

The Influence of Food Neophobia and Perception on  
Willingness to Consume Novel Food of Thai Consumers

อิทธิพลของโรคกลัวอาหารใหม่และการรับรู้ที่มีต่อความเต็มใจ  
ที่จะบริโภคอาหารใหม่ของผู้บริโภคชาวไทย

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**Abstract**

This study aimed to determine the factors affecting consumer's willingness to consume novel foods (WTC) by focusing on perception of novel food, perception of eating novel food and food neophobia. A conceptual model was analysed by structural equation modelling. Results from 603 Thai respondents have shown that perception of novel food has a strong direct positive influence on WTC, but food neophobia has negatively both direct and indirect effects on WTC through perception of novel food and eating novel food.

Hence, food companies employing innovative technology to produce novel food should increase consumer perception through data, offering extensive information, and prominently feature on product labels details regarding its composition, quality, health and environmental benefits, as well as safety. This approach will alleviate food neophobia by ensuring consumers feel more comfortable with novel food choices.

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### **บทคัดย่อ**

การวิจัยนี้มีจุดประสงค์เพื่อวิเคราะห์ปัจจัยที่ส่งผลต่อความเต็มใจบริโภคอาหารใหม่ โดยให้ความสำคัญกับปัจจัยด้านการรับรู้ของผู้บริโภคต่ออาหารที่ผลิตจากเทคโนโลยีอาหารใหม่ ปัจจัยด้านการรับรู้ของผู้บริโภคต่อการรับประทานอาหารที่ผลิตโดยเทคโนโลยีใหม่ และปัจจัยด้านโรคกลัวอาหารใหม่ที่ไม่คุ้นเคย โดยใช้แบบจำลองสมการโครงสร้างในการวิเคราะห์ ผลการวิจัยจากการสำรวจผู้บริโภคชาวไทย จำนวน 603 คน พบว่า ปัจจัยด้านการรับรู้ของผู้บริโภคต่อเทคโนโลยีอาหารใหม่มีอิทธิพลเชิงบวกต่อความเต็มใจบริโภคอาหารใหม่ แต่ปัจจัยด้านโรคกลัวอาหารใหม่มีอิทธิพลเชิงลบทั้งทางตรงและทางอ้อมต่อความเต็มใจบริโภคอาหารใหม่ผ่านปัจจัยด้านการรับรู้การบริโภคอาหารใหม่และเทคโนโลยีอาหารใหม่ของผู้บริโภค

ดังนั้น ธุรกิจอาหารที่ใช้เทคโนโลยีที่เป็นนวัตกรรมผลิตอาหารควรเพิ่มการรับรู้ให้แก่ผู้บริโภคผ่านข้อมูลและแสดงรายละเอียดหลากหลายผลิตภัณฑ์เกี่ยวกับส่วนประกอบ คุณภาพ ประโยชน์ต่อสุขภาพและสิ่งแวดล้อม ตลอดจนความปลอดภัยที่โดดเด่น วิธีการนี้สามารถลดภาวะการกลัวอาหารใหม่ของผู้บริโภคได้ ทำให้ผู้บริโภครู้สึกสบายใจมากขึ้นกับการเลือกรับประทานอาหารใหม่จากนวัตกรรม

**คำสำคัญ:** *ความเต็มใจของผู้บริโภค การรับรู้ โรคกลัวอาหารใหม่ อาหารใหม่*

### **Introduction**

Since 2016, substantial investments by both investors and food companies have been directed towards research and development in alternative protein sources, including plant-based meat (PBM), cultured meat (CM), and printed food (PF). It means that we were in the early stages of the plant-based and lab-grown meat industry. Notably, retail sales of plant-based meats in the United States account for only 1% of the market, whereas plant-based milk alternatives command a significant 14% share of the dairy market (Reynolds, 2021). In Thailand, the market for PBM substitutes has experienced steady growth, increasing from US\$21.6 million in 2015 to US\$32.8 million in 2020. Projections indicate that it will further rise to US\$50.9 million by 2025, with an average annual growth rate of 8.71% (GlobalData, 2021). However, the consumption of meat, particularly beef, is also on the upswing (Euromonitor, 2020). This trend poses a substantial challenge for PBM and lab-grown meat producers in Thailand, as consumers will scrutinize taste, texture, and flavor in comparison to conventional meat, representing a significant obstacle to the acceptance of plant-based meat products (Caputo, Sogari, & Van Loo, 2022).

