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Ecolabels as a means to satisfy consumers' environmental concerns, need for information, and trust in short fruit and vegetable supply chains: a cross-national study

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Abstract

Short fruit and vegetable supply chains have become an important context for sustainable food systems, as they prioritize local, transparent, and environmentally friendly production processes. These supply chains are particularly relevant in addressing consumer concerns about food production. In this context, fruit and vegetable production raises significant environmental concerns, driving consumer demand for ecolabelled products. However, trust and perceived credibility of these labels remain critical, especially in short supply chains that emphasize transparency and local engagement. Therefore, this study examines the factors influencing consumer Willingness to pay for environmental labels on fruits and vegetables in the short supply chains. Specifically, we hypothesize that consumers' willingness to pay for fruits and vegetables with ecolabels is higher for those who show interest in packaging information, who are concerned about the environment and those who have positive attitudes towards and trust in current certifications. We collected the data for our study via an online survey involving 1,029 participants from Egypt, France, Greece, Italy, and Morocco, applying partial least squares structural equation modelling for our analysis. Our results indicate that positive attitudes and trust in certifications have a positive effect on consumer perceptions of environmental labels in all the countries studied, and particularly in France and Greece. The influence of interest in ecolabel information on Willingness to pay is lower and is only detected in Greece and Italy. In Morocco and Italy, on the other hand, environmental concerns about production have a significant influence. The relevance of short fruit and vegetables supply chains in these findings underscores the importance of promoting trust and transparency in labelling within localized food systems, as this can further align fruit and vegetable supply chains with consumer demand for eco-friendly products.

Keywords: Consumer attitudes, Environmental concern, Ecolabels, Trust in labels, Short fruit and vegetables supply chains, Willingness to pay

Introduction

With rising environmental awareness, consumers increasingly seek sustainable options, especially in the fruit and vegetable (FV) sector, where demand for ethically produced products is growing. FV production involves environmental challenges like pesticide use, soil degradation, and greenhouse gas emissions, intensifying consumer concerns and their need for transparency (Goryńska-Goldmann et al. 2023). To address this, manufacturers and organizations provide ecolabels, which inform consumers about a product's environmental and ethical impact. These labels help consumers make informed choices, increasing interest in product origins, nutritional content, and sustainability practices. Therefore, consumers actively seek trustworthy labels that reflect environmental responsibility and ethical sourcing (Aprile and Punzo 2022).

Despite the growing use of ecolabels, key information is often missing, and concerns persist about their reliability. Various organizations issue certifications, but their effectiveness depends on consumer trust (Rupprecht et al. 2020). Existing research highlights that positive attitude towards ecolabels influence purchasing decisions, reflecting awareness of environmental and ethical impacts (Peiró Signes et al. 2023). This has led to rising demand for transparency, third-party verification, and clear labelling standards (Brach et al. 2018). However, confusion can undermine credibility (Wilson and Lusk 2020), making trust essential for both consumer choices and encouraging sustainable business practices, ultimately fostering a more responsible market (Nygaard 2023). Additional information in certifications raises costs for manufacturers and certification bodies (Yenipazarli 2015). Understanding consumers' willingness to pay (WTP) for sustainable products is crucial to assess the feasibility of integrating sustainability into agriculture and its impact on market dynamics. Studies show that factors like socio-demographics, individual values, and label reliability influence consumer WTP for sustainability certifications (Sgroi et al. 2023).

In addition, amongst FV supply chains, short food supply chains (SFSCs) are worth examining in detail. As consumers question the global agri-food system and increasingly move towards more sustainable food supply methods, SFSCs represent an alternative food network. SFSCs comprise food supply structures characterized by a restricted number of economic units and geographical proximity between producers and consumers. These food networks are now widespread worldwide and provide a vast range of environmental, economic, and social benefits (Benos et al. 2022). FVs are amongst the most important products to be exchanged within the SFSC framework because the latter offers shorter transportation routes and guarantees the quality and freshness of these products (Drejerska & Sobczak-Malitka 2023). In addition, it provides greater transparency to the production process as well as familiarity and a closer connection between producers and consumers (Rai et al. 2023).

Our study area includes five Mediterranean countries: Italy, France, Greece, Morocco, and Egypt. Our research specifically targets these countries in order to gain a comprehensive understanding of consumer behaviour in relation to FV ecolabels. The specific traits of Mediterranean consumers, such as their cultural values, environmental awareness, and attitudes for fresh, locally-produced food, as highlighted in previous studies (Aranceta-Bartrina et al. 2017; Lisa Clodoveo et al. 2022), make FV ecolabels an attractive option for both consumers and businesses in this region.

Hence, the research is structured around the following key research questions (RQ):

- RQ1 Does consumers' interest in packaging information influence their WTP for FVs with ecolabels?
- RQ2 To what extent does environmental concern drive consumers' WTP for FVs with ecolabels?
- RQ3 How do consumers' trust in and perceptions of existing certification schemes affect their WTP for FVs with ecolabels?

This study makes several key contributions to the literature on sustainable food consumption and ecolabel effectiveness. First, it provides empirical evidence on consumer WTP for ecolabelled FVs in the Mediterranean region, an area where limited research has been conducted despite its strong agricultural and environmental significance. Second, by integrating insights into SFSCs, this research offers a novel perspective on the potential of addressing consumer concerns about ecolabel credibility. Third, our findings contribute to policy and marketing strategies by identifying the most influential drivers of ecolabel acceptance, helping stakeholders design more effective sustainability communication and certification frameworks.

The rest of the article is structured as follows. The next section addresses the theory surrounding the three hypotheses tested in our study and the previous literature dedicated to these topics. The methodological section presents our survey design, data collection details, and the analytical techniques used to meet our objectives. The ensuing section describes the findings that emerge from our estimated models and subsequent hypothesis testing. Lastly, we end with a discussion, which includes some of the key findings of our study, and our conclusions, in which we explore recommendations for future research.

Literature review and research hypotheses

Food consumer attitudes are changing towards more sustainable and environmentally friendly products, as shoppers no longer make their purchase decisions solely based on product characteristics, but also on the basis of their environmental and social impact (Galati et al. 2019). Consumer attitudes for FVs that meets sustainability standards is influenced by several factors, one of which for Portuguese consumers is their interest in information on product packaging (Vicente et al. 2021). This information is a crucial element in consumers' purchase decisions as it helps them make choices and weigh their priorities (Marchini et al. 2021). A survey by Miller et al. (2017) found that FV consumers in the UK, Japan, India, and Indonesia who seek information are more knowledgeable about sustainability, positively influencing their ecolabel attitudes. Similarly, real-world shopping uncertainty highlights the role of clear information in shaping consumer choices. Labelling is an important communication tool that provides consumers with valuable insights into the sourcing, production, and ethical considerations associated with the products they purchase (Orzan et al. 2018). In the case of FVs, labels could significantly influence American consumer attitudes and purchasing behaviour, especially among consumers concerned with environmental sustainability (Rihn et al. 2019). These labels can contain a wide variety of information, including details about the

products' nutritional content, geographical origin, and shelf life. They can also refer to existing product certifications, such as organic, environmentally friendly certifications, and other ethical and social information (Jürkenbeck 2023).

