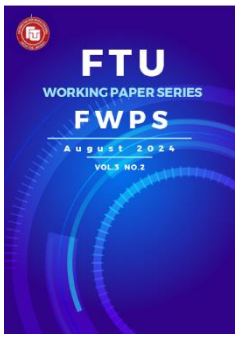

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KHÁM PHÁ CÁC NHÂN TỐ ẢNH HƯỞNG ĐẾN Ý ĐỊNH TIÊU DÙNG THỊT CÓ NGUỒN GỐC TỪ THỰC VẬT: ÁP DỤNG LÝ THUYẾT HÀNH VI DỰ ĐỊNH

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Tóm tắt

Thịt có nguồn gốc từ thực vật đang nhận được nhiều sự chú ý từ giới nghiên cứu và các doanh nghiệp chế biến thực phẩm bởi lợi ích của sản phẩm đối với cá nhân và môi trường, hướng tới mục tiêu phát triển bền vững. Nghiên cứu điều tra ảnh hưởng của các nhân tố chính trong mô hình Lý thuyết hành vi dự định (TPB) kết hợp với các yếu tố nội tại của sản phẩm thịt thực vật tới ý định tiêu dùng của người Việt Nam. Nhóm nghiên cứu đã thu thập và phân tích thông tin từ 229 người tiêu dùng kết hợp sử dụng mô hình cấu trúc tuyến tính bình phương nhỏ nhất từng phần (PLS – SEM) để kiểm tra tác động qua lại của các yếu tố trong mô hình. Kết quả cho thấy, người tiêu dùng có xu hướng bị ảnh hưởng mạnh mẽ nhất bởi quy chuẩn chủ quan và nhận thức kiểm soát hành vi. Dựa trên những kết quả này, nhóm nghiên cứu cũng đề xuất các khuyến nghị cho các nhà hoạch định chính sách và doanh nghiệp chế biến thực phẩm để khuyến khích người tiêu dùng sử dụng các sản phẩm có nguồn gốc từ thực vật.

Từ khóa: thịt có nguồn gốc từ thực vật, ý định tiêu dùng, PLS – SEM

APPLYING THE THEORY OF PLANNED BEHAVIOR TO EXAMINE FACTORS INFLUENCING INTENTION TO CONSUME PLANT-BASED MEAT

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Abstract

Plant-based meat, which originates from plants, is receiving significant attention from researchers and food processing businesses due to its benefits for individuals and the environment, aligning with the world's sustainable development goals. This study was conducted to investigate the influence of key factors in the TPB model combined with intrinsic factors of plant-based meat products (product benefits, barriers, and sensory characteristics) on the consumption intentions of Vietnamese consumers. The research team collected and analyzed information from 229 consumers, using a partial least squares structural equation modeling (PLS-SEM) approach to examine the interrelationships among the factors in the model. The results showed that consumers were most strongly influenced by subjective norms and perceived behavioral control. Based on these findings, the research team also proposed recommendations for policymakers and food processing businesses to encourage consumer usage of plant-based products.

