

# The multidimensional Food Choice Model: The case of the acceptance of novel foods integrating innovation with familiarity

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## ABSTRACT

This study examined the psychosocial factors influencing consumers' acceptance of legume-enriched foods, a "low-disruption" innovation that reformulates familiar staples with legume ingredients. Using structural equation modeling on a nationally representative sample (N = 1905), we tested a Multicomponent Food Choice Model encompassing cognitive, emotional, social, behavioral, motivational, and moral dimensions. In the cognitive dimension, attitude emerged as a unified evaluation (with highly correlated affective and cognitive facets) predicting intention. Awareness of environmental consequences had a negative direct effect on willingness to pay but a positive indirect effect through the moral pathway. Positive anticipated emotions predicted intention, while negative anticipated emotions were linked to willingness to pay. In the social dimension, perceived norms predicted intention but not willingness to pay. In the behavioral dimension, perceived control supported intention but not payment, and prior experience with legumes and reformulated products distinguished readiness from financial engagement. In the motivational dimension, health and sustainability motives enhanced attitude and, in turn, both intention and willingness to pay, whereas price and sensory appeal motives were negatively associated with attitude and willingness to pay. Within the moral dimension, a sequence from awareness to personal norm via ascription of responsibility was observed. Personal norm predicted willingness to pay but not intention. Overall, acceptance followed two complementary routes: affective-social processes drove behavioral intention, while moral and value-based processes, tempered by price sensitivity and experience, underpinned financial engagement. These findings highlight actionable levers for communication strategies aimed at fostering uptake and acceptance of novel foods.

## 1. Introduction

Promoting sustainable diets increasingly relies on developing novel foods that are both nutritionally beneficial and environmentally responsible, while still fitting seamlessly into consumers' everyday eating habits. Legume-enriched foods (i.e., traditional staples reformulated with added legume ingredients) have recently been presented as a promising solution to this challenge.

According to Mosikyan et al. (2024), novel foods include newly developed or reformulated products, foods new to a particular region, and technology-based innovations such as cultured or 3D-printed meat. Legume-enriched foods fall into the first category. They are reformulated traditional staples, in which familiar bases such as pasta, bread, or snacks are enriched with legume ingredients to improve their nutritional and environmental profiles. By combining cereals or other common bases with legumes, these products provide a familiar source of plant

protein and fibre that can enhance nutritional quality, support the reduction of animal-based protein consumption, and lower the overall environmental footprint of the diet (Affrifah et al., 2023; Imam et al., 2024).

This reformulation-based innovation differs significantly from more disruptive categories of novel foods. While insect-based foods are often linked to strong disgust reactions and food neophobia, and cultured meat to perceptions of unnaturalness, technological risk, and high costs (Egolf et al., 2019; Siegrist & Hartmann, 2020), legume-enriched foods use familiar ingredients within established food formats. By combining two already trusted components (legumes and staple foods) these products introduce change through reformulation rather than disruption. This familiarity is likely to maintain sensory expectations and processing fluency, thereby minimizing perceived risk (Laureati et al., 2024; Torrico et al., 2019). As a result, acceptance of legume-enriched foods is less influenced by single dominant barriers and more by the

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interplay of evaluative, affective, normative, and feasibility-related processes, making them an ideal test case for studying *innovation within familiarity*. In these contexts, acceptance cannot be explained by isolated predictors but requires a multidimensional perspective on food choice (Siegrist & Hartmann, 2020).

Recent systematic reviews have already summarized the wide range of factors influencing the acceptance and adoption of novel foods (Günden et al., 2024; Hoesterey et al., 2023; Laureati et al., 2024; Mosikyan et al., 2024). These works highlight that consumer acceptance depends on multiple, interrelated factors, including consumer-related, product-related, and situational factors. Among these factors, the psychological dimensions have emerged as particularly salient, encompassing constructs such as attitudes, emotions, perceived behavioral control, norms, and moral considerations, variables consistently found to predict acceptance across various product types.

However, existing reviews that have identified the main predictors of novel food acceptance have also emphasized that this evidence remains fragmented across separate theoretical traditions (Kröger et al., 2022; Laureati et al., 2024; Mosikyan et al., 2024; Onwezen et al., 2021). This fragmentation has limited prior research's ability to capture how different psychological mechanisms jointly shape consumer acceptance, as determinants are often examined in isolation or within single-theory frameworks. As a result, there is growing consensus in the literature that advancing the field requires moving beyond the identification of individual predictors toward integrative models capable of organizing cognitive, affective, social, motivational, and moral processes within a coherent decision-making framework (Carfora & Catellani, 2025). For example, most studies on reformulated foods have focused primarily on health-related motives and attitudes (Shan et al., 2017; Sogari et al., 2023), providing only a partial account of acceptance processes and leaving the interaction among multiple psychological dimensions underexplored.

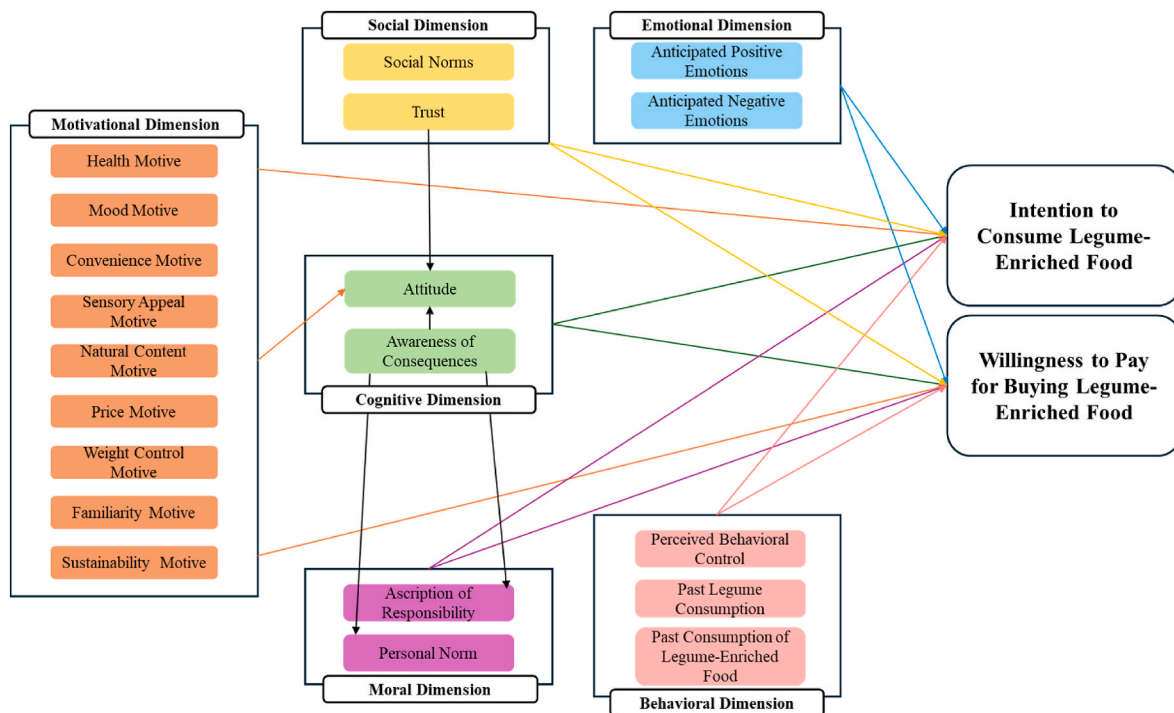
Rather than applying a single existing theory, the present study addresses these limitations by developing an integrative, overarching framework that organizes established psychological determinants of

food choice according to their functional role in the decision-making process. Specifically, this present study introduces the Multicomponent Food Choice Model (MFCM), an integrative framework that encompasses cognitive, affective, motivational, social, moral, and behavioral components within a single structural model (Fig. 1). Using a nationally representative sample of Italian consumers, we examined whether this model predicts intention and willingness to pay for legume-enriched foods, offering both theoretical and practical insights into how innovation can succeed by leveraging familiarity.

## 2. Theoretical background

When studying novel food adoption, research has typically focused on three indicators, intention, willingness to pay, and actual behavior, which capture progressive stages from psychological readiness to behavioral commitment (Laureati et al., 2024). As novel foods are often new and unfamiliar, actual purchase data are difficult to obtain, leading most studies to use intention as a proxy for behavioral readiness, or willingness to pay as an economic indicator of acceptance (Beghin & Gustafson, 2021). Although related, these constructs reflect distinct engagement levels: intention represents motivational readiness (Ajzen, 1991), whereas willingness to pay involves monetary sacrifice, signaling a stronger financial commitment (OECD, 2018). This distinction is critical because the two often diverge in food contexts (Kallas et al., 2019).

