

Article

Food Waste, Social Media, and Gen Z: A Recipe for Sustainable Consumption

Ariyaporn Sakulsom

International College, Silpakorn University, Charoen Krung Road, Si Phraya Subdistrict, Bang Rak District, Bangkok, Thailand
n.ariyaporn@gmail.com

Abstract

This study examines how social media influences sustainable food literacy among Thai Generation Z. Utilising the Stimulus-Organism-Response (SOR) model, it investigates the impact of informational posts and influencer endorsements on attitudes toward sustainable food consumption, as well as the subsequent development of meal planning skills, food labeling comprehension, food storage knowledge, and the practical application of sustainability principles. Data were gathered through an online questionnaire distributed on social media platforms used by Thai Gen Z. The sample of 352 Gen Z participated in the online questionnaire process. The findings indicate that influencer endorsements significantly and positively shape attitudes, which, in turn, enhance all four dimensions of sustainable food literacy. Conversely, informational posts show no significant direct or mediated effects. These results highlight that relatable and credible influencers are more effective in promoting sustainable food practices among Gen Z than informational content alone, emphasising the power of culturally engaging, personality-driven communication. The study provides theoretical contribution by refining the Stimulus-Organism-Response (SOR) model in the context of social media's influence on sustainable food literacy among Thai Gen Z. It fills a gap in the literature by differentiating the effects of two social media stimuli, informational posts and influencer endorsements, on attitudes and food literacy behaviours.

Academic Editor: Aweewan Panyagometh

Received: April 9, 2026

Revised: June 5, 2026

Accepted: June 29, 2026

Published: July 1, 2026

Keywords: Attitude toward Sustainable Food Consumption; Food Literacy; Informational Posts, Influencer Endorsements; Social Media; Stimulus-Organism-Response Model; Sustainable Consumption Behavior

1. Introduction

Food waste remains a major global sustainability challenge, with around one-third of all food produced, approximately 1.3 billion tons, lost or wasted annually [1]. This across the food value chain, contributing to greenhouse gas emissions and global food insecurity. In response, the United Nations included food waste reduction in Sustainable Development Goal (SDG) 12, promoting responsible consumption through systemic behavior shifts [2].

Within this context, Generation Z (born 1997–2012) has emerged as a key demographic shaping sustainable consumption trends. Digitally native and environmentally aware, Gen Z engages actively with sustainability narratives online and often adopts plant-based, waste-conscious lifestyles. Their use of platforms like Instagram, TikTok, and Facebook places them at the crossroads of digital influence and sustainable behavior change. While social media can support education and advocacy (e.g., “ugly produce” or

zero-waste campaigns), it also risks promoting excessive consumption through idealised food aesthetics and viral trends.

In Thailand, where food carries deep cultural significance, food waste is a growing concern. The country discards an estimated 9.7 million tons of food annually [3], driven by urban lifestyles, overconsumption in hospitality sectors, and cultural practices encouraging surplus. Efforts such as the Thai Save Food initiative, in collaboration with the FAO, aim to promote sustainable food management and consumer responsibility.

While existing studies have explored social media's general impact on sustainability attitudes, few have examined how specific content types, like informational posts and influencer endorsements—affect food literacy dimensions. These include meal planning, food labeling comprehension, storage practices, and sustainability in daily habits. This study addresses that gap by investigating how such digital stimuli influence Thai Gen Z's attitudes and food literacy behaviours. As heavy social media users and emerging sustainability advocates, Thai Gen Z offers critical insight into how online experiences translate into practical, sustainable food practices. These insights can inform targeted interventions and policy strategies.

2. Literature Review

2.1 Generation Z and Social Media

Generation Z, born between the mid-1990s and early 2010s, is deeply embedded in the digital landscape, using social media not only for entertainment and connection but also for activism and sustainability advocacy [4]. Platforms like Instagram, TikTok, and Reddit provide a steady stream of content, trends, and peer influence that shape Gen Z's attitudes toward sustainability and food-related knowledge. Social media influencers, ranging from micro-influencers promoting niche sustainable habits to macro-influencers endorsing eco-conscious brands, play a significant role in shaping Gen Z's sustainable food practices. Advocates of zero-waste lifestyles, plant-based diets, and mindful consumption help normalise skills like meal planning, food storage, and label comprehension [5]. Campaigns such as #TooGoodToGo and communities like "Sustainable Living" on Reddit foster practical knowledge sharing, from composting and low-impact recipes to tips on reading food labels, encouraging behavioral change through social reinforcement [6,7]. Engaging content such as TikTok videos and Instagram infographics makes sustainability more accessible and actionable [8]. Visually appealing, interactive posts improve knowledge retention and influence Gen Z's food literacy across dimensions like meal planning, storage, and sustainability application [9].

Such content often offers direct, personalised narratives around ethical sourcing, environmental impact, and reducing food waste. However, social media also presents challenges. Misinformation and greenwashing can lead to misconceptions, particularly around food labels and environmental claims [10]. Despite this, when paired with credible sources and authentic influencers, social media remains a powerful tool for advancing sustainable food literacy among Gen Z [11].

2.2 Food Waste and Sustainable Consumption Among Gen Z

Food waste, defined as the disposal of edible food at any stage of the food supply chain, poses a critical environmental, economic, and ethical concern. It is commonly categorised into three stages: production and post-harvest loss, retail and distribution-level waste, and consumer-level waste, where poor food planning, storage practices, and misinterpretation of expiration labels often contribute most significantly [1]. According to the Food and Agriculture Organisation, nearly one-third of all food produced globally is wasted, highlighting the pressing need to address consumption-related waste behaviours.

Sustainable food consumption aims to reduce the environmental footprint by promoting mindful eating, minimising waste and prioritising ethical sourcing, including local and organic produce. These behaviours are shaped by a combination of social norms, economic constraints, and digital influences [12]. While these values are gaining traction among Gen Z, the consistent integration of sustainable practices into daily life remains a challenge. Social media can bridge this gap by offering practical guidance, such as meal planning tips, label reading, and storage strategies, yet it also has the potential to spread misleading or oversimplified information. For Generation Z, digital platforms play a dual role: they raise awareness while also contributing to confusion. This demographic's digital nativity makes them particularly receptive to both high-quality educational content and viral misinformation. Complicating matters, the perceived cost of sustainable food options such as organic or locally sourced products can be a barrier to adoption, especially in developing economies [13]. In Thailand, these economic concerns intersect with cultural factors. Traditional Thai values emphasising hospitality and abundance may unintentionally normalise food excess. Furthermore, the widespread availability of affordable street food, while culturally rich, may reduce the perceived value of food, diminishing the motivation for careful planning or storage.

