Original Paper

Circular economy in action.

Co-creating shared value in the tapioca industry of Indonesia

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Abstract. *Circular Economy (CE) integrates social and environmental considerations into business strategies, recognizing these aspects as crucial* *for achieving organizational and ecosystems sustainability. While previous studies on CE and its correlation with Creating Shared Value (CSV) predominantly focus on developed nations, this research aims to fill the gap by showing an empirical investigation of the implementation of a circular business model in the tapioca industry of Indonesia. This study employed the Triple Bottom Line (TBL) framework, encompassing economic, environmental, and social performance and analysed 132 survey responses from tapioca business managers and owners in Indonesia using a quantitative approach with SmartPLS 4. The findings indicate that CE and CSV practices positively influence TBL performance and reveal a strong association between CE practices and CSV opportunities. By aligning with the TBL framework, this study highlights the transformative potential of CE and CSV practices in driving sustainability, profitability, and social equity in the global agroindustry.*

1. Introduction

The concept of sustainable economics has emerged as a critical response to climate change, environmental degradation, and related socio-economic issues caused by business activities (Ncube et al., 2021). In addressing these challenges, the Circular Economy (CE) model has been adopted as a novel and alternative industrial paradigm, offering solutions to the negative externalities associated with the linear economy model (Campoli et al., 2024; Pagliaro, 2023; Ünal & Shao, 2019). The CE model, guided by the 4R strategies (redesign, reduce, reuse, and recycle), encourages companies and industries to operate within a closed-loop system, optimize resource use, maximize product utility, transform waste into by-products, and support sustainable development (Dalto et al., 2023).

As a sustainable business model, the CE model is expected to be instrumental in achieving the Sustainable Development Goals (SDGs) (Geissdoerfer et al., 2018). It offers benefits across economic, environmental, and social sectors. These include reducing environmental damage, minimizing agricultural waste, enhancing economic value, and creating job opportunities (Diéguez-Santana et al., 2014; Poponi et al., 2022).

Previous research on sustainable business or CE practices has demonstrated that CE, with its emphasis on resource efficiency and waste reduction, can conserve natural resources such as land, water, and energy. This lowers the dependency of agroindustry on these resources while also protecting the environment (Lusye Marthaliaa & Asteria, 2023). Other research has concentrated on the impact of the CE model on economic (Bello et al., 2023; Chishty, 2023; Hernández-Arzaba et al., 2022; Khan et al., 2022; Schöggl et al., 2023), environmental (Bello et al., 2023; Hernández-Arzaba et al., 2022; Khan et al., 2022), and social performance (Bello A.O., et al., 2023). In addition, studies have explored the role of Creating Shared Value (CSV) concept within the Triple Bottom Line (TBL) framework, which motivates the realization of CE principles (Piwowar-Sulej et al., 2021; Vedula et al., 2022; Mohapatra et al., 2024).

The literature on CE adoption highlights several limitations in current CE studies. First, the overall contribution from business and management studies to this discipline remains scarce, with prior research primarily emphasizing theoretical concepts and technological solutions. Key areas such as management perspectives, business model innovation, and waste management require further exploration within the CE framework (Dominko et al., 2022). Furthermore, studies on the application of CE and CSV principles and their impact on economic, social, and environmental performance (Park, 2024) have predominantly centered on developed countries (Alam et al., 2024).

This study examines the Indonesian tapioca industry to fill the gap from previous study in the context of CE in developing country. The tapioca industry in Indonesia plays a significant role in the nation's agro-industry, contributing substantially to economic growth and employment, particularly in rural areas (Taslim & Rifin. 2019). As one of the largest tapioca producers in the world, Indonesia's tapioca industry is characterized by its extensive network of smallholder farmers and processing industries. However, the industry faces numerous challenges, including inefficient resource utilization, high levels of waste production, and environmental degradation. Despite its potential, the adoption of circular economy (CE) principles within Indonesia's tapioca industry remains limited and fragmented, with most businesses still focusing on short-term profitability rather than sustainable practices.