To explain the psychological processes behind both outcomes, in this study we referred to the Theory of Planned Behavior (TPB; Ajzen, 1991), a leading framework for predicting food-related decisions. The TPB proposes that intention depends on attitude, subjective norm, and perceived behavioral control, representing cognitive, social, and control-related evaluations. However, these predictors alone rarely capture the full complexity of food choice, prompting researchers to extend the model with additional psychological dimensions (Menozi et al., 2017; Satria & Putritamara, 2024). Building on this work, we tested a Multicomponent Food Choice Model (MFCM), integrating six



**Fig. 1.** Multidimensional food choice model applied to novel foods. the case of legume-enriched food

*Note.* The figure illustrates the Multicomponent Food Choice Model (MFCM). The coloured arrows represent the hypothesised directional paths linking each psychological dimension to outcome variables. The black arrows depict the hypothesised relationships between specific variables.

interrelated dimensions (cognitive, affective, social, behavioral, motivational, and moral) and clarifying how traditional TPB predictors operate alongside complementary mechanisms that jointly shape acceptance of legume-enriched foods. Importantly, consistent with the TPB and related frameworks, the psychological dimensions included in the model are not expected to operate at the same stage of the decision-making process. Some dimensions primarily shape evaluative meaning, operationalized through attitudes, while others regulate feasibility and experiential readiness, influencing the translation of evaluations into behavioral intentions and economic commitment. This distinction is clarified in the following sections.

### 2.1. The cognitive dimension: cognitive attitude and awareness of consequences

Within the TPB, attitude is the central cognitive determinant of intention, reflecting the belief-based evaluation of a behavior (Ajzen, 1991). In food contexts, cognitive attitude has consistently emerged as one of the strongest predictors of intention (Carfora et al., 2020; Menozzi et al., 2017), including for various novel foods such as algae-based products (Bahraseman et al., 2025), insect-enriched foods (Menozzi et al., 2017), omega-3-fortified products (Patch et al., 2005), and gene-edited cheese (Castellini et al., 2025). For this reason, we hypothesized that.

**H1.** Cognitive attitude toward legume-enriched foods will positively predict the intention to consume them (H1a) and the willingness to pay for them (H1b).

When food choices have sustainability implications, the cognitive dimension can be broadened to include awareness of consequences, defined as individuals' understanding of the broader environmental and social outcomes associated with their choices (Harland et al., 1999; Schwartz, 1977). By linking personal food-related benefits with societal outcomes (e.g., reduced environmental impact or lower reliance on animal-based proteins) awareness of consequences informs evaluative judgments and contributes to the formation of attitudes (Carfora, Morandi, & Catellani, 2022; Scalco et al., 2017). Importantly, awareness primarily operates at a cognitive level: rather than eliciting affective responses, it shapes belief-based evaluations regarding the desirability and appropriateness of a product, in line with the belief-evaluation structure of attitudes outlined in the Theory of Planned Behavior (Ajzen, 1991).

Beyond its role in attitude formation, awareness of environmental and ethical consequences has also been identified as a key determinant of acceptance in novel food contexts. For example, Ong (2025) showed that environmental awareness significantly predicts the intention to consume 3D-bioprinted meat, while Siegrist and Hartmann (2020) highlighted its role in reducing uncertainty and resistance toward food technologies. Similarly, in the cultured meat domain, ethical and ecological awareness have been found to predict more favorable perceptions and higher acceptance (Pasquariello et al., 2025; Pilařová et al., 2023). Consistent with this evidence, previous studies suggest that awareness of consequences may influence behavioral outcomes both directly and indirectly by shaping attitudes (Carfora et al., 2020, 2022a). Accordingly, we formulated the following hypothesis.

**H2.** Awareness of environmental consequences will positively predict cognitive attitude toward legume-enriched foods (H2a), the intention (H2b), and willingness to pay (H2c); moreover, the effects of awareness on intention (H2d) and willingness to pay (H2e) will be mediated by cognitive attitude.

### 2.2. The affective dimension: affective attitude and anticipated emotions

Beyond cognitive reasoning, food choices are also driven by affective processes. Within the TPB framework, affective attitude represents the

emotional appraisal of a behavior, that is, how pleasant, enjoyable, or emotionally rewarding it feels (Ajzen, 2020; Conner et al., 2015). In dietary domains, affective attitude often captures hedonic expectations linked to taste and sensory pleasure and is typically a strong, independent predictor of intention (Conner & Norman, 2021).

**H3.** Affective attitude towards legume-enriched foods will positively predict the intention to consume them (H3a) and the willingness to pay for them (H3b).

Affective predictors also include anticipated emotions, defined as the feelings expected as a consequence of performing (or not performing) a behavior (Perugini & Bagozzi, 2001; Sandberg & Conner, 2008). Recent research shows that these emotional expectations strongly influence sustainable and dietary behaviors (Pompili et al., 2025; Scaglioni et al., 2025). In the context of novel or reformulated foods, however, such mechanisms have been less systematically examined.

Carfora, Morandi, and Catellani (2022) found that both positive anticipated emotions (e.g., pride, satisfaction) and negative anticipated emotions (e.g., guilt, regret) significantly predicted intentions toward the consumption of plant-based meat. Notably, positive emotions encouraged addition intentions (i.e., incorporating plant-based foods into the diet), whereas negative emotions promoted replacement intentions (i.e., substituting animal meat with plant-based meat). Similarly, Dillard et al. (2024) showed that anticipated emotions such as enjoyment or disgust play a decisive role in shaping consumers' willingness to try novel foods.

Taken together, these findings underscore the role of affective anticipations in shaping acceptance of innovations that modify familiar products. Accordingly, we included anticipated emotions as direct predictors of consumers' behavioral readiness and economic engagement, given that these affective responses are theorized to influence decision-making directly rather than indirectly through cognitive evaluative processes such as attitude formation (Perugini & Bagozzi, 2001).

**H4.** Anticipated positive emotions will positively predict the intention to consume legume-enriched foods (H4a) and the willingness to pay for them (H4b).

**H5.** Anticipated negative emotions will positively predict the intention to consume legume-enriched foods (H5a) and the willingness to pay for them (H5b).

### 2.3. The social dimension: trust in the food system

Within the TPB (Ajzen, 1991), subjective norms represent the sole social component influencing behavioral intention, reflecting perceived expectations of others regarding a specific behavior. Recent developments have emphasized the importance of distinguishing among different types of social norms: injunctive norms (what others approve of), descriptive norms (what others currently do), and dynamic norms (how others' behaviors are changing over time). These norms primarily shape perceived social pressure and behavioral expectations rather than evaluative attitudes (Sparkman & Walton, 2017; Carfora & Catellani, 2023).

**H6.** Perceived social norms will positively predict the intention to consume legume-enriched foods (H6a) and the willingness to pay for them (H6b).

Social influence alone cannot explain consumers' confidence in those who produce, regulate, and communicate about food. Trust has therefore been recognized as a key extension of the TPB's social dimension. Trust in producers, institutions, and certification systems shapes both attitudes and intentions, particularly when product quality or safety cannot be directly verified (Carfora et al., 2021; Canova et al., 2020; Lee, Fu, & Chen, 2020). The importance of trust is amplified for novel foods, where unfamiliarity and informational asymmetries lead consumers to rely only on trusted sources. Reviews show that transparency,

certification, and institutional endorsement enhance acceptance of reformulated and alternative-protein foods, whereas low trust increases skepticism and neophobia (Günden et al., 2024; Siegrist & Hartmann, 2020). In line with this prior evidence, trust is expected to function both as an antecedent of attitude, by shaping attitudes, and as a direct driver of intention by reducing uncertainty and enabling behavioral commitment in contexts of limited verifiability.

Accordingly, the following hypotheses were proposed.

**H7.** Trust will positively predict attitudes towards legume-enriched foods.

**H8.** Trust will directly predict the intention to consume (H8a) and the willingness to pay for legume-enriched foods (H8b).

Because trust may influence consumer behavior both directly and indirectly through attitude, we also examined whether its effects on intention and willingness to pay operate indirectly via attitude, stating the following Research Question (RQ).

**RQ1.** Does trust exert indirect effects on intention (RQ1a) and willingness to pay (RQ1b) through attitude (i.e., partial mediation)?

#### 2.4. The behavioral dimension: perceived behavioral control and past behavior

Within the TPB, perceived behavioral control represents the behavioral component, referring to the perceived ease or difficulty of performing a given behavior (Ajzen, 1991). In food-related contexts, it generally shows positive, although variable, associations with intention and, to a lesser extent, behavior. Meta-analyses on dietary decisions confirm that perceived behavioral control predicts intention and behavior, although its strength depends on contextual constraints such as access, affordability, and skills, and often remains weaker than attitude (Dorce et al., 2021; McDermott et al., 2015; Riebl et al., 2015). Because perceived behavioral control encompasses both internal self-efficacy and external opportunities, barriers such as limited availability, higher cost, or uncertainty about product use tend to lower perceived control and weaken the intention-behavior link (Hardin-Fanning & Ricks, 2016). These constraints are amplified for novel foods, where distribution and information are still uneven. Recent reviews highlight that acceptance depends not only on psychological evaluations, but also on situational enablers such as market access and informational transparency (Günden et al., 2024; Mosikyan et al., 2024). Accordingly, perceived behavioral control primarily reflects conditions of feasibility and enactment rather than evaluative judgments (i.e., attitudes), and is therefore considered as direct predictor of behavioural intention and economic commitment. Thus, we expected that.

