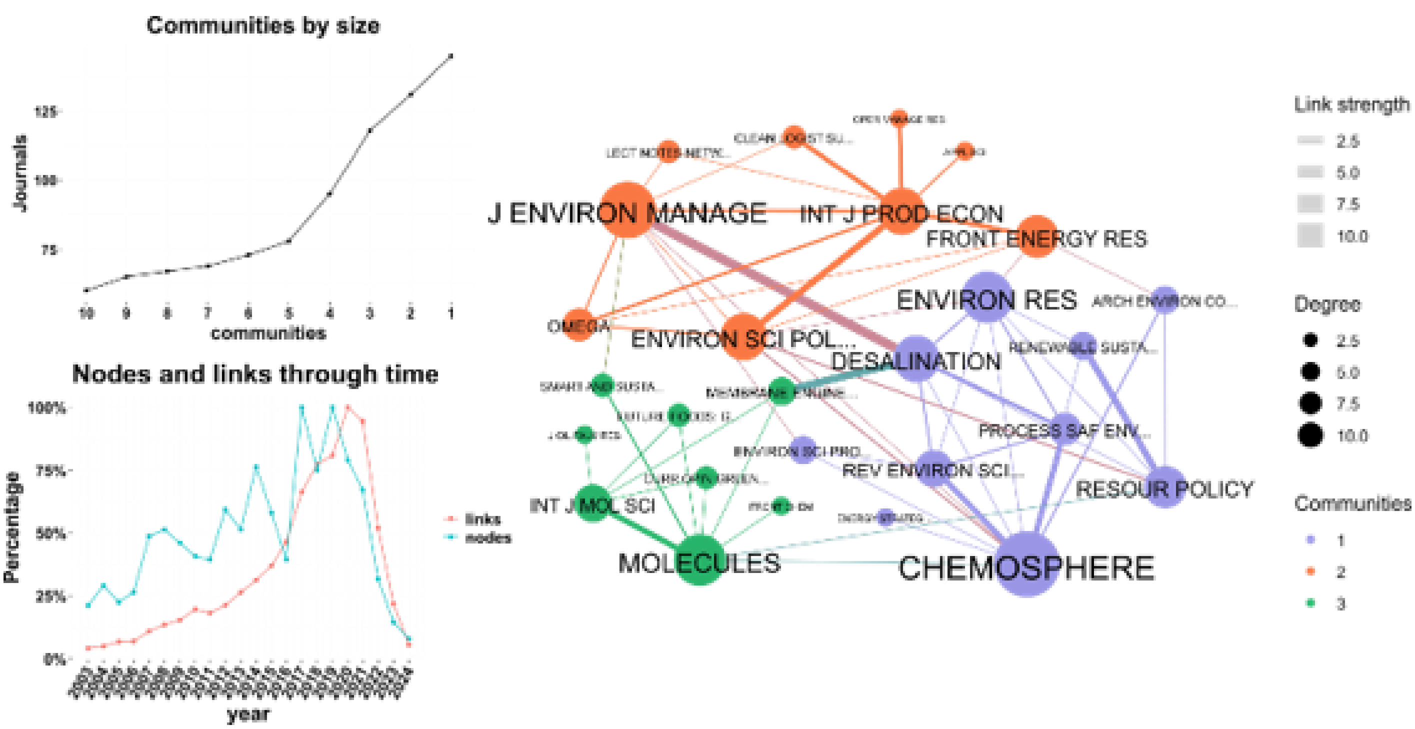

Figure 4: Journal collaboration network. Source: own elaboration.

Table 4: Production by Author.

Sl. No.	Author	Total Publications	H- Index	Affiliation
1.	Al-Ansari T	3	48	Hamad Bin Khalifa University, Doha, Qatar
2.	Ghosh S	3	78	Laboratoire Leprince-Ringuet, Palaiseau, France
3.	Krstić M	3	16	Università del Salento, Lecce, Italy
4.	Kumar P	3	10	Indian Institute of Technology Hyderabad, Sangareddy, India
5.	Menezes B	3	15	Hamad Bin Khalifa University, College of Science and Engineering, Doha, Qatar
6.	Miglietta P	3	21	Università del Salento, Lecce, Italy
7.	Narkhede B	3	42	Indian Institute of Management Mumbai, Mumbai, India
8.	Raut R	3	51	Indian Institute of Management Mumbai, Mumbai, India
9.	Sehnem S	3	19	Universidade do Oeste de Santa Catarina, Joacaba, Brazil
10.	Shon H	3	79	University of Technology Sydney, Sydney, Australia

Source: own elaboration.

