

Waste return product management strategy based on 4R through circular product innovation to increase profitability. (Study on MSMEs Eyang's Recipe)

Nety Satriana*, Thukas Shilul Imaroh

Universitas Mercu Buana, Indonesia

Email: nesatria@gmail.com*, ts_imaroh@yahoo.com

Keywords:	Abstract
circular economy; circular product innovation; zero waste; food MSMEs; mass balance model	Sustainability and food waste are major challenges for food-based MSMEs, particularly those implementing consignment-based distribution systems, where unsold perishable products can reduce operational efficiency and profitability. This study aimed to formulate a Circular Economy strategy through Circular Product Innovation to reduce product waste, improve cost efficiency, and strengthen the business sustainability of Resepnya Eyang baked brownies. The study employed an Action Research design dominated by qualitative methods and supported by descriptive quantitative data. Data were collected through field observations, semi-structured interviews, documentation, and focus group discussions involving 16 consumers. The data were analyzed using Root Cause Analysis, RBV-VRIO, source triangulation, and the Mass Balance Model. The findings showed that product returns were primarily caused by limited outlet control, inaccurate demand forecasting, short product shelf life, weak product display positioning, and restricted marketing activities. Consumer acceptance of Brownie Cookies was high, with taste ratings of 4.5/5 among loyal consumers and 4/5 among potential consumers. The Mass Balance Model indicated that approximately 7–8% of previously unsold brownies could be reprocessed into marketable cookies, reducing potential waste to nearly zero. The study concluded that Circular Product Innovation can support waste reduction, resource efficiency, competitive advantage, and sustainable profitability among food-based MSMEs through a closed-loop production system.

INTRODUCTION

Sustainability has become one of the strategic issues in the development of Micro, Small, and Medium Enterprises (MSMEs) (Harnida et al., 2024; Nustini et al., 2024; Ramli et al., 2022, 2023). Changes in consumer behavior toward more environmentally friendly products, increasing pressure for operational efficiency, and limited resources have encouraged business actors to implement business models that are not only oriented toward economic profit but also consider environmental and sustainability aspects (Elkington, 1997; Ellen MacArthur Foundation, 2015; Willard, 2012). In the food industry, these challenges are becoming increasingly complex due to the characteristics of products with limited shelf life, which creates the potential for food waste if

they are not managed effectively (Food and Agriculture Organization, 2011; Papargyropoulou et al., 2014).

Based on data from the Ministry of Cooperatives and SMEs of the Republic of Indonesia, the MSME sector contributes approximately 60% to national Gross Domestic Product (GDP) and absorbs around 97% of the workforce, making MSME sustainability a strategic factor for national economic stability. One of the MSME sectors facing these sustainability challenges is the culinary industry, particularly bakery products. Bakery products are classified as perishable goods with relatively short shelf lives, high sensitivity to demand fluctuations, and a significant risk of food waste due to overproduction and unsold inventory (Garcia-Garcia et al., 2017).

This study employed a case study approach focusing on *Resepnya Eyang* baked brownies, an MSME culinary business established in 2014 that markets its products through a consignment system at the Hero, Foodhall, and FamilyMart supermarket chains in the Greater Jakarta area. This distribution model has successfully expanded market reach; however, it also increases the risk of unsold products because manufacturers have limited control over inventory rotation and sales performance at each outlet. Based on company operational data, the waste rate of brownie products ranged from 5–8% per quarter, resulting in the need to recall several products before their expiration dates. This condition increased production, distribution, and product-return handling costs while reducing company profitability.

The Circular Economy provides a more comprehensive approach compared with the traditional linear economy model (take-make-dispose). This approach views waste not as the final stage of the production cycle but as a resource with potential economic value that can be recovered through product innovation, reuse, and other processing activities (Ellen MacArthur Foundation, 2015; Kirchherr et al., 2017; Stahel, 2016). According to Stahel (2016), the Circular Economy represents a restorative and regenerative industrial system designed to recover and regenerate resources through strategies such as product life extension, reuse, repair, remanufacturing, and recycling.

This study proposed the implementation of the Circular Economy concept through a Circular Product Innovation strategy by processing brownies that remained suitable for consumption but were not sold into new products in the form of Brownie Cookies. This approach aimed to extend the product life cycle, maximize resource utilization, reduce waste, and create additional economic value (Bocken et al., 2016; Kirchherr et al., 2017; Lüdeke-Freund et al., 2019). Therefore, the concept of zero waste is not only an environmental preservation effort but also a strategic approach to improving cost efficiency and business profitability.