When purchasing FVs, consumers generally pay attention to this varied information on the labels to make informed purchase decisions. The origin of products, especially locally grown or domestically produced FVs, holds particular interest for many Spanish consumers who aim to support local farmers (Fuentes et al. 2023). In addition, labels often indicate whether the product is organically or conventionally grown. This distinction as Kuhar and Juvancic (2012) found out is crucial for Slovenian FV consumers who prefer organic products, as they are grown without synthetic pesticides or fertilizers Kuhar and Juvancic (2012). Certifications such as "Organic", "Non-GMO Project Approval", or "Fair Trade" are examples of information on labels that provide further insight into the products' production methods and ethical considerations. In addition, some consumers are keen to understand the nutritional content of the products they consume, including details about calories, vitamins, minerals, and other nutrients, helping them to make healthier choices (McGuinness et al. 2022). However, some consumers may not appreciate or utilize nutrition labels on food products. For instance, research suggests that certain individuals find labels confusing or difficult to interpret, leading them to disregard the information altogether (Deakin 2011; Monier-Dilhan 2018). Consumers also look at the packaging date of certain packaged FVs to assess their freshness. According to Tarancón et al. (2021); Török et al. (2023), information on how to store and handle the fresh fruits is valuable and helps to maintain freshness and quality, which ultimately helps consumers to extend the shelf life of their purchases Tarancón et al. (2021).

Research on consumer attitudes has shown that people who are more interested in and informed about the environmental and social impact of their choices are more likely to make environmentally conscious decisions and are willing to pay a higher price for sustainable products (Gomes et al. 2023). From this, we can generally infer that the WTP for certified sustainable products is seen as a form of consumer activism, where individuals view their purchasing power as a means to contribute to positive environmental change. We therefore can assume that consumers who have a greater interest in the information on the packaging (and/or on the electronic labels), particularly information on FV labels, are more willing to pay for products that align with their ethical and sustainable values.

Therefore, we hypothesize that FV consumers' inclination towards information on product packaging positively influences their WTP that feature ecolabels, such that:

H1

Consumers' interest in information on the packaging has a positive effect on their WTP for FVs with ecolabels.

Consumers with strong environmental concerns are more likely to prefer FVs produced through sustainable methods, such as organic farming and reduced pesticide use. Studies indicate that in European, higher environmental concern translates into a greater willingness to pay for ecolabelled FVs, as these labels signal environmentally responsible

production (Aprile et al. 2012). Similarly, in France and Germany, consumer attitudes for sustainably grown FVs are influenced by a commitment to reducing environmental impact and supporting eco-friendly agricultural practices (Aschemann-Witzel and Zielke 2017).

Environmental concern also plays a crucial role in shaping purchasing decisions, as consumers seek to align their choices with their sustainability values. People who care deeply about the environment may feel uncomfortable when choosing conventionally grown fruits and vegetables. To avoid this, they are more likely to buy FVs with ecolabels, as these labels reassure them that their choices support the environment (Moser and Raffaelli 2012). The presence of ecolabels reassures consumers that their purchase contributes to environmental conservation, reinforcing their motivation to choose sustainable fruits (de-Magistris and Gracia 2016).

Given this evidence, environmental concern emerges as a key driver of consumer attitudes for FVs with ecolabels. Consumers who prioritize environmental sustainability are more inclined to support eco-friendly agricultural practices through their purchasing choices. Therefore, we hypothesize:

H2

Consumers' concern for the environment has a positive effect on their WTP for FVs with ecolabels.

Environmental certifications serve as a signal to consumers about the environmentally friendly characteristics of accordingly labelled products. Attitudes of FV consumers about such certifications can significantly influence their purchase decisions (van Bussel et al. 2022). If FV consumers have positive attitudes towards environmental certifications, they are likely to be more inclined to support and value products that meet environmental standards. Consumer satisfaction may be a result of these positive attitudes. Consumer positive attitudes with current certifications reflect the perceived adequacy of these schemes in addressing environmental concerns (Truong et al. 2022). If consumers are satisfied with existing FV certifications, they are more likely to have a positive attitude towards these certifications. However, positive attitudes of FV consumer towards current environmental certifications may depend on various factors, including trust, which is a fundamental element in the consumer decision-making process (Ricci et al. 2018). When FV consumers trust current food certifications, there is a sense of reliability and trust in the attached label (Wu et al. 2021). Several elements can contribute to building trust in these certificates. However, one important aspect that fuels consumer scepticism is the occurrence of greenwashing. Greenwashing occurs when companies amplify or distort their environmental efforts to create a misleading impression of their environmental friendliness (de Freitas Netto et al. 2020).

Some studies have highlighted the influence that consumer trust in certifications has on their WTP for products with higher prices. They have found a positive correlation between FV consumer trust in certifications and their WTP for premium certified products. When FV consumers have positive attitudes in the authenticity and reliability of certifications, they are more likely to perceive that the certified product is higher in

quality, safer, or more sustainable (de-Magistris and Gracia, 2016). It should be noted this can vary, whereby consumers in certain regions or demographic groups assign more or less value to certificates, which also has an impact on their WTP (Denver et al. 2023).

Integrating these components leads to the hypothesis that consumers who trust in and have positive attitudes towards established certification schemes tend to accept and pay for labels for products such as FVs, such that:

H3

Consumers' positive attitudes (familiarity or satisfaction) towards and trust in the current certifications have a positive impact on their WTP for FVs with ecolabels.

Finally, consumer attitudes towards environmentally friendly products are influenced by their demographic profiles, such as age, income, and education level. Consumers of different ages have different attitudes and a greater or lesser WTP (Gomes et al. 2023). In case of FVs, Vicente et al. (2021) mentioned that Portuguese consumers' education level plays an important role, as people with higher levels of education are more likely to understand the impact of their consumption choices and show a greater WTP for environmentally certified FVs. Education level also has a significant impact on consumer attitudes (Vicente et al. 2021).

In addition, younger consumers tend to assign more value to sustainability and are more willing to pay for environmentally friendly certifications than older generations (Gomes et al. 2023). Menozzi et al. (2015) highlighted how socio-demographic and personal factors influence young Italian adults' vegetable consumption. Their findings suggest that targeted interventions—particularly for male students, those in non-food science fields, and less active individuals—can foster greater adoption of sustainable dietary habits. This underscores the need for tailored strategies to promote environmentally conscious food choices among younger consumers. Nevertheless, challenges remain, particularly in relation to economic constraints and competing priorities. While some consumers strive to align their purchases with their environmental values, others face financial constraints that limit their ability to prioritize more sustainable choices (Baumgärtner et al. 2017).

