



## **Thai Consumers' Perceptions of Sustainable Food Packaging**

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### **ABSTRACT**

This study explored Thai consumers' perceptions of sustainable food packaging, investigating factors influencing their awareness, such as environmental consciousness and knowledge of eco-friendly options. Conducted through a structured survey with 800 Thai online food consumers, the research assessed attitudes toward plastic packaging waste, factors guiding the preference for sustainable options, and potential impacts on the food service industry. Findings revealed a substantial surge in Thai consumer interest in sustainable food packaging, driven by heightened environmental awareness. However, a significant gap emerged between consumer demand and the limited availability of sustainable options in the Thai online food sector. Despite growing interest, consumers lacked specific knowledge about diverse sustainable packaging alternatives and their environmental implications. This knowledge gap poses a challenge in aligning consumer aspirations with industry choices and the global sustainability standard such as ISO 14001, FDA guidelines and European Green Deal objectives. The study underscores the need for educational initiatives to enhance consumer awareness of clearing on eco-labeling to educate consumers on the sustainability benefits of the packaging. Bridging this knowledge gap is crucial to aligning consumer preferences with sustainability goals in the food packaging industry partnering with eco-certification bodies to enhance credibility. The research not only identifies trends but offers actionable steps for rising demand for sustainable alternatives, global regulatory push, and technology driven advancements. By implementing these recommendations, business as a leader in sustainability can meet market demands for sustainability, contributing to a more environmentally responsible future in the Thai online food industry regulatory requirements.

**Keywords:** Consumer perceptions, Eco-Friendly practices, Environmental awareness, Food service industry, Sustainable food packaging.

## INTRODUCTION

The food service industry is associated with significant environmental consequences, including energy consumption, water usage, and waste generation. Consumer awareness and eco-friendly practices can influence the industry to adopt more sustainable practices, such as reducing single-use plastics, minimizing food waste, and sourcing ingredients responsibly utilizing biodegradable materials such as corn starch, bamboo, sugarcane bagasse, and seaweed. As global awareness of environmental issues increases, consumers are becoming more conscious of the environmental footprint of the products and services they use. In Thailand, consumers are likely to express a growing preference for eco-friendly and sustainable options in the food service industry. For example, the materials like Polylactic Acid which decompose in industrial composting facilities. This shift in demand can drive businesses to adopt environmentally friendly practices to remain competitive. Governments and regulatory bodies are increasingly focusing on sustainability and environmental conservation. In response to global challenges like climate change, governments may enact regulations and policies that encourage or mandate eco-friendly practices in industries, including food service. Businesses in Thailand may face regulatory pressures to align with these sustainability initiatives. Consumers are becoming more loyal to brands that demonstrate a commitment to environmental and social responsibility. Adopting eco-friendly practices can enhance the brand image and reputation of food service businesses in Thailand. Conversely, a lack of attention to sustainability may result in negative perceptions among environmentally conscious consumers. As concerns about resource scarcity grow, businesses are recognizing the importance of adopting sustainable practices to ensure the long-term availability of resources. Moreover, sustainable practices can often lead to cost savings in the long run, making them economically viable for businesses in the food service industry. The food service industry relies heavily on agricultural supply chains. Climate change and environmental degradation can impact the availability and quality of raw materials. Sustainable practices, including responsible sourcing and supply chain management, can enhance the resilience of the food service industry in Thailand to environmental challenges. Local communities in Thailand may be increasingly concerned about the environmental impact of businesses operating in their areas. Food service establishments that engage with and contribute positively to their local communities through eco-friendly practices are likely to build stronger relationships and community support. Furthermore, consumer awareness and eco-friendly practices are having a significant impact on sustainability in the food service industry [1]. The consumers have more awareness of the environmental and social impacts on their food choices, they are increasingly demanding sustainable options from restaurants and other food service establishments [2]. This shift in consumer demand is driving the food service industry to adopted eco-friendly practices, such as using sustainable packaging, reducing food waste, and sourcing locally grown ingredients [3]. There are several factors that are contributing to the growing consumer awareness of sustainability [4]. One factor is the increasing media coverage of environmental issues, such as climate change and plastic pollution. Another factor is the rise of social media, which has made it easier for consumers to learn about and connect with sustainable businesses [3]. Additionally, many consumers are becoming more interested in healthy eating and living a more sustainable lifestyle. The food service industry is responding to this growing consumer demand for sustainability in a few ways [5]. For example, in food service industry are now offering sustainable packaging options, such as compostable food containers and recycled utensils and transition from traditional single use plastics to reusable and recyclable options. Others are reducing their food waste by donating surplus food to local food banks or

composting it. The implementation of lightweight designs that use less material while maintaining durability. The food service industry's response to this demand includes offering sustainable packaging options, reducing food waste through donations and composting, and sourcing locally grown ingredients to minimize environmental impact [5]. The adoption of these eco- friendly practices not only addresses consumer preferences but also contributes positively to the overall sustainability of the industry [1]. By addressing the research questions outlined earlier, this study aims to provide invaluable insights guiding food service industries in the development of strategies to enhance their sustainability practices. Understanding the intricate interplay between consumer awareness and eco-friendly initiatives is imperative for the industry to effectively navigate its challenges, optimize its environmental impact, and cater to the escalating demand for environmentally conscious dining options. So that the research objectives are:

- 1) To assess consumer perceptions and attitudes towards plastic packaging waste when ordering food online.
- 2) To analyze the factors that influence consumer decision-making regarding the choice of eco-friendly packaging options.
- 3) To explore the impact of consumer preferences and behaviors on the food service industry's practices and policies.
- 4) To analysis potential gaps in consumer awareness and knowledge regarding the environmental consequences of plastic waste.

