



TEALHELIX

SMART LABELS
INCLUSIVE SOLUTIONS

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DELIVERABLE 2.2

Survey in multiple EU countries

White Research

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This work is dedicated to the memory of Justina Baršytė, our project coordinator, whose vision and commitment were invaluable to this project.

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ABBREVIATIONS

BEUC	The European Consumer Organisation
BFI-10	Big Five Inventory - 10-item personality scale
EC	European Commission
EEA	European Environment Agency
EEB	European Environmental Bureau
EIT Food	European Institute of Innovation and Technology – Food
EP	European Parliament
EPHA	European Public Health Alliance
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FIC	Food Information to Consumers
FIES	Food Insecurity Experience Scale
fsQCA	Fuzzy-set Qualitative Comparative Analysis
GDP	Gross Domestic Product
GIS	Geographic Information System
IDDRI	Institute for Sustainable Development and International Relations (Institut du Développement Durable et des Relations Internationales)
JRC	Joint Research Centre (European Commission)
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
OSM	OpenStreetMap
PPML	Poisson Pseudo-Maximum Likelihood (regression method)
PPP / PPS	Purchasing Power Parity / Purchasing Power Standard
QCA	Qualitative Comparative Analysis

QGIS	Quantum Geographic Information System
SDGs	Sustainable Development Goals (United Nations)
UN	United Nations
WHO	World Health Organisation
WTP	Willingness to Pay

Executive summary

Deliverable **D2.2 “Survey in Multiple EU Countries”** presents the findings of an extensive study on how external factors influence European consumers’ understanding and use of sustainability information on food labels. The study was carried out within the TealHelix project, which seeks to advance food sustainability labelling through personalisation and inclusivity, ensuring that information is meaningful and accessible to all consumers.

The work builds on an EU survey conducted in 11 EU Member States - Belgium, France, Germany, Greece, Italy, the Netherlands, Poland, Portugal, Spain, Sweden, and Estonia. In total, 3,005 participants took part in the survey. After applying standard data-cleaning procedures, the final analytical sample consisted of 2,767 respondents, providing insights into the socio-cultural, psychological, economic, and demographic factors shaping consumers’ food-related sustainability behaviours.

The analysis examined two main behavioural outcomes:

- **Consideration of sustainability labels** when purchasing food products, and
- **Willingness to pay (WTP)** a price premium for sustainable food products.

Regression and configurational (fsQCA) analyses revealed several clear patterns:

- **Personality and values matter:** traits such as conscientiousness and openness are associated with food-label engagement and are present in some profiles related to willingness to pay a premium.
- **Cultural and regional context influences behaviour:** higher individualism, long-term orientation, and economic prosperity at the regional level correspond with stronger engagement.
- **Younger and more educated consumers are the most receptive to sustainability information**, though **affordability remains a limiting factor** for many.

Overall, the results confirm that **consumers’ willingness to engage with sustainability-labelled food is not determined by a single factor**, but by a combination of personal, cultural, and contextual conditions. Inclusivity, affordability, and trust in certification remain essential for wider adoption of sustainable food choices.

1. Introduction

1.1. Aim and scope

Consumers have been surrounded by unsustainable food environments due to well-established norms¹, cultural practices² and promotion of unsustainable foods that dominate the media^{3,4} in comparison to more sustainable choices.⁵ Indeed, as stressed in a report by Agora and IDDRI, food environments in the EU have been characterised by the prevalence of unsustainable patterns, through mechanisms such as price incentives, portion sizes and the marketing of unhealthy foods.⁶ This has resulted in scepticism and a lack of trust around food claims, in addition to low motivation to consume sustainable food. TealHelix aims to advance sustainable food consumption by developing a targeted food sustainability labelling approach that empowers consumers through personalisation and inclusion, including vulnerable consumers.

Task 2.2 investigates in depth the ways external factors shape how consumers engage with sustainability in the food sector. The activities focus on understanding what drives individuals to consider sustainability information on food labels and what influences their willingness to pay extra for products that reflect such values. Beyond identifying these underlying factors, the task also seeks to observe different consumer groups, showing how personality traits, cultural dimensions, demographic and regional characteristics combine to shape their attitudes toward food sustainability. This approach makes it possible to capture the diversity of consumer responses, illustrating how distinct patterns of motivations, barriers, and behaviours emerge across segments. By highlighting these differences, the task provides a clearer understanding of which groups are more receptive to sustainability information on food products, which encounter greater barriers, and how strategies can be tailored to address the specific needs of each. Special attention is given to ensuring that the needs and perspectives of diverse consumer groups, including those more vulnerable or less represented, are taken into account.

Report D2.2 presents the findings of an EU-wide survey conducted by White Research (WR) across several European Member States (Belgium, Poland, Portugal, Sweden, Netherlands, Italy, France, Spain, Germany, Greece, Estonia). Specifically, the survey derives insights on:

- i. **socio-cultural, psychological, and economic factors** that shape consumer preferences, intentions, and behaviour,

¹ Robinson, E., Thomas, J., Aveyard, P., & Higgs, S. 2014. What everyone else is eating: a systematic review and meta-analysis of the effect of informational eating norms on eating behaviour. *Journal of the Academy of Nutrition and Dietetics*, 114(3), 414-429. <https://doi.org/10.1016/j.jand.2013.11.009>

² Jayasinghe, S., Byrne, N. M., & Hills, A. P. 2025. Cultural influences on dietary choices. *Progress in Cardiovascular Diseases*. <https://doi.org/10.1016/j.pcad.2025.04.006>

³ Kent, M. P., Guimaraes, J. S., Bagnato, M., Remedios, L., Pauzé, E., Pritchard, M., ... & Weippert, M. 2023. Broadcast television is not dead: exposure of children to unhealthy food and beverage advertising on television in two policy environments (Ontario and Quebec). An observational study. *The Journal of Nutrition*, 153(1), 268-278. <https://doi.org/10.1016/j.tjn.2022.10.010>

⁴ Fretes, G., Veliz, P., Narvaez, A. M., Williams, D. A., Sibille, R., Arts, M., & Leroy, J. L. 2025. Digital marketing of unhealthy foods and non-alcoholic beverages to children and adolescents: A narrative review. *Current Developments in Nutrition*, 9(2), 104545. <https://doi.org/10.1016/j.cdnut.2025.104545>

⁵ Higgs, Suzanne. 2015. "Social Norms and Their Influence on Eating Behaviours." *Appetite* 86: 38-44. <https://doi.org/10.1016/j.appet.2014.10.021>

⁶ Agora and IDDRI. 2024. Towards food policies that support healthy and sustainable consumption. Available at: https://www.agora-agriculture.org/fileadmin/Projects/2024/2024-03_national_food_strategies_SWu/A-AGR_364_Towards_food_policies_that_support_sustainable_and_healthy_consumption_WEB.pdf

- ii. significant **demographic factors** that determine consumer motivation,
- iii. the **effectiveness of current sustainability labelling schemes** on consumer understanding and purchasing behaviour, and
- iv. **key external factors** that drive consumers to seek and use sustainability information for food choices.

The purpose of this survey is to identify meaningful patterns and differences in how consumers engage with sustainability labelling when making food choices. It examines how personality traits, cultural orientations, demographics, and regional factors shape their consideration of sustainability information on food labels and their willingness to pay extra. The analysis also explores the distinctive drivers and barriers consumers may face, offering deeper insight into the diverse ways consumers approach, value, and use sustainability information.

1.2. Outline of the report

Section 1 of this report introduces the main aim and scope of the study, providing an overview of its objectives and its role within the framework of the TealHelix project. Section 2 presents the current context regarding sustainability labelling in the EU, outlining key policy developments and methodological approaches that form the foundation of the analysis. Additionally, the main findings from the background research are presented, identifying the principal factors influencing consumers' engagement with sustainability information. Moreover, Section 3 outlines the methodological approach used in this study, including the survey design, data collection, and analytical methods. Additionally, Section 4 reports the results of the EU-wide survey, including the profiling of consumers and an analysis of the external, motivational, and behavioural factors shaping sustainable food choices. Finally, Section 5 draws conclusions and compares the survey findings with insights from the desk research. It also discusses the implications of these results for other TealHelix work packages and highlights directions for future research and policy action.

2. Approach and Methodology

To ensure a clear and systematic approach to addressing the research objectives of Task 2.2, the methodology adopted in this study consists of two main components:

- A **background research** was conducted to map the existing knowledge on external factors that motivate and drive consumer behaviour. This aimed at compiling a concise overview of previous research to guide the development of survey items and provide a basis for comparing the survey findings with the broader body of knowledge.
- By integrating the consortium's definitions of food sustainability and consumer vulnerability, a **survey questionnaire** was developed, consisting of 142 items and 42 questions.

Overall, the activities in this study were designed to improve our understanding of the key factors affecting the consumer motivation in seeking and using sustainability-related information when buying food products. This includes:

- **Individual factors** such as the level of understanding of the provided sustainability information, preferences, intentions, behavioural aspects or the efficiency of existing schemes;
- **External factors** stemming from the structure and implementation of current sustainability labelling schemes, including their design, transparency, and overall efficiency;
- A special emphasis on **social, cultural, psychological, economic, regional** and **demographic** factors affecting their choice.

To guide our study, the following research questions were defined:

RQ1: How / to what extent do external socio-cultural, psychological, and economic factors influence consumer preferences, intentions, and behaviour toward sustainability-labelled food products?

RQ2: Which demographic factors (e.g., age, gender, income) are most significant in determining consumers' motivation to seek and use sustainability-related information for food products?

RQ3: How effective are current sustainability labelling schemes in influencing consumer understanding and purchasing behaviour for food products?

RQ4: What are the key external factors that drive consumers to seek and engage with sustainability information, and how do these factors differ across consumer groups?

2.1. Background research

To inform the background research of Task 2.2, we consulted existing academic sources using exploratory searches in Google Scholar. These searches were organised around broad thematic categories corresponding to the external factors examined in this deliverable. Some example queries can be found in Table 1.

Table 1. Example search terms used in the background research

Category	Example search terms
Psychological factors	"psychological factors AND sustainable food labelling"; "values AND sustainable food AND consumers"; "sustainability labelling AND consumers AND psychology"
Demographic factors	"demographic factors AND sustainable food labelling"; "demographic factors AND sustainability labelling"; "animal welfare labelling AND demographics"
Economic factors	"economic factors AND sustainable food labelling"; "income AND sustainable consumption"; "price perception AND eco-labels"; "green premium AND consumer behaviour"
Socio-cultural factors	"cultural factors AND sustainable food choice"; "Hofstede dimensions AND food labelling"; "socio-cultural determinants AND sustainability labelling"
Regional factors	"regional factors AND sustainable consumption"; "geographical differences AND sustainability behaviour"; "regional disparities AND sustainable food labelling"
Effectiveness of sustainability labels	"effectiveness AND sustainability labelling AND EU"; "consumer understanding AND sustainability labelling"; "label comprehension AND sustainability information"

2.2. Definitions & terminology

The definitions used in this study were established by the TealHelix project consortium based on existing frameworks and research. These definitions are widely recognised within the relevant field and ensure consistency across the project's research activities.

Sustainable food

According to the 2014 Food and Agriculture Organisation (FAO) definition and the European Commission's 2020 Group of Chief Scientific Advisors publication "Towards a Sustainable Food System", a sustainable food system "delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised. A sustainable food system should thus ensure and contribute to all elements of environmental, social and economic sustainability."^{7,8}

Food sustainability dimensions

Based on the EU legislative framework for Sustainable Food Systems⁹, the 2014 FAO definition and the European Commission 2020 Group of Chief Scientific Advisors publication "Towards a Sustainable Food System", the following dimensions of sustainability are considered in this study:

- **Environmental** (impact on ecosystems and natural resources)
- **Social** (labour conditions, human rights, overall fairness within the supply chain)
- **Economic** (affordability of food)
- **Nutrition/Health** (dietary patterns and overall human health)
- **Animal welfare** (physical and emotional well-being of the animals within the food production system)

⁷ Food and Agriculture Organization of the United Nations (FAO). 2014. Developing Sustainable Food Value Chains: Guiding Principles. Rome: FAO. Available at: <https://openknowledge.fao.org/server/api/core/bitstreams/e47d2ad8-5910-435e-a6b4-92dda2367dc7/content>

⁸ European Commission, Directorate-General for Research and Innovation, and Group of Chief Scientific Advisors. *Towards a Sustainable Food System: Moving from Food as a Commodity to Food as More of a Common Good: Independent Expert Report*. Luxembourg: Publications Office, 2020. <https://data.europa.eu/doi/10.2777/282386>.

⁹ European Commission. *Legislative Framework for Sustainable Food Systems*. Accessed April 4, 2025. https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy/legislative-framework_en#related-work.



Figure 1. "A sustainable food system", adapted from FAO (2014)

To ensure a shared understanding among respondents, the concept of sustainable food and the specific sustainability dimensions considered in this study were presented within the questionnaire. This introductory section provided a brief explanation of the term as defined by the consortium, outlining the environmental, social, and economic aspects that framed the questions that followed.

Moreover, regarding consumer vulnerability, the definitions used in the 2021 briefing of the European Parliament Research Service were adopted.¹⁰ Two main approaches to identifying vulnerable consumers are considered:

- **Class-based vulnerability:** This type of vulnerability is determined by the specific social or demographic group to which an individual belongs. It includes characteristics such as income level, language proficiency, and other similar factors. The advantage of this definition is that it provides legal clarity, enabling a clear and structured categorisation of consumers into distinct groups based on their shared traits.
- **State-based vulnerability:** This type of vulnerability is more dynamic, and it considers individual characteristics, personal circumstances and the economic market/societal conditions. Here, all the possible conditions that can affect the consumer's ability to make rational decisions are included, such as stressful life events or the type of information available within the market.

¹⁰ European Parliamentary Research Service (EPRS), Šajin, Nikolina. 2021. Vulnerable Consumers. Members' Research Service, PE 690.619. Brussels: European Parliamentary Research Service. Available at: [https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/690619/EPRS_BRI\(2021\)690619_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/690619/EPRS_BRI(2021)690619_EN.pdf)

3. Results of the background research

3.1. Sustainable food labelling in the EU

In today's increasingly urbanised world, the demands for the production of food, fuel and fibre are higher.¹¹ According to a report from BEUC, the European Public Health Alliance and the Eurogroup for Animals as part of the Put Change on the Menu project, *'the Farm to Fork Strategy (...) states clearly that current consumption patterns in the EU are not sustainable from both an environmental and economic point of view'*.¹² Modern agriculture has developed into a sizable economic sector to answer these demands, creating global networks for the production, processing, transport, and distribution of food.¹³ However, in the effort to meet demands, the activities surrounding the global food supply chain have also created challenges, as it is contributing to 26% of the anthropogenic gas emissions. These adverse impacts on the planet also affect social and economic outcomes, including public health, human well-being, food security, social inclusion, and economic prosperity, highlighting the critical role of food and agriculture as a link between people and the planet.¹⁴

Food labelling has been used as an instrument for providing information to the consumers about the content of their food, assisting them in making informed decisions.¹⁵ The EU defines food labelling as **"any words, particulars, trademarks, brand name, pictorial matter or symbol relating to a food and placed on any packaging, document, notice, label, ring or collar accompanying or referring to such food"**.¹⁶ When referring to the food labels capturing different dimensions of sustainability, those focus on characteristics of value chains, aiming to increase consumer understanding and awareness around the impact of their food choices. The need for regulated (and voluntary) certification on food sustainability has existed since the 1990s, when the EU began efforts to regulate the organic farming sector. In 2010, the EU organic logo was introduced, marking the first food-related certification directly from the EU.¹⁷ Other certifications, such as the Fairtrade logo and the Rainforest Alliance, have been on the market for longer.

Besides the communication of different sustainability dimensions, food labels have been used with the goal to transform the food environment itself, meaning "the physical, economic, political, and sociocultural context in which each consumer engages with the food system. Curating and

¹¹ Ran, Y., A. Nilsson Lewis, E. Dawkins, R. Grah, F. Vanhuyse, E. Engström, and F. Lambe. 2022. "Information as an Enabler of Sustainable Food Choices: A Behavioural Approach to Understanding Consumer Decision-Making." *Sustainable Production and Consumption* 31: 642–56. <https://doi.org/10.1016/j.spc.2022.03.026>

¹² BEUC, European Public Health Alliance and the Eurogroup for Animals. 2023. The illusion of choice - Why someone already decided what you will eat for lunch. Available at: https://www.beuc.eu/sites/default/files/publications/BEUC-X-2023-080_The_illusion_of_choice_report.pdf

¹³ European Environment Agency (EEA). 2024. "Agriculture and Food System." Last modified September 4, 2024. Accessed October 10, 2024. Available at: <https://www.eea.europa.eu/en/topics/in-depth/agriculture-and-food>

¹⁴ Hoek, Annet C., Shirin Malekpour, Rob Raven, Eli Court, and Emily Byrne. 2021. "Towards Environmentally Sustainable Food Systems: Decision-Making Factors in Sustainable Food Production and Consumption." *Sustainable Production and Consumption* 26: 610–26. <https://doi.org/10.1016/j.spc.2020.12.009>

¹⁵ European Court of Auditors. 2024. Food Labelling in the EU: Consumers Can Get Lost in the Maze of Labels. Luxembourg: Publications Office of the European Union. Available at: <https://www.eca.europa.eu/en/publications>

¹⁶ Council of the European Union. 2011. "Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the Provision of Food Information to Consumers." Available at: <https://eur-lex.europa.eu/eli/reg/2011/1169/oj>

¹⁷ ClimaTalk. 2021. "Introduction to the EU Organic Regulation and Its Logo". Available at: <https://climataalk.org/2021/09/26/introduction-to-the-eu-organic-regulation-and-its-logo/>.

transforming food environments directly influence food choices and food acceptability¹⁸, which can lead to an increase in the production of sustainable foods.¹⁹

Making information around the impact of food choices to the consumer more accessible, reliable, consistent, and transparent can also yield the benefits of consuming more healthy and nutritious food.²⁰ Promoting sustainable food choices is considered an essential priority of the EU, as it is at the heart of Farm to Fork Strategy, the EU Green Deal and aligns with the European Commission's broader agenda to achieve the United Nations' Sustainable Development Goals. Certified foods, across farm, processing and retail levels, have been shown to perform better across environmental, economic and social indicators, covering all three sustainability pillars and generate a higher value in the production side of the food chain as well.²¹

The EU market features a wide range of food sustainability labels. In 2024, the Joint Research Centre published a report assessing the current landscape of sustainability labelling in the EU. The results revealed several key points.

According to the 2024 JRC report on sustainability labelling in the EU food sector, several types of labels are considered: the positive endorsement labels (certifications), the labels coming from the initiative of brands (private sustainability program, selection of certified ingredients), and the graded labels. Focusing on the impacts covered by the labels, environmental impacts extend over climate change, land use, biodiversity loss, water use, waste generation and food waste, among others, whereas social impacts extend over decent work, measures against discrimination, promoting fair trade and empowering local communities.²²

The report also highlights that 39% of newly launched food products include sustainability-related claims (rising to 50% when organic claims are counted), with 36% featuring environmental labels, 22% carrying organic labels, and 13% making social responsibility claims. Moreover, the uptake of sustainability claims in products in the EU has risen from 20% to 50% between 2011 and 2022.

¹⁸ Schönfeldt, Hettie C., and Beulah Pretorius. 2018. "Chapter Two – Agriculture and Food Systems for Improved Nutrition." In *Advances in Food Security and Sustainability*, vol. 3, edited by David Barling and Jessica Fanzo, 53–68. Amsterdam: Elsevier. <https://doi.org/10.1016/bs.af2s.2018.09.004>

¹⁹ European Commission, Joint Research Centre. 2024. *Sustainability Labelling in the EU Food Sector: Current Status and Coverage of Sustainability Aspects*. Luxembourg: Publications Office of the European Union. Available at: <https://data.europa.eu/doi/10.2760/90191>

²⁰ Poore, J., and T. Nemecek. 2018. "Reducing Food's Environmental Impacts through Producers and Consumers." *Science* 360 (6392): 987–92. <https://doi.org/10.1126/science.aag0216>

²¹ Bellassen, Valentin, Marion Drut, Mohamed Hilal, Antonio Bodini, Michele Donati, Matthieu Dubois de Labarre, Jelena Filipović, et al. 2022. "The Economic, Environmental and Social Performance of European Certified Food." *Ecological Economics* 191: 107244. <https://doi.org/10.1016/j.ecolecon.2021.107244>

²² European Commission, Joint Research Centre. 2024. *Sustainability Labelling in the EU Food Sector: Current Status and Coverage of Sustainability Aspects*. Luxembourg: Publications Office of the European Union. Available at: <https://data.europa.eu/doi/10.2760/90191>

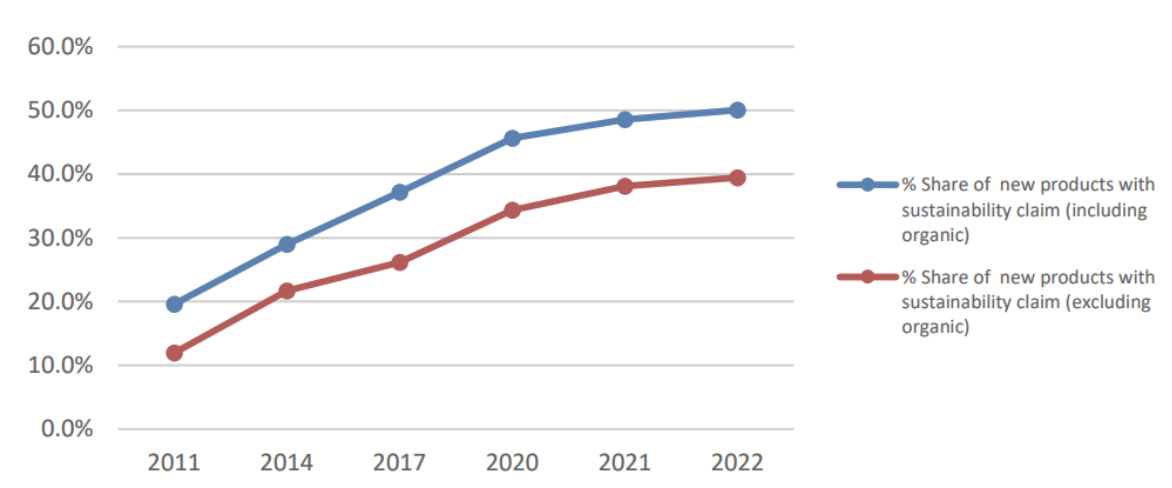


Figure 2. Uptake of sustainability claims in product launches in the EU between 2011 and 2022 within 24 EU countries (JRC; EC, 2024)

By presenting information on environmental impacts (such as climate change, land use, biodiversity loss, water use and waste generation) and social aspects (including decent work, anti-discrimination measures, fair-trade practices and community empowerment) on product packaging. Labels are a distinctive symbol which provides information between more and less sustainable practices, information which otherwise the consumer would have very little incentive to obtain otherwise²³.

However, while the opportunity exists, the actual purchase of labelled food products depends on the motivation of the consumer to use this information, their understanding of it, and the level of trust in a particular label.^{24,25,26} The **Put Change on the Menu** (2023) report also highlights the role of other factors, such as advertising, pricing, but also psychological elements, such as supermarkets' layout and product-positioning practices. The report adds that 50% of consumers were flexible in terms of what they had planned to buy.²⁷

Moreover, while some consumers consider the environmental impact of food and its use of resources, some still tend to not be aware of the actual impact of food production and rather believe that these elements are not related. Inconvenience and higher prices were also identified as barriers

²³ de Boer, Joop. 2003. "Sustainability Labelling Schemes: The Logic of Their Claims and Their Functions for Stakeholders." *Business Strategy and the Environment* 12 (4): 254–64. <https://doi.org/10.1002/bse.362>

²⁴ Grunert, Klaus G., Sophie Hieke, and Josephine Wills. "Sustainability Labels on Food Products: Consumer Motivation, Understanding and Use." *Food Policy* 44 (February 1, 2014): 177–89. <https://doi.org/10.1016/j.foodpol.2013.12.001>.

²⁵ Sirieix, Lucie, Marion Delanchy, Hervé Remaud, Lydia Zepeda, and Patricia Gurviez. 2013. "Consumers' Perceptions of Individual and Combined Sustainable Food Labels: A UK Pilot Investigation." *International Journal of Consumer Studies* 37 (2): 143–51. <https://doi.org/10.1111/j.1470-6431.2012.01109.x>

²⁶ Gorton, Matthew, Barbara Tocco, Ching-Hua Yeh, and Monika Hartmann. 2021. "What Determines Consumers' Use of Eco-Labels? Taking a Close Look at Label Trust." *Ecological Economics* 189: 107173. <https://doi.org/10.1016/j.ecolecon.2021.107173>

²⁷ BEUC, European Public Health Alliance and the Eurogroup for Animals. 2023. The illusion of choice - Why someone already decided what you will eat for lunch. Available at: https://www.beuc.eu/sites/default/files/publications/BEUC-X-2023-080_The_illusion_of_choice_report.pdf

as well as the lack of specific definition of food sustainability.²⁸ A limited understanding of sustainability itself can also be a barrier.²⁹

In terms of policies and regulations, in 2014, the regulation on the provision of food information to consumers entered into force (FIC Regulation).³⁰ This regulation requires the presence of a declaration of the food content of energy and selected nutrients.³¹ As a result, it established the labelling requirements for a clearer, more harmonised presentation of information in products. With the introduction of the Farm to Fork strategy, the EU has announced the revision of the FIC regulation in order to incentivise consumers to switch their choices to more healthy and sustainable food. The goal of reducing food waste is also integrated in this process. Alongside this revision, a public consultation was launched, following the adoption of Europe's Beating Cancer Plan, to assess the introduction of rules on labelling alcoholic beverages, stipulating a mandatory list of ingredients and a nutrition declaration. The consultation ran from December 2021 to March 2022, for a Commission adoption planned for the fourth quarter of 2022. However, the process has so far not continued further.³²

For sustainability labelling specifically, the Commission has announced a proposal for a sustainability labelling framework, which will be part of the Sustainable Food System Framework initiative. This initiative oversees the establishment of rules on “sustainability labelling of food products, minimum criteria for sustainable public procurement of food and governance and monitoring”.³³ The adoption of the framework was planned for the end of 2023, however, the proposal is still pending.

In March 2023, the Commission adopted a proposal for a Directive on Green Claims, which applies across product categories and is not limited to food products.³⁴ Within the proposal, the importance of empowering consumers to play an active role in ecological transition is underlined, as well as the commitment to ensure the availability of reliable, comparable and verifiable information to allow for more sustainable decisions and to reduce greenwashing.³⁵ Moreover, criteria on how companies should prove the environmental claims and labels are included with requirements for those to be checked by independent and accredited verifiers and rules on the governance of environmental labelling schemes. The targets of the Directive will be explicit claims made on a voluntary basis by the companies which cover environmental impacts on the performance of the product or the trader and are not covered by other EU rules.