Some consumers turn to PBM because of health issues about obesity, cardiovascular disease, and cancer (Jiang, Evans, Hauizhi, & Suqin, 2020). Several consumers decided to reduce red meat consumption to eliminate health risk. This is an opportunity to PBM or other food choices that are intentionally developed replacing conventional meat. During COVID-19 or African Swine Fever outbreak in Thailand, pandemics seems to be a positive factor for the PBM market in the year 2020 onwards (GlobalData, 2021). However, some consumers refuse to consume this kind of food products not only PBM but also other novel foods such as CM or PF. ‘Novel food’ term not only refer to invention of a new food technology but also to new food products that introduction into the market. Another reason that can influence consumers to adopt more sustainable meat consumption such as plant-based meat is that those products can reduce the environmental effects (Katare, Yim, Byrne, Wang, & Wetzstein, 2023).

There are numerous factors that influence consumer decision to consume these novel foods. It raises the question that why do they refuse them even experts inform safe or more sustainable and environmentally friendly? What and how factors influence consumers’ willingness to consume. With limitation of nutrition and food technological knowledge, consumers’ decision on food choices are very complicated. This is a reason why consumers make decisions about what to consume based on heuristic processes in daily life, which explain consumers’ perception or acceptance of food technology and food hazard (Siegrist & Hartmann, 2020). Moreover, Individual differences, such as food neophobia, play a crucial role in shaping consumer preferences and acceptance of new foods. Food neophobia (FN), a personality trait characterized by aversion to exotic or unfamiliar foods, along with perception and sensitivity, are intrinsic factors that influence decision-making (Jaeger, Prescott, & Worch, 2022). Thus, FN should be a part of model explaining how one’s fear of novel food consumption that drive food patterns (Faria & Kang, 2022).

Additionally, cultural differences contribute to varying perspectives and acceptance levels among consumers. For instance, Chinese individuals in Germany exhibit higher levels of FN compared to Germans, yet they are more open to consuming insect-based foods (Hartmann, Shi, Giusto, & Siegrist, 2015). This underscores the importance of considering FN as a valuable tool for understanding consumer perspectives and decisions regarding novel foods. Studies on consumer perception and food neophobia towards novel foods in Thailand are extremely scarce. This study seeks to fill in the lack of research by examining customer perceptions towards food technology

and food neophobia, both of which influence their willingness to try novel foods that are not already available in Thailand.

### **Research Objectives**

This study aimed to explore filling the research gap by focusing on consumer perception on food technology, food neophobia, and willingness to consume novel foods that are not available in the market. It will answer research questions that how does food neophobia impact willingness to consume novel foods? How does perception of food produced by new technology influence willingness to consume novel foods? And how does food neophobia relate to perception of novel food and perception of eating novel food? Does the perception of eating novel food influence willingness to consume it? And does perception of novel food influence perception of eating novel food?

### **Literature Review**

#### **Consumer acceptance of food-related technologies**

To reduce negative impact of on environment, Poore and Nemecek (2018) suggested that producers should be flexible by choosing from multiple farming practices (e.g., conservation agriculture, integrated systems of practice, or organic farming), monitoring their own impacts, and delivering impact information to consumers. Michel, Hartmann, and Siegrist (2021) offered another approach to decline meat consumption by replacing it with meat alternatives such as PBM. However, Meat alternatives are still niche products. Some consumers change to plant-based diet, while some consumers are far from replacing conventional meat with PBM, CM or other new food-related technologies. It indicates the different degree of consumer acceptance, which means there are various factors contributing to consumer decision to increase probability of novel food consumption.

According to ethical and environmental concern, researchers focused on agri-food technologies to enhance the safety, nutritional value, and sustainability of food. But most consumers do reject novel food-related technologies and perceive in a negative way leading to low consumer acceptance of novel foods (Ross, Collins, McCarthy, & Kelly, 2022; Siegrist & Hartmann, 2020). It is challenging commercial feasibility of novel foods. Lack of familiarity with the novel food and technology is a big issue of acceptance. For example, 3D-printed food has existed

since the first open-source 3D food printer developed in the early 2000s. This novel food proposed to be a beneficial concept of personalized nutrition to improve an individual health. Although many research findings advocate the proposal concept about both health benefit and environment impact, especially reducing food waste in food system. At present, consumer acceptance of this food is still low (Ross et al., 2022).