Therefore, in this study, we consider age and education level as control variables to observe their effects on consumers' WTP for FVs. Figure 1 shows the conceptual model of the impact that interest in information on the label, environmental concerns, positive attitude towards and trust in current certifications, and control variables have on consumers' WTP for FVs with ecolabels.

Methods

Survey design

The questionnaire included multiple-choice queries, Likert matrix questions containing several items, and open-ended inquiries. Seven-point Likert scales ranging from “1—strongly disagree” to “7—strongly agree” were used since they have a stronger correlation with observed significance levels compared to 5-point scales and respondents report that these offer the most accurate choices (Lozano et al. 2008).

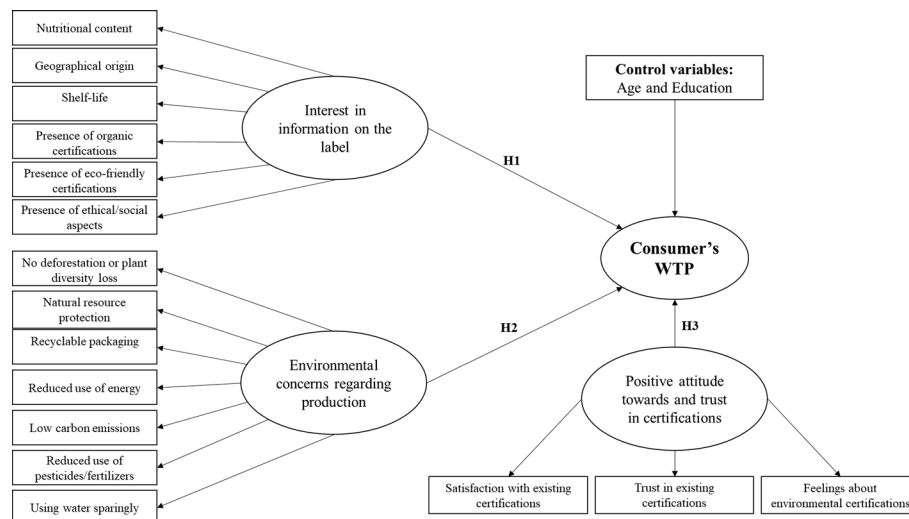


Fig. 1 Research theoretical framework

The first and second set of screening questions included socio-demographic information (such as gender, age, and education level) and filter questions. The latter was used to identify participants who were the main decision-makers regarding the purchase of FVs in their households and who shopped for food at least once a week and who looked for certifications or standard information on labels when buying FVs. To confirm that participants purchase FVs through SFSCs, they were asked about the primary source of their FV purchases. Participants were classified under the SFSC quota if they selected “local market” or “online + local products” as their most frequent purchase channels.

The questionnaire was further divided into different sections, containing information on the label such as: nutritional content, geographical origin, shelf life, presence of environmentally friendly certifications and information (Peiró Signes et al. 2023); environmental concerns regarding production impacts, such as deforestation, the failure to preserve natural resources, non-recyclable packaging, high carbon emissions, and wasteful water consumption (Isaak and Lentz 2020); and attitudes towards and trust in certifications, such as satisfaction with existing certifications, trust in existing certifications, and feelings towards environmental certifications (Nygaard 2023). Details are provided in Table 2. The questionnaire also included explanations about some of the sustainability concepts and the environmental standards to clarify the topic for the respondents.

The development of the scale items began with a thorough review of the relevant literature presented in Jürkenbeck (2023); Orzan et al. (2018); Peiró Signes et al. (2023); and Ricci et al. (2018), which helped to build a theoretical understanding of the constructs under investigation. This foundation guided the creation of an initial pool of items that were believed to adequately capture the domain of interest, thus following the recommended inductive approach for exploratory research (Hinkin 1998).

Specifically, the elaboration of the questionnaire drew upon existing survey instruments from prior studies addressing consumer preferences for ecolabelled FVs.

Relevant items from these instruments were carefully adapted to fit the specific context of this research. This approach allowed us to leverage previously validated measures while ensuring they were appropriately contextualized for our study.

Moreover, we further contextualized the analysis by considering common dimensions identified across previous studies investigating factors influencing trust in sustainability claims, attitudes towards environmental certifications, environmental concern and interest in the label information. A total of 16 items were considered across three main thematic areas: (i) interest in the information on the label (six items), (ii) environmental concern regarding production (seven items), and (iii) attitude towards and trust in certification (three items) (see Table 3).

To enhance clarity, examples of the measures used for each dimension are the following.

Interest in label information was measured with statements such as: “*when shopping, I usually check...*” (scores: 1 = strongly disagree ... 7 = strongly agree) (Jürkenbeck 2023; Orzan et al. 2018).

- ... the nutritional content (e.g. vitamins) information
- ... geographical origin information;
- ... shelf-life information;
- ... presence of the organic certification information;
- ... presence of environmentally friendly production certifications information;
- ... presence of ethical/social aspects information (i.e. referring to the moral consequences of food choices, for humans and/or animals).

Environmental concern regarding production included items such as “it is important to me that the fruit & vegetables I purchase are produced...” (scores: 1 = strongly disagree ... 7 = strongly agree) (Isaak and Lentz 2020; Peiró Signes et al. 2023);

- ... without leading to deforestation nor loss of diversity of plants in their production environment
- ... in a natural resources protecting process (e.g. to prevent soil degradation);
- ... without using packaging that is not recyclable;
- ... with a reduced use of energy; with low carbon emissions;
- ... with a reduced use of pesticides/fertilizers;
- ... using water sparingly.

Attitude towards and trust in certification was captured through statements like (Chetioui et al. 2023; Ricci et al. 2018):

- “I am satisfied with the information provided by existing certifications/standards” (scores: 1 = strongly disagree ... 7 = strongly agree);
- “I trust claims on existing certifications/standards (i.e. I believe that the information they provide is true)” (scores: 1 = strongly disagree ... 7 = strongly agree);
- “how do you feel about environmental certifications?” (scores: 1 = very negative ... 7 = very positive).

The questionnaire was drafted in English and then it was translated into the official languages of the respective target countries. The back-translation approach was employed to validate the translated questionnaire (Epstein et al. 2015). Initially, the questionnaire was drafted in English and translated into the target languages. Native-speaking experts from each country translated the survey questions, and then retranslated the text back into English, which were then carefully reviewed by at least two experts. The resulting version was compared with the original to identify any discrepancies. Special attention was given to maintaining contextual accuracy and cultural nuances throughout the translation process. These versions were available at the beginning of June 2023.

Data collection

The survey was conducted through the Qualtrics[®] online platform (www.qualtrics.com) in June 2023. Participants were selected in collaboration with Toluna[®] (www.toluna.com), an international market research agency as part of a cross-national panel in Egypt, France, Greece, Italy, and Morocco. These five countries are known for their Mediterranean diet, characterized by the abundant consumption of fruits and vegetables (EUROSTAT 2022). The data collection process was conducted anonymously, ensuring that no personal information was gathered in the survey. Ethical approval was obtained from the Bioethics Committee of the University of Bologna (Protocol No. 0122660, dated 08/05/2023).