Keywords: plant-based meat, consumption intentions, PLS-SEM

1. Introduction

Since 2015, world leaders have committed to achieving the 17 Sustainable Development Goals (SDGs) of the United Nations by 2030, with the number of research studies on sustainable growth steadily increasing (Griggs et al., 2013; United Nations, 2020). Among these, sustainable diets are gradually gaining acceptance due to their positive impacts on the environment, community health, and social well-being (Faber et al., 2020; Graça et al., 2019; Lang, 2020). Sustainable diets are defined as diets with minimal environmental impact that contribute to ensuring food and nutrition security, thereby safeguarding biodiversity and ecosystems (Burlingame & Dernini, 2012). Awareness of sustainable diets has led to an increase in demand for alternative foods (Grasso et al., 2020), prompting many people to shift towards plant-based diets (Mintel Group, 2016). Plant-based or animal-based substitute products are considered environmentally sustainable due to their ability to reduce negative environmental impacts (Hallstrom et al., 2015; Auestad & Fulgoni, 2015). A study in Denmark (Werner et al., 2014) revealed that greenhouse gas emissions in a typical diet are 48% higher than in a plant-based diet. Furthermore, due to the increasing environmental impact of the livestock industry, alternative protein sources such as plant-based protein are becoming increasingly essential globally (Aschemann et al., 2020). Transitioning to a plant-based diet can not only improve the sustainability of the food industry and its environmental impact (Haas et al., 2019; Zhang et al., 2020) but also has numerous health benefits (Fan et al., 2019; Satija et al., 2016). However, in Vietnam, this is a relatively new topic, and the applicability of research results from abroad to Vietnam is low due to differences in economic, political, social, and cultural aspects.

Especially when analyzing the predictive behavior intention of consumers using plant-based foods, no research has provided analyses based on intrinsic factors of products impacting attitudes and consumption intentions along with factors in the TPB model. Based on this, the research team has decided to focus on studying the factors influencing the intention to consume plant-based meat to better understand and analyze the reasons affecting consumer choices for this product. Thus, the study will serve as a foundation to help food businesses better

understand customer needs and psychology, providing a basis for larger-scale studies to support the development of the plant-based food production industry.

2. Literature review and hypothesis development

2.1. The theory of planned behavior

The theory of planned behavior (TPB) has been successfully applied in the past to understand and predict behaviors related to food consumption, including studies on healthy diets (McDermott et al., 2015), dietary behaviors (McEachan et al., 2011), functional foods (Patch et al., 2005; Menozzi et al., 2017), and green food consumption (Zhu et al., 2013). Previous studies have shown that attitudes, subjective norms, and perceived behavioral control positively influence the intention to choose plant-based substitute products (Povey et al., 2001; Wyker et al., 2010). According to Hank (2017), individuals with strong subjective perceptions of meat are more likely to adopt a vegetarian diet, influenced by differences in perceptions, ethics, and self-identification processes of individual consumers and those around them. Thus, subjective standards significantly impact the desire and intention to consume plant-based meat. This study also demonstrates that the intention/behavior of purchasing plant-based meat by consumers is heavily influenced by subjective standards regarding the environment, health, and economics. Those who are concerned or heavily influenced by social pressure regarding responsibility and ethics tend to consume more plant-based meat (Han-Shen Chen, 2022). According to Povey et al. (2001), perceived behavioral control is the strongest predictor of the intention to consume plant-based meat. Individuals accustomed to omnivorous or animal meat consumption may struggle when transitioning to a vegetarian diet. Although this conclusion contradicts the findings of Conner and Van (1993) that attitude is the most important factor influencing the intention to consume plant-based meat, it provides a clearer explanation of behavior. This means that to transition their diet to predominantly plant-based, individuals must manage what they eat and adjust their behavior deliberately; otherwise, they cannot achieve the attitudes and societal standards that drive action or create intention. Based on the assumptions of TPB, this study aims to test the following hypotheses

Hypothesis 1 (H1): Attitude positively influences the intention to consume plant-based meat.

Hypothesis 2 (H2): Subjective norms positively influence the intention to consume plant-based meat.

Hypothesis 3 (H3): Perceived behavioral control positively influences the intention to consume plant-based meat.

2.2. Extended theory of planned behavior

The theory of planned behavior (TPB) has been demonstrated in numerous experimental studies and is one of the most influential theories for predicting human behavior. However, some researchers do not support TPB due to its limitations in predicting more complex behaviors (Dunn et al., 2011; Paul et al., 2016). Therefore, researchers have extended TPB by integrating additional factors influencing consumer intentions and utilizing supplementary

structures within the TPB framework to improve predictability (Yadav et al., 2016; Nguyen et al., 2019). Based on previous research and literature synthesis, this study attempts to incorporate three variables into the TPB framework when predicting the intention to use plant-based meat, namely product benefits, perceived barriers, and sensory attributes.