The food service industry in Thailand is a significant contributor to the country's economy, generating over 1 trillion baht in revenue annually. The Food and Agriculture Organization of the United Nations found that reducing food waste by just 10% could reduce greenhouse gas emissions by 1.4 billion tons per year [6]. Additionally, a study by the Ellen MacArthur Foundation found that switching to sustainable packaging could save the global economy \$100 billion per year. While the food service industry is making progress in adopting eco-friendly practices, there are still some challenges that need to be addressed [5]. Most of the waste from lunch boxes is plastic waste, which cannot decompose naturally. It takes hundreds of years to completely decompose. [7]. And in 2021, it was found that 72% of Thai consumers are aware of the environmental impact of food packaging, with 63% stating that they choose to use environmentally friendly packaging. [8]. While consumer awareness of sustainability is growing, there are still many consumers who are not aware of the environmental and social impacts of their food choices. To address these sustainability challenges, understanding the interplay between consumer awareness and ecofriendly practices is crucial. Consumer awareness of the environmental impact of food choices is growing, and consumers are increasingly seeking out restaurants that prioritize sustainability. This growing demand for ecofriendly practices presents an opportunity for restaurants to differentiate themselves and attract environmentally conscious customers. Given the growing importance of sustainability in the food service industry, this research aims to investigate the impacts of consumer awareness and ecofriendly practices on sustainability in the food service industry in Thailand. By understanding these factors, restaurants can develop strategies to enhance their sustainability practices and meet the growing demand for environmentally conscious dining options. This research will investigate the impact of consumer awareness and eco-friendly practices on sustainability in the food service industry in Thailand. Despite the growing challenges, the food service industry in Thailand is still in its early stages of sustainability adoption [9]. This research is important because it addresses a critical issue facing the food

service industry in Thailand. By understanding the factors that influence consumer awareness and eco-friendly practices, we can develop more effective strategies to promote sustainable food choices and practices in the industry. The research will use a mixed methods approach to collect and analyze data. The quantitative data will be collected through a survey of consumers in Thailand. The survey will collect data on consumer awareness of sustainability issues, attitudes towards eco-friendly practices, and food choices. primarily through the collection of data using survey instruments to explore the opinions and suggestions of a sample of 800 consumers in the Bangkok metropolitan area who are interested in environmentally friendly products. The questionnaire includes questions to measure opinions of food service industry consumers, including their knowledge of environmental issues, their concern and awareness about environmental problems, consumer attitudes towards environmentally friendly products, individual environmental concern. The questionnaire also assesses product quality for environmentally friendly products and trust in environmentally friendly products. The findings of the research will be used to develop recommendations for how to promote sustainable food choices and practices in the food service industry in Thailand.

### **LITERATURE REVIEW**

Consumer behavior assumes a pivotal role in addressing environmental concerns associated with packaging. The promotion of environmentally friendly product purchases is closely linked to the effectiveness of environmental education, which enlightens consumers about market constraints and fosters more discerning purchasing decisions [10]. To gauge consumer awareness, behavior, and expectations, a comprehensive online survey was conducted by [5], involving 646 participants. The utilization of social media proved particularly efficacious in amassing substantial data within a limited timeframe [11]; [12]. Gender emerges as a significant determinant influencing environmental interest and sustainability awareness, with women exhibiting greater levels of consciousness and concern [13]. The study by [14] underscores the influence of age on consumers, noting that older individuals tend to possess greater environmental knowledge, while younger consumers, despite having easier access to information, may exhibit lesser awareness of environmental symbols. Furthermore, higher educational attainment correlates positively with increased interest in sustainability, thereby shaping consumer perceptions [15]. However, the positive impact of education on consumer behavior hinges on the willingness to pay a premium for sustainable products [16]. Despite the positive correlation between education and sustainability awareness, research indicates that current methods of disseminating information may fall short in convincing consumers of the advantages associated with environmentally friendly choices [17]. The study posits that enhanced education on sustainable products could prove instrumental in effectively communicating their environmental benefits. Moreover, increased visibility and media coverage play a crucial role in disseminating information, thereby heightening consumer awareness regarding sustainable packaging practices [18]; [19]. In conclusion, facilitating easily accessible knowledge is essential in enabling consumers to comprehend sustainable packaging practices, thereby aiding food companies in meeting the escalating demand for environmentally friendly products.

Consumer behavior theory is a field of study that examines how individuals, groups, and organizations make decisions and choices regarding the purchase, use, and disposal of goods and services. Several theories contribute to our understanding of consumer behavior, and here are some key ones:

**Psychological Theories:**

- Maslow's Hierarchy of Needs: This theory suggests that individuals have a hierarchy of needs that they seek to satisfy, starting from basic physiological needs (like food and shelter) to higher-order needs (such as self-actualization).
- Motivation-Need Theory: Developed by Abraham Maslow and others, this theory proposes that consumers are motivated to fulfill specific needs, and their behavior is driven by these needs.
- Perception and Learning Theories: These theories explore how consumers perceive and process information. Learning theories, such as classical and operant conditioning, also play a role in understanding how consumers acquire and modify their behavior.

Understanding consumer behavior is crucial for businesses and marketers to develop effective marketing strategies, design products, and create successful advertising campaigns.

- **Hypothesis: H1:** Elevated consumer awareness concerning the environmental impact of food packaging is positively associated with a heightened preference for eco-friendly packaging options.