For CM, recently some studies have shown that a majority of consumers in the United States, Italy, Germany, India and China are willing to try or consume it regularly. Some are willing to pay a premium price to replace conventional meat (Bryant, Szejda, Parekh, Deshpande, & Tse, 2019; Mancini & Antonioli, 2019; Weinrich, Strack, & Neugebauer 2020). Moreover, Egolf, Hartmann, and Siegrist (2019) found that Swiss consumers were more acceptable CM than genetically modified food, which support food companies launching the products in Europe. Comparing CM to PBM, Slade (2018) found the consumer preferences between PBM and CM are correlated. Consumers widely accept PBM over CM currently because PBM products are already available. Some consumers have already consumed that facilitate some who wish to reduce red meat consumption or change to plant-based diet (Bryant et al., 2019). These fill the perspective of Bryant and Barnett (2020) that cultured meat nearly meets commercial feasibility. Then the consumer objections based on food neophobia will be low impacts on novel foods and their acceptance will depend on the price and taste.

### **Food neophobia and food technology neophobia**

Food neophobia, an individual difference, reflects one's avoidance of trying or consuming new or unfamiliar foods, highlighting its role in influencing consumer acceptance and food choices (Jaeger et al., 2022). This characteristic has significant implications for children's nutrition, as they often exhibit a preference for a limited range of foods, driven in part by a heightened level of food phobia. Notably, food phobia is not exclusive to children; it can also affect adults. Henriques, King, & Meiselman (2009) found that food phobia is prevalent in both children and adults, especially when novel foods are perceived as potentially harmful, strange, or containing unfamiliar substances. Scientific confidence plays a key role in mitigating neophobia related to novel food technology (Ross et al., 2022). The further highlighting the impact of this internal factor. Moreover, while food neophobia and food technology neophobia are distinct concepts, they are interrelated (Cox & Evans, 2008). Both types of neophobia contribute to consumers' reluctance to consume

novel foods and their resistance to such innovations. Bryant et al. (2019) conducted research across the USA, China, and India, revealing that food neophobia exerts a strong and negative influence on consumer acceptance of both plant-based meat (PBM) and cultured meat (CM). Importantly, their findings emphasize that consumers who are more familiar with novel food products are more inclined to purchase them.

Food neophobia not only impacts consumer decisions regarding novel or unfamiliar foods but also affects their choices in everyday familiar food consumption (De Toffoli et al., 2019; Laureati et al., 2018). For example, Jaeger et al. (2022) found that food neophobia negatively influences the willingness to consume unfamiliar foods and beverages in various countries, including the US, UK, Australia, Germany, and Denmark. As cultured meat approaches commercial feasibility in the current food technology landscape, consumer objections rooted in food neophobia are expected to exert minimal influence on novel foods. Instead, acceptance of these innovations is primarily influenced by considerations related to price and taste (Bryant & Barnett, 2020). However, it is crucial to investigate the relationship between food neophobia and food-related consumer behaviour, particularly among Thai consumers, given the diverse attributes and characteristics influencing food choices across different cultures (Jaeger et al., 2022).

### **Perception and acceptance of novel foods**

Verbeke, Sans, and Van Loo (2015) separated perceptions determining acceptance or rejection of novel foods into two sets: the first set is the perceived relevance of individuals such as perceived personal, societal benefits, and risks of technology, and the second set is perceived scientific knowledge or uncertainty of technology itself. Perceived personal relevance is the extension of individual thought about some things that will benefit or cost their life. When an individual perceives food technologies to be highly relevance to personal benefit or lifestyle, they are more likely to have positive attitudes toward those food products and are willing to buy them. On the other hand, if they perceive a product to their life negatively, they will reject it. Recently, Ross et al. (2022) found that personal relevance highly determines consumers' willingness to try novel food as 3D printed food, which emphasizes the relationship between consumer perception and their behaviour. Commonly, consumers always evaluate costs and benefits to themselves over to society, which rely on individual differences (Bryant & Barnett, 2020). Understanding and tracking

consumers' barriers to accept novel food is very complex because it involves understanding individual perception, risk-benefit analysis, knowledge, and socio-economic characteristics.

