REDUCING FOOD WASTE BY REUSING LEFTOVER CROISSANT INTO DESSERT AT SHANGRI-LA JAKARTA

Dania Rahmadini[1], Dyah Mustika Wardani [2], Yulianto [3]

Perhotelan, Fakultas Ekonomi dan Bisnis, Universitas Bina Sarana Informatika

Jl. Kali Abang Tengah No.8, Perwira, Kec. Bekasi Utara, Kota Bekasi
daniaa.rahni@gmail.com

Abstract

This study aims to examine food waste management strategies in the hospitality sector through the innovation of repurposing leftover croissants into dessert products as a means to reduce food waste at Shangri-La Hotel Jakarta. The background of this research stems from the high volume of food waste, particularly pastry products such as croissants, which are frequently left over during buffet breakfast services. A descriptive qualitative approach was employed, utilizing data collection techniques such as direct observation, in-depth interviews, and documentation of the croissant repurposing process. The findings indicate that the application of circular economy principles and zero waste practices by transforming leftover croissants into new products such as mini fruit tarts and almond croissants contributes significantly to food waste reduction, generates economic value, and enhances product diversification in the hotel's bakery operations. These practices reflect the effective implementation of reuse within the 3R (reduce, reuse, recycle) framework and align with Sustainable Development Goal (SDG) 12 on responsible consumption and production.

Keywords: Food Waste, 3R, Product Innovation, Zero Waste, Sustainable Tourism.

INTRODUCTION

The Indonesian tourism industry experienced significant fluctuations during the COVID-19 pandemic from 2020 to 2024. Data from the Central Statistics Agency (BPS, 2024) shows that the number of foreign tourist visits dropped sharply from 4.05 million visits in 2020 to 1.56 million in 2021 due to international travel restrictions. However, a recovery began in 2022, with visits reaching 5.47 million, increasing dramatically to 11.68 million in 2023, and peaking at 14.39 million in 2024. This signifies stability and sustainable growth in the Indonesian tourism sector.

Sumber : (BPS, 2024)

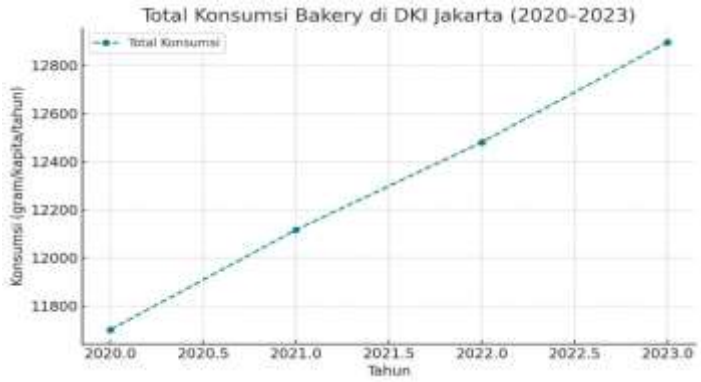
The increase in the number of foreign tourists also went hand-in-hand with the rise in domestic tourist travel to DKI Jakarta. Based on BPS data (2024), the number of domestic tourist trips increased from 3.5 million in 2020 to 6.86 million in 2024, or an increase of nearly 96%. According to the Head of BPS DKI Jakarta, this increase was also driven by the organization of various national and international events such as music concerts, cultural festivals, industry exhibitions (MICE), and sports events (Santosa, 2025).

Sumber : (BPS, 2024)

This phenomenon has a direct impact on hotel occupancy rates (TPK). Nationally, the TPK increased from 40.14% in 2020 to 54.85% in 2024. A similar trend also occurred in DKI Jakarta, rising from 30.70% in 2020 to 62.05% in 2024 (BPS, 2024). This increase in hotel occupancy shows that the hospitality sector has recovered post-pandemic and is entering a phase of sustainable growth.