This intersection of digital influence, cultural context, and economic reality creates a complex landscape for food-related decision-making. To foster lasting change, interventions should enhance food literacy through education, community engagement, and policy initiatives that make sustainable choices more accessible and culturally resonant. By integrating modern sustainability efforts with traditional values, Thai Gen Z can be empowered to play a pivotal role in building more resilient food systems.

2.3 Theoretical Framework: Stimulus–Organism–Response (SOR) Model

The Stimulus–Organism–Response (SOR) model, developed by Mehrabian and Russell (1974), offers a robust framework for understanding how external stimuli shape internal states and drive behavioral responses. Widely used in consumer behavior and digital media research, the SOR model guides this study's exploration of how social media affects food literacy and sustainability behaviours among Thai Generation Z.

In this context, the stimulus (S) is social media content, specifically informational posts (e.g., sustainability tips, infographics) and influencer endorsements (e.g., advocacy for plant-based diets or low-waste lifestyles). The organism (O) represents Gen Z's attitudes toward sustainable food consumption, reflecting their cognitive and emotional responses to such content. The response (R) comprises behavioral expressions of food literacy, measured across four dimensions: Meal Planning Skills, Food Label Understanding, Food Storage Knowledge, and Practical Sustainability Application (e.g., reducing food waste). The SOR model effectively captures the progression from digital exposure to internal processing and behavioral change. Previous studies have demonstrated its utility in areas like green consumption [14], eco-tourism [15], and food choice behavior [16]. This research extends the model to a new domain, how social media fosters specific food literacy competencies in Thai Gen Z. By tracing this digital-to-behavioral pathway, the study offers insights for leveraging digital media to promote sustainable development and food system resilience.

2.4 Stimulus (Social Media Content)

The first component of the SOR model represents external stimuli that influence internal psychological states and subsequent behavioral responses. In this study, social media serves as the primary stimulus shaping Gen Z's attitudes toward sustainable food consumption, which, in turn, is hypothesised to influence their food literacy. Platforms like

Instagram, TikTok, and Facebook expose users to sustainability-related content, categorised into two types: informational posts and influencer endorsements.

Informational posts include educational content, statistics, and infographics about food waste and sustainability. They aim to raise awareness by providing factual knowledge about the environmental, economic, and ethical implications of food waste [6] [7]. Exposure to well-structured informational content has been shown to foster heightened environmental awareness and behavioral change [9], which forms a foundation for stronger food literacy. Beyond direct informational content, Gen Z's attitudes are shaped by the individuals they encounter and trust on social media. Influencers, individuals with cultivated audiences, play a critical role in shaping sustainable food attitudes and practices. Influencer-driven content often blends personal narratives with advocacy for sustainable lifestyles, including tips on meal planning, food storage, and label comprehension [5]. The perceived trustworthiness and expertise of influencers strongly impact consumer decision-making, aligning with the principle that source credibility, particularly expertise and trustworthiness, is central to persuasion [17]. These social media cues drive psychological engagement, influencing cognitive and emotional processing, attitudes, and ultimately, food literacy. However, influencer content also poses challenges, such as misinformation and greenwashing, which can confuse consumers about sustainable food practices.

2.5 Organism (Psychological Processing)

Building on the influence of external stimuli, this section explores the internal psychological processes that mediate the link between social media exposure and behavioral outcomes—specifically, the application of food literacy dimensions. Within the SOR (Stimulus-Organism-Response) model, the “organism” refers to internal cognitive and affective processes triggered by external stimuli. In this study, attitude toward sustainable food consumption is identified as the primary mediating factor.

Attitude is a key predictor of behavioral intention and actual behavior, especially in sustainability contexts [18]. Social media content, including informational posts and influencer endorsements, can shape favourable attitudes toward sustainable food practices by emphasising ethics, health, and environmental benefits [8]. For Thai Gen Z, repeated engagement with such content may shift their evaluations, fostering more positive perceptions of sustainable behaviours. This attitudinal shift can drive the application of food literacy skills, including meal planning, label comprehension, storage techniques, and sustainable practices. In this framework, attitude represents the organism component by capturing the affective orientation that shapes how individuals interpret and respond to digital stimuli. Rooted in the theory of planned behavior and affective evaluation [18,19], attitude guides cognitive-emotional processing and subsequent behavior. Positioning attitude as a mediator highlights its role in transforming social media exposure into practical food-related competencies tied to sustainability. Therefore, we propose:

H1: *Exposure to informational social media posts about food waste and sustainability will positively influence Gen Z's attitude toward sustainable food consumption.*

H2: *Exposure to influencer endorsements of sustainable food practices will positively influence Gen Z's attitude toward sustainable food consumption.*

Thus, attitude is expected to mediate the relationship between exposure to informational content and the application of food literacy among Thai Gen Z. Informational posts often deliver factual knowledge that raises awareness and understanding of sustainable practices. When processed cognitively, these messages can strengthen pro-sustainability attitudes, which in turn influence literacy behaviours such as sustainable meal planning,

interpreting food labels, proper storage, and waste reduction. Similarly, exposure to influencer endorsements is hypothesised to impact food literacy via the mediating role of attitude. Influencers, through credibility and relatability, shape followers' emotional responses and perceptions. When promoting sustainable food practices, their content can positively influence attitudes, which then drive behavior change. Once internalised, these attitudes may lead individuals to adopt food literacy skills in daily life, planning meals, reading labels, preserving food, and reducing waste. Thus, attitude acts as the key psychological mechanism connecting social media stimuli to sustainable food literacy.

2.6 Response (Behavioral Outcomes)

Food literacy, in this study, goes beyond nutritional knowledge to include practical skills and consistent behaviours essential for navigating food systems and making sustainable dietary choices. It involves effective meal planning, proper food storage and preservation, understanding food sourcing and labelling, and actively reducing food waste. These competencies reflect the action-oriented aspects of food literacy, translating knowledge into tangible behaviours.