To enrich empirical research on CE principles and CSV opportunities within the framework of business management, this study focuses on their application in developing countries. This research assesses the implementation of circular business models in the tapioca sector, identifying challenges, opportunities, and their impact on TBL performance. The findings will provide insights into transitioning from linear to circular models, promoting sustainability, and creating shared value for stakeholders in the agro-industry.

2. Literature review

2.1 Circular Economy (CE)

The demand for sustainable business processes has substantially increased over the past few decades (Durán-Romero et al., 2020; Reike et al., 2018). The TBL concept introduced by Elkington (1997) offers a straightforward framework for integrating sustainability into business strategies, emphasizing economic, environmental/ecological, and social performance. Within this framework, businesses are encouraged to reevaluate their production cycles to optimize resource efficiency, reduce natural resource use, and generate positive impacts on the community and the environment (Kraaijenhagen et al., 2016).

The CE model emerges as an alternative strategy for achieving sustainable business practices within the TBL framework. CE principles prioritize minimizing waste and maximizing resource value (Phonthanukitithaworn et al., 2024). Unlike the linear business model, which regards products as waste at the end of their lifecycle (Mehmood et al., 2021), this model focuses on extending product lifecycles (Geissdoerfer et al., 2017). Moreover, integrating CE practices into business processes contributes to the SDGs, delivering environmental, economic, and social benefits (Schroeder et al., 2019).

The CE concept, initially introduced by Pearce and Turner (1989), has undergone substantial evolution. In a simplified framework, CE is often explained through the 3R structure: reduce, recycle, and reuse (OECD, 2011). Another perspective describes CE as an economic system that replaces the end-of-life concept by incorporating reduction, reuse, recycling, and recovery practices for products and materials within production, distribution, and consumption processes (Rukundo et al., 2021). In a more complex framework, Morseletto (2020) expands on the CE model using three modified schemes (Potting et al., 2017): (i) smarter product use and manufacturing (reuse, rethink, reduce); (ii) extending product or material lifespans (reuse, repair, refurbish, remanufacture, repurpose); and (iii) maximizing material utility (recycle, recovery) (Morseletto, 2020).

Energy recovery represents a crucial aspect of the CE implementation in the food processing and agro-industrial sectors. Organic waste in agro-industries can be converted into biogas, aligning with the reduce principle by lowering carbon emissions (Rao et al., 2024). In the tapioca industry, utilizing waste and by-products for biogas production is a viable application of CE practices (Lerdlattaporn et al., 2021). Recycling practices, such as utilizing recycled water in production processes, further enhance efficiency and lower undesirable outputs in the food processing sector (Pagotto & Halog, 2015). Moreover, proper waste management in the agro-industrial sector facilitates alternative uses, such as repurposing waste into animal feed or using nutrients for crop cultivation (Alzaabi et al., 2023; Tully & Ryals, 2017).

Based on the literature review, this study employed four strategies to examine the application of CE practices in the agro-industrial sector, specifically in the tapioca industry of Indonesia. The analyzed CE practices involve Reduce (R1), Recycle (R2), Recovery (R3), and Repurpose (R4). These 4R practices are particularly relevant for addressing challenges in the food processing industry, specifically the management of organic waste produced.

2.2. Circular economy practices and economic, environmental and social performance

As previously discussed, CE practices aim to foster sustainable business operations that positively impact the TBL framework. The TBL framework emphasizes three dimensions of organizational performance: Environmental (Planet), Economic (Profit), and Social (People) (Gbejewoh et al., 2021). The tapioca industry, characterized by considerable waste generation, necessitates effective management strategies to mitigate its environmental impact.

Meta-analyses indicate that CE practices boost both environmental and financial performance (Yin, 2023). Other research further highlights the positive impact of CE adoption on environmental and economic performance across various industries, including the automotive industry 4.0 (Khan, S.A.R., et al., 2022) and the agro-industry sector (Arzaba, et al., 2022). Moreover, CE practices enhance waste processing and recycling efficiency, help organizations avoid fines from environmental protection agencies and reduce future waste disposal and associated costs (Sardana, et al., 2020).

