International Journal of Analysis and Applications

Factors Influencing the Purchase Behaviour of Plant-Based Food Products in Thailand: An Extension of the Theory of Planned Behaviour

Kamonphon Nakhonchaigul*, Kampanat Siriyota*

Department of Marketing, Faculty of Business Administration and Accountancy,

Khonkaen University, Khonkaen, 40002, Thailand

**Corresponding Authors: Kamonphon.n@kkumail.com, skumpa@kku.ac.th*

ABSTRACT. This study aims to investigate the factors influencing the adoption intention of plant-based food products and to examine the mediating effects on the relationship between adoption intention and actual behaviour. The research is based on the Theory of Planned Behavior (TPB) as the foundational theoretical framework. Convenience sampling has been applied for data collection through an online questionnaire (G-Form), resulting in 582 usable responses. The measurement model was analyzed using Confirmatory Factor Analysis (CFA), and the structural equation model was assessed using Structural Equation Modeling (SEM). The findings indicate that factors positively influencing the adoption intention include attitudes towards plant-based food products, subjective norms, environmental concerns. Word-of-mouth communication was identified as a mediating variable in the relationship between adoption intention and actual behaviour. This research corroborates the Theory of Planned Behavior. Also, it identifies additional factors relevant to the acceptance of plant-based food products beyond the theoretical framework in Thailand. The findings provide valuable insights for business and marketing strategies about plant-based food products.

1. Introduction

The current increase in population numbers has led to a rise in consumption, including meat products. The Food and Agriculture Organization (FAO) has projected that global meat consumption will escalate from 284 million tons in 2007 to 600 million tons by 2050 [1]. The

Received Jun. 13, 2024

2020 Mathematics Subject Classification. 91B74.

Key words and phrases. plant-based foods; theory of planned behavior; adoption intention; actual behaviour; green product.

https://doi.org/10.28924/2291-8639-22-2024-128

ISSN: 2291-8639

increased meat consumption may lead to food shortages due to competition for food among the global population. In contrast, current natural resources and food sources are being degraded by rising global temperatures. Consequently, many countries have become aware of and are striving to address global warming, encouraging citizens to prioritize this crisis and supporting the private sector in developing innovative products to mitigate climate change and food shortages. This has led to novel food products, with plant-based foods being particularly prominent. It has been observed that livestock farming emits more carbon dioxide and methane than plant cultivation, uses more water, and depletes resources. The production processes for plant-based foods can reduce greenhouse gas emissions by 30-90% compared to meat production [2]. Despite the global increase in the consumption of plant-based foods, their awareness and adoption remain limited. Although advancements in technology have enabled the development of plant-based food products that closely mimic meat qualities, the acceptance of these products remains relatively low [3]. Therefore, raising awareness about plant-based diets is crucial, especially considering the lack of research in Thailand. This study encourages more significant interest in plant-based foods and reduces meat consumption, which can help alleviate environmental issues and mitigate global warming.

The theory of planned behaviour (TPB) is a fundamental model that explains consumer behaviour and posits that human behaviour is influenced by deliberate planning and intentions, which directly predict behaviour [4]. The conventional TPB comprises three main components: attitude, subjective norms, perceived behavioural control. However, researchers often include additional variables beyond these three components in the context of environmentally supportive behaviour. These may consist of environmental concerns, health consciousness, and moral norms. This study incorporated three additional variables to expand the TPB framework, focusing specifically on actual behaviour. Therefore, adding factors influencing consumer decision-making is essential to extend the TPB to fit consumption contexts. This expansion aims to enhance understanding of such behaviours in society and promote effective changes linked to reducing environmental impacts in the future.

Furthermore, several research studies have found that the formation of intentions may only sometimes lead to behaviour enactment or result in minimal behaviour occurrence [5] . They conducted a literature review on sustainable consumption patterns and identified a significant research gap focusing on the study of alternative meat consumption. Therefore, to understand

actual behavioural occurrences, this research aims to address this gap by investigating word-of-mouth communication as a mediator variable in examining this research vacuum. Word-of-mouth communication arises when consumers feel satisfied and enjoy sharing their experiences. It has been observed that consumers who engage in word-of-mouth communication tend to have a propensity to make purchasing or consumption decisions based on these recommendations [6].

The research questions for this study are pivotal in advancing our understanding of consumer behaviour towards plant-based food products in Thailand. By investigating the factors influencing consumers' intentions to accept plant-based food products, the study contributes to the existing literature on sustainable consumption and dietary choices. Understanding these factors can inform policymakers, marketers, and stakeholders about effective strategies to promote plant-based diets and sustainable food consumption practices in Thailand. Furthermore, by examining the mediating role of word-of-mouth communication, the study adds nuance to our understanding of the mechanisms underlying consumer decision-making processes. This may contribute to the broader literature on information dissemination and consumer behaviour, particularly in the context of sustainable consumption. The findings from this research could have practical implications for businesses and organizations seeking to promote plant-based food products, as they highlight the importance of interpersonal communication channels in shaping consumer preferences and behaviours.

2. Literature Review

2.1 Theory of Planned Behavior (TPB)

TPB is a widely used theory in predicting individual behaviour and understanding human behaviour [4], [7]. It is an expanded theory from the Theory of Reasoned Action (TRA) proposed by Ajzen and Fishbein [8]. It suggests three main factors influencing intentions leading to behaviour: attitude toward behaviour, subjective norms, and perceived behavioural control. Attitude toward behaviour, the first variable in predicting behavioural intentions, refers to an individual's overall evaluation or preference toward something [9]. This includes favorable and unfavorable assessments, shaping individuals' beliefs about the consequences of their actions, thus leading to diverse attitudes. As [8] described, subjective norms refer to individuals' perceptions of societal expectations or desires that influence them, including primary groups like family or close relationships and secondary groups like friends or coworkers, affecting whether they engage in certain behaviours. Perceived behavioural control is individuals' perception of the

ease or difficulty of performing a behaviour, considering their skills, resources, opportunities, or information gleaned from past experiences or word-of-mouth.

Previous research on innovation acceptance has extensively utilised the Theory of Planned Behavior (TPB) due to its ease of understanding the causes of consumer behaviour. Research employing the TPB as a foundational theory can reference studies [10], [11], [12], [13], [14]. Hence, in this study, the researchers have incorporated variables such as attitude toward plant-based food products, subjective norms, and perceived behavioural control as predictors to investigate the factors influencing intentions to accept innovations.