Moreover, the acceptance of novel foods varies across different cultural contexts. For instance, Bryant et al. (2019) observed that distinct factors influence the purchase of novel products in various countries. In China, perceived healthiness positively influences the intention to purchase both plant-based meat (PBM) and CM. In contrast, in India and the USA, perceived healthiness does not significantly impact purchase intent for these products. Similarly, the perceived goodness of these novel foods varies in its influence on consumer acceptance. This perception positively predicts CM acceptance in the USA and China but not in India. Michel and Siegrist (2019) found that perceived naturalness is a crucial heuristic factor to examining consumer acceptance in terms of intentions, willingness to consume, or behaviour Román, Sánchez-Siles, and Siegrist (2017) classified food naturalness into three categories: 1) the way of food has been grown (food origin), 2) what and how technology and ingredients has been used) and 3) the final product attributes as healthiness, tastiness, freshness, and eco-friendliness. Previous studies used self-reported behaviour or behavioural intention, or willingness to eat as dependent variables examining the relevance of perceived naturalness.

Several studies found food naturalness are significant factor influencing consumption of organic, local-traditional, functional, and healthy food positively (Román et al., 2017). Food unnaturalness is the root of disgust, health, and safety concerns. A lower perceived naturalness of novel foods contributes to a lower intention to consume or to reject them (Michel & Siegrist, 2019). However, in the viewpoint of individuals, the importance of naturalness is different from the perceived unnaturalness. One would agree that novel foods are unnatural but might consider it less important. Consumers would form their opinions and judgements based on naturalness or trust in any food choices whatsoever they agree to eat. This relationship was confirmed by Ross et al. (2022). They found that perceived naturalness has negatively determinant of willingness to try 3D-printed food. They also found a negative relationship between trust in science and naturalness perception.

Perceived naturalness plays a significant role in shaping perceptions of novel food technology but may not directly correlate with consumer acceptance. Siegrist, Sütterlin, and Hartmann (2018) noted that individuals exhibited low acceptance of cultured meat (CM) because they perceived it as less natural when compared to organic meat, despite CM being positioned as

an environmentally and animal-friendly alternative to conventional meat. Importantly, perceived naturalness indirectly influences willingness to consume CM through the mediation of evoked disgust, which negatively impacts consumer willingness to embrace CM. This insight sheds light on why consumers may be hesitant to adopt novel foods. In the early stages of novel meat technologies such as plant-based meat (PBM), CM, or printed meat, the general perception of naturalness regarding these innovations significantly influences consumer acceptance. Therefore, this study posits a direct and positive relationship between the perceived naturalness of new food technology and consumers' willingness to embrace novel foods.

Perceived healthiness is the result of personal health issues and eating novel foods because a novel technological food product is lack of validation and assessment for its impacts on human health. Food safety control is required to illustrate transparent information improving consumers' perceived healthiness. However, consumers may be willing to try novel foods, their willingness is still low probability of repeat purchases or changing their eating habits (Verbeke et al., 2015). In line with sustainable and environmental issues, novel foods as CM or 3D-printed food present the ways in which food would be produced in the future without reducing consumption (Bryant & Barnett, 2020). New food technologies will be part of this trend rather than being barriers to increase consumers' healthier diet. The perceived healthiness of consumers should be focused. In the food industry, scientists and food business players do their parts improving the food chain up to highest standard, which is the key factor impacting consumer's perceived risk and quality issues related to health. Without trust and perception of health benefits, consumers will be lacking in purchasing the novel food-related technology (Ross et al., 2022). These are very useful for food marketers to modify the product profiles providing health and nutrition information.

From the literature, rarely food consumption studies are conducted about food neophobia and perceptions of novel foods which are two important elements in the Black Block model of consumer behaviour. The factors are pictured in the conceptual framework of the study (Figure 1). The hypotheses are derived as follows:

H1: Food neophobia has a directly negative impact on willingness to consume novel foods.

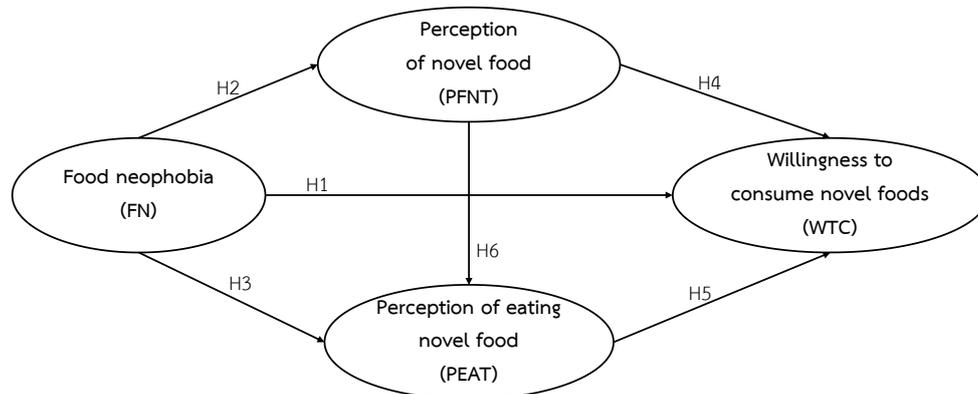
H2: Food neophobia has a direct negative impact on perception of novel food.