Beyond economic and environmental benefits, CE practices also hold potential for advancing social sustainability, a dimension that remains underexplored, particularly in terms of welfare and quality of life (Iofrida et al., 2024). Existing studies suggest that the implementation of CE practices yields favorable social impacts while simultaneously driving economic growth. However, other research highlights challenges in assessing social performance within the context of CE due to the complexity and absence of measurement standards or frameworks (Walker, et al., 2021). Although the social domain encompasses a wide array of topics, "job creation" is frequently the sole indicator cited to evaluate circularity or the sustainability impacts of CE practices (Kravchenko et al., 2019; Padilla-Rivera et al., 2021). Referring to these insights, the study proposes the following hypotheses:

H1. CE practices positively affect economic performance (profit).

H2. CE practices positively affect environmental performance (planet).

H3. CE practices positively affect social performance (people).

2.3 Creating shared value

CE practices not only serve as an alternative for achieving sustainable business processes and improving the TBL performance but also provide opportunities for creating shared value (CSV) (Axhami, et al., 2023). CSV opportunities refer to stimulating competitiveness while simultaneously enhancing social conditions in the communities where the companies operate (Porter & Kramer 2011). Strengthening a robust local business ecosystem is a tangible approach to realizing CSV, as it fosters productivity and innovation (Salonen & Camilleri, 2020). This ecosystem facilitates efficiency and streamlines collaboration, which are distinctive characteristics of CSV that are not explicitly observed in the social responsibility concept in other business processes (von Liel, 2016).

Porter and Kramer (2011) identify three primary dimensions of the CSV concept. First, Redefining Products and Markets. Companies can create shared value by developing products and services that address pressing social or environmental needs. Second, Redefining Productivity in the Value Chain. Companies can enhance productivity by optimizing their value chains, for example, through more efficient resource utilization, waste reduction, and emissions minimization. Finally, Enabling Local Cluster Development. Companies can foster shared value by supporting local clusters, comprising business communities, suppliers, educational institutions, and related organizations (Porter & Kramer, 2011).

Previous studies demonstrate that effective implementation of CSV initiatives positively influences the TBL framework in achieving sustainability (Li et al., 2023). Empirical evidence further reveals that CSV strategies have a positive impact on the social, environmental, and financial performance of companies (Zeng & Tavalaei, 2021). These findings underscore the role of CSV strategies in promoting the sustainable development of a company.

Research on CSV opportunities within the framework proposed by Porter and Kramer (2011) remains limited. However, several prior studies have discussed the relationship between CE and CSV practices in the sustainability context. Axhami et al. (2023) highlights that CE practices aim to and have the potential to generate shared value in both production and consumption processes. Moreover, the CE model reflects a holistic, integrative managerial approach to create, deliver, and capture shared value while offering solutions for challenges in sustainable development (Ünal & Shao, 2019). This study introduces the novel application of the CSV perspective promoted by Porter and Kramer (2011) to CE practices in the agro-industrial sector. Therefore, the following hypotheses are proposed:

H4. Companies leveraging CSV opportunities positively influence economic performance (profit).

H5. Companies leveraging CSV opportunities positively influence environmental performance (planet).

H6. Companies leveraging CSV opportunities positively influence social performance (people).

H7. CE practices offer opportunities to generate conducive shared value.

To provide a clearer understanding of the research framework, the operationalization table below outlines the variables examined in this study, namely Circular Economy (CE), sustainable performance, and Creating Shared Value (CSV).

3. Materials and Methods

Based on the perspectives regarding the influence of CE and CSV principles on the TBL performance outlined in previous studies, this study proposes a research model illustrated in Figure 1. The study posits that achieving the optimal performance of the TBL framework requires the integration of CE practices with CSV initiatives. To test the proposed hypotheses, this study employed a quantitative method through a survey of agribusiness companies, specifically within the tapioca industry in Lampung, Indonesia.