2.2 Environmental Concern (EC)

EC is considered a significant variable influencing the purchase of environmentally friendly products. Researchers have studied products or services that are ecologically friendly, finding that the level of environmental awareness and consciousness about environmental issues are crucial factors in consumer consumption of such products and services. EC is a critical factor in the decision-making process for purchasing environmentally friendly products [15] . It was found that environmental concern affects the intention to buy ecological products, consistent with the research of [16] and [10], who found that environmental concern influences positive intentions to buy environmentally friendly products [17] it was discovered that environmental concern influences the intention to purchase innovative agricultural food industry products, such as artificial meat. This finding aligns with [14] study, which found that environmental concern positively influences consumers' willingness to accept plant-based foods in China and New Zealand. Furthermore, [18] studied sustainable consumption among Taiwanese consumers and found that environmental concern influences the intention to purchase plant-based alternative meat products.

2.3 Health Consciousness (HC)

HC is a significant motivator that drives individuals to behave in ways that promote or improve their health. In making decisions to purchase health-related foods, it is often found that the variable of health consciousness is crucial to the intention to accept or buy. For instance, consumers' purchase of organic food prevents diseases and contributes to better health [19]. Besides health concerns, health consciousness is also a driving variable that influences environmentally friendly food purchases. For example, in the case of organic food (food produced naturally without chemicals or genetic modification), consumers believe that

consuming organic food has positive health effects. This belief leads health-conscious individuals to consume organic food more frequently. Similarly, in the case of plant-based meat substitutes (which have a lower carbon footprint than animal-based products), consumers believe that consuming plant-based foods is healthier. Therefore, health-conscious individuals tend to seek plant-based foods more, and health consciousness is a crucial variable that may help the market for plant-based meat alternatives expand rapidly [20].

[21] found that health consciousness significantly influences the intention to purchase environmentally friendly foods. This is similar to the findings of [22], who found a positive relationship between health consciousness and the intention to purchase environmentally friendly products among young consumers in India. Health consciousness was found to have a more significant influence than environmental awareness. [23] study on the acceptance of food innovations and the consumption of organic food by consumers found that health consciousness was related to the acceptance of food innovations and the consumption of organic food. This finding is similar to the results of [24], [25]. Furthermore, [26] found that consumers' health consciousness influences their consumption of plant-based alternative foods, which aligns with the findings of [27] and [28].

2.4 Moral Norms (MN)

MN refers to individuals' perception of ethical standards of behaviour [29]. It is the decision-making based on personal values and ethics without external pressure. In summary, moral norms is the plan or practice that individuals adhere to, considering it morally good, causing guilt in their hearts, which affects behaviour. We can observe moral norms variable in [30] study, which added moral norms variable and found that it influences the intention to purchase environmentally friendly products. [31] surveyed the driving factors influencing the intention to buy organic food among Malaysian consumers, finding that moral norms influence the intention to buy organic food. This aligns with [32] research, which found that feeling wrong about buying meat affects Vietnamese consumers' intention to purchase organic meat. In studies on the consumption of meat substitutes, in addition to environmental factors, factors related to health consciousness and animal welfare ethics are essential variables influencing intention [33], [34], [35]. This is consistent with [36] the statement that animal welfare (moral norms) is a significant motivator for the continuous consumption of plant-based meat, and considering animal welfare also affects increased consumption of plant-based foods.

2.5 Word of Mouth Communication (WOM)

WOM involves individuals assessing products or services and directly communicating through social networks [37]. This type of communication influences consumer purchasing decisions significantly. Information obtained through word of mouth is often deemed trustworthy as it comes from familiar individuals or actual experiences, thus impacting consumer purchasing decisions [38]. [39] research stated that group references' word of mouth is a vital source of information regarding new products, affecting consumer purchasing decisions. Meanwhile, [40] found that the intention to accept innovations influences word of mouth. Furthermore, [41] it discovered that word of mouth drives the purchase process of environmentally friendly products.

2.6 Relation between Adoption intention, Actual behavior and Word of mouth communication

The intention is a crucial mediator variable influencing behaviour in TPB [42], [43]. This concept stems from identifying a gap between attitude and behaviour (Attitude-behavior gap), where individuals may have positive attitudes towards a behaviour but exhibit it to a lesser extent. It has been found that the intention to perform a behaviour is a better predictor of actual behaviour than attitude [8]. However, an Intention-behaviour gap exists, suggesting that actual behaviour may not always align with intention. In other words, intention cannot predict behaviour with 100% accuracy [44].

Several researchers have recommended further studies on intention to purchase and actual behavior to address this gap in future research [10], [12], [23], [45], [46]. These studies aim to clarify uncertainties surrounding this gap.

In this research, the variable of word-of-mouth communication is used as a mediator between the adoption intention and actual adoption behaviour [40] utilised word-of-mouth communication as a mediating variable in a study on environmental marketing, similar to [47], who demonstrated its impact on the relationship between perceived benefits and online purchasing. Additionally, [48] word-of-mouth communication mediated the relationship between intention to purchase environmentally friendly products and greenwashing. Moreover, individuals who speak positively about products and services to others tend to use or engage in the behaviour themselves, narrowing the gap between intention and actual behaviour.

Hypothesis 1 (H1): Attitude towards plant-based food products influences adoption intention of plant-based food products.

Hypothesis 2 (H2): Subjective norms influence adoption intention of plant-based food products.

Hypothesis 3 (H3): Perceived behavioural control influences adoption intention of plant-based food products.

Hypothesis 4 (H4): Environmental concern influences adoption intention of plant-based food products.

Hypothesis 5 (H5): Health consciousness influences adoption intention of plant-based food products.

Hypothesis 6 (H6): Moral norms influence adoption intention of plant-based food products.

Hypothesis 7 (H7): Plant-based food products adoption intention influences actual behaviour of plant-based food products.

Hypothesis 8 (H8): Plant-based food products adoption intention influences word-of-mouth communication.

Hypothesis 9 (H9): Word-of-mouth communication influences actual behaviour of plant-based food products.

Hypothesis 10 (H10): Word-of-mouth communication mediates the relationship between the plant-based food products adoption intention and actual behaviour of plant-based food products.

