

LINKING GREEN PACKAGING INNOVATION TO ENVIRONMENTAL AND ECONOMIC SUSTAINABILITY OUTCOMES: EVIDENCE FROM HALAL CANNING INDUSTRIES IN ZAMBOANGA CITY

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ABSTRACT This study investigated the relationship between Green Packaging Innovation (GPI) and environmental and economic sustainability outcomes among halal canning industries in Zamboanga City using a convergent mixed-methods approach. Findings showed that GPI ($M = 3.91$), environmental sustainability ($M = 3.91$), and economic sustainability ($M = 3.86$) were implemented to a great extent. Environmental sustainability significantly influenced economic sustainability outcomes ($\beta = 0.654, p < 0.001$), while GPI significantly moderated this relationship ($\beta = -0.185, p = 0.002$). Qualitative findings identified regulatory compliance, halal certification requirements, environmental stewardship, and market competitiveness as major drivers of GPI adoption. Although participants reported challenges related to costs and material availability, they noted improvements in waste management, operational efficiency, and brand reputation. The findings underscore the strategic importance of green packaging innovation in enhancing sustainability and support initiatives that strengthen biodegradable packaging, improve resource efficiency, and foster stakeholder collaboration for long-term industry development.

Keywords: Green Packaging Innovation; Environmental Sustainability; Economic Sustainability; Halal Canning Industries; Structural Equation Modeling; Sustainable Development; Zamboanga City; Halal Certification

INTRODUCTION

Background of the Study

The global transition toward sustainable production has accelerated in response to environmental degradation, increasingly stringent regulations, and growing consumer demand for environmentally responsible products. The food industry, traditionally dependent on single-use and non-biodegradable packaging materials, is progressively adopting Green Packaging Innovation (GPI), including biodegradable, recyclable, compostable, and reusable alternatives. These innovations play a critical role in reducing waste generation, minimizing carbon emissions, and improving resource efficiency across supply chains [1].

Moreover, GPI aligns closely with the United Nations Sustainable Development Goals (SDGs), particularly SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 8 (Decent Work and Economic Growth), by promoting sustainable industrial practices and enhancing long-term organizational competitiveness [2].

Beyond environmental benefits, green packaging has demonstrated considerable economic potential. Organizations that adopt sustainable packaging practices may realize cost savings through efficient resource utilization, strengthen brand reputation, and improve market competitiveness. As businesses increasingly embrace circular economy principles, GPI has become an important strategic tool for achieving both environmental stewardship and sustainable economic growth [2]. The Halal food sector presents a distinctive context for the adoption of sustainability initiatives. Guided by the principle of *halalan toyyiban*, Halal production extends beyond compliance with religious requirements to encompass safety, wholesomeness, ethical responsibility, and environmental sustainability throughout the value chain [3]. Packaging is a critical component of this framework, ensuring product integrity, hygiene, traceability, and consumer trust. Consequently, integrating green packaging

into Halal operations provides an opportunity to align Islamic ethical principles with global sustainability objectives.

In the Philippines, Zamboanga City has been identified as a strategic center for Halal development because of its cultural diversity, established food manufacturing industry, and proximity to Muslim markets in Southeast Asia [4]. Government initiatives have further promoted the integration of Halal standards with sustainable production practices, reflecting national commitments to the Sustainable Development Goals (SDGs) through the Philippine Halal Industry Development Strategic Plan and the establishment of the National Halal Industry Development Office [5]. These developments position Halal canning enterprises as key contributors to sustainable industrial growth in the region.

Despite these advancements, empirical evidence on the role of Green Packaging Innovation within Halal industries remains limited. Existing studies have primarily focused on conventional food manufacturing sectors and developed economies, with minimal attention given to Halal enterprises in emerging markets [2]. Furthermore, previous research has largely emphasized environmental outcomes while giving comparatively less attention to economic sustainability indicators such as profitability, competitiveness, and long-term business resilience. Local enterprises also face challenges, including limited access to sustainable packaging technologies, higher material costs, and inadequate institutional support.

Given these gaps, this study examines the relationships among Green Packaging Innovation, environmental sustainability, and economic sustainability outcomes in Halal canning industries in Zamboanga City. By generating localized empirical evidence, the study contributes to the growing body of knowledge on sustainable food systems and supports the integration of Islamic ethical principles with global sustainability frameworks in developing economies.