Sumber : (BPS, 2024)

As hotel occupancy rates increase, the food and beverage sector is also experiencing growth. BPS (2024) data shows that bakery production in Indonesia increased from 396.4 tons in 2020 to 422 tons in 2023. Meanwhile, the level of bakery consumption in DKI Jakarta rose from 11,700 grams per capita per year (2020) to 12,896 grams per capita per year (2023). This increase in consumption is thought to be influenced by the rising public demand, especially post-pandemic, when the trend of consuming practical food and pastry products has become increasingly popular among tourists and local communities.



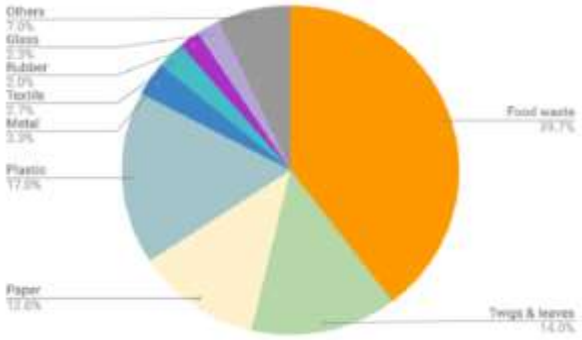
Sumber : (BPS, 2024)

Pastry and bakery products have now become an important element in hotel food and beverage services. Pastries are served not only as desserts but also as complements to buffet services, coffee breaks, and special events. For example, JW Marriott Hotel in Surabaya makes the pastry corner a main attraction at breakfast service, with menu

variations such as croffles, waffles, and bomboloni (Ashari & Jatmiko, 2023). This shows that bakery products play an important role in meeting guest expectations for variety and quality of service.

However, the increasing trend of bakery consumption also poses a serious challenge in the form of food waste. According to (GAPMMI, 2023), high demand for bakery products is often followed by the risk of an increasing volume of food waste due to overproduction and uneven consumption patterns. Food waste is a major problem in hotel operations, whether in the form of leftover raw materials, unfinished food, or spoiled food due to improper storage (Pastini et al., 2024).

The food waste crisis in Indonesia is becoming increasingly worrying. A Bappenas report (Wahyu, 2023), notes that food waste in the 2021–2023 period reached 23–48 million tons per year, equivalent to 115–184 kg per capita, contributing 38.7% of total waste generation. This food waste causes economic losses of Rp213–551 trillion per year, enough to feed up to 125 million people. Additionally, food waste also contributes 7.29% of national greenhouse gas emissions.



Sumber : (Wahyu, 2023).

According to (Nurtekto & Ni Komang Ayu Artiningsih, 2024), bread waste can be utilized to become breadcrumbs through a drying and grinding process, while (Yulianto et al., 2024), found that leftover breakfast croissants can be processed into bread and butter pudding at Gets Hotel Semarang. At Grand Ambarrukmo Hotel Yogyakarta, leftover pastry is even utilized to become traditional market snacks such as *kue pancong* and *timus* (Firdausi, 2020). These practices show that food waste can be managed creatively to create added value while reducing environmental impact.

Based on this background, this study focuses attention on the phenomenon of high pastry food waste, especially croissants, in star hotel buffet services. Croissants are often the product with the highest leftover rate because they are produced in large quantities and have quality standards that do not allow for re-storage. Therefore, a food waste management strategy based on the 3R principles (reduce, reuse, recycle) and product innovation that supports the zero waste concept is needed.

LITERATURE REVIEW

Circular Economy and the 3R Principles

The circular economy is an economic system that focuses on maintaining the value of products, materials, and resources for as long as possible so that they remain within the utilization cycle (Kirchherr et al., 2017), The circular economy is defined as a system of production and consumption designed to preserve the value of products, materials, and resources for as long as possible. One of its main principles is the 3R (reduce, reuse, recycle), which emphasizes reducing waste generation, reusing products, and recycling materials to retain their value (Rodriguez et al., 2020), The circular economy offers a relevant approach to reducing the environmental impact of tourism activities through principles such as system redesign, resource reuse, and product lifecycle optimization. The reinforcement of this theory can be seen in the implementation of the 3R Principle (Reduce, Reuse, Recycle) as an operational approach in food waste management.