The research hypotheses and the research framework are depicted in Figure 1.

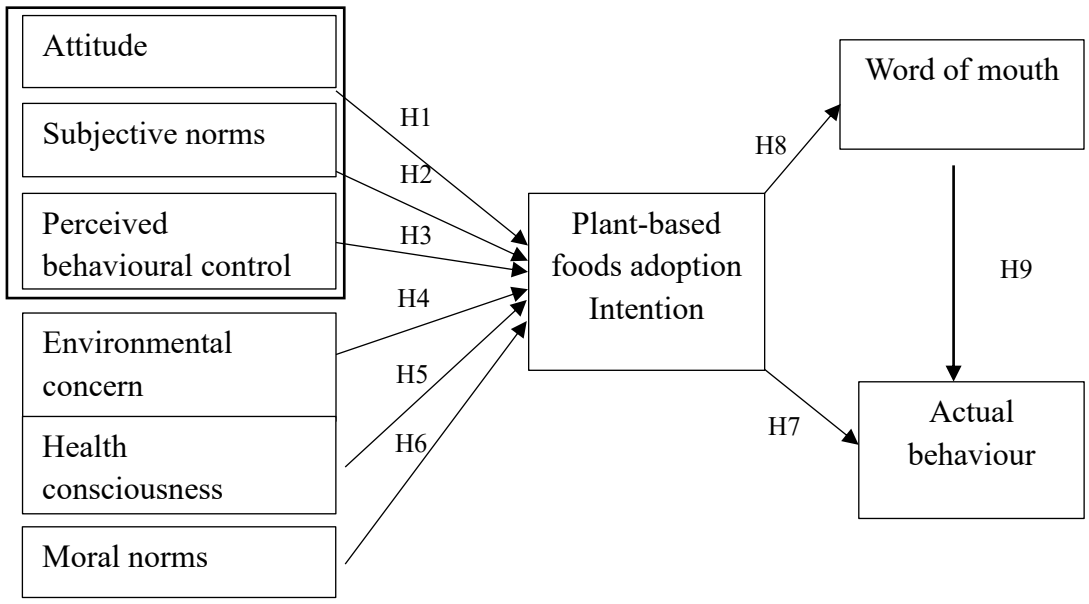

Figure 1. Conceptual framework

3. Method

The research methodology employed in this study is quantitative, utilising a questionnaire as the research instrument. All questions are closed-ended and use a 5-point Likert scale [49]. There are a total of 42 questions, categorised into sub-factors related to attitudes towards plant-based food products (5 questions), subjective norms (5 questions), perceived behavioural control (5 questions), environmental concern (5 questions), health consciousness (5 questions), moral norms (4 questions), word-of-mouth communication (4 questions), plant-based food adoption intention (4 questions), and actual behaviour of plant-based food (5 questions). As mentioned in the text, these questions were developed and adapted from various sources.

Content validity of the questionnaire was ensured through examination by five content experts, and all items had an index of item objective congruence (IOC) above 0.50, indicating their usability [50]. The Cronbach's alpha coefficient for the reliability analysis of the entire questionnaire was 0.979, with individual variables ranging from 0.802 to 0.950, all above the acceptable threshold of 0.70 [51], indicating high reliability.

A non-probability sampling method, specifically convenience sampling, was used to collect data through an online questionnaire. Data were collected from October 15, 2023, to November 15, 2023, resulting in 660 responses, meeting the predefined target of at least 500 responses. Data screening involved two steps: examining screening questions to 17 datasets. Second, responses with a standard deviation less than 0.25 were removed, excluding an additional 61 datasets. Therefore, the final analysis included 582 datasets.

4. Results

General information from the respondents' analysis shows that most respondents were female, accounting for 58.8% of the total, with ages ranging from 25 to 34 years old, representing 32.6%. Most respondents were single, making up 72.3%, and held bachelor's degrees, accounting for 72.9%. The majority worked as company employees (25.4%) and had incomes ranging from 15,001 to 25,000 baht monthly, total 27.8%.

Harman's single-factor test examined data for standard method bias [52]. This was conducted through exploratory factor analysis (EFA), revealing nine factors with eigenvalues greater than 1. The first factor had an eigenvalue of 45.027, which accounted for 27.016% of the variance. The variance ranged from 1.720 to 45.027, indicating reliable data with no substantial self-reports towards any variable. Kurtosis ranged from -1.237 to -0.665, and skewness from -

0.397 to 1.727. These values showed a normal data distribution, falling within the acceptable range of -2 to 2 [48].

Further examination of variance inflation factor (VIF) and tolerance values showed no issues with multicollinearity. VIF values ranged from 2.009 to 3.676, while tolerance values ranged from .272 to .498, well below the thresholds of 10 and 5, respectively [53]. Discriminant validity was assessed by comparing the square root of the average variance extracted (AVE) with the correlations between latent variables. The square root of AVE for each factor exceeded the correlations between latent variables in the same row, indicating acceptable discriminant validity across all measures in Table 1.

Table 1. Discriminant validity

Constructs	ATT	EC	HC	PBC	MN	SN	WOM	INT	AB
ATT	.801								
EC	.711**	.795							
HC	.666**	.667**	.792						
PBC	.679**	.631**	.656**	.758					
MN	.707**	.541**	.546**	.599**	.873				
SN	.606**	.526**	.472**	.525**	.601**	.787			
WOM	.553**	.537**	.467**	.538**	.497**	.506**	.834		
INT	.738**	.642**	.590**	.641**	.654**	.642**	.608**	.861	
AB	.581**	.541**	.421**	.517**	.526**	.590**	.606**	.730**	.828

Convergence Validity and Reliability Analysis found that the factor loadings ranged from .629 to .925 (> .50) [54], indicating high convergence validity. Regarding the values of Cronbach's alpha reliability coefficient using the Cronbach's alpha method, they ranged from .877 to .927 (> .70) [55], indicating the high reliability of the obtained data. The results of the Composite Reliability (CR) and Average Variance Extracted (AVE) analysis of latent variables found that the minimum CR value was .871. The maximum was .928 (> .60). For AVE, the minimum value was .576, and the maximum was .763 (> .50). These values indicate that each latent variable can effectively explain the variance of the observed variables. All variables are accurate and reliable, the convergence and reliability analysis results are summarized in Table 2.