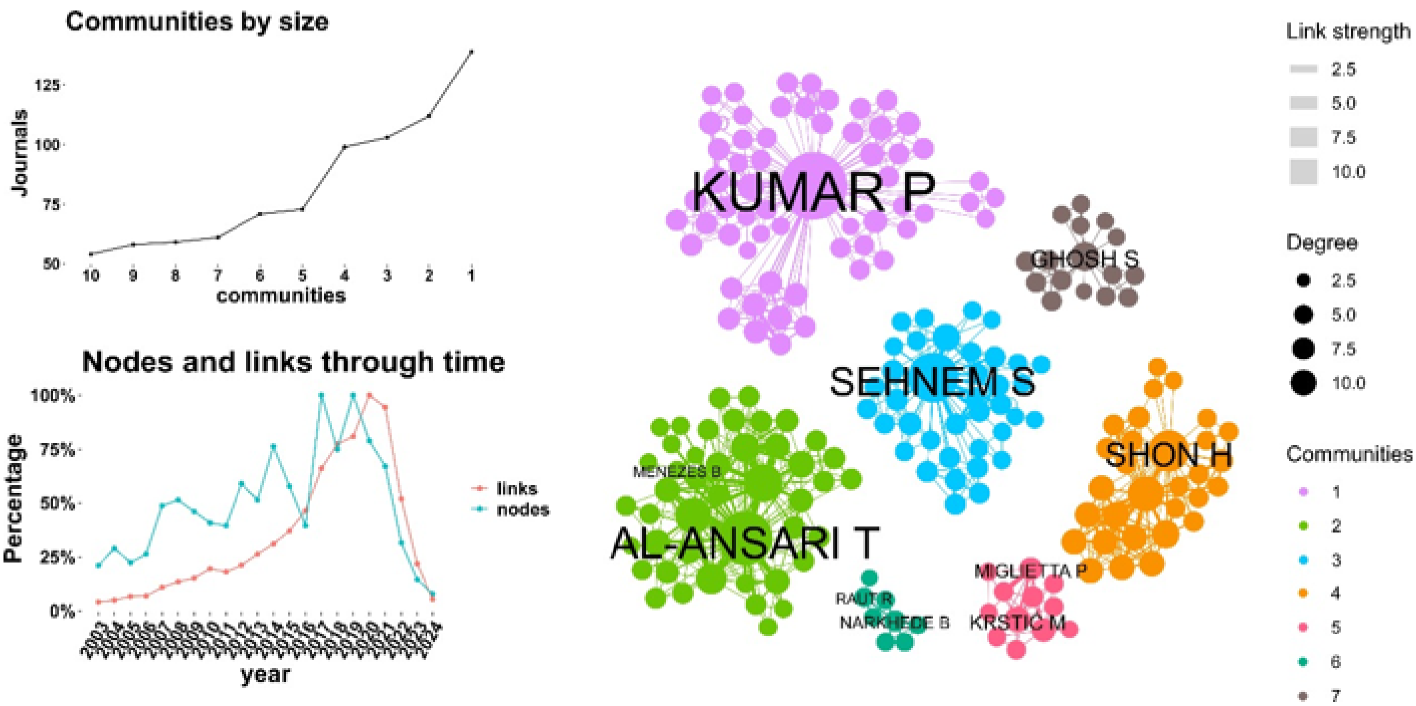

Figure 5: Author collaboration network. Source: own elaboration.

precision agriculture and artificial intelligence, which enhance efficiency and reduce waste, aligning with CE goals and sectoral resilience (e.g., 'these innovations boost productivity while minimizing environmental impact'). Meanwhile, Vianna *et al.* (2024) emphasize agricultural waste valorization via biochemical technologies, identifying plastic recycling and biomass management as key opportunities, supported by a bibliometric analysis of 858 articles. From a technological perspective, Francisco Luis *et al.* (2022) underscore how industry 4.0 (digitization, IoT) and blockchain enable traceability and material cycle closure-critical for circular models in agri-food systems ('blockchain ensures authenticity and reduces costs for SMEs').

