Consumers’ Behaviour and Willingness to Pay for Insect-based Food in the United Kingdom

Asmaa Saud Alhujaili

Thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy

School of Agriculture, Policy and Development

Department of Agri-Food Economics and Marketing

July, 2024

Declaration of Original Authorship

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

Asmaa Alhujaili

Abstract

According to the Food Agriculture Organization, the world population is expected to grow to above 9 billion by 2050. This forecast sets enormous environmental, ethical, and economic challenges to the agri-food sector underscoring an urgent need to identify sustainable methods of production and new food products. The economic challenges of innovative supply chains require also an understanding of consumers' acceptance and willingness to pay (WTP) for new food products if new markets have to develop successfully. Understanding consumers' perceptions, acceptance, and preferences is crucial to facilitating the introduction of novel food and this is also the case for alternative sources of protein like edible insects, especially in the UK where there is a lack of studies on this topic.

Three methods were used to develop this UK study. A systematic review was conducted to gain a comprehensive understanding of factors influencing consumer acceptance of edible insects. A qualitative study explored stakeholders' and consumers' perceptions employing both in-depth interviews and focus groups. A survey was developed on an extended version of the theory of planned behaviour where participants' behaviour was evaluated estimating preferences and WTP for bread and pasta made with insects. Qualitative data was analysed with thematic analysis, while quantitative data used multi-way analysis of variance, non-linear regression models and the price sensitive meter.

The findings of these three studies show that in the UK, gaining consumers' acceptance of insect-based food products is challenging. Implications of these findings are discussed in terms of marketing, policy and research for future studies.

Acknowledgement

I would like to express my heartfelt gratitude to Allah for his unwavering guidance and blessings throughout my doctoral journey. He has been a constant source of strength and inspiration.

I am deeply indebted to my supervisor, **Dr Giuseppe Nocella**, for his invaluable mentorship, and expertise. His guidance has been instrumental in shaping my research and academic growth. I extend my sincere appreciation to my academic monitor, **Dr Richard Bennet**, for his insightful guidance and unwavering support throughout my PhD journey. His expertise and encouragement have been invaluable.

A special word of thanks to my dear friend, **Dr Agnese Rondoni**, for her unwavering support, encouragement, and companionship during the highs and lows of my PhD journey. Her presence and celebration of milestones have meant the world to me. I extend my heartfelt gratitude to my friend (soon to be) **Dr Somaya Alnasser** for her consistent support and companionship during the most challenging times of finalizing my thesis. Her presence and encouragement have been a source of comfort and strength.

I am immensely grateful to my friends **Dr Dimitrios Iakovidis, Dr Jorge Campos Gonzalez, Dr Heather Maggs, and Dr Tamisan Latherow** for their kindness, encouragement, and unwavering support during the challenging phases of my PhD journey. Their support has been a source of strength and motivation.

I am grateful to **Dr Donna Peach** for creating a supportive environment for PhD students through the PhD forum. I am also thankful to all the friends I made through this platform for their camaraderie and support.

My deepest gratitude goes to my supportive family for their unconditional love, encouragement, and sacrifices throughout my PhD journey.

تعجز الكلمات عن وصف امتناني وشكري لوالدي، **سعود وغزيل،** أشكركم من أعماق قلبي، على كل ما قدمتموه لي ولأبنائي. لقد كنتما الدعامة القوية التي استندت إليها في كل مراحل حياتي وليس فقط دراستي للدكتوراه. كنتما معي دائماً بكل حب وتفانٍ رغم بعد المسافات. دعواتكم وكلماتكم الدافئة ودعمكم اللا محدود مصدر سكينة وطمأنينة خاصة في أصعب الأيام.

To **my parents**, **Saud** and **Ghozil**, for their prayers and unwavering support, especially when I am at my lowest. Their dedication to the well-being of myself and my children and the care they provided, despite being miles apart, have been my pillars of strength.

To my eldest sister **Abeer**, her pride in my achievements has been a constant source of motivation and joy. Her smiles have been my biggest encouragement. I extend my gratitude to my brothers, **Hossam** and **Ahmed**, for having my back in the hardest times. Their presence has been a source of strength and reassurance. To my sister **Leena**, for her unconditional love and support that she provided to me and for caring about my children as much as she cares about her two little angels. A heartfelt thank you to my sister **Shatha**, who can read me without saying a word; her support and understanding made the toughest times bearable. I am indebted to my little sister, **Shaymaa**, for her joyful company, immense love, care, and dedication to looking after my children as if they were her own. Her support has been a source of immense comfort and reassurance.