²⁸ van Bussel, L. M., A. Kuijsten, M. Mars, and P. van 't Veer. 2022. “Consumers’ Perceptions on Food-Related Sustainability: A Systematic Review.” *Journal of Cleaner Production* 341: 130904. <https://doi.org/10.1016/j.jclepro.2022.130904>

²⁹ Cook B, Costa Leite J, Rayner M, Stoffel S, van Rijn E, Wollgast J. Consumer Interaction with Sustainability Labelling on Food Products: A Narrative Literature Review. *Nutrients*. 2023 Sep 2;15(17):3837. doi: 10.3390/nu15173837. PMID: 37686869; PMCID: PMC10489983. <https://pmc.ncbi.nlm.nih.gov/articles/PMC10489983/>

³⁰ European Commission. 2025. “Food information to consumers-Legislation” European Commission, Available at: https://food.ec.europa.eu/food-safety/labelling-and-nutrition/food-information-consumers-legislation_en

³¹ Storcksdieck Genannt Bonsmann, Stefan, Ginerva Marandola, Emanuele Ciriolo, Rene Van Bavel, and Jan Wollgast. 2020. *Front-of-Pack Nutrition Labelling Schemes: A Comprehensive Review. Scientific analysis or review*. Luxembourg: Publications Office of the European Union. <https://doi.org/10.2760/436998>

³² European Commission. 2025. “Food labelling - revision of rules on information provided to consumers for alcoholic beverages”. Available at: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12749-Food-labelling-revision-of-rules-on-information-provided-to-consumers_en

³³ European Commission. 2025. “Sustainable EU food system-new initiative”. Available at: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13174-Sustainable-EU-food-system-new-initiative_en

³⁴ European Commission. 2025. “Green claims”. Available at: https://environment.ec.europa.eu/topics/circular-economy/green-claims_en

³⁵ European Commission. 2023. Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on substantiation and communication of explicit environmental claims (Green Claims Directive). COM/2023/166 final. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52023PC0166>

During February 2025, the European Commission announced its roadmap document for a thriving EU farming and agri-food sector, the Vision for Agriculture and Food. The goal of the Vision is to simplify the current legislative framework and create an EU digital strategy for agriculture.³⁶ As part of the forthcoming initiatives, targeted labelling will be introduced for animal welfare.³⁷

A possible future direction for sustainability labelling in the EU is the one of a single, encompassing food label. A 2023 EIT Food research on 10,000 consumers across 18 EU countries showed that two thirds (63%) of the consumers would use a universal eco-label. Concerning the attributes present in a label, the majority of the consumers showed a preference for animal welfare, use of chemicals and pollution.³⁸ That makes clear that consumers in the EU want to be informed about sustainability and guide their choices accordingly.

3.2. Effectiveness of sustainability labelling

The effectiveness of the current sustainability labelling schemes in influencing consumer understanding and purchasing behaviour has been studied through multiple lenses in the academic literature. To illustrate the range of existing evidence, in this section we highlight a set of exemplary studies that are representative of common findings in the literature. For example, an Italian study on young consumers based on four different EU sustainability labels revealed that visibility played a significant role in the understanding of labels and that exposure to the logos affects consumer understanding. Out all four labels, the organic label was found to be the easiest to interpret, having also the highest consumption frequency and score in trust. Focusing on the socio-demographic factors, only gender had an effect on understanding, with males scoring better in this regard.³⁹

Earlier work of Grunert et al. (2014), found that even though consumers had vastly differing definitions of sustainability, the understanding of sustainability labels themselves was not affected. The carbon footprint (working with the Carbon Trust) and animal welfare (Animal Welfare Approved) labels performing the best even for the consumers who hadn't seen the labels before. In terms of consumer groups, labels were found to be more effective in motivated, mindful, and informed consumers.⁴⁰ Specifically labelling was found to be more effective for consumers who engaged already in sustainable behaviours. In addition, a lack of nutrition knowledge tends to hinder the effectiveness of labelling.⁴¹

At the product level, research on price perception for organic products indicates that occasional and non-consumers of organic products are more price-sensitive than regular consumers, making them less willing to pay the typical price premium associated with sustainability attributes⁴². These findings

³⁶ European Commission. 2025. "Commission Presents Its Roadmap for a Thriving EU Farming and Agri-Food Sector," press release, February 19, 2025, Brussels. Available at : https://ec.europa.eu/commission/presscorner/detail/en/ip_25_530.

³⁷ AGRINFO. 2025. "European Commission Sets Out Its Vision for Agriculture and Food for 2025–2029". Available at: <https://agrinfo.eu/book-of-reports/eu-vision-for-agriculture-and-food-20252029/pdf/>.

³⁸ EIT Food. 2023. "Eco-labelling. Whitepaper: will consumers accept a universal eco-labelling with open arms?". Available at: <https://www.eitfood.eu/reports/eco-labelling>

³⁹ Annunziata, Azzurra, Angela Mariani, and Riccardo Vecchio. "Effectiveness of Sustainability Labels in Guiding Food Choices: Analysis of Visibility and Understanding among Young Adults." *Sustainable Production and Consumption* 17 (January 1, 2019): 108–15. <https://doi.org/10.1016/j.spc.2018.09.005>.

⁴⁰ Onwezen, Marlien, Dwyer, Liam, and Snoek, Harriette. "Conditions for the effectiveness of labelling: a systematic review", *Wageningen Economic Research* (2021) <https://edepot.wur.nl/497077>

⁴¹ Food and Agriculture Organization of the United Nations (FAO). 2016. Influencing food environments for healthy diets – summary. Available at : <https://openknowledge.fao.org/server/api/core/bitstreams/1c4161e0-8858-4183-b39f-4c76cba27304/content>

⁴² Aschemann-Witzel, Jessica, and Stephan Zielke. "Can't Buy Me Green? A Review of Consumer Perceptions of and Behaviour Toward the Price of Organic Food." *Journal of Consumer Affairs* 51, no. 1 (2017): 211–51. <https://doi.org/10.1111/joca.12092>.

may suggest that consumers who are more price-sensitive or less engaged with sustainability attributes may be less influenced by sustainability labels, which could reduce the overall impact of such schemes.

Furthermore, it has also been proven that focusing only on the provision of information to consumers, without reconsidering the wider food environment results in limited impact.⁴³ Overall, recommendations suggest putting in place demand-side policies to tackle interconnected issues such as sustainability, health, and food security. Such policies should support healthy and sustainable consumption patterns and should allow for a coordinated approach across relevant policy areas. Implemented examples include labelling and information as discussed in this report, but also public food procurement and product reformulation, and using marketing and advertising rules and fiscal measures.

3.3. Consumer motivation and sustainability labelling

Our research further investigated external factors influencing consumers' motivation to seek out and use sustainability-related information, labels, and claims on food products. Although specific search queries were designed to target different categories of external factors, many of the selected articles examined multiple factors simultaneously (for example, the intersection of social and demographic or economic and demographic influences). Consequently, in the subsection below, a synthesis of the findings is presented, starting with socio-cultural factors, followed by demographic and economic factors, and concluding with psychological factors. Finally, this section discusses research on the overall effectiveness of food sustainability labelling in influencing consumer behaviour.

3.3.1. Food insecurity

Food insecurity is a public health issue that limits individuals' access to adequate food, leading to eating behaviours associated with poor diet quality and chronic diseases.⁴⁴ Food security can be considered a social determinant of health. According to the World Health Organisation (WHO), the latter are "broadly defined as the conditions in which people are born, grow, live, work and age, and people's access to power, money and resources [which] have a powerful influence on health inequities", leading to "unfair and avoidable differences in health status".⁴⁵ Another WHO study adds that "Social and economic conditions result in a social gradient in diet quality that contributes to health inequalities".⁴⁶ Therefore, lifestyle factors -including food diets- are a social determinant of health, including food security. Indeed, Campanera, Gasull, and Gracia-Arnaiz (2023) explained that "food insecurity is an expression of social inequality that compromises the physical and emotional health of marginalised people, and therefore their right to health".⁴⁷

⁴³ Agora and IDDRI (2024). Towards food policies that support healthy and sustainable consumption. https://www.agora-agriculture.org/fileadmin/Projects/2024/2024-03_national_food_strategies_SWu/A-AGR_364_Towards_food_policies_that_support_sustainable_and_healthy_consumption_WEB.pdf, quoting SAPEA 2023.

⁴⁴ Tari Selçuk, Kevser, Ramazan Atan, Sedat Arslan, and Nursel Dal. "Is Food Insecurity Related to Sustainable and Healthy Eating Behaviours?" *Environmental Science and Pollution Research* 30 (May 19, 2023): 74280–89. <https://doi.org/10.1007/s11356-023-27694-8>.

⁴⁵ WHO (2025). Social determinants of health. https://www.who.int/health-topics/social-determinants-of-health#tab=tab_1

⁴⁶ WHO, Wilkinson R., and Marmot M. (2003). Social determinants of health – the solid facts second edition. <https://iris.who.int/bitstream/handle/10665/326568/9789289013710-eng.pdf?sequence=1&isAllowed=y>

⁴⁷ Campanera M, Gasull M, Gracia-Arnaiz M. Food Security as a Social Determinant of Health: Tackling Inequalities in Primary Health Care in Spain. *Health Hum Rights*. 2023 Jun;25(1):9-21. PMID: 37266309; PMCID: PMC9973507. <https://pmc.ncbi.nlm.nih.gov/articles/PMC9973507/>

Food insecurity represents a notable socioeconomic disparity, which may result in the consumption of both lower-quality and less sustainable food products.⁴⁸ Additionally, individuals who are food insecure tend to be affected by chronic stress, resulting in nutritional patterns of overeating and food addiction, as shown in studies researching the dietary intake in relation to frameworks such as the Healthy Eating Index.⁴⁹ Moreover, a report from Agora and IDDRI stresses that while specific data on food insecurity is missing at the EU level, according to Eurostat in 2024 “9.5% of the EU population were unable to afford a meal containing meat, fish or a vegetarian equivalent every second day”.⁵⁰

3.3.2. Demographic factors

Demographic factors constitute a strong indicator of consumers’ understanding of sustainability and their expectations around sustainability information. In this context, previous studies focused on gender, age group, income, level of education and employment status.⁵¹

Beginning with gender, a 2015 study conducted in Germany on characterising convinced sustainable food consumers found that more female consumers fall under the convinced consumer groups than males, showing an underlying understanding that their personal decisions have an impact on sustainability. Moreover, they are willing to increase their contribution to sustainability through their behaviour. When looking at specific sustainability labels, women were also more likely than men to be convinced consumers of certified organic products. In contrast, for fair-trade products, no significant gender differences emerged.⁵²

In a study surveying consumer samples in the UK, Germany, Spain, Sweden, and Poland, it was also found that women have more concern for the environment and make use of labels more often than men, but when assessed for label understanding, both genders score the same.⁵³ In general, more value is attributed to food sustainability by women compared to men.⁵⁴ Additionally, a 2023 study in Lebanon on consumer’s knowledge and attitudes around organic foods showed that women score higher on objective knowledge, with the possible explanation that women are the primary shoppers of their households.⁵⁵

⁴⁸ Hirvonen, Kalle, Yan Bai, Derek Headey, and William A. Masters. “Affordability of the EAT–Lancet Reference Diet: A Global Analysis.” *The Lancet Global Health* 8, no. 1 (2020): e59–e66. [https://doi.org/10.1016/S2214-109X\(19\)30447-4](https://doi.org/10.1016/S2214-109X(19)30447-4).

⁴⁹ Leung, Cindy W., Elissa S. Epel, Lorrene D. Ritchie, Patricia B. Crawford, and Barbara A. Laraia. “Food Insecurity Is Inversely Associated with Diet Quality of Lower-Income Adults.” *Journal of the Academy of Nutrition and Dietetics* 114, no. 12 (December 1, 2014): 1943–1953.e2. <https://doi.org/10.1016/j.jand.2014.06.353>.

⁵⁰ Agora and IDDRI. 2024. Towards food policies that support healthy and sustainable consumption. Available at: https://www.agora-agriculture.org/fileadmin/Projects/2024/2024-03_national_food_strategies_SWu/A-AGR_364_Towards_food_policies_that_support_sustainable_and_healthy_consumption_WEB.pdf

⁵¹ D’Souza, Clare, Mehdi Taghian, Peter Lamb, and Roman Peretiatko. “Green Decisions: Demographics and Consumer Understanding of Environmental Labels.” *International Journal of Consumer Studies* 31, no. 4 (July 1, 2007): 371–76. <https://doi.org/10.1111/j.1470-6431.2006.00567.x>.

⁵² Meyer-Höfer, Marie von, Vera von der Wense, and Achim Spiller. “Characterising Convinced Sustainable Food Consumers.” *British Food Journal* 117, no. 3 (January 1, 2015): 1082–1104. <https://doi.org/10.1108/BFJ-01-2014-0003>.

⁵³ Grunert, Klaus G., Sophie Hieke, and Josephine Wills. “Sustainability Labels on Food Products: Consumer Motivation, Understanding and Use.” *Food Policy* 44 (February 1, 2014): 177–89. <https://doi.org/10.1016/j.foodpol.2013.12.001>.

⁵⁴ Onwezen, Marlien, Dwyer, Liam, and Snoek, Harriette. “Conditions for the effectiveness of labelling: a systematic review”, *Wageningen Economic Research* (2021) <https://edepot.wur.nl/497077>, referring to Verain et al., 2017; Grunert et al., 2014; Bellows et al., 2008; Howard and Ellen, 2006.

⁵⁵ Fatha, Latifa, and Rami Ayoubi. 2021. “A Revisit to the Role of Gender, Age, Subjective and Objective Knowledge in Consumers’ Attitudes towards Organic Food.” *Journal of Strategic Marketing* 31 (3): 499–515. <https://doi.org/10.1080/0965254X.2021.1939405>.

Regarding age, results from studies were found to be mixed within the different studies.⁵⁶ Older consumers in the United Kingdom were found more willing to buy sustainably and ethically labelled products.⁵⁷ However, a study on German consumers with a choice experiment unravelled those younger consumers valued sustainability information on food.⁵⁸ In terms of attitude toward sustainability information, a study on Italian consumers found that younger consumers are more positively inclined towards sustainability information, and they are willing to pay more for sustainable products.⁵⁹

Age also plays a significant role to the overall pro-environmental behaviour of the consumers. In a study for different products within Italy, France, Germany, the USA and China, it was found that younger consumers are overall found to be more environmentally conscious and displayed a higher interest in sustainability certifications.⁶⁰

3.3.3. Economic factors

Following existing research on the role of economic capacity in sustainable consumption, we include personal income as a key economic factor in our analysis of willingness to pay (WTP).⁶¹ Prior literature consistently shows a positive statistical association between net monthly income and the willingness to pay for environmentally friendly products. For example, one study based on a sample of 927 Portuguese Generation Z consumers found that higher personal income levels significantly increase WTP for green products.⁶²

3.3.4. Psychological factors

Psychological factors involve individual values that affect consumer motivation regarding purchasing behaviour and attention to the sustainability labelling information. Theories used in this research include social and evolutionary psychology to categorise consumers in behavioural clusters.

Firstly, ecologically oriented consumers have a higher purchasing frequency and attention to label information, which in turn connects to putting a higher value on carbon footprint labelled products. On the other hand, consumers who are price-sensitive regard health more than the environmental

⁵⁶ Onwezen, Marlien, Dwyer, Liam, and Snoek, Harriette. "Conditions for the effectiveness of labelling: a systematic review", *Wageningen Economic Research* (2021) <https://edepot.wur.nl/497077>

⁵⁷ Bartels, Jos, and Marleen C. Onwezen. "Consumers' Willingness to Buy Products with Environmental and Ethical Claims: The Roles of Social Representations and Social Identity." *International Journal of Consumer Studies* 38, no. 1 (January 1, 2014): 82–89. <https://doi.org/10.1111/ijcs.12067>.

⁵⁸ Sporleder, Eva, Maike Kayser, Nina Friedrich, and Ludwig Theuvsen. "Consumer Preferences for Sustainably Produced Bananas: A Discrete Choice Experiment." *International Food and Agribusiness Management Review* 17 (January 1, 2014): 59–82.

⁵⁹ Sogari, Giovanni, Chiara Corbo, Martina Macconi, Davide Menozzi, and Cristina Mora. "Consumer Attitude towards Sustainable-Labelled Wine: An Exploratory Approach." *International Journal of Wine Business Research* 27, no. 4 (January 1, 2015): 312–28. <https://doi.org/10.1108/IJWBR-12-2014-0053>.

⁶⁰ Mota-Gutierrez, Jatziri, Antonina Sparacino, Valentina Maria Merlino, Simone Blanc, Filippo Brun, Fabrizio Massimelli, Emanuela Vassallo, Danielle Borra, and Stefano Massaglia. "Socio-Demographic and Cross-Country Differences in Attention to Sustainable Certifications and Changes in Food Consumption." *Npj Science of Food* 8, no. 1 (June 1, 2024): 31. <https://doi.org/10.1038/s41538-024-00274-x>.

⁶¹ Cascavilla, A., Caferra, R., Morone, A. et al. Experimental evidence on consumers' willingness to pay in the sustainable fashion industry. *Sci Rep* 15, 38752 (2025). <https://doi.org/10.1038/s41598-025-23008-9>

⁶² Gomes S., Lopes J.M., Nogueira S, Willingness to pay more for green products: A critical challenge for Gen Z, *Journal of Cleaner Production*, Volume 390, 2023, 136092, ISSN 0959-6526, <https://doi.org/10.1016/j.jclepro.2023.136092>

sustainability label but show less concern for societal security and for delayed gratification (valuing the immediate results over future environmental prosperity).⁶³

Altruism has been found to be an important factor in consumer purchasing choices. Individuals that are primarily guided by altruism are more likely to opt for responsible behaviour and to support social and environmental initiatives with their purchasing decisions. Some examples were a survey on the willingness of US consumers to pay more for Fair Trade and organic coffee and a survey on Mediterranean consumers' choice of eco-labelled seafood. High altruism has been found to correlate with consumer awareness, information seeking and sustainable food choices.^{64,65,66} An additional set of values for understanding food labels is universalism, security and tradition, which were found to be associated with sustainability in the level of food production.⁶⁷ Finally, in a systematic review of the relationship between product attributes and consumer decision-making, self-transcendence has been strongly associated with choosing sustainable products.⁶⁸

Regarding motivation and the gap between the intention to use sustainability information and actual behaviour, a 2020 study highlights the role of motivational conflicts. A motivational conflict can be between two or more key factors that influence food choice, such as taste and the moral obligation to buy a sustainable product. The key indicator that was examined was attitudinal ambivalence, which can weaken the link between attitudes and intentions. Consumers who hold conflicting or inconsistent views about sustainable food are less likely to choose it, despite positive attitudes toward sustainability.⁶⁹

Finally, when it comes to emotions, both negative and positive ones (guilt and pride) have been connected with the Basque consumer's willingness to buy Fair Trade products, although pride has been showed to be slightly more influential than guilt. Going hand-in-hand with this is the capacity of these emotions to support consumers with already established positive attitudes toward sustainable products in making the purchase decision (although a direct effect was not observed).⁷⁰

⁶³ Steiner, B.E., A.O. Peschel, and C. Grebitus. "Multi-Product Category Choices Labeled for Ecological Footprints: Exploring Psychographics and Evolved Psychological Biases for Characterizing Latent Consumer Classes." *Ecological Economics* 140 (October 1, 2017): 251–64. <https://doi.org/10.1016/j.ecolecon.2017.05.009>.

⁶⁴ Peiró-Signes A., Ngel, Á., Lluís Miret-Pastor, Maria Tsiouni, Dario Siggia, and Antonino Galati. "Determinants of Consumers' Response to Eco-Labelled Seafoods: The Interaction between Altruism, Awareness and Information Demand." *Journal of Cleaner Production*, November 2023. <https://doi.org/10.1016/j.jclepro.2023.139758>.

⁶⁵ Suplico Jeong, Luz, Reynaldo Bautista, Miguel Paolo, and Rayan Dui. "Does Altruism Affect Purchase Intent of Green Products? A Moderated Mediation Analysis." *Asia-Pacific Social Science Review* 20 (March 1, 2020): 159–70.

⁶⁶ Galati, Antonino, Lluís Miret-Pastor, Dario Siggia, Maria Crescimanno, and Mariantonietta Fiore. "Determinants Affecting Consumers' Attention to Fish Eco-Labels in Purchase Decisions: A Cross-Country Study." *British Food Journal* 124, no. 10 (January 1, 2022): 2993–3013. <https://doi.org/10.1108/BFJ-05-2021-0498>.

⁶⁷ Grunert, Klaus G., Sophie Hieke, and Josephine Wills. "Sustainability Labels on Food Products: Consumer Motivation, Understanding and Use." *Food Policy* 44 (February 1, 2014): 177–89. <https://doi.org/10.1016/j.foodpol.2013.12.001>.

⁶⁸ Bangsa, Adjengdia Bunga, and Bodo B. Schlegelmilch. "Linking Sustainable Product Attributes and Consumer Decision-Making: Insights from a Systematic Review." *Journal of Cleaner Production* 245 (February 1, 2020): 118902. <https://doi.org/10.1016/j.jclepro.2019.118902>.

⁶⁹ Elhoushy, Sayed. "Consumers' Sustainable Food Choices: Antecedents and Motivational Imbalance." *International Journal of Hospitality Management* 89 (2020): 102554. <https://doi.org/10.1016/j.ijhm.2020.102554>.

⁷⁰ Fernández-Ferrín, Pilar, Sandra Castro-González, Belén Bande, and M. Mercedes Galan - Ladero. "Drivers of Consumer's Willingness to Pay for Fair Trade Food Products: The Role of Positive and Negative Emotions." *International Review on Public and Nonprofit Marketing* 21 (March 10, 2023): 1–24. <https://doi.org/10.1007/s12208-023-00366-6>.

Finally, political identity also plays a role as a socio-psychological factor influencing sustainability-related food behaviour. A 2023 study carried out in Greece unveiled that conservatives show less concern for environmental impacts of foods. On the opposite side of the spectrum, a 2015 panel study showed that liberally oriented consumers are more committed to sustainable choices and more motivated to change their behaviour to support the road to equity and justice.⁷¹ This study highlighted the relationship between moral foundations and involvement in food sustainability, suggesting that social groups who are not satisfied with the status quo are more likely to readily change their behaviour. Consistent to this, existing research on the willingness to engage in climate action has provided evidence of negative relationship between pro-social and pro-environmental behaviour and conservatives.⁷² Overall, more liberal individuals are willing to engage in environmental action, but this could also be due to the associated information reaching conservative individuals less frequently.⁷³

3.3.5. Regional factors

To capture the spatial context in which respondents live, we incorporate a set of regional-level indicators. These factors help us understand how broader environmental and infrastructural conditions shape individuals' eco-label consideration and willingness to pay for sustainable food products.

First, transportation connectivity is included because it affects the flow of people and goods across space, influencing consumers' access to markets, the availability of sustainable products, and ultimately their purchasing behaviour.⁷⁴ Second, we account for the air quality index, as previous studies have shown that exposure to poor or improving air quality can increase awareness of environmental issues and strengthen preferences for sustainable consumption.⁷⁵ Finally, we include measures of extreme weather conditions, which have been associated with shifts in consumption patterns and a heightened demand for green and resilient products, as well as broader regional green innovation.^{76,77} Together, these regional factors allow us to embed individual behaviour within the wider environmental and infrastructural context in which it occurs.

⁷¹ Watkins, Leah, Robert Aitken, and Damien Mather. "Conscientious Consumers: A Relationship between Moral Foundations, Political Orientation and Sustainable Consumption." *Special Volume: Transitions to Sustainable Consumption and Production in Cities* 134 (October 15, 2016): 137–46. <https://doi.org/10.1016/j.jclepro.2015.06.009>.

⁷² Tiganis, Antonios, Polymeros Chrysochou, and Athanasios Krystallis. "Political Ideology Shapes Heterogeneous Preferences for Food Values." *Food Quality and Preference* 112 (December 1, 2023): 105038. <https://doi.org/10.1016/j.foodqual.2023.105038>.

⁷³ Latkin, Carl A., Lauren Dayton, Da-In Lee, Grace Yi, and Mudia Uzzi. "Correlates of Levels of Willingness to Engage in Climate Change Actions in the United States." *International Journal of Environmental Research and Public Health* 18, no. 17 (2021). <https://doi.org/10.3390/ijerph18179204>.

⁷⁴ OECD (2018), Enhancing Connectivity through Transport Infrastructure: The Role of Official Development Finance and Private Investment, The Development Dimension, OECD Publishing, Paris, <https://doi.org/10.1787/9789264304505-en>

⁷⁵ Lim, T., Kim, T. T., & Kim, S. Y. (2025). EXPRESS: Consumer Response to Climate Change: Wildfire Smoke and Sustainable Product Choice. *Journal of Marketing Research*, 0(ja). <https://doi.org/10.1177/00222437251352490>

⁷⁶ Xin Tian, Shasha Cao, Yan Song, The impact of weather on consumer behaviour and retail performance: Evidence from a convenience store chain in China, *Journal of Retailing and Consumer Services*, Volume 62, 2021, 102583, ISSN 0969-6989, <https://doi.org/10.1016/j.jretconser.2021.102583>

⁷⁷ Jun Wen, Xin-Xin Zhao, Qiang Fu, Chun-Ping Chang, The impact of extreme weather events on green innovation: Which ones bring to the most harm?, *Technological Forecasting and Social Change*, Volume 188, 2023, 122322, ISSN 0040-1625, <https://doi.org/10.1016/j.techfore.2023.122322>

3.3.6. Socio-cultural factors: Hofstede's 6-D model

Although psychological factors capture internal value orientations and motivations, consumer engagement with sustainability information is also shaped by external socio-cultural contexts. Cross-national cultural differences can influence how consumers interpret sustainability labels, trust information, and respond to behavioural interventions. To account for these broader cultural influences, several studies have employed Hofstede's 6-D model⁷⁸ of six dimensions of national cultures, with the focus on competing states of affairs that differ between countries rather than individuals.⁷⁹ These states represent preferences that ultimately determine how national groups behave toward specific behavioural interventions, such as food labelling. The six dimensions are the following⁸⁰:



Figure 3. Hofstede's Six Cultural Dimensions⁸¹

3.3.7. Hofstede's 6-D model and food sustainability labelling

Regarding food labelling as an information point for consumers based on Hofstede's dimensions, a 2022 study on Chinese and Australian consumers showed that **individualistic cultures** (i.e., a characteristic of most Western societies) have a preference for explicit production information, as it is seen as a direct benefit to the consumer. Regarding the **Power Distance** dimension, consumers in high power distance countries have a greater respect for authority and prefer labels that are regulated by the government and other accredited authorities. When it comes to the **long and short**

⁷⁸ In late 2023, the dimension previously known as Masculinity vs. Femininity was renamed Motivation towards Achievement and Success (MAS) (Worthy et al., 2025). The new label was adopted to use more inclusive language and to move away from the binary treatment of gender in the original concept. Within this dimension, masculinity refers to a societal preference for achievement, heroism, assertiveness, and material rewards, while femininity reflects a preference for cooperation, modesty, care for the vulnerable, and an emphasis on quality of life. Gender-related differences remain visible: in feminine societies, women share caring and modest values equally with men, whereas in masculine societies, women tend to be relatively assertive and competitive but still less so than men, which maintains a noticeable gap in values. Despite the change in terminology, the underlying concept and country scores have not been altered.