Furthermore, critical barriers are identified Ada *et al.* (2022) identify the 'insufficient implementation of CE legislation' as the

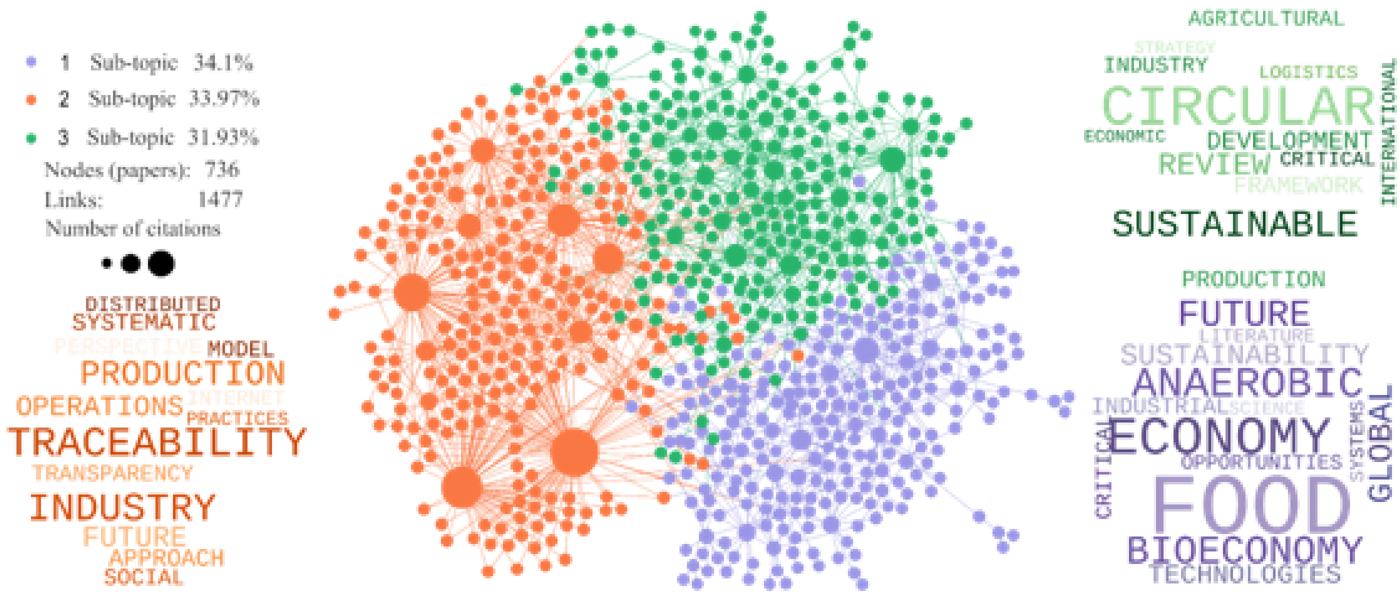

Figure 6: Internetwork with the three biggest clusters. Source: own elaboration.

primary obstacle for cooperatives, while Chauhan *et al*. (2021) highlight institutional and financial risks, as well as food losses due to por logistical practices. Proposed solutions include global regulatory frameworks and IoT-based Smart systems (Fatimah *et al*., 2020), which link CE to SDGs. Finally, Jabbour *et al*. (2020) emphasize the potential of big data for sustainable supply chains, though they caution about the need for enhanced analytical capabilites in firms. Collectively, these studies advocate for an integrated technological and policy transition, where innovations such as AI, blockchain, and IoT not only optimize resource use but also require institutional support to overcome systemic barriers.

This study addresses the main gap identified in the literature: the lack of a comprehensive understanding of how digital technologies enable CE in ASCs. The results show that technologies such as blockchain, IoT, and AI are key enablers for solving critical challenges related to traceability, waste reduction, and resource optimization. However, important gaps remain, including the limited presence of longitudinal studies, insufficient integration of social dimensions, and weak cross-sector collaboration. These findings highlight that the relationship between CE, ASCs, and technology must be understood as an interconnected system, where digital innovation acts as a key enabler of circular transformation.

Future research directions

Future research should focus on three main areas. First, longitudinal studies are needed to assess the long-term impact of digital technologies on circular performance in ASCs. Second, more empirical research is required in developing countries to evaluate adoption barriers and scalability. Third, interdisciplinary approaches integrating technological, economic, and social dimensions are essential to better understand the transition toward circular agricultural supply chains.

CONCLUSION

This study provides a comprehensive overview of the emerging field of the CE applied to agricultural supply chains with digital technologies, highlighting its rapid development and growing relevance. Based on an analysis of 277 publications, clear trends are identified, driven by sustainability concerns, climate change, and food security challenges. Technologies such as blockchain, IoT, and artificial intelligence stand out as key enablers for improving traceability, transparency, and efficiency in agricultural supply chains, reflecting a shift from theoretical approaches toward practical applications within the industry 4.0 framework.