The survey began with a pre-test or soft launch, during which around 100 questionnaires (through the panels provided by the Toluna research agency) were completed. The results from the pre-test were not included in the final data collection. We conducted the pre-test to refine our questionnaire, incorporating feedback from the preliminary respondents to improve clarity and relevance. After correcting minor errors identified during this phase, we conducted the final survey. Participants reported that it took an average of 15 to 20 min to complete.

The sample size was determined based on Cochran's sampling formula (Cochran 1977), considering a confidence level of 95% and a margin of error of 5%. In order to ensure a balanced and comprehensive sample that would provide meaningful insights (Futri et al. 2022), and to limit the potential biases ensuing from the use of an online survey sample (Grewenig et al. 2023), we also applied a quota strategy based on gender, age, and education, taking into account their distribution within the target country populations.

The survey was addressed to 169 consumers in Egypt, 220 in France, 225 in Greece, 245 in Italy, and 170 in Morocco (see Table 1). After thorough data-cleaning and validation, some participants were excluded from the survey due to the filter and control questions described in the previous Sect. (3.1 Survey design) or because their responses were incomplete. As a result of this process, our final sample included 1,029 respondents in five countries.¹

The demographic characteristics of the final participants are described in Table 1. Gender distribution was almost equal. In Italy, France, and Egypt, the number of

¹ . The supplementary material for this article can be found online at <https://amsacta.unibo.it/id/eprint/7696/>.

Table 1 Sample demographic information

| Characteristic | Italy | | France | | Greece | | Morocco | | Egypt | |
|----------------------|-------|------|--------|------|--------|------|---------|------|-------|------|
| | N | % | N | % | N | % | N | % | N | % |
| Gender | | | | | | | | | | |
| Male | 111 | 45.3 | 103 | 46.8 | 125 | 55.6 | 96 | 56.5 | 81 | 47.9 |
| Female | 134 | 54.7 | 117 | 53.2 | 100 | 44.4 | 74 | 43.5 | 88 | 52.1 |
| Age (in years) | | | | | | | | | | |
| 18–24 | 23 | 9.4 | 42 | 19.1 | 29 | 12.9 | 36 | 21.2 | 29 | 17.2 |
| 25–54 | 126 | 51.4 | 86 | 39.1 | 122 | 54.2 | 105 | 61.8 | 129 | 76.3 |
| 55–64 | 61 | 24.9 | 50 | 22.7 | 56 | 24.9 | 25 | 14.7 | 9 | 5.3 |
| Over 65 | 35 | 14.3 | 42 | 19.1 | 18 | 8.0 | 4 | 2.4 | 2 | 1.2 |
| Education | | | | | | | | | | |
| Primary school | 10 | 4.1 | 4 | 1.8 | 1 | 0.4 | 2 | 1.2 | 0 | 0.0 |
| Secondary or college | 191 | 78.0 | 102 | 46.4 | 94 | 41.8 | 48 | 28.2 | 106 | 62.7 |
| Higher education | 44 | 18.0 | 114 | 51.8 | 130 | 57.8 | 120 | 70.6 | 63 | 37.3 |
| Total Sample | 245 | | 220 | | 225 | | 170 | | 169 | |

female participants was higher than that of males, while in Greece and Morocco, the number of male participants was higher than that of females. In all five countries, most respondents were in the 25–54 years age bracket. The distribution of educational levels varied from primary school to higher education in the countries surveyed.

Research methodology

Partial least square structural equation modelling (PLS-SEM) and the SmartPLS software (version 4.0.9.5) were used to assess the most important and significant factors influencing consumer attitudes. PLS-SEM is a variance-based estimation approach that does not rely on maximum likelihood (ML) estimation but instead uses an iterative algorithm to maximize explained variance in dependent constructs (Hair et al. 2021). Based on our research objectives and dataset characteristics, including the mix of ordinal Likert-scale responses and categorical variables, we selected partial least squares structural equation Modelling (PLS-SEM) as the most appropriate method. Unlike covariance-based structural equation modelling (CB-SEM), which requires normally distributed continuous variables and typically relies on maximum likelihood (ML) estimation, PLS-SEM is a variance-based approach that does not impose such distributional assumptions. PLS-SEM is highly flexible in terms of sample size and data distribution, making it particularly suitable for studies investigating attitudes in theory development and exploratory research (Shela et al. 2023; Si et al. 2023). Moreover, it accommodates different data scales, including metric, ordinal, and binary-coded variables (Ringle et al. 2023).

We employed partial least squares structural equation modelling (PLS-SEM) using the SmartPLS software (version 4.0.9.5). PLS-SEM is a variance-based estimation approach that does not rely on maximum likelihood (ML) estimation but instead uses an iterative algorithm to maximize explained variance in dependent constructs (Hair

et al. 2021). Given our dataset characteristics, including the mix of ordinal Likert-scale responses and categorical variables, PLS-SEM is a more appropriate choice than CB-SEM, which requires normally distributed continuous variables and often relies on ML estimation (Henseler et al. 2016).

Rationale for the use of reflective measurement models

In order to determine the credibility of our study's constructs, we first confirmed the reliability and validity of our measurement model which serves as the basis for the evaluation of the structural model. Due to the different approaches to evaluate the measurement model using reflective and formative scales, we used assessment measures based on the relationship between indicators and latent constructs related to the reflective measurements (Shela et al. 2023). We based our decision to adopt reflective models on the theoretical underpinnings and empirical evidence that suggest the latent constructs causally influence the observed indicators. We conceptualized these constructs as underlying phenomena that manifest through various observable behaviours and attitudes, consistent with the nature of reflective measurement models (Hair et al. 2021).

Tests on the measurement model's reliability and validity

The model's internal reliability, which is measured by indicator or factor loadings, was evaluated based on the guidelines provided by (Hair et al. 2021). We examined the internal consistency reliability using Cronbach's alpha and composite reliability (CR). The constructs' validity converges in explaining the variance of the indicators as determined by our use of the average variance extracted (AVE) (Hair et al. 2021). The relevant literature identifies two criteria for measuring discriminant validity: the Fornell–Larcker criterion and the heterotrait–monotrait ratio (HTMT). Despite some uncertainties in the use of the Fornell–Larcker criterion in the literature to determine discriminant validity and the HTMT criterion, which is recognized as the better criterion (Hair et al. 2021), we applied both criteria in our study.

