Sustainable management and competitiveness in agro-industrial MSMES on the Ecuadorian coast: A literature review from the circular economy (2015-2025)

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Abstract

For agro-industrial MSMEs, sustainability and competitiveness are strategic elements, especially in territories where pressure on natural resources and environmental demands from international markets are growing. In this context, the circular economy emerges as a comprehensive approach to optimizing processes, recovering waste, and improving business performance. This study conducted a systematic literature review from 2015 to 2025 using the PRISMA methodology to analyze how sustainable management based on circular economy principles contributes to the competitiveness of agro-industrial MSMEs on the Ecuadorian coast. A structured search was conducted in Scopus and Web of Science, yielding 42 initial records, 19 of which met the inclusion criteria. The results demonstrate that the adoption of circular practices depends on organizational capacity, technological availability, environmental leadership, and value chain integration. Competitive benefits associated with reducing operating costs, productive diversification, using by-products, and accessing markets with advanced environmental standards were also identified. However, significant barriers related to financing, infrastructure, technical training, and local governance were also identified. In conclusion, the circular economy is a viable mechanism to improve the competitiveness of the Ecuadorian coast's agro-industry, provided its implementation is accompanied by public policies, capacity building, and institutional support.

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Introduction

Growing pressure on natural resources, structural changes in global markets, and international environmental demands have created a challenging scenario for micro-, small-, and medium-sized enterprises (MSMEs) in the agribusiness sector. These organizations play a vital role in job creation, food security, and territorial development. However, they operate in contexts marked by high volatility, technological limitations, and inconsistent institutional frameworks (Rizos et al., 2016). In regions such as the Ecuadorian coast, where the economy depends on exporting agricultural products like cocoa, bananas, palm oil, coffee, and fish, these tensions are exacerbated by climate vulnerability, seasonal production cycles, and increasingly stringent environmental standards in international markets (Salgado-Tello et al., 2024).

In this context, the linear production model based on extracting, producing, and disposing has significant limitations from environmental and competitive points of view. Soil degradation, increased waste generation, inefficient resource use, and waste management costs have driven the transition to more regenerative and efficient approaches. The circular economy has gained relevance by proposing the optimization of material use through strategies such as prevention, reuse, repair, recovery, and recycling (Geissdoerfer et al., 2017). Unlike traditional environmental management models, the circular economy incorporates systemic transformations involving technological innovation, organizational redesign, and the adoption of new business models aimed at closing production cycles (Kirchherr et al., 2017).

In the agro-industrial sector, there are ample opportunities to apply the circular economy due to the large amount of organic waste generated during cultivation, processing, and export. Recent literature indicates that valorizing by-products and implementing technologies that efficiently use water, energy, and biomass can reduce costs, improve productivity, and increase business resilience (Mehmood et al., 2021; Centobelli et al., 2021). These benefits are especially relevant for MSMEs, which often face budget constraints and high levels of uncertainty in their daily operations.

However, the adoption of circular practices remains limited in developing countries due to factors such as a lack of technical capacity, restricted access to clean technologies, weak institutional coordination, and insufficient financial instruments to promote sustainable innovation (Derakhshan et al., 2023). In the case of Ecuador's coast, these limitations are compounded by territorial issues such as climate variability, inadequate infrastructure for managing agro-industrial waste, and unequal access to sustainable markets, hindering the transition to more circular production models.

Despite the growing body of research on the circular economy, there is still a scientific gap regarding its application in Latin American agro-industrial MSMEs. Most systematic reviews focus on Europe and Asia, whose institutional and technological conditions differ considerably from those of Latin American countries (Le et al., 2022; Luthra et al., 2022). The lack of comparative studies limits our understanding of the factors that determine the adoption of circular practices in territories with heterogeneous structural capacities.

In this context, this study conducts a systematic literature review from 2015 to 2025 to analyze how sustainable management based on the circular economy contributes to the competitiveness of agro-industrial MSMEs on the Ecuadorian coast. Although direct empirical evidence in Ecuador is limited, international comparative analyses provide valuable insights into effective circular strategies, predominant barriers, and the territorial conditions under which such practices can enhance competitiveness.

Additionally, this study identifies a scientific gap related to the lack of conceptual models integrating the circular economy, competitiveness, and territory in the context of agro-industrial MSMEs. In response, this article proposes a model that articulates internal capacities, enabling factors, circular strategies, and competitive outcomes. This model offers a conceptual tool that contributes to both academic analysis and the design of public policies aimed at sustainable

development.

Theoretical framework

Circular economy: fundamentals, evolution and relevance for agribusiness

Over the past decade, the circular economy has evolved as a strategic approach seeking to decouple economic growth from resource-intensive consumption. This model aims to keep materials in use for as long as possible by promoting reuse, repair, redistribution, recycling, and energy or material recovery (Geissdoerfer et al., 2017). Unlike the traditional linear model, the circular economy is designed to be regenerative. It aims to reduce dependence on virgin raw materials, minimize environmental impact, and promote business models based on closed cycles.

Kirchherr et al.'s (2017) influential work analyzed over a hundred definitions of the concept, arguing that the circular economy involves systemic transformation encompassing product redesign, process reconfiguration, and changes in consumption and governance patterns. This systemic character is particularly relevant to the agro-industrial sector, where biomass flows and the high volume of organic waste offer significant opportunities for resource recovery and regeneration. Recent studies have shown that implementing circular practices in agribusiness can reduce post-harvest losses, allow for the reuse of by-products as biofertilizers, and generate energy from waste. These practices contribute to both economic and ecological sustainability (Mehmood et al., 2021).

In Latin America, circular practices are still emerging, though there are advances in specific sectors, such as cocoa, bananas, and palm. Research in Ecuador reveals initial initiatives for composting, using agro-industrial waste, and improving water efficiency. However, implementation is inconsistent and depends on institutional, technical, and financial factors (Salgado-Tello et al., 2024). These fragmented initiatives demonstrate the potential of the circular economy to strengthen business sustainability in agro-exporting regions.

Sustainable management in MSMEs: capacities, constraints and opportunities

Sustainable management integrates economic, environmental, and social dimensions into companies' planning and operations. For micro, small, and medium-sized enterprises (MSMEs), this concept translates into practices related to resource efficiency, environmental impact reduction, regulatory compliance, and improved working conditions (Nidumolu et al., 2009). However, the literature acknowledges that MSMEs face structural barriers hindering the adoption of sustainable approaches. These barriers include a lack of financing, insufficient technology, low technical training, and the absence of effective public policies (Rizos et al., 2016).

Despite these limitations, several studies emphasize that MSMEs can develop sustainability-related advantages when they possess environmental leadership, adequate technical capabilities, and a learning-oriented organizational culture. Centobelli et al. (2021) argue that sustainability can improve competitiveness by driving innovation through differentiated products and more efficient processes. Thus, sustainable practices should be understood as a strategy to strengthen resilience and competitive stability, not merely as regulatory compliance.