Food literacy is examined through four interconnected dimensions, each representing a key behavioral outcome. Meal planning skills involve more than just planning; they include creating shopping lists to avoid unnecessary purchases, selecting recipes based on available ingredients, and managing time and resources to reduce spoilage [20]. Food storage and preservation knowledge refers to understanding and applying techniques like freezing and canning to extend shelf life and limit waste [21]. Understanding food sourcing and labelling means interpreting food labels to make informed, sustainable choices—such as recognising eco-labels, understanding production methods (e.g., organic or local), and selecting products aligned with sustainability principles [22]. Lastly, the practical application of sustainability involves actions like mindful preparation to minimise scraps, using leftovers creatively, and participating in composting or responsible disposal [20]. These four dimensions illustrate how food literacy can be enacted in daily life to support sustainable food practices. Accordingly, the following hypotheses are proposed to empirically test the mediating role of attitude in this social media–sustainability relationship:

H3: *Attitude toward sustainable food consumption mediates the positive relationship between exposure to informational social media posts and Gen Z's:*

H3.1: *Meal planning skills*

H3.2: *Food labelling comprehension*

H3.3: *Food storage and preservation knowledge*

H3.4: *Practical application of sustainability*

H4: *Attitude toward sustainable food consumption mediates the positive relationship between exposure to influencer endorsements and Gen Z's:*

H4.1: *Meal planning skills*

H4.2: *Food labelling comprehension*

H4.3: *Food storage and preservation knowledge*

H4.4: *Practical application of sustainability*

3. Research Methodology

3.1 Research Design and Samples

This quantitative study examined the impact of social media content on specific dimensions of food literacy among Thai Generation Z, mediated by their attitude toward sustainable food consumption. A structured online questionnaire was distributed via popular platforms used by this demographic, including Instagram, Facebook, TikTok, and

LINE with the target of 400 samples. Screening questions ensured participants were from the target population: Generation Z individuals aged 18-28 with daily social media use exceeding one hour. This method allowed systematic measurement of variables across a large sample, ensuring broad reach to active Thai Gen Z social media users exposed to sustainability-related content. The sampling likely employed convenience sampling, with targeted distribution to relevant online communities to maximise the inclusion of individuals exposed to the stimuli. As all participants were 18 or older, parental consent was not required. Ethical guidelines were strictly followed, and participants were fully informed about the study's objectives, voluntary participation, and the right to withdraw at any time. Anonymity and confidentiality of responses were ensured.

This study assessed the independent variables (social media content), the mediating variable (attitude toward sustainable food consumption), and the dependent variables (dimensions of food literacy) using adapted scales. Informational posts were measured with four items [23-25], assessing individuals' perceptions of the influence of this content on their awareness, attitudes, and behaviours related to sustainable food practices. Influencer endorsements was measured with four items [26], evaluating the perceived trustworthiness, knowledge, and credibility of influencers promoting sustainable food and waste reduction. Attitude toward sustainable food consumption was assessed with four items [27,28], capturing both affective and cognitive evaluations of sustainable food behaviours. Food literacy was measured across four distinct dependent variables, each with items adapted from validated tools for youth and young adults [22,29] Meal Planning Skills, Food Storage and Preservation Knowledge, Food Sourcing and Labelling Understanding, and Practical Application of Sustainability. These distinct domains were examined to capture the multifaceted nature of food-related skills and knowledge relevant to sustainable behavior.

3.2 Data Analysis Techniques

Data analysis began with descriptive statistics to examine the distribution of each variable, including central tendency and variability measures. The reliability of each scale was assessed using Cronbach's alpha for internal consistency. Confirmatory factor analysis (CFA) was then conducted to evaluate construct validity, focusing on convergent and discriminant validity. Structural Equation Modelling (SEM) was used to test the direct and indirect (mediation) effects of social media content on food literacy dimensions through attitudes toward sustainable food consumption. All analyses were performed using R Studio, providing comprehensive insights into the hypothesised relationships.

4. Result

4.1 Descriptive Statistics

The sample included both male and female participants, with a gender distribution of approximately 32.10% males (n=113) and 67.90% females (n=239). In terms of education, most respondents were either pursuing or had completed a bachelor's degree (approximately 92.05%, n=324), while a smaller proportion had held a master's degree (approximately 7.95%, n=28). Regarding living situations, the majority of participants lived with family (approximately 82.10%, n=289), followed by those residing in shared housing (approximately 9.94%, n=35), and those living independently (approximately 7.95%, n=28). The sample also showed high levels of social media engagement. On average, participants spent about 3 hours per day on social media (approximately 73.86%, n=260), with others reporting 1-3 hours (approximately 17.90%, n=63) and 7-9 hours (approximately 7.95%, n=28). The most commonly used platforms were Facebook (approximately 98.01%, n=345), Instagram (approximately 86.08%, n=303), and TikTok (approximately 53.98%, n=190).

These platforms served as key digital spaces where participants engaged with content and influencers related to food and sustainability.

4.2 Reliability and Confirmatory Factor Analysis (CFA)

Reliability analyses demonstrated good internal consistency for all multi-item scales, with Cronbach's alpha ranging from 0.61 to 0.78 (all within minimally acceptable limits). Confirmatory Factor Analysis (CFA) supported the unidimensionality of the constructs, and the overall measurement model exhibited acceptable to good fit despite a significant chi-square ($\chi^2(458) = 1255.327$, $p < .001$). Specifically, CFI (0.905), TLI (0.892), and SRMR (0.053) indicated satisfactory fit, while RMSEA (0.063, 90% CI [0.059, 0.067]) also fell within or near conventionally acceptable ranges. Furthermore, Composite Reliability (CR) ranged from 0.602 to 0.881 (passing acceptable values of 0.60-0.90), and Average Variance Extracted (AVE) ranged from 0.523 to 0.689 (passing acceptable values of 0.50-0.70) for the Independent, Mediating, and Dependent Variables (summarised in Tables 1-3). These findings provided sufficient evidence of a well-fitting and reliable measurement model, supporting its suitability for subsequent hypothesis testing.

Table 1. Confirmatory Factor Analysis of Independent Variables: Informational Post and Influencer Endorsement

Construct	Item	Factor Loadings
Informational Post	I can gain useful information about food waste and sustainability from social media posts.	0.816
	I find the information about food waste and sustainability in social media posts to be accurate and trustworthy.	0.763
	The content I see about food waste and sustainability on social media feels relevant to my lifestyle.	0.619
	These posts help me understand how food waste impacts the environment.	0.828
	Cronbach's Alpha = 0.69, CR =0.820, AVE =0.626 KMO =0.869 Bartlett's Test = $p < 0.001$	
Influencer Endorsements	I find influencers who talk about food waste and sustainable food practices to be trustworthy.	0.827
	I trust the information influencers provide about reducing food waste.	0.769
	I believe influencers who promote sustainable food consumption are knowledgeable about the topic.	0.813
	I consider influencers to be credible sources when it comes to sustainable food and food waste topics.	0.636
	Cronbach's Alpha = 0.68, CR =0.832, AVE =0.618 KMO =0.865 Bartlett's Test = $p < 0.001$	

Table 2. Confirmatory Factor Analysis of Mediating Variable: Attitude toward Sustainable Food Consumption