Evaluation of the structural model

The structural model was evaluated using the coefficient of determination (R^2) and predictive relevance (Q^2) (Suphasomboon and Vassanadumrongdee 2022), and standardized root-mean-square residual (SRMR) (Henseler et al. 2016). To examine the effects of interest in information on the labels, environmental concerns, and positive attitudes towards and trust in current certifications on consumers' WTP for FVs with environmental labels, the structural model was evaluated. In the model, WTP was considered a dummy variable indicating whether consumers were willing to pay more for FVs with ecolabels or not. If they answered "yes" to the above question, we then asked them how much extra they were willing to pay for FVs with ecolabels, expressed in different percentages. These values representing the increase in consumers' WTP are spread across seven levels, from 5% to more than 30% (up to 5%, 10%, 15%, 20%, 25%, 30%, and more than 30% (Table 2). We then used this answer as an input for the WTP variable in the model.

Table 2 Frequency Analysis of Exposed WTP for Ecolabelled FVs

| % WTP | Italy | | France | | Greece | | Morocco | | Egypt | |
|-------|-------|------|--------|------|--------|------|---------|------|-------|------|
| | N | % | N | % | N | % | N | % | N | % |
| 0% | 62 | 25.3 | 74 | 33.8 | 89 | 39.6 | 43 | 25.3 | 14 | 8.3 |
| 5% | 96 | 39.2 | 68 | 31.1 | 55 | 24.4 | 45 | 26.5 | 45 | 26.6 |
| 10% | 54 | 22.0 | 39 | 17.8 | 50 | 22.2 | 40 | 23.5 | 20 | 11.8 |
| 15% | 12 | 4.9 | 22 | 10.0 | 17 | 7.6 | 25 | 14.7 | 31 | 18.3 |
| 20% | 11 | 4.5 | 10 | 4.6 | 10 | 4.4 | 7 | 4.1 | 21 | 12.4 |
| 25% | 9 | 3.7 | 3 | 1.4 | 2 | 0.9 | 6 | 3.5 | 21 | 12.4 |
| 30% | 1 | 0.4 | 1 | 0.5 | 2 | 0.9 | 2 | 1.2 | 16 | 9.5 |
| > 30% | 0 | 0 | 3 | 1.4 | 0 | 0.0 | 2 | 1.2 | 1 | 0.6 |
| Total | 245 | | 220 | | 225 | | 170 | | 169 | |

Results

Measurement model analysis

The results of the analysis of the measurement model are displayed in Table 3, including the observed and latent variables, the values of the factor loadings, Cronbach's alpha, and AVE for the five countries. Following Hair et al. (2021), factor loadings between 0.4 and 0.7 require careful evaluation before removal, based on their impact on internal consistency reliability and convergent validity. In our case, we adopted a threshold of 0.55 as a balance between ensuring sufficient explanatory power of the retained indicators and maintaining an acceptable level of internal reliability. This choice allowed us to exclude weaker indicators while preserving those contributing meaningfully to the construct's measurement, as further supported by the evaluation of Cronbach's alpha and composite reliability. For this reason, we dropped the observed variable for geographical origin for France. For Egypt, we removed shelf-life information, the reduced use of energy, the reduced use of pesticides and fertilizers, and the sparing use of water. The criteria for Cronbach's alpha and CR were in the acceptable range of 0.6 to 0.95 (Hair et al. 2021). In general, the minimum value for AVE is considered to be 0.5, but with a CR value above 0.6, a value of 0.4 is also acceptable (Suphasomboon and Vassanadumrongdee 2022). We measured validity using the Fornell–Larcker criterion and the HTMT ratio. In the case of the Fornell–Larcker criterion, the shared variance within each construct must be smaller than their AVEs, and the HTMT ratio should be less than 0.9 (Hair et al. 2021). In our case, both criteria met acceptance levels and confirmed the model's discriminant validity.

Structural model analysis

After identifying suitable measurement models, we estimated the structural model. Based on the elimination of some observed variables from certain measurement models, we estimated separate models for each country, allowing for country-specific analysis while maintaining the validity of each measurement model. We evaluated the model using R^2 and Q^2 and SRMR. The R^2 , which indicates the model's explanatory power, ranges from 0.08 for Morocco to 0.27 for Egypt. This variability underlines the different influences of these factors in the countries studied and illustrates the variables'

Table 3 Results of factor loadings, reliability, and validity of final constructs

| Scales and items | Italy | | | | France | | | |
|---|-----------|------|------|------|-----------|------|------|------|
| | λ | CA | CR | AVE | λ | CA | CR | AVE |
| Interest in information on the label | | 0.84 | 0.88 | 0.55 | | 0.79 | 0.85 | 0.54 |
| Nutritional content information | 0.78 | | | | 0.71 | | | |
| Geographical origin information | 0.58 | | | | - | | | |
| Shelf-life information | 0.69 | | | | 0.70 | | | |
| Presence of organic certifications | 0.81 | | | | 0.75 | | | |
| Presence of eco-friendly certifications | 0.82 | | | | 0.76 | | | |
| Presence of ethical/social aspects/information | 0.75 | | | | 0.74 | | | |
| Environmental concern regarding production | | 0.93 | 0.94 | 0.70 | | 0.91 | 0.93 | 0.65 |
| No deforestation or plant diversity loss | 0.84 | | | | 0.79 | | | |
| Natural resource protection | 0.83 | | | | 0.80 | | | |
| Recyclable packaging | 0.77 | | | | 0.71 | | | |
| Reduced use of energy | 0.84 | | | | 0.85 | | | |
| Low carbon emissions | 0.87 | | | | 0.88 | | | |
| Reduced use of pesticides/fertilizers | 0.85 | | | | 0.76 | | | |
| Using water sparingly | 0.86 | | | | 0.85 | | | |
| Positive attitude towards and trust in certifications | | 0.81 | 0.89 | 0.72 | | 0.74 | 0.85 | 0.65 |
| Satisfaction with existing certifications | 0.86 | | | | 0.82 | | | |
| Trust in existing certifications | 0.88 | | | | 0.82 | | | |
| Feelings about environmental certifications | 0.81 | | | | 0.78 | | | |

