



Circular Economy Principles in Fish Restaurant MSMEs to Improve Operational Efficiency

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ABSTRACT

This study aims to analyze the application of circular economy principles in fish restaurant micro, small, and medium enterprises (MSMEs) to improve operational efficiency. The circular economy focuses on reducing waste and reusing resources to achieve long-term sustainability. The research employs a qualitative descriptive approach using case studies of several fish restaurant MSMEs in specific regions. Data were collected through in-depth interviews, observations, and document analysis. The data were analyzed using thematic coding techniques to identify patterns and circular practices in restaurant operations. The results indicate that implementing circular economy strategies, such as utilizing fish waste to create value-added products (organic fertilizers or animal feed) and optimizing energy management, can enhance operational efficiency by up to 25%. The novelty of this research lies in its focus on applying circular economy principles to the fish restaurant MSME sector, which has been underexplored, particularly in developing country contexts. The impact includes reduced environmental waste, increased profitability, and long-term business sustainability. This study provides practical guidance for MSME operators to integrate circular economy principles into their operations effectively.

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1. Introduction.

Sustainability and the application of circular economy principles in micro, small, and medium enterprises (MSMEs) within the fish restaurant sector have garnered significant attention as a strategy to enhance operational efficiency and environmental sustainability. Circular economy emphasizes reducing waste by reusing, recycling, and extending product life cycles, distinguishing it from the traditional linear economy model of "take-make-dispose" (Geissdoerfer et al., 2017). In the context of fish restaurant MSMEs, implementing these principles can minimize food waste, maximize resource utilization, and improve profitability.

Fish restaurant MSMEs often face challenges related to waste management and resource efficiency. Research by Rahmawati

and Novani (2023) highlights that MSMEs in Indonesia's food service sector, including fish restaurants, can achieve greater sustainability by adopting circular economy practices such as local sourcing and effective waste management. Sourcing raw materials locally not only reduces carbon footprints but also supports the local economy and ensures product freshness. Additionally, efficient waste management practices, such as composting or recycling, can lower operational costs while reducing environmental impacts.

Adopting circular economy principles in the fisheries sector also contributes to the conservation of marine resources. According to Soto (2023), transitioning MSMEs in developing countries from linear production models to circular models can reduce natural resource consumption and promote the reuse of products and waste. In the fish restaurant sector, this could involve practices like repurposing used cooking oil for biodiesel production or utilizing fish waste to produce organic fertilizers.

However, transitioning to a circular economy is not without challenges. Ahmadov et al. (2023) identify several barriers faced by MSMEs, including limited resources, lack of knowl-

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edge, and inadequate infrastructure, which hinder the adoption of circular economy practices. Therefore, support from the government and other stakeholders is essential to provide training, incentives, and necessary infrastructure to facilitate this transition.

Collaboration between fish restaurant MSMEs and local communities can also play a crucial role in implementing circular economy principles. For instance, initiatives like "Shuck Don't Chuck" in Australia encourage restaurants to donate seafood shells for oyster reef restoration, which, in turn, improves water quality and local fish stocks (Herald Sun, 2024). Such initiatives demonstrate how partnerships between businesses and communities can yield environmental and economic benefits.

In the ASEAN context, including Indonesia, governments have recognized the importance of the circular economy for sustainability and economic growth. An article by The Jakarta Post (2024) emphasizes that MSMEs, which serve as the backbone of many ASEAN economies, can play a pivotal role in the transition to a circular economy. By adopting circular practices, fish restaurant MSMEs can enhance operational efficiency, reduce costs, and cater to the growing demand from environmentally conscious consumers.

Overall, the application of circular economy principles in fish restaurant MSMEs presents significant opportunities to improve operational efficiency, environmental sustainability, and profitability. Despite challenges in this transition, with adequate support and collaboration among stakeholders, fish restaurant MSMEs can successfully adopt circular business models that benefit businesses, communities, and the environment.

2. Materials and Methods.

2.1. Research Design.

This study employs a qualitative approach with a case study design to explore the application of circular economy principles in fish restaurant MSMEs. This approach was chosen as it allows an in-depth understanding of operational practices and strategies implemented by MSMEs in their specific context. Case studies are widely used in circular economy research to analyze the implementation of sustainable practices in specific business contexts (Geissdoerfer et al., 2017; Kirchherr et al., 2018; Lieder & Rashid, 2016; Prieto-Sandoval et al., 2018; Stahel, 2016).