Statement of the Problem

Despite the growing adoption of Green Packaging Innovation (GPI), empirical evidence on its environmental and economic sustainability outcomes among Halal enterprises remains limited. In Zamboanga City's emerging Halal canning sector, these relationships have yet to be adequately explored.

Specifically, this study sought to answer the following questions:

1. What is the extent of Green Packaging Innovation, environmental sustainability, and economic sustainability outcomes among Halal canning industries in Zamboanga City?
2. Is there a significant relationship between environmental sustainability and economic sustainability outcomes among Halal canning industries in Zamboanga City?

Review of Related Literature

Green Packaging Innovation (GPI) has emerged as a critical strategy for addressing environmental challenges in the food industry. Organizations increasingly adopt biodegradable, recyclable, compostable, and reusable packaging materials to reduce waste, conserve resources, and mitigate climate change impacts [1]. These initiatives support global sustainability goals and enhance competitiveness, brand value, and circular economy practices. Within the Halal food sector, the principle of *halalan toyyiban* extends sustainability beyond religious compliance to include safety, ethics, and environmental stewardship [3].

Knowledge, environmental awareness, and regulatory compliance are key determinants of GPI adoption. However, barriers such as limited technical knowledge, implementation costs, and inadequate infrastructure continue to impede adoption, particularly among SMEs [6]. Regulatory frameworks, including Extended Producer Responsibility policies and Philippine laws, further encourage sustainability adoption. Green Packaging Innovation contributes significantly to environmental sustainability through waste reduction, resource efficiency, recyclability, and biodegradability while also generating economic benefits, including improved cost efficiency, profitability, competitiveness, and long-term business growth [2]. In the Philippines, particularly in Zamboanga City's emerging Halal sector, empirical evidence remains limited. Thus, this study addresses the need for localized insights into the relationships among GPI, environmental sustainability, and economic sustainability outcomes in Halal canning industries.

Theoretical Framework

This study is anchored on four complementary theories that explain the adoption of Green Packaging Innovation (GPI) and its influence on sustainability outcomes in Halal canning industries. The Triple Bottom Line Theory [7] emphasizes balancing environmental and economic performance. The Theory of Planned Behavior [8] explains how stakeholder attitudes influence GPI adoption. The Resource-Based View [9] highlights organizational capabilities as sources of competitive advantage, while Innovation Diffusion Theory [10] describes the adoption of innovations based on perceived

benefits, compatibility, and ease of implementation. Collectively, these theories provide a comprehensive framework for understanding GPI and sustainability outcomes.

Methodology

Research Design

This study employed a quantitative, descriptive-correlational research design to determine the extent of Green Packaging Innovation (GPI) and environmental and economic sustainability outcomes and to examine their relationship among Halal canning industries in Zamboanga City. Data were collected through a structured questionnaire and analyzed using descriptive statistics and Structural Equation Modeling (SEM).

Research Locale

The study was conducted in Zamboanga City, Philippines, due to its growing Halal canning industry and adoption of green packaging practices. The locale was selected to provide localized insights into Green Packaging Innovation and its environmental and economic sustainability outcomes.

Population and Sampling Procedure

The study population consisted of managers, supervisors, and quality assurance personnel from Halal canning enterprises in Zamboanga City. Purposive sampling was employed to select respondents with relevant experience in sustainable packaging and decision-making. The sample size was determined based on Structural Equation Modeling (SEM) requirements.

Research Instruments

A structured questionnaire was used to assess Green Packaging Innovation (GPI) and its environmental and economic sustainability outcomes among Halal canning industries in Zamboanga City. The instrument utilized a 5-point Likert scale and was developed from relevant literature, validated by experts, and pilot-tested to ensure its validity and reliability.

Data Gathering Procedure

Data were collected through a structured questionnaire administered to managers, supervisors, and packaging personnel in Halal canning industries in Zamboanga City. Prior approvals were secured, and respondents were informed of the study's purpose, voluntary participation, and confidentiality measures. The instrument employed a 5-point Likert scale, and completed questionnaires were coded and analyzed using statistical software. A pilot test was conducted to establish the instrument's validity and reliability and to ensure its suitability for Structural Equation Modeling (SEM).

Data Analysis Procedure

Data were analyzed using descriptive and inferential statistics. Mean and standard deviation were used to summarize Green Packaging Innovation and sustainability outcomes [11]. Structural Equation Modeling (SEM) examined relationships among variables and tested the hypotheses [12]. Reliability was determined using Cronbach's alpha, with values of 0.70 or higher considered acceptable [13]. Statistical analyses were conducted using SPSS for descriptive statistics and WarpPLS for SEM.

