DOI: https://doi.org/10.62985/j.huit_ojs.vol26.no3E.570

MODELING GREEN FOOD CONSUMPTION INTENTIONS IN VIETNAM: A HYBRID SEM-ANN APPROACH

Tran Thi Bich Hoi[1*], Vu Van Dong[1], Nguyen Ngoc Duy Phuong[2]

[1]*Ho Chi Minh City University of Industry and Trade*

[2]*International University, Vietnam National University Ho Chi Minh City (VNU-HCM)*

*Email: *6013250021@huit.edu.vn*

Received: 14 April 2026; Revised: 29 April 2026; Accepted: 14 May 2026

ABSTRACT

Amid escalating environmental challenges, green food consumption has emerged as an important pathway toward sustainable development. However, understanding consumers' green food consumption behavior remains challenging due to the complex and potentially non-linear relationships among its determinants, particularly in developing economies such as Vietnam. This study examines the factors influencing green food consumption intentions in Vietnam by extending the Theory of Planned Behavior (TPB) with additional constructs, including trusts, perceived value, and ecolabels. To enhance both explanatory and predictive power, the study employs a hybrid analytical approach that integrates Partial Least Squares Structural Equation Modeling (PLS-SEM) and Artificial Neural Networks (ANN). Data were collected from Vietnamese consumers and analyzed using PLS-SEM to test hypothesized relationships, followed by ANN to capture non-linear patterns and rank the relative importance of key predictors. The findings indicate that TPB-related factors significantly influence consumers' intentions, while trusts and perceived value emerge as the most important determinants. The ANN results further demonstrate the predictive capability of the hybrid SEM–ANN approach in modeling green food consumption intentions. This study contributes to the literature by extending TPB in the context of green food consumption and demonstrating the usefulness of SEM–ANN integration in consumer behavior research. The findings also offer practical implications for businesses and policymakers seeking to promote sustainable consumption in Vietnam.

Keywords: TPB, SEM-ANN, green food consumption intentions, Vietnam.

1. INTRODUCTION

The global food system is recognized as a major contributor to natural resource depletion, biodiversity loss, and greenhouse gas emissions amid growing climate change and environmental degradation [1]. The natural environment and ecosystems are under a great deal of stress due to unsustainable food production, distribution, and consumption methods [2], [3]. Thus, one of the most important ways to advance sustainable development is to move toward ecologically friendly food consumption models, particularly green food consumption (GFC). Eating green food shows that customers are becoming more conscious of environmental and health issues, in addition to reflecting a change in consumer behavior. Previous research has demonstrated that a number of influences, such as attitudes, ecological awareness, knowledge, community norms, and obstacles pertaining to cost and accessibility, have an impact on GFC behavior [4], [5]. However, there is still a disconnect between consumer intentions and actual behavior, especially in developing nations, despite growing awareness of green consumption.

TPB is regarded as a fundamental theoretical framework for elucidating consumer behavior [6], [7]. TPB contends that behavioral intention, which is derived from attitudes, perceived behavioral control, and subjective norms, has a direct influence on a personality's conduct [8]. While TPB has been successful in explaining a variability of behaviors, including green consumer behavior, new research indicates that this model should be extended to more accurately represent the situation of GFC, where perceived value, product information, and reliability are important factors. In particular, ecolabels are seen as a crucial instrument for lessening information asymmetry and assisting customers in identifying products that are environmentally friendly [9], [10]. Furthermore, perceived worth and trust have been found to be important elements in encouraging the consumption of green foods [11], particularly in a situation when customers must deal with inaccurate and unreliable product information.

Despite the fact that GFC behavior has been the subject of several studies, most recent research still predominantly uses linear analytical techniques like regression or structural equation modeling [12]. These techniques are useful for testing theoretical ideas, but they are not very good at identifying complex interactions and nonlinear correlations between variables [13], [14], [15]. The application of sophisticated analytical techniques is crucial in the setting of increasingly complex consumer behavior that is influenced by many interrelated elements. Recently, research has begun combining SEM with ANN to leverage the benefits of both structures [14]. While ANN aids in the detection of non-linear correlations and enhances the model's prediction power, SEM is utilized in this process to assess causal relationships based on theory [15]. This hybrid technique provides deeper insights into customer behavior by ranking the relative relevance of statistically significant elements in addition to identifying them.

Currently, in Vietnam, consumers are strongly shifting toward choosing green foods to protect their health and the environment [16], [17]. Pham et al. used SEM to study publicity, virtual communities, service value, and green service choice as factors associated with green service consumption for tourism development [18]. In addition, research on the role of social networks in GFC was also analyzed by Trong et al. [19]. Research has shown that the TPB model of individual cultural, social, and psychological factors is related to GFC. Additionally, Luan et al. used SEM and one-way ANOVA with SPSS and Amos software to evaluate a study on GFC, in which environmental concerns play a particularly important role [16]. Another study on GFCs using a PLS-SEM model described by Nguyen et al. showed that attitudes play a central role in converting purchase intentions into actual purchase behavior [20]. However, this market still faces significant hurdles in adopting a more comprehensive research approach to promote sustainable consumption and complex nonlinear relationships [21]. Furthermore, advanced models such as SEM-ANN are still rarely discussed for addressing nonlinear relationships in this GFC domain. Although international studies have begun to incorporate SEM-ANN models to decode these complex behaviors [22], [23], However, in emerging economies like Vietnam, the application of this hybrid model remains a significant gap. Most current domestic research still relies primarily on traditional linear analysis methods, which cannot fully reflect the multidimensionality and non-linear relationships in customer psychology.

To address the aforementioned limitations, this study supports the construction and validation of a hybrid SEM-ANN model for in-depth assessment of factors affecting GFC behavior in Vietnam. Beyond merely verifying theories, the research seeks to have significant practical consequences for businesses. Specifically, the research focuses on three main contributions:

- Determine the determinants affecting intentions and actions related to the intake of eco-friendly foods.
- Analyzing the expanded function of ecolabels, perceived worth, and convictions within the context of TPB.

- Rank the importance of factors using an ANN model.

This study aims to bridge the theoretical and empirical gap between PLS-SEM and ANN by investigating the psychological issues influencing green food choices, structured as follows: First of all, the study expands the scope of TPB by integrating key variables within the context of GFC in Vietnam. Secondly, this study joins a hybrid SEM-ANN approach to enhance the ability to describe and predict consumer behavior. Lastly, the study provides empirical evidence, contributing to existing research. The study's foundation is TPB with perceived value, trust, and eco-label. In order to connect variables with intention and conduct, hypotheses H1–H8 are developed.

2. OVERVIEW OF RESEARCH AND DEVELOPMENT OF THE HYPOTHESIS

2.1. Green food consumption behavior

The practices of choosing, acquiring, and utilizing food items that are more ecologically friendly while maintaining food safety and health advantages are known as GFC [24], [25]. Furthermore, in the setting of increasing environmental problems, climate change, the impact of the greenhouse effect, and food safety, GFC is becoming an increasingly important research topic that has been widely studied by many researchers [26], [27].

Previous research has demonstrated that a variety of factors, including environmental awareness, attitudes, social norms, trusts, and perceived values, have an impact on GFC behavior [28], [29]. The gap between intention and actual conduct, however, is one of the main problems in this subject, indicating the need for more thorough analytical models to explain consumer behavior.

2.2. Theory of Planned Behavior

Among the most general theoretical frameworks in consumer behavior research is the TPB [30], [31]. TPB has been used extensively in studies on the consumption of organic and green foods, and it has been demonstrated to be an effective behavioral intention interpreter [6], [32]. Moreover, ecolabels function as a trustworthy signal in the context of GFC, assisting consumers in identifying items that are traceable, safe for their health, and environmentally beneficial [33], [34]. This fosters a favorable perception of the product, boosts social support, and facilitates decision-making for consumers. However, recent studies suggest that TPB needs to be expanded to better suit the context of GFC [35], [36], where influences related to information and trust play a key role.

2.3. Ecolabels and their role in green food consumption

Ecolabels are a communication tool that aids in informing consumers about a product's eco-friendly features [37]. Ecolabels act as a signal to lessen information asymmetry in the food industry, since customers can scarcely evaluate a product's "green" features directly. Furthermore, a number of studies demonstrate that eco-label positively influences attitudes, environmental awareness, and the desire to buy green items [38], [39]. From there, a research framework is proposed:

Hypothesis 1 (H1): Attitudes on eco-friendly food are positively impacted by ecolabels.

Hypothesis 2 (H2): Trust in green food is positively impacted by ecolabels.