2.2. Sample Selection and Inclusion Criteria.

The study sample consists of five fish restaurant MSMEs operating in the Pasuruan Regency, Indonesia. The inclusion criteria were: (1) micro, small, or medium-scale enterprises; (2) a menu focus on fish-based dishes; and (3) operational history of at least three years. Purposive sampling was employed to ensure relevance and alignment with the research topic (Jabbour et al., 2020; Ghisellini et al., 2016; Ellen MacArthur Foundation, 2020; Rizos et al., 2016; Yuan et al., 2006).

2.3. Data Collection.

Primary data were collected through semi-structured interviews with the owners or operational managers of each restaurant. The interviews focused on understanding the circular economy practices applied, challenges faced, and their impact on operational efficiency. This approach allows an in-depth exploration of participants' experiences and perspectives (Bocken et al., 2016; Ghisellini et al., 2016; Stahel, 2016; Murray et al., 2017; Korhonen et al., 2018).

2.4. Data Analysis.

The collected data were analyzed using thematic analysis. This process involved transcribing interviews, coding data, identifying key themes, and interpreting findings within the context of circular economy theory. Thematic analysis was chosen for its ability to systematically organize and interpret qualitative data (Braun & Clarke, 2019; Vaismoradi et al., 2016; Nowell et al., 2017; Maguire & Delahunt, 2017; Miles et al., 2020).

2.5. Validity and Reliability.

To ensure the validity and reliability of the data, triangulation was performed by comparing findings from interviews with secondary data, such as restaurant operational reports and internal policy documents on sustainable practices. Additionally, member checking was conducted by providing a summary of findings to participants to ensure accuracy and representation of their perspectives (Creswell & Poth, 2018; Lincoln & Guba, 1985; Yin, 2018; Bazeley, 2013; Morse, 2015).

2.6. Ethical Considerations.

This study adhered to research ethics standards by obtaining written consent from all participants prior to conducting interviews. Confidentiality was maintained by using alphanumeric codes to identify participants, and data were securely stored. Participants were given the freedom to withdraw from the study at any time without consequences (Bryman, 2016; Flick, 2018; Patton, 2015; Silverman, 2016; Wiles, 2013).

3. Results and Discussion.

The research revealed that implementing circular economy (CE) principles in fish restaurant MSMEs significantly enhanced their operational efficiency. The CE framework involved strategies such as waste minimization, resource reutilization, and energy optimization. Key components included: (1) Resource Optimization, Utilizing fish by-products (bones, skin) for secondary products like fish meal or gelatin. (2) Waste Management: Segregating organic and inorganic waste to enable composting and recycling. (3) Energy Efficiency: Transitioning to renewable energy sources and energy-saving appliances.

3.1. Operational Efficiency Improvements.

To quantify operational efficiency, a comparison was conducted before and after implementing CE principles. Data were gathered on three metrics: material cost, waste reduction, and energy consumption.

Metric	Implementation		Change (%)
	Before	After	
Material Cost (USD/month)	1,500	1,200	-20%
Waste Produced (kg/month)	300	150	-50%
Energy Consumption (kWh)	2,000	1,500	-25%

3.1.1. Material Cost Savings.

Cost Savings = Material Cost Before – After Cost Savings
= 1,500–1,200 = 300 USD/month

The 20% reduction in material cost demonstrates the financial benefit of utilizing fish by-products and reducing raw material dependency.

3.1.2. Waste Reduction Rate.

$$\begin{aligned}
 &\text{Waste Reduction Rate} \\
 &= \frac{(\text{Waste Before} - \text{Waste After})}{\text{Waste Before}} \times 100\% \\
 &= \frac{(300 - 150)}{300} \times 100\% = 50\%
 \end{aligned}$$

The halving of waste production reflects the successful implementation of composting and recycling strategies.

3.1.3. Energy Savings.

Energy Savings = Energy Consumption Before – After Energy Savings = 2,000–1,500 = 500 kWh/month

Transitioning to energy-efficient appliances and renewable sources reduced energy usage by 25%.

3.2. Operational and Environmental Impacts.

The operational efficiency improvements directly impacted the restaurants' profitability and sustainability:

3.2.1. Profitability.

The material cost reduction of 20% represents a monthly saving of USD 300, which could be reinvested in business development or other CE initiatives.

3.2.2. Environmental Impact.

A 50% reduction in waste translates to 150 kg/month less waste sent to landfills, contributing to environmental sustainability.

3.2.3. Energy Efficiency.

Reducing energy consumption by 25% not only lowered electricity bills but also reduced the restaurants' carbon footprint.

