AGROINDUSTRIAL TECHNOLOGY JOURNAL
ISSN : 2599-0799 (print) ISSN : 2598-9480 (online)
Accredited SINTA 3: No.225/E/KPT/2022

Circular Economy Adoption in Agroindustry: Drivers, Barriers, and Value Creation Insights from Bibliometric and Systematic Literature Review

Ayumi Chairunnisa[1*], Devi Maulida Rahmah[1], Januardi[1]

[1]Padjadjaran University, Sumedang, West Java, 45363, Indonesia
[*]Email Correspondance: ayumi22001@mail.unpad.ac.id

Article history:
Submitted: 14 April 2026
Revision: 21 May 2026
Accepted: 19 June 2026
Online: 30 November 2026
DOI:
http://doi.org/10.21111/atj.v10i2.32

***ABSTRACT**: The transition toward a circular economy has gained increasing attention as a strategic approach to enhancing resource efficiency and sustainability in agroindustry. This study aims to analyze research trends and identify the drivers, barriers, and value creation associated with circular economy adoption in the agroindustrial sector. A systematic literature review integrated with bibliometric analysis was conducted using 24 Scopus-indexed articles and visualized through VOSviewer. The results reveal a growing research focus on resource efficiency, waste valorization, technological innovation, and sustainable agri-food supply chains. Three main categories of drivers were identified, namely environmental and resource efficiency drivers, technological drivers, and institutional and strategic drivers. However, circular economy adoption is hindered by financial, organizational, market, and policy barriers. The proposed conceptual framework demonstrates how the interaction between these drivers and barriers influences value creation through improved resource efficiency and value-added products (economic value), waste reduction and resource conservation (environmental value), and stakeholder engagement and employment opportunities (social value). These findings provide insights for researchers, practitioners, and policymakers seeking to accelerate the transition toward sustainable agroindustrial systems.*

***Keywords:** Circular Economy, Agroindustry, Drivers and Barriers, Value Creations*

1. INTRODUCTION

Global economic development has generated significant environmental challenges, including increasing waste generation, climate change, and declining environmental quality. The linear economic model, characterized by a "take–make–dispose" pattern, promotes continuous resource extraction without adequate restoration efforts, resulting in environmental degradation, biodiversity loss, and resource depletion. These challenges have intensified the need for a transition toward a circular economy (CE), a regenerative system that promotes resource reduction, reuse, recycling, and recovery throughout production and consumption processes (Kirchherr et al., 2017). By implementing strategies such as closing, slowing, and narrowing resource loops, CE aims to improve resource efficiency while minimizing waste generation (Bocken et al., 2016; Geissdoerfer et al., 2018). The implementation of CE can occur at micro, meso, and macro levels, requiring different policy and managerial interventions ranging from resource optimization and technological adaptation to stakeholder collaboration and

supportive regulatory frameworks (Baral et al., 2023). Among industrial sectors, the agro-industry plays a crucial role in the global transition to a circular economy, given the resource intensity of its operations and the volume of waste generated by its production activities. The agro-industrial sector contributes significantly to global wastewater, carbon emissions, and solid waste accumulation, particularly in food processing activities (Setyowati et al., 2023; Tarirohan et al., 2023). This industry also generates large amounts of solid waste—approximately 118 million tons of processed food waste that ends up in landfills, accounting for about 74% of total production waste and most of the waste generated is disposed of through landfilling or incineration (El Kaylay et al., 2023; Melo Torres, 2019). Therefore, waste valorization has become an important strategy for improving resource efficiency, enhancing competitiveness, generating economic and social benefits (Alfiero et al., 2019; Santagata et al., 2020). Moreover, the valorization of agroindustrial waste contributes to several Sustainable Development Goals (SDGs), particularly SDG 12 (Responsible Consumption and Production) through resource efficiency and waste reduction, SDG 13 (Climate Action) through lower greenhouse gas emissions, and SDG 8 (Decent Work and Economic Growth) through the development of bioenergy, bio-based products, and circular business opportunities.

However, the implementation of the circular economy in the agroindustry often faces various substantial barriers. Population growth, changing food consumption patterns, and increasing globalization of trade have made the agroindustrial system increasingly complex (Katsikouli et al., 2021). Various barriers to adoption include resource constraints, technological complexity, and a lack of support from top management, as well as environmental factors such as regulations and market pressures that slow down the process of adopting and implementing CE principles (Syed Shah Alam et al., 2019). The significant environmental impact and the complexity of the agro-industrial system highlight the urgency of applying circular economy principles in the agro-industrial sector, particularly in the processing of agricultural products, to reduce waste and improve resource efficiency.

Despite the growing interest in circular economy adoption in agroindustry, existing studies have largely focused on specific aspects such as sustainability practices, waste valorization, and supply chain management. While bibliometric studies provide insights into research trends, thematic developments and intellectual structures, systematic literature reviews mainly synthesize empirical findings. However, limited research has integrated these approaches to explain how drivers and barriers influence value creation in agroindustry, resulting in a fragmented understanding of circular economy adoption. To address this gap, this study integrates bibliometric analysis and systematic literature review to provide a comprehensive assessment of circular economy adoption in agroindustry. By combining these complementary approaches, this study develops a conceptual framework linking drivers, barriers, and value creation, thereby offering a more holistic perspective on sustainable agroindustrial transformation.

Based on these challenges, this study aims to identify thematic trends, drivers, barriers, and value creation in the adoption of the circular economy in the agroindustry. To achieve this objective, four research questions are proposed: (1) What are the main thematic trends in circular economy research in the agro-industrial sector?; (2) What drivers facilitate the implementation of circular economy practices in the agroindustry sector?; (3) What barriers limit the adoption of circular economy practices in the agroindustry sector?; and (4) How do drivers and barriers interact to influence value creation in a circular agroindustrial system? Addressing these questions will contribute to a more comprehensive understanding of the factors shaping circular

economy adoption in agroindustry. The main contribution of this study lies in integrating bibliometric analysis and systematic literature review to develop a unified conceptual framework that links drivers, barriers, and value creation in agroindustry. By providing a holistic perspective on circular economy adoption, this study offers theoretical insights for future research and practical guidance for policymakers and industry practitioners seeking to accelerate sustainable agroindustrial transformation.

2. MATERIALS AND METHODS

This study adopts a Systematic Literature Review (SLR) approach, supplemented by bibliometric analysis, to address the research questions. The SLR method was chosen because it enables the systematic synthesis of findings from previous research and the identification of knowledge gaps, trends, and directions for future research. The results of the synthesis are expected to provide evidence-based recommendations for policy development, industry practice, and further studies. The SLR procedure used in this study follows the methodological framework developed by Howard et al (2017).

The Scopus database was used to select literature on the implementation of the circular economy in the agro-industrial sector. Scopus was chosen as one of the largest and most reliable databases for academic literature. This database also includes features that support bibliometric analysis, such as comprehensive metadata and complete citation data. The collected articles were selected as the basis for bibliometric analysis.