2.4. Perceived worth

Perceived value is identified as purchasers' overall evaluation of a product's values relative to its cost. When it comes to eating green foods, perceived value includes social, emotional, and health benefits in addition to functional benefits [13]. According to studies,

people are more likely to make a purchase when they believe that eco-friendly meals have definite advantages and are worth the price [40]. As a result, the following theories are put forth in this article:

Hypothesis 3 (H3): Perceived value has a beneficial effect on the intention to purchase green food.

2.5. Trust

Because it can be challenging to verify product attributes, trust plays a critical role in GFC behavior. Since it is frequently impossible for consumers to independently confirm whether a product is genuinely "green," they must rely on the source, brand, or label [41], [42]. Prior research has demonstrated that trust is a major factor in determining intentions and actions related to eating green food, particularly when there is insufficient or unclear information [13], [43]. Based on that, we put out the following theory:

Hypothesis 4 (H4): The propensity to buy green food is progressively impacted by trust.

2.6. Attitudes, subjective norms, and perceived behavioral control

According to TPB, behavioral intention is affected by three main causes: attitude, subjective norms, and perceived behavioral control. When consumers have a positive perception of green food, they are more likely to purchase it [28]. The impact of friends, family, and society on consumer choices is reflected in subjective norms. Accessibility, price, and terms of purchase are all related to perceived behavioral control. Furthermore, these three elements play a critical role in understanding green consumer behavior, as several studies have proved [35], [40]. Therefore, this study suggests:

Hypothesis 5 (H5): The propensity to purchase eco-friendly food is positively impacted by attitudes.

Hypothesis 6 (H6): Subjective norms have a favorable consequence on the intention to consume green food.

Hypothesis 7 (H7): Purchasing green foods is positively impacted by perceived behavioral control.

2.7. Consumer behavior and intentions

Numerous studies have exhibited that purchase intention has a favorable influence on actual consumer behavior when it comes to the intake of green foods, albeit the degree of influence may vary depending on contextual factors [7], [40], [43]. Consequently, the hypothesis that follows is put forth:

Hypothesis 8 (H8): Consumption of green foods is positively impacted by purchase intention.

The correlations among the variables are articulated through the aforementioned study hypotheses. The postulated relationships among variables seek to evaluate the impact of these issues on the intention and behavior regarding the consumption of green food. Figure 1 depicts the proposed investigation model in this study.

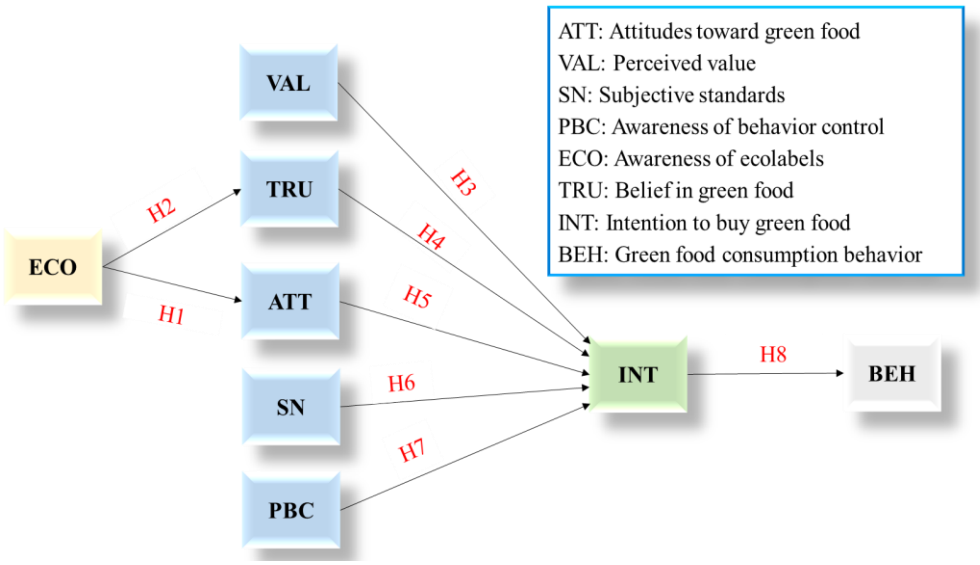

Figure 1. The suggested research model

2.8. Hybrid SEM-ANN approach

Conventional analytical techniques like SEM predominantly emphasize linear correlations among variables [14], [15]. However, consumer behavior is often non-linear and complex [13], [15]. Therefore, recent studies suggest combining SEM with ANN to enhance analytical capabilities in various fields and yield reliable results. Research hypotheses and theoretical models are tested using SEM [40]. On the other hand, ANNs are used to rate the significance of predictive factors and identify non-linear correlations [13], [14]. This hybrid approach increases the research's practical relevance by enabling the study to discover statistically significant components as well as providing information on each factor's relative impact.

3. RESEARCH METHODS

3.1. Research design

The purpose of this investigation is to evaluate hypotheses regarding the issues influencing Vietnamese consumers' consumption of green foods using a quantitative approach. The study develops an integrated research model that integrates consumer psychological, social, and cognitive elements based on TPB and extended variables. Additionally, the study uses a hybrid strategy that combines SEM and ANN to enhance the model's explanatory and predictive capabilities. In particular, ANN is used to identify non-linear correlations and rank the significance of independent variables with respect to the dependent variable, whereas SEM is used to assess causal linkages based on theoretical underpinnings.

3.2. Research samples and data gathering techniques

Data is gathered using a structured questionnaire survey, formulated based on scales validated in prior research. The survey targeted consumers in Vietnam, particularly focusing on urban areas, where access to and awareness of green food are higher. The sample technique employed is a hybrid of convenience sampling and propagation sampling, consistent with consumer behavior studies in a real-world context. The minimum sample size is determined by applying the requirements of the PLS-SEM approach. The sample size

must be at least ten times the number of pathways that lead to an endogenous variable quantity in the model [6], [40], [44].

3.3. Questionnaire and scale design

The questionnaire is structured into three main parts: Part 1: Introduction and confidentiality commitment; Part 2: Survey screening questions; Part 3: Primary scales and demographic information. All information in the questionnaire is described in Table 1.

The model's variables are measured on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). To guarantee dependability and quantifiability, the scales are inherited and modified from earlier research. including ATT, VAL, SN, PBC, ECO, TRU, INT, and BEH, as shown in Figure 1.

Table 1. Scale system for factors in the research model

Variable name	Items	Description of the scale	Ref.
ATT	ATT1	I think buying green food is a sensible choice.	[40]
	ATT2	I believe that green foods help improve my quality of life	[12]
	ATT3	I feel reassured and satisfied when using green food	[45]
VAL	VAL1	I believe that the price of green food is justified compared to the benefits it provides	[46]
	VAL2	I find that green foods offer clear health benefits	[35]
	VAL3	Overall, green foods are a valuable choice	[7]
SN	SN1	My significant others believe that I should purchase eco-friendly food	[44]
	SN2	My family supports my use of green foods	[32]
	SN3	Friends/relatives encouraged me to eat green foods	[40]
PBC	PBC1	I can proactively choose green foods when shopping	[21]
	PBC2	I have the means (financial resources, time) to buy green food	[40]
	PBC3	I can easily find green food where I live	[31]
ECO	ECO1	I pay attention to eco-labels on food packaging	[9]
	ECO2	Eco-label helps me identify environmentally friendly products	[38]
	ECO3	I often rely on eco-labels when choosing food products	[38]
TRU	TRU1	I believe that green food is safer for health	[42]
	TRU2	I believe the information provided about green food	[39]
	TRU3	I believe in relevant certifications/brands	[31]
INT	INT1	I intend to buy green food in the near future	[40]
	INT2	I will prioritize choosing green foods whenever possible	[39]
	INT3	I plan to consume green foods more often	[40]
BEH	BEH1	I frequently buy green foods	[15]
	BEH2	I prefer choosing green foods over conventional foods	[39]
	BEH3	I make it a habit to include green foods in my daily meals	[15]

Each concept is assessed by three observed factors, articulated in a straightforward and clear statement format appropriate for respondents in Vietnam. Additionally, in order to guarantee clarity, terms like "green food" and "ecolabel" are defined in plain language and

supported by examples to enable respondents to fully comprehend the survey's content. Besides, the questionnaire is piloted with about 30 to 50 participants prior to formal deployment in order to improve the questions' language, organization, and clarity.

An online survey created using the Google Forms platform is used to gather data. The survey consists of Vietnamese consumers aged 18 and above who are aware of or interested in green food. In order to accommodate respondent access conditions and the exploratory nature of the study, a non-probability sampling method that combines suitability sampling and snowball sampling is used.