Eco-friendly products are defined as those that minimize environmental impact throughout their life cycle, from raw material extraction to disposal [20]. Consumers who prioritize health and environmental well-being are increasingly drawn to these products, driven by the growing awareness of the interconnectedness between environmental health and personal health [21]. The perceived barriers to adopting those behaviors influence their health-related decisions [22]. Ecofriendly products span various categories, including household goods, personal care items, clothing, and building materials. They often incorporate recycled or renewable materials, prioritize energy efficiency, and employ manufacturing processes that minimize waste and emissions. Additionally, many eco-friendly products are designed to be easily recyclable or biodegradable, further reducing their environmental footprint. Consumers are increasingly drawn to eco-friendly products due to a growing awareness of environmental issues and a desire to make more sustainable choices. Businesses are responding to this demand by integrating eco-friendly practices into their production processes and developing products that align with environmentally conscious values. Government regulations and certifications, such as Energy Star or organic certifications, also play a role in promoting the development and adoption of eco-friendly products. Research on eco-friendly product buying behavior often employs survey methods to collect data from consumers, exploring their attitudes, beliefs, and intentions towards these products. Additionally, researchers utilize qualitative methods such as interviews and focus groups to gain deeper insights into consumers' motivations and decision-making processes. To measure the impact of eco-friendly product purchasing on health, researchers may employ various metrics, including self-reported health outcomes or objective measures of environmental exposure. Studies have shown that purchasing eco-friendly products can have several positive outcomes, both for individuals and the environment. For individuals, these benefits can include reduced exposure to harmful chemicals, improved indoor air quality, and a greater sense of personal well-being associated with contributing to environmental sustainability [21]. For the environment, eco-friendly products can lead to reduced resource consumption, less pollution, and a more sustainable future. Ultimately, the shift toward eco-friendly products represents a positive step toward a

more sustainable and responsible approach to consumption. As consumers become more educated and conscientious about their choices, the market for eco-friendly products is likely to continue expanding, contributing to a greener and more sustainable future. While research on eco-friendly products and health-conscious green buying has provided valuable insights, the remaining gaps represent exciting opportunities for future research and discovery. The study needs to explore the specific mechanisms through which eco-friendly products influence health, investigate the role of emotions and social influence in green buying decisions, and develop effective interventions to encourage more consumers to adopt eco-friendly behaviors.

- **Hypothesis: H2:** Enhanced consumer awareness regarding sustainable practices in the food service industry fosters consumer adoption of eco-friendly packaging options.

In the food industry, manufacturers are investing in environmentally friendly packaging [23]. However, consumers lack confidence in purchasing these products due to insufficient theory explaining their demand [23]. To address this gap, researchers conducted a literature review on environmentally friendly packaging, identifying 246 studies and focusing on 31 pertinent ones [23]. Most studies address factors limiting consumer expectations, emphasizing the need to examine values influencing willingness to pay, as suggested by [24]. [25] perspective on consumers' behavior is endorsed, emphasizing aligning products with needs, and generating enthusiasm. [24] stress the importance of understanding consumer purchasing behavior affecting willingness to pay a premium for eco-friendly packaging. The "Pro-environmental consciousness" model by [26] is endorsed for explaining consumers' willingness to purchase environmentally friendly products, even with higher costs. The research highlights the role of consumers in adopting environmentally friendly packaging, noting awareness of environmental impacts doesn't always influence buying behavior [27]. Most purchase drivers are rooted in product functionality and protection. In summary, consumers must weigh several factors before making a purchase, and manufacturers of food products in environmentally friendly packaging should take these factors into careful consideration. This way, they can ensure that their products align with consumer needs and generate enthusiasm for purchase making consumer aware of the advantages they gain by choosing food products in environmentally friendly packaging. The global food industry is currently undergoing a notable transformation as it confronts the imperative issue of sustainability. Throughout from production and processing to packaging and consumption [28]. This growing awareness is compelling industry stakeholders to embrace and implement sustainable practices at every stage [29]. Consumer behavior and demand are powerful catalysts for sustainability in the food industry [30]. they studies consumer needs through an academic questionnaire survey focusing on biodegradable paper packaging. And it can be concluded that consumer demand is increasing for sustainable products. Encourage companies to adapt their practices to meet these expectations. Companies that effectively communicate their sustainability efforts can gain a competitive advantage, fostering consumer loyalty and further driving the industry towards greener practices. [31]. The food industry encompasses various critical concerns, but one issue that directly affects our daily lives is the packaging used for food. Daily, a substantial amount of food is purchased and brought home, highlighting the immense significance of packaging [32]. Upon studying stores offering delivery services, it was noted that the majority opt for plastic boxes due to their cost-effectiveness and convenience. However, after conducting comprehensive research, a broader perspective of the situation and critical trends emerged. It became apparent that these stores were yet to grasp the subsequent implications. Furthermore,

they viewed their own stores as small-scale and believed they didn't significantly impact the sustainability of the food industry. If this perception persists, it is anticipated that in the coming decade, fewer stores will transition towards using sustainable packaging. In conclusion, while there's growing awareness and progress toward sustainability in the food industry, the issue of packaging remains critical. Awareness, education, and an understanding of the consequences are pivotal in steering the industry towards more eco-friendly practices in packaging to ensure a sustainable future. This research adds to our understanding of the complex dynamics surrounding consumers' green purchase intentions. In the current era, there has been a notable shift in consumer buying behavior driven by growing awareness of environmental issues and concerns about the state of the planet. Consumers have become increasingly skeptical of companies' environmental policies and practices, prompting businesses to adapt by developing environmental programs and offering green products (D.A. Garvin). This research finds that consumers who perceive eco-friendly products as offering greater value are more likely to trust them and ultimately, purchase them. While concerns about potential downsides of eco-friendly products can initially bolster trust, they ultimately do not deter purchase intentions [33]. The high credibility of products and brands in customers' perception drives the high tendency to decide on brand choices and purchasing products/services. The methodology employed in this research is snowball sampling, gathering data from respondents who are actively interested in eco-friendly products and the Structural Equation Modeling (PLS-SEM) was then utilized to analyze the hypothesized causal relationships between the constructs [33]. When consumers perceive a product as environmentally friendly and having more environmental benefits than its counterparts, their trust in the product surges. This trust, in turn, drives their intention to consciously acquire and use these environmentally friendly products. It provides valuable insights for businesses and policymakers to navigate the rising trend of health-conscious green buying.