RESULTS AND DISCUSSION

Table 1. Extent of Green Packaging Innovation and Environmental and Economic Sustainability Outcomes among Halal Canning Industries in Zamboanga City

Variables	Mean	SD	Interpretation
Green Packaging Innovation (Knowledge of Materials)	3.92	0.618	To a Great Extent
Environmental Sustainability	3.91	-	To a Great Extent
Economic Sustainability Outcomes	3.86	-	To a Great Extent

Problem 1

The findings indicate that Halal canning industries in Zamboanga City demonstrate a high level of implementation of Green Packaging Innovation (GPI) and exhibit favorable environmental and economic sustainability outcomes. Specifically, Green Packaging Innovation in terms of knowledge of materials obtained an overall mean of 3.92 (SD = 0.618), indicating that stakeholders possess substantial knowledge of eco-friendly, recyclable, and biodegradable packaging materials. Environmental sustainability (M = 3.91) and economic sustainability outcomes (M = 3.86) were likewise largely assessed, suggesting that sustainability practices are embedded within organizational operations.

The results imply that Halal canning enterprises recognize the strategic value of sustainable packaging in achieving environmental and business objectives. Stakeholders' high level of material knowledge reflects their ability to make informed decisions and comply with industry standards, supporting the Resource-Based View [9]. Favorable environmental and economic sustainability outcomes further indicate that green packaging initiatives enhance waste reduction, resource efficiency, profitability, competitiveness, and long-term growth. Consistent with previous studies [14], these findings affirm that Green Packaging Innovation is an integral component of sustainable business practices in Halal canning industries.

Problem 2

Table 2 presents the results of the Structural Equation Modeling (SEM) analysis examining the relationship between environmental sustainability and economic sustainability outcomes among Halal canning industries in Zamboanga City. The findings reveal a significant positive relationship between the two constructs ($\beta = 0.654$, $p < 0.001$), with a substantial effect size ($f^2 = 0.504$). This indicates that improvements in environmental sustainability practices are associated with enhanced economic sustainability outcomes.

Table 2. Relationship between Environmental Sustainability and Economic Sustainability Outcomes among Halal Canning Industries in Zamboanga City

Hypothesis	Path Coefficient (β)	p-value	SE	f^2	Interpretation
H1: Environmental Sustainability → Economic Sustainability Outcomes	0.654	<0.001	0.057	0.504	Significant

Effect size interpretation: 0.02 = Small; 0.15 = Moderate; 0.35 = Large.

The results indicate that organizations implementing environmentally responsible practices such as waste reduction, resource efficiency, recyclability, biodegradability, and regulatory compliance are more likely to achieve improved cost savings, profitability, competitiveness, and long-term business growth. The substantial effect size suggests that environmental sustainability is a strong predictor of economic performance within the Halal canning sector.

These findings support the Triple Bottom Line Theory [7], Dynamic Capabilities Theory [15], and Circular Economy principles [16], which emphasize the interdependence of environmental responsibility and economic value. Consistent with recent studies [17], environmental sustainability significantly enhances organizational performance and market positioning. Thus, the null hypothesis was rejected, confirming that environmental sustainability is a significant driver of economic sustainability outcomes and organizational resilience.

CONCLUSION

The findings revealed that Halal canning industries in Zamboanga City exhibit a high level of Green Packaging Innovation (M = 3.92), environmental sustainability (M = 3.91), and economic sustainability outcomes (M = 3.86), indicating that sustainable practices are well integrated into their operations. Furthermore, environmental sustainability significantly influences economic sustainability outcomes ($\beta = 0.654$, $p < 0.001$, $f^2 = 0.504$), demonstrating that environmentally responsible practices contribute substantially to improved profitability, competitiveness, cost efficiency, and long-term business growth within the Halal canning sector.

Recommendations

It is recommended that Halal canning industries strengthen their adoption of Green Packaging Innovation by expanding the use of biodegradable and recyclable materials and enhancing partnerships with sustainable packaging suppliers. Industry stakeholders and policymakers should provide greater technical and financial support to facilitate sustainability initiatives. Future researchers are encouraged to examine additional factors influencing Green Packaging Innovation and conduct comparative studies across other Halal industries and regions to further validate and extend the findings of this study.

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