The application of the 3R principle not only reduces negative environmental impacts but also plays a role in increasing the efficiency of limited natural resource utilization (Arenibafo & Emmanuel, 2023)

1. Reduce is the principle of minimizing the use of resources and energy in production and consumption processes, with the goal of reducing waste and environmental impacts. By lowering the use of raw materials and energy, production processes become more efficient and sustainable (Bostanabad, 2025). In the hospitality industry, this means designing food production processes in line with demand and avoiding overproduction, such as in the daily croissant production in hotels (Wardi & Putri, 2024).
2. Reuse is a principle in waste management that refers to the use of goods or materials that are still fit for consumption without going through any processing beforehand (Informasi et al., 2025). *Reuse involves using items or materials again without recycling them. For example, leftover croissants can be reprocessed into dessert products such as bread pudding or croutons* (Wardi & Putri, 2024).

3. Recycle is the process of reprocessing materials that are no longer in use into new products that can be reused. This process aims to reduce waste volume, conserve natural resources, and minimize negative environmental impacts (Informasi et al., 2025). In the food and beverage sector, recycling involves processing food waste into useful new products. In pastry, for instance, this may mean turning leftover bread into fermentation material or as a mixture for new dough (Wardi & Putri, 2024).

Product Innovation

Kotler & Keller (2016) state that product innovation is the development of new ideas, goods, or services capable of creating added value for both consumers and producers. Innovation is not limited to the creation of new products but also includes improvements or reprocessing of existing products to make them more appealing. In the culinary industry, product innovation often arises from the utilization of materials considered to have little value, including food waste. (Ettlie, 2007) emphasizes that innovation based on waste utilization can create a competitive advantage as it not only reduces production costs but also broadens the menu diversification offered to consumers. Successful product innovation is that which provides tangible added value to customers, such as new benefits, ease of consumption, and attractive packaging (Wardani, 2021). According to (Koppenhagen et al., 2024), product innovation can be categorized as disruptive innovation, characterized by usefulness contradictions, overcoming limitations of previous products, user-centered focus, attention to user needs and experiences, co-evolution of problems and solutions, and solution development alongside problem understanding. Nunkoo et al. (2019) assert that innovation in sustainable tourism includes new methods for managing waste, whereby hotel kitchens can play a vital role in sustainability-oriented innovation.

According to Kotler and Keller (2016), product innovation can be categorized into four main dimensions:Produk baru bagi dunia *(new-to-the-world products)* adalah produk yang benar-benar inovatif dan menciptakan pasar baru yang sebelumnya belum ada.

1. New-to-the-world products – products that are entirely innovative and create a new market that did not previously exist.
2. New product lines – allow a company to enter existing markets with product categories they have not previously offered.
3. Additions to existing product lines – new variations of existing products, such as new sizes, flavors, or models, providing more choices to consumers.
4. Improvements or revisions of existing products – enhancements in quality, features, or design of existing products to increase market competitiveness (Options, 2019).

Sustainable Development and SDG 12

The concept of sustainable development emphasizes a balance between economic, social, and environmental aspects in every development activity (Bengtsson et al., 2018) In the context of tourism, this translates into practices that provide economic benefits to communities, positive experiences for tourists, while minimizing negative environmental impacts. The Sustainable Development Goals (SDGs), particularly SDG 12 on responsible consumption and production, highlight the importance of reducing food waste throughout the entire food supply chain. In the context of SDG 12, the SCP (Sustainable Consumption and Production) theory is manifested through four indicators (Bengtsson et al., 2018);

1. Waste Reduction
   One of the main SCP indicators is the implementation of practices aimed at reducing waste throughout the production and consumption chain, including food waste, plastic waste, and hazardous waste.
2. Sustainable Product Design (Eco-Design)
   Products should be designed to be long-lasting, easily repairable, recyclable, and energy-efficient, both in their production process and in consumer use.
3. Development of Environmentally Friendly Innovations in the Industry
   SCP emphasizes the importance of technological and process innovations in industries to become greener and low-emission, including the food and tourism sectors.
4. Circular Economy and Zero Waste Implementation
   SCP is closely linked to the circular economy, where products and materials are reused, reprocessed, or repurposed to avoid the linear "take-make-dispose" approach.