⁷⁹ Hofstede, Geert. 1991. *Cultures and Organizations: Software of the Mind*. London: McGraw-Hill. Available at: <https://scispace.com/pdf/software-of-the-mind-1yrref4jmp.pdf>

⁸⁰ Hofstede, Geert. 1991. "Dimensionalizing Cultures: The Hofstede Model in Context." *Online Readings in Psychology and Culture* 2, no. 1. <https://doi.org/10.9707/2307-0919.1014>

⁸¹ Figure taken from Santoso, Harry, and Martin Schrepp. 2019. "The Impact of Culture and Product on the Subjective Importance of User Experience Aspects." *Heliyon* 5 (September): e02434. <https://doi.org/10.1016/j.heliyon.2019.e02434>.

-term orientation dimension, consumers in countries with long-term orientation focus more on long-term health benefits when choosing a product, especially regarding health. Lastly, in terms of openness to change, countries scoring high in the **Uncertainty Avoidance** dimension are less likely to accept change and innovation, including products that they have never purchased before.⁸²

A further insight from this study is that in countries with high **Power Distance** and **Uncertainty Avoidance** (such as the case study, China) consumers that presented low involvement in sustainability for their food choices, paid more attention to the labelling cues related to nature. Specifically, they displayed more intuition in their judgment of the product and product nature characteristics such as the name of the certification.

Another study on Hofstede's 6-D model, which matched data on eco-labels with national culture dimensions revealed that when it comes to the number of eco-labels present in a country, **Individualism, Masculinity and Indulgence** have a positive correlation, whereas power distance, long-term orientation and uncertainty avoidance have a negative correlation⁸³. Moreover, in countries with higher GDP the dimensions of **Individualism** and **Power Distance** were found to be significant in consumer choices of eco-labels.

Finally, a 2024 study that combined meta-analysis of consumer data across 18 countries encompassing 75 papers on ecolabels' persuasiveness revealed the following insights on the 6 dimensions of culture as moderators: Consumers from countries with greater levels of **Power Distance, Masculinity, Uncertainty Avoidance**, and **Individualism** tend to find ecolabels more persuasive.⁸⁴ This is a result of ecolabels being regarded as a call to action, representing high assertiveness and self-responsibility and fulfilling their role of providing information, minimising uncertainty. In addition, certified ecolabels generated more persuasiveness than voluntary ones.

4. The Survey

The background analysis shows that several external factors have been examined in relation to consumers' engagement with sustainable food products and labelling. The survey, which is presented in the following sections, gathers data on several of these factors, alongside measures of food label consideration and willingness to pay, and enables the creation of consumer profiles based on the patterns observed in the sample.

4.1. Target countries

A consumer-targeted survey was developed and coded via the **SurveyMonkey** platform in English, whereas the distribution was conducted via the crowdsourcing platform **Prolific**. The survey targeted primarily the six pilot countries of the TealHelix project: **Lithuania, Latvia, Estonia, Germany, Poland, and Greece**. However, due to insufficient rates of response in some of the pilot countries (Latvia, Lithuania), it was decided to extend the target countries to **Belgium, Sweden, the Netherlands, Italy, France, Spain**, and **Portugal**.

⁸² Ho, Kenneth Fu Xian, Fang Liu, Liudmila Tarabashkina, and Thierry Volery. "Cross-Cultural Differences in Consumers' Attention to Food Labels." *British Food Journal* 124, no. 12 (January 1, 2022): 4888–4904. <https://doi.org/10.1108/BFJ-07-2021-0751>.

⁸³ Manta, Francesco, Francesco Campobasso, Annunziata Tarulli, and Domenico Morrone. "Showcasing Green: How Culture Influences Sustainable Behaviour in Food Eco-Labelling." *British Food Journal* 124, no. 11 (January 1, 2022): 3582–94. <https://doi.org/10.1108/BFJ-05-2021-0478>.

⁸⁴ Velasco, Franklin, Omar Itani, and Paul Cajina. "Ecolabel Persuasion Effect across Cultures: A Comprehensive Meta-Analysis." *International Marketing Review*, July 30, 2024. <https://doi.org/10.1108/IMR-10-2023-0293>.

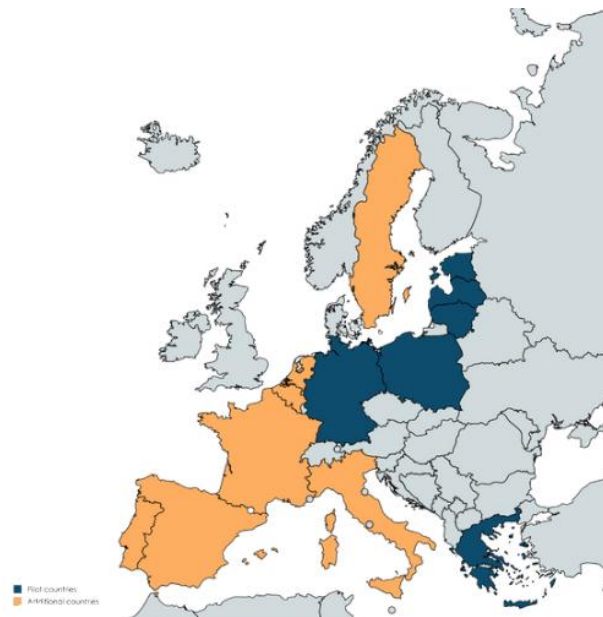


Figure 4. TealHelix Survey Countries

4.2. Questionnaire structure

The survey questionnaire consisted of the following **14** sections listed below:

- Section 1:** Dietary habits and food preferences
- Section 2:** Awareness & knowledge of sustainable food
- Section 3:** Socioeconomic status
- Section 4:** Label understanding and trust
- Section 5:** Food literacy
- Section 6:** Purchasing behaviour and WTP for sustainable food
- Section 7:** Food vulnerability
- Section 8:** Food insecurity
- Section 9:** Values
- Section 10:** Awareness of consequences
- Section 11:** Ascription of responsibility
- Section 12:** Personality
- Section 13:** Political orientation
- Section 14:** Demographics

The questionnaire comprised close-ended questions, including multiple choice answer formats, Likert scales and value assigning tasks to identify preferences. Before data collection, the survey underwent pilot testing to a small group of 100 participants. The aim was to assess the clarity and technical functionality of the questionnaire. Feedback from the pilot phase was used to improve the flow between sections, and address any technical issues identified. The full questionnaire is available in [Appendix 1](#).

4.3. Data collection

Data were collected from May to July 2025. Participants were compensated for their time, which encouraged more people to take part in the survey. Screening questions on age and country of residence ensured that respondents belonged to the target population. Additionally, we pre-screened participants to ensure response quality: participants were required to (i) be fluent in English, (ii) have previously completed at least 20 studies, and (iii) have an approval rate of at least 80%.

Following data collection, we followed a systematic data-cleaning process to remove incomplete, invalid, or implausible responses. The initial sample consisted of 3,004 respondents. We first excluded 214 individuals who either did not provide information about their town of residence or entered invalid responses, such as towns with fewer than three characters. Next, we removed 3 respondents with missing values in key variables central to our analysis, such as food label consideration and willingness to pay a premium for sustainable food products. We then identified and excluded 15 respondents residing in overseas regions. Additionally, we removed 2 respondents who reported living in Denmark and 1 in Latvia.⁸⁵ Finally, we dropped 1 observation in which the respondent reported an age of 2006, likely indicating a birth year rather than age, raising concerns about the overall reliability of the responses that this participant provided. We also excluded 2 respondents who reported having more than 15 children in the household, as these entries are deemed implausible. After applying these filters, the sample used for regression analysis includes 2,767 respondents.

We examine the distribution of respondents by country in Table 2. The majority resides in Poland. Approximately 300 respondents come from each of the following countries: France, Germany, Greece, Italy, the Netherlands, Portugal, and Spain. More than 100 respondents are from Belgium and Sweden, while Estonia has the smallest number of participants, with 83 respondents.

⁸⁵ Denmark was not one of the study's target countries. Latvia was initially included in our target countries, as one of the project's pilots, however, due to an insufficient number of available participants in Prolific's pool from Latvia, we decided to exclude it from the study.

Table 2: Frequencies of participants by Country⁸⁶

Countries	Frequency	Percentage (%)
Belgium	128	4.63
Estonia	83	3
France	297	10.73
Germany	299	10.81
Greece	298	10.77
Italy	301	10.88
The Netherlands	304	10.99
Poland	321	11.6
Portugal	294	10.63
Spain	291	10.52
Sweden	151	5.46

4.4. Data preprocessing

We begin our data preparation by cleaning and standardising the town of residence reported by each respondent. To achieve this, we apply geocoding in Python using the Nominatim service from OpenStreetMap (OSM), which converts place names into geographic coordinates. This step enables us to correct inconsistencies in city names, such as “Milan” versus “Milano”, and ensures a more accurate and unified dataset. The resulting geographic coordinates are assigned to each respondent and subsequently imported into QGIS. Using the latest NUTS boundary shapefiles provided by Eurostat (2024), we spatially match respondents to their corresponding NUTS 2 region. This spatial join ensures that all respondents can be accurately linked to the regional-level indicators from Eurostat.

4.5. Data processing

Based on the questionnaire responses, we constructed the individual-level variables used in the statistical analysis.

→ **Food Label Consideration:** To construct our first measure of sustainable food product adoption, we rely on Question 11: “*Which of the following labels do you take into account while shopping for food products?*”. This question was designed to capture respondents’ intentions toward

⁸⁶ Frequency table based on the sample used in the regression analysis.

sustainable food consumption. It included seven different food labels, with respondents rating each on a 7-point scale ranging from “*Never consider this label*” to “*Always consider this label*”. The purpose of this question was to provide initial insights into respondents’ awareness, understanding, and trust in sustainable food labels. To assess the internal consistency of these items, we conducted a reliability analysis using Cronbach’s Alpha. The resulting value was 0.8, above the commonly accepted threshold of 0.7, indicating that these items can be reliably combined into a single measure.⁸⁷ We then computed the average consideration score for each respondent by taking the mean of their responses across the seven labels.

- **Willingness to Pay a Premium for Sustainable Food Products:** To construct the second measure of sustainable food product adoption, we rely on Question 19: “*Please indicate the extra percentage that you would be willing to pay for a sustainable food product.*” This question was designed to capture respondents’ willingness to pay extra, reflecting their actual purchasing intent toward sustainable food products. Unlike attitudinal measures, it incorporates economic considerations, such as price sensitivity and individual budget constraints. The resulting variable is expressed as a percentage.
- **Food Vulnerability:** To measure food vulnerability, we rely on Question 20: “*For each statement, please select Yes or No*” which consisted of seven items derived from the established Food Insecurity Experience Scale (FIES).⁸⁸ Each item required a binary response, with “Yes” coded as 1 and “No” coded as 0, where a “Yes” indicates a sign of food vulnerability. For each respondent, we sum the number of “Yes” responses across the seven items to construct a food vulnerability index. This index ranges from 0 to 7, with higher scores indicating greater food vulnerability.
- **Relationship with Sustainability:** To construct an index capturing the respondent’s perceived connection to sustainability, we rely on Question 21: “*Please choose the picture below that best describes how you feel about your relationship with sustainability right now. Note: The more the two circles overlap, the more you feel yourself and sustainability interconnected as a whole.*” Respondents choose from seven visual options, where 1 represents minimal connection and 7 represents full connection to sustainability. The resulting index ranges from 1 to 7, with higher scores indicating a stronger perceived relationship with sustainability.
- **Relationship with Natural Environment:** To construct an index capturing the respondent’s perceived connection to the environment, we rely on Question 22: “*Please choose the picture below that best describes how you feel about your relationship with the natural environment right now. Note: The more the two circles overlap, the more you feel yourself and the natural environment interconnected as a whole.*” Respondents chose from seven visual options, where 1 represents minimal connection and 7 represents full connection to the environment. The resulting index ranges from 1 to 7, with higher scores indicating a stronger perceived relationship with the environment.
- **Relationship with Animal Welfare:** To construct an index capturing the respondent’s perceived connection to animal welfare, we rely on Question 23: “*Please choose the picture below that best describes how you feel about your relationship with animal welfare right now. Note: The more*

⁸⁷ van Griethuijsen, R.A.L.F., van Eijck, M.W., Haste, H. et al. Global Patterns in Students’ Views of Science and Interest in Science. *Res Sci Educ* 45, 581–603 (2015). <https://doi.org/10.1007/s11165-014-9438-6>

⁸⁸ Food and Agriculture Organization of the United Nations (FAO). 2025. “Measuring Hunger.” Available at: <https://www.fao.org/in-action/voices-of-the-hungry/fies/en/>

the two circles overlap, the more you feel yourself and animal welfare interconnected as a whole.” Respondents chose from seven visual options, where 1 represents minimal connection and 7 represents full connection to animal welfare. The resulting index ranges from 1 to 7, with higher scores indicating a stronger perceived relationship with animal welfare.

- **Relationship with Healthy Nutrition:** To construct an index capturing the respondent’s perceived connection to healthy nutrition, we rely on Question 24: *“Please choose the picture below that best describes how you feel about your relationship with healthy nutrition right now. Note: The more the two circles overlap, the more you feel yourself and healthy nutrition interconnected as a whole.”* Respondents chose from seven visual options, where 1 represents minimal connection and 7 represents full connection to healthy nutrition. The resulting index ranges from 1 to 7, with higher scores indicating a stronger perceived relationship with healthy nutrition.
- **Relationship with Community:** To construct an index capturing the respondent’s perceived connection to the community, we rely on Question 25: *“Please choose the picture below that best describes how you feel about your relationship with your community right now. Note: The more the two circles overlap, the more you feel yourself and your community interconnected as a whole.”* Respondents chose from seven visual options, where 1 represents minimal connection and 7 represents full connection to the community. The resulting index ranges from 1 to 7, with higher scores indicating a stronger perceived relationship with the community.
- To construct the **Big Five personality traits**, we rely on Question 29: *“Please indicate your level of agreement with each of the following statements.”* Respondents rated their agreement using a 7-point Likert scale. We followed the standard methodology for implementing the 10-item short version of the Big Five Inventory (BFI-10), a validated and efficient tool for capturing the five personality dimensions: extraversion, agreeableness, conscientiousness, neuroticism, and openness. The measurement scale included two items for each personality trait, except for agreeableness, which is measured using three items, as recommended in the literature, since the inclusion of a third item significantly enhances the reliability and performance of the index. Reverse scoring was applied to negatively worded items, as appropriate.⁸⁹
- **Age** was included as a continuous variable, based on the responses to Question 31. For gender (Question 35), we created **three dummy variables: male, non-binary**, and **other**, using female as the reference category. In addition, we construct a dummy variable for **migrant status** using information from Question 32 (country of origin) and Question 33 (country of residence). Respondents are classified as immigrants if the country they currently live in differs from their country of origin. We included **political orientation** based on responses to Question 30, converted into a numerical variable where higher values reflect a more liberal political stance. **Educational attainment** was derived from Question 36, with higher values corresponding to higher levels of education, such as a Ph.D. From Question 38, we included a numerical variable capturing the **number of children reported** by each respondent. Finally, **personal income** is included as provided in Question 41.

Regional Variables

⁸⁹ Beatrice Rammstedt, Oliver P. John, Measuring personality in one minute or less: A 10-item short version of the Big Five Inventory in English and German, *Journal of Research in Personality*, Volume 41, Issue 1, 2007, Pages 203-212, ISSN 0092-6566, <https://doi.org/10.1016/j.jrp.2006.02.001>

To extract regional variables, we draw on multiple data sources. Specifically, we use respondents' self-reported town of residence to assign them to their corresponding NUTS 2 region.⁹⁰ Then, we merge the individual-level data with NUTS 2–level indicators, including **Gross Domestic Product (GDP) per capita in Purchasing Power Standards** and **total population** from Eurostat, **road network stock** to capture transportation accessibility from OpenStreetMap (OSM), and an **air quality indicator** from the European Environment Agency (EEA). Additionally, we incorporate the **growth of maximum temperature** from WorldClim and **the geographical area of each region**, calculated in QGIS (in square meters) using the most recent Eurostat shapefile available (2024).⁹¹

- **Gross Domestic Product (GDP) per capita in Purchasing Power Standards:** Regional Gross Domestic Product (GDP) per capita, expressed in million Purchasing Power Standards (PPS), is reported at the NUTS 2 level. The conversion to PPS is based on national Purchasing Power Parities (PPP), which are regularly calculated and published by Eurostat to ensure geographic and temporal comparability.⁹² To mitigate the influence of annual fluctuations and outliers, we use the mean value for the period 2019 - 2023.
- **Population Density:** Population on 1 January should be based on the concept of usual resident population, i.e. the number of inhabitants of a given area on 1 January of the year in question (or, in some cases, on 31 December of the previous year).⁹³ The population figures can be based on data from the most recent census adjusted by the components of population change produced since the last census or based on population registers. The variable has been standardised to ensure geographic and time comparability by Eurostat. To mitigate the influence of annual fluctuations and outliers, we use the mean value for the period 2020–2024. Population density is then calculated by dividing the population by the area, with all areas converted to square kilometres.
- **Stock of Roads:** To comprehensively capture transportation accessibility for all respondents in each region, we incorporated data on the road network from OpenStreetMap (OSM) as of January 2025. The analysis accounts for various types of roads, including motorways, cycleways, pedestrian paths, steps, secondary and tertiary links, track grades, trunk and primary roads, living streets, bridleways, busways, and others.⁹⁴ We then calculated the total length of the road network (in kilometers) for each NUTS 2 region.
- **Yearly Air Quality:** Next, we construct an air quality index based on data from the European Environment Agency (EEA), following the approach of the Year Average Common Air Quality Index (YACAQI).⁹⁵ The index incorporates information on PM10 (annual mean, 90.4th percentile of daily means), PM2.5 (annual mean), ozone (93.2nd percentile of maximum daily 8-hour

⁹⁰ The NUTS classification divides each country into three hierarchical levels (NUTS 1, NUTS 2, and NUTS 3), based on population thresholds and administrative divisions, to enable consistent regional statistical comparisons.

⁹¹ QGIS is a geographic information system (GIS) software. It supports viewing, editing, printing, and analysis of geospatial data in a range of data formats.

⁹² Eurostat. 2025. "Gross domestic product (GDP) at current market prices by NUTS 2 region (dataset nama_10r_2gdp)". Available here : https://ec.europa.eu/eurostat/databrowser/view/nama_10r_2gdp/default/table?lang=en

⁹³ Eurostat. 2025. "Population on 1 January by age group and sex and NUTS 2 region (dataset demo_r_pjangroup)". Available here: https://ec.europa.eu/eurostat/databrowser/view/DEMO_R_PJANGROUP/default/table?lang=en

⁹⁴ Geofabrik GmbH. 2025. "Download OpenStreetMap for Europe.". Available here: <https://download.geofabrik.de/europe/>

^{95, 96} Sef van den Elshout, Hans Bartelds, Hermann Heich, Karine Léger, "CAQI Air quality index Comparing Urban Air Quality across Borders – 2012", (2012), <https://ekomonitor.mk/wp-content/uploads/2020/11/citeair-comparing-urban-air-quality-across-borders.pdf>

means), and NO₂ (annual mean). To reduce the impact of annual fluctuations and outliers, we use the mean values for the period 2019–2023. Each component is standardised according to the established methodology, and the final index is calculated as the average of all standardised components.⁹⁶

- **Temperature Growth:** To compute temperature growth, we use data on the maximum monthly temperatures for the period 2020–2024. For each year, we calculate the average of the monthly maximum temperatures and then determine the year-to-year growth rates. Finally, we take the mean of these annual growth rates to obtain the overall temperature growth measure.⁹⁷

We also collect country-level data on Hofstede’s cultural dimensions. Specifically, we obtain measures for Power Distance, Individualism, Motivation toward Achievement and Success (Masculinity), Uncertainty Avoidance, Long-Term Orientation, and Indulgence.

4.6. Modelling

4.6.1. Regression Analysis

For consistency and comparability, we use a fixed sample size in all regression analyses. In addition, the education variable has 16 missing values, the income variable has 236 missing values and children at home has 8 missing values. To preserve the full sample, we imputed the missing values using the mean of the respective index in each case. To account for potential bias introduced by this imputation, we included three additional dummy variables in the regression models, one for education, one for income and one for children at home, coded as 1 for observations with imputed values and 0 otherwise. This approach allows us to retain the full sample while controlling any systematic differences in the missing data.

We employ a series of Ordinary Least Squares (OLS) regression models to analyse our dataset. These models allowed us to examine the effects of individual characteristics and regional factors on key outcomes, including the labels that the respondents take into account while shopping food products and their willingness to pay a premium for sustainable products. To control for unobserved heterogeneity at regional level, we include NUTS 1 fixed effects across all our models, thereby accounting for regional-specific factors that could otherwise bias our results. Since our analysis is cross-sectional, we use time-averaged values of the main regional independent variables to mitigate the influence of time-specific shocks within regions. Finally, we clustered the standard errors at the NUTS 2 level to correct for heteroskedasticity and within-region autocorrelation, ensuring more robust inference by adjusting for correlated and non-constant error variance within clusters. The analysis was conducted in Python using the statsmodels library, which enables the specification and estimation of statistical models through R-style formula syntax.

4.6.2. QCA Analysis

In addition to the regression-based analyses described above, this study applied **fuzzy-set Qualitative Comparative Analysis (fsQCA)** to complement and extend the findings. Whereas OLS regression identifies the direct effect of individual predictors to the target variable while holding other

⁹⁷ WorldClim. 2025. “Historical Monthly Weather Data: Climate Variables 1950–2024.”. Available here: <https://www.worldclim.org/data/monthlywth.html>

variables constant, fsQCA takes a configurational perspective. This enables the detection of multiple, distinct combinations of conditions, or causal paths/recipes, that can lead to the same outcome.

The methodological logic of fsQCA aligns closely with the aims of this study, which examines how combinations of *individual personality traits, cultural orientations, demographic or regional factors* influence sustainable food consumption choices. The research context is characterised by causal complexity, as no single factor, such as a specific Big Five trait or Hofstede cultural dimension, is expected to fully explain the outcome on its own. Rather, the outcome is likely shaped by multiple interacting conditions whose influence depends on the broader configuration in which they appear.

The rationale for introducing fsQCA is therefore twofold. First, the decision to consider food labels or to pay more for sustainable food products is unlikely to be driven by any single factor in isolation. Second, consumer behaviour in this context is characterised by causal asymmetry, meaning that the presence of certain conditions linked to high engagement does not imply that the absence of those same conditions explains low engagement.. By accommodating conjunctural causation, fsQCA enables the identification of distinct causal paths, i.e. different “recipes” of traits, cultural values, demographic or regional attributes that are sufficient for high engagement in sustainable food consumption.

The fsQCA approach is applied here for profiling purposes. By identifying the distinct combinations of personality traits, cultural dimensions, demographic or regional characteristics that lead to each outcome, the analysis produces clear behavioural profiles. These profiles help characterise distinct clusters of consumers who share similar condition patterns, offering a deeper understanding of the diversity of pathways leading to sustainable consumption behaviours.

By adopting fsQCA alongside OLS regression, the analysis captures both variable-oriented and case-oriented perspectives. The regression models provide estimates of the relative strength and statistical significance of individual predictors, while the configurational approach of fsQCA reveals how different sets of conditions jointly produce the outcomes. This mixed-method strategy strengthens the robustness of our findings and integrates diverse data types into a coherent, configurational explanation of the outcomes under study.

Further details on the theoretical framework of Qualitative Comparative Analysis are provided in the [Appendix 2](#) and [Appendix 3](#). The Appendix also includes a brief comparison between regression analysis and QCA, as well as a discussion on why QCA was chosen over other profiling approaches, such as clustering.

5. Data Analysis and Key Takeaways

5.1. Descriptive statistics

We started exploring the dataset with a series of frequency and summary statistics tables. Starting with age in Table 3, the majority of respondents are between 21 and 35 years old, representing over 63% of the sample. Fewer than 3% are between 18 and 20, while the remaining respondents are 36 years old or older.

Table 3. Frequencies of participants by Age

Value	Frequency	Percentage (%)
18-20	73	2.64
21-25	592	21.39
26-30	702	25.38
31-35	472	17.05
36-40	317	11.46
41-45	235	8.49
46-50	144	5.21
51-55	117	4.23
55 plus	115	4.15

Notes: Frequency table based on the sample used in the regression analysis.

Table 4 shows that 57% of respondents identify as male, approximately 41% as female, and 1.52% as non-binary. Additionally, 0.29% of respondents preferred not to disclose their gender, while 0.18% chose to self-describe.

Table 4. Frequencies of participants by Gender

Gender Value	Frequency	Percentage (%)
Female	1134	40.98
Male	1578	57.03
Non-binary	42	1.52
Prefer not to say	8	0.29
Prefer to self-describe	5	0.18

Notes: Frequency table based on the sample used in the regression analysis.

In Table 5, we can see that the majority of respondents (54.75%) fall into the second- and third-income groups, reporting an average monthly household income per family member (after taxes and

deductions) between 500€ and 2,500€. Approximately 5% of respondents report an income below 500€, while just over 15% have an income between 2501€ and 3500€. Additionally, 8.53% chose not to disclose their income level. The remaining respondents report an income exceeding 3500€.

Table 5. Frequencies of participants by Income

Value	Frequency	Percentage (%)
Under 500€	138	4.99
501€ to 1500€	775	28.01
1501€ to 2500€	740	26.74
2501€ to 3500€	426	15.4
3501€ to 4500€	237	8.57
4501€ to 5500€	97	3.51
5501€ and above	118	4.26
Prefer not to say	236	8.53

Notes: Frequency table based on the sample used in the regression analysis.

Next, in Table 6 we explore the distribution of participants based on the number of children in their household. The vast majority of respondents, over 77%, report having no children at home. Approximately 21% have one or two children, while only 1.5% report having more than two children.

Table 6. Frequencies of participants by Nr of children at home

Value	Frequency	Percentage (%)
0	2148	77.63
1	368	13.3
2	209	7.55
3	35	1.26
4	4	0.14
5	2	0.07
6	1	0.04

Notes: Frequency table based on the sample used in the regression analysis.

We examine the distribution of participants by education level in Table 7. Over 70% of respondents hold either a Bachelor's or Master's degree, while fewer than 5% have completed a Ph.D. Approximately 20% have completed secondary education, and less than 1% report having only completed primary school. Around 2.4% hold another type of diploma, and approximately 0.6% chose not to disclose their level of education.

Table 7. Frequencies of participants by Education

Value	Frequency	Percentage (%)
Primary school diploma	14	0.51
Secondary school diploma	538	19.44
Bachelor's degree or equivalent	1028	37.15
Master's degree	986	35.63
Doctorate's degree (Ph.D.)	119	4.3
Other type of diploma (e.g., professional programmes)	66	2.39
I would rather not disclose it	16	0.58

Notes: Frequency table based on the sample used in the regression analysis.

In Table 8, we report summary statistics for two key individual-level variables. The Food Label Consideration index has a mean of 3.48, a median of 3.43, and a standard deviation of 1.14, with values ranging from 1 to 7. The skewness (0.16) and kurtosis (−0.37) are both close to zero, indicating an approximately symmetric distribution without heavy tails and suggesting few, if any, outliers. These statistics imply that most respondents cluster around the average level of knowledge (≈ 3.5) regarding food label consideration.