Plant-based meat demonstrates numerous humane values while reducing negative impacts on animals (Jiang He, 2020), along with environmental and health benefits, which have significantly influenced consumer intentions and behaviors towards consuming plant-based meat in many Western countries (Hopwood et al., 2020). Ye and Mattila (2021) studied the effectiveness of social benefits in enhancing the consumption of plant-based meat. Their findings indicate that emphasizing social benefits (environmental benefits and animal welfare) has a stronger impact than increasing taste satisfaction through positive experiences when demonstrating that consumers are doing well.

Hypothesis 4a (H4a): Product benefits positively influence consumption attitudes.

Hypothesis 4b (H4b): Product benefits positively influence the intention to consume plant-based meat.

Pohjolainen et al. (2015) found various barriers to adopting a plant-based diet. Lack of cooking skills, misconceptions about healthy eating, difficulties in accessibility (where to buy, suitable preparation, recipes, etc.), ingredient availability, and the belief that plant-based meat tastes unappealing (Hielkema et al., 2021; Reipurth et al., 2019). Furthermore, Pohjolainen (2015) indicated that obstacles to consuming plant-based meat are not fixed when considering other socio-cultural variables and motivations, but they influence individual determinants of desire to consume plant-based meat.

Hypothesis 5a (H5a): Product barriers negatively influence consumption attitudes.

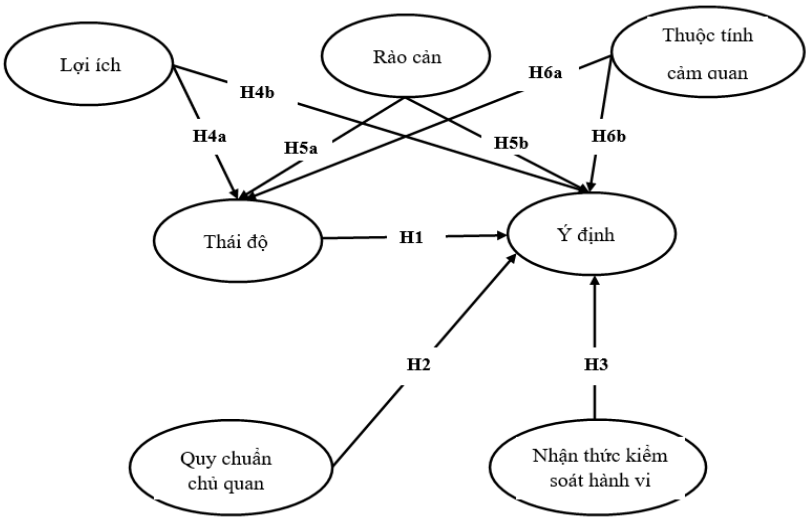
Hypothesis 5b (H5b): Product barriers negatively influence the intention to consume plant-based meat.

Sensory attributes, such as visual, olfactory, gustatory, and textural aspects of food that human senses can perceive, are often used to evaluate food quality. According to the findings of Marcel Pointke and colleagues (2022), the sensory attributes of plant-based meat products are rated quite highly and are a key predictive factor in increasing acceptance and purchase intentions of plant-based products (Bryant et al., 2019; Trindade et al., 2001).

Hypothesis 6a (H6a): Sensory attributes positively influence consumption attitudes.

Hypothesis 6b (H6b): Sensory attributes positively influence the intention to consume plant-based meat.

Figure 1. Proposed conceptual model



3. Method

3.1. Questionnaire design

The survey questions were constructed by the research team based on referencing previous research questionnaires and modified to fit the scope and purpose of the study. The survey includes questions about participants' personal information, daily food consumption habits, and perceptions of factors influencing the intention to consume plant-based meat. To study the factors influencing the intention to consume plant-based meat, the authors designed the questionnaire using a 5-point Likert scale: (1) Completely disagree; (2) Disagree; (3) Neutral; (4) Agree; (5) Completely agree. Survey participants will select levels 1 to 5 for statements based on their agreement with those statements.