This research aimed to formulate a Circular Economy implementation strategy through Circular Product Innovation as an effort to reduce product waste, improve cost efficiency, and strengthen business sustainability in the *Resepnya Eyang* baked brownies MSME. Specifically, this study aimed to: (1) identify the factors causing returned waste products within the consignment distribution system; (2) formulate actions and methods to overcome returned waste products resulting from unsold inventory; and (3) measure the effectiveness of managing returned waste products by transforming them into new products with economic value. The findings of this study

are expected to provide practical benefits for Resepnya Eyang and similar food-based MSMEs in developing more sustainable business models, as well as academic contributions to the development of literature concerning the relationship between Circular Economy, Circular Product Innovation, Food Waste Management, and the Mass Balance Model in consignment-based food-sector MSMEs.

Research related to the Circular Economy and food waste has grown rapidly in recent years, demonstrating increasing academic attention toward sustainability issues within the food industry. A summary of relevant previous studies is presented in Table 1.

Table 1. Summary of Previous Research Studies

Author (Year)	Title/Research Focus	Method	Key Findings
Banaite (2016)	Toward Circular Economy: Analysis of Indicators in the Context of Sustainable Development	Literature review & comparative analysis	The circular economy should not only be understood as waste management (3R), but must be integrated with sustainable development.
Urošević, Milanović, & Dukić (2025)	Impact of The Circular Economy on Sustainable Development	Literature review with a descriptive qualitative approach	The circular economy has been proven to increase the efficiency of resources/raw materials, reduce waste and environmental impact, and support economic growth.
Sehnem (2019)	Circular Economy: Benefits, Impacts and Overlapping with Supply Chain Management	Systematic Literature Review (SLR)	The circular economy has been proven to provide economic and environmental benefits; found the success and failure factors of CE implementation.
Kennard (2018)	Food Waste Management	Literature review	Food waste in the retail sector occurs due to overstocking, weak demand forecasting, and a contract system that shifts risk to suppliers.
Garcia- Garcia et al. (2024)	Improving Waste Management Strategies in the Food Sector: Case Study from Spain,	Multiple case study, comparative descriptive	Waste must be mapped before it is settled as it has the potential to be a source of profit; Landfill is not a long-term solution.

Tunisia & Hong Kong			
Jain, Newman, Cepeda-Marquez, & Zeller (2018)	Global Food Waste Management: An Implementation Guide for Cities	Descriptive analytical, comparative case studies	About one-third of food is wasted globally; Food waste must be seen as a resource that can be recovered through a circular economy approach.
Garcia-Garcia, Woolley, Rahimifard, Colwill, White, & Needham (2017)	A Methodology for Sustainable Management of Food Waste	Descriptive qualitative based on decision support system	Not all food waste should be disposed of; prevention and upcycling are superior to disposal in food waste management.
Guinea, Florença, Baroca, & Anjos (2020)	The Link between the Consumer and the Innovations in Food Product Development	Literature/narrative review	Direct consumer engagement increases the success of new products; Traditional product innovation is effective when maintaining the original taste but increasing convenience.
Source: Processed by the author from the research manuscript, 2026			

In general, previous research has shown that the Circular Economy can improve resource-use efficiency, reduce food waste, and create new economic value. However, most existing studies have focused on large-scale companies; therefore, research on the implementation of the Circular Economy within MSMEs, particularly those operating under consignment-based systems, remains limited (Banaite, 2016; Sehnem, 2019).

Based on the theoretical review and previous studies, several research gaps were identified as the foundation of this research: (1) most studies have focused on large-scale industrial contexts, while research on MSMEs remains limited; (2) limited studies have examined the application of the Circular Economy specifically within consignment-based business models; (3) insufficient research has integrated operational management, waste reduction, and product innovation simultaneously; and (4) limited applied research has focused on bakery products such as brownies. This study seeks to address these gaps by integrating the concepts of Circular Economy, Circular Product Innovation, Food Waste Management, and Reverse Logistics within the context of baked brownie MSMEs (Kirchherr et al., 2017; Bocken et al., 2016).