To guarantee that the research sample's demographics are diverse, the questionnaire is disseminated using a variety of internet platforms, including social media (Facebook, Zalo) and personal contacts. The data collection period lasted approximately four weeks, from February 1, 2026, to February 28, 2026. A total of 170 responses were collected. To ensure data quality, the study employed several control measures. Initially, screening questions are used to ensure participants meet the study criteria (residing in Vietnam and being 18 years of age or older). Secondly, in order to identify non-serious answers, the questionnaire contained an attention span question. Unsatisfactory answers are eliminated from the dataset for analysis (e.g., failing the attention span question or displaying indications of repeating responses). 108 valid responses are used for additional analysis following data cleaning. Lastly, the final sample size satisfies the minimal standards needed to conduct SEM model analysis.

4. RESEARCH FINDINGS

4.1. Data analysis using PLS-SEM

Two stages of data analysis are carried out. The measurement model and the structural model are validated in the first part of the study using PLS-SEM via SmartPLS software.

4.1.1. Evaluating the measurement model

The study initially establishes latent variables and the related observed variables based on theoretical principles in order to concretize the conceptual framework in the SmartPLS software and produce the structural model results displayed in Figure 2 [15]. Next, the inner model's structure is then shaped in accordance with the suggested study plan by creating hypothetical paths to link the exogenous and endogenous structures. Following data preparation, an iterative estimate process to maximize forecasting capabilities and determine indicator weights is initiated by the PLS Algorithm with path weighting mode [15]. Lastly, the path diagram is extracted using the software's visualization capabilities, which concurrently show the R^2 values, normalized beta coefficients, and external loading coefficients to offer empirical support for the model's causal links.

The coefficient of determination (R^2) in PLS-SEM analysis is used to evaluate how well independent factors explain the dependent variable in the structural model. Likewise, R^2 shows the proportion of the endogenous variable's variance that can be accounted for by the model's predictor variables. An R^2 value of about 0.75 is seen as strong, 0.50 as moderate, and 0.25 as weak in earlier research [15], [47]. In consumer behavior, marketing, and social science research, where human behavior is frequently influenced by numerous uncontrolled elements, the authors stress that the R^2 value should be taken into account within the particular context of the study. As a result, average R^2 levels might still be regarded as realistically significant [44], [47], [48].

In this PLS-SEM model, the variables ECO, VAL, PBC, and SN do not show R^2 values because they are exogenous variables. These variables function as independent input variables and are unaffected by the model's other variables. Therefore, SmartPLS does not calculate the

coefficient of determination R^2 for these variables. The R^2 value is evaluated only for endogenous variables such as ATT, TRU, INT, and BEH, variables that are described by one or more other variables in the model.

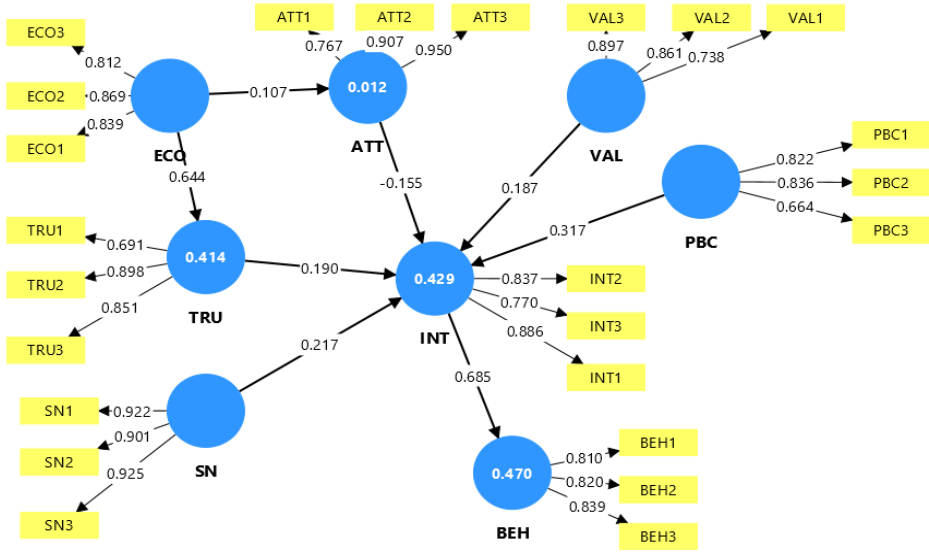

Figure 2. Consequences of PLS-SEM model analysis

The results of the analysis in Figure 2 show that the R^2 values of the endogenous variables range from 0.012 to 0.470. Specifically, the R^2 of ATT is 0.012, indicating that ECO only explains 1.2% of the variation in attitude, which is a very low level of explanation. Meanwhile, the R^2 of TRU reaches 0.414, meaning that ECO explains 41.4% of the variation in trust. For the INT variable, the R^2 value reach 0.429, indicating that the variables ATT, TRU, SN, VAL, and PBC explain 42.9% of the variation in green consumption intentions. Finally, the R^2 of BEH reach 0.47, meaning that green consumption intention explains 47.0% of the variation in green consumption behavior. Overall, the model has moderate explanatory power for TRU, INT, and BEH.

After finishing the research model and allocating all observed variables to each latent idea, the study involved using the PLS Algorithm in SmartPLS software [39]. The standard configuration of the PLS algorithm prioritizes the adoption of a Path weighting structure to maximize the R^2 rate for the model's endogenous structures [47]. Technical indicators are taken from the Construct Reliability and validity section to evaluate the scientific validity and dependability of the scales when the algorithm has converged [7]. The scale is assessed with Cronbach's Alpha (CA) and Composite Reliability (CR). Convergent validity is calculated using Average Variance Extracted (AVE). Table 2 displays the findings of the structural analysis, which evaluated the study's scales' convergent validity and reliability.

In order to guarantee the reliability and convergent validity of the scale, prior research has recommended that the external loading factor be better than 0.7, CA and CR be more than 0.7, and AVE be improved than 0.5 [7], [21], [32], [40]. During the initial evaluation, the observed variable PBC3 has a low external loading coefficient (0.664) and reduces the intrinsic reliability of the PBC scale (CA = 0.669) and is therefore removed. After removing this variable, the measurement model is re-evaluated. The outcomes indicate that all remaining observed variables had external loading coefficients that met the acceptable threshold. At the same time, every scale satisfies the criteria for convergent validity and reliability, with CA ranging from 0.746 to 0.904, CR better than 0.8, and AVE superior to 0.6. The TRU scale satisfies the requirements for reliability and convergent validity, thus even if the TRU1

variable has a moderate external loading coefficient (0.691), it is kept. Overall, the model's scales satisfy the specifications, enabling more structural model investigation.

Table 2. Findings from the assessment of the measurement model

Construct	Item	Loading	CA	CR	AVE
ATT	ATT1	0.767	0.865	0.909	0.771
	ATT2	0.907			
	ATT3	0.950			
ECO	ECO1	0.839	0.794	0.878	0.706
	ECO2	0.869			
	ECO3	0.812			
TRU	TRU1	0.691	0.746	0.857	0.670
	TRU2	0.898			
	TRU3	0.851			
VAL	VAL1	0.738	0.798	0.873	0.697
	VAL2	0.861			
	VAL3	0.897			
SN	SN1	0.922	0.904	0.940	0.839
	SN2	0.901			
	SN3	0.925			
PBC	PBC1	0.822	0.742	0.820	0.605
	PBC2	0.836			
INT	INT1	0.886	0.777	0.871	0.693
	INT2	0.837			
	INT3	0.770			
BEH	BEH1	0.810	0.765	0.863	0.678
	BEH2	0.820			
	BEH3	0.839			

The study proceeded to investigate the discriminant validity between latent variables using the Heterotrait-Monotrait ratio (HTMT) following the completion of the reliability and convergent validity assessment of the scale [7], [44]. In order to determine whether the study concepts overlap in terms of measurement, the HTMT table uses the PLS Algorithm to display the correlation between indicators across various structures in comparison to the average of correlations within the same structure [48]. An HTMT score of less than 0.85, which is usually applied to ideas with well-defined theoretical distinctions, according to earlier research [44]. For constructs with substantial conceptual resemblance, social and behavioral science research generally accepts an HTMT criterion of less than 0.9 [44]. The following evaluation of the discriminant validity of the proposed model using the HTMT matrix are depicted in Table 3.

The results of the discriminant validity assessment via the HTMT index in Table 3 show that most values between pairs of latent variables are lower than the threshold of 0.85. Some variable pairs such as INT–BEH, PBC–TRU, and VAL–ATT have HTMT values of 0.873, 0.881, and 0.891, respectively, higher than the strict threshold of 0.85 but still lower than the usual threshold of 0.90. Therefore, according to the HTMT criterion is smaller 0.90, the

measurement model achieves discriminant validity, indicating that the concepts in the model are sufficiently distinct to proceed with structural model analysis and hypothesis testing.