Table 1. The measurement scale of the proposed constructs

Construct/Items	Item code	Reference
Benefits		
Plant-based meat provides all the necessary nutrients like animal-derived meat.	BE1	Pandey et al. (2020), Feher et al. (2020), Wang & Scrimgeour (2021)
Plant-based meat helps protect animal species.	BE2	
Plant-based meat from plants brings many health benefits.	BE3	

Consuming plant-based meat helps reduce the consumption of natural resources.	BE4	
Plant-based meat helps reduce the amount of CO2 emissions into the environment.	BE5	
Barriers		
Plant-based meat is not widely available in stores.	BA1	Pandey et al. (2020), Feher et al. (2020)
The cost of plant-based meat is higher than animal-derived meat.	BA2	
There are fewer dishes that can be prepared with plant-based meat.	BA3	
Plant-based meat is more difficult to preserve compared to animal-derived meat.	BA4	
Sensory		
The taste of plant-based meat is better than animal-derived meat.	SE1	Pandey et al. (2020)
Plant-based meat looks more appealing than animal-derived meat.	SE2	
The smell of plant-based meat is more aromatic than animal-derived meat.	SE3	
Plant-based meat is softer than animal-derived meat.	SE4	
Attitude		
I feel comfortable when using plant-based meat.	AT1	Pandey et al. (2020), Wang & Scrimgeour (2021)
I feel confident when using plant-based meat because it's good for my health.	AT2	
I feel responsible for the environment when using plant-based meat.	AT3	
I feel socially responsible when using plant-based meat.	AT4	

Social norm		
My decision to purchase plant-based meat is influenced by those around me.	SN1	Pandey et al. (2020), Wang & Scrimgeour (2021)
My family and friends often discuss and encourage me to use plant-based meat.	SN2	
My workplace/organizations/school regularly provide information and encourage the use of plant - based meat.	SN3	
Media outlets frequently provide information and encourage the use of plant-based meat.	SN4	
Perceived behavior control		
I make the decision to purchase plant-based meat products myself.	PBC1	Ajzen (1991), Han et al.(2010), Pandey et al. (2020), Wang & Scrimgeour (2021)
I actively seek out places that sell products made from plant-based meat.	PBC2	
I have the financial capability to purchase plant-based meat products.	PBC3	
Intention		
I will actively seek out plant-based meat at stores and supermarkets.	INT1	Pandey et al. (2020), Nguyen et al. (2021)
I am willing to pay more to purchase plant-based meat for better health.	INT2	
I intend to buy plant-based meat to minimize environmental issues.	INT3	
I will seek information and share information about plant-based meat with everyone around me.	INT4	

3.2. Data collection

The research team conducted a survey on the Qualtrics platform in Hanoi over a period of 4 weeks from March 16th to April 16th. The team collected data using a random sampling method and obtained 229 valid survey samples. In the research paper, the team proposed 9

hypotheses, so the minimum sample size required is 90 samples. This sample size meets the requirements for PLS-SEM statistics and is suitable for further research.

4. Data analysis and results

4.1. Descriptive statistics

After checking and filtering the data, there were 229 valid survey samples for analysis, representing diverse demographic information including gender, age groups, residential and working areas, education levels, occupations, income, and marital status. Regarding gender, 60.3% of survey participants were female, while 39.3% were male. According to the age distribution of the research sample, young adults aged 18 to 22 accounted for the largest proportion with 164 participants (71.6%). In terms of education level, the majority of respondents (88.2%) had a university education. Regarding occupation, there were 152 students participating in the survey, accounting for 66.40% of the research sample, followed by office workers (17.9%). According to the survey on monthly income, due to the majority of participants being students, the income level below 5 million VND accounted for the largest proportion with 66.4%. According to the statistics on marital status, 183 survey participants were still single, accounting for 79.9% of the total.