METHOD

Research Approach and Design

This study employed an Action Research approach dominated by qualitative methods and supported by descriptive quantitative data. This approach was selected because the research aimed not only to identify the causes of unsold products within the consignment system but also to design, implement, and evaluate applicable solutions for Resepnya Eyang baked brownies MSME. Quantitative measurements were conducted using several indicators, including the number of unsold products, waste levels, reprocessing costs for converting products into Brownie Cookies, cost of goods (COG), product profit margins after innovation, and consumer acceptance of the new products (Heizer et al., 2020).

The research design was structured as a Capstone Project using Action Research as the primary framework for addressing business problems. The research process consisted of six interconnected stages: (1) problem identification, involving the assessment of unsold product conditions within the consignment system; (2) diagnosis of root causes through observations, interviews, documentation, and Root Cause Analysis; (3) strategic decision-making, involving the selection of the Circular Economy approach based on diagnostic results; (4) strategy implementation, involving the transformation of brownies into Brownie Cookies, including product recall, production, packaging, and market testing; (5) evaluation of implementation outcomes using key performance indicators and the Mass Balance Model; and (6) formulation of strategic recommendations.

Data Source

This study uses primary data and secondary data as a form of source triangulation to increase the credibility of research results. Primary data was obtained through observation, in-depth interviews, documentation, and Focus Group Discussions (FGD) involving four main groups of informants, namely MSME owners as decision makers, production teams who provide information about the production process and raw material feasibility standards, modern market parties who provide external perspectives on distribution effectiveness, and consumers who provide perceptions, experiences, and preference for products resulting from innovation. Secondary data is obtained from historical production and sales data, unsold product data and waste levels, data on production, distribution, and reprocessing costs, and company operational documents.

Data Collection Techniques

Field observations were carried out directly at Hero, Foodhall, and FamilyMart outlets which are the locations for the consignment of Resepnya Eyang's Brownies products to ensure the validity of the data and information obtained. The focus of observation is directed at consumer behavior, product display position, stock condition, and the potential for product waste. The field observation schedule is presented in Table 2.

Table 2. Field Observation Schedule at Modern Retail Outlets

Date	Location	Observation Hours	Duration	Observed Areas
May 9, 2026	Hero Kotwis	14.00-15.00	1 hour	Isle bakery, cookies, and snacks
May 9, 2026	Hero Emerald	19.00-20.00	1 hour	Isle bakery, cookies, and snacks
May 10, 2026	Hero PIM	17.00-18.00	1 hour	Isle bakery, cookies, and snacks
May 10, 2026	Foodhall PIM	19.00-20.00	1 hour	Isle bakery, cookies, and snacks
May 9, 2026	Foodhall BXC	16.30-17.30	1 hour	Isle bakery, cookies, and snacks
May 10, 2026	Foodhall KG	14.00-15.00	1 hour	Isle bakery, cookies, and snacks
17 May 2026	IMF Sudpark	13.00-14.00	1 hour	Isle bakery, cookies, and snacks
17 May 2026	IMF Aston	15.30-16.30	1 hour	Isle bakery, cookies, and snacks
17 May 2026	IMF Hankam	20.00-21.00	1 hour	Isle bakery, cookies, and snacks

Source: Processed by author, 2026

In-depth interviews were conducted in a semi-structured manner to business owners, those in charge of the production division, distribution division, and logistics division. The Focus Group Discussion (FGD) was conducted on 16 respondents who were divided into two groups, namely 8 loyal consumers who had bought Eyang's Resepnya Brownies several times and 8 potential consumers who routinely bought similar products at modern retail but had never bought Eyang's Resepnya products. The FGD aims to obtain input on taste, texture, packaging, price perception, buying interest, and acceptance of brownie cookie products as a result of circular product innovation.

Data Analysis Techniques

Data analysis is carried out through several stages. First, Root Cause Analysis (RCA) uses Fishbone Diagram and 5 Why Analysis is used to identify the root causes of waste return products based on six categories of factors (Man, Method, Material, Machine, Market/Environment, and Measurement). Second, Resource Based View (RBV-VRIO) analysis is used to identify the company's internal resources that are valuable, rare, inimitable, and organized as a source of competitive advantage. Third, source triangulation is carried out by comparing the results of interviews with business owners, production teams, modern market parties, consumer FGD results,

and field observations to ensure the consistency of findings. Fourth, the Mass Balance Model is used to describe and compare material flow before (as-is) and after (to-be) implementation of the Circular Product Innovation strategy, so that the effectiveness of the zero waste strategy can be measured systematically.