Table 3. Results of discriminant validity assessment using the HTMT matrix

	ATT	BEH	ECO	INT	PBC	SN	TRU	VAL
ATT								
BEH	0.334							
ECO	0.114	0.537						
INT	0.313	0.873	0.578					
PBC	0.395	0.779	0.543	0.793				
SN	0.726	0.376	0.346	0.558	0.580			
TRU	0.352	0.835	0.816	0.688	0.881	0.473		
VAL	0.891	0.648	0.353	0.552	0.655	0.812	0.692	

4.1.2. Evaluating the structural model

Once the measurement model satisfies the criteria for discriminant validity, convergent validity, and reliability, the consideration moves on to assess the essential model in order to check the hypotheses. The path coefficient (β), the statistic value (t), and the value (p), which are calculated via bootstrapping with 5.000 replicate samples, are used to examine the associations between the variables. Recent PLS-SEM guidelines state that 5.000 bootstrap samples are sufficient to generate trustworthy statistical significance test findings [4], [21], [29]. One accepted hypothesis is when the $p < 0.05$ and $t > 1.96$ for the two-sided test at a 5% significance level [47] [43].

Table 4. Results of the structural model and research hypothesis testing

H	Relationship	β	t	p	Result
H1	ECO → ATT	0.107	0.761	0.447	Rejected
H2	ECO → TRU	0.644	12.276	0.000	Accepted
H3	VAL → INT	0.179	1.056	0.291	Rejected
H4	TRU → INT	0.260	2.211	0.027	Accepted
H5	ATT → INT	-0.150	0.960	0.337	Rejected
H6	SN → INT	0.228	1.572	0.116	Rejected
H7	PBC → INT	0.237	1.653	0.098	Rejected
H8	INT → BEH	0.685	13.999	0.000	Accepted

The structural model results, summarized in Table 4, reveal a compelling phenomenon, the primary constructs of the traditional TPB are largely insufficient in predicting green food purchase intentions within the Vietnamese context [44]. The failure of these hypotheses gives important insights into the persistent "Green Gap" and the complexity of the current market [44]. The disconnect between traditional TPB factors and intentions. First, the study found no significant link between the core psychological drivers of TPB and behavioral intentions. Specifically, Hypothesis H5, which proposed a positive relationship between ATT and INT, was rejected ($\beta = -0.150$, $p = 0.337$). This clearly illustrates the "Green Gap" phenomenon: while consumers may acknowledge the benefits of sustainable food, this cognitive appraisal is not potent enough to catalyze a concrete purchase intention [44]. Similarly, H7 ($\beta = 0.237$, $p = 0.098$) failed to reach statistical significance, suggesting that

individual resource constraints, such as time or cost, are not the primary "bottlenecks" preventing consumption in this sample. Notably, H6 (β=0.228, p=0.116) was insignificant in the linear SEM model but was identified as the second most vital predictor in the non-linear ANN analysis. This discrepancy underscores that social pressure operates through complex, non-compensatory mechanisms that traditional linear assumptions fail to capture. Eco-label Awareness did not significantly foster a positive Attitude H1 (β = 0.107, p = 0.447). Although consumers recognize certifications such as VietGAP or RAT, this awareness does not automatically translate into a favorable psychological evaluation of the product. Instead, ECO serves as a powerful driver of H2, confirming that in markets characterized by high information asymmetry, labeling information only gains value when it successfully establishes genuine reliability rather than merely influencing general perceptions. Finally, the role of VAL remained marginal, as Hypothesis H3 was rejected (β = 0.179, p =0 .291). This result indicates that while consumers recognize health benefits (VAL2), the trade-off between these gains and the high price premium lacks sufficient weight to overcome underlying skepticism regarding product authenticity within a linear framework. Consequently, building a foundation of trust appears to be a more critical prerequisite than simply emphasizing the health-to-price value proposition.

The statistically significant correlations in the structural model are shown in Figure 3. With a β coefficient of 0.644 and p = 0.000, the results explain that ECO has a positive effect on TRU, demonstrating that ecological awareness plays a role in the promotion of customer trust. In addition, TRU positively impacts INT with β = 0.260 and p = 0.027, indicating that trust plays a role in promoting green consumption intentions. Specifically, INT has the strongest impact on BEH with β = 0.685 and p = 0.000, demonstrating that green consumption intention is a crucial factor leading to actual green consumption behavior.

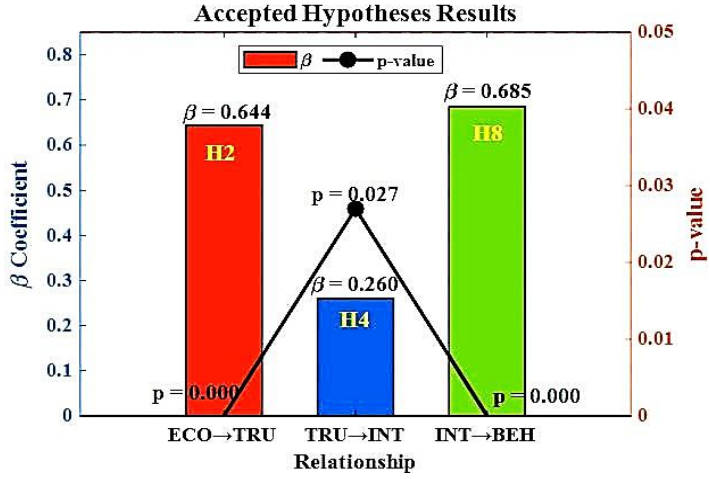

Figure 3. Connections in the model are statistically significant

The research findings viewing that core causes of TPB such as attitude, subjective norms, and perceived behavioral control do not have an important influence in the context of GFC in Vietnam. Instead, trusts play a crucial mediating task in the link between perceived ecolabels and consumption intentions. This suggests that consumer behavior in this sector is more strongly influenced by factors related to reliability and information than by traditional cognitive factors. This study uses the PLSpredict approach, which is based on k-fold cross-validation (with k=10), to quantify forecasting mistakes at the level of observable variables in order to bridge the gap between theory and practice in predicting (see Figure 4) [47].

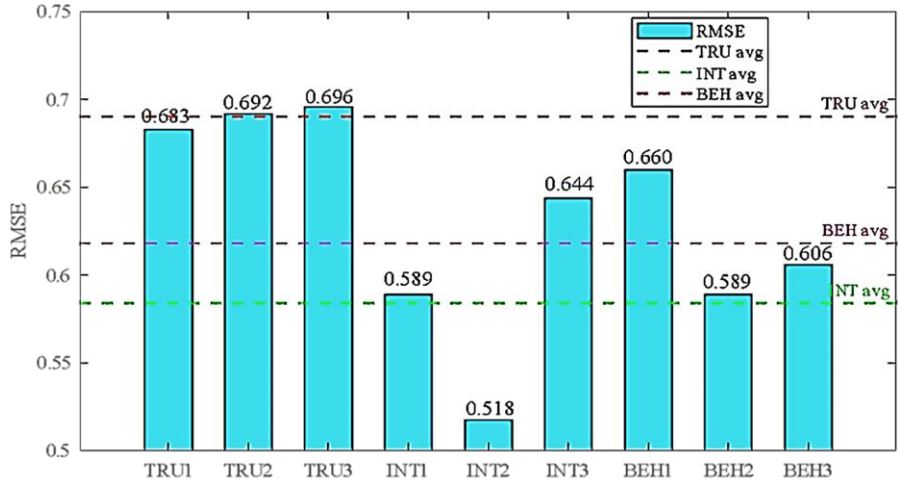

Figure 4. RMSE prediction errors of observed variables in the PLS-SEM model

An important methodological stage in the hybrid SEM-ANN modeling process is the use of PLSpredict [13] [49]. In particular, a strict standard for linear predictive performance is established by contrasting error metrics like Root Mean Square Error (RMSE) of the PLS model with the benchmark LM model [47]. In addition to confirming the structural model's dependability, this result serves as a crucial baseline before utilizing ANN, a more potent method for capturing intricate nonlinear relationships to maximize the accuracy of forecasting future GFC behavior [50].

The PLSpredict results show that the RMSE values of the observed variables belonging to TRU, INT, and BEH ranged from 0.518 to 0.696, as analyzed in Figure 4. Of these, INT2 has the lowest RMSE at 0.518, indicating the lowest forecast error, while TRU3 has the highest RMSE at 0.696. When averaged across each latent variable, the RMSE for TRU, INT, and BEH are 0.690, 0.584, and 0.618, respectively. These results show that the PLS-SEM model has the best predictive ability for the INT variable, followed by BEH, while its predictive ability for TRU is more limited. These RMSE values will be used as a basis for comparison with the RMSE Testing of ANN models in the next analysis step.