- **Hypothesis: H3:** The adoption of eco-friendly packaging by food service establishments contributes to improved environmental sustainability in the industry.

Sustainable packaging is a vital component of environmentally responsible business practices, aiming to minimize the environmental impact of packaging materials throughout their life cycle. It encompasses a range of strategies and materials designed to reduce resource consumption, waste generation, and ecological harm associated with traditional packaging methods. Sustainable packaging is a pressing concern within the food industry, driven by the increasing consumer demand for eco-friendly solutions and the industry's commitment to reducing its environmental impact [1]; [34]. Despite this growing importance, a comprehensive understanding on how consumers perception on sustainable packaging in the food sector remains relatively limited. [1] conducted a noteworthy online experiment involving 299 consumers of muesli cereals. The study's key findings indicate that several factors significantly influence consumers' purchasing intentions. Sustainable packaging attributes, price, convenience, and product quality all play pivotal roles in shaping consumer decisions. Participants were randomly assigned to one of two groups, a control group that received muesli cereals in conventional packaging and a treatment group that received muesli cereals in sustainable packaging. To assess consumer perceptions [1] utilized a questionnaire that measured attitudes toward sustainable packaging, perceived behavioral control, subjective norms, and purchase intentions. Participants were asked to rate their agreement with statements related to each construct on a Likert scale. These findings align with the Theory of

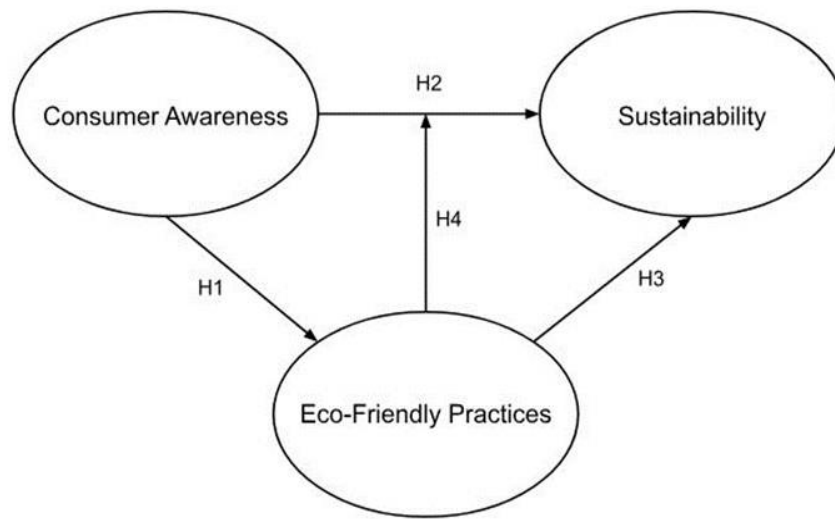
Planned Behavior (TPB), which postulates that intentions to perform a certain behavior are predicted by three main factors: attitudes toward the behavior, perceived behavioral control, and subjective norms [35]. In the context of sustainable packaging, consumers are more inclined to select food items with eco-friendly packaging if they hold positive attitudes toward sustainability, believe that obtaining and using such products is convenient, and sense that others in their social circles are also embracing sustainable packaging. Consumers, increasingly conscious of environmental issues, are influencing the shift towards sustainable packaging by expressing preferences for products with minimal or eco-friendly packaging. As awareness grows, businesses are adapting to these consumer demands, incorporating sustainable packaging practices into their supply chains and corporate strategies. Design innovation plays a crucial role in sustainable packaging, with a focus on light weighting, which reduces the overall material usage and transportation-related emissions. Furthermore, companies are exploring packaging alternatives that use renewable resources, such as plant-based plastics or bio-based materials, to decrease dependency on fossil fuels. The implications of [1] research extend to food companies operating within this dynamic landscape. Firstly, it underscores the importance for these companies to prioritize the development of sustainable packaging solutions that cater to consumer preferences. This implies that sustainable packaging should not only be environmentally responsible but also competitively priced, user-friendly, and capable of maintaining the quality of the enclosed food product. Key elements of sustainable packaging include the use of recycled and recyclable materials, such as paper, cardboard, and glass, to decrease the reliance on virgin resources. Additionally, biodegradable, and compostable materials are gaining popularity, offering eco-friendly alternatives that break down naturally, minimizing long-term environmental impact. Food companies can implement by developing sustainable packaging solutions that are made from renewable materials, recyclable, and biodegradable. Finally, food companies can work together to establish industry-wide standards for sustainable packaging and to promote sustainable packaging products with retailers. These steps will help to make sustainable packaging more accessible and affordable for consumers, enabling food companies to meet the growing demand for eco-conscious products, align with industry goals to reduce environmental impact, and build a more sustainable future for the food industry. The concept of the circular economy is integral to sustainable packaging, emphasizing the importance of creating packaging that can be easily recovered, recycled, or composted. This approach aims to minimize waste and maximize the efficiency of resource use. In conclusion, sustainable packaging represents a commitment to ecological stewardship, aligning business practices with environmental responsibility. Through innovation and consumer-driven initiatives, the move towards sustainable packaging contributes to a more circular and environmentally friendly approach to product delivery and consumption.