Table 2. Survey respondent characteristics

	N	**%**		**N**	**%**
Gender			***Occupation***		
Male	90	39,3	Students	152	66,4
Female	138	60,3	Office staff	41	17,9
Others	1	0,4	Self-employed	16	6,6
Age			Others	20	8,7
18 – 22 years old	164	71,6	***Income (VND)***		
23 – 30 years old	41	17,9	Less than 5 million/month	154	66,8
31 – 40 years old	15	6,6	From 5 to less than 10 million/month	34	14,8
41 – 65 years old	9	3,9	From 10 to less than 15 million/month	24	10,5
Level of education			From 15 to less than 20 million/month	12	5,2
High school	3	1,3	From 20 million/month and above	5	2,1
College	3	1,3	***Married status***		
University	202	88,2	Single	183	79,9
Above university	21	9,2	Married, had kid	17	7,4
			Married, no kid	29	12,7

4.2. Measurement model evaluation

4.2.1. Internal consistency

Before conducting the structural model calculation, the team conducted a measurement model validation using Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). The Cronbach's Alpha coefficient ranged from 0.686 to 0.922, which is deemed appropriate according to Churchill's (1979) recommendation that values above 0.6 are acceptable. All constructs achieved Composite Reliability (CR) ranging from 0.814 to 0.960, exceeding the common threshold of 0.7 (Nunnally & Bernstein, 1994).

Factor loadings and AVE were used to assess the convergent validity of the model. As presented in Table 3, factor loading values ranged from 0.715 to 0.922, all exceeding 0.7, indicating high reliability of these items. Only QCCQ3 had a factor loading of 0.686, but this value still falls within an acceptable range as suggested by Hair et al. (2017). The AVE values ranged from 0.637 to 0.789, exceeding the acceptable threshold of 0.5 (Fornell & Larcker, 1981), demonstrating that the measurement model meets the requirements for convergent validity.

Table 3: Evaluation indices for measurement model

Constructs/Items	**Factor loading**	**Cronbach's alpha**	**CR**	**AVE**
Benefits		0,864	0,876	0,646
BE1	0,761			
BE2	0,861			
BE3	0,786			
BE4	0,787			
BE5	0,821			
Barriers		0,861	0,881	0,703
BA1	0,876			
BA2	0,838			
BA3	0,825			
BA4	0,812			
Sensory		0,912	0,960	0,789
SE1	0,908			
SE2	0,900			
SE3	0,922			
SE4	0,820			
Social norm		0,827	0,855	0,655

Constructs/Items	Factor loading	Cronbach's alpha	CR	AVE
SN1	0,805			
SN2	0,882			
SN3	0,686			
SN4	0,851			
Perceived behavior control		0,819	0,828	0,734
PBC1	0,892			
PBC2	0,858			
PBC3	0,819			
Attitude		0,852	0,867	0,694
AT1	0,829			
AT2	0,900			
AT3	0,715			
AT4	0,877			
Intention		0,810	0,814	0,637
INT1	0,828			
INT2	0,757			
INT3	0,768			
INT4	0,837			

4.2.2. Discriminant validity

To determine the distinctiveness of a construct from other constructs within its component, researchers utilized the Fornell-Larcker criterion (Bagozzi & Yi, 1988). If the correlation among latent constructs in the proposed model is smaller than the square root of the average variance extracted (AVE) of that construct, then the discriminant validity of the measurement model is satisfied in this study. The results of the Fornell-Larcker criterion show that the proposed measurement model has valid discriminant distinctiveness. In summary, the measurement model has been tested for the reliability of internal consistency, convergent validity, and discriminant validity, affirming the suitability of the model in this study for measuring the structural model.