By contrast, Willingness to Pay a Premium for Sustainable Food Products shows a mean of 16.59% and a median of 15%, with a standard deviation of 14.10. The variable ranges from 0% to 100%, and its skewness (2.29) and kurtosis (7.24) indicate a right-skewed distribution with a concentration of lower values and a long right tail, reflecting the presence of some extreme responses. This pattern suggests that while eco-labeling responses are fairly normally distributed, willingness-to-pay values are more dispersed and include high-end outliers. Overall, the majority of respondents appear willing to pay an additional 15% for sustainable food products. To further validate these findings, we complement the baseline analysis with a Poisson Pseudo Maximum Likelihood (PPML) regression model.

Beyond the two focal variables, the remaining measures show generally moderate to high endorsement levels with relatively balanced distributions. Food Vulnerability averages 2.20, indicating low perceived vulnerability, though its positive skew suggests some respondents report higher concerns. Indices capturing relationships with sustainability, the natural environment, animal welfare, healthy nutrition, and community all cluster around values of 3.5–4.5, with distributions that are largely symmetric and without heavy tails, reflecting moderate agreement across respondents. Personality traits measured by the Big Five reveal higher scores for Agreeableness (mean 4.97) and Conscientiousness (mean 4.57), while Extraversion is lower (mean 3.67), and Neuroticism and Openness fall in the mid-range; skewness and kurtosis values indicate these traits are broadly normally distributed. Age has a mean of 33.5 years and a median of 31, with a wide range from 18 to 78 and moderate positive skew, suggesting a sample concentrated among younger adults but including older participants as well. Overall, these descriptive statistics highlight that while most attitudinal and personality measures are symmetrically distributed around moderate to high values, willingness to pay stands out as the most variable construct with clear evidence of outliers.

Table 8. Summary Statistics – Individual Level Variables

Variable	Mean	Median	Standard deviation	Minimum	Maximum	Skewness	Kurtosis	Number of Observations
Food Label Consideration	3.48	3.43	1.14	1.00	7.00	0.16	-0.37	2767
Willingness to pay a Premium for Sustainable Food Product	16.59	15.00	14.10	0.00	100.00	2.29	7.24	2767
Food vulnerability	2.20	2.00	2.04	0.00	7.00	0.60	-0.70	2767
Relationship with Sustainability	3.69	4.00	1.25	1.00	7.00	-0.11	-0.31	2767
Relationship with Natural Environment	4.23	4.00	1.33	1.00	7.00	-0.24	-0.31	2767
Relationship with Animal Welfare	3.98	4.00	1.55	1.00	7.00	0.00	-0.76	2767
Relationship with Healthy Nutrition	4.51	5.00	1.35	1.00	7.00	-0.42	-0.29	2767
Relationship with Community	3.54	4.00	1.47	1.00	7.00	0.05	-0.72	2767
Extraversion	3.67	3.50	1.35	1.00	7.00	0.16	-0.52	2767
Neuroticism	3.95	4.00	1.49	1.00	7.00	0.05	-0.80	2767
Conscientiousness	4.57	4.50	1.19	1.00	7.00	-0.08	-0.31	2767
Agreeableness	4.97	5.00	0.99	1.00	7.00	-0.42	0.09	2767
Openness	4.53	4.50	1.04	1.00	7.00	0.39	0.19	2767
Age	33.49	31.00	10.41	18.00	78.00	1.14	1.03	2767

Notes: Summary statistics for the main individual variables.

In Table 9, we present the regional-level variables. We included the logarithmic form of gross domestic product (GDP) per capita to reflect the level of economic activity across NUTS 2 regions, and population density to account for urbanisation. Following established literature, we also applied

a log transformation to the stock of motorways (in kilometers) within each region.⁹⁸ Among the regional variables, population density appears to contain some outliers. However, we opted not to apply a log transformation, as doing so would have resulted in a high correlation with the log-transformed stock of roads, potentially introducing multicollinearity into the model.

Table 9. Summary Statistics - Regional Variables

Variable	Mean	Median	Standard deviation	Minimum	Maximum	Skewness	Kurtosis	Number of Observations
Log Gross Domestic Product per Capita	10.40	10.43	0.34	9.59	11.11	-0.06	-0.67	2767
Log Stock of Roads in Kilometers	17.91	18.09	0.84	12.28	19.46	-1.06	2.44	2767
Population Density	545.63	231.43	988.55	3.17	12063.68	5.33	35.38	2767
Yearly Air Quality	0.64	0.64	0.10	0.23	0.87	-0.37	1.13	2767
Temperature Growth	0.05	0.06	0.14	-0.19	0.32	0.15	-1.14	2767
Long Term Orientation	52.57	51.00	9.02	39.00	71.00	0.24	-0.89	2767
Individualism	68.71	67.00	15.83	47.00	100.00	0.53	-0.64	2767

Notes: Summary statistics for the main regional variables.

Next, in Figure 5, we examine the Pearson correlation matrix of the individual-level variables to assess potential multicollinearity issues prior to regression analysis. This analysis also provides initial insights into the relationships between key drivers of willingness to pay a premium for sustainable products and considerations related to food labelling. Overall, we find that the two dependent variables, willingness to pay a premium and food label considerations, are most strongly correlated with individuals' relationship to sustainability. Notably, food label considerations show stronger correlations with most independent variables compared to willingness to pay. Correlations among the remaining variables are generally modest and smaller than $r = .60$, which confirms that multicollinearity is unlikely to be a concern in the subsequent regression analysis.

⁹⁸ Ajay Agrawal, Alberto Galasso, Alexander Oettl; Roads and Innovation. Review of Economics and Statistics 2017; 99 (3): 417–434. doi: https://doi.org/10.1162/REST_a_00619

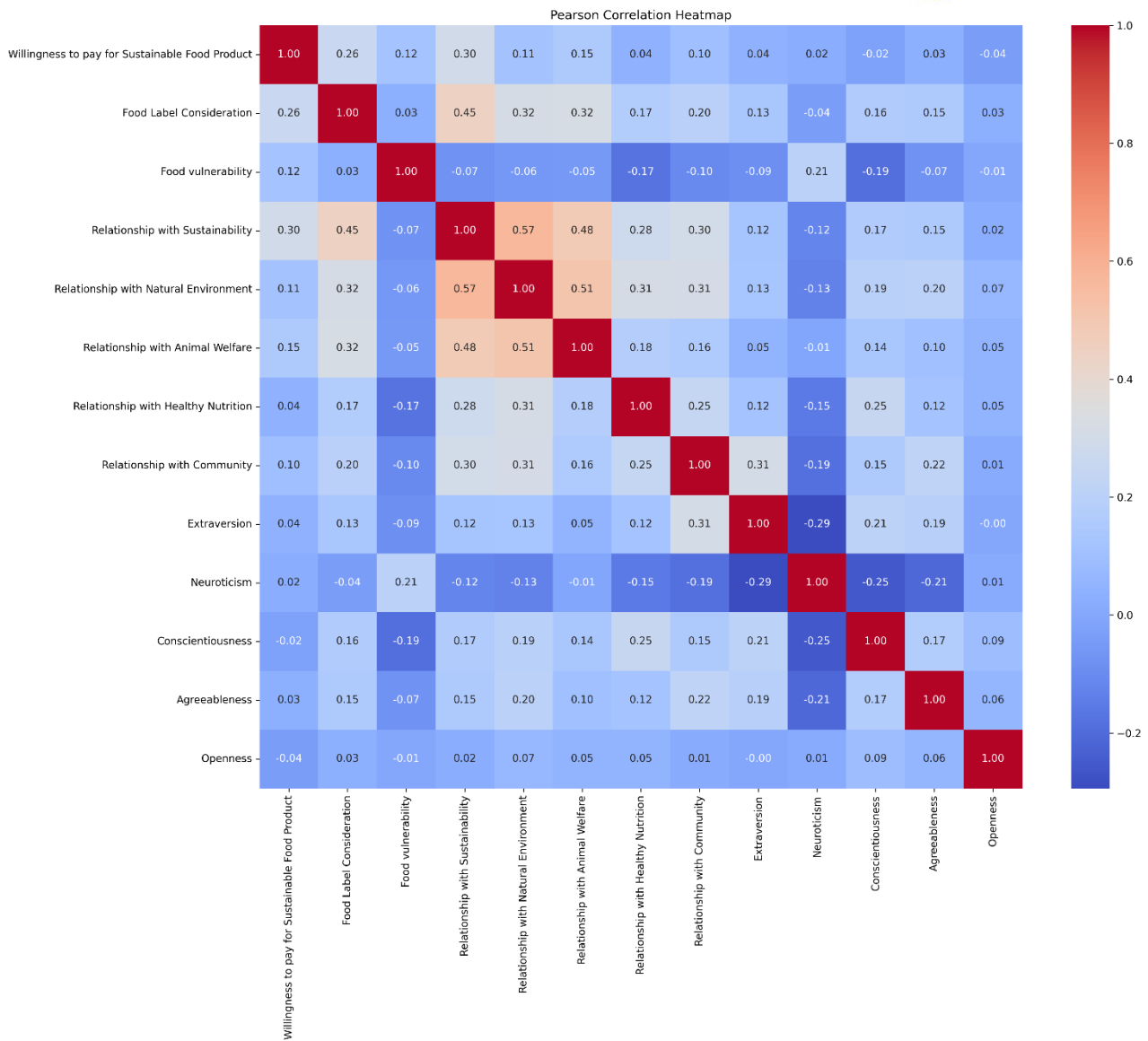


Figure 5. Pearson correlation between the dependent variable and the main independent individual level variables

In Figure 6, we extend the initial correlation table by including demographic variables. Once again, no evidence emerges that would raise concerns about multicollinearity.

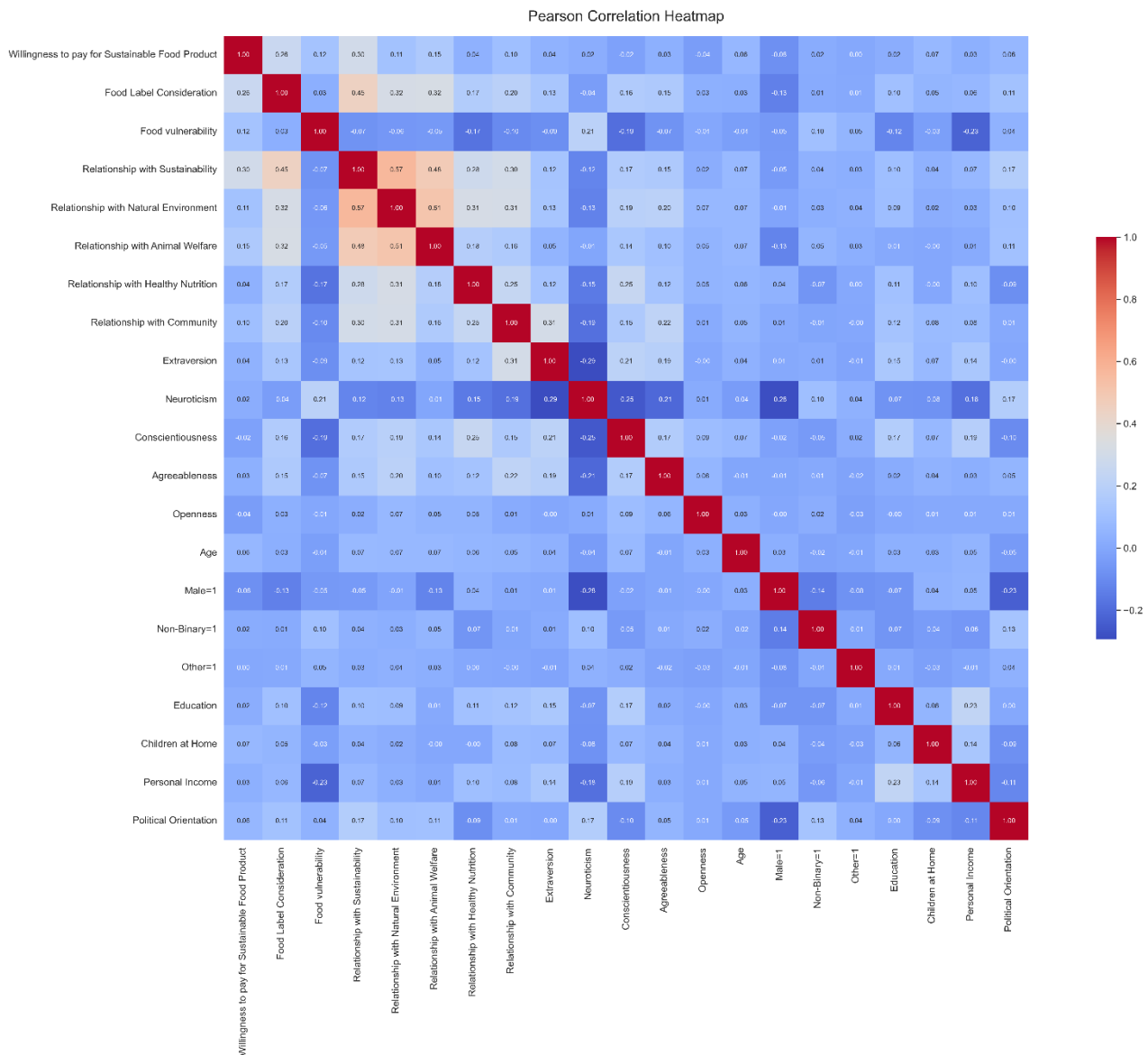


Figure 6. Pearson correlations between dependent variables, main independent individual level variables and demographic variables

Finally, in Figure 7 we incorporate the regional variables. Overall, the correlations between variables remain modest, with the exception of those related to Hofstede's six-dimensional cultural model. Due to the strong intercorrelations among these dimensions, and in line with recent literature, we include only Individualism and Long-Term Orientation in the regression analysis.⁹⁹

Given that our analysis is conducted at the NUTS 2 level, we interact these indexes with NUTS 2 dummy variables to allow them to vary within NUTS 1 regions and thus remain identifiable in the presence of NUTS 1 fixed effects during the regression analysis. This approach allows us to create regional variation at NUTS 2 level while also helping to mitigate potential multicollinearity concerns.

⁹⁹ We present the correlations among Hofstede's six cultural dimensions in Appendix Figure A1. Several of the dimensions exhibit correlations above .60, which could lead to multicollinearity issues in the regression analysis if included simultaneously.

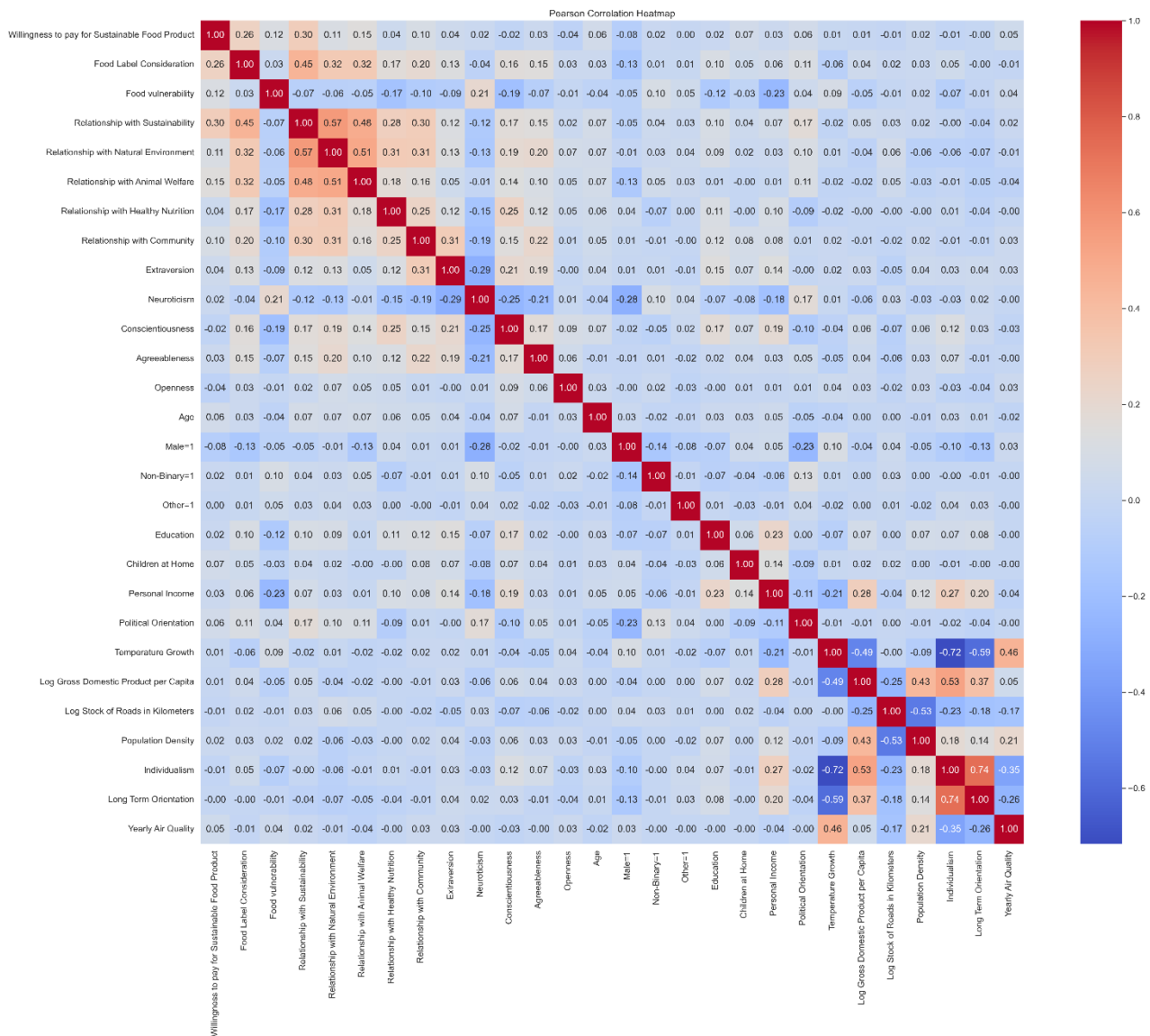


Figure 7. Pearson correlation between the dependent variable and the main independent individual level variables, the demographic variables and the regional variables

5.2. Regression Results

We highlight in **green** the coefficients that are positive and statistically significant, and in **red** those that are negative and statistically significant. Clustered standard errors at the NUTS 2 level are reported in parentheses. Asterisks indicate levels of statistical significance: $p^{***} < 0.01$, $p^{**} < 0.05$, and $p^* < 0.10$. All variables have been standardised to have a mean of zero and a standard deviation of one, allowing for direct comparison of coefficients in the regression models.

Table 10 presents the OLS regression results from the individual-level models. Column (1) investigates the factors influencing respondents' understanding and trust in eco-labels, focusing on how various individual characteristics affect the consideration of eco-labels when purchasing food products. The most substantial predictor is the respondent's relationship with sustainability: a one-standard-deviation increase in this variable is associated with a 0.33 standard-deviation increase in eco-label consideration. A smaller but still positive effect is found for the relationship with animal welfare, corresponding to a 0.12 standard-deviation increase. Food vulnerability also emerges as a positive determinant of eco-label consideration. Among the Big Five personality traits, extraversion,

conscientiousness, and agreeableness are positively and significantly associated with eco-label consideration, with coefficients ranging from 0.05 to 0.065. Finally, higher education and the presence of children in the household are also linked to increased attention to eco-labels, pointing to the role of knowledge and family context in shaping sustainable food choices.

On the other hand, gender and age are associated with a lower likelihood of considering eco-labels when purchasing food products. Being male, compared to being female, decreases the probability of considering food labels by approximately 0.1 standard deviations. Additionally, younger respondents show a stronger tendency to pay attention to labelling.

Moving to column (2), which examines willingness to pay a premium for sustainable food products, we find that some factors exhibit similar coefficients and magnitudes to those in column (1), while others show opposite effects. As before, the relationship with sustainability remains the strongest predictor of willingness to pay an additional amount for sustainable food. A stronger connection to animal welfare also has a positive impact, as does the presence of children in the household and food vulnerability. In contrast to the findings for eco-label consideration, personal income positively affects willingness to pay a premium. Gender and age continue to have a negative influence.

Table 10. Regression Results – Individual Models

Variable	FOOD LABEL CONSIDERATION	WILLINESS TO PAY FOR SUSTAINABLE FOOD PRODUCT
	(1)	(2)
Relationship with Sustainability	0.325***	0.317***
	(0.023)	(0.026)
Relationship with Natural Environment	0.020	-0.079***
	(0.022)	(0.024)
Relationship with Animal Welfare	0.120***	0.057**
	(0.023)	(0.025)
Relationship with Healthy Nutrition	0.026	-0.017
	(0.017)	(0.024)
Relationship with Community	0.032	0.026
	(0.022)	(0.026)
Food Vulnerability	0.093***	0.123***
	(0.019)	(0.023)
Extraversion	0.051***	0.016
	(0.018)	(0.018)
Neuroticism	0.018	0.011
	(0.017)	(0.020)
Conscientiousness	0.065***	-0.044**
	(0.022)	(0.018)
Agreeableness	0.050***	0.007
	(0.017)	(0.023)
Openness	0.010	-0.032*
	(0.015)	(0.019)
Immigrant=1	0.010	0.024

	(0.015)	(0.021)
Age	-0.034*	-0.088***
	(0.019)	(0.020)
Male=1	-0.096***	-0.065***
	(0.015)	(0.018)
Non-Binary=1	-0.028	-0.018
	(0.018)	(0.013)
Other=1	-0.010	-0.020
	(0.017)	(0.015)
Education	0.031*	0.002
	(0.018)	(0.021)
Children at Home	0.043**	0.070***
	(0.022)	(0.023)
Personal Income	0.027	0.058**
	(0.017)	(0.025)
Political Orientation	0.025	-0.009
	(0.020)	(0.022)
NUTS 1 Fixed Effects	Yes	Yes
R²	0.274	0.158
Adjusted R²	0.252	0.132
Observations	2767	2767

Notes: Cluster standard errors at the NUTS 2 level are reported in parentheses. The p-values for the asterisks are 0.10 (*), 0.05 (**), and 0.01 (***).

When examining the Big Five personality traits in Model 2, extraversion does not appear to significantly relate to the willingness to pay a premium for sustainable products. This suggests that although extraverts may be socially engaged or expressive, these traits do not necessarily translate into a greater propensity to incur additional costs for sustainability. Interestingly, we observe a negative association between conscientiousness and willingness to pay. A plausible explanation is that conscientious individuals, which are typically characterised by self-discipline, organisation, and careful planning, may support sustainability in principle but are also more likely to adhere to strict budgeting practices, making them less willing to pay extra for sustainable products. To explore this

further, Table 11 presents a frequency distribution of income levels among respondents scoring 6 or higher on the conscientiousness index. The results reveal that over 28% of highly conscientious respondents belong to the lowest income groups (<1500€), suggesting that financial constraints amplify the effect of conscientiousness on spending decisions.

Table 11. Cross Frequency Conscientious with Income

Income Group	Freq.	Percentage (%)
1	11	2.43
2	117	25.83
3	118	26.05
4	89	19.65
5	59	13.02
6	19	4.19
7	40	8.83
Total	453	100

Regarding agreeableness, this predisposition does not appear to translate into a greater willingness to pay extra for sustainable products, as indicated by the lack of significance in the second model. Finally, openness has a negative effect but it is a weak one only significant at 10%.

The first model reports an adjusted R^2 of 0.25, indicating that the included variables explain 25% of the variation in the dependent variable. The second model has an adjusted R^2 of 0.13, accounting for 13% of the variation.¹⁰⁰

Next, Table 12 incorporates regional-level variables to examine their relationship with both the consideration of eco-labels and the willingness to pay a premium for sustainable food products. With regard to eco-label consideration, regional GDP per capita demonstrates a positive effect, suggesting that individuals in wealthier regions are more likely to value sustainability indicators such as labelling. In contrast, population density exhibits a negative association, which aligns with recent literature indicating that urban residents may be slightly less inclined to prioritise environmental

¹⁰⁰ R^2 is within the given thresholds provided by the literature for instance: In Hess R, Visschers VH, Siegrist M. The role of health-related, motivational and sociodemographic aspects in predicting food label use: a comprehensive study. *Public Health Nutrition*. 2012;15(3):407-414. doi:10.1017/S136898001100156X, the authors report a R^2 of 0.32. In another paper, Understanding consumers' perspectives on food labelling in India <https://doi.org/10.1111/j.1470-6431.2009.00825.x>, the R^2 cox and snell is 0.126 and R^2 Nagelkerke is 0.17. Finally, in Dominick, S. R., Fullerton, C., Widmar, N. J. O., & Wang, H. (2017). Consumer Associations with the "All Natural" Food Label. *Journal of Food Products Marketing*, 24(3), 249–262. <https://doi.org/10.1080/10454446.2017.1285262> the Pseudo R^2 varies between 0.05 and 0.06.

protection compared to those in rural areas.¹⁰¹¹⁰² Additionally, individualism at the regional level shows a significant and positive relationship with eco-label consideration, consistent with prior studies that associate individualist cultures with greater autonomy and responsibility in consumption choices. In terms of willingness to pay a premium price, regional factors appear to play a more limited role. Only a weak negative effect is observed for population density, while long-term orientation shows a weak but significant positive association. This finding is consistent with theoretical expectations, as individuals in regions with a strong long-term orientation are more likely to consider future-oriented outcomes, such as health and environmental benefits, when making food purchasing decisions.¹⁰³

¹⁰¹ Regional coefficients are typically modest in magnitude because the associated variables do not vary at the individual level. Instead, regional dummies or contextual indicators capture differences that exist only between groups of respondents, not within them. This does not imply that regional effects are unimportant; rather, they reflect broad contextual influences that shape outcomes in aggregate.