Table 2 Factor Loading, CR, AVE และ Cronbach's Alpha

ตัวแปร	Loading	CR	AVE	α
Attitude toward plant-based food products (ATT)		**.906**	**.659**	**.901**
(ATT1) It's a good idea to consume plant-based food products instead of animal-based ones.	0.829			
(ATT2) I like the idea of consuming plant-based products to reduce the consumption of animal-based foods.	0.769			
(ATT3) I am interested in consuming plant-based products to reduce the consumption of animal-based foods.	0.844			
(ATT4) I am satisfied with the benefits of consuming plant-based food products instead of animal-based ones.	0.822			
(ATT5) I believe that consuming plant-based food products instead of animal-based ones is something that should be done.	0.792			
Subjective Norms (SN)		**.889**	**.620**	**.907**
(SN1) My family members have a positive attitude towards consuming plant-based food products.	0.666			
(SN2) My family members agree with the decision to consume plant-based food products.	0.677			
(SN3) My friends agree with the decision to consume plant-based food products.	0.766			
(SN4) I want to consume plant-based food products based on individuals I respect, such as teachers or professors.	0.914			
(SN5) I want to consume plant-based food products based on individuals I admire, such as celebrities, influencers, or social media personalities.	0.882			

Perceived Behavioral Control (PBC)		**.871**	**.576**	**.877**
(PBC1) Consuming plant-based food products is not difficult for you.	0.788			
(PBC2) The decision to purchase plant-based food products depends on yourself.	0.629			
(PBC3) It is easy for you if you want to buy plant-based food products.	0.818			
(PBC4) It is easy for you to increase consumption of plant-based food products instead of animal-based ones.	0.813			
(PBC5) If plant-based food products are available, you have the financial resources to purchase them immediately.	0.731			
Environmental Concern (EC)		**.895**	**.633**	**.900**
(EC1) You are aware of the problem of global warming that you are facing.	0.640			
(EC2) One of the causes of global warming comes from animal agriculture and food production processes.	0.756			
(EC3) You want to reduce meat consumption to help mitigate global warming.	0.804			
(EC4) You often choose to consume food with production processes or methods that do not disrupt the balance of nature.	0.866			
(EC5) You often choose to consume food that helps create environmental sustainability for the future.	0.888			
Health Consciousness (HC)		**.894**	**.628**	**.895**
(HC1) You often choose to consume food that does not contain antibiotics and hormones.	0.775			
(HC2) You often choose to consume food that aids in digestion and bowel movement.	0.839			

(HC3) You often choose to consume food that emphasizes vitamins and minerals.	0.834			
(HC4) You often choose to consume food that helps control weight.	0.758			
(HC5) You often choose to consume food that promotes your overall health and well-being.	0.750			
Moral Norms (MN)		**.928**	**.763**	**.927**
(MN1) Consuming plant-based food products instead of animal-based food products is not considered sinful.	0.882			
(MN2) Consuming plant-based food products instead of animal-based food products is considered accumulating merit.	0.836			
(MN3) Consuming plant-based food products instead of animal-based food products is considered a practice for spiritual well-being.	0.925			
(MN4) Consuming plant-based food products instead of animal-based food products is one way to show compassion towards animals.	0.848			
Word of mouth communication (WOM)		**.901**	**.696**	**.905**
(WOM1) You will always speak about the benefits of consuming plant-based food products to others.	0.882			
(WOM2) You will recommend plant-based food products to others.	0.853			
(WOM3) You will support your friends and acquaintances to consume plant-based food products.	0.840			
(WOM4) You will share the advantages of consuming plant-based food products through social media.	0.755			
Plant-based food products Adoption Intention (INT)		**.920**	**.743**	**.923**

(INT1) You plan to consume plant-based food products to replace the consumption of animal-based food products	0.870			
(INT2) You will try to seek out plant-based food products to reduce the consumption of animal-based food products	0.892			
(INT3) You are willing to pay for plant-based food products to reduce the consumption of animal-based food products.	0.840			
(INT4) You are pleased to consume plant-based food products to reduce the consumption of animal-based food products in the near future	0.843			
Actual Behaviour of plant-based food products (AB)		**.916**	**.687**	**.922**
(AB1) Consuming plant-based food products is a part of your lifestyle.	0.798			
(AB2) You continue to consume plant-based food products regularly even though there are other alternatives	0.784			
(AB3) You continue to consume plant-based food products regularly even if the price is high.	0.863			
(AB4) You regularly purchase plant-based food products whenever there is an opportunity.	0.823			
(AB5) If there are both plant-based food products and animal-based food products available, you will always choose to buy the plant-based products first.	0.873			

The structural equation modeling analysis results revealed that the acceptance of environmental innovation in Thai consumers regarding plant-based food products did not initially align with the observed data or meet the predefined criteria. Therefore, the researchers proceeded with model modification by adjusting the parameters with the agreement to relax the constraints. Following this model modification, the analysis of the goodness-of-fit index of the overall model showed that it now adequately fits the observed data, with all five indices meeting

the acceptance criteria. These indices are: $\chi 2/df = 1.842$, GFI = .875, CFI = .961, TLI =.952, NFI = .919, RMSEA = .038, and SRMR = .0464. Hence, it can be concluded that the structural equation model is now congruent with the observed data. In analyzing the beta coefficients (β) representing the relationships between variables, the values ranged from .017 to .699, as shown in Table 3.

Table 3 Standardized Coefficients (β) of the Relationships between Variables

Path	Hypothesis	Path Coefficient (β)	S.E.	t-value	Interpretation
ATT ⟶ INT	H1	.286***	0.076	4.149	Supported
SN ⟶ INT	H2	.201***	0.048	4.069	Supported
PBC ⟶ INT	H3	.054	0.073	.873	Unsupported
EC ⟶ INT	H4	.202***	0.059	3.740	Supported
HC ⟶ INT	H5	-.017	0.068	-.361	Unsupported
MN ⟶ INT	H6	.075	1.515	1.515	Unsupported
INT ⟶ AB	H7	.640***	0.047	13.510	Supported
INT ⟶ WOM	H8	.699***	0.038	16.777	Supported
WOM ⟶ AB	H9	.230***	0.048	5.143	Supported

Remark: $R^2_{INT} = .77$, $R^2_{WOM} = .49$, $R^2_{AB} = .67$ ***P < .001

The structural equation model analysis revealed several significant direct effects. Firstly, consumers' attitudes towards plant-based food products (ATT) significantly influenced their plant-based food products adoption intention (INT) (β = .286, p < .001). Similarly, subjective norms (SN) exerted a significant favourable influence on adoption intention (INT) (β = .201, p < .001). Additionally, environmental concern (EC) also had a significant positive effect on adoption intention (INT) (β = .202, p < .001). Furthermore, plant-based food products adoption intention (INT) significantly predicted actual behaviour (AB) towards plant-based food products (β = .640, p < .001), as well as word-of-mouth communication (WOM) about these products (β = .699, p < .001). Conversely, WOM also significantly influenced actual behaviour (AB) (β = .230, p < .001), as shown in Figure 2.