Construct	Item	Factor Loadings
Attitude toward Sustainable Food Consumption	I have a positive feeling about choosing sustainable food.	0.785
	I think that sustainable food consumption is an interesting topic.	0.742
	I believe consuming sustainable food is a wise choice.	0.663
	Choosing sustainable food is a smart and responsible action.	0.861
	Cronbach's Alpha = 0.74, CR =0.881, AVE =0.624 KMO =0.863 Bartlett's Test = p < 0.001	

Table 3. Confirmatory Factor Analysis of Dependent Variables

Construct	Item	Factor Loadings
Meal Planning Skills	I understand how to plan meals that minimise food waste.	0.763
	I know how to create a shopping list to avoid buying unnecessary food.	0.759
	I understand how to choose meals that utilise existing ingredients.	0.867
	I understand how to prioritise food purchases based on my time, budget, and cooking skills.	0.720
	Cronbach's Alpha = 0.77, CR =0.826, AVE =0.564 KMO =0.865 Bartlett's Test = p < 0.001	
Food Labelling Comprehension	I understand the environmental impacts of various food choices.	0.635
	I understand how to compare food labels to select healthier and more sustainable options.	0.706
	I understand how to identify sustainably produced or ethically sourced food.	0.791
	I understand how to determine the origin of food products from their labels.	0.679
	Cronbach's Alpha = 0.69, CR =0.712, AVE =0.689 KMO =0.728 Bartlett's Test = p < 0.001	
Food Storage and Preservation Knowledge	I understand how to store fruits and vegetables to prolong their freshness.	0.859
	I understand how to freeze food to extend its shelf life.	0.726
	I understand safe methods for using leftovers in new meals.	0.649
	I understand the meaning of food labels such as "use by" and "best before" dates.	0.813
	Cronbach's Alpha = 0.77, CR =0.873, AVE =0.672 KMO =0.783 Bartlett's Test = p < 0.001	

Construct	Item	Factor Loadings
Practical Application of Sustainability	I understand strategies for reducing food waste during meal preparation.	0.583
	I understand how to creatively use leftover food to make new meals.	0.642
	I understand the process of separating food waste for composting or other disposal methods.	0.610
	I understand the best methods to store food to prevent spoilage.	0.768
	Cronbach's Alpha = 0.61, CR =0.725, AVE =0.546 KMO =0.650 Bartlett's Test = $p < 0.001$	

4.3 Structural Model Results (Hypothesis Testing)

This section summarises the hypothesised relationships among variables: the influence of social media exposure on sustainable food behaviours among Generation Z, with particular emphasis on the mediating role of attitude toward sustainable food consumption (see Table 4 for a Hypothesis Testing Summary and Figure 1 for Structural Model Results). Hypothesis 1, which proposed a positive direct effect of informational social media posts on attitude, was not supported ($\beta = -0.171$, $p = 0.205$). In contrast, Hypothesis 2 was supported, indicating that exposure to influencer endorsements significantly and positively predicted attitude ($\beta = 0.628$, $p < 0.001$).

Table 4. Hypothesis Testing Summary

	Path	B	p-value	Status
H1	Informational Posts → Attitude	-0.171	0.205	Not Supported
H2	Influencer Endorsements → Attitude	0.628	<0.001	Supported
H3.1	Informational Posts → Attitude → Meal Planning	-0.098	0.21	Not Supported
H3.2	Informational Posts → Attitude → Food Labeling Comprehension	-0.133	0.217	Not Supported
H3.3	Informational Posts → Attitude → Food Storage & Preservation Knowledge	-0.124	0.222	Not Supported
H3.4	Informational Posts → Attitude → Practical Application of Sustainability	-0.108	0.224	Not Supported
H4.1	Influencer Endorsements → Attitude → Meal Planning	0.362	<0.001	Supported
H4.2	Influencer Endorsements → Attitude → Food Labeling Comprehension	0.490	<0.001	Supported
H4.3	Influencer Endorsements → Attitude → Food Storage & Preservation Knowledge	0.458	0.001	Supported
H4.4	Influencer Endorsements → Attitude → Practical Application of Sustainability	0.398	0.001	Supported

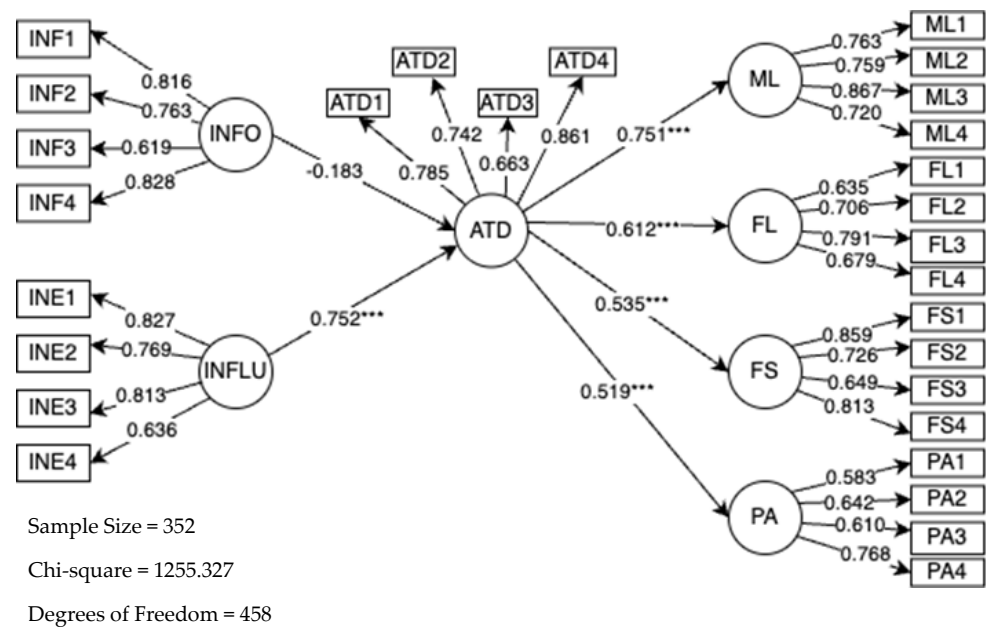


Figure 1. SEM Model Summary (Standardised Coefficient)

The core analytical focus centred on whether attitude mediated the relationship between social media content and sustainable food behaviours using bootstrap analysis (Hypotheses 3 and 4). Hypotheses 3.1 through 3.4, which posited that attitude would mediate a positive relationship between informational posts and four dimensions of sustainable food behavior, were not supported. The indirect effects were non-significant for meal planning ($\beta = -0.098$, $p = 0.210$), food labeling comprehension ($\beta = -0.133$, $p = 0.217$), food storage and preservation knowledge ($\beta = -0.124$, $p = 0.222$), and practical application of sustainability ($\beta = -0.108$, $p = 0.224$). Conversely, Hypotheses 4.1 through 4.4, which proposed that attitude would mediate the relationship between influencer endorsements and sustainable food behaviours, were fully supported across all four dimensions: meal planning ($\beta = 0.362$, $p < 0.001$), food labeling comprehension ($\beta = 0.490$, $p < 0.001$), food storage and preservation knowledge ($\beta = 0.458$, $p = 0.001$), and practical application of sustainability ($\beta = 0.398$, $p = 0.001$).