| Scales and items | Greece | | | | Morocco | | | | Egypt | | | |
|---|-----------|------|------|------|-----------|------|------|------|-----------|------|------|------|
| | λ | CA | CR | AVE | λ | CA | CR | AVE | λ | CA | CR | AVE |
| Interest in information on the label | | 0.85 | 0.89 | 0.57 | | 0.85 | 0.89 | 0.57 | | 0.84 | 0.88 | 0.60 |
| Nutritional content information | 0.75 | | | | 0.81 | | | | 0.77 | | | |
| Geographical origin information | 0.66 | | | | 0.60 | | | | 0.73 | | | |
| Shelf-life information | 0.64 | | | | 0.62 | | | | - | | | |
| Presence of organic certifications | 0.79 | | | | 0.85 | | | | 0.75 | | | |
| Presence of eco-friendly certifications | 0.86 | | | | 0.87 | | | | 0.85 | | | |
| Presence of ethical/social aspects/information | 0.80 | | | | 0.72 | | | | 0.78 | | | |
| Environmental concern regarding production | | 0.90 | 0.92 | 0.63 | | 0.84 | 0.87 | 0.48 | | 0.78 | 0.86 | 0.61 |
| No deforestation or plant diversity loss | 0.77 | | | | 0.77 | | | | 0.79 | | | |
| Natural resource protection | 0.83 | | | | 0.66 | | | | 0.79 | | | |
| Recyclable packaging | 0.85 | | | | 0.81 | | | | 0.75 | | | |
| Reduced use of energy | 0.80 | | | | 0.77 | | | | - | | | |
| Low carbon emissions | 0.80 | | | | 0.68 | | | | 0.78 | | | |
| Reduced use of pesticides/fertilizers | 0.73 | | | | 0.59 | | | | - | | | |
| Using water sparingly | 0.78 | | | | 0.48 | | | | - | | | |
| Positive attitude towards and trust in certifications | | 0.63 | 0.78 | 0.54 | | 0.74 | 0.84 | 0.63 | | 0.71 | 0.84 | 0.64 |
| Satisfaction with existing certifications | 0.69 | | | | 0.82 | | | | 0.87 | | | |
| Trust in existing certifications | 0.76 | | | | 0.74 | | | | 0.78 | | | |
| Feelings about environmental certifications | 0.76 | | | | 0.82 | | | | 0.73 | | | |

λ = Factor loading; CA = Cronbach's alpha; CR = Composite reliability; AVE = Average variance extracted

Number of observations in each country: Italy (245), France (220), Greece (225), Morocco (170), and Egypt (169)

complicated interplay in shaping consumers' WTP. The Q^2 values for WTP were greater than zero in the model, ensuring the models' predictive relevance (Suphasomboon and Vassanadumrongdee 2022). The SRMR criterion for all models falls within the acceptable threshold of ≤ 0.08 (Henseler et al. 2016), indicating a good model fit. The relatively low R^2 values for WTP in Italy, Greece, and Morocco, may be due to both the scale compatibility issue and the number of predictors used in the model. As discussed by Fishbein and Ajzen (2010), differences in the measurement levels between independent variables (e.g. Likert scales) and the dependent variable (categorical WTP levels) can reduce predictive relationships. Moreover, focusing on a small set of theoretically relevant predictors may constrain the model's capacity to capture the full variance in consumer willingness to pay. Table 4 provides the results of the SEM model with the dependent WTP variable expressed as different percentage levels of product price. It's worth noting that the variable measuring interest in label information is significant only in Greece and not significant in the other four countries. Concern for the environment regarding the production processes emerges as a significant factor influencing consumer WTP in Italy, Morocco, and Egypt. In all five countries, a positive attitude towards and trust in certifications consistently contributes to a significant increase in consumer WTP. Interestingly, age has a differentiated influence on WTP. In Italy, France, and Greece, age correlates negatively with WTP, while in Egypt, surprisingly, it has a positive effect. Consumers' education level also plays a role in shaping WTP patterns. In France, a higher level of education has a positive effect on WTP, suggesting an informed consumer base. In Egypt, on the other hand, a higher level of education has a negative effect on WTP.

Discussion

Our study examined the factors that influence consumer attitudes regarding ecolabels and standards for FVs, focusing on the effect that factors such as interest in label information, environmental concerns, and positive attitudes and trust have in five different Mediterranean countries: Italy, France, Greece, Morocco, and Egypt. As a first result,

Table 4 Results of structural equation model: WTP expressed as a percentage at seven levels

| Variables | Italy β (SD) | France β (SD) | Greece β (SD) | Morocco β (SD) | Egypt β (SD) |
|---|-----------------------|------------------------|------------------------|-------------------------|-----------------------|
| Interest in information on the label | 0.036 (0.069) | 0.021 (0.078) | 0.151*** (0.066) | -0.030 (0.076) | 0.100 (0.084) |
| Environmental concern regarding production | 0.090* (0.072) | 0.069 (0.062) | -0.006 (0.065) | 0.154** (0.082) | 0.105* (0.068) |
| Positive attitude towards and trust in certifications | 0.195*** (0.064) | 0.307*** (0.063) | 0.181*** (0.070) | 0.210** (0.098) | 0.301*** (0.087) |
| Age | -0.118*** (0.051) | -0.226*** (0.061) | -0.096* (0.067) | 0.015 (0.071) | 0.220*** (0.062) |
| Education | -0.012 (0.049) | 0.127*** (0.060) | 0.016 (0.069) | -0.014 (0.067) | -0.134** (0.066) |
| R^2 | 0.09 | 0.23 | 0.09 | 0.08 | 0.27 |
| Q^2 | 0.05 | 0.19 | 0.04 | 0.017 | 0.22 |
| SRMR | 0.076 | 0.068 | 0.077 | 0.073 | 0.078 |

β = Coefficient, SD = Standard deviation, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Number of observations in each country: Italy (245), France (220), Greece (225), Morocco (170), and Egypt (169)

positive attitudes towards trust in certifications were found to be consistently influential factors in all five countries, having a positive impact on those countries' consumer attitudes regarding ecolabels. This result underscores the importance of building consumer trust in the certification process and promoting a positive perception of sustainable products. This result is consistent with findings by Janssen and Hamm (2012), (Vittersø et al. 2019), Medici et al. (2021a, b), Aprile and Punzo (2022), and Malissiova et al. (2022) which reveal that there is a positive relationship between attitude for certified FVs in the studied countries. This positive attitude plays a crucial role in consumer attitudes and is based on the trust and credibility of these certifications and standards. The results of studies carried out by Lambarraa-Lehnhardt et al. (2021) and Chetioui et al. (2023) also show that Moroccan consumers have a positive attitude towards buying organic food and that their attitude is significantly influenced by labelling, health awareness, and environmental concerns.

Certifications are a sign of quality in terms of ensuring safety and transparency in food production and distribution processes (Rai et al. 2023) and they reduce the perceived risks associated with food safety and environmental impacts (Ge 2022). In SFSCs, where consumers may have a closer connection to the source of their food, consumer trust in certifications reduces the perceived risks of unsustainable farming practices (Gerardi 2023). Regardless of their geographical location, consumers value the assurance that certified products meet certain standards, be it in terms of organic farming practices, fair labour conditions, or environmental sustainability (Rai et al. 2023). This quality assurance and risk mitigation promote trust, making consumers more willing to pay a premium for certified products (Morone et al. 2021). A positive attitude towards certifications also indicates a consumer base that values ethical and sustainable practices. Consumers who prioritize these values are more likely to have a positive attitude towards certifications, affecting their purchase decisions and their WTP a premium for products that align with their values (Peiró Signes et al. 2023).