¹⁰² Mbiankeu Nguea S., M., Demographic dividend and environmental sustainability: The mediation effects of economic growth, ICT, foreign direct investment, and urbanization, *Next Sustainability*, Volume 2, 2023, 100005, ISSN 2949-8236, <https://doi.org/10.1016/j.nxsust.2023.100005>

¹⁰³ All variables are standardized. It is true in the single variable regression model the coefficients should be between 0-1. This does not apply for multiple variable regression model were standardized regression coefficients greater than one can legitimately occur, Deegan, J. (1978). On the occurrence of standardized regression coefficients greater than one. *Educational and Psychological Measurement*, 38(4), 873–888. <https://doi.org/10.1177/001316447803800404>

Table 12. Regression Results – Regional Models

Variable	FOOD LABEL CONSIDERATION	WILLINESS TO PAY FOR SUSTAINABLE FOOD PRODUCT
	(1)	(2)
Relationship with Sustainability	0.323***	0.316***
	(0.023)	(0.027)
Relationship with Natural Environment	0.020	-0.078***
	(0.022)	(0.024)
Relationship with Animal Welfare	0.120***	0.057**
	(0.023)	(0.024)
Relationship with Healthy Nutrition	0.028*	-0.017
	(0.017)	(0.024)
Relationship with Community	0.032	0.026
	(0.022)	(0.026)
Food Vulnerability	0.095***	0.123***
	(0.019)	(0.023)
Extraversion	0.052***	0.017
	(0.018)	(0.018)
Neuroticism	0.017	0.011
	(0.017)	(0.020)
Conscientiousness	0.064***	-0.045**
	(0.022)	(0.018)
Agreeableness	0.049***	0.007
	(0.018)	(0.023)
Openness	0.011	-0.032*
	(0.015)	(0.019)
Immigrant=1	0.007	0.024

	(0.015)	(0.021)
Age	-0.033*	-0.089***
	(0.019)	(0.020)
Male=1	-0.096***	-0.065***
	(0.015)	(0.019)
Non-Binary=1	-0.029	-0.018
	(0.018)	(0.013)
Other=1	-0.011	-0.020
	(0.017)	(0.015)
Education	0.029	0.002
	(0.019)	(0.021)
Children at Home	0.042*	0.069***
	(0.022)	(0.023)
Personal Income	0.026	0.057**
	(0.017)	(0.025)
Political Orientation	0.026	-0.010
	(0.020)	(0.022)
Log GDP pc	0.103***	0.053
	(0.035)	(0.034)
Population Density	-0.088***	-0.064*
	(0.031)	(0.038)
Log of Road Infrastructure Stock	0.037	-0.017
	(0.024)	(0.031)
Growth in Temperature	-0.071	-0.075
	(0.073)	(0.091)
Air Quality	0.012	0.003

	(0.027)	(0.030)
Long Term Orientation	0.185	1.062*
	(0.418)	(0.561)
Individualism	0.649**	0.503
	(0.281)	(0.391)
NUTS 1 Fixed Effects	Yes	Yes
R²	0.278	0.159
Adjusted R²	0.253	0.131
Observations	2767	2767

Notes: Cluster standard errors at the NUTS 2 level are reported in parentheses. The p-values for the asterisks are 0.10 (*), 0.05 (**), and 0.01 (***).

In the Appendix, we also present the results from a Poisson regression model that includes the full set of regional controls. This specification incorporates NUTS 1 fixed effects and clusters standard errors at the NUTS 2 level, reflecting the count-like and non-negative nature of the dependent variable, willingness to pay more for a sustainable product, which exhibits a modest concentration of zero responses (over 5%). The findings are broadly consistent with those from the OLS model, though the estimated coefficients tend to be slightly smaller in magnitude.

5.3. Consumer profiling

The fsQCA profiling approach is applied in three distinct contexts, each focusing on a different set of conditions relevant to sustainable food consumption. In each analysis, the aim is not to assess the isolated, direct influence of individual variables on the dependent variable, as in regression analysis, but to discover configurations (combinations) of personality traits, cultural values or demographic characteristics that lead to the outcomes under study. This configurational logic allows for the detection of multiple paths to the same behaviour, and for the identification of distinct consumer profiles that differ in their underlying condition patterns.

The *first analysis* explores how personality traits, represented by the Big Five model¹⁰⁴, impact consumer behaviours related to sustainable food consumption. Specifically, we examine how various combinations of extraversion, neuroticism, conscientiousness, agreeableness, and openness influence the consideration of food labels and the willingness to pay extra for sustainable food products. This approach aims to clarify how personality traits collectively, rather than individually, shape consumer decision-making, by identifying distinct trait configurations associated with each outcome.

The *second analysis* examines how national cultural values influence the two behaviours under study. Specifically, we test combinations of Hofstede's cultural dimensions, meaning power distance, individualism, achievement, uncertainty avoidance, long-term orientation, and indulgence, as

¹⁰⁴ Digman, J. M. (1997). Higher-order factors of the Big Five. *Journal of personality and social psychology*, 73(6), 1246. <https://psycnet.apa.org/doi/10.1037/0022-3514.73.6.1246>

possible predictors of these outcomes.¹⁰⁵ The goal is to detect which cultural traits, alone or in combination, are linked to higher or lower engagement with food labelling and sustainable purchasing.

The *third analysis* shifts focus to key demographic factors, including gender, age, education, and income. Here, we investigate how specific demographic profiles and their combinations relate to food label consideration and willingness to pay more for sustainable food products. By examining these variables together, the analysis highlights not just the impact of single characteristics, but also how different demographic “recipes” can shape consumer attitudes and behaviours toward sustainability.

As aforementioned, details on the theoretical framework of Qualitative Comparative Analysis are provided in the Appendix. Likewise, calibration of the variables and the results of the necessary conditions analysis are also reported in the Appendix. The main text below presents only the sufficient conditions analysis, as this part of the method directly identifies the combinations of factors that explain the outcomes.

5.3.1. Personality traits

Regarding food label consideration (Table 13) fsQCA identified six causal paths explaining this behaviour with moderate overall coverage (0.585) and acceptable consistency (0.764). The most influential path (causal path 1), in terms of unique coverage, shows that **a combination of highly extraverted individuals who are emotionally stable (low neuroticism) and less open to new experiences can lead to high food label consideration**. This indicates that outgoing and socially confident yet conventional consumers frequently pay attention to food labels. Another notable configuration (causal path 4) includes **highly extraverted, conscientious, and open individuals**, though this combination uniquely explains fewer cases. Interestingly, **low agreeableness** frequently appears as part of paths that lead to higher label consideration, suggesting that *sceptical consumers* may critically evaluate products and their labels. Overall, **extraversion** emerges as a consistent contributor across multiple paths, highlighting its importance in predicting food label consideration.

¹⁰⁵ Hofstede, Geert. 1991. “Dimensionalizing Cultures: The Hofstede Model in Context.” *Online Readings in Psychology and Culture* 2, no. 1. <https://doi.org/10.9707/2307-0919.1014>

Table 13. Personality trait combinations predicting food label consideration

Causal path	fextra	fneuro	fcons	fagree	fopen	Consistency	Raw Coverage	Unique Coverage
1	•	⊗			⊗	0.778	0.324	0.133
2		•	•	⊗		0.804	0.190	0.071
3	•			⊗	•	0.799	0.253	0.043
4	•		•		•	0.841	0.167	0.011
5		⊗	⊗	⊗	•	0.804	0.163	0.026
6	•		⊗	•	⊗	0.854	0.131	0.017
Frequency cutoff	51							
Consistency cutoff	0.80							
Solution consistency	0.764							
Solution coverage	0.585							

Note: Black circles (•) indicate the presence of a condition and circles with “x” (⊗) indicate its absence. Blank spaces indicate “Don’t care” conditions.

Concerning willingness to pay a premium for sustainable food products (Table 14), fsQCA identified four distinct causal paths, explaining fewer cases overall (coverage = 0.283), though maintaining a slightly higher consistency (0.789). The most prominent path, covering the most unique cases (causal path 3), features **extraverted, neurotic, less conscientious, less agreeable, but open-minded individuals**. This specific personality profile underscores consumers who are emotionally sensitive, spontaneous, sociable, and open-minded, uniquely driven by sustainability considerations. Another significant path (causal path 1) **includes extraverted, emotionally stable (low neuroticism), agreeable, but less open consumers**, suggesting that socially engaged, emotionally balanced, and traditional consumers strongly align with sustainability concerns, reflected in their willingness to financially support sustainable products. Conversely, the path involving individuals high on all five traits (causal path 4) demonstrates consistency (0.821) but explains only a few cases, indicating that individuals with uniformly high personality trait scores are rare among consumers willing to pay extra for sustainable products.

Table 14. Personality trait combinations predicting willingness to pay a premium for sustainable food products

Causal path	fextra	fneuro	fcons	fagree	fopen	Consistency	Raw Coverage	Unique Coverage
1	•	⊗		•	⊗	0.8795	0.141	0.026
2	•		⊗	•	⊗	0.817	0.146	0.021
3	•	•	⊗	⊗	•	0.812	0.151	0.099
4	•	•	•	•	•	0.821	0.049	0.006
Frequency cutoff						51		
Consistency cutoff						0.80		
Solution consistency						0.789		
Solution coverage						0.283		

Note: Black circles (•) indicate the presence of a condition and circles with “x” (⊗) indicate its absence. Blank spaces indicate “Don’t care” conditions.

To summarise, the fsQCA findings highlight **extraversion** as a key trait consistently influencing both food label consideration and willingness to pay more for sustainable food products. However, the effects of extraversion vary depending on how it interacts with other traits. Food label consideration involves multiple diverse personality configurations, often characterised by combinations of extraversion, openness, conscientiousness, and frequently low agreeableness. In contrast, willingness to pay extra for sustainable products is linked with fewer, more specific trait combinations, prominently featuring openness and emotional sensitivity alongside extraversion.

5.3.2. Cultural dimensions

The analysis of Hofstede’s cultural dimensions in relation to the two food-related behaviours under study revealed multiple sufficient configurations explaining variation across European regions. To examine how cultural contexts align with these causal configurations, we applied Hofstede’s dimensions at the country level. Each case was linked to its country and assigned to the fsQCA-derived configurations when its membership in a path exceeded 0.5. Sufficiency was then assessed by comparing recipe and outcome memberships, with sufficiency holding when the recipe score was less than or equal to the outcome score. This procedure identified which countries, as characterised by their Hofstede dimensions, were represented in each configuration and whether these configurations were sufficient for the outcome, leading to the maps (Figures 8 and 9) shown below.

For food label consideration (Table 15), four cultural configurations proved sufficient, together explaining around 43 % of the outcome with a solution consistency of 0.798. The *first pathway* combined **high power distance, high achievement and success motivation, high uncertainty avoidance, long-term orientation and indulgence**. This path reflects societies where hierarchy is accepted, people are highly driven to achieve and compete, rules and stability are valued, long-term planning is prioritised, and enjoyment of life and leisure is openly expressed. Belgian, French, and Greek regions provide the strongest empirical examples of this pathway.

A *second pathway* revealed a very different cultural logic. Here, food label consideration was associated with **low power distance, collectivism (low individualism), low achievement and success motivation, low uncertainty avoidance, restraint (low indulgence) and long-term orientation**. This configuration reflects cultures where people see each other as equals, value group harmony, show little emphasis on competition or ambition, are comfortable with uncertainty, practice self-control and modesty, and focus on long-term goals. Estonian regions consistently displayed high membership in this pattern, making them the clearest empirical anchor. The *third configuration* combined **high power distance, collectivism, high achievement and success motivation, high uncertainty avoidance, restraint, and a short-term orientation**. This profile reflects cultures where hierarchy is accepted, group loyalty is valued over individual interests, people are driven by competition and success, strict rules and stability are emphasised, self-control is expected, and the focus is on immediate results rather than long-term planning. Polish regions aligned most strongly with this pathway.

Finally, the *fourth pathway* pointed to food label consideration in societies characterised by **high power distance, individualism, high indulgence, high uncertainty avoidance, low achievement and success motivation, and short-term orientation**. This pattern captures individualist yet indulgent, hierarchical, uncertainty-avoiding, short-term oriented, and less achievement-driven societies. Spanish regions illustrate this cultural recipe most clearly. Taken together, these findings demonstrate *equifinality*, as very different cultural logics, ranging from indulgent hierarchies to restrained collectivism, can all foster attention to food labels.

Table 15. Cultural dimension combinations predicting food label consideration

Causal path	fpdi	find	fach	func	flong	findul	Consistency	Raw coverage	Unique coverage
1	•		•	•	•	•	0.794	0.234	0.100
2	⊗	⊗	⊗	⊗	•	⊗	0.865	0.090	0.028
3	•	⊗	•	•	⊗	⊗	0.826	0.300	0.142
4	•	•	⊗	•	⊗	•	0.832	0.140	0.003
Frequency cutoff	83								
Consistency cutoff	0.80								
Solution consistency	0.798								
Solution coverage	0.431								

Note: Black circles (•) indicate the presence of a condition and circles with “x” (⊗) indicate its absence. Blank spaces indicate “Don’t care” conditions.

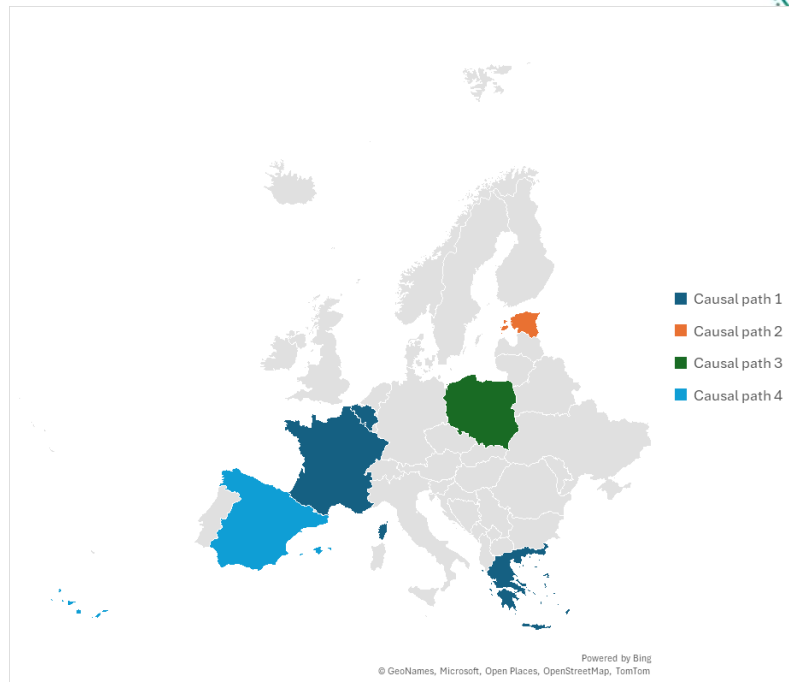


Figure 8. Cultural dimensions combinations leading to food label consideration per country

When examining willingness to pay extra for sustainable food (Table 16), three sufficient configurations were identified, together explaining 27.5% of the outcome with a solution consistency of 0.793. Compared to food label consideration, willingness to pay a premium was explained by fewer cultural pathways, and the overall explanatory power was weaker, indicating that other individual-level or structural factors such as income, education, or environmental attitudes also play an important role.

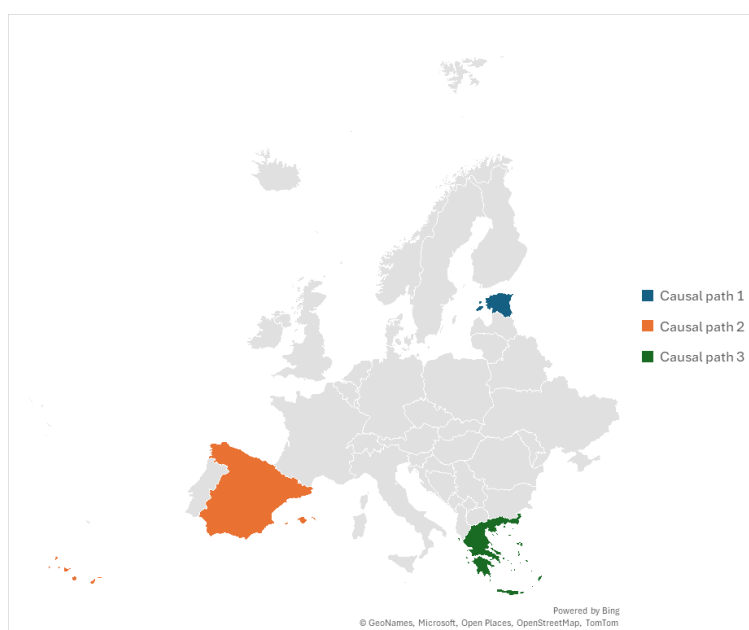
The *first configuration* reflected **low power distance, collectivism, low achievement and success motivation, low uncertainty avoidance, restraint, and long-term orientation**. This profile describes a culture where people see each other as equals, value group harmony over individual success, avoid competition, are comfortable with ambiguity, emphasise self-control, and plan for the long term rather than seeking quick rewards, with Estonia emerging as the clearest example. The *second pathway* highlighted willingness to pay extra in societies that combine **high power distance, individualism, low achievement and success motivation, high uncertainty avoidance, restraint, and short-term orientation**. Here, hierarchy is accepted, people act more independently than collectively, ambition and competition are weak, rules and stability are valued, self-control is emphasised, and focus is on immediate needs rather than the future. Spanish regions provide the strongest empirical cases for this profile. The *third configuration* pointed to societies characterised by **high power distance, individualism, high indulgence, high uncertainty avoidance, low achievement and success motivation, and short-term orientation**. This configuration describes a culture where hierarchy is accepted, people act independently, pleasure and enjoyment are openly pursued, strict rules and stability are important, ambition is weak, and focus is placed on short-term gains rather than long-term goals. Greek regions demonstrate this pathway.

Thus, as with food label consideration, multiple cultural routes lead to a willingness to pay more, but the range of viable configurations is narrower. Whereas food label use was explained by four cultural logics across Belgium, Estonia, France, Greece, Poland, and Spain, willingness to pay was primarily associated with Estonia, Greece, and Spain.

Table 16. Cultural dimension combinations predicting willingness to pay a premium for sustainable food products

Causal path	fpdi	find	fach	func	flong	findul	Consistency	Raw Coverage	Unique Coverage
1	⊗	⊗	⊗	⊗	•	⊗	0.859	0.105	0.031
2	•	•	⊗	•	⊗	•	0.841	0.167	0.030
3	•	⊗	•	•	•	•	0.811	0.213	0.076
Frequency cutoff					83				
Consistency cutoff					0.810				
Solution consistency					0.793				
Solution coverage					0.275				

Note: Black circles (•) indicate the presence of a condition and circles with “x” (⊗) indicate its absence. Blank spaces indicate “Don’t care” conditions.


Figure 9. Cultural dimensions combinations leading to high WTP per country

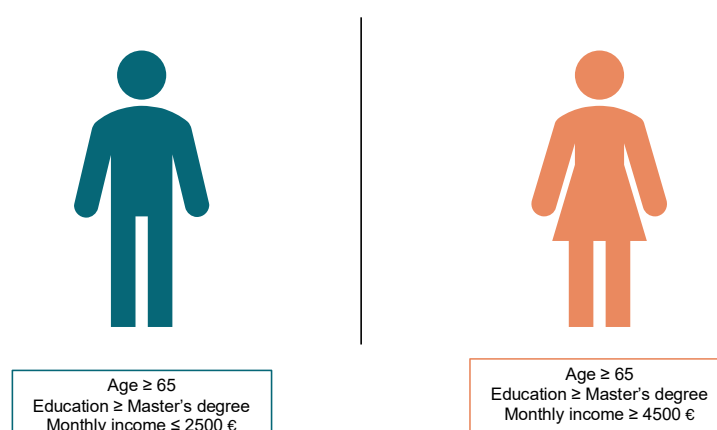
5.3.3. Demographic factors

Regarding food label consideration (Table 17 and Figure 10), the first path (causal path 1) links **being male, with older age, higher education, and lower income**. This means that men, especially those who are older and have higher education but lower income, are more likely to consider food labels under this combination. The second path (causal path 2) focuses on **females, especially those who are older, more educated, and have higher income**. Overall, both men and women can be likely to consider food labels, but in different demographic contexts, with men with fewer resources, and women who have higher income.

Table 17. Demographic factor combinations predicting food label consideration

Causal path	Male	Female	Non-binary	Other gender	Age	Education	Income	Consistency	Raw Coverage	Unique Coverage
1	●	⊗	⊗	⊗	●	●	⊗	0.801	0.108	0.057
2	⊗	●	⊗	⊗	●	●	●	0.804	0.041	0.041
Frequency cutoff	120									
Consistency cutoff	0.80									
Solution consistency	0.814									
Solution coverage	0.327									

Note: Black circles (●) indicate the presence of a condition and circles with “x” (⊗) indicate its absence. Blank spaces indicate “Don’t care” conditions.

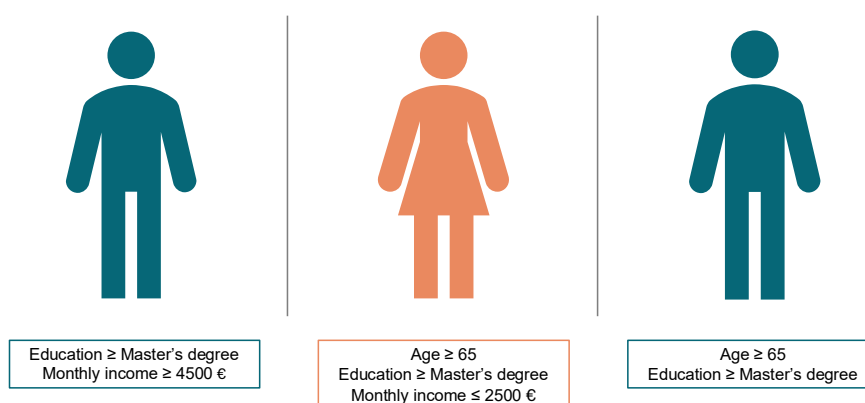
**Figure 10. Consumer profiles considering food labels**

For willingness to pay a premium for sustainable food products (Table 18 and Figure 11), one path (causal path 2) includes being **male, older, and more educated, without higher income**. Causal path 3 features **females who are older, more educated, but with lower income**, while causal path 1 includes **young males who are more educated and have higher income**.

Table 18. Demographic factor combinations predicting willingness to pay a premium for sustainable food products

Causal path	Male	Female	Non-binary	Other gender	Age	Education	Income	Consistency	Raw Coverage	Unique Coverage
1	●	⊗	⊗	⊗		●	●	0.697	0.146	0.065
2	●	⊗	⊗	⊗	●	●		0.755	0.165	0.084
3	⊗	●	⊗	⊗	●	●	⊗	0.746	0.082	0.082
Frequency cutoff	120									
Consistency cutoff	0.74									
Solution consistency	0.725									
Solution coverage	0.313									

Note: Black circles (●) indicate the presence of a condition and circles with "x" (⊗) indicate its absence. Blank spaces indicate "Don't care" conditions.


Figure 11. Consumer profiles willing to pay more for sustainable products

In both outcomes, different demographic “recipes” lead to food label consideration or willingness to pay more for sustainability. Both gender matter, but only in specific combinations with education and income. There’s no single group that dominate, but instead, several different paths involving either men or women, combined with age and education, can explain who is most likely to pay attention to food labels or pay more for sustainable food.

5.3.4. Summary of Profiles

Personality Traits Dimension:

Food label consideration: Characteristics of the representative profile are: 1) highly extraverted individuals, 2) emotionally stable and 3) less open to new experiences.

Willingness to pay a premium for sustainable food products: Characteristics of the representative profile are: 1) extraverted, 2) neurotic, 3) less conscientious, 4) less agreeable, and 5) open-minded individuals.

Cultural dimensions:

Food label consideration: Representative profile A: 1) high power distance, 2) high achievement and success motivation, 3) high uncertainty avoidance and 4) long-term orientation and indulgence. – fits with Belgium, Greece and France. Representative profile B: 1) low power distance, 2) collectivism (low individualism), 3) low achievement and success motivation, 4) low uncertainty avoidance and 5) restraint (low indulgence) and long-term orientation – fits with Estonia. Representative profile C: 1) high power distance, 2) collectivism, 3) high achievement and success motivation, 4) high uncertainty avoidance, restraint, and 5) a short-term orientation – fits with Poland. Representative profile D: 1) high power distance, 2) individualism, 3) high indulgence, 4) high uncertainty avoidance, 5) low achievement and success motivation, and 6) short-term orientation – fits with Spain.

Willingness to pay a premium for sustainable food products: Representative profile A: 1) low power distance, 2) collectivism, 3) low achievement and success motivation, 4) low uncertainty avoidance, restraint, 5) and long-term orientation – fits with Estonia. Representative profile B: 1) high power distance, 2) individualism, 3) low achievement and success motivation, 4) high uncertainty avoidance, restraint, and 5) short-term orientation – fits with Spain. Representative profile C: 1) high power distance, 2) individualism, 3) high indulgence, 4) high uncertainty avoidance, low achievement and success motivation, and 5) short-term orientation – fits with Greece

Demographic factors:

Food label consideration: Representative profile A: 1) male, 2) older, 3) higher education, and 4) lower income, Representative profile B: 1) Females, 2) older, 3) educated, and have 4) higher income

Willingness to pay a premium for sustainable food products: Representative profile A: 1) male, 2) older, and 3) more educated, 4) without higher income. Representative profile B: features 1) females, 2) older, 3) more educated, 4) and with lower income, Representative profile C: 1) young males, 2) more educated and 3) have higher income.

5.4. Key observations

This section integrates our findings from both the regression and fsQCA analyses to provide a broader interpretation of the factors influencing consumers consideration of food labels and their willingness to pay a premium for sustainable food products. By comparing statistical and configurational perspectives, we aim to understand not only which variables matter most, but also how they interact in shaping consumer behaviour. The results are considered in relation to existing research on sustainability, consumer psychology, and food labelling, highlighting where our findings confirm established patterns and where they offer new insights into the complexity of sustainable food choices.

Across all models, the **most consistent and robust predictors are the respondent's overall concern for sustainability and concern for animal welfare**, both of which exhibit strong positive effects. Additionally, **food vulnerability shows a consistently positive association with sustainable food preferences**. Age and gender also emerge as significant factors, with **younger individuals and females demonstrating greater consideration of food labels** and a **higher willingness to pay more for sustainable options**. In contrast, **older and male respondents tend to show less engagement with food sustainability** in line with what the literature finds. Finally, **having children in the household is positively associated with the adoption and consumption of sustainable food products**, suggesting that families may place greater importance on food sustainability. This is in line with the literature suggesting that **sustainability is becoming part of**

family life, mainly through food choices, supported by mothers' values and children's influence.¹⁰⁶ Regarding the regional indicators, population density shows a consistent negative effect across both regression models. A possible explanation behind this finding is that **respondents in more urbanised environments may tend to place less importance on the consumption of sustainable food products**.¹⁰⁷

The two models also reveal important differences, with certain variables showing significance in only one model and some predictors even changing the direction of their estimated effects. This is not unexpected, as the models are based on fundamentally different dependent variables. The first model captures respondents' intention to consider food labels, reflecting attitudinal and informational aspects of sustainability. A psychological intention reflects a person's mindset or motivation to buy a product. It is based on attitudes, norms, and perceived control. In contrast, the second model focuses on willingness to pay extra for sustainable food products, where economic considerations and price sensitivity are likely to play a more prominent role. An economic valuation represents the actual monetary amount a person is ready to spend for a product. It reflects financial trade-offs and budget considerations. For example, **extraversion and agreeableness are significant positive predictors of food label consideration but not of willingness to pay**, suggesting a potential divide between social or personality traits and cost-sensitive behaviour. Conversely, personal income emerges as a significant positive driver in the second model, indicating that **wealthier individuals are more likely to be willing to pay extra for sustainable food products**.

We also find a strong and positive association between food vulnerability and both consideration of food labels and willingness to pay a premium for sustainable products. This suggests that **even individuals experiencing food insecurity or vulnerability exhibit strong preferences and demand for sustainable food**. Since personal income is included as a control variable in the regressions, the effect of income is held constant. This implies that, beyond economic capacity, individuals facing food insecurity may still recognise the value of labelling, such as for food quality, origin, or ethical sourcing, and perceive sustainable products as offering added safety, health, or quality benefits.