These findings highlight the differential effects of social media content types on sustainable food behavior among Gen Z. While informational posts neither significantly shaped attitudes nor indirectly influenced behavior via attitudinal mediation, influencer endorsements emerged as a key driver of positive attitudes, which in turn significantly enhanced sustainable food practices. This underscores the potent role of social influence, specifically through endorsements, in shaping Generation Z's sustainability-related attitudes and behaviours, thereby affirming the mediating function of attitude in this context.

5. Discussion

The discussion highlights social media's role in shaping Thai Gen Z's food literacy. The strong positive influence of influencer endorsements on attitudes toward sustainable food consumption, which significantly fostered all food literacy dimensions, emphasises the power of relatable figures in promoting values and driving behavioral change. In contrast, the lack of a direct effect from informational posts and the failure of attitude to mediate this relationship suggests that simply providing information may not effectively prompt attitudinal and behavioral shifts in this demographic. This underscores

the need for persuasive communication approaches and the strategic use of credible sources like influencers to advance food literacy and sustainable food practices among Gen Z in Thailand.

5.1 Major Findings

5.1.1 The Significant Influence of Influencer Endorsements on Attitude

The findings reveal a significant positive influence of influencer endorsements on Thai Gen Z's attitudes toward sustainable food consumption, strongly supporting Hypothesis 2. This highlights the persuasive power of social media influencers as credible and relatable opinion leaders in shaping young consumers' attitudes toward sustainability. As noted in the literature review, the impact of these digital figures is tied to their perceived trustworthiness, expertise, and authenticity [30]. Thai Gen Z, as digital natives, are skilled at discerning these cues online. When influencers are seen as reliable and knowledgeable, their messages are more likely to be internalised and influence their audience [31], aligning with Source Credibility Theory.

The effectiveness of influencer endorsements is also enhanced by specific content formats. Personal narratives, where influencers share their sustainable living journeys, foster empathy and resonance with followers. Integrating sustainable choices into lifestyle content, such as plant-based meals, eco-friendly shopping routines, or low-waste habits, normalises these behaviours, making them more attainable and desirable [32]. Practical demonstrations, such as tutorials on food waste reduction or interpreting food labels, enhance comprehension and self-efficacy among viewers [33]. The credibility of influencers presenting such content significantly impacts its effectiveness, making it essential to select influencers based on value alignment and established credibility within the demographic.

5.1.2 Attitude as a Mediator: Pathway to Food Literacy

The study's findings strongly support Hypotheses 4.1 through 4.4, showing that attitude significantly mediates the relationship between influencer endorsements and all four food literacy dimensions: Meal Planning Skills, Food Labeling Comprehension, Food Storage and Preservation Knowledge, and the Practical Application of Sustainability. This emphasises the crucial role of attitude as a cognitive-emotional filter through which the stimulus (influencer content) is processed and translated into behavioral outcomes, in line with the Stimulus-Organism-Response (SOR) model.

Positive attitudes fostered by influencer endorsements motivate Thai Gen Z to adopt more proactive meal-planning behaviours, such as preparing sustainable shopping lists and organising meals to minimise waste. Influencers who share easy-to-follow, sustainable recipes or meal preparation guides reinforce the practicality of these habits [34]. As "human brands" who cultivate strong emotional bonds with followers [35], their sustainable recommendations can be especially influential. Influencers who promote reading expiration dates, identifying sustainable certifications, or understanding ingredient lists contribute to enhanced food labeling literacy. A positive attitude toward sustainable food choices increases the likelihood of focusing on these label details, driven by intrinsic motivation to make eco-conscious purchasing decisions [9]. Research shows that trust in eco-labels fosters positive environmental attitudes, which encourage pro-environmental behaviours, such as choosing sustainable options.

When influencers demonstrate creative food storage techniques or share tips on extending food shelf-life, viewers with positive sustainability attitudes are more likely to apply this knowledge in their own lives. The emotional connection with trusted influencers makes such content more memorable and actionable, reinforcing food preservation behaviours [11]. This actionability is strengthened by trust in credible influencers who offer valuable information. Moreover, the engaging nature of such content can spread

within social networks, potentially creating a viral effect that amplifies positive food preservation behaviours [17]. Lastly, the practical application of sustainability, such as reducing food waste, composting, or prioritising locally sourced produce, is where the impact of influencers, mediated by attitude, is especially clear. Influencers who model these practices normalise sustainable living, particularly when the message is received through a positive attitude [36]. This effect is enhanced by the influencers' perceived credibility and expertise, fostering trust and encouraging sustainable practices [37].

Together, these findings highlight the importance of attitude not just as a psychological construct, but as a gateway to sustainable behavior change. Influencer content, when filtered through a positive attitude, fosters deeper engagement and practical application of sustainability knowledge. This strongly supports the SOR model, where influencer endorsements (stimuli) shape attitudes (organism), which drive food literacy behaviours (responses) among Thai Gen Z.

5.1.3 The Non-Significant Direct Effect of Informational Posts on Attitude

The lack of a significant direct influence of informational posts on Thai Gen Z's attitudes toward sustainable food consumption contrasts with the strong impact of influencer endorsements. Several factors may explain this result. First, information overload can reduce cognitive engagement and desensitise individuals to general factual content. [38] Bawden and Robinson (2009) note that an abundance of information can negatively impact on deep processing, potentially leading to a numbing effect. Thai Gen Z, as digital natives, are constantly bombarded with information and may filter out content that lacks personal relevance, emotional appeal, or novelty [38].