3.1 Sample

The study population comprises practitioners in the agro-industrial sector, specifically in the tapioca industry. Lampung was selected as the locus of the study due to its prominence in the tapioca industry and its comprehensive implementation of CE practices (Yosep et al., 2024). The sampling technique employed was judgmental sampling, selecting respondents with relevant characteristics, experience, or expertise regarding the topic of the study (Malhotra & Birks, 2006). The sample primarily included directors or their representatives with comprehensive knowledge of CE practices within their companies. The sample size consisted of approximately 132 respondents, including company directors/owners and managers.

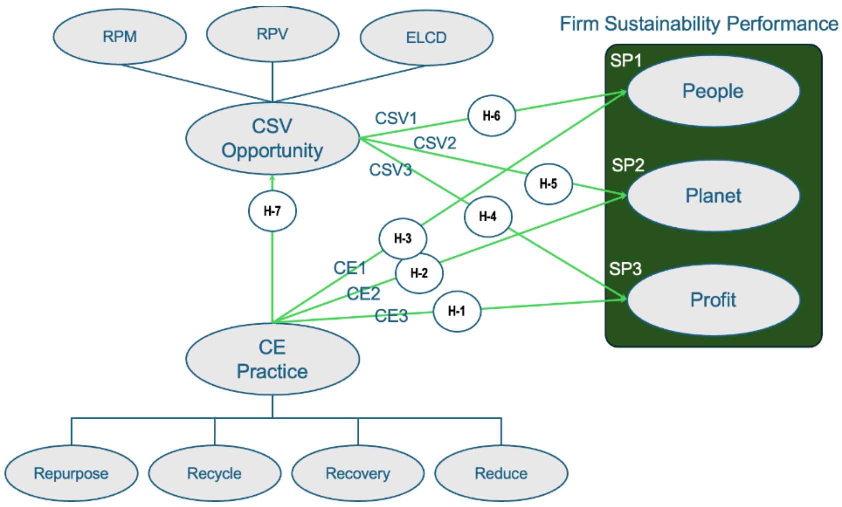

Figure 1. Research framework

Table 1. Operationalization of the role of circular economy in the agro-industry sector [Appendix A]

3.2 Data Collection

Data was collected through surveys using two instruments: digital forms distributed via Google Forms and physical questionnaires. The question consisted of three sections. The first section included screening questions to ensure the respondents met the desired inclusion criteria. The second section contained questions related to respondent characteristics and demographics. The third section focused on questions pertaining to the variables under study. All question items were measured using a 4-point Likert scale, where 1 = strongly disagree and 4 = strongly agree. Secondary data from government institutions and industries relevant to the study were also utilized to support the findings of the study and strengthen the analysis.

3.3 Data analysis

The validity and reliability of measurements and the model of the study was evaluated using structural equation modeling based on partial least squares (PLS-SEM) with the SmartPLS 4 software package (Ringle et al., 2015). The method was selected for its capacity to analyze complex relationships and interdependencies within the dataset. PLS-SEM is a robust and comprehensive statistical technique that enables advanced analysis of structural relationships among variables (Hair et al., 2019). By utilizing this analytical model, this study presents a detailed and data-driven analysis of the impact of CE practices and CSV initiatives on business sustainability in the tapioca industry of Indonesia.

The measurement model involves both formative and reflective constructs, necessitating various assessment criteria to evaluate validity and reliability. For reflective measurement, particularly at the first-order reflective construct level, the evaluation focuses on discriminant validity, reliability, and convergent validity. The process begins with assessing the validity and reliability of individual constructs. Reliability is determined by the outer loading of each indicator on the latent construct, with values above 0.6–0.7 deemed acceptable. Convergent validity is evaluated using the Average Variance Extracted (AVE), where an AVE value greater than 0.5 indicates adequacy. Subsequently, structural model analysis (inner model) was employed for hypothesis testing through path coefficient analysis.

4. Results and Discussion

Based on data processing from 189 questionnaires comprising 42 question items, a total of 132 valid respondents were obtained. The respondents were predominantly female (89%) and aged 40 years or older, as presented in Table 2. This demographic aligns with the target population of the study, primarily individuals at the managerial level or higher.