**H9.** Perceived behavioral control will positively predict intention to consume legume-enriched foods (H9a) and willingness to pay for them (H9b).

A growing body of research has suggested extending the TPB to include past behavior as an additional determinant, especially for repetitive, context-dependent actions such as food consumption (Conner et al., 2002). In the food domain, incorporating past behavior substantially increases the TPB's predictive power by capturing the habitual and experiential components of choice (Koklic et al., 2019). Prior experience and familiarity have also been identified as key antecedents of novel food acceptance, including plant-based and insect-enriched products (Bahraseman et al., 2025).

In this study, two forms of past behavior were considered: past legume consumption, indicating general familiarity with the base ingredient, and past consumption of legume-enriched foods, reflecting direct exposure to similar reformulated products. This distinction allows for testing whether general dietary habits or specific experiences more strongly shape consumers' intentions and willingness to pay. Integrating

past behavior into the TPB framework improves prediction by capturing stable behavioral tendencies not fully accounted for by cognitive evaluations. In food-related behaviors, which are often repetitive and context-dependent, past behavior reflects habitual patterns and accumulated experience, increasing behavioral readiness and economic engagement even when evaluative attitudes are already favorable (Catellani & Carfora, 2023). Consistent with extensions of the TPB, we therefore model past legume consumption and past consumption of legume-enriched foods as exerting primarily direct effects on intention and willingness to pay, rather than operating indirectly through attitude.

**H10.** Past behavior, operationalized as both past legume consumption and past consumption of legume-enriched foods, will positively predict intention to consume (H10a) and willingness to pay for legume-enriched foods (H10b).

#### 2.5. The motivational dimension: the food choice motives

Although the TPB (Ajzen, 1991) has proven highly effective in predicting food-related intentions, its motivational foundations have often been only partially examined. Most applications have emphasized health-related motives as distal antecedents of attitudes or intentions (Carfora et al., 2020), occasionally adding sensory appeal, price, or convenience, or ethical and environmental concerns such as animal welfare and environmental protection (Carfora, Morandi, Jelić, & Catellani, 2022; Dowd & Burke, 2013).

Across studies on various novel foods, distinct motivational patterns have been examined, often considering only certain motives while neglecting others. For functional or reformulated products, acceptance is mainly associated with health, sensory appeal, convenience, price, and familiarity (Hentilä et al., 2023; Russo et al., 2020). In contrast, research on emerging or technology-based innovations, such as insect-based or cultured meat, has focused on health, ecological, ethical, and natural-content motives (Bryant & Barnett, 2020; Kröger et al., 2022; Onwezen et al., 2021; Tan et al., 2025). This uneven coverage highlights the need to examine the full range of food choice motives within an integrated framework.

The Food Choice Questionnaire (FCQ; Steptoe et al., 1995) provides such a framework, offering a validated taxonomy of nine motivational factors: health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, and ethical concern. These factors span cognitive, affective, and contextual aspects of food decision-making. FCQ has been widely applied to map consumer priorities and motivational profiles (Cunha et al., 2018; Markovina et al., 2015). Cavallo, Saidi, et al. (2025) further showed that integrating FCQ motives with the TPB improves prediction of attitudes and intentions towards sushi consumption.

Based on the aforementioned studies, we stated that.

**H11.** Health motives will positively predict attitudes (H11a), intention (H11b), and willingness to pay (H11c) for legume-enriched foods.

Although mood-related motives have been linked to adherence to healthy and sustainable dietary patterns (Carfora, Morandi, Jelić, & Catellani, 2022), they have not been systematically examined in relation to novel or reformulated foods. No prior studies have assessed whether emotional gratification and well-being influence consumers' acceptance of legume-enriched products. This gap is particularly relevant for legume-enriched products, whose affective evaluation remains largely unexplored.

**RQ2.** Do mood-related motives influence attitude (RQ2a), intention (RQ2b), and willingness to pay (RQ2c) for legume-enriched foods through their affective or health-related components?

Because legume-enriched foods are typically reformulated versions

of traditional staples (e.g., pasta, bread, beverages, or biscuits) that require no additional preparation effort, convenience motives are also expected to play a positive role. Consumers may perceive these products as easy to integrate into their daily routines, unlike other novel foods that require major changes in cooking or consumption habits (e.g., Hoek et al., 2011).

**H12.** Convenience motives will positively predict attitudes (H12a), intention (H12b), and willingness to pay (H12c) for legume-enriched foods.

Sensory appeal often acts as a double-edged determinant in the acceptance of novel or reformulated foods. While sensory enjoyment generally increases food liking, the introduction of functional or plant-based ingredients may alter familiar taste and texture profiles, leading consumers with strong sensory orientation to evaluate such products less favorably (Verbeke, Sans, & Van Loo, 2015; Boukid, 2021). In the context of novel or reformulated foods, perceived sensory deterioration (such as earthy flavor, dense texture, or visual irregularities) has been identified as a major barrier to acceptance (Hentilä et al., 2023). Accordingly, a stronger emphasis on sensory appeal may hinder positive evaluations of legume-enriched foods.

**H13.** Sensory appeal motives will positively predict attitudes (H13a), intention (H13b), and willingness to pay (H13c) for legume-enriched foods.

While the natural content motive typically promotes positive evaluations of minimally processed foods, it may play an ambivalent role for reformulated products such as legume-enriched foods. Despite their plant-based origin, these products can be perceived as technologically modified rather than naturally occurring, resulting in lower perceived naturalness and cooler evaluations (Rozin, 2005; Román et al., 2017; Siegrist & Hartmann, 2020).

**H14.** Natural content motives will negatively predict attitudes (H14a), intention (H14b), and willingness to pay (H14c) for legume-enriched foods.

Price consciousness has consistently been identified as a key barrier to the adoption of sustainable or reformulated foods. Consumers with a strong focus on low price tend to evaluate innovative products less favorably, perceiving them as less affordable or not worth the premium cost often associated with healthier or more sustainable options (Apostolidis and McLeay, 2016; Aschemann-Witzel and Zielke, 2017; Aschemann-Witzel and Zielke, 2017). Recent findings further confirm that, in the case of novel or reformulated foods, higher price sensitivity is associated with lower acceptance and purchase intention (De Hooge, 2025). Therefore, price motives are expected to negatively predict attitudes and behavioral intentions towards legume-enriched foods.

**H15.** Price motives will negatively predict attitudes (H15a), intention (H15b), and willingness to pay (H15c) for legume-enriched foods.

The weight control motive, reflecting consumers' concern with maintaining or reducing body weight, has been identified as a reliable and cross-culturally consistent determinant of food choice (Markovina et al., 2015) and may promote acceptance of novel or reformulated foods marketed for health or weight management (Verbeke, 2006; Ares, & Deliza, 2010). However, despite this theoretical rationale, no previous studies have directly examined whether weight control motives influence consumers' attitudes and behavioral intentions towards novel or reformulated foods such as legume-enriched products.

**H16.** Weight control motives will positively predict attitudes (H16a), intention (H16b), and willingness to pay (H16c) for legume-enriched foods.

Familiarity is a central psychological driver in food evaluation, shaping consumers' expectations and reducing perceived uncertainty. Early and repeated exposure to familiar foods reinforces sensory and

cultural expectations, facilitating faster and more confident evaluations (Günden et al., 2024; Tuorila & Hartmann, 2020). In contrast, unfamiliarity often triggers food neophobia, a reluctance to try novel foods which represents a major barrier to innovation acceptance (Siegrist & Hartmann, 2020). However, in the case of legume-enriched products, familiarity is expected to have a positive influence, as these foods combine a familiar ingredient with a familiar product matrix.

**H17.** Familiarity motives will positively predict attitudes (H17a), intention (H17b), and willingness to pay (H17c) for legume-enriched foods.

Although the original FCQ included ethical concern as one of its nine motivational factors, this construct primarily captured ethical issues in a broad and not yet fully systematized way. A more recent conceptualization of these motives is proposed by the Sustainable Food Choice Questionnaire (Verain et al., 2021), which integrates three sustainability-related motives, namely animal welfare, environmental concern, and local or seasonal origin, reflecting the growing salience of ethical and ecological drivers. Previous studies have shown that sustainability motives positively influence attitudes and behavioral intentions towards sustainable and plant-based foods (Onwezen et al., 2021; Verbeke, Sans, & Van Loo, 2015). Given that legume-enriched foods are perceived as environmentally friendly and aligned with sustainability values, we hypothesised that.

**H18.** Sustainability motives will positively predict attitudes (H18a), intention (H18b), and willingness to pay (H18c) for legume-enriched foods.

Since these motivational constructs are theorized to shape behavior primarily through their influence on attitude formation, we also examined whether their effects on intention and willingness to pay operate indirectly via overall attitude.

**RQ3.** Do food choice motives also exert indirect effects on intention (RQ3a) and willingness to pay (RQ3b) through overall attitude (i.e., partial mediation), over and above the direct paths?