Second, the format and presentation style of informational posts are likely key in determining user engagement. Text-heavy, static, or visually unengaging posts may fail to attract or retain the attention of a fast-scrolling audience. The non-interactive nature of traditional informational content may hinder its ability to engage users accustomed to the dynamic, interactive formats of influencers, which have been shown to influence green participation behavior [39]. In contrast to the personalised content of influencers, traditional informational posts may appear disconnected from the daily lives of Gen Z. Third, source credibility and relatability are crucial. Gen Z tends to trust individual content creators, especially those they follow and perceive as authentic, more than faceless institutions or impersonal posts [30]. This aligns with the Source Credibility Theory, which suggests that the effectiveness of a message depends on the perceived trustworthiness, expertise, and attractiveness of the communicator [37,40]. Thus, informational posts lacking relational or stylistic attributes may struggle to influence attitudes or behavior.

5.1.4 The Non-Significant Mediating Role of Attitude in the Relationship Between Informational Posts and Food Literacy Dimensions

The absence of a significant mediating role for attitude in the relationship between informational posts and the four dimensions of food literacy logically aligns with the earlier finding that informational content did not significantly shift attitudes. If the initial stimulus (informational posts) fails to trigger a meaningful change in the mediating variable (attitude), it follows that its ability to influence subsequent behavioral outcomes, such as food literacy, is likely limited [18]. In other words, if an individual's attitude is not altered by the informational posts, they may not develop the intrinsic motivation required to engage in new behaviours or adopt new skills.

Even if informational posts contributed to some degree of cognitive awareness or factual learning, this may not have been sufficient to induce a strong attitudinal shift. Without a significant change in attitude, the motivation to adopt or develop new skills, such as meal planning, food labeling comprehension, or sustainable practices, may remain weak or absent [41]. This distinction underscores the difference between knowledge acquisition and behavioral adoption, emphasising that gaining knowledge does not automatically lead to a change in behavior [42]. Additionally, informational posts tend to focus on raising awareness rather than providing practical, skill-based guidance. While awareness is undoubtedly a crucial first step, the kind of behavior-driven, emotionally resonant content that Gen Z needs to improve food literacy behaviours may be missing. Without this element, awareness alone may not lead to the formation of sustainable habits [43].

5.2 Practical Implications of the Findings

The influence of social media influencers on Thai Generation Z's sustainable food attitudes presents powerful opportunities. Traditional campaigns often fall short, while influencer-led, engaging content offers a more compelling way to drive behavior change and boost food literacy.

5.2.1 Effectiveness of Leveraging Social Media Influencers

Thai Gen Z relies heavily on social media for both information and inspiration. Influencers are often seen as more relatable and trustworthy than traditional authority figures. This creates a strong opportunity to shape attitudes and behaviours. A promising approach involves adopting a hyperlocal influencer strategy. Instead of focusing solely on macro-influencers, campaigns should prioritise micro and nano-influencers with strong ties to specific communities or regions. These local influencers typically generate higher engagement and can deliver messages that feel more tailored and culturally relevant. These local voices also help reflect the rich diversity of Thai food culture across regions, making messages feel more relatable. Additionally, there's value in collaborating with "edutainment" specialists. These are creators who blend education and entertainment, like food bloggers who share eye-catching recipe videos with embedded nutritional tips, or comedians addressing food waste through humour. Long-term partnerships, rather than one-off campaigns, allow influencers to develop deeper content, foster audience trust, and reinforce sustainable practices over time.

5.2.2 Strategies for Collaborating with Influencers

To fully harness this potential, influencer collaboration must move beyond simple endorsements toward co-creating content that feels authentic and relevant to their audiences. This includes interactive initiatives like sustainable cooking challenges, creative food waste reduction contests, and behind-the-scenes content — such as farm visits, chef interviews, and sourcing stories — that foster transparency and trust. Gamified learning tools like food waste sorting games or recipe-matching puzzles, especially when developed with influencers, can make sustainability education more engaging and memorable. Cultural sensitivity is

essential; influencers can adapt global sustainability messages to Thai contexts, highlighting traditional recipes that align with sustainable practices.

5.2.3 Making Informational Content More Impactful

Content should prioritise short-form, visually dynamic formats such as TikTok, Instagram Reels, and YouTube Shorts using trends, music, and creative editing to capture Gen Z's attention and maximise impact. Interactive formats such as infographics with clickable elements, AR filters that gamify food waste sorting or display nutritional info, and live Q&A sessions with influencers and food experts offer immersive, real-time learning experiences. These tools not only boost engagement but also personalise the learning journey, helping Gen Z connect more deeply with sustainability messages.

5.2.4 Role of Social Media Platforms

Social media platforms play a critical role in ensuring reliable sustainability information reaches users. They should collaborate with government agencies, academics, and NGOs to create and promote verified content through dedicated channels, algorithmic prioritisation, and robust fact-checking systems that limit misinformation. Educational tools embedded directly into apps, such as food labeling guides or food waste footprint calculators, can help make learning part of daily digital behavior. Platforms should also invest in local Thai creators by providing funding, training, and promotional support to amplify high-quality, culturally relevant content.

5.3 Implications for Government, Policymakers, and Businesses

Governments should spearhead national food literacy strategies that integrate influencer and social media engagement. This requires dedicated funding, evidence-based content, and strong partnerships with platforms to enhance visibility and credibility. Transparent influencer marketing, supported by regulation, will build public trust. Businesses should align their sustainability messaging with these efforts, promoting eco-friendly products, supporting education, and encouraging food waste reduction. By uniting influencers, digital platforms, and culturally tailored content, Thailand can empower Gen Z to drive the shift toward sustainable food practices. The key lies in collaboration, creativity, and cultural relevance.

This study makes a significant theoretical contribution by refining the Stimulus-Organism-Response (SOR) model in the context of social media's influence on sustainable food literacy among Thai Gen Z. It fills a gap in the literature by differentiating the effects of two social media stimuli, informational posts and influencer endorsements, on attitudes and food literacy behaviours. Unlike previous studies that treat digital content as uniform, this research isolates the persuasive mechanisms of each stimulus. Influencer endorsements, with their perceived credibility, relatability, and narrative appeal, strongly influence attitudinal change. In contrast, informational posts show weaker effects, highlighting the importance of content type in digital behavior models. This differentiation enhances the "Stimulus" component of the SOR model. The study also strengthens the "Organism" element by validating the attitude toward sustainable food consumption as a mediator. Positive attitudes driven by influencer content foster stronger engagement with sustainable practices, while informational posts show a limited effect. Crucially, the "Response" is reframed as a multidimensional construct of food literacy, including Meal Planning Skills, Labeling Comprehension, Food Preservation Knowledge, and Practical Sustainability. This links affective and cognitive processes to tangible, skill-based behaviours, extending the SOR model's applicability in digital and sustainability contexts. Finally, by situating the research within the cultural and generational context of Thai Gen Z, this study provides novel, regionally grounded insights. It acknowledges the unique

digital habits, values, and sustainability perceptions of this demographic, contributing to a more context-sensitive and globally applicable theoretical model. Overall, this work emphasises the importance of content type and source credibility in using social media to promote food literacy and pro-environmental behavior among younger audiences in emerging economies.