PLS-SEM can demonstrate linear correlations between variables; however, it is unable to accurately capture non-linear relationships. As a result, the study keeps using ANN models to rank the relative relevance of factors influencing customer behavior and evaluate their predictive capacity. By integrating ANNs, it is possible to overcome the drawbacks of linear models and gain a greater understanding of the predictive power and relative significance of the model's components.

4.2. Analysis using ANN

The ANN analysis is conducted using Altair AI Studio 2025.1 to capture non-linear and non-compensatory relationships between predictors. The model employed a multi-layer perceptron architecture with a back-propagation algorithm [15]. Finding a thorough list is quite challenging when conducting research on Vietnam's expanding niche market for GFC [40]. Consequently, "snowball" sampling can be used to poll consumers who frequently exchange information within sustainable consumer communities and who have similar health and environmental concerns [6]. With a sample size of n=108, the model attained 80% statistical power to identify path coefficients. Therefore, a ten-fold cross-validation technique is applied [13], [47]. To guarantee objectivity in model evaluation, the data is split into training and testing portions in a 70:30 ratio [44]. The network configuration consisted of an input layer

(comprising significant predictors from PLS-SEM), one hidden layer with nodes automatically optimized by the software, and one output layer (GFC intention) [13]. The sigmoid activation function is utilized for both layers to normalize the output [13]. Furthermore, this study uses the RMSE index to measure accuracy. Finally, a sensitivity analysis is performed to compute the relative importance of each input variable [15], providing the normalized importance percentage to rank the drivers of GFC intention [13].

Based on the structure validated by PLS-SEM, three distinct ANN models (ANN1, ANN2, ANN3) are designed to predict a specific dependent variable. In this study, the variables TRU, INT, and BEH represent different stages in the purchaser decision-making process and therefore need to be analyzed through independent ANN models. In addition to preserving consistency between the two approaches, building equivalent ANN models for each dependent variable enables a more precise evaluation of the contribution of factors in each model stage.

Additionally, splitting the ANN models reduces the possibility of forecasting findings being biased due to the inclusion of several dependent variables in a single model [15], [44]. Analyzing each output variable independently enhances the accuracy and dependability of the study findings because they each have unique relationship structures and distribution characteristics. This includes: (i) the influence of ECO perception on TRU, (ii) the combined influence of ATT, VAL, SN, PBC, and TRU on INT, and (iii) the influence of INT on BEH. The specific processes involved in implementing an ANN are depicted in Figure 5. First, the (Read Excel) phase is used to import research data into the program. Variables appropriate for each ANN model are then chosen in the (Select Attributes) stage, including input and output variables. The roles of the variables in the model are then defined using the (Set Role) phase, where the variable to be forecasted is set as the label/target variable, and the other variables are specified as input/predictor variables.

The Split Data stage divides the data into a training set and a testing set after the roles of the variables have been determined. The model is constructed and trained at the Neural Net step using the training set, which aids in the model's learning of both linear and nonlinear interactions between input and output variables. After the ANN model is trained, the (Apply Model) step is used to apply the built model to the test set. Finally, the Performance step is used to evaluate the predictive performance of each ANN model through the RMSE index. A lower RMSE number suggests a less predicted error and a more accurate model [13], [15].

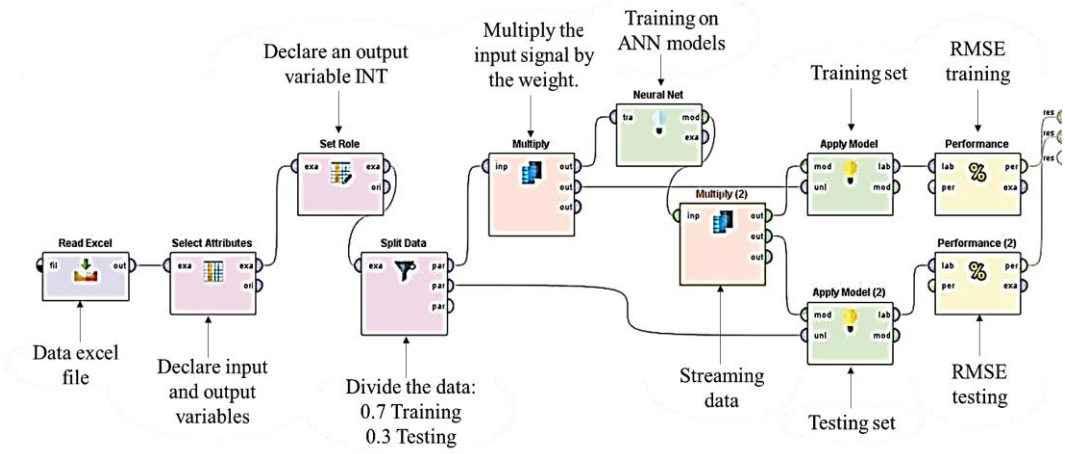

Figure 5. ANN implementation process

Table *5* presents the RMSE values of the three ANN models on the training and test sets. The results show that ANN1, with ECO as the input variable and TRU as the output variable, achieved an RMSE training of 0.527 and an RMSE testing of 0.509. ANN2, using ATT, VAL, SN, PBC, and TRU to predict INT, achieved an RMSE training of 0.463 and an RMSE testing of 0.459. ANN3, using INT to forecast BEH, achieved RMSE Training (0.471) and RMSE Testing (0.369). Overall, there is no discernible difference in the RMSE values between the training and testing sets, suggesting that the ANN models have reasonably stable prediction skills and do not exhibit overfitting.

Table 5. RMSE Values of ANN Models

ANN	Input	Output	RMSE Training	RMSE Testing
ANN1	ECO	TRU	0.527	0.509
ANN2	ATT, VAL, SN, PBC, TRU	INT	0.463	0.459
ANN3	INT	BEH	0.471	0.369

The study used the RMSE index to evaluate the prediction capability of the conventional linear model and the nonlinear model after building the theoretical framework and validating causal linkages using PLS-SEM. A summary and comparison table of the two approaches' prediction performance can be found in Figure 6.

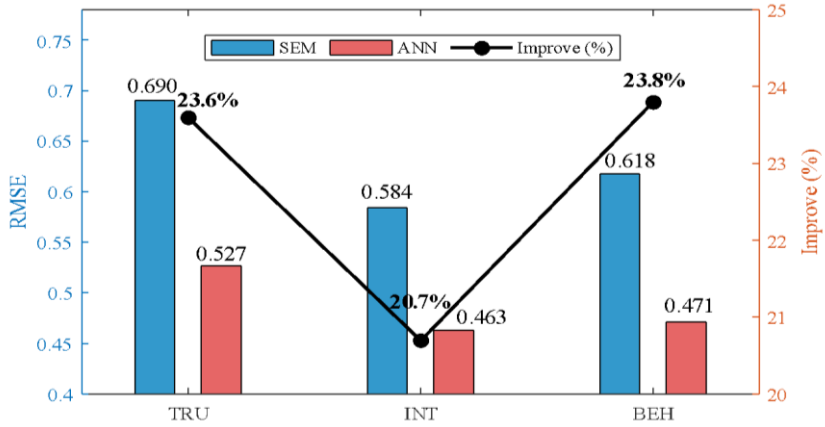

Figure 6. Comparison of RMSE forecasting errors between PLS-SEM and ANN

Experimental results in Figure 6 show that the RMSE training values of all three models, ANN1, ANN2, and ANN3, are significantly lower than the average RMSE values obtained from the PLSpredict model in PLS-SEM. Specifically, the forecast error for the TRU structure decreased from 0.690 to 0.527; INT decreased from 0.584 to 0.463; and BEH decreased from 0.618 to 0.471. This demonstrates that, in comparison to linear regression models, ANN models can optimize weights to reduce mistakes and produce improved predicted accuracy [44].

Empirical evidence demonstrates that the relationship between factors driving GFC (such as attitudes, perceived value, and subjective norms) and actual behavior is not just linear, as evidenced by the significant decrease in RMSE when switching from PLS-SEM to ANN (an average improvement of over 20%) [14], [44].

The ANN2 network achieves the lowest RMSE (0.463), corresponding to the fact that the INT2 variable in PLS-SEM also has the lowest error (0.518). The alignment between the two methodologies bolsters the data's validity and demonstrates that the input factors, including ATT, VAL, SN, PBC, and TRU, are highly effective predictors of consumers' propensity to purchase green food [44]. This RMSE comparison offers persuasive

justification for managers to have confidence in future projections regarding sustainable consumer behavior.

Although training the ANN2 model has yielded superior forecasting accuracy, as proven by low RMSE error rates. In this structure, the complex and nonlinear interaction mechanisms between variables are often hidden, making theoretical explanation difficult [14]. Therefore, after completing the training phase, the study conducted Attribute Weights analysis using a sensitivity analysis procedure to calculate the relative importance of the input variables to the output variable INT.