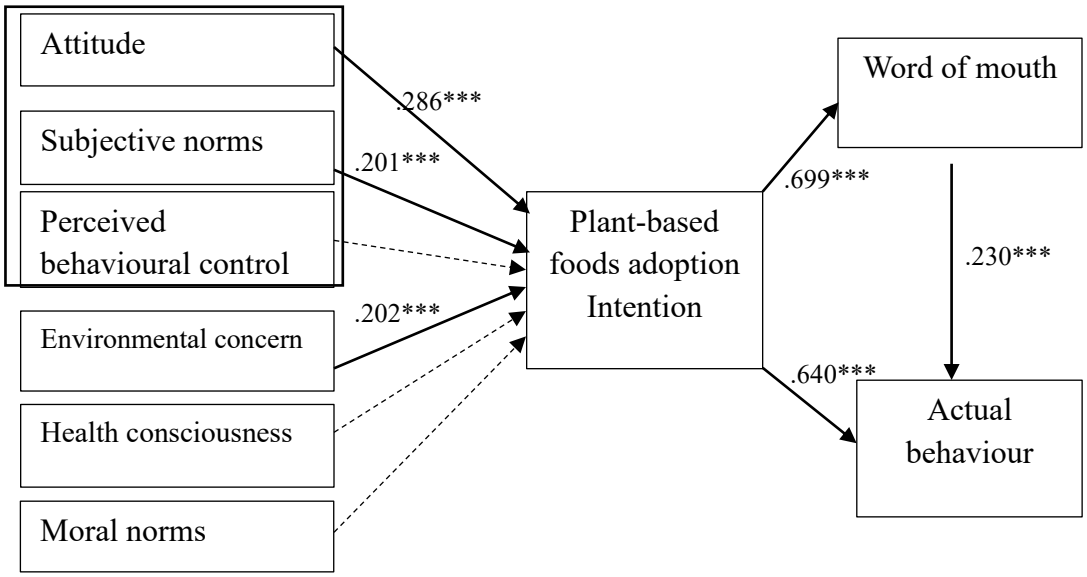

Figure 2 Path Analysis

After model modification, the goodness-of-fit indices indicated a satisfactory fit between the model and the observed data: $\chi^2/df = 1.842$, GFI = .875, CFI = .961, TLI = .952, NFI = .919, RMSEA = .038, SRMR = .0464, satisfying the recommended thresholds. The coefficients of determination (R^2) for adoption intention (INT), actual behaviour (AB), and word-of-mouth communication (WOM) were .77, .67, and .49, respectively. Notably, the mediation analysis revealed significant indirect effects. Specifically, when not mediated by word-of-mouth communication, the direct effect (DE) from intention to accept (INT) to actual behaviour (AB) was .640 ($p < .001$). Conversely, when word-of-mouth communication acted as a mediator (TE), the total effect increased to .801 ($p < .001$).

Table 4 Standardized Coefficients of Direct Effects (DE), Indirect Effects (IE), and Total Effects (TE)

Variable	**R^2**	**Antecedences**					
		INT			**WOM**		
		DE	**IE**	**TE**	**DE**	**IE**	**TE**
WOM	.49	.699***	-	.699***	-	-	-
AB	.67	.640***	.161***	.801***	.230***	-	.230***

Remark: *P < .05, **P < .01, ***P < .001

Therefore, the research identified that word-of-mouth communication is a partial mediator between the plant-based food products adoption intention and the actual behaviour of plant-based food products.

5. Discussion and Conclusion

From the study on consumer acceptance of environmental innovation products in Thailand, with a case study on plant-based food products, it was found that attitudes towards plant-based food products, subjective norms, and environment concern influence the plant-based food products adoption intention. Factors that do not affect the intention to adopt plant-based food include perceived behavioural control, health consciousness, and moral norms. Additionally, the plant-based foods adoption intention was found to influence the actual behavior of plant-based foods and word-of-mouth communication.

Attitudes towards plant-based food products influence the intention to accept them positively, consistent with the research by [14], [17], [56]. Similarly, subjective norms significantly influence the intention to adopt plant-based food products among Thai consumers, aligning with the studies by [16], [26], [57]. Moreover, environmental concern positively influences the intention to adopt plant-based food products, consistent with the research by [14], [17], [43]. Consumers with environmental concern are more inclined to adopt plant-based foods.

Perceived behavioural control does not influence the intention to adopt plant-based food products among Thai consumers, consistent with [26]. This could be due to the need for more awareness among consumers about the benefits of plant-based foods compared to animal-based foods. Similarly, health consciousness does not significantly affect the intention to accept plant-based food products, aligning with the findings of [14], [58]. Consumers' concerns about health may translate into something other than the intention to accept plant-based foods due to perceptions of nutritional deficiencies or health risks associated with plant-based diets.

Moral norms do not influence the plant-based food products adoption intention, consistent with [26] and [54]. However, it is noteworthy that Thai consumers may agree with animal welfare principles but may not necessarily reduce their consumption of animal products.

The relationship between the intention to adopt plant-based food products and actual behaviour aligns with the Theory of Planned Behavior [9], as shown in the studies by [42] and [12]. Additionally, word-of-mouth communication is influenced by the intention to accept

innovations [40], consistent with [41]. Word-of-mouth communication drives environmentally friendly purchasing behaviour.