Data Validity and Reliability

Data validity is strengthened through triangulation of sources, methods, and documentation. Source triangulation is carried out by comparing information from business owners, production teams, modern market parties, consumers, and company documents. The triangulation method was carried out through a combination of observation, in-depth interviews, FGDs, and company data analysis. Interview data is also cross-checked with operational documents such as production, sales, returns, and unsold product reports, as well as compared between periods to ensure historical data consistency. Validation of strategy implementation is carried out by comparing the implementation results to the research objectives, namely reducing waste, increasing resource efficiency, and increasing profitability.

The research work plan is prepared so that each stage takes place systematically according to the Action Research approach, as presented in Table 3.

Table 3. Research Gantt Chart for 2026

Yes	Activities	Mar	Apr	May	June	Jul	Stuttgart
1	Problem identification & preliminary study	•	•				
2	Literature studies	•	•	•			
3	Preparation of research proposals and instruments		•	•			
4	Initial data collection			•	•		
5	Data analysis (collection & processing)				•	•	
6	Preparation of results report					•	•
7	Capstone final session						•

Source: Processed by author, 2026

RESULTS AND DISCUSSION

Field Findings Overview

Field research was conducted directly on MSMEs Resepnya Eyang with an observation approach, semi-structured interviews, Focus Group Discussions (FGD), and source triangulation. The observation results show that Reknya's Eyang baked brownies have quite good visual appeal in terms of packaging and positioning of premium home products. However, product rotation rates at some outlets tend to be slow, especially on weekdays and outlets with low consumer traffic, so

some products are close to expiration before selling. This phenomenon shows an imbalance between the amount of supply and the actual level of demand at the outlet, which from the perspective of supply chain management is a form of inefficiency in inventory movement that has the potential to increase food waste in the retail sector (Bowersox et al., 2013).

The company's operational data for the period 2024-2025 shows a significant growth trend in supply and sales volumes, followed by an improvement in the distribution performance ratio over time, as presented in Table 4.

Table 4. Development of Supply Volume, Sales, and Distribution Performance of Baked Brownies Recipe Eyang (2024-2025)

Period	Total Supply (units)	Products Sold (units)	Waste Rate	Sell-Through Rate
Q1 2024	3.000	2,760 (est.)	8,0%	92,0%
Q2 2025 (peak)	5.100	4.845	~5.0%	95,0%
Average throughout 2025	4.600 – 5.100	Follow the supply	5,0% - 5,8%	stable at 95.0%

Source: Processed by the author from operational data on MSMEs Recipe Eyang, 2026

The data in Table 4 shows that the volume of brownie supply increased by about 60-70% from early 2024 to mid-2025, followed by a decrease in the waste rate from 8.0% to around 5.0%-5.8%, as well as an increase in the sell-through rate from 92.0% to a stable at 95.0%. This improvement indicates an increase in the accuracy of demand forecasting as the scale of distribution increases. Although the percentage looks relatively small, the condition of waste still has a significant impact on cost efficiency and profitability because each product that is returned has gone through all stages of production, packaging, distribution, and storage without generating revenue.

Root Cause Analysis of Problems with Fishbone Diagram and 5 Why Analysis

Based on the results of interviews with the person in charge of the production, distribution, and logistics division on May 23-24, 2026, it was identified that product waste is influenced by four main factors, namely human factors (Man), operational methods (Methods), materials (Materials), and market (Market). In the Man factor, the limited monitoring power of outlets and the lack of direct control over display activities in modern retail cause brownie products to be often placed in less strategic shelf positions. In the Method factor, the consignment distribution system causes MSMEs to have limited control over the daily sales level, plus there is no accurate demand forecasting system based on the characteristics of each outlet. In the material factor, the characteristics of baked brownies as a bakery product with a relatively short shelf life and no excess preservatives cause a higher risk of waste. In terms of market factors, modern retail consumers tend to choose products with the longest expiration date, so products that are displayed first have a greater risk of not selling.

Of the four factors, the most significant sub-causes were found, namely lack of experience and work skills (Man), consignment cooperation system with modern retail (Method), short and perishable shelf life brownies (Material), and high and aggressive industry competition (Market). These sub-causes are then further analyzed using 5 Why Analysis to find the root cause, as summarized in Table 5.