## 2.6. The moral dimension: ascription of responsibility and personal norm

As legume-enriched foods provide a valuable source of plant-based protein, they can help reduce the consumption of animal-derived products, thereby supporting more sustainable and ethically responsible diets. In this context, the moral dimension of food choice becomes particularly relevant, as consuming such foods may be seen as a prosocial act aligned with environmental protection and animal welfare concerns (Hoesterey et al., 2023). Moral processes capture the extent to which individuals perceive their dietary behaviors as ethically significant and feel personally accountable for their outcomes.

Two constructs are central to moral regulation: ascription of responsibility, or the perception of personal accountability for one's food choices (Kaiser & Shimoda, 1999), and personal norm, an internalized moral obligation to act in line with ethical beliefs (Thøgersen, 2006). Unlike social norms, personal norms reflect internalized rather than externally driven expectations and have been shown to predict sustainable dietary behaviors, such as reduced meat consumption and the adoption of plant-based alternatives (Carfora et al., 2020; Onwezen et al., 2013). Although derived from moral norm theory (Schwartz, 1977), these constructs can be integrated into the TPB as proximal moral antecedents of intention. Awareness of consequences activates responsibility, which strengthens personal norm and, in turn, guides intention and willingness to pay for sustainable or ethically aligned foods (Carfora et al., 2021). This integration captures context-specific moral mechanisms underlying plant-based food acceptance. Unlike evaluative attitudes, these moral constructs are theorized to guide behavior through internalized obligation and self-regulation; accordingly, their effects are expected to operate directly on intention and

willingness to pay rather than through attitudinal evaluations (Schwartz, 1977).

**H19.** Awareness of environmental consequences will positively predict ascription of responsibility

**H20.** Ascription of responsibility will positively predict personal norm.

**H21.** Personal norm will positively predict the intention to consume legume-enriched foods (H21a) and the willingness to pay for them (H21b).

Because moral cognition is theorized to unfold through a sequential activation of beliefs and norms, we also examined whether awareness of consequences exerts indirect effects on intention and willingness to pay via ascription of responsibility and personal norm.

**RQ4 (Research Question 4).** Does awareness of consequences indirectly influence intention (RQ4a) and willingness to pay (RQ4b) through a sequential moral pathway involving ascription of responsibility and personal norm?

### 3. Methods

#### 3.1. Sample and procedure

Ethical approval for this study was obtained from the Ethics Committee of the Department of Psychology of the Catholic University of the Sacred Heart (protocol code 97/23).

Between December 2024 and January 2025, a sample representative of the adult Italian population in terms of gender, age, education, and geographic area was recruited through a panel provider (SWG, <https://www.swg.it>) to participate in a study on eating habits. Only native Italian speakers aged 18 and over were eligible to participate. Participants were provided with privacy information and asked to sign an informed consent form if they wished to participate in the research.

To determine the minimum required sample size, we conducted an a priori power analysis using the A-priori Sample Size Calculator for Structural Equation Models (Soper, 2025). Based on an anticipated medium effect size ( $f^2 = 0.15$ ), desired statistical power of 0.80,  $\alpha = .05$ , 26 latent variables, and 79 observed indicators, the analysis indicated a minimum sample size of  $N = 1114$  participants. To ensure robust statistical power and compensate for potential data loss, we doubled this number. After data collection, 323 participants were excluded because they failed at least one of two attention check items included in the questionnaire. The final sample thus consisted of  $N = 1905$  participants: 57.1% identified as women, 42.9% as men, and 0.1% as non-binary. Participants' ages ranged from 18 to 75 years ( $M = 52.16$ ,  $SD = 15.03$ ). Regarding education, most participants held a high school diploma (46.8%), followed by those with a university degree (31.7%), and a smaller proportion who had completed middle or professional school (15.7%). Additionally, 5.2% had a master's degree and 1.7% had obtained a PhD. The characteristics of our sample differed in part from those of the general Italian population. Compared to national statistics, our sample included a slightly higher proportion of women (57.1% vs. 51.1%) and a higher average age ( $M = 52.16$  vs. approximately 46.5 years; ISTAT, 2023). Participants in our study were also more educated than the national average: whereas 37% of the Italian population has completed only compulsory education, 46.8% of our participants held a high school diploma, and 31.7% had a university degree.

#### 3.2. Measures

All measures were assessed using a 7-point Likert scale ranging from 1 = Strongly disagree to 7 = Strongly agree, unless otherwise specified (see Supplementary Materials). *Attitude* was assessed with six semantic differential items capturing both affective and cognitive dimensions of

evaluation on 7-point bipolar scales (adapted from Carfora, Morandi, Jelić, & Catellani, 2022). *Social norms* were assessed with four items capturing injunctive, descriptive-static, and dynamic components (adapted from Carfora, Morandi, Jelić, & Catellani, 2022). *Perceived behavioral control* was measured with seven items assessing perceived ease and ability to consume legume-enriched foods (adapted from Dorcé et al., 2021). *Past consumption of legumes* was assessed by asking participants how often they had consumed legumes in the past month. *Past consumption of legume-enriched food* was measured by asking how often they usually purchased these food products. *Anticipated emotions* were measured with six items assessing the positive and negative feelings participants expected to experience depending on their future consumption of legume-enriched foods (Carfora, Morandi, Jelić, & Catellani, 2022). *Trust towards legume-enriched foods and their stakeholders* was assessed with seven items (adapted from Carfora et al., 2019). *Food choice motives* were measured using 28 items adapted from the Food Choice Questionnaire (Steptoe et al., 1995) and the Sustainable Food Choice Questionnaire (Verain et al., 2021). Awareness of consequences was measured with three items (Carfora et al., 2020). Ascription of responsibility was measured with three items (Carfora et al., 2020). Personal norm was measured with three items (Carfora et al., 2020). Intention to consume legume-enriched foods was assessed with three items (Carfora et al., 2020). Willingness to pay for legume-enriched foods was assessed with five items designed for this study. Participants were presented with realistic price scenarios for different legume-enriched products and asked how much they would be willing to pay compared to the average market price. The mean of standardized factor loadings for each measure, composite reliability, average variance extracted (AVE), and positive square root of the AVE are shown in Table 1. Finally, two instructional attention check items were embedded within the questionnaire to ensure data quality and identify inattentive responses. Specifically, one attention check was included in the perceived behavioral control scale and one in the ascription of responsibility scale. These items explicitly instructed participants to select a specific response option on the response scale (e.g., "Disagree").

#### 3.3. Data analyses

Data were analyzed using IBM SPSS Statistics (version 29) and Mplus (version 8.9).

Descriptive statistics (means, standard deviations, and frequency distributions) were computed for all study variables. A series of one-way ANOVAs examined differences in past legume-enriched food consumption across sociodemographic and behavioral groups. Effect sizes were reported as partial eta-squared ( $\eta_p^2$ ), with 0.01, 0.06, and 0.14 interpreted as small, medium, and large effects, respectively (Cohen, 1988). Sociodemographic variables (e.g., gender, age, education) and selected behavioral factors (e.g., food purchasing frequency) were included in the descriptive analysis to contextualize legume consumption patterns within the sample. These variables were not included in the Multicomponent Food Choice Model, as the model was designed to capture the interplay of psychosocial processes underlying acceptance. Moreover, their categorical and unbalanced distribution would have reduced model stability and parsimony. Nevertheless, differences in baseline consumption across sociodemographic groups are reported to provide contextual insight for interpretation.

All latent constructs were tested within a confirmatory factor analysis (CFA) to ensure reliability and discriminant validity before estimating the full structural model. Model fit was assessed using  $\chi^2$ , RMSEA, CFI, TLI, and SRMR, following conventional thresholds (Hu & Bentler, 1999). Nested model comparisons assessed the incremental contribution of cognitive, affective, social, motivational, moral, and behavioral components, using the TPB model as the baseline. We adopted a theory-driven, nested modeling strategy to evaluate the incremental contribution of successive psychological blocks beyond the canonical TPB. Models were estimated in the following order. In Model 1