According to (Van Vu et al., 2020), explain that the application of the reduce, reuse, and recycle principles in managing food waste in hotels is a tangible contribution of the tourism sector toward achieving SDG targets. Thus, food waste management is not merely a technical issue but also a part of a global commitment to support sustainability.

RESEARCH METHODOLOGY

This study employs a descriptive qualitative approach with the aim of gaining an in-depth understanding of the phenomenon of managing leftover croissants through product innovation based on a circular economy and zero waste concept. The research design was conducted naturalistically, with the researcher serving as the primary instrument, while data analysis was carried out inductively to derive meaning from the field findings. The research was conducted at the pastry bakery section of Hotel Shangri-La Jakarta over a period of six months, from July 2024 to January 2025, coinciding with the researcher's on-the-job training period. Data were collected through in-depth interviews with bakery and pastry staff, direct observations of the leftover croissant processing after breakfast service, and documentation in the form of activity photographs and supporting documents. Data validity was strengthened through triangulation techniques by comparing information from interviews, observations, documentation, and relevant literature.

RESULTS AND DISCUSSION

This study found that croissants are among the products with the highest leftover rates in the breakfast buffet service at Hotel Shangri-La Jakarta. This phenomenon is closely related to the standards of a five-star hotel, which demand product availability in large quantities until the end of service hours. Although this strategy aims to maintain guest satisfaction, the consequence is overproduction, meaning that the quantity produced exceeds the actual consumption by guests. This fact demonstrates that food waste in hotels is not merely a technical kitchen issue but reflects an imbalance in production management and demand planning. Efforts by the pastry team to reuse leftover croissants into new desserts represent an important step in addressing this challenge. Edible croissants are not discarded immediately but are sorted, reprocessed, and transformed into new products such as mini fruit tarts with custard and fresh fruits, or almond croissants with nut toppings. This innovation proves that leftover food is not the end of the consumption cycle but can serve as a secondary raw material in the culinary creative process. It reflects the practical application of the circular economy, in which a product's value is retained within a utilization cycle.

1. Implementation of Leftover Croissant Management in Hotels

Hotel Shangri-La Jakarta implements a structured food waste management strategy based on the 3R principle (Reduce, Reuse, Recycle) for leftover croissants from the breakfast service at SATOO Restaurant. Observations and interviews indicate that each stage of croissant management is carried out systematically and data-driven, aiming not only to reduce waste but also to create economic value and positive social impact. This strategy is part of the hotel's efforts to implement the circular economy concept, where resources that were previously considered waste can be optimally utilized.

a. Reduce

The first stage of the 3R principle, reduce, is applied even before food waste is generated. The bakery team carefully plans the volume of croissant production based on hotel occupancy data, guest demographics, and the schedule of special events such as conferences, weddings, or banquets. Coordination with the front office and banquet divisions provides accurate forecasts, minimizing the risks of overproduction. In addition, daily monitoring of consumer preferences—such as the popularity of plain, chocolate, or cheese croissants—helps the team adjust production in real time. This approach reflects the principles of data-driven decision-making in the hospitality industry. Instead of relying on estimates alone, production is continuously adapted to actual guest demand. The reduce strategy not only prevents waste but also optimizes the use of flour, butter, sugar, and energy. Beyond environmental benefits, it reduces unnecessary labor costs and promotes a culture of efficiency and sustainability among the kitchen staff. This finding supports the circular economy theory, which emphasizes resource optimization and waste prevention from the beginning of the production cycle.The analysis shows that waste reduction is implemented from the early stage of croissant production. The bakery team plans the production volume based on room occupancy data, guest types, and hotel events such as seminars or special functions. Routine coordination between departments, including front office and banquet, ensures more accurate estimations of needs. Additionally, the bakery team monitors daily consumption patterns, such as which croissant variants are preferred, allowing production adjustments. The analysis indicates that the reduce approach effectively minimizes leftover croissants, reduces raw material, energy, and labor waste, and fosters an environmentally conscious work culture. In other words, reduce is not only about cutting production volume but also about data-based decision-making and real-time adaptation to guest demand.