5.4 Limitations and Future Research

The interpretation and generalisability of this study's findings are subject to several methodological limitations. First, reliance on self-reported online questionnaires may introduce social desirability bias, where participants provide idealised versions of their attitudes and behaviours, potentially leading to over-reporting positive attitudes toward sustainable consumption and food literacy. Future research could use objective measures or behavioral tracking (e.g., analysing actual online interactions or food-related purchases) to complement self-reported data. A mixed-methods approach, combining surveys with qualitative interviews or observational data, could offer a more accurate picture of participants' true behaviours and motivations. Additionally, the study's analysis of "informational posts" as a singular entity overlooks variations in format, visual appeal, interactivity, and source credibility that may influence effectiveness. Furthermore, focusing on attitude as the sole mediating factor ignores other psychological constructs, such as perceived self-efficacy and trust in online sources. Finally, caution should be exercised when generalising the findings to other digital platforms like TikTok, LINE, or YouTube, which have distinct user behaviours and content dynamics that may affect food literacy and sustainable consumption differently.

6. Conclusions

This study explored how different types of social media content, specifically influencer endorsements and informational posts, impact sustainable food literacy among Thai Generation Z. Guided by the Stimulus-Organism-Response (SOR) model, it examined how these stimuli influence attitudes and, in turn, behaviours related to meal planning, food labeling, storage, and sustainability. The key findings reveal that influencer endorsements significantly shape positive attitudes toward sustainable food consumption, which then mediate improvements across all four food literacy dimensions. In contrast, informational posts did not show a significant direct or mediated effect, highlighting that sharing factual content alone is insufficient to change attitudes or behaviours in this demographic. These results emphasise the importance of emotionally resonant and relatable communication. Influencers, especially those viewed as credible and authentic, play a powerful role in translating sustainability messages into actionable behaviours. This has practical implications for campaign designers, policymakers, and educators seeking to engage Thai Gen Z in meaningful food literacy initiatives. Ultimately, the research highlights that fostering sustainable food behaviours among Thai Gen Z requires more than information, it demands connection, creativity, and culturally attuned strategies that resonate with the values and digital habits of this generation.

Funding: This research received no external funding.

Institutional Review Board Statement: Ethical review and approval were waived for this study due to its minimal-risk nature. The data were collected through an anonymous online survey that did not involve any personal identifiers or sensitive information. Participation was entirely voluntary, and respondents could withdraw at any time without consequence.

Data Availability Statement: No new data were created or analyzed in this study. Data supporting the findings of this study are available from the corresponding author upon reasonable request.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Acknowledgments: The authors also gratefully acknowledge the National Institute of Development Administration (NIDA) for providing essential academic resources and an enabling research environment.

Conflicts of Interest: The author declares that there are no conflicts of interest.

References

1. FAO; IFAD; UNICEF; WFP; WHO. *The state of food security and nutrition in the world 2021. Transforming food systems for food security, improved nutrition and affordable healthy diets for all.*; FAO: Rome, Italy, 2021.
2. UNEP. Food waste in Asia Pacific: Current trends and outlook. United Nations Environment Programme. Available online: <https://www.unep.org/>
3. Thailand Pollution Control Department. Thailand's food waste statistics and trends. Pollution Control Department. Available online: <https://www.pcd.go.th/>
4. Smith, M. Generation Z and social media: The evolving influence of digital activism. *Social Media + Society* **2020**, *6*, 1-9, <https://doi.org/10.1177/2056305120904427>
5. Jin, S.V.; Muqaddam, A. Influence of influencers on Gen Z's sustainable consumption choices. *Journal of Consumer Behavior* **2022**, *21*, 118-135.
6. Koay, K.Y.; Pang, P.M.; Chua, A.Y. Social media and food sustainability: How digital content influences consumer choices. *Journal of Consumer Research* **2022**, *48*, 1020-1036.
7. Lim, S.P.; Wang, L.; Zhao, Y. Understanding pro-environmental behaviors: Social media's role in fostering food sustainability among Gen Z. *Journal of Environmental Psychology* **2023**, *81*, 101892, <https://doi.org/10.1016/j.jenvp.2022.101892>
8. Wang, S.; Zhang, X.; Li, Z. Social media as a tool for promoting sustainable food consumption among Generation Z. *Journal of Consumer Psychology* **2023**, *33*, 88-103.
9. Taufique, K.M.R.; Mollah, M.N.; Ehsan, M. Influence of social media on consumer sustainability behavior. *Environmental Economics and Policy Studies* **2021**, *23*, 445-460, <https://doi.org/10.1007/s10018-021-00313-0>.
10. Kim, J.; Lee, K.; Shin, H. Misinformation on social media and food sustainability: The effect of false claims on consumer attitudes. *Sustainability* **2021**, *13*, 1-17.
11. Lou, C.; Yuan, L. How social media influencers affect sustainable consumption behaviors in Gen Z. *Sustainability* **2019**, *11*, 2823.
12. Vermeir, I.; Verbeke, W. Sustainable Food Consumption: Exploring the Consumer "Attitude – Behavioral Intention" Gap. *Journal of Agricultural and Environmental Ethics* **2006**, *19*, 169-194, <https://doi.org/10.1007/s10806-005-5485-3>.
13. Huang, R.; Yang, J.; Wang, L. Economic constraints and sustainable consumption behaviors: A study on the trade-off between sustainability and affordability. *Environmental Economics and Policy Studies* **2023**, *25*, 49-66, <https://doi.org/10.1007/s10018-022-00384-3>
14. Wang, Y.; Li, Y.; Liu, X. Green consumption behavior: A meta-analysis of social media influence. *Sustainability* **2021**, *13*, 512-529, <https://doi.org/10.3390/su13041512>