Table 4. Fornell-Larcker criterion

`	AVE	BE	PBC	SN	BA	SE	AT	INT
BE	**0,646**	**0,804**						
AT	**0,734**	0,187	**0,857**					
SN	**0,741**	0,457	0,289	**0,809**				
BA	**0,703**	0,352	-0,019	-0,065	**0,838**			
SE	**0,789**	0,279	0,021	-0,023	0,811	**0,888**		
AT	**0,694**	0,423	0,498	0,399	0,147	0,159	**0,833**	
INT	**0,637**	0,301	0,419	0,585	-0,120	-0,029	0,402	**0,798**

4.3. Structural model evaluation

4.3.1. Direct relationship

The direct effects were evaluated using path coefficient values (ß) generated through Bootstrap with 229 cases and 1000 return samples. The results (Table 5) show that 4 out of 9 hypotheses were accepted. Among the three intrinsic aspects of plant-based meat products (benefits, barriers, and sensory attributes), only benefits had a direct and significant impact on attitude towards consuming plant-based meat. Additionally, barriers (ßBA => INT = - 0.226, $p < 0.05$), subjective norms (ßSN => INT = 0.441, $p < 0.05$), and perceived behavioral control (ßPBC => INT = 0.223, $p < 0.05$) all significantly influenced the intention to consume plant-based meat. Subjective norms had the greatest impact on purchase intention, with a ß value of 0.441. This finding suggests that subjective norms are the most important determining factor in encouraging Vietnamese consumers to be interested in and intend to consume plant-based meat. Rejected hypotheses (**H1b, H1c, H2a, H2c, and H3**) indicate that perceived product evaluations and attitudes towards sustainable food are not direct predictors of intention to consume products for meat alternatives.

Table 5: Direct effects evaluation

Path relation (Hypothesis)	Path coefficient	SD	t-stat	p-value	Results
Benefits => Attitude	0,424	0,067	6,332	***	**Accepted**
Barriers => Attitude	-0,102	0,115	0,887	0.375	**Refused**
Sensory => Attitude	0,124	0,108	1,149	0,250	**Refused**

Path relation (Hypothesis)	Path coefficient	SD	t-stat	p-value	Results
Benefits => Intention	0,058	0,076	0,765	0,445	**Refused**
Barriers => Intention	-0,226	0,094	2,393	0.017	**Accepted**
Sensory => Intention	0,127	0,084	1,521	0,128	**Refused**
Attitude => Intention	0,103	0,065	1,578	0,115	**Refused**
Social norm => Intention	0,441	0,059	7,527	***	**Accepted**
Perceived behavior control => Intention	0,223	0,058	3,844	***	**Accepted**

4.3.2. Indirect relationship

The indirect impact test of attitude in causal relationships is proposed in the implementation model by applying the bootstrapping method (Zhao et al., 2010). Table 6 displays all relationships between product intrinsic characteristics and consumer intentions. From the results shown in the table, attitude does not play a significant mediating role in the causal relationship between product characteristics and intentions towards consuming plant-based meat ($p > 0.001$) (Hair et al., 2014).

Table 6: Estimation of the ìdirect effects

Indirect Effects	Path coefficient	SD	t-value	p-value
Sensory => Attitude => Intention	0,013	0,016	0,814	0,416
Benefits => Attitude => Intention	0,044	0,030	1,476	0,140
Barriers => Attitude => Intention	-0,011	0,015	0,682	0,496

4.3.3. Total effect

Table 7 illustrates the aggregate impact of various determinant factors on consumers' intention towards plant-based meat. Subjective norms have the highest total impact on intention, with β**SN** = 0.441, followed by **PBC** (βPBC = 0.223). This finding indicates that subjective norms are the most crucial determinant factor in encouraging Vietnamese consumers to be interested in and intend to consume plant-based meat.