The findings also show that the transition toward a CE in agriculture is a complex socio-technical process, where technology, although essential, is not sufficient on its own. Its effective implementation depends on integration with innovative business models, appropriate regulatory frameworks, and the ability to overcome social and economic barriers. From a theoretical perspective, the study extends approaches such as the Natural Resource-Based View (NRBV), emphasizing how circular and technological strategies contribute to environmental and competitive performance, while underscoring the need for a systemic approach that closes loops of materials, information, and value in supply chains.

Finally, the study offers relevant practical implications for key stakeholders. Policymakers should promote regulations and incentives that facilitate digitalization and waste valorization, while agricultural firms should invest in technological capabilities and collaborative pilot projects. At the same time, academia and the Agtech sector play a crucial role in developing accessible and interdisciplinary solutions. Overall, the future of circular agricultar supply chains will depend not only on technological innovation but also on strategic collaboration among governments, industry, and academia to build sustainable and scalable systems.

ABBREVIATIONS

CE: Circular Economy; **ASC:** Agricultural Supply Chain; **ASCs:** Agricultural Supply Chains; **IoT:** Internet of Things; **AI:** Artificial Intelligence; **WoS:** Web of Science; **SDGs:** Sustainable Development Goals; **PRISMA:** Preferred Reporting Items for Systematic Reviews and Meta-Analyses; **ToS:** Tree of Science; **SAP:** Search Algorithm for ToS Precision Enhancement; **FSCs:** Food Supply Chains; **AFSC:** Agri-Food Supply Chain; **LCA:** Life Cycle Assessment; **NRBV:** Natural Resource-Based View; **CO_2:** Carbon Dioxide; **bioPET:** Bio-based Polyethylene Terephthalate; **bio-MEG:** Bio-based Monoethylene Glycol; **SMEs:** Small and Medium-Sized Enterprises; **R:** Reduce, Reuse, Recycle; **Q1:** First Quartile; **Q2:** Second Quartile; **Q3:** Third Quartile; **Q4:** Fourth Quartile.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES

Acerbi, F., Forterre, D. A., & Taisch, M. (2021). Role of Artificial Intelligence in Circular Manufacturing: A Systematic Literature Review. *IFAC-PapersOnLine*, *54*(1), 367–372. https://doi.org/10.1016/J.IFACOL.2021.08.040

Ada, E., Sagnak, M., Uzel, R. A., & Balcıoğlu, İ. (2022). Analysis of barriers to circularity for agricultural cooperatives in the digitalization era. *International Journal of Productivity and Performance Management*, *71*(3), 932–951. https://doi.org/10.1108/IJPPM-12-2020-0689

Adriaanse, L. S., & Rensleigh, C. (2013). Web of science, scopus and google scholar a content comprehensiveness comparison. *Electronic Library*, *31*(6), 727–744. https://doi.org/10.1108/EL-12-2011-0174

Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, *11*(4), 959–975. https://doi.org/10.1016/J.JOI.2017.08.007

Barbosa, M. W., Bronzo, M., Júnior, N. T., & de Sousa, P. R. (2025). Predictors of Corporate Reputation: Circular Economy, Environmental, Social, and Governance, and Collaborative Relationships in Brazilian Agribusiness. *Sustainability* 2025, Vol. 17 *Page 2969*, *17*(7), 2969. https://doi.org/10.3390/SU17072969

Barros, M. V., Salvador, R., de Francisco, A. C., & Piekarski, C. M. (2020). Mapping of research lines on circular economy practices in agriculture: From waste to energy. *Renewable and Sustainable Energy Reviews*, *131*, 109958. https://doi.org/10.1016/J.RSER.2020.109958

Bornmann, L., & Marx, W. (2014). How to evaluate individual researchers working in the natural and life sciences meaningfully? A proposal of methods based on percentiles of citations. *Scientometrics*, *98*(1), 487–509. https://doi.org/10.1007/S11192-013-1161-Y

Chauhan, C., Dhir, A., Akram, M. U., & Salo, J. (2021). Food loss and waste in food supply chains. A systematic literature review and framework development approach. *Journal of Cleaner Production*, *295*, 126438. https://doi.org/10.1016/J.JCLEPRO.2021.126438