The fsQCA results, on the other hand, clearly showed that **there is no single pathway leading to sustainable food consumption**. Behaviour emerges from different combinations of personality traits, cultural values or demographic factors that work together in context. No single factor was necessary on its own to explain either food label consideration or willingness to pay more for sustainable products. This can support the view that sustainable consumption is best understood as the result of interacting influences rather than isolated drivers.¹⁰⁸

In the personality analysis, extraversion appeared most often across the configurations for both outcomes, but it did not act alone. For label consideration, it combined with emotional stability and low openness. For willingness to pay extra, it paired with neuroticism and openness. The recurrence

¹⁰⁶ Ritch, Elaine L., and Douglas Brownlie. 2016. "Doing It for the Kids: The Role of Sustainability in Family Consumption." *International Journal of Retail & Distribution Management* 44 (11): 1100–17. <https://doi.org/10.1108/IJRDM-08-2015-0136>

¹⁰⁷ Population density exhibits only a very weak positive correlation with willingness to pay for sustainable food products (0.02) and food label consideration (0.03), as shown in Figure 7. These coefficients are close to zero, suggesting negligible association. Regression analysis identifies a negative consistent relationship. Population density is widely used in the literature as a proxy to capture the degree of urbanization Michaels G., Rauch F., Redding S. J., Urbanization and Structural Transformation, *Quarterly Journal of Economics*, Volume 127, Issue 2, May 2012, Pages 535–586, <https://doi.org/10.1093/qje/qjs003>

¹⁰⁸ White, K., Habib, R., & Hardisty, D. J. 2019. How to SHIFT Consumer Behaviours to be More Sustainable: A Literature Review and Guiding Framework. *Journal of Marketing*, 83(3), 22–49. <https://doi.org/10.1177/0022242919825649>

of low agreeableness in label related profiles may reflect a more questioning or critical approach to product information, something that a regression model focused on averages might overlook. The cultural results also underline the importance of looking at patterns rather than single scores. High achievement, power distance and uncertainty avoidance formed one pathway to label use, while low indulgence and strong long term orientation formed another. In some cases, opposite ends of a cultural dimension, such as indulgence and restraint, were linked to the same outcome depending on the surrounding values. This makes clear that **cultural influences are not simple linear predictors but part of more complex configurations**. Demographic findings were equally diverse. Food label consideration was linked both to older lower income men and to older higher income women, pointing to different income levels for the same behaviour. Willingness to pay a premium showed a similar pattern, with older well-educated men without higher income appearing alongside older well-educated women on lower incomes. Here again, the effect of any single demographic factor depends on how it interacts with others.

By combining fsQCA with regression, we gain two perspectives that address different aspects of consumer behaviour. Regression provides estimates of the average effect of each variable, showing how much each factor contributes on its own while holding others constant. This is valuable for understanding broad tendencies across the entire sample, as it highlights which individual predictors are most consistently linked to the outcomes of interest. However, regression assumes that variables act in an additive and independent way, which may overlook the fact that consumer behaviour often depends on the interplay of several factors. FsQCA approaches the problem differently. Instead of focusing on average effects, it examines how different conditions combine to produce an outcome. This configurational logic acknowledges causal complexity, meaning that the same behaviour may arise from multiple distinct pathways, a principle known as equifinality. It also recognises asymmetry, where the factors that lead to the presence of an outcome are not simply the opposite of those that lead to its absence. By mapping out these combinations, fsQCA is able to reveal profiles that are invisible to regression models.

When used together, the two methods complement one another. Regression points to the most influential variables across the dataset, while fsQCA highlights the specific constellations of traits, cultural orientations, and contextual factors that co-occur in groups of individuals who make similar choices. This combination produces a richer and more comprehensive understanding of the determinants of sustainable food consumption. A separate section in the Appendix provides a detailed comparison between regression and fsQCA, outlining their respective assumptions, strengths, and limitations.

The practical implications are significant. If campaigns relied only on regression, they might aim for a single generalised message targeting the “average” consumer. The fsQCA results show that such an approach would miss important differences between groups. Instead, sustainability campaigns can be designed to reflect the specific pathways that drive engagement among different audiences, like for example, tailoring messages for consumers motivated by environmental values, for those influenced more by cultural norms, or for those responding primarily to trust in certification. Recognising and addressing these varied causal pathways increases the likelihood that campaigns will resonate, encourage meaningful behavioural change, and support long-term shifts toward more sustainable food consumption.

5.5. Addressing the Research Questions

The survey and analytical results provide direct answers to the four research questions defined in this study. By combining regression and fsQCA, the analysis highlights both the consistent, average effects of external factors on consumer behaviour and the diversity of configurations through which sustainable food engagement emerges. Regression results offer a clear ranking of significant

predictors, while fsQCA demonstrates how different combinations of socio-cultural, psychological, demographic, and regional attributes can lead to similar outcomes. Collectively, these complementary perspectives provide a robust evidence base to respond to each research question.

Table 19. Response to the research questions

RQ1	How do external socio-cultural, psychological, and economic factors influence consumer preferences, intentions, and behaviour toward sustainability-labelled food products?
	Regression shows sustainability orientation (+0.33) and animal welfare concern (+0.12 for labels, +0.06 for WTP) as the strongest drivers. Economic capacity (income, +0.06) significantly conditions WTP. FsQCA confirms that socio-cultural and psychological factors do not act alone but interact in distinct combinations. For instance, extraversion with conscientiousness and low openness (coverage = 0.178) or collectivist cultural orientations (coverage = 0.147) are sufficient for label engagement.
RQ2	Which demographic factors are most significant in determining consumer motivation to seek and use sustainability-related information?
	Regression highlights gender, income, children at home, and age as significant. Women are consistently more engaged, and income enables WTP. Families with children are more sustainability-oriented. Age reduces WTP but appears in fsQCA solutions, with older low-income men (coverage = 0.129) and older high-income women (coverage = 0.117) both demonstrating high label consideration.
RQ3	How effective are current sustainability labelling schemes in influencing consumer understanding and purchasing behaviour?
	Respondents reported an average WTP of 16.6% above standard prices (median 15%), indicating willingness to translate attitudes into spending, though the distribution is skewed with a long right tail. Regression shows label use strongly associated with WTP, but constrained by affordability. FsQCA underscores that effectiveness depends on configuration, as in some groups, labels are sufficient when aligned with strong cultural authority cues, while in others, labels succeed only when combined with supportive demographics or values.
RQ4	What are the key external factors that drive consumers to seek and engage with sustainability information, and how do these differ across consumer groups?
	The strongest universal drivers are sustainability concern, animal welfare, and food vulnerability. Regression quantifies their effects, while fsQCA reveals that groups differ in how these combine with traits and context. For instance, extraversion and conscientiousness are key in some pathways (coverage 0.178), while cultural dimensions such as high power distance and achievement are decisive in others (coverage 0.234).

5.6. Comparison with existing literature: new findings and insights

The survey results both confirm and extend the insights from the background research, providing a richer and more differentiated picture of how European consumers engage with sustainability labelling and willingness to pay more. While the background research mapped the broad influences of socio-cultural, demographic, psychological, and economic factors, it often left open questions about their relative weight, the ways they interact, and the contexts in which they matter most. By analyzing a large cross-country sample with both OLS regression and fsQCA, our study both validates many earlier findings and highlights novel patterns that were previously underexplored.

Values and sustainability orientations

The background research consistently highlighted values such as altruism, ecological concern and awareness of consequences as central to sustainable food choices. Our regression analysis aligns with this, showing that personal identification with sustainability is the strongest individual predictor of both label consideration (+0.33 SD) and willingness to pay (+0.32 SD). The fsQCA complements this by showing how stable dispositions such as extraversion and conscientiousness combine with demographic or cultural factors to form reliable pathways to label engagement. Taken together, the two approaches confirm the importance of values while clarifying how they operate alongside other traits in shaping behaviour.

Animal welfare and ethics

Previous research noted that animal welfare and fairness concerns play a role in sustainable food choices, but findings were inconsistent and sometimes limited to niche products such as organic meat or Fairtrade goods. Our survey strengthens the evidence base by showing that animal welfare is a consistent positive predictor of both label use (+0.12 SD) and willingness to pay (+0.06 SD), even across a diverse European sample. This demonstrates that ethical dimensions are integral to consumer decision-making.

Demographics

The literature reported mixed evidence on demographics. Women were generally found to be more attentive to sustainability information, while age and education effects varied across contexts. Our survey attempts to clarify these patterns. Women and households with children are consistently more engaged with both labels and willingness to pay more, confirming gendered and family-related effects highlighted in some studies. Age, however, shows a more complex profile. While younger respondents demonstrate higher label consideration, older consumers are not uniformly disengaged. FsQCA shows that older low-income men and older high-income women can both form sufficient profiles for label engagement, illustrating that the relationship between age, income, and sustainability is conditional rather than linear. Education raises label use, while income specifically supports willingness to pay extra, clarifying the division of roles between knowledge and affordability.

Psychological traits

The background research noted psychological factors such as altruism, universalism, and tradition but offered limited systematic evidence on personality traits. Our survey provides one of the first large-scale analyses linking Big Five personality dimensions to sustainable food choices. Extraversion, conscientiousness, and agreeableness predict higher label consideration, while conscientiousness reduces willingness to pay more, possibly reflecting budget consciousness. FsQCA demonstrates that these traits form part of configurations. For example, extraversion combined with low openness and low agreeableness can still produce high label use, indicating that sustainability engagement can arise from diverse psychological profiles.

Regional and cultural factors

The desk research, particularly drawing on Hofstede's cultural dimensions, suggested that culture conditions receptivity to eco-labels but lacked robust European-wide evidence. Our regression analysis confirms this by showing that cultural individualism strongly predicts label use (+0.65 SD) and that long-term orientation is linked to higher willingness to pay (+1.06 SD). FsQCA goes further, revealing that both high-achievement, high power distance cultures and restrained collectivist cultures (low individualism, long-term orientation) can foster sustainable engagement. This finding validates the claim of causal asymmetry in the literature and demonstrates that contrasting cultural orientations can both yield sustainability-oriented behaviours under different combinations of conditions.

Economic constraints

The literature often framed affordability as the most significant barrier to sustainable consumption. Our findings partially support this: income is a significant predictor of willingness to pay a premium (+0.06 SD), but not of label consideration, where knowledge and values dominate instead. This distinction shows that while economic capacity is critical for translating intentions into purchasing behaviour, awareness and value alignment are sufficient to shape consideration of labels even among lower-income groups. Such nuance was often missing from previous accounts.

Effectiveness of labels

Finally, the desk research emphasised that label effectiveness depends on trust, visibility, and consumer motivation, but evidence was largely case-specific. Our survey demonstrates that eco-labelling consideration is widely distributed (mean score 3.48 on a 7-point scale), and that WTP averages around 16.6%, though skewed with some high outliers. Regression confirms that trust-related values (sustainability, animal welfare) predict engagement, while fsQCA shows that multiple consumer profiles, across different demographic and cultural contexts, arrive at similar engagement outcomes. These results lend empirical weight to the claim that sustainability labelling alone is insufficient if not combined with broader strategies, but they also demonstrate that labels have robust appeal when aligned with consumer values and profiles.

In summary, the survey confirms the broad drivers identified in the desk research (values, ethics, gender, education, income), while adding new insights. First, food vulnerability can act as a positive driver rather than a barrier. Second, configurational analysis (fsQCA) demonstrates empirically that multiple, even contrasting, consumer profiles can lead to the same sustainability outcomes, substantiating the theoretical claim of equifinality in consumer behaviour. Jointly, these insights provide a richer and more actionable understanding of sustainable food labelling than the literature alone, underscoring the need for both broad-based interventions and tailored strategies across consumer groups.

6. Conclusions

6.1. Summary of key takeaways

The dual-method approach applied in the present deliverable, with the use of both OLS regression and fsQCA, provides both statistical generalizations and configurational insights into sustainable food choices. Regression analysis identifies consistent, statistically significant predictors of label consideration and willingness to pay more, while fsQCA reveals the configurational nature of consumer behaviour, where multiple distinct combinations of conditions can lead to the same outcome. Together, the two methods illustrate that sustainable food consumption is structured around strong, universal drivers, but also shaped by diverse, context-specific pathways.

The OLS regression results underscore the centrality of sustainability values. A one-standard-deviation increase in self-reported connection to sustainability increases label consideration by 0.33 standard deviations (SD) and WTP by 0.32 SD. This makes sustainability the single strongest predictor across all models. Concern for animal welfare also plays an important role, raising label use by 0.12 SD and WTP by 0.06 SD, though its effect is secondary. Surprisingly, food vulnerability, typically associated with constrained consumption, predicts higher engagement (+0.09 SD for label use and +0.12 SD for WTP). This suggests that consumers facing food insecurity may still prioritise perceived reliability, trust, or ethical standards in sustainable products.

Demographics emerge as both enablers and barriers. Men are consistently less engaged (−0.10 SD for labels; −0.07 SD for WTP), while women show higher responsiveness to sustainability information. Education supports label use (+0.03 SD), while income positively influences WTP (+0.06 SD), confirming that financial capacity is key to translating attitudes into behaviour. Having children at home increases both outcomes (+0.04 SD and +0.07 SD), reflecting parental concern for health and long-term well-being. Age has a mixed role, as older respondents are less willing to pay (−0.09 SD), yet appear in some fsQCA pathways as strong label users, when combined with other supportive factors.

Regarding personality traits, extraversion, conscientiousness, and agreeableness each increase label consideration (+0.065 SD, +0.065 SD, +0.05 SD, respectively). However, conscientiousness decreases WTP (−0.04 SD), pointing to budget-conscious tendencies. Openness and neuroticism do not emerge as direct drivers in regression but reappear in fsQCA recipes, indicating that their influence depends on context and interaction with other traits. Finally, at the regional level, higher GDP per capita (+0.10 SD) and cultural individualism (+0.65 SD) increase label use, while long-term orientation boosts WTP (+1.06 SD). Population density negatively affects both outcomes (−0.09 SD and −0.06 SD), perhaps due to urban consumers' greater exposure to competing food signals or marketing saturation. The regression models explain around 25% of variance in label consideration and 13% in WTP, indicating that, while robust, much variation remains explained only when configurations of factors are considered.

The fsQCA results confirm this complexity. For label consideration, six sufficient pathways emerge (overall coverage 0.585, consistency 0.764). Extraversion recurs frequently, but it is effective in different configurations: with conscientiousness and low openness; with emotional stability and lower agreeableness, or in combination with collectivist cultural orientations. Equally, cultural factors show dual logics, as high power distance and achievement orientation can encourage label use, but so can restrained collectivist values combined with long-term orientation. Demographic pathways also diverge, showing that both older low-income men and older high-income women achieve high label consideration through different mechanisms.

For WTP, four causal pathways were identified (coverage 0.482, consistency 0.731). These pathways reflect psychological, cultural, and demographic trade-offs. Some combine extraversion with openness and neuroticism, while others combine agreeableness with emotional stability. Demographic pathways again diverge, with one including younger, highly educated, high-income men, while another featuring older, educated, modest-income women. No single condition was necessary for WTP either, highlighting causal asymmetry, meaning that different traits and contexts can substitute for one another in producing the outcome.

The main insight is that regression points to broad, average predictors of sustainable choices, while fsQCA highlights the multiple pathways through which different consumers arrive at similar behaviours. Policy and interventions should therefore combine universal levers with profile-specific approaches. For example, strategies stressing long-term health and ethical commitments may resonate with older, family-oriented groups, while identity- and values-based appeals may be more effective for younger, urban, high-income consumers.

6.2. Recommendations for stakeholders

The evidence from this study shows that sustainable food labelling has considerable potential, but its effects are uneven across consumer groups, countries, and contexts. To turn this potential into tangible impact, action is required at multiple levels, from EU institutions to retailers and civil society. The results highlight not only which factors matter, but also how they interact. This complexity means that future strategies need to be both comprehensive and adaptable, recognising broad drivers such as sustainability values while also accounting for the diverse consumer pathways revealed by the configurational analysis.

At the level of EU policy and regulation, the findings directly support the objectives of the Farm to Fork Strategy and the upcoming Framework for Sustainable Food Systems. Both initiatives stress the need for clear, reliable, and widely trusted sustainability information. In the present study, sustainability concern was the single strongest predictor of both label consideration (+0.33 SD) and willingness to pay more (+0.32 SD). Without credible and harmonised schemes, however, these values cannot be fully translated into market outcomes. The Directive on Green Claims and the Commission's proposal for an EU sustainability labelling framework are therefore crucial steps. A unified, EU-wide sustainability label, supported by recent consumer surveys showing that 63% of Europeans would welcome a universal eco-label, could cut through fragmentation and counteract greenwashing. The evidence presented here strengthens the case for ambitious, harmonised regulation.

Policy design must also reflect one of the more unexpected findings of our research, which shows that **food vulnerability increases engagement with food sustainability labels and willingness to pay a premium**. Our analysis suggests that vulnerable consumers may view sustainability and animal welfare claims as signals of quality and reliability, helping them navigate uncertainty. This has direct relevance for the EU's Zero Hunger ambition and its concern with food affordability. It underlines that sustainable food must not be positioned only as a premium choice for wealthier consumers. Measures such as targeted subsidies, vouchers, or sustainable public procurement standards can help ensure that the groups most motivated to engage are not priced out.

Demographic differences also deserve attention. The Farm to Fork Strategy explicitly calls for shifting consumer behaviour at scale, yet our results show that engagement is not uniform. Women, younger respondents and households with children were more likely to use labels and pay more for sustainable food, while men and older consumers were less engaged. While education has only a limited impact on label use, income plays a more decisive role in shaping willingness to pay a premium. These patterns indicate that demographic groups differ in their level of engagement, but the study does not provide evidence on which specific message frames would be more effective for each group. Any communication implications should therefore be limited to the observation that strategies will need to account for demographic variation, without specifying content that the survey did not measure. Using regional drivers, we find a negative relationship between population density and sustainable food labelling, both in terms of intentions and actual purchases. Respondents in highly populated areas, such as cities, are less likely to engage in sustainable food behaviours. A possible explanation behind this result is that in urbanized environments **the economic and lifestyle, such as higher living costs, time constraints, and greater competition for resources, may lead individuals to prioritise immediate economic needs over long-term sustainability goals**. Policy interventions that reduce these burdens could encourage urban residents to invest more in sustainable food choices.

The food industry and retailers also have a critical role within this policy landscape. The Sustainable Food Systems framework highlights industry responsibility for providing consumers with transparent, credible, and accessible information. Packaging and retail environments should clearly communicate

sustainability and animal welfare, supported by credible third-party certification. The configurational analysis further shows that sustainable engagement emerges through multiple consumer profiles, with different demographic groups reaching the same behaviour through different pathways. This indicates that consumers are not motivated by a single logic and that communication strategies may need to account for this diversity.

In urban contexts, where our analysis revealed lower engagement, retailers can reinforce labelling through store design, shelf placement and promotional practices that make sustainable options visible and easy to choose.

For civil society organisations and educators, the findings reinforce the importance of the EU's wider agenda on sustainability literacy and education for the green transition. Civil society actors can help bridge this by making sustainability information more accessible, and by connecting moral values to everyday practices through community pilots, educational programmes, and storytelling campaigns. Embedding sustainability literacy into school curricula, as encouraged under the European Education Area, will be critical to shaping long-term consumer norms.

A final recommendation concerns the importance of configurational thinking. The fsQCA results demonstrated that no single factor is necessary or sufficient, and that **multiple, even contrasting, consumer pathways can lead to sustainable outcomes**. This aligns with the EU's vision of building a resilient food system that allows for diversity across Member States while maintaining common objectives. For policymakers, this means combining EU-wide regulation with room for national and regional adaptation. For retailers and industry, it means tailoring marketing to segmented consumer profiles. For civil society, it means framing messages in ways that resonate with local cultural orientations. Importantly, labelling should be embedded within the broader package of measures already envisaged in Farm to Fork, including fiscal incentives, green public procurement, and controls on misleading claims. Only when these instruments work together can sustainability labelling achieve its full potential.

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Appendix 1

Survey questionnaire

Disclaimer and privacy statement

This study is conducted in the context of the EU-funded TealHelix project. The goal of this survey is to get a better understanding of the external factors affecting consumers motivation to seek and use sustainability-related information in food labelling. This understanding will help us contribute to the development of consumer-driven resilience and inclusive strategies. Once aggregated and analysed, the findings of this survey will be reported in a public deliverable that will be uploaded to the project's website.

Completing the survey will take you approximately 14-16 minutes. Thank you in advance for helping us gather your relevant knowledge and opinions!

All the collected answers will be combined and anonymised before any results are published. All data will be treated according to GDPR, guaranteeing your privacy.

* 1. I have read the [TealHelix Data Protection Policy](#) and I consent to the terms and conditions.

☐ I consent

☐ I do not consent

Prolific ID

* 2. What is your Prolific unique ID?

Welcome to TealHelix EU Survey

Sustainable food is food made in a way that's good for the planet, your health, your wallet and taking into account communities well-being and animal welfare. In this survey we will ask about your attitudes linked to sustainable food products.

* 3. What is your type of diet and nutritional habits?

☐ I don't follow any nutrition rules

☐ Flexitarian (mostly plant-based foods while occasionally allowing meat and fish)

☐ Low carb / no carb

☐ Lactose - free (e.g., no dairy products)

☐ Gluten - free (e.g., no wheat products)

☐ Vegetarian (not eating meat and fish)

☐ Pescetarian (not eating meat, but eating fish)

☐ Vegan (not eating any animal products)

☐ Other (please specify)

* 4. How familiar are you with the concept of sustainable food?

- ☐ Not at all familiar
- ☐ Less familiar
- ☐ Somewhat familiar
- ☐ Very familiar
- ☐ Extremely familiar

* 5. According to the Food and Agricultural Organization (FAO, 2020), sustainability comprises social, economic, and environmental dimensions. Please indicate how important different aspects of sustainability are for you personally by allocating **a total of 100 points** to the categories listed below. Note that there is no right or wrong answer, this question is merely designed to get an idea about individual consumer preferences. **If a dimension is not relevant to you, please assign it 0 points. You must distribute all 100 points to proceed.**

Environmental sustainability	
Nutrition (healthiness of foods)	
Socio-economic aspects (price/affordability)	
Social aspects (fair working conditions)	
Animal welfare	

**Ionising radiation,
HH**

How the production of this food can expose workers or nearby communities to radiation. Too much radiation can damage cells, leading to serious illnesses like cancer.

☐ ☐ ☐ ☐ ☐ ☐
**Photochemical
ozone formation,
HH**

How pollution from the production of this food creates harmful ozone near the ground, often called "smog." Breathing in smog can cause lung problems and make it harder to breathe.

☐ ☐ ☐ ☐ ☐ ☐
**Respiratory
Inorganics /
Particulate matter**

How the production of this food can release tiny particles, like dust or smoke, into the air. These particles can cause lung diseases, heart problems, and make people sick.

☐ ☐ ☐ ☐ ☐ ☐
**Human Toxicity
(cancer and non-
cancer effects)**

How chemicals used in the production of this food can harm human health.

Some chemicals can cause serious illnesses like cancer, while others can damage organs, weaken the immune system, or lead to chronic diseases.

☐ ☐ ☐ ☐ ☐ ☐
**Acidification
(terrestrial and
freshwater)**

How the production of this food releases pollution that makes rain, soil, and water more acidic. This can damage forests, poison lakes, and harm animals and plants.

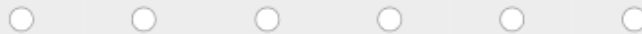
☐ ☐ ☐ ☐ ☐ ☐

**Eutrophication
(freshwater and
marine &
terrestrial)**

How excessive nutrients from the production of this food enter rivers, lakes, oceans or the soil. This leads to algae blooms, which use up oxygen and create dead zones where fish and other aquatic life cannot survive. On land, this can harm plants, reduce soil quality, and disrupt natural ecosystems.


**Ecotoxicity,
freshwater**

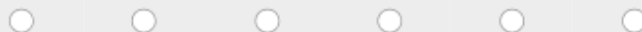
How toxic chemicals from the production of this food can end up in rivers and lakes, poisoning fish, plants, and other aquatic life, making the water unsafe.


Land use

How land is altered to produce this food. Clearing too much land can destroy forests, reduce wildlife habitats, and degrade soil health.


Water use

How much water is used to produce this food. Overuse of water can lead to shortages, making it harder for people, plants, and animals to survive.


**Resource use
(energy carriers
and
minerals/metals)**

How producing this food relies on natural resources like fossil fuels, minerals, and metals. Overuse of these resources can lead to pollution, depletion, and environmental destruction through mining and drilling.



Biodiversity

How the production of this food affects the variety of life on Earth, including plants, animals, and microorganisms. A loss of biodiversity from food production can disrupt ecosystems and harm the balance of nature.

☐ ☐ ☐ ☐ ☐ ☐

* 7. Please answer the questions below regarding the **healthiness** of food products:

I would never consider this aspect when buying food	I would rarely consider this aspect when buying food	I would sometimes consider this aspect when buying food	I would often consider this aspect when buying food	I would always consider this aspect when buying food	I don't understand this aspect
---	--	---	---	--	--------------------------------

Salt content

The quantity of salt used in the product. While salt enhances flavor, too much salt can lead to high blood pressure and other health issues.

☐ ☐ ☐ ☐ ☐ ☐
Content of saturated fats

A type of fat that is often found in animal products and certain oils. High intake of saturated fats can increase cholesterol levels in the blood, raising the risk of heart disease.

☐ ☐ ☐ ☐ ☐ ☐
Sugar content

Sugar can be naturally occurring in fruits and vegetables or added to processed foods. Too much added sugar can lead to weight gain, diabetes, and other health problems.

☐ ☐ ☐ ☐ ☐ ☐
Content of fibers

Fibers are parts of plant foods that our bodies can't digest. Fibers help keep the digestive system healthy, regulate blood sugar, and lower cholesterol levels, while also helping to maintain a healthy weight.

☐ ☐ ☐ ☐ ☐ ☐

Protein content

Proteins are found in foods like meat, beans, and nuts, and they play a crucial role in muscle growth, immune function, and overall body maintenance.

☐ ☐ ☐ ☐ ☐ ☐
Mineral content

Nutrients like calcium, iron, and potassium that are vital for strong bones, muscle function, and overall well-being. A well-rounded diet ensures an adequate intake of essential minerals.

☐ ☐ ☐ ☐ ☐ ☐
Vitamin content

Essential nutrients that support body functions like immunity, energy production, and cell repair. Different foods provide different vitamins, making a balanced diet important for good health.

☐ ☐ ☐ ☐ ☐ ☐

* 8. Please answer the questions below regarding the **social sustainability** of food products:

I would never consider this aspect when buying food	I would rarely consider this aspect when buying food	I would sometimes consider this aspect when buying food	I would often consider this aspect when buying food	I would always consider this aspect when buying food	I don't understand this aspect
---	--	---	---	--	--------------------------------

Worker rights

A set of legal and ethical standards that ensure employees are treated with dignity and respect, providing fair conditions and protections.

☐ ☐ ☐ ☐ ☐ ☐
Fair wages

A payment system that ensures workers receive adequate compensation for their labor, allowing them to afford a decent standard of living and work in fair conditions.