H3: Food neophobia has directly negative impact on perception of eating novel food.

H4: Perception of novel food has directly positive impact on willingness to consume novel foods.

H5: Perception of eating novel food has directly positive impact on willingness to consume novel foods.

H6: Perception of novel food has directly negative impact on perception of eating novel food.



**Figure 1** Conceptual framework of the study

### Methodology

This research conducted a quantitative methodology with cross-sectional design. The data were collected via online survey using Google Forms during April – November 2021. A purposive sample method was used to collect surveys from Thai consumers over the age of 18 who consume meat and make their own food consumption decisions. According to Hair, Babin, Anderson, and Black (2019), the sample size of a linear structure equation model should be 10–20 times the observed variables. This study contains 23 observed parameters. Thus, our sample size was preferred over 460 observations. The final qualified responses were 603 after cleaning.

Given CM, 3D-printed-plant-based meat, and Bio-printed food using cells growing in the lab are not commercially available in Thai market yet. The questionnaire firstly informed brief information about each novel food and then participants would rate their willingness to try and willingness to eat them and continue with perception of novel foods produced by new technology in general which applied the willingness to eat constructs of Wilks, Phillips, Fielding, and Hornsey (2019).

For the measurement of novel food produced by new technology perception (PFNT), starting with the statement that ‘for you, foods produced by new technologies are...’ and then

participants express their perception using bipolar adjectives with seven-point scales through three aspects: bad – good (PENT1), unhealthy – healthy (PENT2), unnatural – natural (PENT3) adapting from Bryant et al. (2019). The fourth statement of PFNT would elicit technology and scientific chemicals beliefs measuring by a seven-point Likert scale (1 = ‘disagree strongly’ to 7 = ‘agree strongly’), the statement is ‘the technology and scientific chemicals being used in the food manufacturing industry are good for the future development of food products as general perceived novel food.

Perceived eating novel food produced by new technologies (PEAT), applied Bryant et al. (2019) measured with ‘for you, foods produced by new technologies are...’ using bipolar adjective with seven-point scales: tasty – untasted (PEAT1) and attract to try – unattracted to try (PEAT2). For the measurements scale of food neophobia, this study applied the 10-item of Pliner and Hobden (1992) food neophobia scale with five-point Likert scales (1 = ‘disagree strongly’ to 5 = ‘agree strongly’). The final part contained questions about socioeconomic and demographic information.

The research hypotheses were tested via SPSS and AMOS version 28 software. Starting with questionnaire reliability testing, this study used ten original FN items as construct itself by not summarizing all items of food neophobia as traditional procedure. All constructs were assessed by Cronbach’s alpha coefficient at first. Then, confirmatory factor analysis (CFA) was examined the measurement model. All standardized factor loadings should be above 0.50 and significant. Average variance extracted (AVE) should exceed 0.5 and composite reliability (CR) cutoff at 0.7. The overall fit indices of the model are required at least acceptable criteria, which are  $\chi^2/df \leq 3.000$ , GFI > 0.900, AGFI > 0.900, TLI = 0.950, NFI > 0.900, CFI > 0.900, RMSEA  $\leq$  0.080 (Hair et al., 2019). When the goodness-of-fit indices met the criteria, the structural model was proceeded to examine the research hypothesis in the final step. The overall fit indices of the structure model were indicated by five criteria, which are  $\chi^2/df \leq 3.000$ , GFI  $\geq$  0.950, AGFI > 0.900, TLI  $\geq$  0.950, NFI  $\geq$  0.950, CFI  $\geq$  0.970, PNFI > 0.500, PCFI > 0.500, RMSEA  $\leq$  0.050.

## **Results and Discussion**

The study’s participants obtained more females (70.40%) than males (29.60%) and 28.09 years in average, primarily being highly educated with bachelor’s degree (70.65%) followed by highly graduate degree (20.73%). Most participants earned less than 18,000 THB/month (57.21%) followed by 18,001 – 30,000 THB/month (23.88%), and 40.80% of them located in Bangkok and

59.20% located in other provinces. After cleaning the data, 603 observations qualified for data analysis.