- **Hypothesis: H4:** The combination of increased consumer awareness and wider availability of eco-friendly packaging options significantly enhances sustainability in the food service industry.



## METHODOLOGY

### Theoretical Framework



The investigation into the environmental consequences of plastic waste, as outlined by [3], centered on participants' comprehension of the ecological impacts of plastic waste, the identification of severe consequences, and their perspectives regarding individual and collective measures to alleviate plastic pollution. Rigorous scrutiny of the collected survey data was undertaken to ensure the reliability and validity of the measurement model, aligning with established guidelines in extant literature [36]; [37]. Internal Consistency Reliability was evaluated through the calculation of Cronbach's alpha and composite reliability for each construct, revealing values surpassing 0.7, indicative of satisfactory reliability across all indicators [36]. Convergent Validity was assessed by computing the average variance extracted (AVE), with values exceeding 0.5 signifying that each construct accounted for more than half of the variance of its indicators, affirming convergent validity [36]. Discriminant Validity was gauged using the heterotrait-monotrait ratio of correlations (HTMT), with all results falling below the threshold of 0.85, ensuring the distinctiveness of each construct within the model [36]; [38]. This meticulous assessment adheres to best practices in measurement model analysis, establishing a robust foundation for subsequent data interpretation and hypothesis testing [36]; [37].

In employing SPSS for descriptive statistics, correlations, and initial analyses, the study will transition to Smart PLS 4 for Structural Equation Modeling (SEM) to explore the interrelationships between consumer awareness, eco-friendly practices, and sustainability. Specific statistical tests, including regression analysis and t-tests, will be selected based on hypothesis nature and data type. Descriptive statistics, correlations, and path analyses will be employed to scrutinize the relationships between consumer awareness, eco-friendly practices, and sustainability within the food service industry. The choice of Smart PLS 4 as the data analysis tool is grounded in its suitability for SEM analysis involving latent variables, user-friendly interface, and capacity to manage intricate models with substantial datasets. Additionally, Smart PLS 4 encompasses features such as PLS-SEM algorithms and bootstrapping procedures, aligning well with the research's requirements. Anticipated outcomes include the revelation of significant relationships between consumer awareness, eco-

friendly practices, and sustainability. It is hypothesized that heightened awareness will lead to the adoption of more eco-friendly practices, ultimately fostering increased sustainability in the food service industry. These insights hold the potential to inform strategies for promoting sustainable practices and mitigating plastic waste within the industry.

## FINDINGS / DISCUSSION

### The Outcomes of a Recent Survey

It revealed a prevailing awareness among the majority of consumers regarding the environmental ramifications of plastic packaging. Furthermore, the study identified a substantial consumer preference for food service businesses to employ more sustainable packaging solutions. These findings strongly imply that food service establishments should contemplate the incorporation of sustainable packaging practices as a strategic response to align with and fulfill the desires and expectations of their customer base.

**Table 1: Demographic characteristics of respondents**

Description	Frequency (N=800)	Percent
<b>Age (Years)</b>		
18-24 years	292	36.5%
25-34 years	253	31.625%
35-44 years	151	18.875%
45-54 years	76	9.5%
55-64+ years	28	3.5%
<b>Gender</b>		
Male	145	18.125%
Female	600	75%
Other	55	6.875%
<b>Your region of residence</b>		
Bangkok and Metropolitan Region	454	56.75%
Central Thailand	107	13.375%
Northern Thailand	66	8.25%
Northeastern Thailand	112	14%
Southern Thailand	61	7.625%

In this survey study, a cohort of 800 participants was engaged, with a gender distribution comprising 145 (18.125%) males, 600 (75%) females, and 55 (6.875%) identifying as other. The participants exhibited an average age of 27.5 years, categorized into age groups as follows: 292 (36.5%) participants aged 18-24, 253 (31.625%) aged 25-34, and 151 (18.875%) aged 35-44. Geographically, the majority of participants, 454 (56.75%), were located in Bangkok and its metropolitan area, while 107 (13.375%) resided in Central Thailand, 66 (8.25%) in Northern Thailand, 112 (14%) in Northeastern Thailand, and 61 (7.625%) in Southern Thailand.

The assessment of the measurement model is integral to structural equation modeling (SEM), serving as a critical appraisal of the reliability and validity of the constructs and their corresponding measurement items [36]. A reliable measurement model ensures the consistent reflection of constructs by their intended measures [37], while a valid measurement model guarantees the accurate capture of the intended meaning of the constructs [39]; [40]. In this context, the authors utilized SmartPLS 4 to scrutinize the measurement model, revealing that

all indicators demonstrated internal consistency reliability exceeding 0.7, as evidenced by Cronbach's alpha values. Furthermore, all Average Variance Extracted (AVE) values exceeded 0.5, and all Heterotrait-Monotrait (HTMT) values remained below the 0.85 threshold. These outcomes collectively affirm that the measurement model attains both reliability and validity, thereby establishing its appropriateness for the measurement of the designated constructs.