**Table 1**  
Descriptive statistics, factor loadings, and reliability indices for latent constructs.

Latent Construct	<i>M</i>	<i>SD</i>	$\bar{\lambda}$	CR	AVE	$\sqrt{\text{AVE}}$	Highest Correlation ( <i>r</i> )
Cognitive Attitude	4.81	1.52	0.89	0.92	0.80	0.89	0.86 (Affective Attitude)
Affective Attitude	4.66	1.46	0.86	0.90	0.74	0.86	0.86 (Cognitive Attitude)
Attitude (2nd order)	4.74	1.49	0.92	0.92	0.86	0.92	0.61 (Positive Anticipated Emotions)
Social Norms	4.22	1.52	0.75	0.84	0.57	0.76	0.79 (Positive Anticipated Emotions)
Perceived Behavioral Control	5.00	1.42	0.68	0.86	0.47	0.69	0.59 (Trust)
Trust	4.58	1.26	0.85	0.94	0.72	0.85	0.67 (Awareness of Consequences)
Positive Anticipated Emotions	4.50	1.45	0.91	0.94	0.83	0.91	0.79 (Subjective Norm)
Negative Anticipated Emotions	3.02	1.58	0.91	0.93	0.82	0.91	0.39 (Personal Norm)
Health Motive	5.48	1.14	0.77	0.85	0.59	0.77	0.57 (Natural Content Motive)
Mood Motive	5.31	1.23	0.79	0.87	0.63	0.79	0.58 (Taste Motive)
Convenience Motive	5.17	1.36	0.84	0.88	0.71	0.84	0.49 (Price Motive)
Taste Motive	5.70	0.95	0.72	0.77	0.53	0.73	0.58 (Mood Content)
Natural Content Motive	5.80	1.29	0.86	0.90	0.75	0.86	0.65 (Local and Seasonal Motive)
Price Motive	5.13	1.36	0.87	0.87	0.76	0.87	0.49 (Convenience Motive)
Weight Control Motive	5.07	1.37	0.85	0.88	0.71	0.85	0.53 (Familiarity Motive)
Familiarity Motive	4.81	1.48	0.78	0.76	0.64	0.78	0.55 (Mood Motive)
Animal Welfare Motive	5.31	1.81	0.91	0.90	0.82	0.91	0.92 (Ethical Concern Motive)
Ethical Concern Motive	5.85	1.45	0.84	0.83	0.71	0.84	0.92 (Animal Welfare Motive)
Environmental Welfare Motive	5.49	1.40	0.93	0.93	0.87	0.93	0.77 (Ethical Concern Motive)
Local and Seasonal Motive	5.40	1.36	0.82	0.86	0.67	0.82	0.65 (Natural Content Motive)
Sustainability Motive (2nd order)	5.51	1.50	0.82	0.90	0.69	0.83	0.61 (Natural Content Motive)
Awareness of Consequences	4.60	1.30	0.87	0.92	0.80	0.89	0.90 (Ascription of Responsibility)
Ascription of Responsibility	4.44	1.46	0.88	0.91	0.78	0.88	0.90 (Awareness of Consequences)
Personal Norm	4.11	1.56	0.91	0.93	0.82	0.91	0.87 (Ascription of Responsibility)
Intention	4.39	1.60	0.93	0.95	0.86	0.93	0.73 (Social Norm)
Willingness to Pay	2.60	1.56	0.86	0.94	0.74	0.86	0.34 (Personal Norm)

Note. *M* = mean; *SD* = standard deviation;  $\bar{\lambda}$  = average standardized loading; CR = composite reliability; AVE = average variance extracted.

(M1), we specified the classic TPB with attitude, subjective norm, and perceived behavioral control predicting intention and willingness to pay (Ajzen, 1991). This provides the benchmark model most established in the literature. In Model 2 (M2), we added past behavior (past legume consumption; past legume-enriched consumption) as a behavioral history block, as it is the most commonly added extension in food choice models and often improves prediction of intentions and behavior (Conner et al., 2002). In Model 3 (M3), we introduced anticipated positive and negative emotions, a typical TPB extension in dietary research that captures the affective dimension of decision-making beyond cognition (Perugini & Bagozzi, 2001). In Model 4 (M4), we added trust (in producers, institutions, certification), to complete the social dimension beyond subjective norms. Although trust is not traditionally included within the TPB framework, several recent studies in the food domain have highlighted its critical role in reducing perceived risk and fostering acceptance. This is the case particularly in the context of novel and sustainable foods, where consumers must rely on external sources of credibility and assurance (Carfora et al., 2019). In Model 5 (M5), we included food choice motives (Steptoe et al., 1995), modeled as antecedents of attitude, to account for stable goal-oriented priorities that shape evaluations of legume-enriched foods.

Finally, in Model 6 (M6), we expanded the cognitive dimension to include awareness of environmental consequences and added the moral block including ascription of responsibility and personal norm. These three variables are traditionally examined together in models of moral and pro-environmental decision-making (Harland et al., 1999; Schwartz, 1977). In this study, they were included together to capture how consumers may interpret legume-enriched foods through an ethical and sustainability perspective, perceiving their consumption as a plant-based alternative aligned with moral and environmental values. This block was added last because it represents a specific evaluative layer relevant only when products convey a moral or sustainability meaning, allowing us to test its incremental contribution beyond the broader cognitive, affective, social, and motivational determinants included in previous models.

All models were estimated with identical measurement specifications. Each step added, without removing, paths from the previous

model to preserve nesting. We compared models using  $\chi^2$  difference tests ( $\Delta\chi^2$ ,  $\Delta df$ ) and changes in CFI, RMSEA, and SRMR, and we tracked changes in  $R^2$  for intention and willingness to pay. Mediation (e.g., motives  $\rightarrow$  attitude  $\rightarrow$  intention/willingness to pay; trust  $\rightarrow$  attitude  $\rightarrow$  intention/willingness to pay; awareness  $\rightarrow$  ascription  $\rightarrow$  personal norm  $\rightarrow$  intention/willingness to pay) was evaluated via bias-corrected bootstrapping (5000 resamples).

## 4. Results

### 4.1. Effects of sociodemographic and behavioral factors on past legume-enriched food consumption

A series of one-way ANOVAs examined the role of sociodemographic and behavioral factors in past consumption of legume-enriched foods (Table S1).

Gender differences were significant,  $F(1, 1902) = 30.39$ ,  $p < .001$ ,  $\eta_p^2 = .016$ , with women consuming more legume-enriched foods ( $M = 1.93$ ) than men ( $M = 1.72$ ). Age had a robust effect,  $F(5, 1899) = 15.80$ ,  $p < .001$ ,  $\eta_p^2 = .040$ , showing a decreasing trend with increasing age; participants under 35 reported higher consumption than those over 55 ( $ps < 0.01$ ). Education was significant,  $F(3, 1901) = 6.31$ ,  $p < .001$ ,  $\eta_p^2 = .010$ , with higher consumption among participants holding a tertiary short-cycle degree compared with those with secondary education ( $p < .001$ ). Socioeconomic status had a small but significant effect,  $F(4, 1900) = 5.34$ ,  $p < .001$ ,  $\eta_p^2 = .011$ , with higher consumption among participants describing their financial condition as very affluent compared with all other groups ( $ps < 0.01$ ). Employment status was also significant,  $F(8, 1896) = 8.29$ ,  $p < .001$ ,  $\eta_p^2 = .034$ . Participants seeking their first job, working occasionally, or studying reported higher consumption than retirees and non-working individuals ( $ps < 0.001$ ). No significant differences emerged across geographical areas,  $F(4, 1900) = 1.62$ ,  $p = .166$ ,  $\eta_p^2 = .003$ . Indicating a homogeneous pattern of consumption throughout the country. Food purchasing frequency showed a modest but significant association,  $F(6, 1898) = 4.14$ ,  $p < .001$ ,  $\eta_p^2 = .013$ , indicating slightly higher consumption among those buying food more frequently. Finally, legume liking strongly predicted past

consumption,  $F(4, 1900) = 17.48, p < .001, \eta_p^2 = .035$ , with mean scores increasing consistently with liking levels.

#### 4.2. Measurement model

A confirmatory factor analysis (CFA) was first conducted to assess the adequacy of the measurement model including all first-order latent variables. The model showed good fit to the data,  $\chi^2(2726) = 7845.97, p < .001, CFI = 0.96, TLI = 0.94, RMSEA = 0.03, 90\% CI [0.031, 0.032], SRMR = 0.04$ .

However, inspection of the inter-factor correlations revealed several strong associations among conceptually related constructs, specifically, a very high correlation between affective and cognitive attitude ( $r = 0.86$ ) and between the four sustainability-related motives (e.g., animal welfare ethical concern:  $r = 0.92$ ). These patterns suggested potential redundancy and the presence of higher-order common variance. Therefore, a second CFA was conducted specifying 2 s-order latent factors, representing attitude (affective and cognitive components) and sustainability motives (animal welfare, ethical concern, environmental welfare, and local and seasonal motives). This higher-order measurement model also demonstrated good fit,  $\chi^2(2808) = 8623.09, p < .001, CFI = 0.94, TLI = 0.93, RMSEA = 0.03, 90\% CI [0.032, 0.034], SRMR = 0.05$ . Although model fit indices were slightly lower compared to the first-order model, the difference was minimal ( $\Delta CFI = 0.007; \Delta RMSEA = 0.002$ ) and well below conventional thresholds (Cheung & Rensvold, 2002). Thus, given its greater theoretical coherence and parsimony, the second-order measurement structure was retained for subsequent analyses.

The standardized factor loadings of the observed indicators on their corresponding latent constructs ranged from 0.61 to 0.95 and were all statistically significant ( $p < .001$ ), supporting convergent validity. Composite reliability (CR) values ranged from 0.75 to 0.95 (Table 1), exceeding the recommended minimum threshold of 0.60 (Bagozzi & Yi, 1988) and confirming the internal consistency of all constructs, except for perceived behavioral control, whose AVE (0.47) was slightly below the recommended 0.50 threshold (Fornell & Larcker, 1981). However, its composite reliability was adequate ( $CR = 0.86$ ), and all factor loadings were significant, supporting the retention of the construct for theoretical completeness. Both attitude and sustainability motives were modeled as second-order latent constructs. The second-order attitude factor, composed of affective and cognitive dimensions, showed excellent internal consistency ( $CR = 0.92, AVE = 0.86$ ). Similarly, the second-order Sustainability Motives factor, encompassing animal welfare, environmental welfare, ethical concern, and local-seasonal motives, demonstrated good reliability ( $CR = 0.90, AVE = 0.69$ ).