All construct reached the reliability criteria indicating by Cronbach’s alpha coefficients ranging from 0.684 to 0.898, which is acceptable. The results of measurement model have shown that three items (item 2, 3 and 5) of original FN measurement are insignificant, and three items (item 7, 8 and 10) have low factor loading as predictor the FN latent variable. So, they were removed from the measurement model. The result of model still found appropriate fit of the measurement model. All standardized factor loading ranged from 0.556 to 0.856 and significant ( $p < 0.001$ ). Although, three constructs have AVE values above 0.500 except PFNT construct, all values of composite construct reliability (CR) exceeded 0.700. Therefore, convergent validity was acceptable to examine the structural equation model for factors influencing willingness to consume novel foods (Table 1 and Table 2).

**Table 1** Cronbach’s alpha coefficients, AVEs and CRs of constructs

Constructs	No. of items	Cronbach’s alpha	AVE	CR
FN	4	0.802	0.509	0.804
PFNT	4	0.731	0.485	0.787
PEAT	2	0.769	0.628	0.770
WTC	6	0.898	0.579	0.891

**Table 2** Correlation between constructs

Constructs	FN	PFNT	PEAT	WTC
FN	1			
PFNT	-0.427	1		
PEAT	-0.189	-0.059	1	
WTC	-0.373	0.672	0.047	1

The overall fit indices met the requirement levels, which suggests that the research model provides a good fit for the empirical data. The result of research hypotheses are shown in Table 3 and the structural model results are shown in Figure 2. FN had weak negative impact on WTC ( $\beta = -0.088$ ,  $p < 0.10$ ), strong negative influence on PFNT ( $\beta = -0.427$ ,  $p < 0.01$ ) and PEAT

( $\beta = -0.262$ ,  $p < 0.01$ ). PFNT had strong positive influence on WTC ( $\beta = 0.639$ ,  $p < 0.01$ ) and strong negative influence on PEAT ( $\beta = -0.171$ ,  $p < 0.01$ ). While PEAT had no statistical significance with WTC. As seen in Figure 2, PFNT mediates the relationship between FN and WTC with a negative total effect of -0.373. PFNT also mediates the link between FN and PEAT with a positive effect of 0.073.

**Table 3** Model path analysis

Hypothesis	Path coefficient	S.E.	C.R.	<i>p</i>	Results
H1 FN → WTC	-0.088	0.100	-1.792	0.073	Weak Supported
H2 FN → PFNT	-0.427	0.083	-7.289	0.000	Supported
H3 FN → PEAT	-0.262	0.122	-4.190	0.000	Supported
H4 PFNT → WTC	0.639	0.103	8.937	0.000	Supported
H5 PEAT → WTC	0.068	0.047	1.520	0.128	Not supported
H6 PFNT → PEAT	-0.171	0.102	-2.203	0.021	Supported

Note:  $p < 0.10$  = Weak supported,  $p < 0.05$  = Supported, and  $p > 0.10$  = Not supported.

Comparing direct and indirect effects on WTC in Table 4, PFNT had the highest direct effect (0.639), and FN had the highest indirect effect (-0.286). If considering FN’s indirect effects of perception construct, the results show that FN had the highest indirect effect on perceived goodness of food produced by new technology in negative direction (-0.343), followed by perceived healthiness, usefulness, and naturalness, respectively.

For willingness to consume construct, the highest indirect effect of FN on WTC cultured-printed food negatively, followed by WTC for cultured meat and 3D-plant-based printed food, respectively. Focusing on WTC construct, the total effect score of cultured-printed food was highest compared to 3D-plant-based and cultured meat. It implied that Thai consumers are more likely to accept 3D-printed meat than meat growing in the laboratory.