Systematic data collection and analysis were conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. PRISMA is widely recognized for enhancing clarity and consistency and providing a clear methodology for reviewing the literature (Page et al., 2021). The framework supports a systematic process of identifying, screening, assessing eligibility, and selecting relevant studies. In this study, the inclusion criteria consisted of journal articles published between 2021 and 2026, written in English, indexed in the Scopus database, and focused on circular economy adoption in the agroindustry sector. Articles not directly related to the research topic, conference papers, book chapters, and publications without full-text access were excluded. The retrieved records were checked for duplicate entries during the identification stage; however, no duplicate records were identified (n = 0). Relevance was assessed through title, abstract, and keyword screening, followed by the application of predefined inclusion and exclusion criteria related to publication year, subject area, document type, and accessibility.

2.1. Formulating Questions and Identifying Sources

The search query used was TITLE-ABS-KEY ("circular economy" AND "agroindustry"). The keywords “circular economy” and “agroindustry” were selected because they represent the two core concepts underpinning this study and are widely used in the literature on circular economy implementation within agroindustrial systems. The search strategy was intentionally designed to focus on studies explicitly addressing the intersection between circular economy principles and agroindustry, thereby ensuring the relevance and specificity of the retrieved records. The search was conducted in the Scopus database on February 23, 2026, yielding 169 initial records for further screening and selection.

2.2. Source Selection

The study period (2021–2026) was selected to capture recent developments in circular economy research across various sectors, including agroindustry. Based on publication year, 142 articles were retained for further screening. Subsequently, articles outside the selected subject areas, namely Environmental Science, Social Sciences, Energy, Agricultural and Biological Sciences, and Business, Management and Accounting, were excluded, resulting in 121 articles. The records were then screened

based on document type, and only journal articles were retained, reducing the dataset to 95 articles. Conference papers, book chapters, editorials, and other non-peer-reviewed publications were excluded. Finally, only articles with accessible full-text content were included to facilitate comprehensive content analysis and consistent data extraction during the systematic review process, resulting in a final dataset of 24 articles for analysis. The screening and selection process based on the PRISMA 2020 framework is presented in Figure 1, which summarizes the number of records retained and excluded at each stage of the review process.

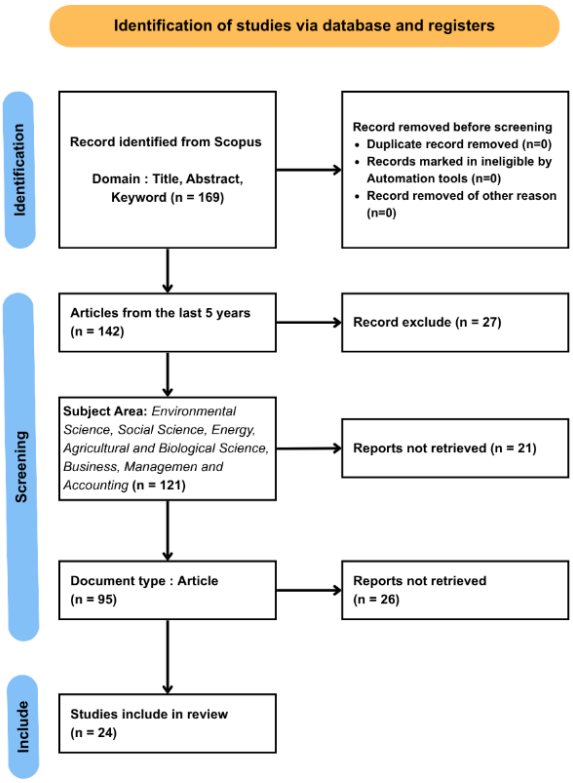


Figure 1. PRISMA Framework

2.3. Bibliometric Analysis

The 24 selected articles were subsequently subjected to bibliometric analysis using VOSviewer version 1.6.20 to identify research trends and thematic relationships related to circular economy adoption in agroindustry. The units of analysis included publications, countries, and author keywords extracted from the selected articles. Keyword co-occurrence analysis was employed to identify dominant research themes and thematic clusters. Given the relatively small dataset, the minimum occurrence threshold for keywords was set to one to ensure that potentially relevant emerging themes were not excluded from the analysis. As a result, 242 keywords met the initial threshold. To improve the relevance and interpretability of the network, a keyword cleaning process was subsequently performed by manually removing generic terms, non-thematic words, and irrelevant keywords, as well as consolidating similar terms where appropriate. This process reduced the dataset to 144 keywords, which were included in the final visualization and thematic analysis. Country contribution analysis was conducted using affiliation data obtained from the Scopus metadata to identify the geographical distribution of publications. The bibliometric network was visualized using VOSviewer's default association strength normalization method.

Following the bibliometric analysis, the selected articles were systematically reviewed to identify drivers and barriers influencing circular economy adoption in agroindustry. The thematic clusters generated through the keyword co-occurrence analysis served as an initial guide for organizing the literature. Factors reported as facilitating circular economy adoption were classified as drivers, whereas factors reported as constraining adoption were classified as barriers. Similar factors identified across multiple studies were compared, synthesized, and grouped into broader thematic dimensions based on their characteristics and roles in the adoption process. The coding and categorization process was conducted by the author through iterative review and cross-checking of the selected articles to ensure consistency in the classification of factors. The synthesized findings were subsequently used to develop the proposed conceptual framework linking drivers, barriers, and value creation.

3. RESULTS AND DISCUSSION

Data analysis was conducted using a cleaned database consisting of 24 documents from the Scopus database, accessed on February 23, 2026, using the keywords "circular economy" and "agroindustry." This study employed bibliometric analysis using VOS-viewer software to generate a citation network that illustrates the collaboration and key relationships between these two elements

3.1. Publication Trend



Figure 2. Trends in Circular Economy Publications in the Agroindustry

The publication trend graph shows the annual distribution of academic articles discussing the circular economy in the agro-industrial sector over the past five years. Based on the publication graph for 2021 through 2025, the number of studies related to the circular economy in the agro-industrial sector shows a fluctuating pattern but is generally on the rise. In 2021, the number of publications was still relatively low, indicating that the topic of applying the circular economy to the agro-industrial sector had not yet garnered significant attention in the global academic discourse. An increase in the number of publications began to emerge in 2023 with a total of 6 articles, although there was a slight decline to 4 articles in 2024. A significant increase occurred between 2024 and 2025, during which the number of publications doubled to 8 articles in 2025, marking the highest number of publications during the observation period. This growing research interest may be attributed to increasing global attention toward sustainability and circular economy transitions, advances in digital and green technologies that support resource efficiency, and the rising interest of industries in adopting circular practices to address environmental challenges and improve competitiveness (Baral et al., 2023; Agnusdei et al., 2023; Dewasiri et al., 2026). As a result, the circular economy is increasingly viewed as a strategic approach to enhancing agroindustrial sustainability while reducing the environmental impacts associated with production processes.