b. Reuse

The second principle, reuse, focuses on extending the usability of leftover products without discarding them. In the case of Shangri-La Jakarta, plain croissants that remain edible are transformed into almond croissants through a process of splitting, filling with almond cream, topping with sliced almonds, and re-baking to restore texture. This creates a product that is visually appealing, flavorful, and consistent with the hotel's five-star quality standards. This strategy exemplifies product innovation. By introducing almond croissants as part of the SATOO Deli offerings, the hotel effectively creates a new product line without increasing raw material costs. Guests perceive the croissants as freshly baked premium pastries, while in reality they

represent a creative adaptation of surplus items. Moreover, croissants unsuitable for reprocessing are not wasted but donated to local social foundations. This practice adds a social responsibility dimension to the reuse strategy, ensuring that the hotel's operations contribute positively to the surrounding community. In this way, the reuse principle generates economic value, culinary innovation, and social benefits simultaneously.

c.Recycle

recycle, goes beyond simple reprocessing to involve transformation. Leftover croissants are used as the base for new desserts, such as mini fruit tarts topped with custard and fresh seasonal fruits. These products diversify the bakery's menu while appealing to guests with attractive presentation and taste. By recycling leftovers, the hotel extends the life cycle of croissants and ensures that surplus does not end up in landfills. Currently, recycling is applied primarily to plain croissants, while other varieties such as chocolate or cheese croissants remain underutilized. This presents an opportunity for the hotel to expand its innovation by creating recipes that can incorporate all types of croissant leftovers. Doing so would amplify the economic and environmental benefits of the recycling initiative and align the bakery more closely with zero-waste principles.

Holistic Impact of the 3R Implementation

The systematic application of reduce, reuse, and recycle at Hotel Shangri-La Jakarta proves highly effective in addressing food waste. Reduction strategies minimize surplus from the outset, reuse transforms leftovers into sellable premium products, and recycling creates new desserts from what would otherwise be waste. Collectively, these measures generate tangible benefits:

a. Economic Impact: Lower raw material and production costs, coupled with additional revenue from new product sales.
b. Social Impact: Strengthened community ties through food donations, demonstrating corporate social responsibility.
c. Environmental Impact: Reduced landfill waste and greenhouse gas emissions, aligning hotel operations with global sustainability goals

This practice not only enhances operational efficiency but also illustrates how a five-star hotel can integrate sustainability principles without compromising service quality or guest satisfaction. The initiative aligns directly with Sustainable Development Goal (SDG) 12: Responsible Consumption and Production, which emphasizes waste reduction and circular economy practices. In conclusion, the croissant management strategy at Shangri-La Jakarta exemplifies the transformation of a challenge into an opportunity. By embedding the 3R principles into daily operations, the hotel demonstrates that sustainability, innovation, and service excellence can coexist. The model offers valuable lessons for the broader hospitality industry, proving that food waste can be reframed as a valuable resource that supports economic efficiency, social engagement, and environmental stewardship.