Data analysis was conducted using SmartPLS 4, involving two stages of validity and reliability tests. First, the outer model test assessed the validity and reliability of the items (indicators) of the study. Second, the Heterotrait-Monotrait Ratio (HTMT) test evaluated the discriminant validity of latent constructs. The HTMT test assesses the uniqueness of constructs by comparing the correlations between indicators of different constructs with the correlations between indicators within the same construct.

Table 2. Construct reliability and validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
CE PRACTISE	0.944	0.955	0.960	0.857
CSV Opportunity	0.764	0.793	0.864	0.681
Economic Performance	0.943	0.947	0.955	0.779
Environment Performance	0.865	0.892	0.909	0.717
Social Performance	0.683	0.690	0.824	0.610

The findings of the study begin with an analysis of first-order constructs, focusing on the dimensions of CE and CSV practices. Most first-order data exhibit strong outer loading values, with significant values exceeding 0.7 (Hair et al., 2019). Only a few outer loading values fall below 0.7 but are retained considering content validity, particularly at the first-order stage.

After completing the first-order testing, the second-order research framework was evaluated. The results demonstrate good validity and reliability, with outer loading values exceeding 0.7 for all items except SP3.d (0.378), which is removed. Furthermore, the HTMT test identifies one value above 0.9, specifically, Planet X CE Practice (0.926). To address this, additional data cleaning was performed, targeting cross-correlation values furthest from the mean. As a result, SP1.e and SP1.f are deleted. Figure 3 illustrates the results of the PLS-SEM algorithm test for the framework of the study.

Figure 2. PLS-SEM of dimension level analysis [Appendix B]

Figure 3. Analysis of research framework model [Appendix C]

Data processing using SmartPLS 4 was conducted to ensure that all items are valid and reliable. Table 3 summarizes the results, displaying that the AVE values of all variables exceed 0.5, indicating that more than 50% of the variance in each construct is explained by its respective indicators. This confirms that all indicators in the study meet the criteria for convergent validity. Furthermore, the composite reliability (rho_c) values for all variables surpass 0.7, demonstrating high reliability across all constructs (Hair et al., 2019).

Table 3. HTMT Analysis

	CE PRACTISE	CSV Opportunity	Economic Perf.	Environment Perf.	Social Perf.
CE PRACTISE					
CSV Opportunity	0.730				
Economic Perf.	0.552	0.608			
Environment Perf	0.836	0.799	0.578		
Social Perf.	0.810	0.816	0.537	0.680	

Discriminant validity between constructs was examined using HTMT values, which should remain below 0.85 (or 0.90 at maximum). HTMT values exceeding this threshold indicate that the discriminant validity between constructs may require further examination. As shown in Table 4, most construct pairs exhibit acceptable discriminant validity, allowing for the hypothesis testing.

Table 4. Hypothesis test result

	Original sample (O)	T statistics (|O/STDEV|)	P values	Notes
CE PRACTISE -> CSV Opportunity (H7)	0.637	11.165	0.000	Significant
CE Practise -> Economic Perf (H1)	0.330	3.110	0.002	Significant
CE PRACTISE -> Environment Perf (H2)	0.587	7.204	0.000	Significant
CE PRACTISE -> Social Perf. (H3)	0.477	5.088	0.000	Significant
CSV Opportunity-> Economic Perf. (H4)	0.312	2.983	0.003	Significant
CSV Opportunity -> Environmental Perf. (H5)	0.297	4.048	0.000	Significant
CSV Opportunity -> Social Perf. (H6)	0.289	3.073	0.002	Significant

Hypothesis testing was conducted through the bootstrapping method in SmartPLS 4 to generate t-statistic values for examining each relationship path. A hypothesis is accepted if p-value < 0.05 and a t-statistic > 1.96; otherwise, it is rejected. The results of the hypothesis testing are presented in Table 5.