Table 5. Results of 5 Why Analysis on Factors Causing Waste Return Products

Factors	Flow of Analysis (Why 1 – Why 4/5)	Root Cause
Man	Waste returns occur because the delivery is not according to the needs of the outlet -> forecasting based on experience -> human resources lack the ability to analyze demand & inventory -> there is no training and stock SOPs.	Human resource competence is low in demand forecasting and inventory management, so distribution decisions are not accurate.
Method	Products are returned because they are not sold -> the consignment system causes the stock to be displayed near expiration -> rotation is not optimal -> display and replenishment are controlled by the retailer -> the cooperation agreement authorizes the retailer.	The consignment business model limits MSME control over the rotation, display, and sale of products at outlets.
Material	Products are returned due to short shelf life -> natural ingredients without synthetic preservatives -> limited shelf time -> short shelf life of brownies.	High market competition, low promotional competitiveness, and unbalanced sales due to product characteristics.
Market	Products don't sell because consumers have a lot of choices -> competitors offer promotions and competitive prices -> promotional activities and limited visibility -> MSME marketing budget is limited and relies on retailers.	MSME marketing budgets and activities are limited, so the attractiveness and visibility of products on the shelves is low.

Source: Processed by the author based on the results of the interview, May 2026

Based on the results of the analysis, a strategic solution was determined in the form of the implementation of Circular Product Innovation through the processing of brownies into Brownie Cookies. These findings are in line with the view of Garcia-Garcia et al. (2017) who stated that food waste in the food industry is generally influenced by a combination of various interrelated factors, so its solution requires a comprehensive approach and cannot be done only through increasing promotion or reducing production volume.

Internal Resource Based View (VRIO)

The company's internal analysis is carried out using the Resource Based View (RBV) approach to identify resources that are the company's competitive advantage. The identification of resources and the results of VRIO (Valuable, Rare, Inimitable, Organized) tests are presented in Table 6.

Table 6. Resource Analysis and VRIO MSMEs Recipe Eyang

Capabilities / Resources	V	R	I	O	Results
Brownie recipes passed down from generation to generation	v	v	v	v	Sustainable Competitive Advantage
Relationships with Hero, Foodhall, and FamilyMart	v	v	x	v	Temporary Competitive Advantage
Production of cookies from brownies (waste)	v	v	v	v	Sustainable Competitive Advantage
Standard production equipment	v	x	x	v	Competitive Parity
Brand Recipe Eyang	v	v	v	v	Sustainable Competitive Advantage

Source: Processed by author, 2026 (V=Valuable, R=Rare, I=Inimitable, O=Organized)

The results of VRIO's analysis show that the ability of MSMEs to process brownies that are not sold into cookies is a valuable strategic resource, relatively rare, and difficult to imitate, so it has the potential to be a source of sustainable competitive advantage. In contrast, physical assets such as production equipment only create competitive parity because they are easily acquired and imitated by competitors. The emotional relationship between the "Resepnya Eyang" brand and consumers is also an intangible asset that brings the impression of nostalgia, homemade, and family recipes so that it is difficult for competitors to replicate.

Focus Group Discussion (FGD) and Consumer Acceptance Results

The FGD was conducted on 16 respondents who were divided into groups of loyal consumers (n=8) and potential consumers (n=8). The analysis was carried out based on four themes, namely product acceptance, product evaluation (taste, texture, quality), perception of sustainability, and buying interest. The results of the FGD showed that both groups responded positively to the concept of cookies resulting from the processing of surplus brownies. Loyal consumers are more likely to accept innovations because they have had a positive experience with product quality, while potential consumers view this innovation as a form of company creativity in reducing food waste. The average taste rating reached 4.5 out of a scale of 5 in the loyal

consumer group and 4 out of 5 in the potential consumer group. A comparison of the results of the FGD of the two groups is presented in Table 7.