For agro-industrial MSMEs on the Ecuadorian coast, sustainable management is particularly relevant due to the region's dependence on vulnerable natural resources and international markets with high environmental standards. These conditions necessitate that companies develop internal capacities to adapt to changing regulations, manage environmental risks, and optimize production processes.

Business competitiveness and its relationship with sustainability

Business competitiveness refers to a company's ability to survive, stand out, and grow in dynamic markets (Porter, 1990). Competitiveness depends on internal factors such as operational efficiency, innovation, and product quality, as well as external factors including public policies, access to financing, infrastructure, and integration into value chains.

According to contemporary literature, sustainability can be a driver of competitiveness. Nidumolu et al. (2009) argue that companies that adopt sustainable practices tend to innovate more, reduce

costs, and position themselves better in markets with environmentally conscious consumers. For agro-industrial MSMEs, these advantages can be crucial in sectors where traceability, environmental certification, and resource efficiency have become requirements for accessing high-value international markets.

In regions like the Ecuadorian coast, competitiveness is associated with companies' ability to respond to changing climatic conditions, comply with environmental standards, and adapt to global demand fluctuations. The circular economy appears as a strategic mechanism to improve competitiveness in these vulnerable environments by promoting material and energy efficiency.

Circular economy and competitiveness: evidence and connection mechanisms

Recent literature has examined the relationship between the circular economy and firms' competitive performance. For example, Centobelli et al. (2021) found that adopting circular practices is associated with improvements in productivity, energy efficiency, and business differentiation. Other studies have reported additional benefits, including reduced operating costs, access to new markets, reduced risks, and a strengthened corporate reputation (Le et al., 2022; Luthra et al., 2022).

From a resource and capability theory perspective, the benefits of the circular economy are explained by the development of valuable, scarce, and difficult-to-imitate internal capabilities, such as technical knowledge, innovation capacity, and efficient resource management (Barney, 1991). These capabilities can become sources of sustainable competitive advantage, especially for companies operating in sectors under high environmental and economic pressure.

Despite the growing number of investigations on this relationship, most focus on manufacturing sectors and regions with high levels of infrastructure. There is less empirical evidence on the circular economy in agro-industrial sectors in emerging economies, which limits our understanding of how these strategies can be implemented in contexts with significant constraints.

Scientific gap and theoretical basis of the study

The literature review reveals three main gaps. First, a lack of systematic studies focusing on agro-industrial MSMEs in Latin America prevents a full understanding of how the circular economy operates in regions with limited institutional and technological capabilities. Second, the available literature does not consistently integrate the concepts of the circular economy, competitiveness, and territory. This restricts the formulation of conceptual models applicable to regions such as the Ecuadorian coast. Third, there is an empirical gap related to identifying specific circular practices that small companies in vulnerable agro-export sectors can adopt.

This study addresses these gaps by providing a systematic synthesis of the available evidence, proposing an integrative conceptual model, and analyzing the implications of the circular economy on competitiveness in a specific territory.

3. General objective

The goal is to analyze how sustainable management based on the principles of the circular economy contributes to the competitiveness of agro-industrial MSMEs on the Ecuadorian coast during the period from 2015 to 2025. This will be accomplished through a systematic literature review based on the PRISMA methodology. The review will identify the circular strategies implemented, their reported effects, and the main barriers and opportunities for their adoption.

4. Methodology

Methodological approach

The study was developed through a systematic literature review that followed the PRISMA 2020 guidelines to guarantee transparency, rigor, and replicability in the processes of searching for, selecting, and synthesizing information (Page et al., 2021). This approach was chosen because it is useful for integrating heterogeneous evidence from different territories and methodologies. This is particularly relevant for research on the circular economy, sustainability, and business

competitiveness, where qualitative and quantitative studies and narrative reviews predominate.

The analysis focused on articles published between 2015 and 2025, a period during which the circular economy gained greater conceptual and operational traction within the business environment. Specifically, the review focused on studies addressing circular practices in MSMEs, preferably in the agribusiness sector, and their relationship with sustainability or competitiveness.

Databases and search strategy

The search was conducted in two international databases: Scopus and Web of Science. These platforms were chosen for their extensive coverage of peer-reviewed publications in applied social sciences, sustainability, economics, and agribusiness.

The search equations, designed in English, used Boolean operators to maximize the retrieval of relevant studies.

Scopus
(TITLE-ABS-KEY("circular economy") AND
TITLE-ABS-KEY("SMEs" OR "MSMEs" OR "small and medium enterprises" OR MIPYMES) AND
TITLE-ABS-KEY("agroindustry" OR "agribusiness" OR "agri-food") AND
TITLE-ABS-KEY("competitiveness" OR "sustainable management"))
AND PUBYEAR > 2014 AND PUBYEAR < 2026

Web of Science
TS=("circular economy" AND ("SMEs" OR "MSMEs" OR "small enterprises")
AND ("agribusiness" OR "agri-food" OR "agroindustry")
AND ("competitiveness" OR "sustainable management"))
AND PY=(2015-2025)

The search was complemented by manual review of reference lists, allowing the identification of additional articles that did not appear in the initial results.

Inclusion and exclusion criteria

The studies were evaluated according to previously defined criteria.

Inclusion
Articles published between 2015 and 2025.
Peer-reviewed studies.
Research that addressed circular economy related to MSMEs or agri-food chains.
Studies that linked circularity with sustainability, efficiency or competitiveness.
Texts available in English or Spanish.
Access to the full text.

Exclusion
Theses, book chapters, conference proceedings or non-refereed documents.
Studies focused exclusively on large companies.
Articles with no explicit relationship between circular economy and competitiveness.
Purely theoretical research without application in productive sectors.

PRISMA 2020 Process

The selection process included four stages: identification, screening, eligibility, and inclusion. The initial search yielded 42 records. After eliminating two duplicates, 40 articles remained for title and abstract review. During this phase, 26 studies were excluded due to not meeting the thematic criteria. Fourteen full-text articles were analyzed, and five were discarded due to a lack of methodological clarity or an inadequate link between the circular economy and competitiveness. Finally, nineteen articles were included in the qualitative and semi-quantitative analyses.

The corresponding PRISMA table is given in the methodological section of the article.

Quality Assessment: MMAT 2018

The Mixed Methods Appraisal Tool (MMAT 2018) was used to assess the methodological quality of the studies, suitable for reviews that include qualitative, quantitative and mixed designs (Hong et al., 2018). This tool assesses five main criteria:

1. Clarity of research questions.
2. Adequacy of the methods used.
3. Data quality and sufficiency.
4. Consistency between findings and analysis.
5. Relevance and contributions of the study.

Each article was scored on a scale of 0% to 100%. Only studies with a score of 75% or more were included in the final synthesis. This approach ensures that the corpus analyzed maintains an adequate and consistent methodological level to support valid conclusions.