To my rock, my beloved husband, **Hatim**. Words cannot express my gratitude for his unwavering belief in me, his unconditional support, and his continued presence by my side throughout this journey. His love and understanding have been my guiding light. I always remember what he used to say: “Focus on your work, and don't think of anything else”.

To my precious children, **Abdullah**, **Judy**, and **Qusai**, thank you for sharing this journey with me. **Abdullah**, my eldest son, he used to say... “Mom, I have no experience in life, but don’t worry, everything will be ok; the most important thing is your well-being”. His spirit and calmness brought me peace. To my daughter, **Princess Judy**: Her faith in me and her loving messages meant the world to me. Thanks for reminding me to take breaks, even if it means sneaking around and taking my laptop so I can have a break. And to my youngest son, **Qusai**: His infectious smile and boundless energy never failed to brighten my day. His presence and love have been my greatest motivation and joy. I always remember what he used to say: “Mom, I love you to the moon and back”.

I am truly fortunate to have been surrounded by such incredible support and love throughout my PhD journey. Without the unwavering support and encouragement of each one of you, I would not have been able to navigate this journey successfully.

Table of Contents

List of Figures

List of Tables

List of acronyms

4Ps: The Marketing mix (Product, Price, Place, Promotion)
ATT: Attitude
DBDC: Double-Bounded Dichotomous Choice
DISG: Disgust
EAQ: Entomophagy Attitude Questionnaire
FN: Food Neophobia
GHG: Greenhouse Gas
IPP: Indifference Price Point
MNL: Multinomial Logistic Regression
OFG: Online Focus Groups
OPP: Optimal Price Point
PBC: Perceived Behavioural Control
PMC: Point of Marginal Cheapness
PME: Point of Marginal Expensiveness
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PSM: Price Sensitivity Meter
SN: Subjective Norms
SPIDER: Sample, Phenomenon of Interest, Design, Evaluation, and Research type
SR: Systematic Review
SWOT: Strengths, Weaknesses, Opportunities, and Threats
TA: Thematic Analysis
TPB: Theory of Planned Behaviour
WTP: Willingness To Pay

CHAPTER 1. Introduction

1.1 Background and problem statement

The world population is projected to increase from 7.7 billion in 2019 to 8.5 billion in 2030 and 9.7 billion in 2050, which increases the pressure to achieve sustainable development goals (Union Nations, 2019). Around two billion people suffered from food insecurity in 2019 and it was projected that the global COVID-19 pandemic could add between 83 and 132 million to this number (OECD/FAO, 2020). The dramatic increase in food insecurity underscores the need to increase food production to meet basic nutritional needs such as proteins, carbohydrates, and fats. Proteins can be found in various food products obtained from plants and animals, but livestock products are the preferred source of protein for millions of people (Moran and Wall, 2011).

The global demand for livestock products is expected to increase to more than double its present rate between 2000 and 2050 Alexandratos, (2006) as the world population and income growth will increase continuously over the coming years (OECD/FAO, 2016). Livestock production, however, is responsible for global issues related to the sustainability of this sector prompting researchers to seek alternative protein sources to meet increasing global food demands while mitigating potential drawbacks. Among these alternatives, insect-based food has emerged as a promising option in terms of health, environmental sustainability, and economic viability in comparison with conventional meat, as well as plant-based products, which are well-known protein alternatives for consumers.

Concerning health, insects, due to their high protein, healthy fat, calcium, iron, and zinc content, are considered a promising alternative to protein obtained from farm animals (Rumpold and Schlüter, 2013; van Huis *et al.*, 2013). Whereas for plants, although they are considered an alternative source of protein, their protein content is low compared to insects which provide food with complete animal protein (Olsen and Hasan, 2012; Orkusz, 2021). Another healthy aspect is the safety of the products. For livestock production, some diseases, such as avian influenza, can pass from animals to humans (FAO, 2022), while the consumption of red and processed meats can lead to NCDs such as cardiovascular disease and colorectal cancer (WCRF/AICR, 2007). A significant concern about the safety of insect and plant-based food pertains to the risk of allergenic reactions. For insects, consuming different insects, such as mealworms, locusts, bees, and crickets, can cause allergic reactions that can be life-threatening (de Gier and Verhoeckx, 2018). Similarly, some plant-based foods can cause allergic reactions as well, for instance, peas which are a primary ingredient in many plant-based alternative foods, such as nuggets, sausages, and patties. Peas are known to be a common allergen, and their widespread use in plant-based food products raises legitimate concerns about potential reactions in susceptible individuals (Yuliarti, Kiat Kovis and Yi, 2021; Maningat, Jeradechachai and Buttshaw, 2022) because legume allergy can be life-threatening (Verma *et al.*, 2013).