In 2026, the number of publications stood at 3 articles, which appears lower than in the previous year. However, this does not indicate a significant decline in research activity, given that 2026 is still an ongoing period and the number of publications has the potential to continue increasing. Overall, publication trends indicate that the topic of the circular economy is becoming increasingly relevant in the development of sustainable agroindustry, particularly in efforts to improve resource utilization efficiency, reduce production waste, and create added value that delivers economic, social, and environmental benefits. This trend also reflects growing global awareness and academic attention to the importance of transforming production systems toward a more sustainable economic model

3.2. Analysis of State Contributions

Based on data obtained from the country-based document graph, an analysis of countries' contributions to the implementation of the circular economy in agroindustry reveals clear differences in terms of academic impact and varying levels of contribution. Italy (5 documents) is the country with the most publications, indicating its dominance in research linking the circular economy to the agroindustry sector. This prominence may be attributed to the country's strong emphasis on sustainability and circular economy initiatives, supported by European Union policies and research funding programs that encourage innovation in resource efficiency and waste valorization. In addition, Italy has

a well-developed agri-food sector, which has become an important context for exploring circular economy practices related to food waste reduction, by-product utilization, and sustainable production systems. It is followed by Indonesia (4 documents) and Brazil (4 documents), showing that these two countries also play an active role in research integrating circular economy principles into industry, particularly the agricultural and agricultural processing sectors. India (3 documents) shows a moderate contribution to the development of concepts regarding the adoption of the circular economy in companies and agro-industrial sustainability. Turkey (2 documents) has a relatively high number of citations (48 citations), indicating that Turkey has a strong academic influence, particularly in the context of developing sustainable business models and strategies for recycling agricultural waste. Other countries, such as Germany, Denmark, the United Kingdom, Peru, Sri Lanka, the Maldives, Chile, Argentina, Portugal, and Malaysia, have made relatively small contributions with 1 document each, indicating that although their contributions are smaller, these countries still play a role in exploring and expanding research on the application of the circular economy in the agro-industrial sector. The total link strength generated by VOSviewer illustrates collaborative relationships among countries globally. Most countries have a connectivity value of 1–2, indicating that international collaboration in circular economy research within the agroindustry remains relatively limited. This finding highlights opportunities for stronger cross-country research partnerships to expand knowledge exchange and accelerate the adoption of circular economy practices. For example, recent studies have demonstrated how digital innovations such as blockchain, Internet of Things (IoT), artificial intelligence (AI), and big data analytics can enhance traceability, optimize resource management, reduce food loss and waste, and improve supply chain resilience in agroindustrial systems. These emerging research themes underscore the potential benefits of international collaboration in advancing innovative and scalable circular economy solutions.

Table 1. Country Contribution in Circular Economy Research on Agroindustry

No	Country	Documents	Citations	Total Link Strength
1	Brazil	4	41	3
2	Denmark	1	18	2
3	Germany	1	3	2
4	India	3	9	2
5	Maldives	1	0	2
6	Peru	1	3	2
7	Sri Lanka	1	0	2
8	Turkey	2	48	2
9	United Kingdom	1	18	2
10	Argentina	1	1	1
11	Chile	1	5	1
12	Indonesia	4	11	1
13	Italy	5	388	1
14	Malaysia	1	0	1
15	Portugal	1	0	1

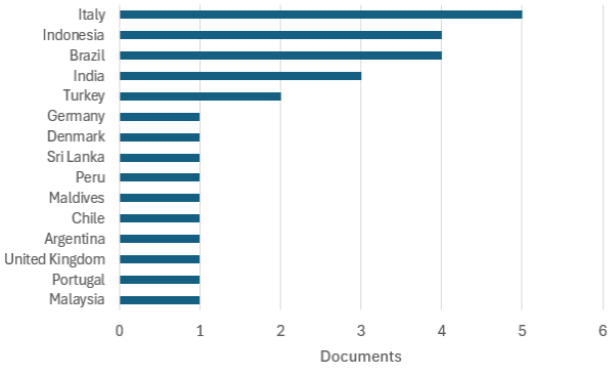


Figure 3. Number of Publications by Country in Circular Economy Agroindustry Research

The country collaboration clusters also provide insights into the relationship between technological innovation and social factors in supporting circular economy adoption. International research networks facilitate the exchange of knowledge on emerging technologies such as digital traceability systems, blockchain, artificial intelligence, and resource optimization tools, which act as important technological drivers. However, the successful implementation of these innovations depends on social and

institutional factors, including stakeholder collaboration, knowledge sharing, and supportive policy environments. This waste generation, and transforming agroindustrial waste into value-added products and new business opportunities, interaction between technological and social dimensions contributes to value creation by improving resource efficiency, reducing thereby supporting the transition toward a circular economy.

3.3. Keyword Co-occurrence Analysis

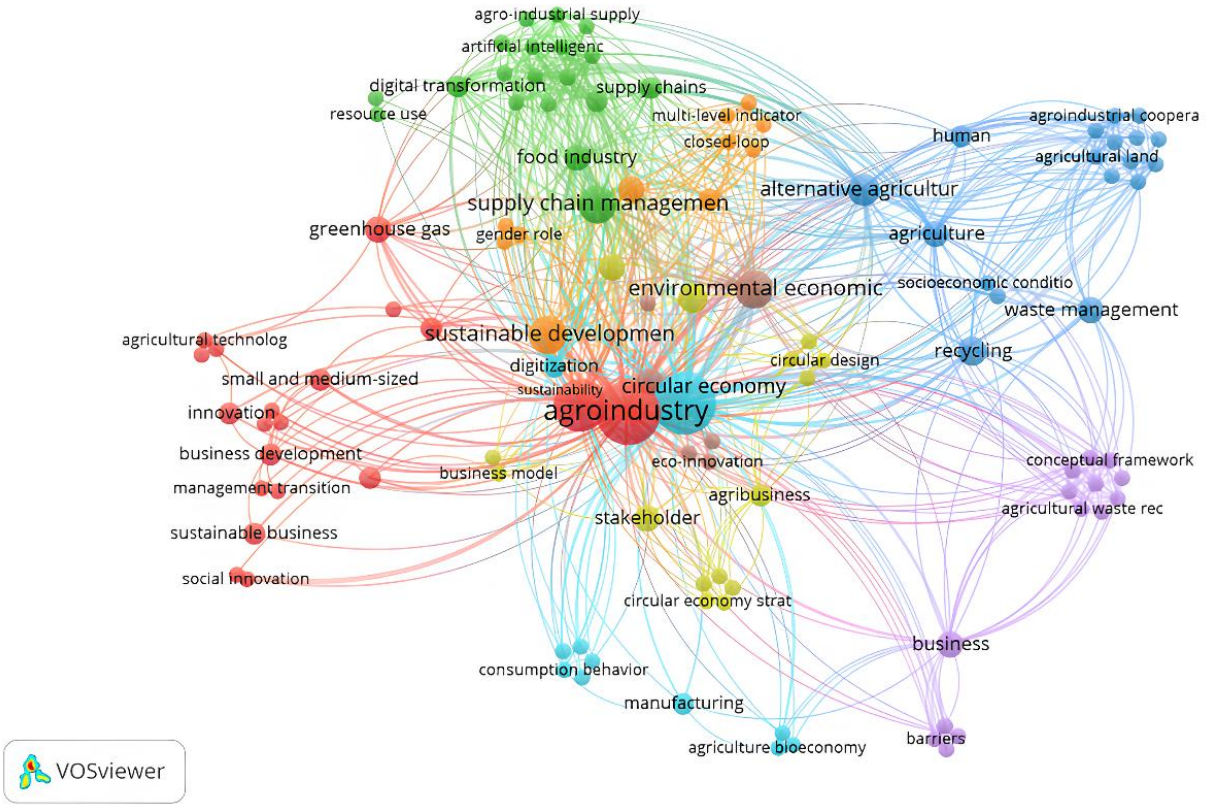


Figure 4. Visualization of the Keyword Co-occurrence Analysis Network

Figure 4 shows a visualization of the thematic relationships between research on the circular economy and agroindustry based on keyword co-occurrence analysis. The most dominant keywords with the largest nodes in the network are “Agroindustry” and “Circular Economy,” indicating a strong connection between the agroindustry sector and the implementation of the circular economy. Agroindustry exhibits the highest occurrence (22) and total link strength (205), indicating its central position within the research network and highlighting its importance as a key context for circular economy implementation.