Data extraction and synthesis

The data were organized using analytical matrices that allowed us to systematize key information from each study, including context, company type, adopted circular strategies, enablers, barriers, effects on competitiveness, and reported limitations. Then, thematic coding was carried out in three stages: open coding, axial coding, and selective coding. This process identified patterns, regularities, and divergences between studies conducted in Asia, Africa, Europe, and Latin America.

Finally, a semi-quantitative analysis was conducted that included frequency counting, geographical distribution of literature, temporal trends, and classification of predominant circular practices. This analysis was performed to complement the qualitative results and strengthen interpretive robustness.

Graphical representation of the PRISMA process

Figure 1 shows the PRISMA flowchart, which summarizes the entire process of identifying, filtering, evaluating the eligibility of, and selecting studies. This ensures transparency, traceability, and the ability to replicate the procedure.

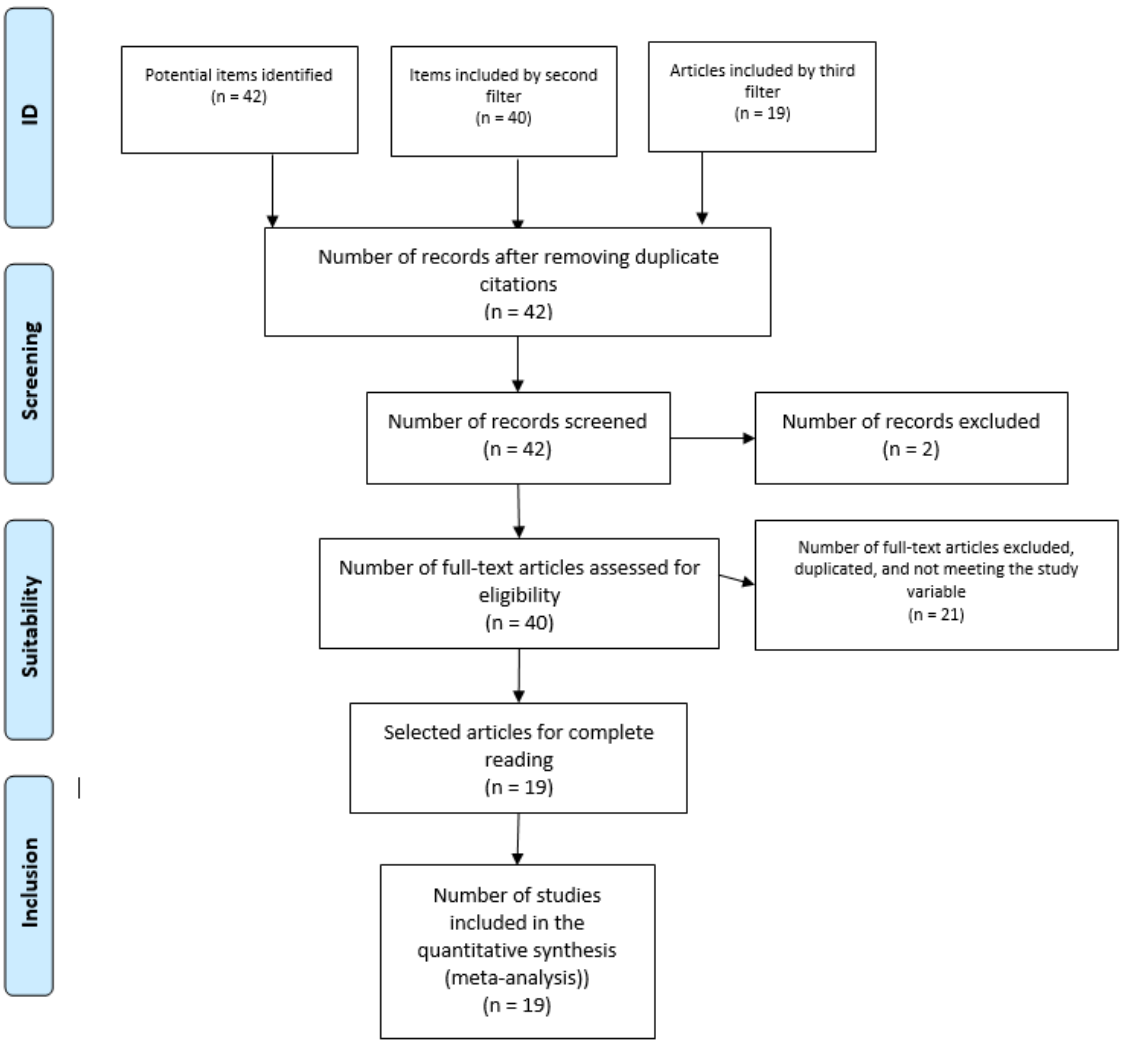

Figure 1. Flowchart of a systematic review carried out under the PRISMA technique (Moher, Liberati, Tetzlaff, Altman, & Group, 2009)

Source: Authors; Based on the proposal of the Prisma Group (Moher, Liberati, Tetzlaff, Altman, & Group, 2009)

Results

The 19 studies included in the systematic review enable us to identify common patterns and significant differences in the literature on the circular economy, sustainability, and competitiveness in agro-industrial MSMEs. The results are presented at two levels: a qualitative content analysis based on thematic groupings, and a semi-quantitative analysis summarizing geographical, methodological, and conceptual trends observed in the corpus.

Qualitative analysis: emerging thematic categories

The coding process made it possible to identify four main categories that describe the dynamics between circular economy and competitiveness in agro-industrial MSMEs.

Circular strategies implemented

The literature shows that the most common circular practices in agro-industrial MSMEs fall into three categories. First, by-product recovery stands out, particularly in chains that generate large amounts of biomass. These practices include composting, producing biofertilizers, converting waste into biomaterials, and generating energy from organic waste. Studies in Asia and Africa indicate

that valorization is the most accessible and impactful strategy for reducing operating costs (Mehmood et al., 2021; Tetteh et al., 2025).

Second, strategies focused on energy efficiency and resource optimization are identified. These include the rational use of water, recirculating materials, controlling post-harvest losses, and adopting energy-efficient technologies. Research by Luthra et al. (2022), for example, highlights that these actions promote operational stability and contribute to financial sustainability.

Third, some studies describe the emerging use of Agri 4.0 technologies, such as sensors, digital traceability, and environmental monitoring systems. These technologies facilitate impact measurement and data-based decision-making. Although adoption of these tools is limited in regions with low technological capacity, they are emerging as key enablers of agro-industrial circularity (Mukherjee et al., 2024).

Factors that facilitate the adoption of circular practices

The literature identifies four types of enablers. The first type corresponds to organizational capabilities, such as environmental leadership, an innovation-oriented business culture, and specialized technical knowledge. Studies in India and Vietnam indicate that these capacities directly influence the likelihood of adopting circular strategies (Le et al., 2022; Luthra et al., 2022).