Another result of our study regards the different influence that the interest in label information variable has on consumer perceptions towards ecolabels and WTP in the surveyed countries. This variable has a significant influence on consumer perceptions in Italy and Greece, while in France, Morocco, and Egypt, contrary to expectations, it has no significant influence. We should note that this variable has a significant influence on Italian consumers' attitudes and WTP in the model, which is consistent with results published by Ingrassia et al. (2017), who examined Italian consumers' attitudes towards food product labelling and found a high interest in information on the label. However, as this variable is not significant in the model, the result should be interpreted with caution. The positive effect observed in Greece implies that cultural or contextual factors may play a crucial role in shaping the relationship between consumer interest in label information and their attitudes for environmental standards (Jeong and Lee 2021). In France, Morocco, and Egypt, interest in label information does not have a significant impact on their attitudes and WTP, though some factors such as cultural aspects may downplay the importance of this variable (Jeong and Lee 2021). For example, traditional eating habits and a strong dependence on local products can overshadow the importance of the interest in the information on labels for consumers in these regions, something particularly evident in the Mediterranean (Serra-Majem et al. 2019). We should

also note that we removed the geographical origin information factor from the French model due to its low indicator reliability. The positive effect observed in Greece could indicate a traditional and societal inclination towards a greater emphasis on sustainable practices, which could in turn promote an attitude that values and prioritizes environmentally friendly and sustainable choices (Tomou et al. 2022). In addition to label information factor, the way certification information is framed may also play a critical role (Dolgopolova et al. 2022); provided a comprehensive review indicating that subtle variations in attribute framing can alter consumers' perceptions of benefits and risks, thereby influencing their purchase decisions. Specifically, when ecolabel information is presented using positive framing, highlighting the benefits of sustainable practices rather than focusing on the drawbacks of conventional methods, consumers are more likely to develop a favourable view of the product, which in turn can enhance their purchase intention.

The economic disparities between these countries may also play a role in shaping their respective consumers' distinct responses. In more developed countries, consumers may be more willing to pay for ecolabels and standards as they can afford to spend part of their budget on environmentally friendly options. On the other hand, in low-income regions or developing countries, such as Egypt and Morocco, basic economic considerations may take precedence over environmental concerns (Hough and Contarini 2023). Consumers with tighter financial constraints may be less interested in information on the label, such as organic and eco-friendly certifications, which may affect their attitudes and WTP as well as their ability to make more sustainable choices. Understanding these factors can contribute to a more detailed interpretation of the survey results and help policymakers, businesses, and researchers to develop strategies to promote sustainable consumption practices in different cultural and economic contexts.

Environmental concerns proved to be an important factor for consumer attitudes regarding ecolabels in Italy, Morocco, and Egypt. The positive impact of environmental concerns on consumer attitudes is in line with the growing global awareness and emphasis on sustainable practices and shows that consumers in these countries consider certified FVs to be a contribution to environmental sustainability (Wang et al. 2020). Issues such as climate change, deforestation, and pollution have become key topics in public debate and prompted consumers to make more sustainable choices in their daily lives. Consumers are increasingly recognizing the profound impact their purchase decisions have on the environment and are making the link between environmental sustainability and personal wellbeing. There is a growing realization that a healthy environment contributes to healthy food, and consumers are willing to pay a premium for products that meet both their health and environmental values. This leads to consumers wanting to support sustainable practices and reduce the environmental impact associated with food production and distribution (Medici et al. 2021a, b). As Vittersø et al. (2019) and Aprile and Punzo (2022) mention, environmental concerns, for example, about the use of chemicals and fertilizers and organic production, have a positive impact on the attitudes and WTP of Italian consumers. In addition, in Morocco, consumer awareness is growing, and their attitudes are shifting towards healthier and more environmentally friendly products (Aguenaou et al. 2021). Nevertheless, the results of the significant influence that environmental concerns have on WTP in Egypt should be interpreted with caution,

as this variable is only significant in the model. As our results indicate, the lack of reliable indicators for the reduced use of pesticides, fertilizers and using water sparingly factors may also be due to the dominance of traditional farming methods in the countries, affecting consumer expectations. In France, especially in northern France, the diet differs from that of other Mediterranean countries studied and is based on meat and dairy products (Ruby et al. 2016). Therefore, people there are more interested in eating meat and dairy products than FVs, which could be a reason for their lower interest and WTP for ecolabels for FVs compared to in the other Mediterranean countries studied (Ellies-Oury et al. 2019). According to Aizaki and Takeshita (2023) and Dudinskaya et al. (2021), the environmentally friendly production of dairy and meat products is a high priority for French consumers, and their WTP for these products is high.

In terms of the socio-demographic variables, education level was found to have a positive significant effect on French consumers' WTP for FV ecolabels, but, contrary to expectations, it had a negative effect in Egypt. As, Aprile and Punzo (2022), and Ge (2022) reveal, education level has an impact on environmental awareness and positively influences WTP for environmentally friendly products. Therefore, efforts to educate consumers about the benefits of certifications, the importance of sustainable practices, and the overall positive impact on local communities and the environment help to build trust. This education not only shapes consumer attitudes but also improves their understanding of the value proposition associated with certified products (Rai et al. 2023). These findings also underscore the critical role of consumer awareness and knowledge about sustainability labels. Lee et al. (2020) found a significant interaction between sustainable label knowledge and purchase intention, suggesting that a higher level of consumer education regarding ecolabel benefits can substantially boost purchase willingness. According to the results of our study, there is a negative correlation between age and WTP for ecolabels, showing that younger people are more interested in these certifications and standards and are willing to pay more. These results are in line with the findings by Shen et al. (2021) and Walaszczyk et al. (2023). According to Walaszczyk et al. (2023), people under the age of 44 are willing to pay more, while those over 65 are willing to pay less for certified food, revealing a negative correlation between age and WTP. Shen et al. (2021) also shows that WTP for labelled food products is lower amongst older consumers.

Despite these noteworthy insights, we should note certain limitations that affect the generalisability and robustness of our results. First, our data collection relied on an online survey platform, which may have biased the sample and excluded certain population groups, such as those with limited internet access. In addition, the sample size might not be sufficiently large to confidently extrapolate the results to the entire study population. Furthermore, this study did not apply PLS-SEM multigroup analysis (PLS-MGA), since some items were removed to ensure construct validity in each country, leading to potential measurement invariance issues that could affect cross-group comparisons (Hair et al. 2021). Future research could test measurement invariance before conducting PLS-MGA to ensure comparability across countries.