The keyword co-occurrence analysis of the selected articles identified three dominant clusters that characterize the thematic focus of the reviewed literature on circular economy adoption in agroindustry. The first cluster (20 items) highlights the importance of sustainability, strategic transformation, and technological and social innovation in supporting the transition toward a circular economy in the agroindustry sector, as evidenced by keywords such as social innovation, sustainability, strategic evaluation, and socio-technical transition. This cluster reflects institutional and strategic dimensions, emphasizing stakeholder engagement, organizational transformation, and governance mechanisms that facilitate circular economy adoption. The second cluster (19 items) emphasizes the role of

digital technology transformation and supply chain integration as strategies for addressing environmental issues, as indicated by the emergence of keywords such as digital transformation, artificial intelligence, supply chain management, and environmental issues. This cluster represents technological dimensions, highlighting the role of digital innovations in improving operational efficiency, traceability, and decision-making processes. The third cluster (18 items) focuses on resource and organizational efficiency in optimizing waste management to create a circular economy in industry, as indicated by keywords such as waste management, alternative energy, closing the loop, socioeconomic conditions, intermediate values, and organization. This cluster corresponds to environmental and resource efficiency dimensions, focusing on waste valorization, resource optimization, and alternative energy utilization to support sustainable production systems.

In addition to these dominant themes, the cluster analysis also highlights the importance of circular business model development and stakeholder collaboration, as reflected by keywords such as collaborative relationship, stakeholder, business model, and development model. Furthermore, the emergence of keywords such as barriers, economic problems, policy making, and consumption behavior indicates the presence of structural challenges that may hinder circular economy adoption, particularly in relation to resource constraints, organizational readiness, regulatory support, and consumer engagement.

The thematic structure suggests a progression in research attention from waste management, recycling, and resource efficiency toward broader organizational, strategic, and technological aspects of circular economy implementation. More recent research has expanded toward organizational and strategic aspects, including stakeholder collaboration and circular business models. The emergence of keywords such as digital transformation, artificial intelligence, and supply chain management indicates a growing interest in leveraging advanced technologies to accelerate circular economy implementation and improve system-wide sustainability performance. Despite the growing attention to technological innovation, sustainability strategies, and resource efficiency, limited studies explicitly examine the interaction between drivers, barriers, and value creation within a single analytical framework. Furthermore, the relatively limited international collaboration identified in the country analysis suggests opportunities for comparative and cross-country research on circular economy adoption in agroindustry.

3.4. Identification of Drivers and Barriers

The drivers and barriers identified in this study are derived from the 24 articles included in the systematic literature review and should therefore be interpreted within the scope of the reviewed dataset. While these findings provide valuable insights into factors influencing circular economy adoption in agroindustry, they reflect the dominant themes emerging from the selected studies rather than the entirety of the circular economy research landscape. The reviewed literature highlights a range of technological, environmental, economic, organizational, and supply chain-related factors that shape the transition toward circular economy practices. Table 2 summarizes the selected studies and the corresponding drivers and barriers identified through the literature synthesis.

Table 2. Synthesis of Drivers and Barriers of Circular Economy Adoption in Agroindustry

Authors	Title	Drivers	Barriers
Dewasiri et al. (2026)	Exploring enablers and challenges in building smart circular economies through industry 4.0 technologies in South Asia	Industry 4.0; digitalization; public-private collaboration	high cost; infrastructure issue; consumption behavior; policy inconsistencies
Banerjee et al. (2026)	Exploring the Drivers, Barriers, and Enablers of Circular Economy Implementation in the Agro-Food Supply Chain: A Qualitative Study	institutional support; sustainability awareness; collaboration	regulatory complexity; organizational readiness
Garcez et al. (2026)	What You Need to Know About Life Cycle Assessment in the "Agri-Food Sector" for Sustainable Business Strategies in SMEs: A Bibliometric Analysis	sustainability strategy; SME efficiency, corporate strategy	limited LCA adoption capability
Istanto et al. (2025)	Circular economy in action: shared value in tapioca industry of Indonesia	triple bottom line; shared value creation; sustainability strategy	organizational capability gap
Rabasedas & Abadia et al. (2025)	Circular Economy Balance Scorecard Framework for Agrifood Companies in Emerging Economy	performance measurement; business strategy	implementation complexity
Solaymani et al. (2025)	What Is the Scale of the Bio-Business Sector? Insights into Quantifying the Size of the New Zealand Bioeconomy	bioeconomy opportunity; policy relevance	measurement complexity
Guerra et al. (2025)	Re-Designing Business Process Models for Enhancing Sustainability in Spinach Production Through Lean Tools with Digital Transformation	digital transformation; lean tools; supply chain efficiency	cost efficiency; technological integration
Betti et al. (2025)	Sustainability and Circularity of the Agri-food Systems: How to Measure It? A First Attempt on the Italian System	sustainability indicators; circular metrics	lack of standardized measurement

Barbosa et al. (2025)	Predictors of Corporate Reputation: Circular Economy, Environmental, Social, and Governance, and Collaborative Relationships in Brazilian Agribusiness	ESG performance; collaboration; corporate reputation	governance complexity
Amir & Mahajan (2025)	Exploring factors influencing circular economy adoption and firm-level practices in the agribusiness sector: an exploratory study of Indian firms	resource efficiency; circular design; collaboration	knowledge gap; organizational readiness
García-Sánchez & Enciso-Alfaro (2025)	Women and circular transition in agri-food industry: The commitment to gender diversity as an engine of change	gender diversity; organizational inclusion	structural inequality
Zuhri et al. (2024)	Assessing the Viability of Circular Economy in Indonesia's MSMEs Agribusiness Sector	sustainability orientation; remanufacturing	limited MSME capability
Maganda et al. (2024)	Transition to the Circular Transition to the Circular Economy: Innovative and Disruptive Production Technologies Adopted by Agribusiness Startups	agtech innovation; precision agriculture	technology adoption complexity
Tumuyu et al. (2024)	Transition Thinking for Circular Agrobusiness Innovation - A Study Case on Agroindustry Company at Sumatera Island, Indonesia	socio-technical transition; organizational learning	internal resistance to change
Tumuyu & Marthalia (2024)	Strategy on circular economy transition: A case study of agrocompany in Indonesia	social innovation; strategic evaluation	organizational readiness
Poponi et al. (2023)	Value optimisation for the agri-food sector: A circular economy approach	collaboration; sustainability value optimization	supply chain complexity
Melendez (2023)	Circular agri-food economy: managerial trends for the sustainability of production systems	eco-innovation; sustainability management	implementation challenges
Alan & Köker (2023)	Analyzing and mapping agricultural waste recycling research: An integrative review for conceptual	waste recycling innovation; bioenergy opportunity	economic feasibility