Chauhan, Y. (2020). Food Waste Management with Technological Platforms: Evidence from Indian Food Supply Chains. *Sustainability* 2020, Vol. 12 *Page 8162*, *12*(19), 8162. https://doi.org/10.3390/SU12198162

Culot, G., Orzes, G., Sartor, M., & Nassimbeni, G. (2020). The future of manufacturing: A Delphi-based scenario analysis on Industry 4.0. *Technological Forecasting and Social Change*, *157*, 120092. https://doi.org/10.1016/J.TECHFORE.2020.120092

Danya, U., Kamaraj, M., Babu, P. S., & Aravind, J. (2024). Bibliometric analysis and review of food waste management via sustainable approaches. *Global Journal of Environmental Science and Management*, *10*(4), 2127–2144. https://doi.org/10.22034/GJESM.2024.04.38

Darshan, M., Akella, S. V. V. S., Raswanth, S. R., & Kumar, P. (2022). A Smart IoT Based Agro-Management System Using Distributed Ledger and Circular Supply Chain Methodology. *Lecture Notes in Electrical Engineering*, *894 LNEE*, 345–354. https://doi.org/10.1007/978-981-19-1677-9_31

De Corato, U. (2020). Agricultural waste recycling in horticultural intensive farming systems by on-farm composting and compost-based tea application improves soil quality and plant health: A review under the perspective of a circular economy. *Science of The Total Environment*, *738*, 139840. https://doi.org/10.1016/J.SCITOTENV.2020.139840

Di Maro, M., Gargiulo, L., Gomez d'Ayala, G., & Duraccio, D. (2024). Exploring Antimicrobial Compounds from Agri-Food Wastes for Sustainable Applications. *International Journal of Molecular Sciences* 2024, Vol. 25 *Page 13171*, *25*(23), 13171. https://doi.org/10.3390/IJMS252313171

Eggers, F., Risselada, H., Niemand, T., & Robledo, S. (2022). Referral campaigns for software startups: The impact of network characteristics on product adoption. *Journal of Business Research*, *145*, 309–324. https://doi.org/10.1016/J.JBUSRES.2022.03.007

Ellahi, R. M., Wood, L. C., & Bekhit, A. E. D. A. (2024). Blockchain-Driven Food Supply Chains: A Systematic Review for Unexplored Opportunities. *Applied Sciences (Switzerland)*, *14*(19), 8944. https://doi.org/10.3390/APP14198944/S1

FAO. (2019). *The State of Food and Agriculture 2019*. FAO. https://doi.org/https://doi.org/10.4060/CA6030EN

Fatimah, Y. A., Govindan, K., Murniningsih, R., & Setiawan, A. (2020). Industry 4.0 based sustainable circular economy approach for smart waste management system to achieve sustainable development goals: A case study of Indonesia. *Journal of Cleaner Production*, *269*, 122263. https://doi.org/10.1016/J.JCLEPRO.2020.122263

Francisco Luis, B. M., Pedro Víctor, N. C. U., Valentín, M. M., & Esteban, R. F. (2022). Blockchain as a Service: A Holistic Approach to Traceability in the Circular Economy. *Environmental Footprints and Eco-Design of Products and Processes*, 119–133. https://doi.org/10.1007/978-981-16-6301-7_6

Garcia, J. M., & Robertson, M. L. (2017). The future of plastics recycling. *Science*, *358*(6365), 870–872. https://doi.org/10.1126/SCIENCE.AAQ0324

Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The Circular Economy-A new sustainability paradigm? *Journal of Cleaner Production*, *143*, 757–768. https://doi.org/10.1016/J.JCLEPRO.2016.12.048

Genovese, A., Acquaye, A. A., Figueroa, A., & Koh, S. C. L. (2017). Sustainable supply chain management and the transition towards a circular economy: Evidence and some applications. *Omega*, *66*, 344–357. https://doi.org/10.1016/J.OMEGA.2015.05.015

Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production*, *114*, 11–32. https://doi.org/10.1016/J.JCLEPRO.2015.09.007

Ghosh, S. K., & Ghosh, S. K. (2023). Circular Economy Catalysing Decarbonization1. *Circular Economy Adoption: Catalysing Decarbonisation Through Policy Instruments*, 3–33. https://doi.org/10.1007/978-981-99-4803-1_1

Gkountani, V. A., & Tsoulfas, G. T. (2021). Circular Economy and Food Production Systems: Tracing Linkages and Exploring Synergies. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, *21*(2), 2021.