There are two main methodological reasons why carrying out this analytical phase is essential. First, breaking the linearity constraints of SEM, Attribute Weights analysis in ANN enables the identification of the strength of input variables when they interact in a non-linear and non-compensatory manner, whereas path coefficients in PLS-SEM only assess strictly linear effects [14]. This better captures the reality of consumer psychology, where a crucial "bottleneck" that linear structural models frequently overlook or undervalue is a factor like trust [14]. Second, validation and re-ranking: This process yields a normalized significance table in addition to aiding in the verification of the SEM results [13]. This value is calculated by dividing the relative significance of each input varying by the highest value obtained in the network and then converting it to a 100% ratio [13].

After training the ANN2 model, Attribute Weights evaluation is performed to assess the relative importance of the input variables in predicting INT, as shown in Figure 7.

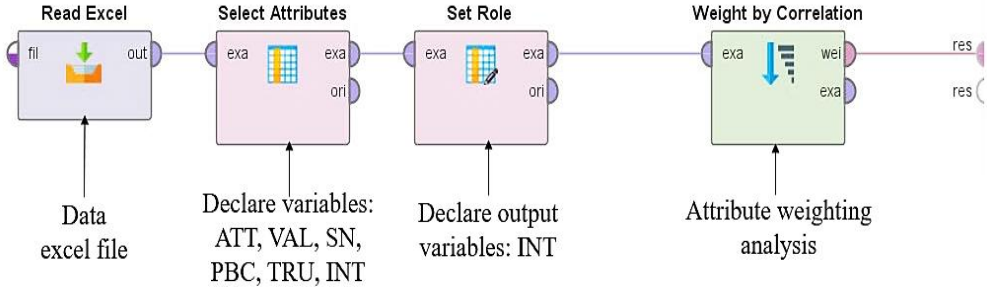

Figure 7. Attribute Weights analysis assessing the relative importance of input variables

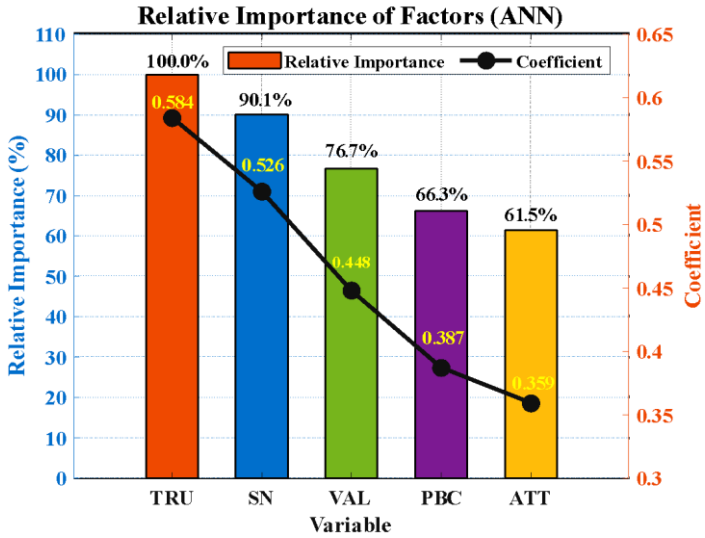

Figure 8. Relative importance of factors in the ANN2 model

Figure 8 details the ranking of importance from the ANN2 model for predicting buy intention for INT. With the highest weighting TRU (0.584), confidence is identified as the most important predictor for green consumer intention. This finding supports the idea that customers cannot immediately assess safety features with the unaided eye in the green food market [41], [42]. Therefore, the psychological decision to buy green food is heavily influenced by trust in certifications like RAT and VietGAP as well as the distributor's honesty. The fact that SN (0.526) came in second in the ANN analysis is one noteworthy finding. However, SN is frequently found to have little to no effect in many linear SEM experiments [31], [36]. The ANN algorithm demonstrates the strong influence of social pressure and opinions from family and friends [7]. This implies that the need for social recognition and conformity to community norms has a significant impact on the intention to consume green food in developing markets such as Vietnam [40]. Furthermore, VAL (0.448) and PBC (0.387) play an important complementary role. Consumers carefully weigh the health benefits received against the price difference they have to pay. However, in order to convert awareness into action intentions, practical obstacles like product availability and shopping ease still need to be solved.

5. DISCUSS THE RESULTS

This analysis employs a two-stage mixed-method SEM-ANN approach to decipher the influences driving GFC behavior in Vietnam. This combination maximizes forecasting capacities using ANN algorithms while also aiding in the testing of theoretical ideas based on SEM correlations.

5.1. Predictive performance and advantages of hybrid models

The confirmation of the nonlinear ANN model's superiority over the conventional linear regression model in the context of complicated consumer behavior is a significant contribution of the study. Based on the RMSE index, the results show an impact on error when converting from the PLSpredict model to the ANN model. Specifically, for INT, the RMSE index adjusted from 0.584 (SEM) to 0.463 (ANN2), equivalent to a reduction in prediction error of approximately 20.7%. Similarly, for BEH, the error decreased from 0.618 to 0.471 (an improvement of 23.8%). This improvement demonstrates that psychological factors such as attitudes or trusts do not interact in a purely linear way. ANN's capacity to manage non-compensatory interactions enables the model to identify minute differences in Vietnamese consumer behavior that structural models frequently miss.

5.2. Re-ranking of the factors in the SEM-ANN model

The Attribute Weights analysis results from the ANN2 model yielded findings that differ from studies based on traditional TPB theory. TRU is the strongest forecasting factor with a weight of 0.584, with confidence being the leading factor driving intentions to buy green food. This is perfectly consistent with the theory of credence goods [41]. In the Vietnamese market, consumers are often concerned about food safety and chemical residue [42]. Trust in certifications such as RAT (safe vegetables) or VietGAP has become a major concern influencing purchasing decisions [42].

ANN ranked SN in second place (0.526), a result often considered weak or insignificant in linear SEM models [36]. This finding underscores the profound influence of social pressure and opinions from family and friends in Vietnam's collective culture [40], [49]. Customers often adopt eco-friendly lifestyles in order to fit in and be accepted by others.

5.3. Attitude and green gap

One noteworthy finding is that ATT, a fundamental component of conventional TPB models, has the lowest relative relevance (0.359) in nonlinear analysis. This finding provides a compelling explanation for the "green gap" phenomenon in the Vietnamese market: people may have very positive attitudes regarding health and the environment, but those attitudes do not always translate into action in the absence of community support (social norms) or assurance regarding the product's origin (trust) [46].

6. CONCLUSION AND FURTHER RESEARCH

6.1. Theoretical contribution

Previous GFC studies utilizing conventional theoretical models like the TPB and only employing SEM in Vietnam frequently revealed that ATT, or environmental awareness and concern, was the most significant determinants. This study was conducted using a mixed-method SEM-ANN methodology, this study has offered a thorough and multidimensional understanding of the determinants influencing GFC behavior in Vietnam. The study has been able to evaluate theoretical hypotheses based on linear relationships and maximize the capacity to predict behavior by investigating intricate nonlinear interactions thanks to the combination of PLS-SEM and ANN. In addition, the study confirms the effectiveness of the SEM-ANN hybrid model. The results comparing RMSE indices for ANNs showed higher predictive accuracy compared to PLS-SEM (with an average error improvement of over 20% for TRU, INT, and BEH). TRU is found to be the most significant predictor of green customer intention, with the greatest weighting TRU (0.584). The fact that SN (0.526) comes second in the ANN analysis is one noteworthy finding. However, SN is frequently found to have little to no effect in many linear SEM experiments. The ANN algorithm shows how social pressure and family and friends' opinions have a significant impact. This implies that the need for social recognition and adherence to community norms significantly impacts the intention to GFC in developing markets like Vietnam. Additionally, PBC (0.387) and VAL (0.448) have a significant extra role. Customers carefully compare the price difference they spend to the health benefits they obtain. A major contribution of the work is the validation of the nonlinear ANN model's superiority over the traditional linear regression model (SEM) in the context of complex customer behavior. The results indicate that switching from the PLSpredict model to the ANN model influences error based on the RMSE index. This illustrates how interactions don't always follow a straight line in complicated decision-making processes like selecting GFC. GFC has qualities that customers would struggle to independently confirm. TRU is therefore a crucial component in fostering a sustainable GFC in Vietnam, according to ANN's ranking of it as the most significant aspect. In addition, SN also plays an equally important role, showing that opinions from family and friends are also a driving force behind GFC.