	framework and future directions		
Agnusdei et al. (2023)	Digitalization as driver to achieve circularity in the agroindustry: A SWOT-ANP-ADAM approach	digital transformation; supply chain integration	technological investment cost
Barros et al. (2023)	Going in Circles: Key Aspects for Circular Economy Contributions to Agro-industrial Cooperatives	innovation; cooperation; bioenergy	organizational complexity
Barros et al. (2023)	Going in Circles: Key Aspects for Circular Economy Contributions to Agro-industrial Cooperatives	circular indicators; resource efficiency	measurement limitations
Poponi et al. (2022)	Evaluating the transition to the circular economy in the agri-food sector: Selection of indicators	supply chain management; decision tools	indicator complexity, environmental economics
Hamam et al. (2021)	Circular economy models in agro-food systems: A review	cleaner production; stakeholder awareness	policy gaps
Dagevos & de Lauwere (2021)	Circular business models and circular agriculture: Perceptions and practices of dutch farmers	circular business models; SME transition	adoption uncertainty, radical change

Based on Table 2, the results of the synthesis indicate that the drivers of circular economy adoption can be categorized into environmental and resource efficiency drivers, technological drivers, and institutional drivers. Among these categories, sustainability-oriented practices, stakeholder collaboration, and technological innovation emerged as the most frequently reported drivers across the reviewed studies. These drivers contribute to improved resource efficiency, waste valorization, and organizational capability in supporting circular economy implementation. In contrast, organizational barriers were the most commonly reported constraints, particularly organizational readiness, capability gaps, and resistance to change. Financial constraints, technological investment costs, implementation complexity, and policy-related issues were also frequently identified as barriers to adoption. Furthermore, the reviewed studies suggest some contextual differences between countries. Studies conducted in developing countries, such as Indonesia, India, and Brazil, more frequently emphasized financial constraints, technology adoption challenges, infrastructure limitations, and organizational readiness. In contrast, studies from developed countries, including Italy, the Netherlands, and New Zealand, tended to focus on sustainability measurement, circular indicators, performance evaluation, and business model development.

3.5. Drivers of Circular Economy Adoption in Agroindustry

3.5.1. Environmental and Resource Efficiency Drivers

Environmental and resource efficiency factors are among the key drivers in the implementation of the circular economy within the agro-industrial sector. Alan and

Köker (2023) emphasized waste recycling innovation and bioenergy opportunities as mechanisms for improving resource efficiency, while Amir and Mahajan (2025) highlighted resource efficiency and circular design as important drivers of circular economy adoption in agribusiness firms. The emergence of terms such as waste management, sustainability awareness, recycling, resource use, alternative energy, and closing the loop underscores the importance of waste reduction and the optimization of resource utilization within production systems. The agroindustry is a sector that generates large amounts of biomass waste, so the application of circular economy principles offers opportunities to improve resource efficiency through the reuse of production residues. Increased awareness of environmental sustainability and the adoption of waste recycling technologies are driving organizations to adopt waste management practices (Aini et al., 2002). Furthermore, the conversion of agricultural waste into biofuels, biochar, organic fertilizers, and biomaterials demonstrates that a circular economy approach can create new economic value from resources previously considered waste (Alan & Koker, 2023). Thus, the integration of resource efficiency strategies and the importance of waste management are critical factors in driving the transition toward a more sustainable agroindustrial system.

3.5.2. Technological and Innovation Drivers

Technology plays a crucial role in driving the circular economy. For example, Agnusdei et al. (2023) identified digital transformation and supply chain integration as key enablers of circularity in agroindustry, while Dewasiri et al. (2026) highlighted Industry 4.0 technologies as important drivers for developing smart circular economy systems in South Asia. These technologies improve traceability, optimize resource utilization, and support data-driven decision-making. The emergence of keywords such as digital transformation, Industry 4.0, innovation, and precision agriculture indicates that technological advancements support increased production efficiency, optimized resource use, and the development of closed-loop systems. Digitalization enables companies to improve material efficiency through real-time resource monitoring, production process optimization, and enhanced material recycling practices, thereby creating economic value and reducing environmental impact (Aiello, 2024). Additionally, advancements in biotechnology further strengthen the implementation of the circular economy through the utilization of biomass as an alternative raw material source. Biotechnology converts biological waste into value-added products such as bioenergy, biomaterials, and bio-based chemicals, which support material efficiency and reduce dependence on non-renewable resources (Solaymani et al., 2025). The integration of digital technology and biotechnology into agro-industrial production systems contributes to increased productivity and extends product lifecycles, thereby strengthening the transition toward a more sustainable circular economy

3.5.3. Institutional and Strategic Drivers

Institutional support and organizational strategies play a crucial role in the implementation of the circular economy in the agro-industrial sector, as evidenced by the emergence of terms such as collaborative relationships, public-private partnerships, stakeholders, corporate strategy, and circular business models. Public-private partnerships and global collaboration with technology providers can support closed-loop supply chains, improve access to technology and funding, and accelerate innovation in circular business models (Dewasiri et al. 2026). Circular business model innovation emphasizes the development of value propositions, value creation, and partnership networks that enable organizations to simultaneously generate economic, social, and environmental benefits through the optimization of resource utilization and waste reduction (Hamam et al., 2021). The implementation of circular economy-based business strategies also underscores the

importance of stakeholder engagement in decision-making, as the success of circular business models heavily depends on consumer acceptance, policy support, and organizational readiness to adopt sustainable innovations (Jeffery, 2009).

3.6. Barriers of Circular Economy Adoption in Agroindustry

3.6.1. Financial Barriers

Several studies identified financial constraints as major barriers. Dewasiri et al. (2026) highlighted high implementation costs and infrastructure limitations, while Agnusdei et al. (2023) emphasized technological investment costs associated with digital transformation initiatives. Keyword analysis results indicate a correlation between economic problems, investment costs, and uncertainty regarding short-term economic benefits, which can influence companies' decisions to adopt circular economy practices. The high initial investment requirements for waste treatment technologies, eco-innovation, and the development of biomass-based business models pose significant challenges in applying the circular economy to the agro-industrial sector (Gedam et al., 2021). Furthermore, the implementation of the circular economy within the agro-industrial supply chain requires the development of business capabilities such as resource recovery and waste valorization, which also entail high initial costs (Kusumowardani et al., 2021). A literature review indicates that economic risks, high implementation costs, and long-term financial uncertainty are the primary factors hindering agroindustrial companies from integrating the circular economy into their supply chains (Mehmood et al., 2021).