The hypothesis testing results, referring to the path coefficients, indicate a significant influence of CE practices on CSV opportunities, with a t-statistic value of 11.165, the highest among all tested paths (H7 is accepted). In addition, CE practices exhibit a positive association with the performance of the TBL framework (H1, H2, and H3 are accepted). Similarly, CSV initiatives positively affect economic, environmental, and social performance (H4, H5, and H6 are accepted).

Table 5. Waste management performance

Type of Waste	Year	Waste Generated	Recycled Waste	Waste Sold to the Community	Untreated Waste
Liquid Waste	2024	1256800 m^3	962108 m^3*	-	294691 m^3**
	2023	1280000 m^3	979868 m^3*	-	300131 m^3**
	2022	1222400 m^3	935774 m^3*	-	286625 m^3**
Solid Waste (Cassava Pulp)	2024	101050 tons	36000 tons*	65050 tons	-
	2023	98526 tons	36000 tons*	62526 tons	-
	2022	90308 tons	36000 tons*	54308 tons	-
Sludge Waste	2024	52915 m^3	52915 m^3***	30643 ton	-
	2023	53892 m^3	53892 m^3***	18173 ton	-
	2022	51467 m^3	-	-	51467 m^3

* Recycled into biogas; ** Treated through wastewater treatment plant (WWTP); *** Recycled into organic fertilizer

CE practices have a significant and positive impact on environmental performance, supporting the hypothesis that CE practices can reduce waste and extend product life cycles, thereby benefiting the environment (Geissdoerfer et al., 2017). For instance, the tapioca industry produces substantial organic waste, such as cassava peels and residual starch. CE practices repurpose this waste for various uses, such as biogas production, reducing environmental pollution and creating a renewable energy source that is more environmentally friendly (Lerdlattaporn et al., 2021). This approach decreases the levels of solid and liquid waste, helping industries mitigate water and soil pollution in surrounding areas.

Figure 4. Tapioca starch production process (Circular Economy Practice) [Appendix D]

Circular Economy (CE) practices, when effectively implemented, demonstrate measurable improvements in waste management and environmental sustainability. As illustrated by a best-practice tapioca company in Lampung Province below, over 962,000 m^3 of liquid waste was recycled in 2024 - mainly into biogas - while the remainder was treated through wastewater facilities. Solid waste was repurposed into recycled materials and community products, and 100% of sludge waste in 2023 and 2024 was converted into organic fertilizer, demonstrating closed-loop processing. However, it is essential to recognize that this example represents a leading case rather than a universal standard. Many companies in similar sectors may not yet adopt such comprehensive CE strategies. Therefore, these findings underscore the urgent need for broader industry adoption of CE practices to amplify environmental benefits at scale and ensure systemic improvements in waste reduction and resource circularity.

Furthermore, converting waste into biogas reduces dependence on fossil fuels, which are major contributors to greenhouse gas emissions. In the tapioca industry in Lampung, the use of biogas derived from organic waste has effectively lowered the carbon footprint and minimized other environmental impacts. By embracing this renewable energy source, companies contribute positively to environmental performance and climate mitigation efforts (Rao et al., 2024). Based on our interviews with the Environmental Analyst of the Lampung Provincial Government, there has been a recorded reduction of 5.35% in greenhouse gas (GHG) emissions from the waste sector in 2023 compared to the baseline, with the target set at 8.24%. Although this figure has not yet met the full target, it still reflects meaningful progress - particularly driven by agro-industrial sectors such as tapioca processing. In addition, the industry's adoption of water recycling practices, by treating and reusing process water, has reduced the volume of wastewater discharged into the environment. This has contributed to improved water quality in surrounding ecosystems, as reflected in the 2023 Water Quality Index achievement of 94.57% (DLH Lampung, 2024). These results further demonstrate the role of CE practices in addressing pollution at its source and enhancing overall environmental integrity.

CE practices also facilitate the development of a strong local ecosystem. The tapioca industry which implements CE practices tends to collaborate with local farmers. Waste materials are repurposed as animal feed or fertilizer, involving local communities as partners or consumers of by-products. It creates an inclusive and sustainable economic cycle that benefits the local community (Porter & Kramer, 2011).