15. Kim, H.J.; Han, H. The impact of social media on eco-tourism decisions: The role of influencer endorsements. *Sustainable Tourism* **2020**, *18*, 234-246, <https://doi.org/10.1016/j.jtras.2020.07.008>.
16. Zhao, L.; Qiu, Z.; Li, Q. Understanding food waste behavior in the digital age: The role of social media. *Journal of Business Research* **2022**, *141*, 307-318.
17. Gunawan, D.D.; Huarng, K.-H. Viral effects of social network and media on consumers' purchase intention. *Journal of Business Research* **2015**, *68*, 2237-2241, <https://doi.org/10.1016/j.jbusres.2015.06.004>.
18. Ajzen, I. The theory of planned behavior. *Organizational Behavior and Human Decision Processes* **1991**, *50*, 179-211, [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T).
19. Schwarz, N.; Clore, G.L. Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology* **1983**, *45*, 513-523, <https://doi.org/10.1037/0022-3514.45.3.513>.
20. Cullen, S.; Murphy, R.; Maher, C. Food literacy and the role of nutrition in food choice. *International Journal of Environmental Research and Public Health* **2015**, *12*, 12951-12969, <https://doi.org/10.3390/ijerph121012951>.
21. Truman, E.; Martin, R.; Thompson, L. Practical approaches to reducing food waste through improved food literacy. *International Journal of Consumer Studies* **2017**, *41*, 632-640.
22. Vidgen, H.; Gallegos, D. Food literacy: A critical tool in tackling food insecurity. *International Journal of Consumer Studies* **2014**, *38*, 72-79.
23. Jung, J.; Shim, S.W.; Jin, H.S.; Khang, H. Factors affecting attitudes and behavioural intention towards social networking advertising: a case of Facebook users in South Korea. *International Journal of Advertising* **2016**, *35*, 248-265, <https://doi.org/10.1080/02650487.2015.1014777>.
24. Oakley, R.L.; Salam, A.F. Examining the impact of computer-mediated social networks on individual consumerism environmental behaviors. *Computers in Human Behavior* **2014**, *35*, 516-526, <https://doi.org/10.1016/j.chb.2014.02.033>.
25. Teoh, C.W.; Koay, K.Y.; Chai, P.S. The role of social media in food waste prevention behaviour. *British Food Journal* **2021**, *124*, 1680-1696, <https://doi.org/10.1108/bfj-04-2021-0368>.
26. Herath, H.M.T.S.; Wanigasuriya, W.A.D.N. Credibility Counts: The Impact of Social Media Influencers on Healthy and Nutritious Food Purchase Intention in Sri Lanka. *Journal of Business and Technology* **2025**, <https://doi.org/10.4038/jbt.v9i1.155>.
27. Bazhan, M.; Shafiei Sabet, F.; Borumandnia, N. Development and validation of a questionnaire to examine determinants of consumer intentions to purchase organic food. *BMC Nutrition* **2023**, *9*, 74, <https://doi.org/10.1186/s40795-023-00731-y>.
28. Belanche, D.; Casalo, L.V.; Flavián, M.; Ibáñez-Sánchez, S. Understanding influencer marketing: The role of congruence between influencers, products and consumers. *Journal of Business Research* **2021**, *132*, 186-195, <https://doi.org/10.1016/j.jbusres.2021.03.067>.
29. Ashoori, M.; Omidvar, N.; Eini-Zinab, H.; Shakibazadeh, E.; Doustmohamadian, A. Development and Validation of Food and Nutrition Literacy Assessment Tool for Iranian High-school Graduates and Youth. *Int J Prev Med* **2020**, *11*, 185, https://doi.org/10.4103/ijpvm.IJPVM_466_19.
30. Jin, S.V.; Muqaddam, A.; Ryu, E. Instafamous and social media influencer marketing. *Marketing Intelligence & Planning* **2019**, *37*, 567-579, <https://doi.org/10.1108/mip-09-2018-0375>.
31. Liu, X.; Zheng, X. The persuasive power of social media influencers in brand credibility and purchase intention. *Humanities and Social Sciences Communications* **2024**, *11*, 15, <https://doi.org/10.1057/s41599-023-02512-1>.
32. Kumar, A.; Pandey, M. Social Media and Impact of Altruistic Motivation, Egoistic Motivation, Subjective Norms, and EWOM toward Green Consumption Behavior: An Empirical Investigation. *Sustainability* **2023**, *15*, 4222.
33. Muda, M.; Hamzah, M.I. Should I suggest this YouTube clip? The impact of UGC source credibility on eWOM and purchase intention. *Journal of Research in Interactive Marketing* **2021**, *15*, 441-459.
34. De Veirman, M.; Cauberghe, V.; Hudders, L. Marketing through Instagram influencers: the impact of number of followers and product divergence on brand attitude. *International Journal of Advertising* **2017**, *36*, 798-828, <https://doi.org/10.1080/02650487.2017.1348035>.

35. Ki, C.-W.; Cuevas, L.M.; Chong, S.M.; Lim, H. Influencer marketing: Social media influencers as human brands attaching to followers and yielding positive marketing results by fulfilling needs. *Journal of Retailing and Consumer Services* **2020**, *55*, 102133, <https://doi.org/10.1016/j.jretconser.2020.102133>.
36. Schouten, A.P.; Janssen, L.; Verspaget, M. Celebrity vs. Influencer endorsements in advertising: the role of identification, credibility, and Product-Endorser fit. *International Journal of Advertising* **2020**, *39*, 258-281, <https://doi.org/10.1080/02650487.2019.1634898>.
37. Sokolova, K.; Kefi, H. Instagram and YouTube bloggers promote it, why should I buy? How credibility and parasocial interaction influence purchase intentions. *Journal of Retailing and Consumer Services* **2020**, *53*, 101742, <https://doi.org/10.1016/j.jretconser.2019.01.011>.
38. Bawden, D.; Robinson, L. The dark side of information: Overload, anxiety and other paradoxes and pathologies. *Journal of Information Science* **2009**, *35*, 180–191, <https://doi.org/10.1177/0165551508095781>.
39. Chen, L.; Haider, M.J.; He, J. Should “green information” be interactive? The influence of green information presentation on consumers’ green participation behavior for driving sustainable consumption of fashion brands. *Journal of Cleaner Production* **2024**, *470*, 143329, <https://doi.org/10.1016/j.jclepro.2024.143329>.
40. Hovland, C.I.; Weiss, W. The Influence of Source Credibility on Communication Effectiveness. *Public Opinion Quarterly* **1951**, *15*, 635-650, <https://doi.org/10.1086/266350>.
41. Kollmuss, A.; Agyeman, J. Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research* **2002**, *8*, 239-260, <https://doi.org/10.1080/13504620220145401>.
42. Carvalho, R.; Lucas, M.R.; Marta-Costa, A. Food Waste Reduction: A Systematic Literature Review on Integrating Policies, Consumer Behavior, and Innovation. *Sustainability* **2025**, *17*, 3236.
43. Sheeran, P. Intention—Behavior Relations: A Conceptual and Empirical Review. *European Review of Social Psychology* **2002**, *12*, 1-36, <https://doi.org/10.1080/14792772143000003>.