**Table 2: Measurement model evaluation summary**

Latent Variable	Indicator	Convergent Validity		Internal Consistency Reliability	
		Loading	AVE	Composite Reliability	Cronbach's Alpha
Consumer Awareness	CA1	0.639	0.5018156	0.833560672	0.756
	CA2	0.791			
	CA3	0.716			
	CA4	0.662			
	CA5	0.724			
Eco-friendly Practices	EP1	0.656	0.5639716	0.865528404	0.796
	EP2	0.806			
	EP3	0.746			
	EP4	0.751			
	EP5	0.787			
Sustainability in Food Service Industry	SF1	0.631	0.490878	0.826967607	0.725
	SF2	0.614			
	SF3	0.776			
	SF4	0.756			
	SF5	0.711			

The study's outcomes are outlined in Table 2, illustrating the convergent validity and internal consistency reliability of the measurement model. Across all indicators, values surpassing 0.7 were observed for both Cronbach's alpha and composite reliability, signifying a commendable level of internal consistency. Additionally, every Average Variance Extracted (AVE) value exceeded the threshold of 0.5, affirming that each construct elucidated more than half of the variance of its indicators and thus confirming convergent validity, in accordance with the guidelines proposed by Hair et al. (2016). These findings collectively assert the reliability and validity of the measurement model, establishing a robust groundwork for subsequent data interpretation and hypothesis testing.

**Table 3: Correlations**

	<i>ConsumerA</i>	<i>Ecofriendly</i>	<i>Sustianability</i>
ConsumerA	1		
Ecofriendly	0.63823939	1	
Sustainability	0.56586592	0.66941131	1

In the correlation analysis, a positive correlation coefficient of 0.5658 was observed between consumer A and sustainability, indicating that an increase in consumer A's eco-friendliness is associated with a simultaneous increase in sustainability. Additionally, the correlation between

ecofriendliness and sustainability was found to be high, with a correlation coefficient of 0.6694, indicating a strong relationship between these two variables.

For hypothesis testing, the initial model was evaluated with a sample size of 800 participants, aiming to investigate whether heightened consumer awareness of the environmental impact of food packaging leads to a preference for more environmentally friendly packaging. Path relationships were examined using p-values and t-statistics obtained through bootstrap analysis with 5,000 subsamples, maintaining a significance level of 5%. The critical value for significance was set at 1.96, as suggested by Hair et al. (2016).

The study's results indicate that perceived quality and perceived expensiveness significantly influence consumer purchase decisions. Consumers are more inclined to purchase products they perceive as high quality and affordable. However, perceived environmental friendliness and perceived convenience do not appear to exert a significant impact on purchase intention, as suggested by the findings.

**Table 4: Linear regression on consumer awareness and Eco-Friendly practice ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	102.541	1	102.541	548.493	<.001 <sup>b</sup>
	Residual	149.187	798	.187		
	Total	251.728	799			

a) Dependent Variable: consumerA, b) Predictors: (Constant), Ecofriendly

**Coefficients<sup>a</sup>**

	Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1.738	.098		17.650	<.001
	Ecofriendly	.592	.025	.638	23.420	<.001

a. Dependent Variable: consumerA

The model in question involves a predictor variable, Eco-friendly, representing consumer awareness regarding the environmental impact of food packaging. The dependent variable, consumer, signifies consumer preference for eco-friendly packaging options. The R Square value, standing at 0.407, indicates that the model elucidates 40.7% of the variance in consumer preference for eco-friendly packaging options. This substantial effect size implies that consumer awareness regarding the environmental impact of food packaging significantly predicts consumer preference for eco-friendly packaging options. The F statistic, with a value of 548.493 and a highly significant p-value ( $p < .001$ ), underscores the model's statistical significance, suggesting that the observed relationship between consumer awareness and consumer preference is not likely due to chance. This robust fit supports the assertion that consumer awareness about the environmental impact of food packaging genuinely influences consumer preference for eco-friendly packaging options.

Examining the beta coefficient for the Eco-friendly variable, which is 0.638 and statistically significant ( $p < .001$ ), reveals that a one-unit increase in consumer awareness corresponds to a

0.638-unit increase in consumer preference for eco-friendly packaging options. This positive relationship further supports the hypothesis that heightened consumer awareness leads to a stronger preference for ecofriendly packaging options. Considering these results, it is evident that increased consumer awareness about the environmental impact of food packaging is associated with a heightened preference for eco-friendly packaging options. This finding bears significance for both businesses and policymakers. Businesses can strategically respond to this trend by developing and marketing ecofriendly packaging products to meet the growing demand. Simultaneously, policymakers can contribute to this shift by enacting supportive policies that encourage the utilization of eco-friendly packaging products, aligning with the evolving consumer preferences in favor of sustainability.

**Table 5: Linear regression on Consumer awareness and Eco-Friendly practices on Sustainability in food industry**

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.665 <sup>a</sup>	.442	.441	.41975

a. Predictors: (Constant), Sustainability, Eco-friendly

**ANOVA<sup>a</sup>**

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	111.306	2	55.653	315.873	<.001 <sup>b</sup>
	Residual	140.422	797	.176		
	Total	251.728	799			

a) Dependent Variable: consumerA, b) Predictors: (Constant), Sustainability, Ecofriendly