☐ ☐ ☐ ☐ ☐ ☐

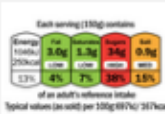
* 9. Please answer the questions below regarding the **animal welfare** of food products:

	I would never consider this aspect when buying food	I would rarely consider this aspect when buying food	I would sometimes consider this aspect when buying food	I would often consider this aspect when buying food	I would always consider this aspect when buying food	I don't understand this aspect
Animal interaction						
<i>Farming practices where animals are allowed to interact with others of their kind, promoting natural behaviors and improving their mental well-being.</i>	☐	☐	☐	☐	☐	☐
Free-range						
<i>Farming practices where animals are allowed to roam outdoors.</i>	☐	☐	☐	☐	☐	☐
Adequate housing and space						
<i>Farming practices that ensure animals have sufficient room to move freely, rest, and engage in natural behaviors, reducing stress and the risk of injury.</i>	☐	☐	☐	☐	☐	☐
Distress-free slaughtering practices						
<i>Farming practices where animals are slaughtered in a humane manner, minimizing pain and distress during the process.</i>	☐	☐	☐	☐	☐	☐
Health care access						
<i>Farming practices where animals are provided with medical care and treatment to ensure their health and well-being.</i>	☐	☐	☐	☐	☐	☐
Usage of routine antibiotics						
<i>Farming practices that involve regularly administering antibiotics to animals, either to promote growth or prevent disease in crowded conditions, which can contribute to antibiotic resistance and reduce effectiveness in treating infections.</i>	☐	☐	☐	☐	☐	☐
Short transport routes						
<i>Farming practices where animals are transported over short distances to reduce stress, prevent injuries, and ensure their well-being during travel.</i>	☐	☐	☐	☐	☐	☐

* 10. Please answer the questions below regarding the **economic sustainability** of food products:

	I would never consider this aspect when buying food	I would rarely consider this aspect when buying food	I would sometimes consider this aspect when buying food	I would often consider this aspect when buying food	I would always consider this aspect when buying food	I don't understand this aspect
Affordability <i>The extent to how easily a food product can be bought without it being too expensive for one's budget.</i>	☐	☐	☐	☐	☐	☐

* 11. Which of the following labels do you take into account while shopping food products?

	Never consider this label	Very rarely consider this label	Rarely consider this label	Sometimes consider this label	Often consider this label	Very often consider this label	Always consider this label
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐

* 12. Please indicate your level of agreement with each of the following statements.
Sustainability claims on food products are..

	Totally disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Totally agree
Vague	☐	☐	☐	☐	☐	☐	☐
Misleading	☐	☐	☐	☐	☐	☐	☐
Unfounded	☐	☐	☐	☐	☐	☐	☐
Unsubstantiated	☐	☐	☐	☐	☐	☐	☐

* 13. In general, do you find it relevant if the food you consume is sustainable?

- ☐ Yes
☐ No

* 14. When shopping for groceries, do you feel that you have access to sufficient information regarding the sustainability of food products?

- ☐ Yes
☐ No

* 15. In general, how well do you understand food label information regarding sustainability?

- ☐ Very poorly
☐ Poorly
☐ Neither well nor poorly
☐ Well
☐ Very well

* 16. How easy is it for you to evaluate if a specific food is relevant for a sustainable diet?

- ☐ Very hard
☐ Hard
☐ Neither hard nor easy
☐ Easy
☐ Very easy

* 17. If you wanted to prepare a sustainable meal at home, how easy or difficult would that be for you?

- ☐ Very hard
☐ Hard
☐ Neither hard nor easy
☐ Easy
☐ Very easy

* 18. Please indicate your level of agreement with each of the following statements:

	Totally disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Totally agree
I would pay more for a food product that is making efforts to be sustainable.	☐	☐	☐	☐	☐	☐	☐
I prioritise discounts and promotions over sustainability when shopping food products.	☐	☐	☐	☐	☐	☐	☐
Price is the most important factor for me when choosing food.	☐	☐	☐	☐	☐	☐	☐

* 19. Please indicate the extra percentage that you would be willing to pay for a sustainable food product.

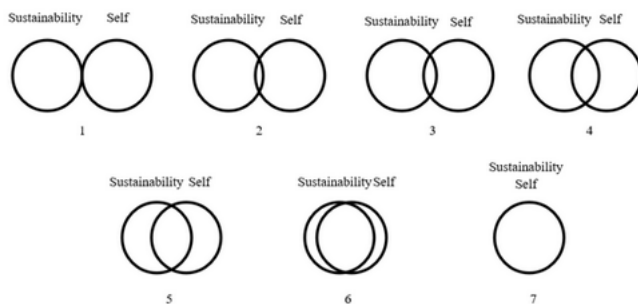
0

100

* 20. For each statement, please select Yes or No. During the last few months, was there a time when:

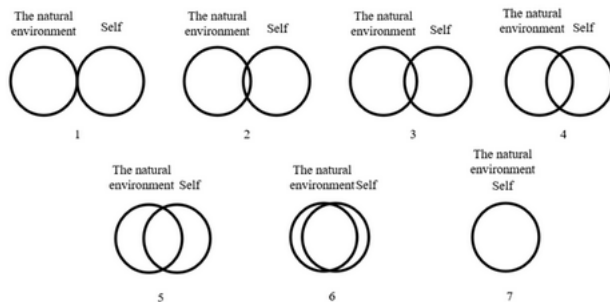
	Yes	No
You were worried you would run out of food?	☐	☐
You were unable to eat healthy and nutritious food?	☐	☐
You ate only a few kinds of foods?	☐	☐
You had to skip a meal?	☐	☐
You ate less than you thought you should?	☐	☐
You were hungry but did not eat?	☐	☐
You went without eating for a whole day?	☐	☐

* 21. Please choose the picture below that best describes how you feel about your relationship with sustainability right now. **Note: The more the two circles overlap, the more you feel yourself and sustainability interconnected as a whole.**

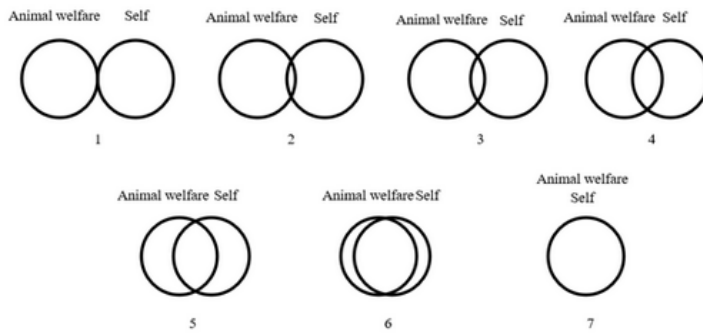
☐ 1☐ 5☐ 2☐ 6☐ 3☐ 7☐ 4

* 22.

Please choose the picture below that best describes how you feel about your relationship with the natural environment right now. **Note: The more the two circles overlap, the more you feel yourself and the natural environment interconnected as a whole.**

☐ 1☐ 5☐ 2☐ 6☐ 3☐ 7☐ 4

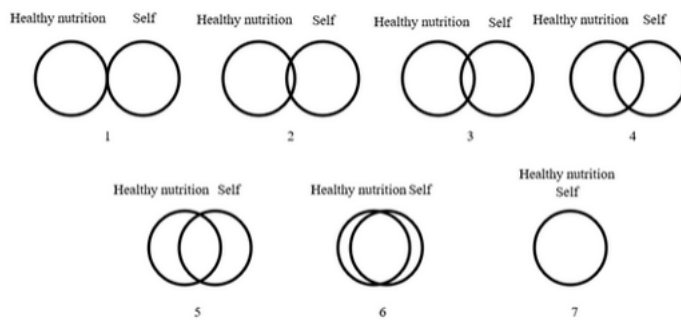
* 23. Please choose the picture below that best describes how you feel about your relationship with animal welfare right now. **Note: The more the two circles overlap, the more you feel yourself and animal welfare interconnected as a whole.**



- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4

- ☐ 5
- ☐ 6
- ☐ 7

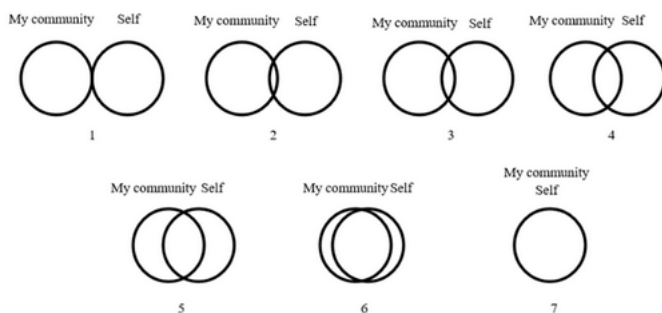
* 24. Please choose the picture below that best describes how you feel about your relationship with healthy nutrition right now. **Note: The more the two circles overlap, the more you feel yourself and healthy nutrition interconnected as a whole.**



- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4

- ☐ 5
- ☐ 6
- ☐ 7

* 25. Please choose the picture below that best describes how you feel about your relationship with your community right now. **Note: The more the two circles overlap, the more you feel yourself and your community interconnected as a whole.**

☐ 1☐ 5☐ 2☐ 6☐ 3☐ 7☐ 4

* 26. Please indicate the extent to which the following words describe your feelings toward buying sustainable food.

	I don't harbor this feeling	Slightly	Moderately	Considerably	Very much	Extremely
Conflicted	☐	☐	☐	☐	☐	☐
Mixed	☐	☐	☐	☐	☐	☐
Indecision	☐	☐	☐	☐	☐	☐

* 27. Please indicate your level of agreement with each of the following statements. Sustainable food choices can...

	Totally disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Totally agree
reduce the exhaustion of natural resources.	☐	☐	☐	☐	☐	☐	☐
support fair wages and better working conditions for farmers and food industry workers.	☐	☐	☐	☐	☐	☐	☐
contribute to global food security by promoting responsible production and consumption.	☐	☐	☐	☐	☐	☐	☐
improve personal health and overall well-being.	☐	☐	☐	☐	☐	☐	☐
promote better animal welfare and ethical treatment of livestock.	☐	☐	☐	☐	☐	☐	☐
reduce negative consequences associated with food consumption.	☐	☐	☐	☐	☐	☐	☐

* 28. Please indicate your level of agreement with each of the following statements. I feel jointly responsible for..

	Totally disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Totally agree
the contribution of food consumption to the exhaustion of natural resources.	☐	☐	☐	☐	☐	☐	☐
supporting local food systems and small-scale farmers.	☐	☐	☐	☐	☐	☐	☐
promoting food security and reducing food waste.	☐	☐	☐	☐	☐	☐	☐
making food choices that support personal and public health.	☐	☐	☐	☐	☐	☐	☐
the ethical treatment and welfare of animals in food production.	☐	☐	☐	☐	☐	☐	☐
the negative consequences of food consumption.	☐	☐	☐	☐	☐	☐	☐

* 29. Please indicate your level of agreement with each of the following statements. I see myself as someone who..

	Totally disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Totally agree
Is reserved	☐	☐	☐	☐	☐	☐	☐
Is generally trusting	☐	☐	☐	☐	☐	☐	☐
Tends to be lazy	☐	☐	☐	☐	☐	☐	☐
Is relaxed, handles stress well	☐	☐	☐	☐	☐	☐	☐
Has a few artistic interests	☐	☐	☐	☐	☐	☐	☐
Is outgoing, sociable	☐	☐	☐	☐	☐	☐	☐
Tends to find fault with others	☐	☐	☐	☐	☐	☐	☐
Does a thorough job	☐	☐	☐	☐	☐	☐	☐
Gets nervous easily	☐	☐	☐	☐	☐	☐	☐
Has an active imagination	☐	☐	☐	☐	☐	☐	☐
Is considerate and kind to almost everyone	☐	☐	☐	☐	☐	☐	☐

* 30. Where would you place yourself on the scale running from very liberal to very conservative?

- ☐ Very liberal
☐ Liberal
☐ Slightly liberal
☐ Moderate
☐ Slightly conservative
☐ Conservative
☐ Very conservative

* 31. Most modern theories of decision-making recognize the fact that decisions do not take place in a vacuum. Individual preferences and knowledge, along with situational variables, can greatly impact the decision process. In order to facilitate our research on decision-making we are interested in knowing certain factors about you, the decision-maker. Specifically, we are interested in whether you actually take the time to read the directions; if not, then some of our manipulations that rely on changes in the instructions will be ineffective. So, in order to demonstrate that you have read the instructions, from the list of sports items below, please select only soccer and no other sports. Thank you very much.

- ☐ Skiing
- ☐ Soccer
- ☐ Snowboarding
- ☐ Running
- ☐ Hockey
- ☐ Football
- ☐ Swimming
- ☐ Tennis
- ☐ Basketball

* 32. **Age:** Insert your age in completed years

* 33. Which country are you from?

* 34. Which country do you currently live in?

* 35. Please name the city/town/village that you are currently living in.

* 36. **Gender:** How do you identify?

- ☐ Male
- ☐ Female
- ☐ Non-binary
- ☐ Prefer to self-describe
- ☐ Prefer not to say

* 37. **Education:** What is the highest level of education you have completed?

- ☐ Primary school diploma
- ☐ Secondary school diploma
- ☐ Bachelor's degree or equivalent
- ☐ Master's degree
- ☐ Doctorate's degree (PhD)
- ☐ Other type of diploma (e.g., professional programmes)
- ☐ I would rather not disclose it

* 38. Please rate your proficiency in the following language skills by selecting the option that best describes your ability. How well do you..

	Poor	Fair	Good	Excellent
speak English?	☐	☐	☐	☐
write English?	☐	☐	☐	☐
read English?	☐	☐	☐	☐

* 39. How many children under age of 18 live in your household? Please insert the number of individuals living in your household **under 18 years old**.

* 40. How many people live in your household, **including yourself**? Please insert the number of individuals living in your household.

* 41. What is your current **occupation**?

- ☐ Employed full-time
- ☐ Employed half-time
- ☐ Student
- ☐ Retired
- ☐ Unemployed
- ☐ Unable to work due to health problems
- ☐ Prefer not to say
- ☐ Other (please specify)

* 42. What is your average monthly household income per family member (after taxes and deductions)?

- ☐ Under 500€
- ☐ 501€ to 1500€
- ☐ 1501€ to 2500€
- ☐ 2501€ to 3500€
- ☐ 3501€ to 4500€
- ☐ 4501€ to 5500€
- ☐ 5501€ and above
- ☐ Prefer not to say

Appendix 2

A1. Theoretical Framework – QCA

Qualitative Comparative Analysis (QCA) is a case-oriented approach that integrates the strengths of qualitative, in-depth, within-case analysis with the systematic rigor of quantitative, cross-case comparison. Originally developed by Charles Ragin, QCA has gained significant attention in the social sciences over the last decades, particularly in fields such as political science, sociology, management, and policy research.^{109,110} The method is especially suited to research problems characterised by complex causality, where outcomes result from specific combinations of causal conditions rather than from the net effect of single independent variables.^{111,112}

The discerning feature of QCA is its set-theoretic foundation. Rather than modelling causal relationships in terms of linear correlations, QCA conceptualises conditions and outcomes as sets to which cases belong to varying degrees. This perspective allows researchers to investigate whether certain conditions are necessary or sufficient for an outcome, either individually or in combination. In doing so, QCA retains a qualitative commitment to deep case knowledge, while benefiting from the formalization and transparency of systematic, quantitative comparison.¹¹³

The starting point of QCA lies in the assumption that social phenomena exhibit complex causality. This means, first, that causal factors often combine to bring about an outcome; second, that there may be multiple distinct causal pathways (equifinality) leading to the same outcome; and third, that the effect of a condition depends on the context created by other conditions (causal asymmetry). A

¹⁰⁹ Ragin, Charles C. 1987. *The Comparative Method: Moving Beyond Qualitative and Quantitative Strategies*. Berkeley: University of California Press

¹¹⁰ Rihoux, Benoît, Priscilla Álamos-Concha, Damien Bol, Axel Marx, and Ilona Rezsözhazy. 2013. "From Niche to Mainstream Method? A Comprehensive Mapping of QCA Applications in Journal Articles from 1984 to 2011." *Political Research Quarterly* 66 (1): 175–84. Available at: <http://www.jstor.org/stable/23563600>

¹¹¹ Mahoney J, Goertz G. A Tale of Two Cultures: Contrasting Quantitative and Qualitative Research. *Political Analysis*. 2006;14(3):227-249. doi:10.1093/pan/mpj017

¹¹² Schneider, Carsten Q., and Claudius Wagemann. *Qualitative Comparative Analysis (QCA) Und Fuzzy Sets: Ein Lehrbuch Für Anwender Und Jene, Die Es Werden Wollen*. 1st ed. Verlag Barbara Budrich, 2007. <https://doi.org/10.2307/j.ctvdf08f5>.

¹¹³ Legewie, N. (2013, September). An introduction to applied data analysis with qualitative comparative analysis. In *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research* (Vol. 14, No. 3).

condition that promotes an outcome in one configuration may inhibit it in another.¹¹⁴ This configurational logic contrasts with variable-oriented approaches such as multiple regression, which typically assume additive, net effects. While statistical models often ask “What is the effect of X on Y, net of other factors?”, QCA instead asks “Which configurations of conditions are linked to the occurrence (or absence) of Y?”.^{115,116}

Since its inception, QCA has evolved into several methodological variants designed to address different types of data and research questions. The earliest form, crisp-set QCA (csQCA), uses dichotomous coding, assigning cases as either fully in (1) or fully out (0) of each condition set. This variant is most appropriate when conditions are inherently binary or when a binary conceptualization is theoretically justified.¹¹⁷ While csQCA is straightforward in application, it can oversimplify complex social phenomena by forcing sharp distinctions where intermediate values might be more accurate.

To address this limitation, fuzzy-set QCA (fsQCA) allows for partial membership scores between 0 and 1, thereby accommodating gradations in the presence or absence of conditions.¹¹⁸ FsQCA has become the most widely applied variant because it enables more detailed representation of empirical observations and greater sensitivity to subtle differences between cases. A third variant, multi-value QCA (mvQCA), handles conditions with more than two discrete, unordered categories. In mvQCA, each category is treated as a separate value within a multi-valued logic framework, making it suitable for nominal data.¹¹⁹ Each variant retains QCA’s core set-theoretic logic and Boolean minimization procedures but adapts the representation of conditions to the nature of the empirical material.

QCA process

Regardless of the variant, QCA follows a systematic process that links conceptualization to formal analysis.¹²⁰ The process begins with **case selection** and the identification of relevant conditions and outcomes, guided by theory and substantive knowledge. In **calibration**, empirical indicators (or variables) are transformed into **set membership scores**. These calibrated data are then assembled into a **Truth Table**, which lists all logically possible configurations of conditions along with the cases that exhibit them. The researcher then applies **consistency and frequency thresholds** to distinguish relevant configurations from those that are inconsistent or weakly represented. The next stage is **Boolean minimisation**, in which logically redundant conditions are removed to yield simpler causal “recipes” that remain consistent with the data. Finally, the resulting configurations are interpreted in light of theory and case knowledge, often through iterative back-and-forth between cross-case patterns and within-case analysis. This structured yet flexible process enables QCA, and

¹¹⁴ Mahoney J, Goertz G. A Tale of Two Cultures: Contrasting Quantitative and Qualitative Research. *Political Analysis*. 2006;14(3):227-249. doi:10.1093/pan/mpj017

¹¹⁵ George, A. L., & Bennett, A. (2005). *Case studies and theory development in the social sciences*. mit Press

¹¹⁶ Rihoux, Benoît, Priscilla Álamos-Concha, Damien Bol, Axel Marx, and Ilona Rezsöházy. 2013. “From Niche to Mainstream Method? A Comprehensive Mapping of QCA Applications in Journal Articles from 1984 to 2011.” *Political Research Quarterly* 66 (1): 175–84. Available at: <http://www.jstor.org/stable/23563600>

¹¹⁷ Ragin, Charles C. 1987. *The Comparative Method: Moving Beyond Qualitative and Quantitative Strategies*. Berkeley: University of California Press

¹¹⁸ Ragin, C. C. (2009). *Redesigning social inquiry: Fuzzy sets and beyond*. University of Chicago press

¹¹⁹ Cronqvist, L., & Berg-Schlösser, D. 2009. Multi-value qca (mvqca). In B. Rihoux, C. C. Ragin (Eds.) *Multi-value qca (mvQCA)* (Vol. 51, pp. 69-86). SAGE Publications, Inc., <https://doi.org/10.4135/9781452226569.n4>

¹²⁰ Pappas, Ilias O., and Arch G. Woodside. 2021. “Fuzzy-Set Qualitative Comparative Analysis (fsQCA): Guidelines for Research Practice in Information Systems and Marketing.” *International Journal of Information Management* 58 (June): 102310. <https://doi.org/10.1016/j.ijinfomgt.2021.102310>.

particularly fsQCA, to capture complex, conjunctural, and equifinal causal relationships in a transparent and replicable way.

Calibration of sets

Calibration is the process of assigning set membership scores to cases so that conditions and the outcome are represented as sets with theoretically grounded thresholds.¹²¹ In fsQCA, calibration represents a conceptual operation in which empirical measures are translated into set membership values on a scale from 0 (full non-membership) to 1 (full membership), with a crossover point at 0.5 representing maximum ambiguity.

The calibration process involves three anchor points:

- Full membership (0.95) - the value at or above which cases are considered fully in the set.
- Full non-membership (0.05) - the value at or below which cases are considered fully out of the set.
- Crossover point (0.5) - the point of maximum ambiguity, where cases cannot be classified clearly as in or out.

Calibration can be direct or indirect.

- **Direct calibration** applies a logistic function to transform raw scores into fuzzy scores, given the three specified anchor points.
- **Indirect calibration** relies on substantive coding rules or qualitative judgments, especially for categorical or ordinal data.

A well-calibrated dataset is essential for valid (fs)QCA, because poor calibration will distort set membership relations, thereby undermining the detection of necessity and sufficiency patterns.

Necessity, Sufficiency, and Parameters of fit

Once conditions (independent variables) and the outcome (dependent variable) are calibrated, fsQCA evaluates their causal role using the concepts of necessity and sufficiency.

A necessary condition is one that must be present for the outcome to occur. In set-theoretic terms, all cases that exhibit the outcome are members of the necessary condition's set ($Y \leq X$). However, a necessary condition alone may not be sufficient to produce the outcome, as it may also be present in cases without the outcome. For example, in an abstract sense, a baseline level of relevant awareness could be necessary for an outcome such as consistent pro-environmental behaviour, even if some individuals with such awareness do not translate it into action.

A sufficient condition is one whose presence guarantees the outcome. In set terms, membership in the condition's set implies membership in the outcome set ($X \leq Y$). However, sufficiency does not require that the condition be present in all outcome cases. For instance, a configuration such as high intrinsic motivation combined with access to enabling resources and supportive contextual norms could be sufficient for consistent pro-environmental behaviour, even if other distinct combinations also produce the same outcome.

Because perfect necessity or sufficiency is rare in empirical social research, fsQCA uses parameters of fit to evaluate the strength of these relations:

¹²¹ Ragin, C. C. (2009). *Redesigning social inquiry: Fuzzy sets and beyond*. University of Chicago press

- Consistency measures the extent to which the set relation holds. High thresholds (≥ 0.90 for necessity; ≥ 0.75 for sufficiency) are recommended.¹²²
- Coverage assesses the empirical relevance of the condition or configuration. For necessity, coverage indicates how much of the outcome is explained by the condition; for sufficiency, it indicates how much of the outcome can be attributed to the configuration.

In this study, necessity analysis will be conducted for all single conditions to identify any personality traits, cultural orientations, or demographic factors without which high sustainable food consumption does not occur. Sufficiency analysis will then identify the distinct configurations of these factors that consistently produce the outcome, highlighting the equifinal nature of sustainable consumption behaviours.

Truth Tables, Limited Diversity, and Boolean Minimization

The Truth Table is the central instrument for representing configurations. Each row corresponds to a unique combination of causal conditions, with associated information on case counts, outcome presence, and sufficiency consistency.¹²³ Real-world datasets rarely exhibit all possible configurations, a phenomenon known as limited diversity.¹²⁴ The unobserved configurations are called logical remainders. Limited diversity is not a flaw, but an analytic feature, as it reveals which theoretically possible combinations do not occur empirically and invites theoretical reasoning about their absence. Boolean minimization reduces the complexity of Truth Tables by eliminating conditions that do not affect the outcome within certain configurations. This produces simplified causal recipes, representing alternative sufficient pathways to the outcome.¹²⁵ In (fs)QCA, Boolean minimization can yield different forms of solutions depending on how the researcher treats logical remainders. The three standard solution types are complex, parsimonious, and intermediate solutions, each balancing empirical coverage and theoretical plausibility in different ways.

The complex solution makes no simplifying assumptions about logical remainders. It relies solely on the observed configurations and their empirical evidence, preserving the full complexity of the data structure. As a result, complex solutions often contain many conditions and are highly detailed, but they may also be harder to generalise. This approach is most useful when the researcher wishes to remain entirely within the bounds of the observed evidence and avoid any speculative assumptions.

The parsimonious solution applies all possible simplifying assumptions, including those derived from logical remainders, without regard to their theoretical plausibility. This yields the most reduced set of causal conditions, often representing the “core” factors that appear in both the complex and intermediate solutions. While the parsimonious solution can offer analytical clarity and highlight key drivers, it risks introducing assumptions that are not theoretically justified and should therefore be interpreted with caution.

The intermediate solution occupies the middle ground between the complex and parsimonious approaches. Here, the researcher specifies which simplifying assumptions are theoretically and

¹²² Legewie, N. (2013, September). An introduction to applied data analysis with qualitative comparative analysis. In *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research* (Vol. 14, No. 3).

¹²³ Lieberman, S. 1991. Small N's and big conclusions: an examination of the reasoning in comparative studies based on a small number of cases. *Social forces*, 70(2), 307-320. <https://doi.org/10.17169/fqs-14.3.1961>

¹²⁴ Ragin, Charles C. 1987. *The Comparative Method: Moving Beyond Qualitative and Quantitative Strategies*. Berkeley: University of California Press

¹²⁵ Schneider, Carsten Q., and Claudius Wagemann. *Qualitative Comparative Analysis (QCA) Und Fuzzy Sets: Ein Lehrbuch Für Anwender Und Jene, Die Es Werden Wollen*. 1st ed. Verlag Barbara Budrich, 2007. <https://doi.org/10.2307/j.ctvdf08f5>.

substantively plausible, by determining for example whether the presence or absence of a condition is more likely to contribute to the outcome. Logical remainders that are consistent with these directional expectations are used in the minimization, while implausible ones are excluded. The intermediate solution is widely recommended as the main basis for interpretation, as it balances empirical grounding with theoretically guided simplification, and often reveals the most interpretable “causal recipes”.^{126,127}

A2. QCA vs Regression

Regression analysis and Qualitative Comparative Analysis differ fundamentally in their methodological logic and the types of causal relationships they are designed to detect.^{128,129} Regression is grounded in correlational analysis and typically assume causal symmetry, meaning that the factors that increase the likelihood of an outcome are presumed to decrease the likelihood of its absence by the same magnitude but in the opposite direction. When the coding of the dependent variable is reversed, the signs of the coefficients change, but their magnitude and statistical significance remain the same. This symmetry assumption is often reasonable, but becomes problematic in contexts characterised by causal asymmetry, meaning situations where the presence of a cause may lead to the outcome, but its absence does not necessarily prevent it, or vice versa.^{130,131,132}

QCA, on the other hand, adopts a set-theoretic, case-oriented approach that is inherently suited to uncovering causal asymmetry. Instead of estimating average marginal effects, QCA identifies combinations of conditions -conjunctures- that are sufficient and/or necessary for an outcome.^{133,134} This configurational logic allows QCA to capture equifinality (different causal “recipes” leading to the same outcome) and conjunctural causation (conditions that matter only in combination with others). When a condition is sufficient but not necessary, or necessary but not sufficient, the causal relationship is asymmetric by definition.¹³⁵ QCA can detect and represent such relationships by default, whereas regression would require separate models or interaction terms to approximate them.