In summary, the study on consumer acceptance of environmental innovation products in Thailand, mainly on plant-based food products, reveals several significant findings. Attitudes towards plant-based food products, subjective norms, and environmental concern all play pivotal roles in influencing the intention to adopt such products. Conversely, perceived behavioural control, health consciousness, and moral norms do not significantly impact the intention to adopt plant-based food products. The intention to adopt plant-based food products positively affects both the behaviour of accepting plant-based foods and word-of-mouth communication. This aligns with previous research indicating that positive attitudes towards plant-based foods and environmental concern are strong drivers of adoption. However, perceived behavioural control, health consciousness, and moral norms do not sway consumers' intentions. Ultimately, the relationship between adoption intentions and actual behaviour, as well as the impact of word-of-mouth communication, underscores the importance of individual decisions in shaping consumption patterns and communication dynamics.

6. Recommendations

6.1 Academic contributions

The theory of Planned Behavior (TPB) was applied to predict and understand human behaviour, particularly concerning the adoption of plant-based food products. The study confirmed the suitability of TPB in studying human behaviour, especially in the context of food products. It was found that attitudes towards plant-based food products and subjective norms significantly influence the intention to adopt them, consistent with TPB. However, perceived behavioural control did not affect the intention to accept plant-based foods, possibly due to contextual differences. Additionally, this study highlighted the importance of contextual factors when studying consumer behaviour, as societal norms, environmental pressures, knowledge levels, and lifestyle beliefs vary across regions. Therefore, research outcomes are specific to particular contexts, and understanding the nuances of each context is crucial for effective interventions [59] .

The study, focusing on Thai consumers, emphasized the importance of understanding the specific context of different regions. In this study, other variables or factors related to the intention to accept plant-based food products were explored beyond those proposed by TPB. Factors such

as societal structure, social pressures, the pace of innovation acceptance, environmental impacts, knowledge levels, and lifestyle beliefs vary across regions. Thus, research outcomes are context-specific, and tailoring interventions to each context is essential for effective results.

6.2 Managerial contributions

The study revealed that linking information about the environmental impacts of meat production to plant-based food consumption could motivate consumers to embrace plant-based diets. [58] found that high environmental awareness significantly influences consumer intention to consume plant-based foods. This highlights the potential for utilizing environmental motivations in food communication strategies tailored to different consumer segments' assessment abilities and preferences, particularly by governmental organizations. Providing environmental impact information per consumers' preferences can increase awareness about the ecological implications of meat consumption.

Social norms remain influential for Thai consumers, as individuals tend to value the opinions and behaviours of their social groups. Family, friends, colleagues, and admired individuals affect individuals' attitudes and behaviours, including the acceptance of plant-based foods [60]. Leveraging influential individuals or groups in marketing strategies can build consumer trust, confidence, and intent to accept plant-based products, facilitating market penetration and adoption.

6.3 Recommendations for Future Research

This study focused on innovative food products, mainly plant-based foods, which are sensitive to consumer preferences due to direct consumption. Future studies could explore other factors influencing consumers' decisions to accept plant-based products. Considering demographic variables such as age, gender, and education level and employing mixed-method research approaches could provide more comprehensive insights into predicting consumer acceptance of plant-based foods.

Conflicts of Interest: The authors declare that there are no conflicts of interest regarding the publication of this paper.

Reference

[1] FAO, FAO World Livestock 2011: Livestock in Food Security, Food and Agriculture Organization of the United Nations, Rome, Italy, 2011. http://www.fao.org/3/i2373e/i2373e.pdf, Accessed on 17 August 2023.

[2] B.E. Balassa, N.G. Nagy, N. Gyurián, Perception and Social Acceptance of 5G Technology for Sustainability Development, J. Clean. Product. 467 (2024), 142964. https://doi.org/10.1016/j.jclepro.2024.142964.

[3] J. He, N.M. Evans, H. Liu, S. Shao, A Review of Research on Plant-Based Meat Alternatives: Driving Forces, History, Manufacturing, and Consumer Attitudes, Comp. Rev. Food Sci. Food Safe. 19 (2020), 2639–2656. https://doi.org/10.1111/1541-4337.12610.

[4] I. Ajzen, The Theory of Planned Behavior, Organ. Behav. Hum. Decis. Process. 50 (1991), 179–211. https://doi.org/10.1016/0749-5978(91)90020-t.

[5] R. Weinrich, Opportunities for the Adoption of Health-Based Sustainable Dietary Patterns: A Review on Consumer Research of Meat Substitutes, Sustainability 11 (2019), 4028. https://doi.org/10.3390/su11154028.

[6] M. Farzin, M. Fattahi, eWOM through Social Networking Sites and Impact on Purchase Intention and Brand Image in Iran, J. Adv. Manage. Res. 15 (2018), 161–183. https://doi.org/10.1108/jamr-05-2017-0062.

[7] I. Ajzen, From Intentions to Actions: A Theory of Planned Behavior, in: J. Kuhl, J. Beckmann (Eds.), Action Control, Springer Berlin Heidelberg, Berlin, Heidelberg, 1985: pp. 11–39. https://doi.org/10.1007/978-3-642-69746-3_2.

[8] I. Ajzen, Understanding Attitudes and Predictiing Social Behavior, Prentice-Hall, 1980.

[9] M.S. Dinc, S. Budic, The Impact of Personal Attitude, Subjective Norm, and Perceived Behavioural Control on Entrepreneurial Intentions of Women, Eurasian J. Bus. Econ. 9 (2016), 23–35. https://doi.org/10.17015/ejbe.2016.017.02.

[10] S.C. Chen, C.-W. Hung, Elucidating the Factors Influencing the Acceptance of Green Products: An Extension of Theory of Planned Behavior, Technol. Forecast. Soc. Change. 112 (2016), 155–163. https://doi.org/10.1016/j.techfore.2016.08.022.

[11] D. Jaiswal, R. Kant, Green Purchasing Behaviour: A Conceptual Framework and Empirical Investigation of Indian Consumers, J. Retail. Consum. Serv. 41 (2018), 60–69. https://doi.org/10.1016/j.jretconser.2017.11.008.

[12] A. Al Mamun, M.R. Mohamad, M.R.B. Yaacob, M. Mohiuddin, Intention and Behavior towards Green Consumption among Low-Income Households, J. Environ. Manage. 227 (2018), 73–86. https://doi.org/10.1016/j.jenvman.2018.08.061.