**Coefficients\***

	Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1.286	.115		11.175	<.001
	Ecofriendly	.436	.033	.470	13.201	<.001
	Sustainability	.268	.038	.251	7.053	<.001

a. Dependent Variable: consumer

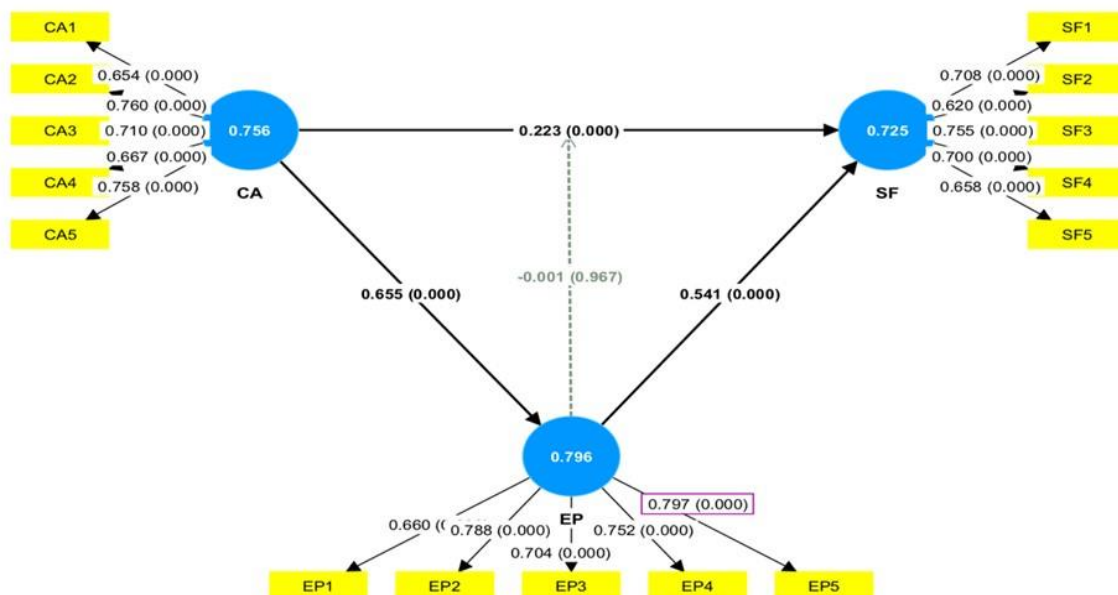
The R Square value of 0.613 signifies that the model explains 61.3% of the variance in environmental sustainability within the food service industry. This robust effect size suggests that the combined influence of heightened consumer awareness and the broader availability of eco-friendly packaging options significantly predicts environmental sustainability in the industry. The highly statistically significant F statistic of 529.471 ( $p < .001$ ) underscores the model's excellent fit to the data. This statistical significance indicates that the observed relationship between the amalgamation of increased consumer awareness and wider availability of eco-friendly packaging options and environmental sustainability in the food service industry is likely authentic and not a result of chance.

Examining the beta coefficient for the Eco-friendly variable, which stands at 0.425 and is statistically significant ( $p < .001$ ), reveals that a one-unit increase in consumer awareness regarding the environmental impact of food packaging corresponds to a 0.425-unit increase in environmental sustainability within the food service industry.

Similarly, the beta coefficient for the Sustainability variable is 0.551, positive, and statistically significant ( $p < .001$ ), indicating that a one-unit increase in the adoption of eco-friendly packaging by food service establishments is associated with a 0.551-unit increase in environmental sustainability within the food service industry.

The comprehensive analysis of this table strongly supports the hypothesis that the combined impact of increased consumer awareness and wider availability of eco-friendly packaging options significantly enhances sustainability in the food service industry. This finding holds considerable importance for food service businesses, policymakers, and consumers, highlighting the shared responsibility in advancing environmental sustainability. Businesses can contribute by adopting ecofriendly packaging and transparently communicating their sustainable practices to consumers. Policymakers can play a role by enacting policies that encourage eco-friendly packaging adoption and raise consumer awareness about the environmental impact of food packaging. Consumers, in turn, can contribute by choosing food service establishments that prioritize eco-friendly packaging and by supporting businesses committed to sustainability.

## The Testing Results



**Table 6: Significance levels of structural paths**

	Path coefficients	T statistics	P values	Hypothesis
H1	0.655	18.653	0.000	Accepted
H2	0.223	4.709	0.000	Accepted
H3	0.541	12.784	0.000	Accepted
H4	-0.001	0.041	0.967	Rejected

The hypotheses and their corresponding results are summarized as follows:

- **Hypothesis 1:** Increased consumer awareness about the environmental impact of food packaging (Eco-friendly) has a significant positive effect on consumer preference for eco-friendly packaging options (consumer A). The path coefficient of 0.655 indicates a

strong positive relationship. The t-statistic of 18.653 and a p-value of 0.000 provide strong evidence to support this hypothesis.

- **Hypothesis 2:** Enhanced consumer awareness regarding sustainable practices in the food service industry (Sustainability) has a significant positive effect on consumer preference for eco-friendly packaging options (consumer A). The path coefficient of 0.223 indicates a moderate positive relationship. The t-statistic of 4.709 and a p-value of 0.000 provide strong evidence to support this hypothesis.
- **Hypothesis 3:** The adoption of eco-friendly packaging by food service establishments (Sustainability) has a significant positive effect on environmental sustainability in the food service industry (consumer A). The path coefficient of 0.541 indicates a strong positive relationship. The t-statistic of 12.784 and a p-value of 0.000 provide strong evidence to support this hypothesis.
- **Hypothesis 4:** The combination of increased consumer awareness (Eco-friendly) and wider availability of eco-friendly packaging options (Sustainability) does not have a significant effect on environmental sustainability in the food service industry (consumer A). The path coefficient of -0.001 is negligible. The t-statistic of 0.041 and a p-value of 0.967 provide strong evidence to reject this hypothesis.