3.6.2. Organizational Barriers

The success of circular economy implementation depends heavily on an organization's ability to manage internal change, foster a culture of innovation, and strengthen coordination among management, employees, and relevant stakeholders. The results of the co-occurrence analysis of keywords indicate a relationship between organization, strategic evaluation, socio-technical transition, innovation culture, and internal values, suggesting that the implementation of the circular economy requires a company's internal readiness to integrate sustainability principles into its business strategy. However, many companies still face difficulties in systematically adopting a circular economy framework, particularly in setting strategic goals, designing appropriate business model innovations, and measuring business progress from a sustainability perspective (Tumuyu et al., 2024). Additionally, shifts in employee mindset and the need for enhanced human resource capacity pose significant challenges, as the implementation of a circular economy requires new competencies,cross-functional collaboration, and continuous organizational learning processes (Tumuyu et al., 2024). Limitations in organizational readiness and a lack of understanding of the circular economy concept indicate that internal corporate factors are among the primary barriers to adopting circular economy practices in the agro-industrial sector.

3.6.3. Market Barriers

Products produced through the circular economy still face challenges in finding suitable markets, as evidenced by the emergence of keywords such as consumption behavior, market demand, and value perception. Consumer acceptance of products based on reuse, recycling, and recovery remains varied, as some consumers still perceive circular products as having lower quality and relatively higher prices compared to conventional products, thereby hindering market development (Dewasiri et al., 2026). In the agro-industrial sector, creating added value through the utilization of waste and by-products requires product differentiation strategies capable of building positive value perceptions aligned with consumer expectations and creating new market opportunities for sustainable products (Tumuyu et al., 2024). Furthermore, the market for circular economy-based products

tends to have specific consumer segments, particularly upper-middle-class consumers who possess higher environmental awareness and are more likely to prioritize product value over price. Therefore, companies need to develop circular business models capable of effectively communicating sustainability value and identifying new market opportunities to accelerate the adoption of the circular economy, particularly in the agro-industrial sector.

3.6.4. Policy Barriers

Policy factors are one of the barriers affecting the implementation of the circular economy in the agro-industrial sector. The results of keyword co-occurrence analysis reveal associations with terms such as "policy implementation," "policy inconsistencies," and "environmental policy," indicating that policy inconsistencies and the suboptimal integration of environmental policies pose significant challenges, particularly in the agro-industrial sector of developing countries. Regulatory ambiguity, the lack of integrated policy standards, and weak coordination among government institutions can create uncertainty for companies in developing circular business models and long-term investment strategies (Ndoka et al., 2025; Munonye, 2025). Additionally, external factors such as limited government incentives, pressure from buyers, and short-term policy dynamics can affect the stability of circular economy implementation (Tumuyu & Marthalia, 2024). Inconsistent policy support can reduce companies' motivation to invest in resource-efficiency-based innovations and green technologies. Therefore, the integration of consistent environmental policies, the provision of fiscal incentives, support for green technology financing, and cross-sectoral policy alignment are critical factors in creating an ecosystem conducive to the development of a circular economy in the agro-industrial sector.

3.7. Conceptual Framework of Drivers, Barriers, and Value Creation in Agroindustry

The implementation of the circular economy in the agro-industrial sector generates value creation from economic, environmental, and social perspectives. From an economic perspective, the circular economy can improve production cost efficiency through the optimization of resource utilization and open new revenue opportunities by valorizing waste and by-products into value-added products such as bioenergy, biomaterials, and functional food ingredients (Ajayi et al., 2024; Okuthe, 2024). From an environmental perspective, the circular economy contributes to waste reduction, improved energy and water efficiency, and reduced greenhouse gas emissions through the implementation of closed-loop systems in the agro-industrial supply chain (Riaz et al., 2024). From a social perspective, the circular economy promotes the creation of new jobs, opportunities for collaboration with stakeholders, and strengthens food security through the development of value chains based on agricultural waste and multi-stakeholder collaboration within a sustainable business ecosystem (Ajayi et al., 2024).

The conceptual framework in Figure 5. illustrates the relationship between drivers, barriers, and value creation in the implementation of the circular economy in the agro-industrial sector. Drivers—comprising environmental and resource efficiency drivers, technological drivers, and institutional and strategic drivers—play a role in encouraging organizations to adopt the circular economy. These factors support the implementation of the circular economy in the agro-industrial sector, which encompasses biomass valorization, resource recovery, sustainable agri-food supply chains, and circular business models, thereby enabling the optimization of biomass waste utilization and improved resource efficiency within production systems.

On the other hand, the process of adopting the circular economy is influenced

by several barriers, namely financial, organizational, market, and policy barriers. These barriers relate to investment constraints, organizational readiness, market acceptance, and policy consistency, which can affect the stability of circular economy practices. The findings suggest that specific drivers can help mitigate these barriers and facilitate value creation. For instance, technological drivers such as digitalization and Industry 4.0 technologies can reduce organizational barriers by improving information availability, operational efficiency, and resource monitoring. Similarly, institutional drivers, including stakeholder collaboration and policy support, can help overcome market and regulatory barriers by enhancing coordination and strengthening implementation capacity. Environmental and resource efficiency drivers, particularly waste valorization and resource optimization, can alleviate financial constraints through cost reductions and the creation of new value-added products. As these barriers are reduced, circular economy adoption is more likely to generate economic value through improved competitiveness and resource efficiency, environmental value through waste reduction and resource conservation, and social value through stakeholder engagement and employment opportunities. Based on these relationships, a conceptual framework is proposed to illustrate how drivers, barriers, circular economy practices, and value creation interact within the agroindustry sector.

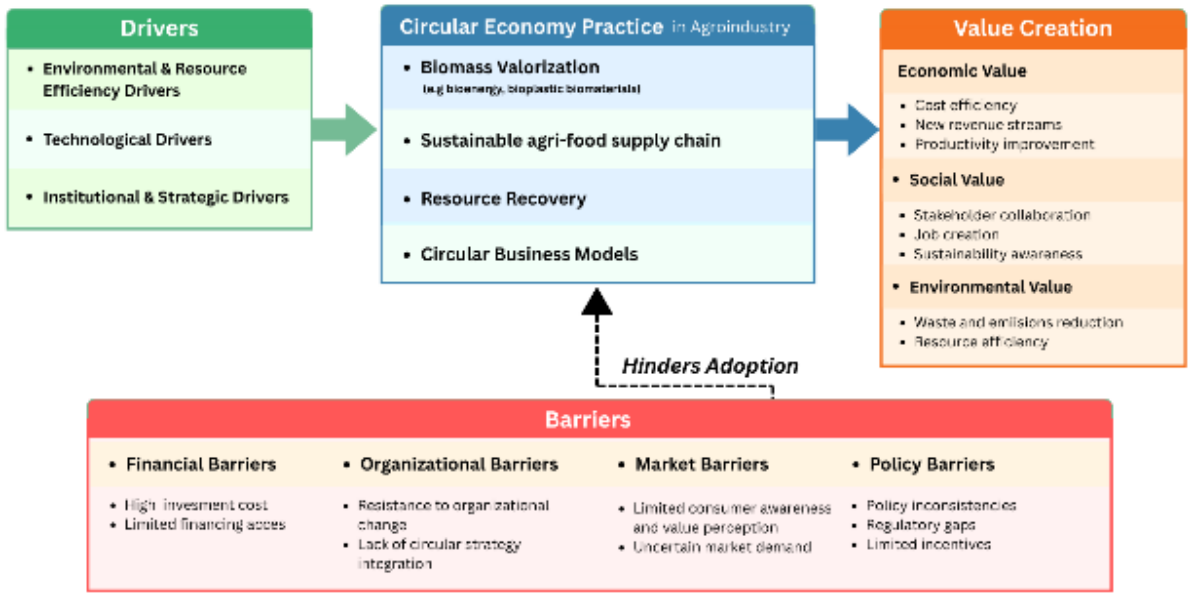


Figure 5. Synthesis of Drivers and Barriers of Circular Economy Adoption in Agroindustry