The second enabler relates to technological availability. Companies with access to efficient machinery, waste treatment systems, and precision technologies have higher circularity rates. The third enabler stems from collaborative networks among companies, universities, and government institutions that facilitate the sharing of experiences and reduce innovation-related costs (Derakhshan et al., 2023). Finally, regulatory and market pressures favor the adoption of circular practices, especially in agro-export chains that face strict traceability and sustainability requirements.

Barriers to the implementation of the circular economy

The included studies agree that MSMEs face structural barriers hindering their transition to circular models. The main obstacle is financial constraints, especially in contexts where there are no green credit lines or specific incentives for sustainable innovation. The technological gap is another relevant barrier due to the high cost of specialized equipment and the lack of waste treatment infrastructure.

Another frequently mentioned barrier is the lack of technical training. Many MSMEs lack personnel trained in environmental management, clean technology use, or circular process design. Additionally, institutional weaknesses linked to poor regulation, lack of monitoring, and low articulation between actors in the value chain predominate in developing countries (Rizos et al., 2016; Derakhshan et al., 2023).

Effects of the circular economy on competitiveness

Adopting circular practices contributes to business competitiveness through several mechanisms identified in the reviewed studies. First, circularity reduces operating costs by promoting the efficient use of inputs and waste recovery, thereby improving profit margins. Second, circularity favors access to international markets that require environmental certifications or sustainability standards, thereby increasing companies' export capacity.

Third, circular practices strengthen MSMEs' resilience to fluctuations in resource availability and increases in raw material costs. Lastly, firms that adopt circular strategies develop internal innovation capabilities that can be converted into sustainable competitive advantages, as outlined in resource and capability theory (Barney, 1991).

Semi-quantitative analysis

The semi-quantitative analysis was carried out based on the 19 included studies, in order to identify patterns in their temporal, geographical and methodological distribution, as well as trends in the topics addressed.

Distribution by year of publication

Studies show a progressive increase in interest in the circular economy in MSMEs from 2017 onwards. Between 2015 and 2017, only three relevant studies were identified, while the period 2020-2024 concentrates the largest part of publications. This pattern coincides with the global consolidation of circular economy public policies and the expansion of applied research in productive sectors.

Geographical distribution

The literature is most concentrated in Asia (India, Indonesia, Vietnam, Sri Lanka) with a total of 9 studies. Africa contributes 3 relevant investigations, mainly in Ghana and Egypt. Europe contributes 4 studies, focusing on conceptual analyses and adoption measurements. Latin America appears to be less represented, with only one study focused on Ecuador and another on Brazil. This low Latin American presence confirms the scientific gap pointed out in the introduction.

The following table summarizes the regional distribution.

Table 1. Geographical distribution of included studies

Region	Number of studies	Approximate percentage
Asia	9	47 %
Africa	3	16 %
Europe	4	21 %
Latin America	2	10 %
Global/theoretical	1	6 %

Distribution by study type

The review shows a predominance of qualitative studies and systematic or narrative reviews. Quantitative studies represent about a third of the corpus, with methodologies based on statistical models such as SEM or PLS-SEM.

Table 2. Methodological typology of the included studies

Type of study	Number of investigations
Qualitative	7
Quantitative	6
Systematic or narrative reviews	6

Frequency of topics analyzed

1. The analysis allowed us to identify the dominant themes in the literature:
2. Circular practices in MSMEs (18 studies).
3. Internal and external enablers of circularity (15 studies).
4. Barriers to the adoption of the circular economy (14 studies).
5. Relationship between circularity and competitiveness (12 studies).
6. Use of digital technologies and Agri 4.0 (6 studies).

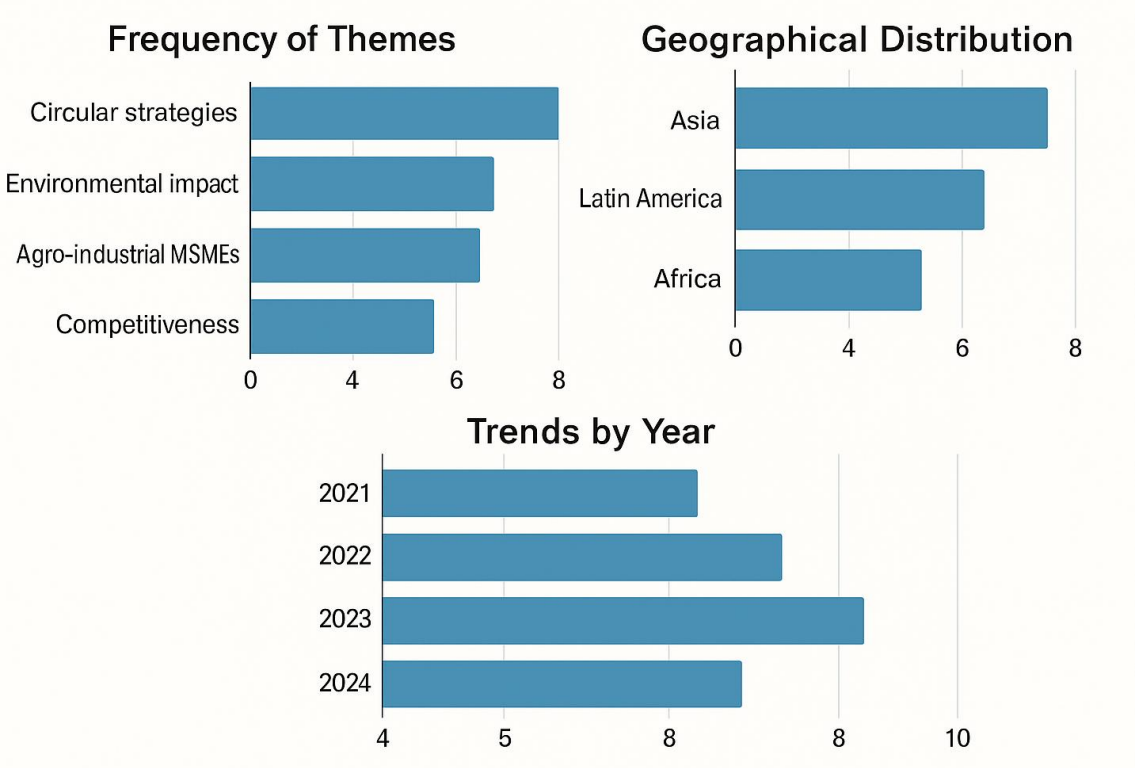

Figure 1. Topic frequency

It shows how much the main concepts are repeated in the 19 studies.

Figure 2. Geographical distribution

It shows that there are few studies in Latin America and almost none in Ecuador.

Figure 3. Trends by year

It demonstrates the growth of the literature and justifies the relevance of the study.