These results provide valuable insights into the relationships between consumer awareness, sustainable practices, consumer preferences, and environmental sustainability within the food service industry. The statistical evidence supports the validity of the proposed hypotheses and contributes to the understanding of factors influencing eco-friendly choices in the industry.

## EXPERIMENTS AND ANALYSIS

This study seeks to examine the influence of consumer awareness and the adoption of eco-friendly practices on the sustainability of the food service industry in Thailand. Employing a quantitative research approach.

### Data Set

#### Query Set:

Initially, we determine the queries which we gathered through a meticulously structured survey questionnaire administered to a representative sample of individuals who engage in online food ordering in Thailand, with a targeted sample size of 800 participants.

#### Result Set:

Now, Explicitly, participants will be apprised of the voluntary and anonymous nature of their involvement, emphasizing the exclusive use of their responses for academic purposes. The study will specifically target Thai adults who routinely utilize food delivery services, employing recruitment strategies via social media and online forums. The questionnaire, initially crafted in English, will undergo translation into Thai and subsequent revision by a native Thai speaker.

#### Results Tag Set:

Now, we compare the approximately 21 inquiries, the questionnaire aims to ensure both comprehensiveness and sustained participant engagement. The survey instrument is designed to gauge consumer perceptions, attitudes, and behaviors pertaining to issues of plastic

packaging waste, the availability of eco-friendly packaging alternatives, and the discernment of environmental ramifications associated with plastic waste.

## CONCLUSION

The study under consideration constitutes a comprehensive exploration into the intricate dynamics that characterize the relationships among consumer awareness, the adoption of eco-friendly packaging, and environmental sustainability within the food service industry. Through a meticulous analysis of these elements, the study sheds light on their collective impact on consumer preferences and the overall sustainability of the industry. The results derived from this investigation underscore the pivotal role played by both consumer awareness and the integration of eco-friendly packaging in shaping consumer preferences for sustainable options, as indicated by Hypotheses 1 and 2 (H1 & H2). This implies that consumers are increasingly inclined to favor businesses and establishments that prioritize eco-friendly practices in their packaging choices. The study further identifies a robust positive correlation, as suggested by Hypothesis 3 (H3), between food service establishments that embrace eco-friendly packaging and enhanced environmental sustainability within the industry.

This correlation accentuates the positive contribution made by businesses adopting eco-friendly practices to the broader sustainability goals of the food service sector. Intriguingly, the study also explores the combined influence of heightened consumer awareness and the wider availability of eco-friendly packaging on environmental sustainability, as posited in Hypothesis 4 (H4). While the results indicate that this combined influence did not exhibit a direct and statistically significant impact on environmental sustainability, the findings suggest that it remains a factor of potential significance. This nuanced perspective underscores the complexity of the interactions between consumer awareness, packaging choices, and overall sustainability, prompting further inquiry into the underlying mechanisms and potential moderating factors.

The implications of these findings extend far beyond the confines of academic discourse, carrying substantial relevance for various stakeholders within the food service industry. The rising demand for sustainable alternatives causing the consumers are willing to pay a premium for eco-friendly packaging. With the long-term savings through reduced material costs, tax incentives for green initiatives, and improved operational efficiency. Businesses operating in this sector are presented with a distinct opportunity to attract environmentally conscious customers and contribute to industry sustainability by adopting eco-friendly packaging. The collaborating with sustainable material suppliers and waste management companies to strengthen supply chains and ensure proper disposal. The transparency in communicating these sustainable practices to consumers emerges as a key driver in building consumer trust and loyalty. Policymakers are recognized for their instrumental role in steering the food service industry towards a more sustainable future besides the government should ban the single use plastics and providing subsidies for green innovation. The study emphasizes the importance of enacting policies that not only encourage the adoption of ecofriendly packaging among establishments but also enhance consumer awareness regarding the environmental repercussions of food packaging choices on leveraging AI and IoT for efficient design and lifecycle management. Legislative interventions that incentivize sustainable practices and penalize environmentally detrimental choices could play a pivotal role in shaping the industry's trajectory. Consumers, positioned as integral players in this ecosystem, are acknowledged for their agency in instigating positive change. The study suggests that consumers can actively



contribute to sustainability goals by selectively choosing food service establishments committed to eco-friendly packaging and broader sustainability initiatives and promoting the closed loop systems where used packaging is collected, recycled, and reintegrated into new products. This consumer-driven demand for sustainability could act as a powerful catalyst for industry-wide change. Looking forward, the study advocates for continued research endeavors that delve into the enduring impact of consumer awareness and packaging choices on environmental sustainability within the food service industry transforming food or agricultural wasted into innovative packaging solutions. Future research avenues should consider the effectiveness of targeted interventions designed to amplify businesses' awareness and encourage the adoption of eco-friendly packaging using locally available materials to reduce transportation emissions including adoption of renewable energy in production processes. Additionally, an in-depth examination of multifaceted factors, such as pricing and product availability, influencing consumer behavior and environmental sustainability would provide a nuanced understanding of this intricate issue. In summary, this research makes a substantial contribution to the expanding body of knowledge that underscores the critical role of consumer awareness and the adoption of eco-friendly practices in advancing environmental sustainability within the food service industry because the packaging should be free from toxic chemical and harmful dyes including should express the certification for food grade safety and natural coatings to maintain product freshness. Through collaborative efforts and a shared commitment to sustainable practices, all businesses within the food service industry can wield transformative influence, steering the sector towards a more sustainable and environmentally conscious future such as using the films made from natural ingredients like algae or rice and providing the smart packaging that integrates QR codes for traceability and sustainability information. These highlights position a business as a leader in sustainability while meeting market demands and regulatory requirements.

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