Gokarn, S., & Kuthambalayan, T. S. (2017). Analysis of challenges inhibiting the reduction of waste in food supply chain. *Journal of Cleaner Production*, *168*, 595–604. https://doi.org/10.1016/J.JCLEPRO.2017.09.028

Jabbour, C. J., Fiorini, P. D. C., Ndubisi, N. O., Queiroz, M. M., & Piato, É. L. (2020). Digitally-enabled sustainable supply chains in the 21st century: A review and a research agenda. *Science of The Total Environment*, *725*, 138177. https://doi.org/10.1016/J.SCITOTENV.2020.138177

Jemili, A., Znouda, E., Stinner, W., & Bouden, C. (2024). Techno-economic optimization of agricultural biomass to electricity supply chain network: A case study of Tunisia. *Renewable Energy Focus*, *50*, 100604. https://doi.org/10.1016/J.REF.2024.100604

Kamble, S. S., Gunasekaran, A., & Sharma, R. (2020). Modeling the blockchain enabled traceability in agriculture supply chain. *International Journal of Information Management*, *52*, 101967. https://doi.org/10.1016/J.IJINFOMGT.2019.05.023

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. https://doi.org/10.1016/J.TIFS.2019.07.034

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, *127*, 221–232. https://doi.org/10.1016/J.RESCONREC.2017.09.005

Korhonen, J., Nuur, C., Feldmann, A., & Birkie, S. E. (2018). Circular economy as an essentially contested concept. *Journal of Cleaner Production*, *175*, 544–552. https://doi.org/10.1016/J.JCLEPRO.2017.12.111

Kumar, A., Mangla, S. K., & Kumar, P. (2024). Barriers for adoption of Industry 4.0 in sustainable food supply chain: a circular economy perspective. *International Journal of Productivity and Performance Management*, *73*(2), 385–411. https://doi.org/10.1108/IJPPM-12-2020-0695

Kumar, S., Raut, R. D., Nayal, K., Kraus, S., Yadav, V. S., & Narkhede, B. E. (2021). To identify industry 4.0 and circular economy adoption barriers in the agriculture supply chain by using ISM-ANP. *Journal of Cleaner Production*, *293*, 126023. https://doi.org/10.1016/J.JCLEPRO.2021.126023

Lampridi, M., Angelopoulou, T., Tagarakis, A. C., & Bochtis, D. D. (2021). A Circular Precision Farming System Towards the Optimization of Dairy Value-Chains. *Springer*

Optimization and Its Applications, *185*, 77–93. https://doi.org/10.1007/978-3-030-84156-0_4

Maina, S., Kachrimanidou, V., & Koutinas, A. (2017). A roadmap towards a circular and sustainable bioeconomy through waste valorization. *Current Opinion in Green and Sustainable Chemistry*, *8*, 18–23. https://doi.org/10.1016/J.COGSC.2017.07.007

Manganda, A. S., Sehnem, S., & Lara, A. C. (2024). Transition to the Circular Economy: Innovative and Disruptive Production Technologies Adopted by Agribusiness Startups. *Environmental Quality Management*, *34*(1), e22293. https://doi.org/10.1002/TQEM.22293

Marku, D., Minga, A., & Sosoli, I. (2024). Circular Economy Perspective and Implications for Livestock Farming in Albania. *The Open Agriculture Journal*, *18*(1). https://doi.org/10.2174/0118743315312132240611074625

Mohamed, A. H. A., Menezes, B. C., & AL-Ansari, T. (2021). Interplaying of food supply chain resilience, industry 4.0 and sustainability in the poultry market. *Computer Aided Chemical Engineering*, *50*, 1815–1820. https://doi.org/10.1016/B978-0-323-88506-5.50281-3

Moral-Muñoz, J. A., Herrera-Viedma, E., Santisteban-Espejo, A., & Cobo, M. J. (2020). Software tools for conducting bibliometric analysis in science: An up-to-date review. *Profesional de La Información*, *29*(1), 1699–2407. https://doi.org/10.3145/EPI.2020.ENE.03

Munir, M. A., Habib, M. S., Hussain, A., Shahbaz, M. A., Qamar, A., Masood, T., Sultan, M., Mujtaba, M. A., Imran, S., Hasan, M., Akhtar, M. S., Uzair Ayub, H. M., & Salman, C. A. (2022). Blockchain Adoption for Sustainable Supply Chain Management: Economic, Environmental, and Social Perspectives. *Frontiers in Energy Research*, *10*, 899632. https://doi.org/10.3389/FENRG.2022.899632