Figure 4. Topic Frequency

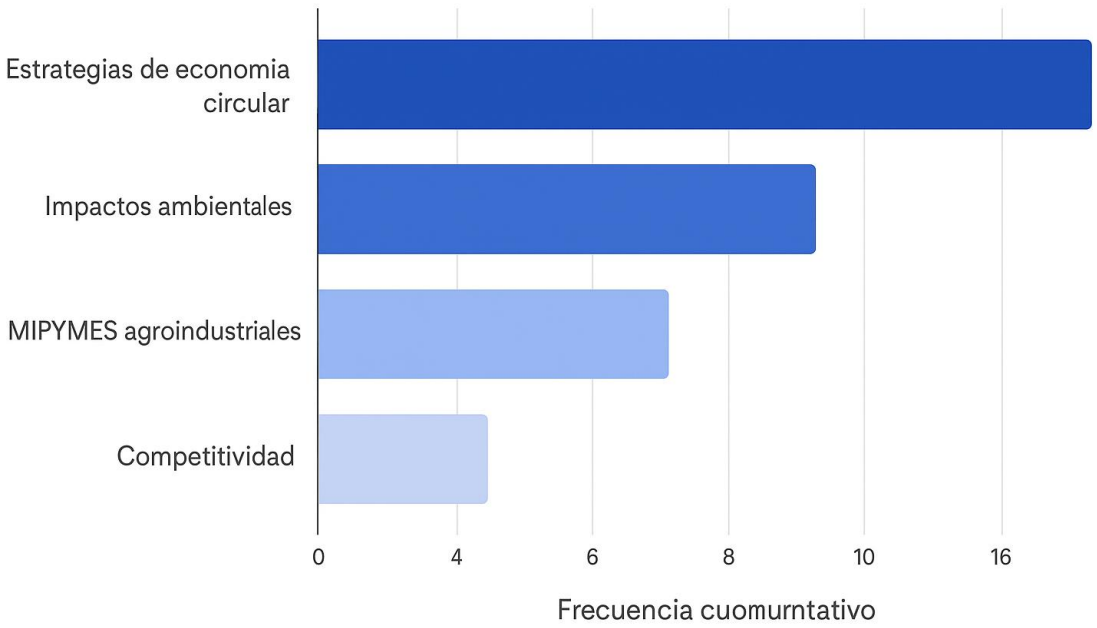

Figure 4 shows that circular economy strategies are the most recurrent theme, followed by environmental impacts and studies focused on agro-industrial MSMEs. In contrast, competitiveness receives less attention in the literature, which confirms the existence of a conceptual and empirical gap that this study seeks to address through a comparative approach and through the conceptual

model proposed in the discussion.

General Summary

The literature agrees that the circular economy improves the operational efficiency and competitiveness of agro-industrial MSMEs, although its implementation depends largely on internal capacities, access to technology, and institutional conditions. The limited presence of studies in Latin America shows a gap that justifies the relevance of this analysis.

Synthetic matrix of studies analyzed

Table 1 shows the results after applying the search filters related to the methodology proposed for this research, after recognizing the relevance of each of the referenced works.

Author / Year	Country	Type of study	Objective of the study	Main findings	Barriers identified	Contributions applicable to the Ecuadorian coast
Putri et al. (2025)	Indonesia	Qualitative	Analyze the adoption of CE in MSMEs	CE improves operational efficiency and reduces costs	Lack of financing; low technification	Energy efficiency and reuse are replicable strategies in Ecuador
Singh et al. (2025)	India	Qualitative	Evaluate factors influencing the adoption of circular innovation	Internal capabilities determine adoption	Technological gap; Resistance to change	Importance of strengthening managerial and technical capacities
Zuhri et al. (2024)	Indonesia	Qualitative	Measuring the viability of CE in agribusiness	Valorization of by-products is feasible for MSMEs	Insufficient training	Ecuador can take advantage of agro-industrial waste for new products
Mukherjee et al. (2024)	India	Qualitative	Explore reverse logistics with AI	AI improves material recovery	Limited technological infrastructure	Potential to improve traceability in banana/cocoa chains
Akinwale (2024)	Saudi Arabia	Quantitative	Measure EC adoption in the value chain	EC increases profitability and efficiency	Lack of state support	It shows the need for incentives for circularity in Ecuador
Baral et al. (2023)	India	Qualitative	Analyze circular capabilities	Organizational culture drives EC	Lack of environmental leadership	Relevance of environmental training in Ecuadorian MSMEs

Derhab & Elkhweski (2023)	Egypt	Qualitative	Review waste management in MSMEs	Waste management is key for EC	Lack of infrastructure and regulations	Similar to limitations in rural areas of Ecuador
Virmani et al. (2022)	India	Mixed	Identify barriers to CD	Financial and regulatory obstacles	High economic uncertainty	Direct response to the situation of Ecuadorian MSMEs
Dalto et al. (2024)	Brazil	Qualitative	EC in Agro-industrial Project Management	Redesigning circular processes improves productivity	High upfront costs	Process redesign can be applied in cocoa and banana agro-industries
Centobelli et al. (2021)	Italy	Qualitative	Determinants of transition to CE	Regulation and strong institutions facilitate transition	Regulatory costs	Ecuador requires policies more aligned with international regulations
Le et al. (2022)	Vietnam	Qualitative	Sustainable EC-performance relationship	EC elevates performance and differentiation	Weak governance	It can guide export differentiation strategies
Tetteh et al. (2025)	Ghana	Qualitative	Agri 4.0 and EC in agribusiness	4.0 technologies promote circular innovation	Technical limitations	Relevant for digitalization of Ecuadorian agro-export chains
Jayalath et al. (2025)	Norway	Quantitative	Transformation of agri-food chains	EC modernizes traditional chains	Green logistics costs	Provides transformation model for Ecuadorian fishing chains
Rabasedas & Moneva (2025)	Argentina	Quantitative	Balanced Scorecard circular	Proposal of indicators for CE	Missing data and reports	Ecuador can adopt a regional circular BSC
Luthra et al. (2022)	India	Quantitative	Behavioral factors in CD	Managerial behavior conditions EC	Lack of sustainable mindset	Needs to strengthen business culture in Ecuador
Mehmood et al. (2021)	Ukraine	Quantitative	Drivers and barriers in agri-food chains	EC reduces waste and improves value	Technological risks	Transferable to Ecuadorian aquaculture chains
Shih et al. (2018)	Taiwan	Qualitative	Circular knowledge management	Internal capacities support EC	Learning gaps	Highlights the need for continuous

						training in MSMEs
Muzondo et al. (2025)	Zimbabwe	Qualitative	EC barriers/enablers in horticulture	Local collaboration improves EC	Lack of capital and technology	Ecuador can follow community models of circularity
Hidayati et al. (2021)	New Zealand/Indonesia	Quantitative	Sustainable agri-food chains	Governance and traceability strengthen competitiveness	Lack of institutional coordination	Ecuador requires stronger territorial governance

Table 1. List of articles analyzed

Source: Own elaboration

Examining the 19 analyzed studies offers a comprehensive perspective on the link between the circular economy and the sustainable management and competitiveness of small and medium-sized enterprises, particularly in agro-industrial areas like the Ecuadorian coast. First, the studies recognize the value of the circular economy as a strategic approach to business development and management. Putri et al. (2025) emphasize that adopting management systems based on the circular economy helps MSMEs optimize operational efficiency, reduce resource-related expenses, and increase resilience. This finding is especially important for agribusiness MSMEs in Ecuador because their ability to compete largely depends on their ability to manage essential resources, such as water, energy, and biological raw materials, in situations where these resources are scarce and production costs are high.