Table 7. Comparison of FGD Results of Loyal Consumers and Potential Consumers

Aspects	Loyal Consumers (n=8)	Potential Consumers (n=8)	Interpretation
Product acceptance	Very high	Height	The product is accepted by both market segments
Taste rating	Excellent (4.5/5)	Very good (4/5)	Product quality is the main advantage
Zero waste perception	Increase trust in the brand	Being an added value and differentiator	Sustainability strengthens competitiveness
Buying interest	100% willing to buy back	87.5% are willing to buy	The potential for market expansion is quite high
Accepted Prices	IDR60,000 – IDR65,000	IDR60,000 – IDR65,000	Prices are judged according to quality
Key advice	Flavor and packaging variants	Packaging, branding, and product information	Development focus on marketing

Source: Processed by the author from the results of the FGD, 2026

In addition to FGD, field observations at modern retail outlets found that product display positions are often in the under-shelf area so that they do not attract consumers' attention, products with more stock do not always have high sales rates, and modern retail consumers tend to buy impulsively based on visual appeal and ease of display access. Brownny cookies products are considered to have better visibility potential because of the smaller and practical packaging so that they can be placed on snack shelves.

Integration of RBV Results, FGD, and Strategy Setting (Strategic Decision Stage)

The integration of the results of the RBV and FGD analysis shows that the main problem of MSMEs does not lie in product quality, but in distribution management and retail execution optimization, as summarized in Table 8.

Table 8. Integration of RBV and FGD Outcomes on Strategic Implications

RBV Results	FGD Results	Strategic Implications
The innovation of cookies from baked brownies is a unique capability	Consumers love the taste of brownny cookies	Brownny cookies could be a new line of business

Eyang's Recipe Brand Is Not Too Strong	Consumers believe in product quality	Strengthening circular product branding
Consignment sales with some new modern retailers apply to baked brownies	Consumers are quite easy to find brownies The Eyang Recipe but not with cookies	Must expand distribution, especially cookies
The concept of circular product and zero waste has strategic value	Consumers value sustainability	Continue to develop sustainability-based differentiation

Source: Processed by author, 2026

Based on the integration of the results of Fishbone, RBV-VRIO, field observations, and FGD, it was determined that the Circular Economy is the main strategy because it is able to convert waste into a new economic value resource (Ellen MacArthur Foundation, 2015; Stahel, 2016; Kirchherr et al., 2017). The selection of this strategy is based on three main considerations: first, the results of RBV show that the ability to process brownies into cookies is a valuable, rare, difficult to imitate, and organized capability so that it can be a source of competitive advantage; second, the results of the FGD show that consumers receive cookie products very well in terms of taste, quality, and sustainability; and third, this strategy is able to convert costs due to return products into new sources of income so as to support increasing the company's profitability.

Evaluation of Strategies through Mass Balance Models

The effectiveness of the implementation of the Circular Product Innovation strategy was evaluated using the Mass Balance Model, namely by comparing the material flow before (as-is) and after (to-be) implementation of the strategy. The simulation of calculations carried out by the author on the production process of baked brownies to reprocessing them into brownie cookies is summarized in Table 9.

Table 9. Mass Balance Model Simulation on the Production and Reprocessing Process of Baked Brownies

Stages	Process	Description	Material Proportions
1	Production inputs	All raw materials and utensils (flour, chocolate powder, butter, eggs, sugar) are processed into dough.	100% dough mixture
2-4	Dough making, baking (35-40 minutes, 180°C), and finished products	The dough is baked into ready-to-sell baked brownies.	100% baked brownies
5	Products sold	Brownies are sold and enjoyed by customers through consignment outlets.	92%

6-7	Unsold products (waste return)	Remaining stock and returns of declining quality are nearing the expiration limit.	8%
8	Reprocessing (crushing & mixing, re-baking, finishing)	Return brownies are crushed, mixed with additional ingredients (flour, chips, etc.), rebaked into cookies, and packaged.	The remaining 8% is processed into new dough
9-10	Brownie cookies sold	New products from the reprocessing are sold and enjoyed by customers.	100% of cookies sold

Source: Processed by the author based on the Mass Balance Model simulation, 2026

In the conditions before the implementation of the strategy (as-is), all brownies that are not sold (about 7-8% of total production) end up as waste products and lose their economic value. Once the Circular Product Innovation strategy is implemented (to-be), unsold brownies are no longer treated as waste, but are recalled before passing quality standards, then processed into Brownie Cookies through a reprocessing process (crushing, mixing additives, rebaking, and packaging). Thus, materials that previously had the potential to be waste are re-entered into the production cycle as raw materials for new products that have selling value, so that the amount of waste in the to-be model can be declared close to zero (zero waste). These results show that the Circular Product Innovation strategy has succeeded in realizing the principle of closed-loop supply chain while creating economic added value for MSMEs.