2. Innovation in Hotel Bakery: Transforming Leftover Croissants at Hotel Shangri-La Jakarta

Innovation in the hospitality industry extends beyond the creation of new products; it also encompasses solutions for routinely encountered food waste. At Hotel Shangri-La Jakarta, leftover plain croissants from the breakfast buffet are systematically collected and transformed into almond croissants. This practice demonstrates how food that would otherwise be discarded can be creatively repurposed into high-value products. The process involves carefully splitting the croissants, adding almond cream filling, topping with sliced almonds, and re-baking to achieve a golden brown exterior with a crisp texture and enhanced flavor. This ensures the final product maintains the hotel's five-star standards for quality, safety, and presentation. By integrating this approach into daily bakery operations, the hotel maximizes the utilization of raw materials while reducing waste and operational costs, illustrating a practical application of sustainable culinary innovation.

The initiative aligns with Kotler and Keller's (2016) four dimensions of product innovation:

a. New-to-the-world Products – While the resulting almond croissants are not entirely new-to-the-world, the New-to-the-World Products Although almond croissants themselves are not a novel pastry, the transformation of leftover breakfast items into premium, sustainable desserts represents an innovative process within the hospitality sector. This approach introduces the idea of a new product subcategory—"sustainable luxury desserts"—where the combination of high culinary standards and environmental responsibility becomes the distinguishing feature. Such practices may even establish benchmarks for other hotels seeking to balance guest satisfaction with sustainability.
b. New Product Lines The repurposed almond croissants are marketed through the SATOO Deli, extending their availability beyond breakfast service. In this way, the hotel expands its product lines by converting what was once surplus into a profitable retail item. This strategic move not only creates new revenue streams but also exemplifies efficient resource allocation and cross-departmental synergy within the hotel's operations.
c. Additions to Existing Product Lines – The addition of almond cream and toppings expands the variety within the bakery's existing product line. This strategy increases consumer choices, enriches flavor

profiles, and enhances visual appeal, while simultaneously promoting efficient use of ingredients. By doing so, the hotel strengthens its product portfolio and reinforces brand value, showing that waste can be transformed into an opportunity for product diversification.

d. Improvements or Revisions of Existing Products Croissants that may have lost crispness during buffet service are restored and upgraded through controlled re-baking. This technique ensures the pastries regain desirable texture and taste, allowing them to meet hotel standards once again. The improvement process exemplifies how hotels can safeguard quality, maintain marketability, and optimize ingredient utilization while significantly reducing operational costs.

The transformation of leftover croissants generates impacts that extend beyond operational efficiency. Economically, the strategy reduces the need for additional raw materials while creating revenue from products that would otherwise be discarded. This improves profitability without compromising quality. Socially, croissants unsuitable for reprocessing are donated to local social foundations, reinforcing the hotel's corporate social responsibility (CSR) and strengthening its relationship with the surrounding community. From an environmental perspective, the practice reduces the amount of food waste sent to landfills, helping to lower methane emissions and the overall ecological footprint of the hotel's kitchen operations.

While this initiative is currently focused on plain croissants, it holds significant potential for expansion. Other croissant varieties—such as chocolate, cheese, or gianduja—can also be reprocessed into new dessert products through innovative recipes. Extending the approach to all types of pastry waste would maximize the hotel's zero-waste strategy and broaden the economic and environmental benefits. Moreover, incorporating systematic documentation, staff training, and regular evaluation can institutionalize this practice, making it a permanent element of the hotel's sustainability program.By combining culinary creativity, operational efficiency, and sustainability, the croissant innovation at Shangri-La Jakarta represents a holistic model of sustainable product development. It aligns with SDG 12 (Responsible Consumption and Production) by demonstrating how the hospitality sector can reduce waste, promote resource efficiency, and create value from surplus materials. This practice proves that food waste can be reframed as a resource—supporting environmental stewardship, enhancing brand reputation, and delivering social benefits at the same time. In summary, the transformation of leftover croissants at Hotel Shangri-La Jakarta illustrates how innovation can address everyday challenges in hospitality operations. It shows that sustainability does not conflict with luxury or guest satisfaction; rather, it can enhance them through creative, high-quality culinary solutions. This initiative paves the way for a fully integrated sustainable food management system that can serve as a replicable model for hotels across Indonesia and beyond.