The square roots of AVE were higher than the corresponding inter-construct correlations for most constructs, supporting discriminant validity (Table 1). Minor exceptions occurred for conceptually related pairs (specifically, affective and cognitive attitude, animal welfare and ethical concern motives, and awareness of consequences and ascription of responsibility), which showed slightly higher inter-factor correlations. Given their strong theoretical coherence and adequate reliability, all constructs were retained. Following the Fornell-Larcker criterion (Fornell & Larcker, 1981), the positive square root of the AVE for each latent construct exceeded its highest correlation with any other construct, supporting discriminant validity across the model (see Table 1). However, a few theoretically related constructs, such as affective and cognitive attitude, animal welfare and ethical concern motives, and awareness of consequences and ascription of responsibility, showed particularly high inter-construct correlations, as expected given their conceptual proximity. Therefore, the Heterotrait–Monotrait (HTMT) ratio (Henseler et al., 2015) was also computed for these pairs to further ensure discriminant validity. All HTMT values remained below the conservative threshold of 0.90, confirming that, despite their relatedness, the constructs represent empirically distinct dimensions within the attitudinal, motivational, and moral domains of the model.

#### 4.3. Comparisons between structural models

To assess the incremental contribution of additional psychosocial constructs beyond the baseline TPB model, six nested models were compared (Table 2). The final model (M6), which included all cognitive, affective, social, motivational, behavioral, and moral variables, showed the best fit to the data ( $\chi^2(2942) = 11,399.38, p < .001, RMSEA = 0.04, CFI = 0.93, TLI = 0.92, SRMR = 0.05$ ). This model explained 60.0% of the variance in intention and 15.8% in willingness to pay. The second-order attitude factor accounted for 29.5% of the variance in its antecedents ( $R^2 = 0.295$ ). Results are presented below according to the model's outcome variables: attitude, moral predictors, intention, and willingness to pay (Fig. 2; see also standardized direct effects for outcome variables in Table S2 and standardized total, total indirect, and specific indirect effects in Table S3). For ease of reference, a complete overview of all hypotheses and research questions, along with their empirical outcomes, is provided in Table S4 in the Supplementary Materials.

#### 4.4. Predictors of attitude

Attitude toward legume-enriched foods was modeled as a second-order factor combining cognitive and affective components (see 5.1 Measurement Model). As hypothesized, awareness of consequences ( $\beta = 0.38, p = .02; H2a$ ), trust ( $\beta = 0.12, p < .001; H7$ ), health motive ( $\beta = 0.19, p < .001; H11a$ ), and sustainability motive ( $\beta = 0.07, p < .001; H18a$ ) had significant positive effects. As expected, the price motive negatively predicted attitude ( $\beta = -0.07, p = .02; H15a$ ). All other motives (mood, convenience, sensory appeal, natural content, weight control, and familiarity) were not significant ( $ps > 0.05; RQ2a, H12a–H14a, H16a, H17a$ ).

#### 4.5. Predictors of moral variables

Awareness of consequences significantly predicted ascription of responsibility ( $\beta = 0.92, p < .001; H19$ ), and ascription of responsibility strongly predicted personal norm ( $\beta = 0.99, p < .001; H20$ ). A strong indirect pathway emerged within the moral cognition sequence. Awareness of consequences exerted a significant indirect effect on personal norm through ascription of responsibility ( $\beta = 0.92, 95\% CI [0.79, 1.09]$ ), confirming the expected moral activation process.

#### 4.6. Predictors of intention to consume legume-enriched foods

Intention to consume legume-enriched foods was significantly predicted by the second-order attitude factor ( $\beta = 0.12, p < .001$ ), supporting both H1a (cognitive attitude) and H3a (affective attitude). For the cognitive dimension, awareness of environmental consequences was not a direct predictor of intention (H2b rejected). However, it had an indirect effect on intention through attitude ( $\beta = 0.06, 95\% CI [0.03, 0.11]$ ), supporting H2d.

For the emotional dimension, positive anticipated emotions ( $\beta = 0.22, p < .001; H4a$ ) predicted intention, while negative anticipated emotions did not (H5a rejected).

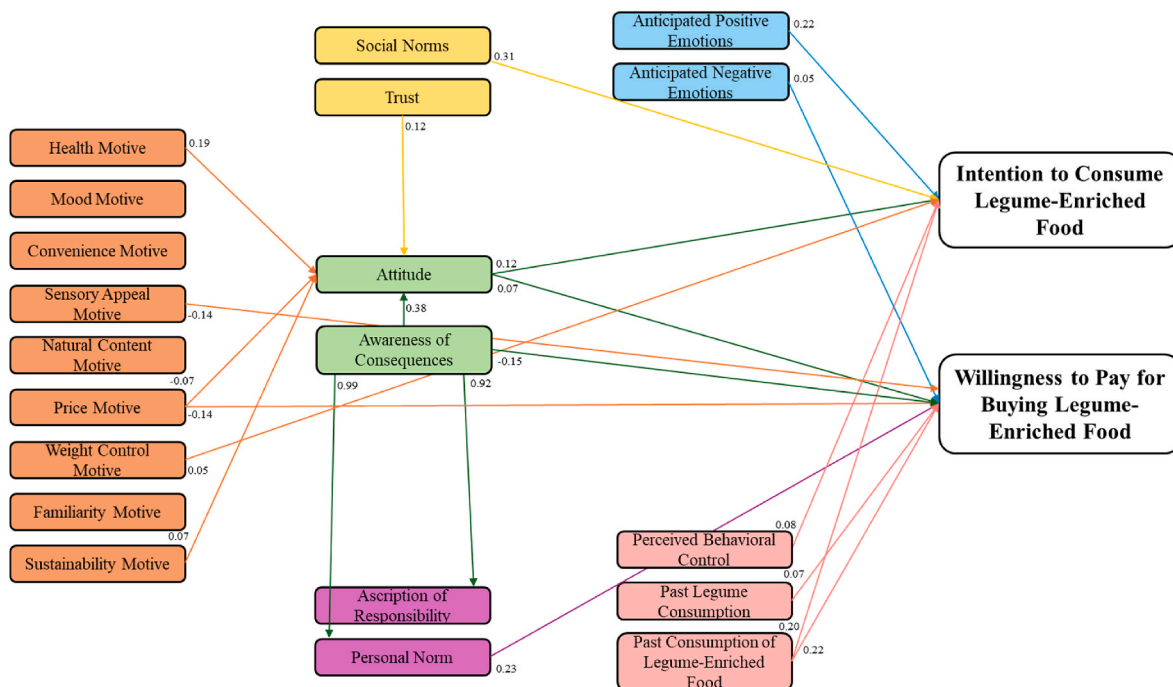
Regarding the social dimension, social norms were positively correlated with intention ( $\beta = 0.31, p < .001; H6a$ ), but trust was not (H8a rejected). However, trust had a positive indirect effect on intention via attitude ( $\beta = 0.04, 95\% CI [0.02, 0.06]; RQ1a$ ), indicating that higher trust enhances positive evaluations of legume-enriched foods, which in turn promote behavioral intention to consume them.

For the behavioural dimension, perceived behavioral control ( $\beta = 0.08, p = .002; H9a$ ) predicted intention. Past consumption of legume-enriched foods significantly predicted intention ( $\beta = 0.20, p < .001$ ), but past legume consumption did not. Thus, H10a was partially supported.

Concerning the motivational dimension, weight control motive had a

**Table 2**  
Comparisons of structural models.

Model	Constructs	$\chi^2$ (df)	$\Delta\chi^2$	$\Delta df$	$p$ ( $\Delta\chi^2$ )	RMSEA	CFI	TLI	SRMR
M1	TPB (Attitude, Social Norm, Perceived Behavioral Control → Intention and Willingness to Pay	17,964.18 (3105)	—	—	—	0.05	0.88	0.87	0.21
M2	M1 + Past Behavior (Past Legume and Legume-Enriched Food Consumption) → Intention and Willingness to Pay	17,114.43 (3098)	849.75	7	<0.001	0.05	0.89	0.88	0.21
M3	M2 + Positive and Negative Anticipated Emotions → Intention and Willingness to Pay	15,815.88 (3086)	1298.55	12	<0.001	0.05	0.90	0.89	0.20
M4	M3 + Trust → Attitude, Intention and Willingness to Pay	14,351.25 (3077)	1464.63	9	<0.001	0.04	0.91	0.90	0.18
M5	M4 + Food Motives (Health, Mood, Convenience, Taste, Natural Content, Price, Weight Control, Familiarity, Sustainability) → Attitude, Intention and Willingness to Pay	13,241.86 (2987)	1109.39	90	<0.001	0.04	0.92	0.91	0.15
M6	M5 + Awareness of Consequences → Ascription of Responsibility → Personal Norms, → Intention and Willingness to Pay	11,399.38 (2942)	1,842.48	45	<0.001	0.04	0.93	0.92	0.05



**Fig. 2.** Multidimensional food choice model applied to legume-enriched food: results of the structural equation Model n. 6  
Note. The figure displays only the paths that reached statistical significance at  $p \leq .05$ .

small but significant effect ( $\beta = 0.05, p = .05$ ; H16b). None of the remaining food choice motives—health (H11b), mood (RQ2b), convenience (H12b), sensory appeal (H13b), natural content (H14b), price (H15b), familiarity (H17b), and sustainability (H18b)—had significant direct effects on intention. However, health ( $\beta = 0.02, 95\% \text{ CI } [0.01, 0.04]$ ), sustainability ( $\beta = 0.02, 95\% \text{ CI } [0.01, 0.04]$ ) and price ( $\beta = -0.01, 95\% \text{ CI } [-0.02, 0.00]$ ) motives showed significant indirect effects on behavioral intention through attitude (RQ3a).