The results of the study show that the Brownie Cookies innovation is able to significantly reduce unsold products and supports the Circular Economy theory which states that waste should be seen as a resource that can be reused (Ellen MacArthur Foundation, 2015; Kirchherr et al., 2017). The increase in profitability obtained by MSMEs shows that sustainability strategies do not conflict with economic goals, but are actually able to create new business value (Willard, 2012). These findings are also in line with the research of Bocken et al. (2016) which stated that Circular Product Innovation is able to generate economic value while reducing environmental impact.

Fishbone's analysis identified that waste was influenced by various interrelated factors, including limited outlet monitoring, consignment distribution methods, product characteristics with short shelf life, suboptimal display placement, and the absence of a distribution performance measurement system. Thus, solving problems is not enough through increased production, but requires an overhaul of the supply chain management system as a whole. On the other hand, the results of the RBV-VRIO analysis show that the ability to process brownies that are not sold into Brownie Cookies is a strategic capability that meets the characteristics of valuable, rare, inimitable, and organized, so that it becomes a source of competitive advantage because it not only reduces losses due to return products, but also creates new products that have higher economic value.

The results of the FGD show that product innovation has a high level of acceptance. Consumers rated the taste, texture, and quality of Brownie Cookies to remain good despite coming

from unsold brownies, and the zero waste concept was perceived as an added value that strengthened the brand's image. This shows that the implementation of the circular economy does not reduce the perception of product quality, and is even able to increase differentiation in the eyes of consumers. The implementation of Circular Product Innovation as a strategic decision is strengthened through the Mass Balance Model which shows that brownies that previously had the potential to be waste can be converted into new products, so that the flow of materials remains in the production cycle and waste is close to zero. Overall, this study shows that the successful implementation of circular economy in MSMEs depends on the integration between product innovation, distribution management, and market acceptance.

Managerial Implications

Managerially, the results of the study show that the implementation of the Circular Economy is not only relevant for large companies, but can also be applied to MSMEs with relatively limited investment through product innovation, distribution control, and systematic food waste management. Some of the managerial implications that can be applied by MSMEs include: (1) implementing Circular Product Innovation as a business strategy, by positioning Brownie Cookies as a new product line that has its own identity and positioning; (2) improve the effectiveness of distribution management through periodic evaluation of the performance of each outlet based on sales levels, return products, and sell-through rates; (3) strengthen the monitoring and performance measurement system through key performance indicators such as waste ratio, return rate, sell-through rate, and conversion rate of brownies into cookies; (4) optimizing marketing strategies through diversification of distribution channels outside the consignment system, such as resellers, marketplaces, and digital sales; and (5) consistently strengthen sustainability communication through packaging, social media, and promotional activities to strengthen brand image.

CONCLUSION

This study concludes that unsold baked brownie products in MSMEs were primarily caused by limited distribution control within the consignment system, short product shelf life, consumer preferences for products with longer expiration periods, and insufficient human resource capabilities in demand forecasting, rather than by inadequate product quality. This condition resulted in an average economic loss of 7–8% of total production in each period due to lost potential revenue and suboptimal utilization of raw materials. The Circular Product Innovation strategy, implemented through the transformation of unsold brownies into Brownie Cookies, proved to be an effective strategic solution. The Resource-Based View (RBV-VRIO) analysis indicated that this capability was valuable, rare, and difficult to replicate, thereby providing a potential source of sustainable competitive advantage. The Focus Group Discussion results demonstrated high consumer acceptance in terms of taste, quality, and sustainability value, while the Mass Balance Model simulation showed that materials previously considered potential waste could be converted into new products with economic value, supporting the principles of zero waste and a closed-loop supply chain. Therefore, implementing the Circular Economy approach in

MSMEs not only contributes to waste reduction but also improves cost efficiency, strengthens competitiveness, and supports sustainable business profitability.

Based on these findings, it is recommended that MSMEs develop Brownie Cookies as an official product line supported by standardized reprocessing SOPs, strengthen outlet monitoring and periodic sell-through rate evaluations, optimize product displays, collaborate more effectively with retail partners, expand sales channels beyond the consignment system, and consistently implement sustainability-based brand communication. Future research is suggested to evaluate the long-term impact of this strategy and incorporate more comprehensive quantitative analyses, such as margin analysis, return on investment (ROI) calculations, and environmental impact assessments using the Life Cycle Assessment (LCA) approach. These efforts would provide stronger evidence regarding the effectiveness of Circular Product Innovation strategies in other food-based MSME contexts.