Nayal, K., Raut, R., Lopes de Sousa Jabbour, A. B., Narkhede, B. E., & Gedam, V. V. (2021). Integrated technologies toward sustainable agriculture supply chains: missing links. *Journal of Enterprise Information Management*, *38*(1), 318–368. https://doi.org/10.1108/JEIM-09-2020-0381

Nosratabadi, S., Mosavi, A., Shamshirband, S., Zavadskas, E. K., Rakotonirainy, A., & Chau, K. W. (2019). Sustainable Business Models: A Review. *Sustainability* 2019, Vol. 11 *Page 1663*, *11*(6), 1663. https://doi.org/10.3390/SU11061663

Pakseresht, A., Yavari, A., Kaliji, S. A., & Hakelius, K. (2023). The intersection of blockchain technology and circular economy in the agri-food sector. *Sustainable Production and Consumption*, *35*, 260–274. https://doi.org/10.1016/J.SPC.2022.11.002

Pandey, V., Pant, M., & Snasel, V. (2022). Blockchain technology in food supply chains: Review and bibliometric analysis. *Technology in Society*, *69*, 101954. https://doi.org/10.1016/J.TECHSOC.2022.101954

Perçin, S. (2022). Evaluating the circular economy–based big data analytics capabilities of circular agri-food supply chains: the context of Turkey. *Environmental Science and Pollution Research*, *29*(55), 83220–83233. https://doi.org/10.1007/S11356-022-21680-2

Provensi, T., Sehnem, S., & Lopes de Sousa Jabbour, A. B. (2025). Towards circularity in supply chains: The case of agtechs. *Computers & Industrial Engineering*, *201*, 110684. https://doi.org/10.1016/J.CIE.2024.110684

Rajit, D., McDonald, S., Tay, C. T., Du, L., Enticott, J., & Teede, H. (2025). Assessing the coverage of PubMed, Embase, OpenAlex, and Semantic Scholar for automated single-database searches in living guideline evidence surveillance: a case study of the international polycystic ovary syndrome guidelines 2023. *Journal of Clinical Epidemiology*, *183*, 111789. https://doi.org/10.1016/J.JCLINEPI.2025.111789

Rajput, S., & Singh, S. P. (2019). Connecting circular economy and industry 4.0. *International Journal of Information Management*, *49*, 98–113. https://doi.org/10.1016/J.IJINFOMGT.2019.03.002

Ranjbari, M., Shams Esfandabadi, Z., Quatraro, F., Vatanparast, H., Lam, S. S., Aghbashlo, M., & Tabatabaei, M. (2022). Biomass and organic waste potentials towards implementing circular bioeconomy platforms: A systematic bibliometric analysis. *Fuel*, *318*, 123585. https://doi.org/10.1016/J.FUEL.2022.123585

Rejeb, A., Rejeb, K., Abdollahi, A., Zailani, S., Iranmanesh, M., & Ghobakhloo, M. (2021). Digitalization in Food Supply Chains: A Bibliometric Review and Key-Route Main Path Analysis. *Sustainability* 2022, Vol. 14 *Page 83*, *14*(1), 83. https://doi.org/10.3390/SU14010083

Ren, H., Qiao, F., Shi, Y., Knutzen, M. W., Wang, Z., Du, H., & Zhang, H. (2015). PlantBottleTM Packaging program is continuing its journey to pursue bio-mono-ethylene glycol using agricultural waste. *Journal of Renewable and Sustainable Energy*, *7*(4). https://doi.org/10.1063/1.4929336/1013235

Robledo, S., Arbelaez-Echeverri, O., Duque, P., Zuluaga, M., Alzate-Cardona, J. D., & Valencia, L. A. (2022). Tree of Science with Scopus: A Shiny Application. *Issues in Science and Technology Librarianship*, *2022*(100). https://doi.org/10.29173/ISTL2698

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. https://doi.org/10.1080/00207543.2018.1533261

Santos, R. de A., Teles, E. O., & Freires, F. G. M. (2024). Applying the Circular Economy Framework to Blockchain Agricultural Production. *Sustainability* 2024, Vol. 16 *Page 8004*, *16*(18), 8004. https://doi.org/10.3390/SU16188004

Sharma, R., Samad, T. A., Chiappetta Jabbour, C. J., & de Queiroz, M. J. (2021). Leveraging blockchain technology for circularity in agricultural supply chains: evidence from a fast-growing economy. *Journal of Enterprise Information Management*, *38*(1), 32–67. https://doi.org/10.1108/JEIM-02-2021-0094