COCLUSION

This study concludes that food waste management at Hotel Shangri-La Jakarta, particularly in relation to croissants, has been successfully implemented through the systematic reuse of leftover products into new desserts. Rather than discarding edible croissants immediately after breakfast service, the hotel's bakery team adopted a structured approach to sort, reprocess, and transform them into premium desserts such as mini fruit tarts and almond croissants. This process reflects the practical application of the circular economy principle, specifically the reuse component of the 3R framework (reduce, reuse, recycle). By treating leftover croissants as secondary raw materials rather than waste, the hotel demonstrates that food waste can be integrated back into the production cycle to generate additional value. From the perspective of product innovation, the findings reveal that transforming croissants into new desserts does more than reduce waste—it diversifies the bakery's offerings and strengthens its menu portfolio. The almond croissants created from leftovers were reintroduced into the buffet and deli with quality standards equal to freshly produced items. Meanwhile, the mini fruit tarts showcased how surplus pastries can be repurposed into visually appealing, guest-pleasing desserts. Both products were well-received by customers, proving that waste-based innovation can coexist with five-star service standards. In line with Kotler and Keller's (2016) innovation framework, these practices represent improvements of existing products, additions to product lines, and the creation of a potential new subcategory of sustainable luxury desserts.

The study also contributes to the broader agenda of sustainability and responsible consumption. By reusing croissants, the hotel supports the achievement of Sustainable Development Goal (SDG) 12, which emphasizes responsible production and consumption patterns. The practice reduces daily pastry waste, lowers operational costs by optimizing raw material usage, and raises staff awareness about the importance of sustainability in hospitality operations. Beyond environmental advantages, the initiative also produces economic benefits (through cost efficiency and revenue generation from new products) and social benefits (through donations of non-reprocessable croissants to social foundations). This multi-dimensional impact highlights that food waste management can be an integrated strategy that balances economic, environmental, and social goals.

However, this research also acknowledges several limitations. The scope of the study focused exclusively on pastry products—specifically croissants—within a single hotel and over a limited time frame (July 2024 to January 2025). As a result, the findings cannot be generalized to all hotels or all food and beverage operations. Furthermore, the recycling practices were mainly applied to plain croissants, while variants such as chocolate,

cheese, and gianduja were not systematically utilized. This presents an area for future development, as creating recipes that incorporate all types of leftover pastries could expand the scope and benefits of food waste reduction.

For future research, it is recommended that similar studies be conducted across a wider range of hotels and pastry types. Comparative research involving multiple properties—ranging from three-star to five-star hotels—could provide more comprehensive insights into the scalability of waste-to-product innovation. Additionally, experimental designs that test guest perceptions of waste-based desserts could offer valuable feedback for improving marketing strategies, packaging, and menu integration. In conclusion, the case of Shangri-La Jakarta provides a replicable model of food waste management based on dessert product innovation. It shows that leftover food can be reframed as a valuable resource that contributes to culinary creativity, operational efficiency, and environmental stewardship. This study proves that food waste management in the hospitality industry should not be viewed solely as a technical kitchen issue, but as an opportunity for innovation and sustainability. By embedding the circular economy into daily bakery operations, hotels can simultaneously achieve cost savings, enhance guest satisfaction, and fulfill their corporate social responsibility.Overall, this research demonstrates that addressing food waste through creative reprocessing is not merely a reactive solution but a proactive strategy for sustainable growth in the hospitality industry. It provides new insights into how the principles of the circular economy and SDG 12 can be practically realized, paving the way for other hotels in Indonesia and globally to adopt similar practices. Thus, the study contributes both academically—by linking sustainability theories with real-world practices—and practically—by offering a model that can inspire hotels to transform food waste challenges into opportunities for innovation, efficiency, and long-term sustainability.

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