Finally, for the moral dimension, personal norm did not predict intention ( $\beta = -0.02, p = .75$ ; H21a). Accordingly, no indirect effect of the moral cognition chain emerged from awareness of consequences to intention via ascription of responsibility and personal norm (RQ4a).

**4.7. Predictors of willingness to pay for legume-enriched foods**

The second-order attitude factor ( $\beta = 0.07, p = .01$ ; H1b and H3b) showed a smaller but significant association with willingness to pay. For the cognitive dimension, awareness of environmental consequences was a significant predictor of willingness to pay, but its effect was negative ( $\beta = -0.15, p = .01$ ; H2c rejected). For H2e, the serial pathway from awareness of consequences through attitude to willingness to pay was

positive and significant ( $\beta = 0.03, 95\% \text{ CI } [0.01, 0.07]$ ).

For the emotional dimension, negative anticipated emotions ( $\beta = 0.05, p = .03$ ; H5b) were a significant predictor, while positive anticipated emotions were not (H4b).

In considering the social dimension, neither subjective norm (H6b) nor trust (H8b) directly affected willingness to buy. However, trust had a positive indirect effect on willingness to pay via attitude ( $\beta = 0.02, 95\% \text{ CI } [0.00, 0.04]$ ; RQ1b), indicating that higher trust enhances positive evaluations of legume-enriched foods, promoting behavioral responses.

For the behavioral dimension, perceived behavioral control (H9b) did not predict willingness to buy. However, past consumption of legume-enriched foods significantly predicted willingness to pay ( $\beta = 0.22, p < .001$ ), as did past legume consumption ( $\beta = 0.07, p = .002$ ). Therefore, H10b was supported.

In the motivational dimension, two motives were negatively related to willingness to pay: sensory appeal ( $\beta = -0.14, p < .001$ ; H13c) and price ( $\beta = -0.14, p < .001$ ; H15c). All other motives (health (H11c), mood (RQ2c), convenience (H12c), natural content (H14c), weight control (H16c), familiarity (H17c), and sustainability (H18c)) were non-significant ( $ps > 0.05$ ). For the willingness to pay, health ( $\beta = 0.01, 95\% \text{ CI } [0.00, 0.03]$ ), sustainability ( $\beta = 0.01, 95\% \text{ CI } [0.00, 0.03]$ ) and price

( $=-0.01$ , 95% CI  $[-0.01, 0.00]$ ) motives showed slight but significant indirect effects on behavioral outcomes through attitude (RQ3b).

Finally, in the moral dimension, personal norm was the strongest predictor of willingness to pay for legume-enriched foods ( $\beta = 0.23$ ,  $p < .001$ ; H21b). For RQ4b, the serial pathway from awareness of consequences through ascription of responsibility and personal norm to willingness to pay was positive and significant ( $\beta = 0.22$ , 95% CI  $[0.10, 0.36]$ ).

## 5. Discussion

The present study proposes a Multicomponent Food Choice Model (MFCM) that integrates cognitive, affective, social, behavioral, motivational, and moral dimensions to explain consumers' acceptance of a food category that represents familiarity within innovation, a form of "low-disruption" innovation exemplified by legume-enriched foods (i.e., reformulated products that incorporate legume ingredients into familiar staples such as pasta, bread, or biscuits).

From a general evaluative perspective, this study shows that consumers hold a predominantly positive view of legume-enriched foods, reflecting both cognitive approval and affective resonance. These products appear to combine familiarity and perceived healthfulness, generating favorable attitudes even in the absence of strong emotional arousal. Nonetheless, descriptive data indicate that while consumers evaluate legume-enriched foods positively, their reported intention to consume and willingness to pay are comparatively lower. This pattern suggests that, at a descriptive level, consumers conceptually appreciate reformulated foods. However, they express more cautious readiness to act or to invest financially in them.

Differences across sociodemographic groups further refine the picture. Women, younger individuals, and participants with higher education or greater financial security reported more frequent consumption, confirming that openness to dietary innovation is partly shaped by socioeconomic and lifestyle factors. The absence of regional differences, instead, suggests that legume-enriched foods have reached a homogeneous level of diffusion across the country. Importantly, liking for legumes strongly predicted past consumption, highlighting the central role of ingredient familiarity in supporting product acceptance. Together, these findings suggest that legume-enriched foods occupy a unique psychological space: they are perceived as healthy and familiar, but their adoption still depends on consumers' prior experience and openness to innovation.

Regarding the cognitive dimension, attitude towards legume-enriched foods was best captured as a unified evaluation. Although affective and cognitive components were measured separately, their very high correlation suggests that emotional and reasoned appraisals largely converge into a single response in this low-disruption category. This interpretation aligns with evidence that acceptance of food innovations is shaped by perceived naturalness and the absence of disgust-eliciting cues, factors typically muted for familiar, reformulated products. In contrast, more disruptive technologies often trigger stronger affective (disgust) and risk responses that can separate evaluations (Egolf et al., 2019; Evans et al., 2010; Siegrist & Hartmann, 2020).

Awareness of environmental consequences did not directly predict intention but showed an indirect effect through attitude, ascription of responsibility, and personal norm. This pattern is consistent with previous findings showing that awareness functions as a cognitive cue that motivates action when associated with a positive evaluative judgment and when internalized as responsibility and personal obligation (Carfora et al., 2020, 2021). For willingness to pay, a dual pattern emerged: a) a direct negative effect when controlling for personal norm, consistent with heightened cost-benefit scrutiny and price sensitivity once the moral push is held constant; b) a positive indirect effect through the same moral pathway. This two-track effect on willingness to pay in the context of novel food extends the literature by showing that pro-environmental awareness can both enable financial engagement

(via moral internalization) and constrain it (via analytic price evaluation).

Overall, the cognitive dimension functioned more as a modulator than a primary accelerator: it overlapped substantially with affective appraisal, supported financial engagement when coupled with moral internalization, and dampened willingness to pay when attention shifted towards the price-benefit trade-off.

Positive anticipated emotions strongly predicted intention, consistent with research showing anticipated affect as a proximal driver of dietary intentions and behavior (Carfora, Morandi, Jelić, & Catellani, 2022; Onwezen et al., 2013). In contrast, negative anticipated emotions (e.g., anticipated guilt) did not predict intention but did predict willingness to pay. This pattern echoes valence-specific routes reported for plant-based meat, where positive anticipated emotions align with addition intentions and negative with replacement intentions, especially among current users (Carfora, Morandi, & Catellani, 2022). It also extends valence-specific routes to a monetary outcome. Negative anticipated emotions appear to correspond to a deeper, resource-demanding commitment (higher willingness to pay), whereas positive anticipated emotions energize behavioral readiness.

Within the social dimension, social norms were confirmed as a robust driver of behavioral intention, supporting prior research in the domain of food choices (e.g., Carfora et al., 2020). However, social norms did not predict willingness to pay. This pattern echoes findings in novel-food research where subjective norms did not carry over to willingness to pay (for a premium price) through intention, indicating a weak intention-mediated normative route to monetary outcomes (Yang et al., 2024). Taken together, these results suggest that conformity-based motivations can foster behavioral readiness yet tend to wane when decisions require financial commitment, a stage at which social desirability pressures generally exert less influence than cost-benefit considerations (Higgins et al., 2022).

For the behavioral dimension, perceived behavioral control was positively related to intention but not to willingness to pay. This asymmetry suggests that perceived behavioral control helps consumers cross the volitional threshold but not the financial one. Translating readiness into payment seems to require moral internalization and/or affective signals that justify the expense, mechanisms that emerged as stronger predictors of willingness to pay in our data. Past behavioral experience also played a differentiated role. While past consumption of legume-enriched foods predicted both intention and willingness to pay, past legume consumption predicted only willingness to pay. These findings imply that specific experience with reformulated products enhances confidence and behavioral readiness, whereas familiarity with the base ingredient reinforces perceived value and justifies financial engagement. In other words, intention depends on product-level familiarity, while willingness to pay also reflects ingredient-level predisposition. Considering both forms of behavioral experience offers a more comprehensive picture of how familiarity shapes acceptance of reformulated foods.