3.8. Contributions and Research Limitations

This study makes a theoretical contribution by integrating bibliometric analysis and a systematic literature review to identify drivers, barriers, and value creation in the adoption of the circular economy within the agro-industrial sector. This study expands the circular economy literature by emphasizing specific characteristics of the agroindustry, particularly biomass valorization, resource recovery, sustainable agri-food supply chains, and circular business models in creating economic, environmental, and social value. Practically, this research provides implications for

industry stakeholders and policymakers in identifying the key factors influencing the successful implementation of the circular economy in the agroindustry sector.

This study has several limitations. First, the data used in the bibliometric analysis is limited to articles indexed in the databases used, and the relatively small number of articles means that the results of the synthesis may not fully represent all developments in research related to the circular economy in the agro-industrial sector. Second, this study employs a qualitative approach based on keyword and literature analysis; consequently, no empirical testing has been conducted on the proposed conceptual framework. Therefore, future research is recommended to conduct empirical testing using quantitative methods or case studies to validate the relationships between drivers, barriers, and value creation in the implementation of the circular economy within the agro-industrial sector

4. CONCLUSIONS AND RECOMMENDATIONS

This study demonstrates that circular economy adoption in agroindustry is a multidimensional process shaped by the interaction between enabling drivers and constraining barriers. The findings reveal that environmental and resource efficiency, technological innovation, and institutional and strategic support collectively facilitate circular economy implementation, while financial, organizational, market, and policy barriers remain significant challenges. Rather than acting independently, these factors interact to determine the extent to which circular economy practices can generate economic, environmental, and social value within agroindustrial systems.

A key contribution of this study is the integration of bibliometric analysis and systematic literature review to develop a comprehensive framework linking drivers, barriers, and value creation in the agroindustry context. The results suggest that successful circular economy adoption requires not only technological advancement but also supportive institutional arrangements, stakeholder collaboration, and organizational readiness. This highlights the importance of adopting a systemic approach that simultaneously addresses resource efficiency, technological capabilities, and governance mechanisms.

From a practical perspective, agroindustrial firms should prioritize investments in digital technologies, resource optimization, and waste valorization initiatives to strengthen circular economy practices and improve resource efficiency. Policymakers are encouraged to provide consistent regulatory support, green financing mechanisms, and targeted subsidies for waste collection and transportation to reduce logistical and financial barriers, particularly for small and medium-sized agroindustrial enterprises. Future research could expand the dataset, incorporate comparative cross-country analyses, and further examine the dynamic relationships between drivers, barriers, and value creation across different agroindustrial sectors.

ACKNOWLEDGMENTS

The author would like to express sincere gratitude to all researchers whose work contributed to this study. Appreciation is also extended to the institutions and databases that provided access to scientific publications used in this research. The author gratefully acknowledges the financial support provided through the KATALIS Kemendiktisaintek 2026 program under Devi Maulida Rahmah, which made this research possible.

REFERENCES

Aiello, L. (2024). Bayesian insights on digitalization and environmental sustainability practices towards the circular economy. *Technological Forecasting and Social Change*. https://doi.org/10.1016/j.techfore.2024.123456

Agnusdei, G. P., Baležentis, T., & Streimikiene, D. (2023). Digitalization as driver to achieve circularity in the

agroindustry: A SWOT-ANP-ADAM approach. *Sustainability, 15*(6), 4972. https://doi.org/10.3390/su15064972

Aini, M. S., Razi, A. F., Lau, S. M., & Hashim, A. H. (2002). Practices, attitudes and motives for domestic waste recycling. *International Journal of Sustainable Development & World Ecology, 9*(3), 232–238. https://doi.org/10.1080/13504500209470115

Ajayi, O. O., Toromade, A. S., & Olagoke, A. (2024). Circular agro-economies (CAE): Reducing waste and increasing profitability in agriculture. *International Journal of Advanced Economics*. https://doi.org/10.51594/ijae.v6i11.1701

Alan, H., & Köker, M. (2023). Analyzing and mapping agricultural waste recycling research: An integrative review for conceptual framework and future directions. *Journal of Cleaner Production, 384*, 135512. https://doi.org/10.1016/j.jclepro.2022.135512

Alamerew, Y. A., Kambanou, M. L., Sakao, T., & Brissaud, D. (2020). A multi-criteria evaluation method of product-level circularity strategies. *Sustainability, 12*(12), 5129. https://doi.org/10.3390/su12125129

Alfiero, S., Christofi, M., & Bonadonna, A. (2019). Street food traders, farmers and sustainable practice to reduce food waste in the Italian context. *British Food Journal, 122*(5), 1361–1380. https://doi.org/10.1108/BFJ-04-2019-0265

Aschemann-Witzel, J., & Stangherlin, I. (2021). Upcycled by-product use in agri-food systems from a consumer perspective: A review of what we know, and what is missing. *Technological Forecasting and Social Change, 168*, 120749. https://doi.org/10.1016/j.techfore.2021.120749

Banerjee, S., Sharma, M., & Gupta, R. (2026). Exploring the drivers, barriers, and enablers of circular economy implementation in the agro-food supply chain: A qualitative study. *Journal of Cleaner Production*. https://doi.org/10.1016/j.jclepro.2026.142315

Baral, M. M., Mukherjee, S., Singh, R. K., Chittipaka, V., & Kazancoglu, Y. (2023). Exploring antecedents for the circular economy capability of micro, small and medium enterprises: An empirical study. *Business Strategy and the Environment, 32*(8), 5785–5806. https://doi.org/10.1002/bse.3448

Barbosa, M. W., Cauchick-Miguel, P. A., & Jabbour, A. B. L. (2025). Predictors of corporate reputation: Circular economy, environmental, social, and governance, and collaborative relationships in Brazilian agribusiness. *Business Strategy and the Environment*. https://doi.org/10.1002/bse.3810

Barros, M. V., Salvador, R., & de Francisco, A. C. (2023). Going in circles: Key aspects for circular economy contributions to agro-industrial cooperatives. *Journal of Cleaner Production, 382*, 135248. https://doi.org/10.1016/j.jclepro.2022.135248

Betti, G., Guerrini, A., & Zamagni, A. (2025). Sustainability and circularity of the agri-food systems: How to measure it? A first attempt on the Italian system. *Ecological Indicators*. https://doi.org/10.1016/j.ecolind.2025.111245