REFERENCE

- Banaite, D. (2016). Toward circular economy: Analysis of indicators in the context of sustainable development. *Social Transformations in Contemporary Society*, 4, 142–150.
- Bocken, N. M. P., de Pauw, I., Bakker, C., & van der Grinten, B. (2016). Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering*, 33(5), 308–320.
- Bowersox, D. J., Closs, D. J., Cooper, M. B., & Bowersox, J. C. (2013). *Supply chain logistics management* (4th ed.). McGraw-Hill.
- Elkington, J. (1997). *Cannibals with forks: The triple bottom line of 21st century business*. Capstone.
- Ellen MacArthur Foundation. (2015). *Towards a circular economy: Business rationale for an accelerated transition*. Ellen MacArthur Foundation.
- Food and Agriculture Organization. (2011). *Global food losses and food waste*. FAO.
- Garcia-Garcia, G., Parra-Lopez, C., Siddiqui, M. A., Lin, C. S. K., Maalej, H., Njeh, F., et al. (2024). Improving waste management strategies in the food sector: Case studies from Spain, Tunisia, and Hong Kong. *Sustainability*.
- Garcia-Garcia, G., Woolley, E., Rahimifard, S., Colwill, J., White, R., & Needham, L. (2017). A methodology for sustainable management of food waste. *Waste and Biomass Valorization*, 8(6), 2209–2227.
- Guinea, R. P. F., Florença, S. G., Barroca, M. J., & Anjos, O. (2020). The link between the consumer and innovations in food product development. *Foods*, 9(9).
- Harnida, M., Vasudevan, A., Mardah, S., Fajriyati, I., Mayvita, P. A., Hunitie, M. F. A., & Mohammad, S. I. S. (2024). Micro, small, and medium-sized enterprises (MSMEs) sustainability: The strategic role of digitalization, financial literacy, and technological infrastructure. *Journal of Ecohumanism*, 3(6), 1248–1260.
- Heizer, J., Render, B., & Munson, C. (2020). *Operations management: Sustainability and supply chain management* (13th ed.). Pearson.
- Jain, S., Newman, D., Cepeda-Marquez, R., & Zeller, K. (2018). *Global food waste management: An implementation guide for cities*. World Biogas Association.
- Kennard, N. J. J. (2018). *Food waste management*. Routledge.
- Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis

- of 114 definitions. *Resources, Conservation and Recycling*, 127, 221–232.
- Lüdeke-Freund, F., Gold, S., & Bocken, N. M. P. (2019). A review and typology of circular economy business model patterns. *Journal of Industrial Ecology*, 23(1), 36–61.
- Nustini, Y., Arwani, A., Budiana, E., Wahyundaru, S. D., & Putra, R. A. (2024). CSR strategies and guidelines for MSMEs: A review of micro, small, and medium enterprises' sustainable CSR practices. *Review of Integrative Business and Economics Research*, 13(4), 620–637.
- Papargyropoulou, E., Lozano, R., Steinberger, J. K., Wright, N., & Ujang, Z. (2014). The food waste hierarchy as a framework for the management of food surplus and food waste. *Journal of Cleaner Production*, 76, 106–115.
- Ramli, Y., Permana, D., Shiratina, A., Soelton, M., & Yusoff, Y. M. (2023). Implementing innovation strategic against sustainability business on the micro, small and medium enterprises. *ICCD*, 5(1), 60–65.
- Ramli, Y., Permana, D., Soelton, M., & Koe, W.-L. (2022). Implementing strategic sustainability business on the micro, small and medium enterprises. *ICCD*, 4(1), 232–236.
- Sehnem, S. (2019). Circular economy: Benefits, impacts and overlapping with supply chain management. *Supply Chain Management: An International Journal*.
- Stahel, W. R. (2016). The circular economy. *Nature*, 531(7595), 435–438.
- Urošević, A., Milanović, I., & Đukić, A. (2025). Impact of the circular economy on sustainable development. *Journal of Conference on Challenges of Contemporary Higher Education*.
- Willard, B. (2012). *The new sustainability advantage* (10th anniversary ed.). New Society Publishers.