Table 7. Total effect on intention to use plant-based meat

Total effect	Path coefficient	SD	t-value	p-value
Attitude => Intention	0,101	0,072	1,401	0,161
Barriers => Intention	-0,236	0,099	2,392	0,017
Sensory => Intention	0,140	0,088	1,600	0,110
Attitude => Intention	0,103	0,065	1,678	0,015
Subjective norm => Intention	0,441	0,059	7,527	0,000
Perceived behavior control => Intention	0,223	0,058	3,844	0,000

5. Discussion

5.1. Theoretical contribution

Firstly, through the exploratory results, the research team realized that the intrinsic factors of the product did not have much impact on attitude or consumption intention. This could be explained by the fact that plant-based meat is not yet widely popular or used by many people in the Vietnamese market (especially among the young population). Therefore, many survey participants may not have been able to assess the product's advantages to develop the intention to use it, hence the survey results may not have reflected much significance.

Secondly, the study demonstrates the direct and positive influence of subjective norms and perceived behavioral control on consumption intention, while attitude does not have much influence. This differs from many previous studies where the relationship between attitude had the most influence on intention and behavior. However, this also contributes to the supplementation of studies in Western countries and indicates differences for developing Asian countries in promoting the consumption of plant-based products. Effective strategies in the West such as enhancing positive attitudes towards plant-based foods may fail in Asian countries. Additionally, the results show that subjective norms have a strong impact on the intention to consume plant-based meat, unlike previous studies (Graça, Calheiros et al., 2015; Lentz et al., 2018). The study indicates that consumption in Vietnam is heavily influenced by information from peers as well as the mass media (Faber et al., 2020; Vainio, 2019; Wang et al., 2016). From this perspective, subjective norms should be considered a useful tool to promote the consumption of plant-based meat among typical consumers. Regarding perceived behavioral control, dietary habits, diversity, and influences from religion may explain the positive perception of current consumption intentions.

Thirdly, product barriers (availability, information, price, etc.) also influence consumption intention. Clearly, in Vietnam, as this is still a new product, despite its positive impact on health and the environment, it still faces many challenges. Compared to Western countries with balanced diets and moderation, Vietnamese people may not necessarily choose plant-based meat to protect their health. Many believe that we can improve health and protect the environment in many ways, not necessarily focusing on plant-based foods and diets.

5.2. Managerial implications

This study provides important insights for product promotion that businesses can pay attention to, with recommendations for enhancing the application of product positioning strategies and developing marketing programs for consumers with sustainable lifestyles. Firstly, subjective norms are identified as an important factor in increasing sales of plant-based meat products. Influencing consumers and their social relationships to motivate product consumption is suggested. Secondly, perceived behavioral control and barriers are also emphasized as important for the intention to consume plant-based meat. The approach to product information can influence customer shopping behavior, thus reputation management and focusing on marketing campaigns are necessary. Thirdly, distributing products through online channels is also encouraged, but pricing needs to be considered to meet customer consumption needs. Businesses also need to optimize production resources and apply modern technology to create environmentally friendly products at appropriate prices.

5.3. Limitation

The current study is limited in analyzing the intention to consume plant-based meat (a new and specific product in the vegetarian diet). As the product is not yet widely known, many survey respondents have not consumed it, making it difficult to provide appropriate answers, potentially affecting the research results. Regarding the surveyed population, the majority of the sample are adolescents, with relatively low income or still financially dependent on their families, reducing the applicability to a larger population scale. Additionally, the quality of responses is not high, with many questionnaires showing a lack of concentration from the respondents. Future studies could expand the survey scope as the research team only focused on surveying consumers in Hanoi. Another limitation of the study is that although it analyzed consumer interest in dietary patterns, it only stopped at descriptive statistics, without clarifying the correlation between that interest and the intention to consume plant-based meat.

Future studies can apply the results of this study and address the mentioned limitations. Specifically, future studies could use and expand the model to include other factors (environmental awareness, food branding, etc.) affecting intention and consumption behavior not only for plant-based products but also for other products and fields. Additionally, future studies could focus on clarifying the relationship between adopting a vegetarian diet and consuming plant-based products.

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