Additionally, various studies indicate that implementing innovative and sustainable practices is influenced by organizational and technological factors. Singh, Kumar, Khan, and Sharma (2025) demonstrate that the capacity to absorb technology, managerial leadership, and a strategic orientation toward sustainability foster the adoption of green innovations in MSMEs. Similarly, Baral, Mukherjee, Singh, Chittipaka, and Kazancoglu (2023) argue that companies' circular capacity develops from institutional pressures, available technical resources, and an organizational culture that values sustainability. These findings emphasize that to achieve competitiveness, Ecuadorian agro-industrial MSMEs must strengthen their internal capacities, promote environmental leadership, and enhance their technological skills for the efficient use of resources.

Regarding obstacles and limitations, numerous studies indicate that transitioning to circular models faces considerable barriers. Virmani, Saxena, and Raut (2022) cite financial difficulties, a lack of technical knowledge, scarce government support, and infrastructure weaknesses as factors that restrict the adoption of the circular economy in MSMEs. Luthra et al. (2022) complement this perspective, showing that behavioral aspects such as risk aversion and an absence of a sustainability-oriented mindset in senior management complicate the implementation of circular practices. These findings are directly related to the reality in Ecuador, where many agribusiness MSMEs deal with limitations in financing, informality, and low technical training. These limitations can hinder sustainable innovation processes, even when circularity could offer a competitive advantage.

Within research aimed at agro-industrial chains, these results are especially significant for your goals. Zuhri, Abdullah, Puspita, and Antoro (2024) found that small and medium-sized enterprises in Indonesia's agricultural sector can successfully implement circular economy practices and achieve sustainability levels that exceed the national average. For Ecuador's coastal region, which is known for its agro-export chains involving bananas, cocoa, palm, and fisheries, these findings suggest that adopting circular practices could enhance sustainability and improve competitiveness in global markets. Additionally, Dalto, Silva, Penha, and Bizarrias (2024) state that managing projects focused on circularity facilitates redesigning agro-industrial processes, optimizes resource

use, and aligns production with environmental and economic goals. This is essential for increasing regional competitiveness.

Various studies highlight the factors that drive and limit the circular economy in food chains. Mehmood, Ahmed, Viza, Bogush, and Ayyub (2021) identify environmental benefits, financial incentives, and institutional pressure as key drivers; however, they also acknowledge constraints, such as economic issues and technological risks. Conversely, Muzondo, Mashapure, and Masiiwa (2025) describe the challenges faced by small and medium-sized enterprises (SMEs) in the horticultural sector, including macroeconomic constraints, financing issues, and inadequate infrastructure. However, they also identify facilitators, such as local collaboration networks and accumulated productive experience. These elements can be transferred to the Ecuadorian context to develop support strategies tailored to agro-industrial MSMEs.

One line of research focuses on the direct connection between the circular economy and competitive performance. Le, Behl, and Pereira (2022) conclude that circular practices increase sustainable performance, and entrepreneurship based on circularity intensifies this effect. For agribusiness MSMEs on the Ecuadorian coast, this suggests that adopting circular models could be a key factor in differentiating themselves and accessing more demanding markets, in addition to favoring environmental sustainability. Similarly, Tetteh, Owusu Kwateng, Manu, and Adjei (2025) study agribusiness companies in Africa and argue that Agri 4. 0 improves innovative performance, especially when the circular economy favors the efficient use of resources. For Ecuador, where agribusiness sectors have begun incorporating digital technologies, these findings present opportunities for competitiveness strategies based on innovation and circularity.

Other studies propose strategic frameworks and management tools to facilitate the transition to circularity. Rabasedas and Moneva (2025) created a Balanced Scorecard adapted for agri-food companies that allows progress toward circularity to be assessed, planned, and monitored through specific indicators. This tool could be implemented in MSMEs on the Ecuadorian coast to systematically organize sustainable management and link it to production and market goals. Shih et al. (2018) present a knowledge management approach for circular agribusiness, demonstrating that internal capabilities, leadership, and the quality of organizational learning processes are key to maintaining circularity and increasing competitiveness.

Finally, various studies underscore the importance of transitioning agribusiness value chains toward more sustainable practices. Hidayati, Garnevska, and Childerhouse (2021) argue that sustainability and supply chain management are critical to accessing high-value markets in the food sector. Conversely, Jayalath, Perera, Ratnayake, and Thibbotuwawa (2025) demonstrate that the circular economy can update traditional supply chains by reducing waste, increasing value, and promoting production resilience in developing countries. In the context of the Ecuadorian coast, these findings suggest that circularity is an essential strategy for improving the integration of agro-industrial MSMEs into more sustainable, competitive, and technologically advanced global value chains.

Integrative Synthesis of Results

The 19 analyzed studies together show that the circular economy can strengthen the competitiveness of agribusiness MSMEs by improving efficiency, fostering innovation, reducing costs, and providing access to specialized markets. However, adoption of these practices depends on internal conditions, such as capacities, leadership, and culture, as well as external conditions, such as public policies, financing, and infrastructure, which are not equally developed in all territories.

International evidence is particularly relevant to the Ecuadorian coast, where MSMEs face conditions similar to those in Asia and Africa, including technological limitations, poor institutional coordination, reliance on natural resources, and limited investment capacity. Therefore, comparative experience is a valuable basis for designing locally adapted strategies.

Discussion

The systematic review carried out allows us to identify common patterns, divergences and important gaps in the literature that examines the circular economy and its relationship with competitiveness

in agro-industrial MSMEs. Unlike descriptive studies, comparative analysis between regions and methodological approaches offers a broader understanding of how circularity is implemented, what its real effects are, and under what conditions it becomes a mechanism of competitiveness.

Cross-region comparison

Studies from Asia demonstrate a higher level of conceptual and operational development regarding the circular economy. Research in India, Indonesia, and Vietnam indicates that micro, small, and medium-sized enterprises (MSMEs) have adopted practices such as waste recovery, resource efficiency, and digital technology integration (Luthra et al., 2022; Le et al., 2022). These advances are partly due to more robust public policies, consolidated industrial infrastructure, and financing programs aimed at sustainable innovation.

In contrast, African literature focuses more recently on the adoption of low-cost technologies and community initiatives that use biomass. Research in Ghana and Egypt emphasizes the significance of local networks and traditional knowledge in promoting circularity despite significant technological and financial constraints (Tetteh et al., 2025; Derakhshan et al., 2023). However, these studies also point out that the lack of regulatory frameworks and informality hinder the stability of these practices.