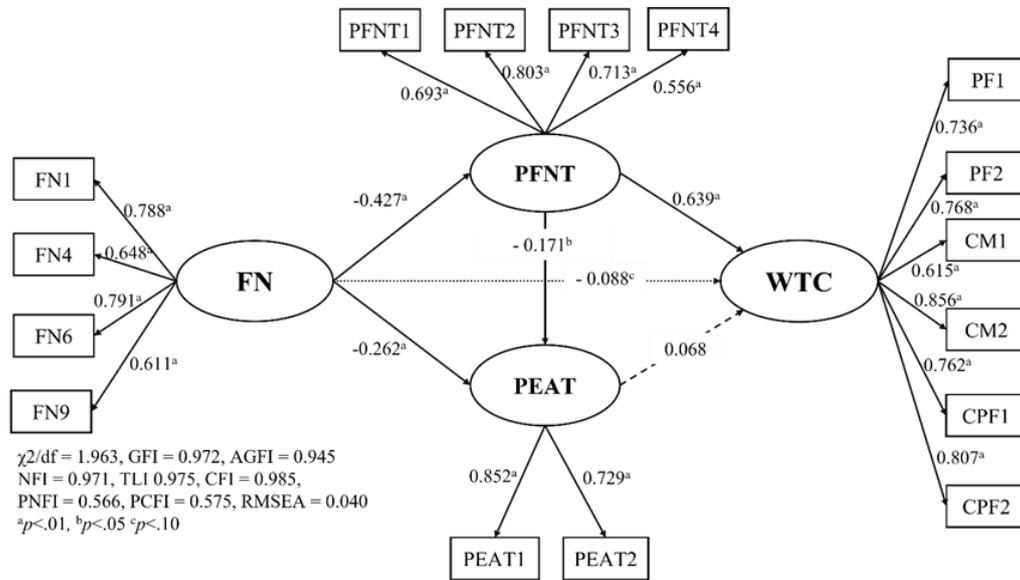


Figure 2 Structural model of factors influencing willingness to consume novel foods

Perceived goodness and perceived healthiness were crucial components of consumer perceptions regarding food produced by new technology, particularly in the context of PFNT (perceived food technology). The pronounced positive impacted of these perceptions supporting H4 and H5 underscores their significant role in determining consumer willingness to adopt novel foods, surpassing the influence of personality traits such as food neophobia (FN) supporting H1, which tends to have a negative effect on consumer acceptance consistent with Jaeger et al. (2022). This observation supporting H2 indicated that despite the presence of FN as a barrier to novel food acceptance among Thai consumers, there remains a favourable disposition toward these innovations, offering promising opportunities for the food industry in Thailand. These findings align with prior research emphasizing the importance of perceived relevance to personal advantages and lifestyle in driving consumer purchasing behaviour (Verbeke et al., 2015).

Additionally, Ross et al. (2022) have demonstrated the substantial role played by consumer perception in shaping their behaviour, reinforcing the significance of this factor. This aligns with Verbeke et al.'s (2015) findings, where individuals informed about the environmental benefits of cultured meat (CM) were more willing to try it compared to those with basic information. Additionally, Chen, Zhou, and Hu (2023) emphasized that providing thorough nutrition and environmental information boosts consumers' willingness to pay for both plant-based and cultured meat, emphasizing the influence of informed consumer perceptions on food choices.

In terms of PEAT, FN had a negative impact on PEAT supporting H3. It indicated that if Thai consumers have a high score of food neophobia, food produced by new technology will taste disgusting for them and will not entice them to try that consist with Jaeger et al. (2022). Even though FN had negative impacts on PEAT, both perceived tried and perceived tasty from PEAT constructs did not affect consumer's WTC by new technology food products (not supporting H5). It implied that consumers were unconcerned with food's appearance or flavor while deciding whether to purchase a product that uses new technologies.

### **Conclusion and Recommendation**

This research explored perceptions, individual differences in terms of food neophobia, and consumer acceptance of alternative meats produced from new food technologies and to examine the factors affecting willingness to consume alternative meat produced from new food technology. These provided valuable insights for the advancement of the emerging alternative protein sector in Thailand, which has only begun to take shape.

The important results indicated that Thai consumers are more eager to consume cultured-printed food, followed by 3D-plant-based and cultured meat. Considering factors that might influence customers' willingness to consume those items, perception of novel food has a strong direct positive effect, but food neophobia has both a negative direct effect and a negative indirect effect via perception of novel food. It can be considered that perceived new food technology is the connection between food neophobia and willingness to consume.

The most essential factors of participant perception of novel food are perceived goodness and perceived healthiness, followed by perceived usefulness and perceived naturalness. This in line with Liu et al. (2023). Lowering consumer food neophobia will benefit the food industry since consumers' perception of food generated by new technologies will improve. The greater it is, the more consumers are willing to consume. In contrast, the lower the amount of food neophobia among consumers, the more willing they are to consume.

The findings suggest that novel food businesses should provide consumers with more information and highlight on the label what it is, how good it is, how it benefits them in terms of health and the environment, and how safe it is to eat to reduce the food neophobia. They will feel more at ease consuming when they have sufficient knowledge and facts. These can increase

perception of novel food and decrease food neophobia levels, making consumers more willing to consume those products.