Bocken, N. M. P., de Pauw, I., Bakker, C., & van der Grinten, B. (2016). Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering, 33*(5), 308–320. https://doi.org/10.1080/21681015.2016.1172124

Campos-Rodríguez, R., Brenes-Peralta, L., Garcia-Salas, A., & Jiménez-Morales, M. F. (2021). Food loss assessment in micro, small and medium-sized agro-industrial enterprises. *Tecnología en Marcha, 34*(3), 145–160. https://doi.org/10.18845/tm.v34i3.5122

Dagevos, H., & de Lauwere, C. (2021). Circular business models and circular agriculture: Perceptions and practices of Dutch farmers. *Sustainability, 13*(1), 128. https://doi.org/10.3390/su13010128

Dewasiri, N. J., Singh, R., Najeeb, A., & Rathnasiri, M. S. H. (2026). Exploring enablers and challenges in building smart circular economies through Industry 4.0 technologies in South Asia. *Discover Sustainability, 7*, 220. https://doi.org/10.1007/s43621-026-02614-1

El Kayaly, D. (2023). Formation of agricluster on the priority of including small farms: Case from Egypt. In *Industry Clusters and Innovation in the Arab World* (pp. 281–308). https://doi.org/10.1108/978-1-80262-871-520231013

Garcez, A. S., Silva, L. F., & Jabbour, C. J. C. (2026). Life cycle assessment in the agri-food sector for sustainable business strategies in SMEs: A bibliometric analysis. *Journal of Cleaner Production*. https://doi.org/10.1016/j.jclepro.2026.141887

García-Sánchez, I. M., & Enciso-Alfaro, E. (2025). Women and circular transition in agri-food industry: The commitment to gender diversity as an engine of change. *Business Strategy and the Environment*. https://doi.org/10.1002/bse.3794

Geissdoerfer, M., Savaget, P., Bocken, N., & Hultink, E. (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

Guerra, J., Nazzaro, C., & Marotta, G. (2025). Re-designing business process models for enhancing sustainability in spinach production through lean tools with digital transformation. *Sustainability, 17*(3), 7565. https://doi.org/10.3390/su170307565

Hamam, M., D'Amico, M., & Di Vita, G. (2021). Circular economy models in agro-food systems: A review. *Sustainability, 13*(6), 3453. https://doi.org/10.3390/su13063453

Inoue, M., Yamada, S., Miyajima, S., Ishii, K., Hasebe, R., Aoyama, K., Yamada, T., & Bracke, S. (2020). A modular design strategy considering sustainability and supplier selection. *Journal of Advanced Mechanical Design, Systems, and Manufacturing, 14*(2). https://doi.org/10.1299/jamdsm.2020jamdsm0023

Istanto, R., Sukardi, S., & Suryani, A. (2025). Circular economy in action: Shared value in tapioca industry of Indonesia. *Sustainability*. https://doi.org/10.3390/su17041245

Jeffery, N. (2009). *Stakeholder engagement: A road map to meaningful engagement*. Doughty Centre for Corporate Responsibility, Cranfield University.

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

Melendez, L. (2023). Circular agri-food economy: Managerial trends for the sustainability of production systems. *British Food Journal, 125*(9), 2895–2910. https://doi.org/10.1108/BFJ-10-2022-0913

Munonye, W. C. (2025). Towards circular economy metrics: A systematic review. *Circular Economy and Sustainability, 5*, 4093–4135. https://doi.org/10.1007/s43615-025-00604-5

Ndoka, E., Alimehmeti, G., Shulla, K., & Voigt, B. (2025). Transitioning to circular business models in developing countries: A systematic literature review of barriers, enablers, and future directions. *Discover Sustainability, 6*. https://doi.org/10.1007/s43621-025-01339-x

Okuthe, G. (2024). Valorizing fruit and vegetable waste: The untapped potential for entrepreneurship in Sub-Saharan

Africa. *Recycling, 9*(3), 40. https://doi.org/10.3390/recycling9030040

Page, M. J., Moher, D., Bossuyt, P. M., Boutron, I., Hoffmann, T., Mulrow, C. D., et al. (2021). PRISMA 2020 explanation and elaboration: Updated guidance and exemplars for reporting systematic reviews. *BMJ, 375*, n160. https://doi.org/10.1136/bmj.n160

Poponi, S., Arcese, G., & Mosconi, E. M. (2022). Evaluating the transition to the circular economy in the agri-food sector: Selection of indicators. *Resources, Conservation and Recycling, 176*, 105916. https://doi.org/10.1016/j.resconrec.2021.105916

Poponi, S., Arcese, G., & Mosconi, E. M. (2023). Value optimisation for the agri-food sector: A circular economy approach. *Journal of Cleaner Production, 397*, 136456. https://doi.org/10.1016/j.jclepro.2023.136456

Riaz, S., Rafiq, I., Ilić, P., Murtaza, G., Hameed, S., Farooqi, Z., Sohail, M., & Karki, J. (2024). Circular economy and sustainable consumption. *Circular Economy Journal*. https://doi.org/10.7251/prb2401169r

Santagata, R., Ripa, M., Genovese, A., & Ulgiati, S. (2020). Food waste recovery pathways for a bio-based circular economy: A systematic review. *Journal of Cleaner Production, 248*, 125490. https://doi.org/10.1016/j.jclepro.2020.125490

Setyowati, N., & Riptanti, E. W. (2023). Creating an innovative culture in agribusiness MSMEs. *Agricultural and Resource Economics, 9*(2), 205–222. https://doi.org/10.51599/are.2023.09.02.09

Shah, M. I., Khan, M. I., & Qureshi, M. A. (2019). Cleaner production adoption in SMEs: A review of barriers and drivers. *Journal of Cleaner Production, 228*, 119–134. https://doi.org/10.1016/j.jclepro.2019.04.273

Solaymani, S., Kari, F., & Sulaiman, N. (2025). Scale of the bio-business sector: Evidence from New Zealand bioeconomy. *Journal of Cleaner Production*. https://doi.org/10.1016/j.jclepro.2025.140221

Tarihoran, A. D. B., Hubeis, M., Jahroh, S., & Zulbainarni, N. (2023). Market-based dynamic capabilities for MSMEs. *Journal of Open Innovation, 9*(3), 100123. https://doi.org/10.1016/j.joitmc.2023.100123

Tumuyu, P., Marthalia, D., & Sari, N. (2024). Transition thinking for circular agrobusiness innovation. *International Journal of Sustainable Development and Planning, 19*(2), 567–576. https://doi.org/10.18280/ijsdp.190218

Tumuyu, P., & Marthalia, D. (2024). Strategy on circular economy transition. *International Journal of Sustainable Development and Planning, 19*(4), 1211–1221. https://doi.org/10.18280/ijsdp.190412

Zuhri, M., Suryani, A., & Sukardi, S. (2024). Viability of circular economy in Indonesia MSMEs agribusiness sector. *Heliyon, 10*(5), e26145. https://doi.org/10.1016/j.heliyon.2024.e26145