[13] C. Contini, F. Boncinelli, E. Marone, G. Scozzafava, L. Casini, Drivers of Plant-Based Convenience Foods Consumption: Results of a Multicomponent Extension of the Theory of Planned Behaviour, Food Qual. Prefer. 84 (2020), 103931. https://doi.org/10.1016/j.foodqual.2020.103931.

[14] O. Wang, F. Scrimgeour, Willingness to Adopt a More Plant-Based Diet in China and New Zealand: Applying the Theories of Planned Behaviour, Meat Attachment and Food Choice Motives, Food Qual. Prefer. 93 (2021), 104294. https://doi.org/10.1016/j.foodqual.2021.104294.

[15] İ. Arısal, T. Atalar, The Exploring Relationships between Environmental Concern, Collectivism and Ecological Purchase Intention, Procedia - Soc. Behav. Sci. 235 (2016), 514–521. https://doi.org/10.1016/j.sbspro.2016.11.063.

[16] W. Zhuang, X. Luo, M.U. Riaz, On the Factors Influencing Green Purchase Intention: A Meta-Analysis Approach, Front. Psychol. 12 (2021), 644020. https://doi.org/10.3389/fpsyg.2021.644020.

[17] Y.C. Shen, H.-S. Chen, Exploring Consumers' Purchase Intention of an Innovation of the Agri-Food Industry: A Case of Artificial Meat, Foods 9 (2020), 745. https://doi.org/10.3390/foods9060745.

[18] H.S. Chen, Towards Environmentally Sustainable Diets: Consumer Attitudes and Purchase Intentions for Plant-Based Meat Alternatives in Taiwan, Nutrients 14 (2022), 3853. https://doi.org/10.3390/nu14183853.

[19] M.F. Chen, Consumer Food Choice Motives and Willingness to Try Plant-Based Meat: Moderating Effect of Meat Attachment, Br. Food J. 126 (2023), 1301–1324. https://doi.org/10.1108/bfj-04-2023-0330.

[20] J. Szenderák, D. Fróna, M. Rákos, Consumer Acceptance of Plant-Based Meat Substitutes: A Narrative Review, Foods 11 (2022), 1274. https://doi.org/10.3390/foods11091274.

[21] X. Qi, A. Ploeger, Explaining Chinese Consumers' Green Food Purchase Intentions during the COVID-19 Pandemic: An Extended Theory of Planned Behaviour, Foods 10 (2021), 1200. https://doi.org/10.3390/foods10061200.

[22] R. Yadav, G.S. Pathak, Intention to Purchase Organic Food among Young Consumers: Evidences from a Developing Nation, Appetite 96 (2016), 122–128. https://doi.org/10.1016/j.appet.2015.09.017.

[23] S.K. Shah, T. Zhongjun, A. Sattar, Z. XinHao, Consumer's Intention to Purchase 5G: Do Environmental Awareness, Environmental Knowledge and Health Consciousness Attitude Matter?, Technol. Soc. 65 (2021), 101563. https://doi.org/10.1016/j.techsoc.2021.101563.

[24] X. Wang, F. Pacho, J. Liu, R. Kajungiro, Factors Influencing Organic Food Purchase Intention in Developing Countries and the Moderating Role of Knowledge, Sustainability 11 (2019), 209. https://doi.org/10.3390/su11010209.

[25] S. Nagaraj, Role of Consumer Health Consciousness, Food Safety & Attitude on Organic Food Purchase in Emerging Market: A Serial Mediation Model, J. Retail. Consum. Serv. 59 (2021), 102423. https://doi.org/10.1016/j.jretconser.2020.102423.

[26] N. Marcus, J. Klink-Lehmann, M. Hartmann, Exploring Factors Determining German Consumers' Intention to Eat Meat Alternatives, Food Qual. Prefer. 100 (2022), 104610. https://doi.org/10.1016/j.foodqual.2022.104610.

[27] S. Jain, M.N. Khan, S. Mishra, Understanding Consumer Behavior Regarding Luxury Fashion Goods in India Based on the Theory of Planned Behavior, J. Asia Bus. Stud. 11 (2017), 4–21. https://doi.org/10.1108/jabs-08-2015-0118.

[28] I. Hameed, I. Waris, M. Amin ul Haq, Predicting Eco-Conscious Consumer Behavior Using Theory of Planned Behavior in Pakistan, Environ. Sci. Pollut. Res. 26 (2019), 15535–15547. https://doi.org/10.1007/s11356-019-04967-9.

[29] C.A. Klöckner, A Comprehensive Model of the Psychology of Environmental Behaviour—A Meta-Analysis, Glob. Environ. Change 23 (2013), 1028–1038. https://doi.org/10.1016/j.gloenvcha.2013.05.014.

[30] M.T. Liu, Y. Liu, Z. Mo, Moral Norm Is the Key: An Extension of the Theory of Planned Behaviour (TPB) on Chinese Consumers' Green Purchase Intention, Asia Pac. J. Market. Log. 32 (2020), 1823-1841. https://doi.org/10.1108/APJML-05-2019-0285.

[31] R. Saleki, F. Quoquab, J. Mohammad, What Drives Malaysian Consumers' Organic Food Purchase Intention? The Role of Moral Norm, Self-Identity, Environmental Concern and Price Consciousness, J. Agribus. Dev. Emerg. Econ. 9 (2019), 584–603. https://doi.org/10.1108/jadee-02-2019-0018.

[32] H.V. Nguyen, N. Nguyen, B.K. Nguyen, S. Greenland, Sustainable Food Consumption: Investigating Organic Meat Purchase Intention by Vietnamese Consumers, Sustainability 13 (2021), 953. https://doi.org/10.3390/su13020953.

[33] D.L. Rosenfeld, The Psychology of Vegetarianism: Recent Advances and Future Directions, Appetite 131 (2018), 125–138. https://doi.org/10.1016/j.appet.2018.09.011.

[34] M.T. Liu, Y. Liu, Z. Mo, Moral Norm is the Key, Asia Pac. J. Mark. Logist. 32 (2020), 1823–1841. https://doi.org/10.1108/apjml-05-2019-0285.

[35] U. Fresán, S. Errendal, W.J. Craig, Influence of the Socio-Cultural Environment and External Factors in Following Plant-Based Diets, Sustainability 12 (2020), 9093. https://doi.org/10.3390/su12219093.