¹²⁶ Legewie, N. (2013, September). An introduction to applied data analysis with qualitative comparative analysis. In *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research* (Vol. 14, No. 3).

¹²⁷ Schneider, Carsten Q., and Claudius Wagemann. *Qualitative Comparative Analysis (QCA) Und Fuzzy Sets: Ein Lehrbuch Für Anwender Und Jene, Die Es Werden Wollen*. 1st ed. Verlag Barbara Budrich, 2007. <https://doi.org/10.2307/j.ctvdf08f5>.

¹²⁸ Schneider, C. Q., & Grofman, B. (2006, July). It might look like a regression equation... but its not! An intuitive approach to the presentation of QCA and fs/QCA results. In *Conference on “Comparative Politics: Empirical Applications of Methodological Innovations”*, Sophia University, Tokyo (Japan) (pp. 15-17).

¹²⁹ Glaesser, J. (2023). Analysing causal asymmetry: a comparison of logistic regression and Qualitative Comparative Analysis (QCA). *International Journal of Social Research Methodology*, 27(3), 289–300. <https://doi.org/10.1080/13645579.2022.2163106>

¹³⁰ Lieberman, S. 1991. Small N's and big conclusions: an examination of the reasoning in comparative studies based on a small number of cases. *Social forces*, 70(2), 307-320. <https://doi.org/10.17169/fqs-14.3.1961>

¹³¹ Clark, William R., Michael J. Gilligan, and Matt Golder. 2006. “A Simple Multivariate Test for Asymmetric Hypotheses.” *Political Analysis* 14 (3): 311–31. <https://doi.org/10.1093/pan/mpj018>

¹³² Glaesser, J. (2023). Analysing causal asymmetry: a comparison of logistic regression and Qualitative Comparative Analysis (QCA). *International Journal of Social Research Methodology*, 27(3), 289–300. <https://doi.org/10.1080/13645579.2022.2163106>

¹³³ Ragin, Charles C. 1987. *The Comparative Method: Moving Beyond Qualitative and Quantitative Strategies*. Berkeley: University of California Press

¹³⁴ Ragin, C. C. (2000). *Fuzzy-set social science*. University of Chicago Press

¹³⁵ Clark, William R., Michael J. Gilligan, and Matt Golder. 2006. “A Simple Multivariate Test for Asymmetric Hypotheses.” *Political Analysis* 14 (3): 311–31. <https://doi.org/10.1093/pan/mpj018>

A further difference lies in how the two methods treat the absence of an outcome. In regression, the model for the absence is simply the inverse of the model for the presence. In QCA, the presence and absence of the outcome are analysed separately, allowing distinct configurations to explain each. This distinction is particularly relevant when outcomes are rare or when the “negation” of an outcome encompasses heterogeneous cases.¹³⁶ For example, avoiding poverty is not simply the mirror image of becoming poor, as the two may have different causal structures.¹³⁷

In conclusion, regression offers a variable-oriented, additive, and often symmetric view of causality, producing effect estimates for individual predictors net of others. QCA provides a configurational, non-additive, and potentially asymmetric view, revealing how multiple conditions combine to produce outcomes. Both methods have strengths and limitations, and in combination they can offer complementary insights: regression quantifies net effects, while QCA maps the complex causal patterns and asymmetries that may underlie them.^{138,139}

A3. QCA vs Clustering

While both fuzzy-set Qualitative Comparative Analysis (fsQCA) and clustering techniques can be used for profiling, they operate on fundamentally different logics and serve complementary purposes in identifying and describing groups.

Cluster analysis is an unsupervised, data-reduction and pattern-recognition method that groups cases based on similarity in their attributes, without explicit reference to an outcome variable.¹⁴⁰ Its objective is to identify internally homogeneous and externally heterogeneous clusters in the multidimensional space defined by the input variables. The resulting clusters provide an empirical classification that can be interpreted as consumer segments or behavioural types. However, clustering is essentially descriptive, meaning that the group formation is driven solely by statistical similarity, and the resulting profiles may or may not be causally relevant to a particular outcome.¹⁴¹

In contrast, QCA is explicitly outcome-oriented and theory-driven. It identifies combinations of conditions that are sufficient and/or necessary for the presence (or absence) of an outcome, rather than grouping cases by overall similarity.¹⁴² The “profiles” emerging from QCA are not arbitrary clusters, but logically derived configurations of attributes that are causally linked to the outcome.¹⁴³

¹³⁶ Goertz, G. 2020. Social science concepts and measurement: New and completely revised edition. Princeton University Press, ISBN: 9780691205465

¹³⁷ Glaesser, J. (2023). Analysing causal asymmetry: a comparison of logistic regression and Qualitative Comparative Analysis (QCA). *International Journal of Social Research Methodology*, 27(3), 289–300. <https://doi.org/10.1080/13645579.2022.2163106>

¹³⁸ Schneider, C. Q., & Grofman, B. (2006, July). It might look like a regression equation... but its not! An intuitive approach to the presentation of QCA and fs/QCA results. In Conference on “Comparative Politics: Empirical Applications of Methodological Innovations”, Sophia University, Tokyo (Japan) (pp. 15-17).

¹³⁹ Glaesser, J. (2023). Analysing causal asymmetry: a comparison of logistic regression and Qualitative Comparative Analysis (QCA). *International Journal of Social Research Methodology*, 27(3), 289–300. <https://doi.org/10.1080/13645579.2022.2163106>

¹⁴⁰ Jain, A. K., M. N. Murty, and P. J. Flynn. 1999. “Data Clustering: A Review.” *ACM Comput. Surv.* 31 (3): 264–323. <https://doi.org/10.1145/331499.331504>.

¹⁴¹ Everitt, B., & Hothorn, T. (2011). An introduction to applied multivariate analysis with R. Springer Science & Business Media. https://doi.org/10.1007/978-1-4419-9650-3_1

¹⁴² Pappas, Ilias O., and Arch G. Woodside. 2021. “Fuzzy-Set Qualitative Comparative Analysis (fsQCA): Guidelines for Research Practice in Information Systems and Marketing.” *International Journal of Information Management* 58 (June): 102310. <https://doi.org/10.1016/j.ijinfomgt.2021.102310>.

¹⁴³ Haynes, P. 2014. Combining the strengths of qualitative comparative analysis with cluster analysis for comparative public policy research: With reference to the policy of economic convergence in the euro currency area. *International Journal of Public Administration*, 37(9), 581-590. <https://doi.org/10.1080/01900692.2014.880849>

These configurations may cut across what would be considered separate clusters in a similarity-based analysis, as QCA is unconcerned with overall distance in the attribute space and instead focuses on the presence or absence of specific conditions in particular combinations.¹⁴⁴

Therefore, the profiling logic of QCA differs from clustering in two important ways. First, it is inherently asymmetric, as the conditions leading to the presence of the outcome may differ from those leading to its absence, requiring separate configurational solutions. Second, it accommodates equifinality and conjunctural causation, allowing for multiple, distinct profiles to be sufficient for the same outcome.

While clustering can be useful for exploratory segmentation, its results do not indicate whether the identified segments have a causal relationship with the outcome of interest. QCA, by contrast, ensures that each identified “profile” is empirically and logically connected to the outcome, making it particularly suitable for the type of outcome-linked behavioural profiling undertaken in this study. By integrating fsQCA into the current analysis, the current study moves beyond descriptive segmentation to produce explanatory profiles that are directly relevant for understanding the diversity of pathways leading to sustainable consumption.

Data calibration and necessary conditions analysis

Calibration of conditions and outcomes

The responses for the first outcome (Fuzzy-set calibration thresholds for outcomes (Table 20)), **food label consideration** (flabel), were calibrated into fuzzy sets using direct calibration, with thresholds set at 2 for full non-membership, 3 for the cross-over point, and 4 for full membership. This allowed for clear differentiation between low, moderate, and high consideration of food labels. The second outcome, willingness to pay extra for sustainable food products (fperc), was calibrated using the 10th, 50th, and 90th percentile thresholds (set at 5%, 15%, and 30%, respectively) to capture low, intermediate, and high levels of willingness to pay more.

Table 20. Fuzzy-set calibration thresholds for outcomes

Initial variable	Fuzzy variable	Full non-membership point ($\mu_{0.05}$)	Cross-over point ($\mu_{0.5}$)	Full membership point ($\mu_{0.95}$)
Food label consideration	flabel	2	3	4
Willingness to pay a premium for sustainable food products	fperc	5	15	30

Regarding the **personality traits** (Tables 22 and 23), each of the Big Five traits, i.e. extraversion (fextra), neuroticism (fneuro), conscientiousness (fcons), agreeableness (fagree), and openness (fopen), were calibrated using the same approach as flabel, with thresholds of 3, 4, and 5, corresponding to full non-membership, the cross-over point, and full membership. For **cultural values** (Tables 24 and 25), Hofstede’s six national dimensions were calibrated using sample-based percentiles to reflect their empirical distribution. Each dimension, meaning power distance (fpdi),

¹⁴⁴ Ragin, C. C. 2009. Redesigning social inquiry: Fuzzy sets and beyond. University of Chicago press

individualism (find), achievement (fach), uncertainty avoidance (func), long-term orientation (flong), and indulgence (findul), was assigned calibration thresholds at the 90th percentile (full non-membership), 50th percentile (cross-over), and 10th percentile (full membership), using specific value anchors from the data for each.

Finally, **demographic variables** (Table 26) were calibrated using the same fuzzy-set procedure. Age (fage), collected as a continuous variable spanning 18 to 70+, was grouped into ordered categories, with the 25–34 age group set as full non-membership, the 35–44 group as the cross-over, and the 55–64 group as full membership. Education, recorded in ordinal form, was recoded so that secondary school, bachelor's degree, and master's degree corresponded to the full non-membership, cross-over, and full membership anchors respectively, reflecting the expected increase in sustainable consumption engagement with higher education levels. Monthly household income, reported in brackets, was coded from lowest to highest and calibrated so that the 1,501–2,500 € category represented full non-membership, 2,501–3,500 € the cross-over, and 3,501–4,500 € full membership. Gender variables were binary in the dataset and therefore required no further calibration.

Table 21. Fuzzy-set calibration thresholds for conditions

Initial variable	Fuzzy variable	Full non-membership point ($\mu_{0.05}$)	Cross-over point ($\mu_{0.5}$)	Full membership point ($\mu_{0.95}$)
Extraversion	fextra	2	3	4
Neuroticism	fneuro	2	3	4
Conscientiousness	fcons	2	3	4
Agreeableness	fagree	2	3	4
Openness	fopen	2	3	4
Power distance index (PDI)	fpdi	35	57	68
Individualism vs. collectivism (IDV)	find	47	67	100
Motivation towards Achievement and Success (MAS)	fach	14	43	70
Uncertainty avoidance (UAI)	func	53	86	100
Long-term orientation vs. short-term orientation (LTO)	flong	39	51	67

Indulgence restraint (IND) vs.	findul	29	44	68
Age	fage	2	3	4
Education	fedu	2	3	4
Income	fincome	3	4	5

After calibration, all fuzzy set variables were recoded to standardise membership scores and avoid ambiguity. Cases at exactly the cross-over point of 0.5 were recoded to 0.501, following best practice recommendations in fsQCA.¹⁴⁵ This small adjustment ensures that these cases are treated as "more in than out" of the set, preventing ambiguity in membership status and allowing for clearer interpretation of results in subsequent set-theoretic analysis. Furthermore, where appropriate, values at 0.95 were recoded to 1 (full membership), and very low values (0.05) were set to 0 (full non-membership), depending on the variable, to ensure consistent fuzzy set assignments and clear interpretation of set memberships in the analysis.

Analysis of Necessary Conditions

Personality traits

The necessity analysis showed that no individual personality trait, whether present or absent, met the conventional consistency threshold for necessity of above 0.9, for either food label consideration (flabel) or willingness to pay a premium for sustainable food products (fperc). For both outcomes (see Table 22 for flabel and Table 23 for fperc), the absence of agreeableness (~fagree) yielded the highest consistencies among single conditions, but these values still did not reach 0.85. This indicates that, while some traits may be relevant, none are strictly essential for the presence of either outcome.

Table 22. Necessary personality traits for food label consideration

Outcome variable: flabel		
Condition	Consistency	Coverage
fextra	0.658	0.724
~fextra	0.419	0.681
fneuro	0.536	0.686
~fneuro	0.528	0.710
fcons	0.409	0.789
~fcons	0.673	0.669

¹⁴⁵ Pappas, Ilias O., and Arch G. Woodside. 2021. "Fuzzy-Set Qualitative Comparative Analysis (fsQCA): Guidelines for Research Practice in Information Systems and Marketing." *International Journal of Information Management* 58 (June): 102310. <https://doi.org/10.1016/j.ijinfomgt.2021.102310>.

fagree	0.249	0.828
~fagree	0.819	0.669
fopen	0.395	0.761
~fopen	0.714	0.710

Table 23. Necessary personality traits for willingness to pay a premium for sustainable food products

Outcome variable: fperc		
Condition	Consistency	Coverage
fextra	0.677	0.632
~fextra	0.451	0.622
fneuro	0.575	0.625
~fneuro	0.537	0.613
fcons	0.405	0.663
~fcons	0.735	0.620
fagree	0.262	0.741
~fagree	0.847	0.587
fopen	0.422	0.691
~fopen	0.758	0.639

Cultural dimensions

Similarly, in both cases, none of the conditions reached the typical threshold for necessity, confirming that there is no single cultural trait that must be present for people to consider food labels (Table 24) or be willing to pay a premium for sustainable food (Table 25). The outcomes are not driven by any one necessary condition, but instead, they are influenced by different combinations of cultural values.

Table 24. Necessary cultural dimensions for food label consideration

Outcome variable: flabel		
Condition	Consistency	Coverage
fpdi	0.577	0.715
~fpdi	0.513	0.715
find	0.516	0.724

~find	0.604	0.743
fach	0.637	0.721
~fach	0.469	0.732
func	0.558	0.732
~func	0.546	0.717
flong	0.573	0.725
~flong	0.540	0.735
findul	0.490	0.729
~findul	0.619	0.726

Table 25. Necessary cultural dimensions for willingness to pay a premium for sustainable food products

Outcome variable: fperc		
Condition	Consistency	Coverage
fpdi	0.600	0.632
~fpdi	0.554	0.655
find	0.570	0.679
~find	0.630	0.658
fach	0.659	0.634
~fach	0.519	0.687
func	0.588	0.654
~func	0.593	0.662
flong	0.618	0.664
~flong	0.580	0.670
findul	0.533	0.673
~findul	0.641	0.642

Demographic factors



For demographic variables, the analysis of necessary conditions also showed that no single characteristic is essential for either food label consideration or willingness to pay a premium for sustainable food products. For both outcomes (Tables 26 and 27), none of the gender categories (male, female, non-binary, or other) came close to the standard necessity threshold, with consistency values all well below 0.9. The absence of age (~fage) and the absence of income (~fincome) both yielded the highest consistencies for flabel (0.778 and 0.785, respectively), and similar results appeared for fperc (~fage, 0.760; ~fincome, 0.798), but even these values fall short of being considered necessary conditions.

Table 26. Necessary demographic factors for food label consideration

Outcome variable: flabel		
Condition	Consistency	Coverage
gender_male	0.605	0.696
gender_female	0.376	0.602
gender_non_bina	0.013	0.591
gender_other	0.004	0.593
fage	0.298	0.711
~fage	0.778	0.704
fedu	0.616	0.695
~fedu	0.490	0.768
fincome	0.271	0.701
~fincome	0.785	0.690

Table 27. Necessary demographic factors for willingness to pay a premium for sustainable food products

Outcome variable: fperc		
Condition	Consistency	Coverage
gender_male	0.603	0.589
gender_female	0.378	0.514
gender_non_bina	0.012	0.465
gender_other	0.004	0.577
fage	0.351	0.711
~fage	0.760	0.584
fedu	0.662	0.634
~fedu	0.510	0.678
fincome	0.292	0.642
~fincome	0.798	0.595

Appendix 3

Country cases in every causal path of cultural dimension combinations predicting food label consideration

For transparency, the tables below list the country and regional cases that showed membership above 0.5 in each of the causal pathways identified for food label consideration and willingness to pay extra for sustainable food. These cases serve as empirical illustrations of the abstract cultural configurations derived through fsQCA. They are not predefined categories but emerge directly from the set-membership structure of the data.

Table 28. Country cases for cultural dimension combinations predicting food label consideration

Cases with greater than 0.5 membership in Causal path 1	BE242 (0.77,0.61), BE100 (0.77,0.7), BE234 (0.77,0.61), BE225 (0.77,0.89), BE225 (0.77,1), BE242 (0.77,0.3), BE211 (0.77,0.501), BE242 (0.77,0.99), BE352 (0.77,0.15), BE310 (0.77,0.85), BE100 (0.77,0.97), BE236 (0.77,0.89), BE328 (0.77,0.501), BE234 (0.77,0.3), BE254 (0.77,0.11), BE236 (0.77,0.99), BE310 (0.77,0.85), BE234 (0.77,0.98), BE234 (0.77,0.78), BE100 (0.77,0.39)
Cases with greater than 0.5 membership in Causal path 2	EE001 (0.68,0.7), EE008 (0.68,1), EE001 (0.68,0.22), EE001 (0.68,0.501), EE001 (0.68,1), EE008 (0.68,1), EE001 (0.68,1), EE001 (0.68,0.97), EE001 (0.68,0.97), EE009 (0.68,0.501), EE001 (0.68,0.07), EE001 (0.68,1), EE008 (0.68,0.98), EE001 (0.68,0.11), EE001 (0.68,0.39), EE001 (0.68,1), EE008 (0.68,0.07), EE008 (0.68,1), EE008 (0.68,1), EE001 (0.68,0.98)
Cases with greater than 0.5 membership in Causal path 3	PL424 (0.62,0.39), PL721 (0.62,0.95), PL841 (0.62,1), PL911 (0.62,0.99), PL415 (0.62,1), PL416 (0.62,0.07), PL22A (0.62,0.98), PL213 (0.62,0.07), PL432 (0.62,0.97), PL634 (0.62,0.99), PL633 (0.62,1), PL823 (0.62,1), PL711 (0.62,0.61), PL913 (0.62,0.98), PL213 (0.62,0.7), PL912 (0.62,0.93), PL814 (0.62,0.89), PL823 (0.62,0.39), PL613 (0.62,0.11), PL514 (0.62,0.99)
Cases with greater than 0.5 membership in Causal path 4	ES511 (0.501,0.85), ES511 (0.501,0.22), ES614 (0.501,0.61), ES300 (0.501,0.07), ES614 (0.501,1), ES620 (0.501,0.99), ES300 (0.501,0.11), ES614 (0.501,0.11), ES614 (0.501,0.22), ES612 (0.501,0.97), ES300 (0.501,0.99), ES300 (0.501,1), ES243 (0.501,0.61), ES243 (0.501,0.39), ES521 (0.501,0.05), ES300 (0.501,0.22), ES300 (0.501,1), ES300 (0.501,0.11), ES511 (0.501,0.95), ES415 (0.501,0.99)

Table 29. Country cases for cultural dimension combinations predicting willingness to pay a premium for sustainable food products

Cases with greater than 0.5 membership in Causal path 1	EE001 (0.68,0.77), EE008 (0.68,0.95), EE001 (0.68,0.12), EE001 (0.68,0.27),
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	EE001 (0.68,0.27), EE008 (0.68,0.27), EE001 (0.68,0.27),
	EE001 (0.68,0.82), EE001 (0.68,0.82), EE009 (0.68,0.98),
	EE001 (0.68,0.82), EE001 (0.68,0.77), EE008 (0.68,0.82),
	EE001 (0.68,0.27), EE001 (0.68,0.501), EE001 (0.68,0.99),
	EE008 (0.68,0.27), EE008 (0.68,0.82), EE008 (0.68,0.95),
	EE001 (0.68,0.97)
Cases with greater than 0.5 membership in Causal path 2	ES511 (0.501,0.96),
	ES511 (0.501,0.27), ES614 (0.501,0.95), ES300 (0.501,0.501),
	ES614 (0.501,0.97), ES620 (0.501,0.501), ES300 (0.501,0.12),
	ES614 (0.501,0.12), ES614 (0.501,0.77), ES612 (0.501,0.05),
	ES300 (0.501,0.4), ES300 (0.501,0.27), ES243 (0.501,0.2),
	ES243 (0.501,0.45), ES521 (0.501,0.05), ES300 (0.501,0.99),
	ES300 (0.501,0.65), ES300 (0.501,0.82), ES511 (0.501,0.501),
	ES415 (0.501,0.501)
Cases with greater than 0.5 membership in Causal path 3	EL303 (0.501,0.82),
	EL522 (0.501,0.65), EL433 (0.501,0.27), EL623 (0.501,0.27),
	EL303 (0.501,0.82), EL522 (0.501,0.27), EL522 (0.501,0.501),
	EL303 (0.501,0.95), EL422 (0.501,0.82), EL303 (0.501,0.501),
	EL303 (0.501,0.95), EL303 (0.501,0.27), EL303 (0.501,0.27),
	EL303 (0.501,0.82), EL303 (0.501,0.501), EL303 (0.501,0.501),
	EL522 (0.501,0.27), EL303 (0.501,0.95), EL303 (0.501,0.82),
	EL421 (0.501,0.27)

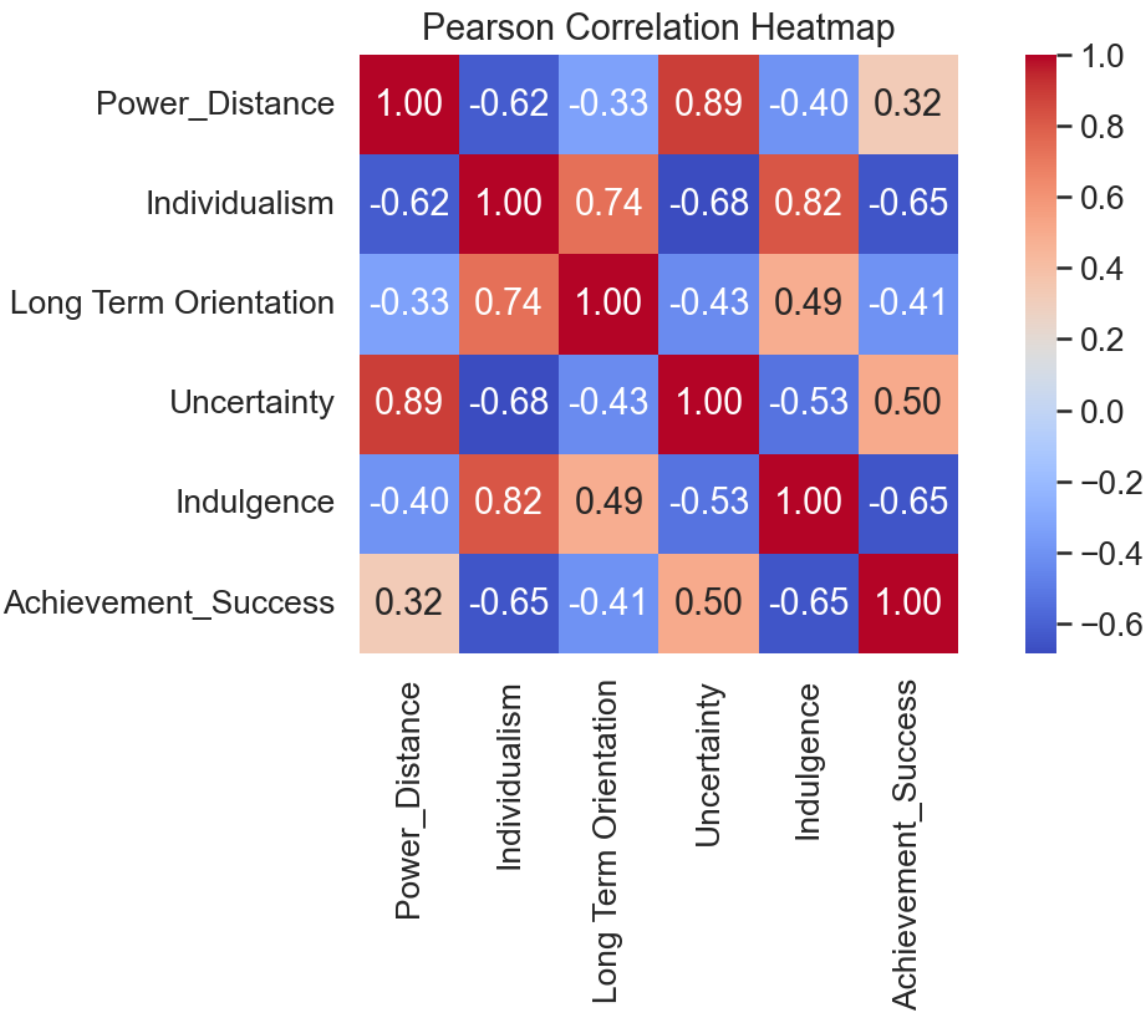


Figure 12. A1 Pearson Correlation Heatmap

Table 30. Poisson Regression Results – Regional Model

Variable	WILLINESS TO PAY FOR SUSTAINABLE FOOD PRODUCT
	(1)
Relationship with Sustainability	0.277***
	(0.021)
Relationship with Natural Environment	-0.067***
	(0.020)
Relationship with Animal Welfare	0.049**
	(0.021)
Relationship with Healthy Nutrition	-0.017
	(0.021)
Relationship with Community	0.020
	(0.022)
Food Vulnerability	0.102***
	(0.018)
Extraversion	0.015
	(0.016)
Neuroticism	0.010
	(0.017)
Conscientiousness	-0.038**
	(0.015)
Agreeableness	0.007
	(0.020)
Openness	-0.028*
	(0.016)
Immigrant=1	0.019

	(0.017)
Age	-0.083***
	(0.019)
Male=1	-0.056***
	(0.015)
Non-Binary=1	-0.018*
	(0.010)
Other=1	-0.019
	(0.012)
Education	0.003
	(0.018)
Children at Home	0.056***
	(0.017)
Personal Income	0.048**
	(0.020)
Political Orientation	-0.003
	(0.019)
Log GDP pc	0.044
	(0.031)
Population Density	-0.048
	(0.038)
Log of Road Infrastructure Stock	-0.012
	(0.026)
Growth in Temperature	-0.054
	(0.074)
Air Quality	0.001

	(0.027)
Long Term Orientation	0.904*
	(0.463)
Individualism	0.463
	(0.324)
NUTS 1 Fixed Effects	Yes
Pseudo R²	0.193
Observations	2767

Notes: Cluster standard errors at the NUTS 2 level are reported in parentheses. The p-values for the asterisks are 0.10 (*), 0.05 (**), and 0.01 (***).