### **Study Limitations and Future Research**

One of the study's limitations was that it measured participants' willingness to try new food (behavioural intention) rather than their actual behaviour. Although participants have been educated about new food options, most of them have not had the opportunity to try them due to the unavailability of certain novel foods, such as bio-printed foods made from lab-grown cells, in the Thai market. While Thailand offers some innovative food options, such as plant-based meat, it may not be feasible to provide participants with tangible products for consumption during online data collection. These factors diminish our capacity to forecast future behaviour accurately. Future research may involve sensory experiments by providing prototype products to participants for tasting. This will enable the analysis of consumers' real experiences with novel products, their likelihood of consumption, and their willingness to pay for novel foods.

### **Conflict of Interest**

There is no conflict of interest.

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**Table 4** Direct effects, indirect effects and total effects of constructs and observed variables.

Independent variable		FN			PFNT			PEAT			WTC		
Dependent variable		DE	IE	TE	DE	IE	TE	DE	IE	TE	DE	IE	TE
Construct	PFNT	-0.427 <sup>a</sup>		-0.427	-	-	-	-	-	-	-	-	-
	PEAT	-0.262 <sup>a</sup>	0.073	-0.189	-0.171 <sup>b</sup>	-	-0.171	-	-	-	-	-	-
	WTC	-0.088 <sup>c</sup>	-0.286	-0.373	0.639 <sup>a</sup>	-0.012	0.627	0.068 <sup>ns</sup>	-	0.068 <sup>ns</sup>	-	-	-
Observed	PEAT1	-	-0.138	-0.138	-	-0.124	-0.124	0.729 <sup>a</sup>	-	0.729 <sup>a</sup>	-	-	-
	PEAT2	-	-0.161	-0.161	-	-0.145	-0.145	0.852 <sup>a</sup>	-	0.852 <sup>a</sup>	-	-	-
	PFNT1	-	-0.296	-0.296	0.693 <sup>a</sup>	-	0.693	-	-	-	-	-	-
	PFNT2	-	-0.343	-0.343	0.803 <sup>a</sup>	-	0.803	-	-	-	-	-	-
	PFNT3	-	-0.304	-0.304	0.713 <sup>a</sup>	-	0.713	-	-	-	-	-	-
	PFNT4	-	-0.237	-0.237	0.556 <sup>a</sup>	-	0.556	-	-	-	-	-	-
	FN1	0.788 <sup>a</sup>	-	0.788	-	-	-	-	-	-	-	-	-
	FN4	0.648 <sup>a</sup>	-	0.648	-	-	-	-	-	-	-	-	-
	FN6	0.791 <sup>a</sup>	-	0.791	-	-	-	-	-	-	-	-	-
	FN9	0.611 <sup>a</sup>	-	0.611	-	-	-	-	-	-	-	-	-
	PF1	-	-0.275	-0.275	-	0.462	0.462	-	0.050	0.050	-	-	0.736 <sup>a</sup>
	PF2	-	-0.287	-0.287	-	0.482	0.482	-	0.052	0.052	-	-	0.768 <sup>a</sup>
	CM1	-	-0.230	-0.230	-	0.386	0.386	-	0.042	0.042	-	-	0.615 <sup>a</sup>
	CM2	-	-0.319	-0.319	-	0.537	0.537	-	0.058	0.058	-	-	0.856 <sup>a</sup>
	CPF1	-	-0.284	-0.284	-	0.478	0.478	-	0.052	0.052	-	-	0.762 <sup>a</sup>

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Independent variable	FN			PFNT			PEAT			WTC		
Dependent variable	DE	IE	TE	DE	IE	TE	DE	IE	TE	DE	IE	TE
CPF2	-	-0.301	-0.301	-	0.507	0.507	-	0.055	0.055	-	-	0.807 <sup>a</sup>

Note: PEAT1 = Perceived tried, PEAT2 = Perceived tasty, PFNT1 = Perceived goodness, PFNT2 = Perceived healthiness, PFNT3 = Perceived naturalness, PFNT4 = General perceived novel food, FN\* = food neophobia item1, 4, 6 and 9, PF1 = trying 3D-plant-based printed food, PF2 = eating 3D-plant-based printed food, CM1 = trying cultured meat, CM2 = eating cultured meat, CPF1 = trying cultured-printed food, CPF2 = eating cultured-printed food  
<sup>a</sup>p <0.01, <sup>b</sup>p<0.05, <sup>c</sup>p<0.10

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