Regarding motivational processes, health and sustainability motives positively influenced attitude, confirming their role as key facilitators of favorable evaluations of plant-based and reformulated products (Onwezen et al., 2021). In addition, both motives indirectly increased intention and willingness to pay through attitude, underscoring that their influence operates mainly via positive evaluation rather than through direct motivational pathways. Conversely, price and sensory appeal motives negatively influenced attitudes and, in turn, willingness to pay, reflecting two enduring barriers to innovation acceptance. The negative impact of sensory appeal is consistent with evidence that reformulation may alter taste or texture, leading taste-oriented consumers to judge such products less favorably (Verbeke et al., 2015).

Likewise, price consciousness emerged as a significant obstacle, consistent with prior findings that functional and sustainable foods are often perceived as overpriced or not worth their premium (Apostolidis and McLeay, 2016; Aschemann-Witzel and; Zielke, 2017,

Aschemann-Witzel and Zielke, 2017). Notably, the natural content motive showed a small negative association with attitude, in line with concerns about processing or “unnaturalness” even for familiar products (Rozin, 2005; Román et al., 2017; Siegrist & Hartmann, 2020). The small positive effect of the weight control motive on intention represents a novel contribution, suggesting that health-oriented consumers view these products as suitable for maintaining dietary balance, even if they do not perceive them as emotionally rewarding. Other motives (mood, convenience, natural content, familiarity, and weight control) were not significant either directly or indirectly. The lack of effect of mood indicates that legume-enriched foods, while perceived as healthy, do not evoke strong emotional gratification.

Regarding the moral dimension, the moral chain was fully supported, consistent with previous findings (Carfora et al., 2020, 2021). Awareness predicted ascription, which in turn strongly predicted personal norm, confirming the internalization of moral responsibility. However, personal norm predicted willingness to pay but not intention, suggesting that moral obligation leads to financial commitment rather than behavioral readiness. This indicates that moral reasoning drives moral investment rather than behavioral activation. Consumers seem willing to purchase when doing so aligns with their moral self-concept, while everyday consumption is shaped primarily by affective and social processes.

Overall, the findings reveal a dual structure of engagement: intention was guided by affective and social readiness, while willingness to pay was governed primarily by moral and value-based commitment, with additional modulation by price sensitivity and prior experience.

### 5.1. Limitations

Although the present study examined a wide range of psychosocial predictors, it did not include all psychological variables that are commonly associated with novel food acceptance, for example perceived risk or disgust (Monaco et al., 2024). This choice reflects the specific characteristics of the product under investigation. Legume-enriched foods combine two familiar and trusted components (i.e., legumes and staple foods) and therefore represent a low-disruption form of innovation (Giacalone et al., 2023). For such products, consumers' evaluations are less likely to be dominated by risk- or disgust-related reactions and can instead be meaningfully explained by broader psychosocial mechanisms such as attitudes, norms, motives, and moral considerations.

Nevertheless, the cross-sectional nature of the data prevents causal inference about the observed relationships. Moreover, as the study relied on self-reported measures, results may be influenced by recall and social desirability biases. Finally, the sample was limited to Italian consumers, and cultural differences in legume consumption or sustainability values may restrict the generalizability of the findings. Future research should replicate this model across different cultural contexts and food innovations, integrating behavioral or experimental data to test the robustness of the proposed multicomponent framework.

### 5.2. Theoretical implications

The present findings have implications for theory development in food choice and novel food acceptance research. By organizing cognitive, affective, motivational, social, behavioral, and moral determinants within a single structural framework, the Multicomponent Food Choice Model provides an integrative architecture that clarifies the functional roles of predictors often examined in isolation. This supports the view that acceptance of food innovations is best understood by modelling the joint operation of multiple psychological processes rather than relying on single-theory explanations. Importantly, the framework also highlights the need for context-sensitive modelling. Future research should examine how the model may be adapted to more disruptive novel food contexts, such as insect-based or cultured foods, where affective

reactions and risk-related perceptions are likely to play a more central role. In such cases, familiarity-based motives or past consumption may become less influential, while constructs related to disgust, perceived risk, or food neophobia may dominate acceptance processes. Accordingly, the Multicomponent Food Choice Model should be interpreted as a flexible framework whose components can be emphasized or adjusted depending on the degree of disruption characterizing the food innovation.

In addition, the observed convergence between cognitive and affective attitude components suggests that, in the context of low-disruption innovations embedded in familiar food formats, beliefs and emotions may coalesce into a more unified evaluative representation. This points to a boundary condition for attitude structure in food choice models, whereby the differentiation between cognitive and affective evaluations may become more pronounced as perceived novelty and disruption increase. Future research should therefore explicitly examine how the structure of attitudes varies across different types of food innovations, testing whether cognitive and affective components diverge in more disruptive contexts and whether this divergence alters their relative predictive roles for intention and willingness to pay.

Finally, a central contribution of this study is the explicit distinction between two forms of behavioral commitment that have typically been examined separately in prior research: behavioral intention and willingness to pay. While intention reflects a planning-oriented readiness to act (Ajzen, 1991), willingness to pay captures a more demanding form of economic and value-based engagement (OECD, 2018). The results show that these outcomes are driven by partially distinct psychological mechanisms, with affective and normative processes primarily supporting intention, and moral and value-based considerations playing a stronger role in willingness to pay. By examining both outcomes within the same integrative model, this study demonstrates that openness to adopting a food innovation does not necessarily translate into readiness to bear economic costs, highlighting the limitations of prior studies that treat these indicators as interchangeable measures of acceptance.

### 5.3. Practical implications

From a practical perspective, the findings indicate that different stakeholders may pursue distinct, yet complementary, objectives when promoting reformulated foods such as legume-enriched products. Increasing behavioral intention is particularly relevant for public health actors and policy initiatives aimed at normalizing sustainable food choices and encouraging trial and adoption, whereas willingness to pay is a critical outcome for industry actors concerned with market viability and economic sustainability. The results suggest that these outcomes should not be targeted with identical strategies. Affective and normative cues may effectively foster openness and intention, for example by emphasizing positive emotions associated with trying the product (such as enjoyment or pride) or highlighting that similar others are increasingly choosing legume-enriched foods. Willingness to pay requires stronger value-based justification. In this case, communication and product positioning should explicitly legitimize economic trade-offs by linking the product to moral and ethical considerations, such as its contribution to environmental sustainability, reduced reliance on animal-based proteins, or broader societal benefits.

Beyond communication strategies, the findings also point to implications for product design and diffusion. The strong role of past behavior indicates that acceptance can be consolidated by embedding legume-enriched foods within familiar formats and everyday consumption contexts, reducing the cognitive and practical effort required for adoption. Product development choices that prioritize familiarity and ease of use may therefore be as important as persuasive messaging. Moreover, the joint role of health and sustainability motives suggests that practitioners should integrate nutritional and environmental value into a coherent offering, rather than treating these dimensions as competing or interchangeable appeals.

Furthermore, the results have implications for pricing strategies and choice architecture. Since willingness to pay appears to be anchored in moral and value-based engagement rather than affective appeal alone, price premiums for legume-enriched foods may be more effectively supported when embedded within transparent value narratives, such as ethical sourcing, environmental contribution, or collective benefits. Labels and certifications that connect individual food choices to broader social or environmental responsibility may also play a complementary role in supporting willingness to pay, particularly for reformulated foods positioned as sustainable alternatives. This suggests that economic acceptance is facilitated not only by lowering prices but also by legitimizing them.

Finally, the role of past behavior highlights the importance of everyday consumption contexts in shaping acceptance. Institutional settings such as school or workplace catering, food service environments, and routine meal contexts may function as key sites for normalizing legume-enriched foods. In these contexts, facilitating repeated exposure (through food service offerings, tasting initiatives, or default inclusion in routine meals) may strengthen acceptance over time by transforming initial openness into stable and habitual consumption, without requiring active or repeated persuasive efforts.

## 6. Conclusion

This study provides an integrative view of consumers' acceptance of legume-enriched foods, a form of low-disruption innovation that blends familiarity with nutritional and environmental benefits. By combining cognitive, affective, social, motivational, and moral determinants within a single framework, the Multicomponent Food Choice Model elucidates how distinct psychological processes jointly predict behavioral and financial commitment. The findings reveal that attitude, social norms, and positive anticipated emotions primarily drive behavioral intention, while moral and motivational engagement explain willingness to pay. These results highlight the need to differentiate between readiness to act and willingness to invest, as they are shaped by partially distinct psychological mechanisms. Overall, the study advances theoretical understanding of food innovation acceptance and offers practical insights for promoting reformulated products that align health, sustainability, and familiarity.

## CRedit authorship contribution statement

**Valentina Carfora:** Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Patrizia Catellani:** Writing – original draft, Supervision, Project administration, Funding acquisition.

## Ethical statement

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of the Department of Psychology of the Catholic University of the Sacred Heart (protocol code 97/23). Written informed consent was obtained from all subjects involved in the study.

## Data availability statement

Data will be made available on request.

## Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Patrizia Catellani reports financial support was provided by National Recovery and Resilience Plan, Mission 4 Component 2 Investment 1.3, Italian Ministry of University and Research, European Union

NextGenerationEU. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.appet.2026.108489>.

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