Soo, A., & Shon, H. K. (2024). A nutrient circular economy framework for wastewater treatment plants. *Desalination*, *592*, 118090. https://doi.org/10.1016/J.DESAL.2024.118090

Soo, A., Wang, L., Wang, C., & Shon, H. K. (2023). Machine learning for nutrient recovery in the smart city circular economy-A review. *Process Safety and Environmental Protection*, *173*, 529–557. https://doi.org/10.1016/J.PSEP.2023.02.065

Stempfle, S., Carlucci, D., de Gennaro, B. C., Roselli, L., & Giannoccaro, G. (2021). Available Pathways for Operationalizing Circular Economy into the Olive Oil Supply Chain: Mapping Evidence from a Scoping Literature Review. *Sustainability 2021*, Vol. 13 *Page 9789*, *13*(17), 9789. https://doi.org/10.3390/SU13179789

Subbarao, P. M. V., D' Silva, T. C., Adlak, K., Kumar, S., Chandra, R., & Vijay, V. K. (2023). Anaerobic digestion as a sustainable technology for efficiently utilizing biomass in the context of carbon neutrality and circular economy. *Environmental Research*, *234*, 116286. https://doi.org/10.1016/J.ENVRES.2023.116286

Sun, O., & Fan, N. (2020). A Review on Optimization Methods for Biomass Supply Chain: Models and Algorithms, Sustainable Issues, and Challenges and Opportunities. *Process Integration and Optimization for Sustainability*, *4*(3), 203–226. https://doi.org/10.1007/S41660-020-00108-9

Valencia-Hernández, D.-S., Robledo, S., Pinilla, R., Duque-Méndez, D., & Olivar-Tost, G. (2020). SAP Algorithm for Citation Analysis: An improvement to Tree of Science Algoritmo SAP para análisis de citaciones: una mejora para Tree of Science. *Ingeniería e Investigación 2020*, *40*(1), 45–49. https://doi.org/10.15446/ing.investig.v40n1.77718

Vermeulen, S. J., Campbell, B. M., & Ingram, J. S. I. (2012). Climate change and food systems. *Annual Review of Environment and Resources*, *37*(Volume 37, 2012), 195–222. https://doi.org/10.1146/annurev-environ-020411-130608

Vianna, L. M. C., de Oliveira, L., & Durante Mühl, D. (2024). Waste valorization in agribusiness value chains. *Waste Management Bulletin*, *1*(4), 195–204. https://doi.org/10.1016/J.WMB.2023.10.009

Watari, T., Nansai, K., & Nakajima, K. (2020). Review of critical metal dynamics to 2050 for 48 elements. *Resources, Conservation and Recycling*, *155*, 104669. https://doi.org/10.1016/J.RESCONREC.2019.104669

Wickham, H., Averick, M., Bryan, J., Chang, W., D', L., Mcgowan, A., François, R., Grolemund, G., Hayes, A., Henry, L., Hester, J., Kuhn, M., Lin Pedersen, T., Miller, E., Bache, S. M., Müller, K., Ooms, J., Robinson, D., Seidel, D. P., … Yutani, H. (2019). Welcome to the Tidyverse. *Journal of Open Source Software*, *4*(43), 1686. https://doi.org/10.21105/JOSS.01686

Yaqot, M., Menezes, B. C., & Al-Ansari, T. (2023). Roadmap to Precision Agriculture Under Circular Economy Constraints. *Journal of Information and Knowledge Management*, *22*(5). https://doi.org/10.1142/S0219649222500927

Yontar, E. (2023). Critical success factor analysis of blockchain technology in agri-food supply chain management: A circular economy perspective. *Journal of Environmental Management*, *330*, 117173. https://doi.org/10.1016/J.JENVMAN.2022.117173

Zuluaga, M., Arbelaez-Echeverri, O., Robledo, S., Osorio-Zuluaga, G. A., & Duque-Méndez, N. (2022). There's an App for That Tree of Science-ToS: A Web-based Tool for Scientific Literature Recommendation. Search Less, Research More! *Issues in Science and Technology Librarianship*, *2022*(100). https://doi.org/10.29173/ISTL2696

Cite this article: Rodríguez-Mañay LO. Circular Economy for Supply Chain in Agriculture with Technology: A Review. J Scientometric Res. 2026;15(2):570-82.