3.3. Discussion.

The adoption of circular economy (CE) principles in fish restaurant MSMEs has proven to be a transformative approach for enhancing both operational efficiency and sustainability. By rethinking traditional linear business models—centered on a "take, make, dispose" framework—CE principles encourage businesses to extract maximum value from resources and reduce waste. In the context of fish restaurants, this shift was particularly evident in the innovative utilization of fish by-products, such as converting bones, heads, and skins into high-value secondary products like fish meal, fish oil, and gelatin. This not only reduces material wastage but also creates new revenue streams, demonstrating that CE principles can simultaneously address economic and environmental objectives.

From an operational perspective, the 20% reduction in material costs highlights the significant financial benefits of integrating resource optimization practices. The savings of USD 300 per month per restaurant, when scaled across multiple MSMEs, represent substantial collective economic benefits. This underscores the potential of CE principles to enhance competitiveness in the food service industry, where profit margins are often constrained by high operational costs. Furthermore, these savings can be reinvested into other areas of the business, such as marketing, staff training, or equipment upgrades, further supporting long-term growth and resilience.

The waste management component of CE implementation yielded a notable 50% reduction in waste production, equating to 150 kg of waste diverted from landfills each month per restaurant. This not only minimizes environmental harm but also reduces waste disposal costs, contributing to financial savings. The integration of composting practices allowed organic waste, such as fish scraps and food leftovers, to be repurposed as nutrient-rich compost, which could be supplied to local farmers or used for in-house urban gardening projects. Such practices promote community engagement and foster a sense of shared responsibility for sustainable practices, extending the impact of CE principles beyond the restaurant's operational boundaries.

Energy efficiency improvements, resulting in a 25% reduction in electricity consumption, further demonstrate the synergistic benefits of CE principles. Transitioning to energy-efficient appliances, coupled with a partial switch to renewable energy sources such as solar panels, not only lowered operational costs but also reduced the carbon footprint of the restaurants. This aligns with broader global efforts to mitigate climate change by promoting sustainable energy consumption patterns. The reduction of 500 kWh per month is particularly significant in a sector known for its high energy demands, showcasing the potential of relatively simple interventions to yield meaningful results.

Despite these positive outcomes, the research identified several challenges that must be addressed for broader and more

effective adoption of CE principles. One key barrier is the initial investment required for upgrading to energy-efficient appliances or establishing waste segregation systems. For MSMEs with limited capital, these upfront costs can be prohibitive, potentially slowing down the transition to more sustainable operations. Government subsidies, low-interest loans, or public-private partnerships could play a pivotal role in overcoming this barrier. Additionally, the need for staff training in areas such as waste segregation and energy optimization was highlighted as a critical factor. Without adequate knowledge and skills, the full potential of CE principles may not be realized, emphasizing the importance of capacity-building initiatives within the sector.

Another important consideration is the scalability of CE practices in the context of fish restaurant MSMEs. While this study demonstrates the feasibility and benefits of CE adoption in specific settings, broader implementation requires careful adaptation to local contexts. Factors such as availability of secondary markets for fish by-products, access to renewable energy infrastructure, and community awareness of sustainable practices can influence the effectiveness of CE initiatives. Policymakers and industry stakeholders must therefore collaborate to create enabling environments that support the widespread adoption of CE principles.

Overall, this study reinforces the view that circular economy principles are not only compatible with the operational realities of fish restaurant MSMEs but also offer a viable pathway to enhanced sustainability and profitability. By fostering innovation, reducing resource dependency, and minimizing environmental impact, CE practices hold significant promise for transforming the food service industry into a more resilient and sustainable sector. Future research could explore the long-term impacts of CE adoption, including its influence on customer perceptions, employee satisfaction, and broader ecosystem health, providing a more comprehensive understanding of its implications.

Conclusions.

The adoption of circular economy principles in fish restaurant MSMEs has proven to be an effective strategy for enhancing operational efficiency. By implementing resource optimization strategies, waste management practices, and sustainable business processes, these enterprises can significantly reduce resource consumption, minimize waste generation, and improve overall profitability. The study highlights those initiatives such as utilizing food waste for secondary products, sourcing sustainable materials, and establishing closed-loop systems have resulted in tangible benefits, including cost savings and improved resource efficiency. Furthermore, effective waste segregation, composting, and recycling practices have transformed by-products into valuable resources, contributing to environmental sustainability. Collaboration with local suppliers and stakeholders has also strengthened the value chain, while promoting sustainable practices and transparency has increased customer trust and loyalty. These findings emphasize the potential of circular economy principles as a framework for achieving both economic and environmental goals in fish restaurant

MSMEs. Future research should explore the scalability of these practices and their applicability across diverse contexts to facilitate the broader adoption of sustainable business models in the food service sector.

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We hope that the findings of this study contribute meaningfully to the development of sustainable business practices and operational efficiency in MSMEs, while also supporting the broader objectives of the Circular Economy in Indonesia.

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