The next hypothesis testing results indicate a significant impact of CE practices on social performance. This aligns with the view that CE practices promote social sustainability, such as improving well-being and quality of life, although the complexity of measuring social outcomes often presents a challenge (Kravchenko et al., 2019; Padilla-Rivera et al., 2021). In the context of the tapioca industry, several companies that have implemented integrated waste treatment systems—combining wastewater treatment plants (IPAL) with biogas digesters—have demonstrated a noticeable decrease in BOD/COD concentrations in their effluent discharge. According to an environmental analyst from the Lampung Provincial Environmental Agency, this technical improvement has correlated with a reduction in community complaints related to strong odors around production facilities, reflecting a positive shift in local environmental quality and social well-being. However, in several other locations where such technologies have not been optimally applied, local pollution and unpleasant odors persist, suggesting that the social benefits of CE remain uneven and highly dependent on the level of implementation.

In other hand, the adoption of CE practices in the tapioca sector has been proven to positively impact economic performance. These practices optimize resource efficiency and waste management while generating operational cost savings and new revenue opportunities. Thus, the CE adoption in the tapioca industry serves as a vital strategy for boosting competitiveness, profitability, and long-term economic sustainability. In line with Arzaba et al. (2022) that demonstrating the positive influence of CE practices on economic performance in the agro-industrial sector. In the tapioca industry, CE practices such as converting waste into biogas, animal feed, or organic fertilizer create additional income streams while reducing dependency on costly primary resources.

By adopting these strategies, the tapioca industry in Lampung can substantially mitigate its negative environmental impact. This approach is consistent with the TBL framework by Elkington (1997), which emphasizes sustainability not only in terms of profit but also in creating positive environmental and social impacts. In addition to CE practices, CSV initiatives positively influence environmental performance in the tapioca agroindustry. CSV initiatives in this sector integrate economic sustainability with positive environmental contributions, generating mutual benefits that align with the TBL framework. Through CSV strategies, companies can address sustainability demands and environmental responsibilities, thereby ensuring business continuity amidst increasing concerns over environmental pollution.

Implementing CSV strategies enables the tapioca industry to enhance productivity across its value chain (Porter & Kramer, 2011). For example, repurposing production waste into biogas or by-products such as animal feed can lower operational costs while generating additional revenue through product diversification. Previous studies have disclosed that CE and CSV practices can improve the financial performance of companies across various sectors (Yin, 2023; Zeng & Tavalaei, 2021). CSV initiatives emphasize the development of local clusters and improvements of social conditions in the communities where companies operate (Porter & Kramer, 2011). Collaboration with local communities can boost the well-being and quality of life of the population living in the vicinity of the companies.

This study highlights the significant influence of CE practices on CSV opportunities emphasizing efficient resource use, waste reduction, and material reuse to generate shared value. CE practices facilitate the development of value-added products from waste materials, creating new business opportunities while meeting community needs. For example, converting tapioca waste into biogas or fertilizer allows companies to address their economic needs and provide solutions for local energy and agricultural demands, aligning with the goals of CSV opportunities (Porter & Kramer, 2011).

Through the adoption of CE practices, companies indirectly enhance environmental awareness within local communities by providing training on waste management, recycling, and sustainable production techniques. This creates CSV opportunities by equipping individuals with relevant skills that can improve their quality of life and open new job opportunities.

Moreover, CE practices, such as minimizing waste and reducing carbon footprints, demonstrate the commitment of companies to environmental sustainability. It not only strengthens their reputation among consumers and other stakeholders but also fosters CSV opportunities by bolstering their market position. Environmentally conscious customers are more likely to support companies that exhibit environmental responsibility, translating these efforts into increased customer loyalty and a good market reputation.

5. Conclusions

The study confirms that Circular Economy (CE) practices positively influence environmental, social, and economic performance within the Triple Bottom Line (TBL) framework in the tapioca agro-industry of Lampung. Key strategies, such as converting organic waste into biogas and recycling process water, have reduced pollution and improved resource efficiency. These efforts also yield economic gains through cost savings and renewable energy generation, reinforcing the industry's shift toward sustainable, low-carbon, and cleaner production systems.