6.2. Practical contribution

The study's conclusions offer stakeholders in the Vietnamese market particular direction from the standpoint of governance and policy. Results from ANN indicate that belief is the leading determining factor, surpassing even attitude, in driving purchase intention. Businesses should build their strategies on TRU rather than just focusing on promoting product benefits. Through transparent sourcing, employing QR codes, traceability systems, and credible certifications to reduce knowledge asymmetry rather than concentrating only on promoting general environmental advantages. The research indicates that policymakers should harness the influence of communities and key opinion leaders to establish green consumption as a favorable societal norm. Enhancing convenience and product accessibility, such as through the proliferation of mini-supermarkets and convenience stores, is essential for converting customer buying intent into everyday sustainable food practices.

6.3. Limitations and directions for further research

Despite its valuable theoretical and practical assistance, this study still has certain limits. Initially, the research predominantly depends on self-reported data, which is prone to bias influenced by cultural expectations, since consumers often overstate their "green" intents and practices. Future study may address this issue by employing more objective metrics, such as barcode scanning data at the point of sale, or by utilizing artificial intelligence to analyze actual behavior. Secondly, the present survey scope is confined to large urban centers such Vietnam Hanoi and Ho Chi Minh City, hence constraining the generalizability of the findings to rural or provincial regions. Subsequent research should broaden the geographical scope and perform multi-group comparative analyses to elucidate the impact of cultural characteristics and product availability across various geographies. Third, employing a cross-sectional research approach cannot conclusively determine long-term causal links or the development of enduring habits. Future research ought to utilize a longitudinal study or experimental design to monitor variations in customer behavior across distinct time intervals. Finally, despite the rigorous application of the hybrid SEM-ANN approach, this study is not without limitations regarding its sample size. The sample of 108 respondents, while meeting the minimum technical requirements for PLS-SEM and being strengthened by the ten-fold cross-validation technique in ANN, remains relatively small for a consumer behavior study. This may limit the generalizability of the findings to the broader Vietnamese population. Future research should, therefore, aim for larger and more diverse samples across different geographical regions to enhance the model's practical value and external validity.

Conflicts of interest: The authors declare no conflicts of interest.

Declaration of competing interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments: The authors sincerely thank Ho Chi Minh City University of Industry and Trade (HUIT) and Vietnam National University Ho Chi Minh City (VNU-HCM) for their support in this research.

REFERENCES

[1] J. Wang and W. Azam, “Natural resource scarcity, fossil fuel energy consumption, and total greenhouse gas emissions in top emitting countries”, *Geoscience Frontiers*, vol. 15, no.2, 2024, art. no. 101757, doi: https://doi.org/10.1016/j.gsf.2023.101757

[2] R. G. Araújo *et al.,* “Agro-food systems and environment: Sustaining the unsustainable”, *Elsevier B.*V, vol. 01, 2023, art. no. 100413, doi: https://doi.org/10.1016/j.coesh.2022.100413

[3] N. K. Arora and I. Mishra, “Responsible consumption and production: a roadmap to sustainable development”, *Environmental Sustainability*, vol. 6, 2023, pp. 1–6, doi: https://doi.org/10.1007/s42398-023-00266-9

[4] S. Suhaeni *et al*, “Factors influencing green, environmentally-friendly consumer behaviour”, *Open Agric*, vol. 9, no 1, 2024, Art. no. 20220269, doi: https://doi.org/10.1515/opag-2022-0269

[5] H. Huo, F. S. Ahmad, and B. Teoh, “Factors affecting consumers’ organic food purchase behavior: A systematic literature review and future research agenda”, *Environment and Social Psychology*, vol. 9, no. 2, 2024, Art. no esp.v9i2.1892, doi: https://doi.org/10.54517/esp.v9i2.1892

[6] B. Arya, S. Chaturvedi, and N. S. Bhati, "Extending the theory of planned behaviour to predict sustainable food consumption", *Environ. Dev. Sustain*, vol. 26, no. 12, 2024, pp. 31277–31300, doi: https://doi.org/10.1007/s10668-024-04466-z

[7] Y. Wang, J. Zhao, and J. Pan, "The investigation of green purchasing behavior in China: A conceptual model based on the theory of planned behavior and self-determination theory", *Journal of Retailing and Consumer Services*, vol. 77, 2024, Art. no. 103667, doi: https://doi.org/10.1016/j.jretconser.2023.103667

[8] E. N. Çoker and S. van der Linden, "Fleshing out the theory of planned of behavior: Meat consumption as an environmentally significant behavior", *Current Psychology*, vol. 41, no. 2, 2022, pp. 681–690, doi: https://doi.org/10.1007/s12144-019-00593-3

[9] D. Paul *et al*, "A Study on Effectiveness of Ecolabels in the Fast-Moving Consumer Goods Sector", in *IOP Conference Series: Earth and Environmental Science*, Institute of Physics, 2023, doi: https://doi.org/10.1088/1755-1315/1161/1/012004

[10] G. Lanaras-Mamounis *et al,* "The development of an index for assessing the circularity level of eco-labels", *Sustain. Prod. Consum*, vol. 33, 2022, pp. 586–596, doi: https://doi.org/10.1016/j.spc.2022.07.019

[11] H. Yang, P. Zhang, and H. Liu, "The influence of the brand image of green agriculture products on China's consumption intention-The mediating role of perceived value", *PLoS One*, vol. 18, no. 10, 2023, Art. no. 0292633, doi: https://doi.org/10.1371/journal.pone.0292633

[12] J. He and D. Sui, "Investigating college students' green food consumption intentions in China: integrating the Theory of Planned Behavior and Norm Activation Theory", *Front. Sustain. Food Syst, vol.* 8, 2024, Art. no. 1404465, doi: https://doi.org/10.3389/fsufs.2024.1404465

[13] J. Zhang and C. Bunchapattanasakda, "Unlocking organic green consumption: A hybrid SEM-ANN analysis of perceived value and trust mechanisms", *Asian Interdisciplinary and Sustainability Review*, vol. 14, no. 2, 2025, Art. no. 28, doi: https://doi.org/10.14456/aisr.2025.39

[14] A. S. Albahri *et al.*, "Hybrid artificial neural network and structural equation modelling techniques: a survey", *Complex and Intelligent Systems*, vol 8, Apr. 2022, pp. 1781–1801, doi: https://doi.org/10.1007/s40747-021-00503-w

[15] M. Ashfaq *et al,* "Doing good for society! How purchasing green technology stimulates consumers toward green behavior: A structural equation modeling–artificial neural network approach", *Bus. Strategy Environ*, vol. 32, no. 4, 2023, pp. 1274–1291, doi: https://doi.org/10.1002/bse.3188

[16] L. Trong Nguyen, T. H. Nguyen, H. Ngoc Nguyen, L. Dai Nguyen, D. Thi Thu Nguyen, and L. Duy LE, "Determinants of green consumer behavior: A case study from Vietnam", *Cogent Business and Management*, vol. 10, no. 1, 2023, Art. no. 2197673, doi: https://doi.org/10.1080/23311975.2023.2197673

[17] T. T. N. Trang, P. T. H. Lan, P. Q. Anh, and K. B. Nguyen, "Sustainability starts with the consumer: How green consumption shapes business model transformation a COM-B analysis of green purchase behavior in Vietnam's agriculture", *Sustainable Futures*, vol. 11, 2026, Art. no. 101664, doi: https://doi.org/10.1016/j.sftr.2026.101664

[18] T. N. Pham, "Modeling tourists' green service intentions through the theory of consumption values: A structural equation modeling approach in Vietnam", *Sustainable Futures*, vol. 11, 2026, Art. no. 101793, doi: https://doi.org/10.1016/j.sftr.2026.101793

[19] N. Van Phuong, N. T. N. Mai, M. Mergenthaler, L. T. Cuc, and P. N. H. Quynh, "The Role of Social Media on Green Food Consumption Intention in Hanoi, Vietnam", *Agris On-line*

Papers in Economics and Informatics, vol. 16, no. 2, 2024, pp.107–120, doi: https://doi.org/10.7160/aol.2024.160208

[20] H. D. Nguyen, B. D. Tho, L. Hoang Thi My, H. Nguyen Thu, N. Trinh Bao, and A. Nguyen Tuan, "Can carbon-labeled food shift Vietnamese consumers towards greener consumption? Integrating theory of consumption value and theory of planned behavior", *Environ. Res. Commun*, vol. 7, no. 7, 2025, art. no. 075022, doi: https://doi.org/10.1088/2515-7620/adf0cf

[21] T. A. Phan and N. B. T. Pham, "Young Adults' Anti-Consumption Tendencies toward Organic Foods in Vietnam: The Mediating Role of Self-Efficacy", *Sage Open*, vol. 13, no. 4, 2023, doi: https://doi.org/10.1177/21582440231207703