[36] M.C. Onwezen, E.P. Bouwman, M.J. Reinders, H. Dagevos, A Systematic Review on Consumer Acceptance of Alternative Proteins: Pulses, Algae, Insects, Plant-Based Meat Alternatives, and Cultured Meat, Appetite 159 (2021), 105058. https://doi.org/10.1016/j.appet.2020.105058.

[37] N. K. Denzin and Y. S. Lincoln, The Sage Handbook of Qualitative Research, Sage, 2011.

[38] H. Li, Y. Liu, R. Suomi, Exploring the Factors Motivating e-Service Users' WOM Behaviour, Int. J. Serv. Technol. Manage. 19 (2013), 187-200. https://doi.org/10.1504/ijstm.2013.055633.

[39] H. Choo, J. Chung, D. Thorndike Pysarchik, Antecedents to New Food Product Purchasing Behavior among Innovator Groups in India, Eur. J. Market. 38 (2004), 608–625. https://doi.org/10.1108/03090560410529240.

[40] M. Farzin, M. Sadeghi, F. Yahyayi Kharkeshi, H. Ruholahpur, M. Fattahi, Extending UTAUT2 in M-Banking Adoption and Actual Use Behavior: Does WOM Communication Matter?, Asian J. Econ. Bank. 5 (2021), 136–157. https://doi.org/10.1108/ajeb-10-2020-0085.

[41] J.A. Román-Augusto, C. Garrido-Lecca-Vera, M.L. Lodeiros-Zubiria, M. Mauricio-Andia, Green Marketing: Drivers in the Process of Buying Green Products—The Role of Green Satisfaction, Green Trust, Green WOM and Green Perceived Value, Sustainability 14 (2022), 10580. https://doi.org/10.3390/su141710580.

[42] M. Altawalbeh, A.M. Al-Mughrabi, Using the TPB Model to Determine Factors Affecting e-Learning Adoption in Jordanian Higher Education, Int. J. Innov. Res. Sci. Stud. 7 (2024), 627–637. https://doi.org/10.53894/ijirss.v7i2.2746.

[43] P. Kamalanon, J.S. Chen, T.T.Y. Le, "Why Do We Buy Green Products?" An Extended Theory of the Planned Behavior Model for Green Product Purchase Behavior, Sustainability 14 (2022), 689. https://doi.org/10.3390/su14020689.

[44] H.V. Nguyen, C.H. Nguyen, T.T.B. Hoang, Green Consumption: Closing the Intention-Behavior Gap, Sustain. Dev. 27 (2018), 118–129. https://doi.org/10.1002/sd.1875.

[45] R. Weinrich, Opportunities for the Adoption of Health-Based Sustainable Dietary Patterns: A Review on Consumer Research of Meat Substitutes, Sustainability 11 (2019), 4028. https://doi.org/10.3390/su11154028.

[46] H.V. Nguyen, N. Nguyen, B.K. Nguyen, A. Lobo, P.A. Vu, Organic Food Purchases in an Emerging Market: The Influence of Consumers' Personal Factors and Green Marketing Practices of Food Stores, Int. J. Environ. Res. Public Health 16 (2019), 1037. https://doi.org/10.3390/ijerph16061037.

[47] I.A. Malik, N.U. Hadi, Inspirational Factors of Electronic Word of Mouth: A Case of Social Networking Sites, J. Manag. Sci. 13 (2019), 253–254.

[48] L. Zhang, D. Li, C. Cao, S. Huang, The Influence of Greenwashing Perception on Green Purchasing Intentions: The Mediating Role of Green Word-Of-Mouth and Moderating Role of Green Concern, J. Clean. Prod. 187 (2018), 740–750. https://doi.org/10.1016/j.jclepro.2018.03.201.

[49] K. Maichum, S. Parichatnon, K.C. Peng, The Influence of Environmental Concern and Environmental Attitude on Purchase Intention Towards Green Products: A Case Study of Young Consumers in Thailand, Int. J. Bus. Mark. Manag. 2 (2017), 1–8.

[50] R.J. Rovinelli, R.K. Hambleton, On the Use of Content Specialists in the Assessment of Criterion-Referenced Test Item Validity, Dutch J. Educ. Res. 2 (1977), 49-60.

[51] W.G. Zikmund, Business Research Methods, Dryden Press, 2013.

[52] H.H. Harman, How Factor Analysis Can Be Used in Classification, Wiley, 1971.

[53] J. Stevens, Applied Multivariate Statistics for the Social Sciences, Routledge, 2002.

[54] J.F. Hair Jr, W.C. Black, B.J. Babin, R.E. Anderson, Multivariate Data Analysis: A Global Perspective, Pearson, Upper Saddle River, 2010.

[55] J.F. Hair, P.N. Sharma, M. Sarstedt, C.M. Ringle, B.D. Liengaard, The Shortcomings of Equal Weights Estimation and the Composite Equivalence Index in PLS-SEM, Eur. J. Market. 58 (2024), 30–55. https://doi.org/10.1108/ejm-04-2023-0307.

[56] E. Martinelli, F. De Canio, Non-Vegan Consumers Buying Vegan Food: The Moderating Role of Conformity, Br. Food J. 124 (2021), 14–30. https://doi.org/10.1108/bfj-01-2021-0023.

[57] T. Roh, J. Seok, Y. Kim, Unveiling Ways to Reach Organic Purchase: Green Perceived Value, Perceived Knowledge, Attitude, Subjective Norm, and Trust, J. Retail. Cons. Serv. 67 (2022), 102988. https://doi.org/10.1016/j.jretconser.2022.102988.

[58] V. Carfora, M. Morandi, P. Catellani, Predicting and Promoting the Consumption of Plant-Based Meat, Br. Food J. 124 (2022), 4800–4822. https://doi.org/10.1108/bfj-07-2021-0829.

[59] A. Rickerby, R. Green, Barriers to Adopting a Plant-Based Diet in High-Income Countries: A Systematic Review, Nutrients 16 (2024), 823. https://doi.org/10.3390/nu16060823.

[60] K.L. Markowski, S. Roxburgh, "If I Became a Vegan, My Family and Friends Would Hate Me:" Anticipating Vegan Stigma as a Barrier to Plant-Based Diets, Appetite 135 (2019), 1–9. https://doi.org/10.1016/j.appet.2018.12.040.