European studies are distinguished by their greater methodological rigor and focus on efficiency models, eco-innovation, and policy evaluation. These studies tend to adopt quantitative approaches or those based on advanced statistical models that measure the effects of the circular economy on productivity and business performance (Centobelli et al., 2021). However, most of these studies are conducted in sectors other than agribusiness, limiting their applicability to rural or peri-urban contexts.

Latin America, on the other hand, is underrepresented in the literature. The few existing studies focus on specific experiences in Ecuador and Brazil, showing that circular practices in agribusiness are still in the early stages. A lack of infrastructure, green financing, and stable policies poses a significant obstacle to developing large-scale circular models (Salgado-Tello et al., 2024). This scenario confirms the need to expand research on Latin American agro-industrial MSMEs, particularly in regions like the Ecuadorian coast.

Theoretical and conceptual divergences

A significant difference among the analyzed studies concerns the conceptualization of the circular economy. While some research addresses it as a set of practices aimed at reducing waste, other research interprets it as a strategic paradigm that transforms production processes entirely. These differences result in variations in how circularity is evaluated and the indicators used to measure its impact.

Similarly, the relationship between circularity and competitiveness varies depending on the theoretical approach adopted. According to the resource-based view, studies emphasize the role of innovation, leadership, and internal capabilities as sources of competitive advantage (Barney, 1991). In contrast, institutional approaches argue that competitiveness depends on external factors, such as regulations, government incentives, environmental standards, and market pressures (Porter, 1990; Rizos et al., 2016). This theoretical duality suggests that the circular economy operates through both internal and external mechanisms simultaneously, and its effectiveness depends on the interplay between them.

Another important divergence concerns the scope of circular practices. While Europe and Asia are trending toward comprehensive circular models that include product redesign, reverse logistics, and digital technologies, Africa and Latin America are dominated by isolated practices mainly related to the valorization of by-products. This difference reflects structural inequalities in terms of technological availability, access to financing, and regulatory maturity.

Critical evaluation of the methodological limitations of previous literature

The review revealed methodological limitations that affect the results and generalizability of the

conclusions. First, most studies have small sample sizes or focus on one or two agro-industrial chains, limiting their applicability to other territories. Additionally, several studies relied on self-perception surveys, an approach that can introduce bias and overestimate the actual adoption of circular practices.

Second, the methods used are notably heterogeneous. While some studies use robust statistical models, others lack methodological clarity or fail to adequately explain how the analyzed companies were selected. Additionally, there is a lack of longitudinal studies that allow the evolution of circular practices to be analyzed over time.

A critical issue is the absence of research that integrates the environmental, economic, and territorial dimensions of the circular economy in agribusiness simultaneously. Most studies address these dimensions in a fragmented manner, making it difficult to formulate comprehensive conceptual models.

Conceptual integration: towards a model applicable to agro-industrial MSMEs

The reviewed evidence suggests that the circular economy influences the competitiveness of agribusiness micro, small, and medium-sized enterprises (MSMEs) through three main mechanisms. The first mechanism is related to operational efficiency and cost reduction through practices such as waste recovery, reduced input usage, and process optimization. The second mechanism is linked to market access and competitive differentiation, particularly in sectors where traceability and environmental certification are essential. The third mechanism involves strengthening internal capacities, such as innovation, organizational learning, and knowledge management. These capacities enhance business resilience in the face of environmental changes.

These findings provide sufficient evidence to justify developing a conceptual model that explains how internal, external, and territorial factors interact to enable agro-industrial MSMEs on the Ecuadorian coast to adopt circular practices and improve competitiveness. A model like this is necessary to overcome the conceptual fragmentation of the literature and offer a framework applicable to contexts with structural limitations.

Proposed conceptual model

The conceptual model is structured around four main components: the company's internal capabilities, external enablers, circular economy strategies, and competitive results. This integrative framework is based on reviewed literature and the need to understand how organizational, institutional, and territorial factors interact when agro-industrial MSMEs on the Ecuadorian coast adopt circular practices.

The model is represented as a dynamic sequence in which internal capacities and external conditions influence the adoption of circular strategies. These strategies then generate improvements in competitiveness under certain moderating conditions derived from the territory.

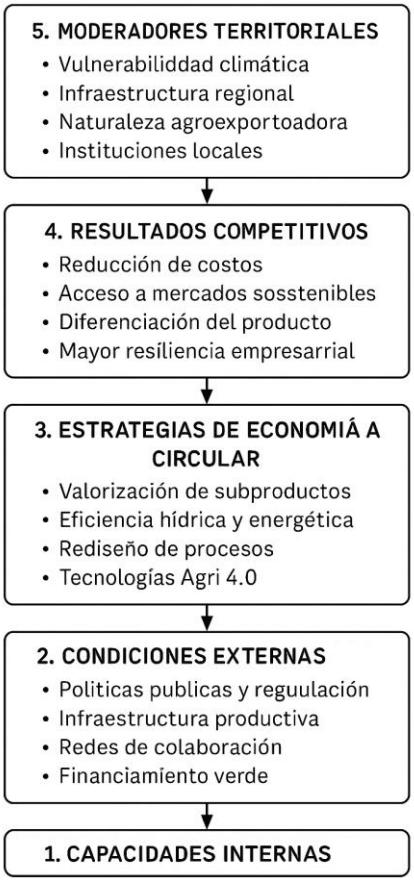

Figure 2. Conceptual Model

Explanation of the conceptual model

The conceptual model is based on resource and capability theory, institutional approaches, and recent studies of circular economy in small-scale enterprises. Its purpose is to explain how agro-industrial MSMEs can improve their competitiveness by implementing circular strategies adapted to their organizational and territorial conditions.

In-house capabilities

The literature reviewed highlights that the adoption of circular practices depends on the existence of specific organizational capacities. Environmental leadership facilitates the incorporation of a sustainable vision in production processes. Organizational innovation allows products and services to be adjusted to circular models. Knowledge management generates learning that favors the continuity of circular practices. Likewise, technological capacity is a pillar for the implementation of efficient processes in the use of resources.

External enablers

External factors also play a decisive role. Clear public policies, economic incentives, or stringent environmental regulations can accelerate the adoption of circular practices. Adequate productive infrastructure facilitates waste management and the implementation of clean technologies. Collaborative networks between companies, universities and local governments encourage the diffusion of innovation. Access to green financing makes it possible to overcome the main barrier identified: economic limitations.

Circular economy strategies

The conceptual model incorporates the most frequent circular practices in agro-industrial MSMEs. The valorization of by-products contributes to reducing costs and dependence on external inputs. Efficiency in the use of water and energy favors economic and environmental sustainability. The redesign of production processes allows us to move towards more efficient systems. Finally, Agri 4.0 technologies facilitate traceability, process control and data-driven decision-making.