[22] K. Di, W. Chen, Q. Shi, Q. Cai, and S. Liu, "Analysing the impact of coupled domestic demand dynamics of green and low-carbon consumption in the market based on SEM-ANN", *Journal of Retailing and Consumer Services*, vol. 79, 2024, Art. no. 103856, doi: https://doi.org/10.1016/j.jretconser.2024.103856

[23] S. Sonkar, P. Singh, and S. Wannow, "Hybrid analytical approach to understanding male consumer behavior: Integrating PLS-SEM, ANN, and sentiment analysis in the context of green grooming products", *Journal of Retailing and Consumer Services*, vol. 90, 2026, Art. no. 104661, doi: https://doi.org/10.1016/j.jretconser.2025.104661

[24] G. Timpanaro and G. Cascone, "Food consumption and the Covid-19 pandemic: The role of sustainability in purchasing choices", *J. Agric. Food Res*, vol. 10, 2022, Art. no. 100385, doi: https://doi.org/10.1016/j.jafr.2022.100385

[25] W. Mazhar and G. Zilahy, "Understanding green food consumption behaviour: A literature review", *Periodica Polytechnica Social and Management Sciences*, vol. 33, no. 1, 2025, pp.97-111, doi: https://doi.org/10.3311/PPso.21002

[26] Z. Deng, Y. Huang, and Q. Tan, "Study on the Effect of Individual Characteristics and Cognitive Degree on Green Food Consumption Behavior", *J. Food Qual*, vol. 1, 2024, Art. no. 3147300, doi: https://doi.org/10.1155/2024/3147300

[27] G. La Ragione *et al*, "Driving green food consumption values: the impact of gamified branded apps on consumer behaviour", *British Food Journal*, vol. 128, no. 13, 2026, pp. 263–281, doi: https://doi.org/10.1108/BFJ-06-2025-0806

[28] P. Rustagi and A. Prakash, "A review on consumer's attitude & purchase behavioral intention towards green food products", *Int. J. Health Sci.*, vol. 6, no. S1, 2022, pp. 9257–9273, doi: https://doi.org/10.53730/ijhs.v6ns1.7092

[29] O. Ogiemwonyi *et al*, "Environmental factors affecting green purchase behaviors of the consumers: Mediating role of environmental attitude", *Cleaner Environmental Systems*, vol. 10, 2023, Art. no. 100130, doi: https://doi.org/10.1016/j.cesys.2023.100130

[30] S. T. Naskar and J. M. M. Lindahl, "Forty years of the theory of planned behavior: a bibliometric analysis (1985–2024)", *Management Review Quarterly*, vo. 76, 2026, pp. 573–632, doi: https://doi.org/10.1007/s11301-025-00487-8

[31] X. Zhao, L. Fan, and Y. Xu, "An investigation of determinants of green consumption behavior: An extended theory of planned behavior", *Innovation and Green Development*, vol. 4, no.1, Art. no. 100198, 2025, doi: https://doi.org/10.1016/j.igd.2024.100198

[32] Y. Li and B. Shan, "Exploring the role of health consciousness and environmental awareness in purchase intentions for green-packaged organic foods: an extended TPB model", *Front. Nutr*, vol. 12, 2025, Art. no. 1528016, doi: https://doi.org/10.3389/fnut.2025.1528016

[33] N. Sreen *et al.*, "Reasons and intuitions: extending behavioural reasoning theory to determine green purchase behavior", *International Review on Public and Nonprofit Marketing*, vol. 20, no. 2, 2023, pp. 447–475, doi: https://doi.org/10.1007/s12208-022-00346-2

[34] V. Sigurdsson *et al.,* "Increasing the effectiveness of ecological food signaling: Comparing sustainability tags with eco-labels", *J. Bus. Res*, vol. 139, 2022, pp.1099–1110, doi: https://doi.org/10.1016/j.jbusres.2021.10.052

[35] S. Singh *et al.*, "Exploring consumer intentions to purchase organic food with the health belief model and theory of planned behavior", *Discover Food*, vol. 5, no. 1, 2025, art. no. 268, doi: https://doi.org/10.1007/s44187-025-00559-4

[36] X. Shen, Q. Xu, and Q. Liu, "Predicting sustainable food consumption across borders based on the theory of planned behavior: A meta-analytic structural equation model", *PLoS One*, vol. 17, no. 11, 2022, art. no. e0275312, doi: https://doi.org/10.1371/journal.pone.0275312

[37] S. S. Mallick *et al.*, "The influence of eco-friendly marketing tools on sustainable consumer choices: A comprehensive review study", *Environment and Social Psychology*, vol. 9, no. 8, 2024, Art. no. v9i8.2863, doi: https://doi.org/10.59429/esp.v9i8.2863

[38] M. S. Rana *et al.*, "Assessing the effectiveness of eco-labels on consumer purchase intentions in the food and beverage industry: A PLS-SEM approach", *Social Sciences and Humanities Open*, vol. 13, 2026, Art. no. 102422, doi: https://doi.org/10.1016/j.ssaho.2025.102422

[39] O. D. P. Simanjuntak, E. P. A. Panggabean, and K. A. Samad, "The influence of environmental awareness, eco-label, eco-brand, and environmental advertisement on purchase intention of environmentally friendly products", *Binus Business Review*, vol. 17, no. 1, Mar. 2026, pp. 31-47, doi: https://doi.org/10.21512/bbr.v17i1.13793

[40] N. Van Phuong, M. Mergenthaler, and P. N. H. Quynh, "Consumer transition: analyzing the impact of environmental and health consciousness on green food choices in Vietnam", *Discover Sustainability*, vol. 6, no. 1, 2025, Art. no. 415, doi: https://doi.org/10.1007/s43621-025-01275-w

[41] K. Nuttavuthisit and J. Thøgersen, "The importance of consumer trust for the emergence of a market for green products: the case of organic food", *Journal of Business Ethics*, vol 140, no. 2, 2017, pp. 323–337, doi: https://doi.org/10.1007/s10551-015-2690-5

[42] N. N. Thuy, G. Saxena, K. Bhattarai, and H. H. Anh, "A quantitative study on the consumption of organic fruits and vegetables in Vietnam", *Sage Open*, vol. 15, no. 2, Apr. 2025, doi: https://doi.org/10.1177/21582440251348843

[43] A. Al Mamun *et al.*, "Predicting attitude and intention to reduce food waste using the environmental values-beliefs-norms model and the theory of planned behavior", *Food Qual. Prefer*, vol. 120, Nov. 2024, Art. no. 105247, doi: https://doi.org/10.1016/j.foodqual.2024.105247

[44] S. S. Alam, Y. H. Ho, S. Ahmed, and C. Y. Lin, "Predicting eco-labeled product buying behavior in an emerging economy through an extension of theory of planned behavior", *Revista de Gestao Social e Ambiental*, vol. 18, no. 9, Art. no. e6220, 2024, doi: https://doi.org/10.24857/rgsa.v18n9-039

[45] I. Kovač, D. Dunković, and B. Kovač, "Greenwashing and consumer skepticism toward eco-labels in Croatia: challenges and policy directions", *British Food Journal*, 2025, doi: https://doi.org/10.1108/BFJ-02-2025-0122

[46] N. Le, N. T. B. Mai, A. B. Tran, and N. T. Huynh, "Consumer purchase behaviour of eco-friendly packaging products: the roles of perceived green value, attitudes, ecological

concerns, advertisement, and construal level", *Acta Psychol. (Amst)*, vol. 263, 2026, Art. no. 106318, doi: https://doi.org/10.1016/j.actpsy.2026.106318

[47] J.F. Hair Jr. *et al., Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R: A Workbook*, Springer Cham, 2021, doi: https://doi.org/10.1007/978-3-030-80519-7

[48] J. Hair and A. Alamer, "Partial Least Squares Structural Equation Modeling (PLS-SEM) in second language and education research: Guidelines using an applied example", *Research Methods in Applied Linguistics*, vol. 1, no. 3, 2022, Art. no. 100027, doi: https://doi.org/10.1016/j.rmal.2022.100027

[49] N. T. Q. Huong and N. Q. Vinh, "A SEM-ANN analysis to examine the green consumption behavior of tourists in Vietnam", *International Journal of Innovative Research and Scientific Studies*, vol. 8, no. 1, 2025, pp. 1589–1601, doi: https://doi.org/10.53894/ijirss.v8i1.4705

[50] A. A. Uikey, Z. Marak, D. AlSaleh, and R. Baber, "Decoding intentions to purchase organic food products in an emerging economy via artificial neural networks", *Agricultural and Resource Economics: International Scientific E-Journal*, vol. 10, no. 4, 2024, Art. no. 12, pp. 301–328, doi: https://doi.org/10.51599/are.2024.10.04.12