Observed from a social performance perspective, Circular Economy (CE) practices have contributed to improving community well-being by mitigating pollution-related health risks, reducing odor nuisances, generating green employment opportunities, and fostering public participation through environmental education initiatives. The incorporation of Creating Shared Value (CSV) strategies further enhances these impacts by optimizing value chains, strengthening local economic clusters, and promoting collaborative engagement with surrounding communities. In the case of the tapioca industry, such efforts have led to tangible social benefits, including job creation, skills development, and improved local livelihoods. However, it is important to note that these outcomes are not uniformly distributed across all areas. In regions where CE practices and waste treatment technologies have not been fully implemented, communities continue to report issues such as unpleasant odors and localized pollution. This indicates that while CE and CSV approaches hold significant potential to support inclusive and resilient development, broader and more consistent adoption is necessary to ensure equitable improvements in quality of life across affected communities.

In other hand, CSV strategies also play a vital role in supporting the TBL framework by enhancing productivity through value chain optimization, strengthening local clusters, and facilitating collaboration with surrounding communities. These strategies enable companies to fulfill social and environmental responsibilities, while also boosting competitiveness and business reputation. In the context of the tapioca industry, CSV initiatives have demonstrated social benefits such as improved community welfare, job creation, and the development of local community skills.

However, while this study highlights clear benefits of CE for business and community, it acknowledges a limitation in fully addressing CE's broader ecological contributions, such as ecosystem restoration, biodiversity protection, and carbon sequestration. The current CE implementation in the study context primarily emphasizes waste reduction and efficiency, rather than ecological regeneration or alignment with global conservation targets. Furthermore, the long-term environmental promises of CE must be examined critically, particularly regarding potential trade-offs, unintended consequences, and the risk of rebound effects. Future research should adopt a more ecologically focused and interdisciplinary approach to assess whether CE practices can genuinely fulfill environmental protection goals and contribute meaningfully to planetary boundaries and sustainability transitions.

6. Limitations and future research

This study is subject to several limitations that should be acknowledged. One significant constraint lies in effectively communicating the conceptual framework of Circular Economy (CE) and Creating Shared Value (CSV) to the respondents through the questionnaire. This difficulty stems from the limited theoretical exposure and familiarity of respondents with CE and CSV principles, particularly within the agro-industrial context of the tapioca industry, which served as the focal point of this research. Despite efforts to simplify and contextualize the survey items, the inherent complexity of these concepts may have influenced the depth and accuracy of the responses. Furthermore, the respondent pool predominantly comprised company directors and managers, whose perspectives, while valuable for assessing business performance and economic sustainability, may not sufficiently reflect ecological considerations and grassroots-level practices crucial for a holistic evaluation of CE implementation.

Another notable limitation pertains to the scope and emphasis of the present framework. This study prioritizes business performance indicators and economic sustainability outcomes, often treating environmental benefits as secondary or indirect results of CE practices rather than central analytical variables. Consequently, key ecological dimensions, such as biodiversity preservation, ecosystem restoration, and long-term environmental integrity, receive less empirical attention. This narrowed focus limits the study's comprehensiveness, particularly in assessing the broader sustainability implications of CE strategies, which ideally encompass economic, social, and environmental pillars in an integrated manner.

Considering these limitations, future research should adopt more interdisciplinary and ecologically grounded approaches to better capture the environmental efficacy of CE practices. Empirical investigations that place ecological outcomes, such as habitat regeneration, pollution reduction, and biodiversity enhancement, at the core of the analytical framework are especially needed. Additionally, expanding the respondent base to include a wider array of stakeholders, such as environmental scientists, community representatives, and field-level workers, may yield more prosperous and more diverse insights into the multifaceted impacts of CE implementation. Such efforts would contribute to a more balanced understanding of how CE and CSV strategies can serve economic interests, ecological resilience, and long-term sustainability.

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