Competitive results

The findings of the literature indicate that the circular economy can generate improvements in competitiveness through four mechanisms: reduction of operating costs, access to markets with rigorous environmental standards, differentiation through sustainable product attributes, and strengthening business resilience in contexts of price volatility or availability of resources.

Territorial moderators

The Ecuadorian coastline has specific territorial characteristics that influence both the adoption of circular practices and the ability of companies to turn them into competitive advantages. Climate vulnerability, productive seasonality, limited infrastructure for waste management, and dependence on agro-export markets function as moderators that can enhance or restrict the effects of circularity.

Conclusions

The analysis shows that the circular economy is a strategic approach with significant potential to strengthen the competitiveness of agro-industrial MSMEs, particularly in regions with structural vulnerabilities, like the Ecuadorian coast. A systematic literature review from 2015 to 2025 shows that circular practices generate tangible benefits, including cost reduction, resource efficiency, product differentiation, and access to markets with growing environmental demands. However, the extent of these benefits hinges on the interplay of internal capacities, external conditions, and territorial factors, underscoring the multifaceted nature of the transition to circular production models.

The results reveal that adoption of circular strategies is strongly influenced by internal factors, such as environmental leadership, innovation, and knowledge management, as well as external elements, such as public policies, infrastructure, financing, and collaboration networks. This combination of factors explains why the circular economy is advancing unevenly across regions, being stronger in Asian and European countries and less developed in Africa and Latin America. Available evidence also shows that agribusiness offers favorable opportunities for circularity due to the high volume of biomass that can be utilized and the growing international demand for sustainable products.

The study identifies an important scientific gap: the lack of connection between the circular economy, competitiveness, and territory in Latin American agro-industrial MSMEs. The reviewed literature mainly focuses on manufacturing sectors and countries with advanced technological infrastructure, leaving the realities of agro-exporting territories facing technological, financial, and logistical barriers unexplored. This gap justifies the conceptual model proposed in this study, which integrates internal capacities, external enablers, circular strategies, and competitive results under the moderating influence of the territory.

Regarding the Ecuadorian coast, the findings suggest that transitioning to circular models could significantly contribute to the agribusiness sector's sustainability and competitiveness, provided there are institutional and technical conditions facilitating the adoption of new practices. The presence of climate risks, limited infrastructure, and institutional weaknesses underscores the importance of stable public policies, targeted incentives, and green financing mechanisms to accelerate this transformation.

While the study offers significant theoretical and practical contributions, it acknowledges limitations such as uneven regional research availability and the prevalence of studies with small sample sizes or self-reported methodologies. These limitations reinforce the need to expand empirical research in Latin American contexts and develop comparative evaluations to better understand the conditions determining the effectiveness of the circular economy in different territories.

Overall, this review's results allow us to conclude that the circular economy represents a sustainable alternative and a concrete opportunity to improve the competitiveness of agro-industrial MSMEs on the Ecuadorian coast. Successful implementation depends on convergence of internal capabilities, public policies, adequate infrastructure, and innovation-oriented business strategies.

This approach strengthens business resilience, diversifies the regional economy, and promotes more sustainable and competitive production models.

Limitations of the study

The present study acknowledges several limitations that should be considered when interpreting its results. First, research on the circular economy in agribusiness MSMEs is unevenly distributed across regions. There is a higher concentration of studies in Asia and Europe, and limited representation in Latin America. This uneven distribution introduces a geographical bias, making it difficult to generalize the findings to contexts such as the Ecuadorian coast, where institutional, technological, and economic conditions differ significantly from those in more industrialized countries.

Second, including only nineteen studies introduces considerable methodological heterogeneity. Many of the analyzed studies are based on self-reporting surveys or small samples, which can affect the validity of the conclusions and lead to an overestimation of the actual adoption of circular practices. Additionally, the scarcity of longitudinal studies prevents us from examining how circular strategies evolve and their competitive impacts over time.

Another limitation is publication bias. The included studies mainly come from journals indexed in high-impact databases, which tend to privilege research with positive or statistically significant results. This could restrict the analysis of failed initiatives, deep barriers, and experiences that did not generate competitive improvement, all of which are relevant to understanding the complexity of transitions toward circularity.

The review focused on articles published in English and Spanish, excluding potentially relevant studies in other languages. Finally, using specific search equations for agribusiness and MSMEs could exclude research with interdisciplinary approaches that do not explicitly use these terms but could provide valuable information.

These limitations do not diminish the relevance of the results but rather underscore the need to strengthen scientific production in Latin American contexts and promote rigorous methodological studies to progress toward a more precise understanding of the relationship between the circular economy and agro-industrial competitiveness.

Practical implications

The findings of this study have several implications for the agro-industrial sector on Ecuador's coast. First, the results suggest the need for technical training programs for MSMEs to strengthen their internal capacities regarding environmental management, innovation, and the adoption of circular technologies. These programs should include practical components on waste recovery, efficient resource use, and production process redesign.

Second, the design of financial instruments to support the transition to circular practices is another practical implication. Creating green credit lines, providing subsidies for clean technology acquisition, and offering incentives for circular economy projects could reduce the economic barriers local companies face. Similarly, establishing public-private partnerships that facilitate access to shared infrastructure for treating and recovering agro-industrial waste is recommended.

Another relevant implication is promoting the integration of Agri 4.0 technologies into agro-export chains. Adopting sensors, environmental monitoring systems, digital traceability tools, and predictive models can improve operational efficiency and strengthen compliance with international standards. These technologies can also generate data supporting circular traceability, which is an increasingly valued aspect in European and North American markets.

Finally, local authorities should develop regulatory frameworks that encourage circularity and discourage linear practices. Incorporating sustainability criteria into certifications, export requirements, and public procurement could stimulate the adoption of circular practices. These actions would improve the competitiveness of agro-industrial MSMEs and strengthen regional resilience to climate and economic impacts.

Future lines of research

Based on the analysis carried out, several research opportunities are identified that would allow deepening knowledge about circular economy and competitiveness in agro-industrial MSMEs:

1. Empirical studies in Ecuador that directly analyze circular practices in agro-industrial chains, in order to fill the gap of regional evidence.
2. Longitudinal research that assesses the evolution of circular strategies and their effects on competitiveness over time.
3. Quantitative models to measure the real economic impact of circularity on small-scale enterprises, including cost-benefit analyses.
4. Comparative studies between regions of Ecuador to identify how territorial conditions influence the transition to the circular economy.
5. Evaluations of the role of Agri 4.0 technologies in the optimization of circular processes and in environmental traceability.
6. Research on green financing mechanisms applicable to MSMEs, including tax incentives and public-private investment models.
7. Studies on public policy and governance that analyze how specific regulatory frameworks facilitate or restrict circularity in agribusiness.
8. Development of circularity metrics and indicators adapted to agro-industrial MSMEs in developing countries.
9. Analysis of the organizational and cultural behavior of companies in relation to the adoption of circular practices.
10. Research on the integration of circular value chains between producers, processors, exporters and technology companies on the Ecuadorian coast.

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