Finally, while the structural model demonstrates an overall acceptable fit, we acknowledge that the R^2 values for WTP are relatively low in Italy, Greece, and Morocco. This can be partly attributed to our adoption of a parsimonious modelling approach, which

included a limited number of predictors. The decision to focus on just three key variables, interest in label information, environmental concern, and trust in certifications, was grounded in the literature, which consistently identifies these as central to consumer acceptance of sustainable food products (Aprile and Punzo 2022; Peiró Signes et al. 2023; Ricci et al. 2018). This approach aligns with established guidelines for PLS-SEM in theory development and exploratory research, where model simplicity and interpretability are prioritized (Hair et al. 2021; Ringle et al. 2023). Similar studies have followed this strategy, emphasizing a focused set of theoretically justified variables to explain WTP for ecolabelled food products. For example, Peiró Signes et al. (2023) and Ricci et al. (2018) developed models centred on a few key predictors, while Denver et al. (2023), Medici et al. (2021a, b), and Herrmann et al. (2022a, b) likewise prioritized model simplicity to ensure clarity and robustness. Additionally, scale compatibility issues between the predictors and the WTP outcome variable may have contributed to the model's lower explanatory power. While PLS-SEM is well-suited to handle mixed measurement scales and non-normal data (Henseler et al. 2016), the use of ordinal predictors alongside a categorical or continuous outcome variable remains a recognized limitation that can reduce model fit and predictive strength (Fishbein and Ajzen 2010). Notably, several comparable studies have adopted a similar approach, using Likert-scale predictors (e.g. attitudes, trust, environmental concern) alongside WTP outcomes expressed in monetary or percentage terms. For example, Peiró Signes et al. (2023) and Ricci et al. (2018) combined attitudinal and trust constructs with WTP measures reported as price premiums. Similarly, de-Magistris and Gracia (2016), Denver et al. (2023), and Medici et al. (2021a, b) linked consumer attitudes to WTP expressed in concrete monetary values. These examples demonstrate that combining ordinal predictors with continuous WTP outcomes is a well-established practice in the literature, even though potential scale compatibility challenges, such as weakened predictive power, are acknowledged (Fishbein and Ajzen 2010; Henseler et al. 2016).

Future research could enhance model performance by incorporating additional predictors such as price sensitivity (Herrmann et al. 2022a, b), subjective norms and social influence (Fishbein and Ajzen 2010), perceived consumer effectiveness (Ricci et al. 2018), personal environmental values (Gomes et al. 2023), or past purchasing behaviour related to sustainability (Dolgoplova et al. 2022), thereby refining the cross-national understanding of WTP for ecolabelled fruits and vegetables.

Conclusions

This study examined the dynamics of consumer attitudes and motivations in choosing ecolabels within short FV supply chains in five Mediterranean countries. It highlighted the importance of factors such as environmental awareness, interest in information on the label, positive attitudes towards trust in certifications, and some demographic factors such as age and education level which influence consumer attitudes regarding FVs with ecolabels. The results obtained reveal differences between the countries studied, underscoring the importance of certain factors in specific regions. Our exploration of consumer attitudes revealed that a positive attitude towards and trust in certifications is the only variable that is significant in all countries. Furthermore, our study specifically investigated consumer WTP for ecolabels within SFSCs, rather than ecolabels in

general, ensuring that our findings are directly relevant to the context of SFSCs. There are differences between the countries studied in terms of the impact that the interest in label information and environmental concerns variables have on consumer attitudes and WTP.

Our study also provides valuable insights into the simultaneous effect that environmental awareness, information preferences, and trust in certifications have on consumer perceptions of environmental labels, opening the door for a more sustainable and responsible future in the global food industry. As consumers increasingly seek environmentally friendly choices, understanding their motivations is critical for FV chain actors to align their practises with evolving consumer expectations. Our findings provide a foundation for future efforts to promote sustainability and consumer awareness in the food industry and highlight the need for tailored strategies to address regional differences in consumer behaviour and attitudes.

The theoretical research implications of our study's results can represent an important contribution to understanding consumer attitudes and motivations in relation to ecolabels for FVs in Mediterranean countries. The consistent positive correlation between trust in certifications and increased consumer WTP across countries suggests that certain factors may be universally applicable. This could encourage further research into the psychological aspects of trust-building and its impact on consumer choices to gain insights that are applicable beyond the Mediterranean region. Future research could build on these insights by examining how different trust-building strategies—such as third-party verification, transparency in certification processes, and direct producer–consumer interactions—shape consumer preferences beyond the Mediterranean region.

Moreover, our study reinforces the dynamic nature of environmental concern in consumer decision-making. The fact that sustainability considerations play a more prominent role in some countries than others suggests that consumer awareness is evolving over time. This underscores the importance of longitudinal studies that track how environmental attitudes shift in response to external factors such as policy changes, climate events, or sustainability marketing efforts. A deeper theoretical understanding of these evolving consumer motivations can inform predictive models of sustainable purchasing behaviour and help refine frameworks for segmenting eco-conscious consumers.

In the realm of management implications, the significant role that trust in certifications plays as a catalyst influencing consumer attitudes regarding ecolabels suggests that SMEs in Mediterranean nations can function not only as a means of ensuring quality, but also as a potent marketing tool for product differentiation in a competitive market landscape. As environmental concerns have become a critical factor in some Mediterranean countries, companies and SMEs in the FV sector operating in SFSCs should consider adopting and promoting sustainable production practices. Focusing on SFSCs is particularly relevant because these chains typically involve fewer intermediaries, allowing producers to build stronger, direct relationships with consumers. This fosters greater transparency and trust—key elements when marketing ecolabelled products. This may include investing in environmentally friendly initiatives, reducing carbon emissions, and communicating these efforts transparently to reflect consumer values. Furthermore, our study underscores the importance of certifications in influencing consumer decisions in the Mediterranean region. Policymakers should consider working towards standardizing

and harmonizing certification standards in Mediterranean countries to create a more coherent and transparent system, aligning with the European Commission's broader efforts to establish a sustainable EU food system (European Commission 2021). These initiatives emphasize the need for robust, reliable certification frameworks that enhance consumer trust and facilitate informed purchasing decisions. In this regard, regulatory actions aimed at strengthening the credibility of ecolabels and promoting sustainability within short food supply chains can contribute to achieving the EU's sustainability objectives while addressing regional disparities in certification practices.

Abbreviations

| | |
|---------|--|
| FV | Fruit and vegetables |
| WTP | Willingness to pay |
| SMEs | Small- and medium-sized enterprises |
| SFSCs | Short food supply chains |
| PLS-SEM | Partial least square structural equation modelling |
| CR | Composite reliability |
| AVE | Average variance extracted |
| HTMT | Heterotrait–monotrait ratio |

Author contributions

Conceptualization was performed by Marzieh Aminravan (MA), Sina Ahmadi Kaliji (SA), Luca Mulazzani (LM), and Luca Camanzi (LC); methodology was conducted by MA, SA, LM, and Cosimo Rota (CR); formal analysis was conducted by MA, SA, LM, and CR; investigation was done by MA, SA, and LC; data curation was presented by MA, SA, LC; writing—original draft preparation was drafted by MA and SA; writing—review and editing were prepared by MA, SA, LM, CR, and LC; supervision was LM and LC; project administration was approved by LC.

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Data availability

The supplementary material for this article can be found online at <https://amsacta.unibo.it/id/eprint/7696/>

Declarations

Ethics approval and consent to participate

Ethical review and approval were obtained by the competent Bioethics Committee (Protocol n. 0122660 of 08/05/2023). The data collection was anonymous, and no personal information was gathered.

Competing interests

None.

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