Environmental concerns around livestock production stem from its contribution to global greenhouse gas emissions (GHG) (10-18%) (Steinfeld *et al.*, 2006; Westhoek *et al.*, 2011; Rojas-Downing *et al.*, 2017; OECD/FAO, 2020). Additionally, livestock farming is a major consumer of land, with 40% of the world's land used for agriculture, of which 70% is grazing land (OECD/FAO, 2020). Both insect and plant-based foods offer notable environmental advantages over conventional protein sources, including lower GHG emissions and reduced land and energy consumption. Furthermore, insects appear to be more environmentally friendly than plant-based foods, as demonstrated in Figure 1.1.

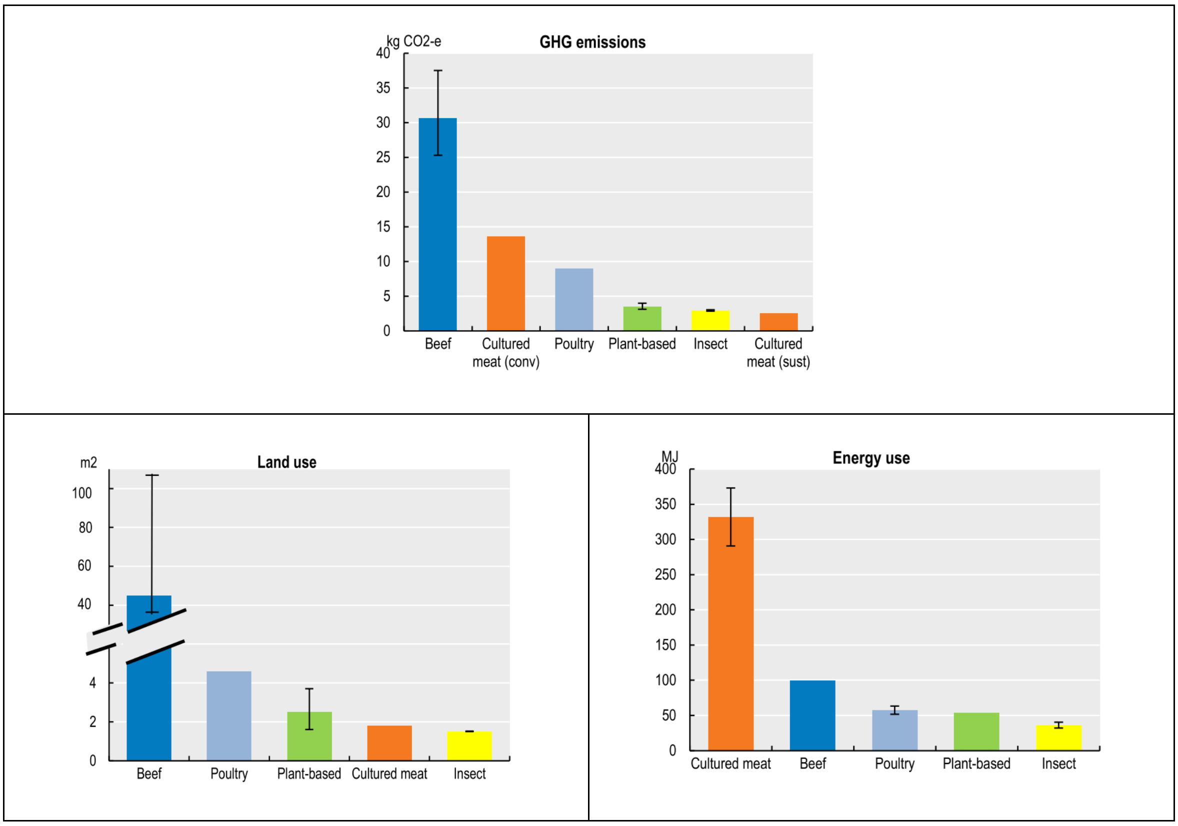


Figure 1. 1 The environmental impact of 1 kg of meat and meat alternatives. Source: Frezal, Nenert and Gay (2022).

However, Quang Tran, Van Doan and Stejskal (2022) suggested that while insect-based food production requires more energy than plant-based food, it uses less land and water.

Additionally, the environmental impact depends on the type of insect species used. This means that the overall sustainability of insect-based protein can be highly variable and context-dependent, requiring careful consideration of specific practices and species involved.

Both health and environmental implications can directly affect the economic viability of livestock production by influencing resource efficiency, consumer demand, and long-term sustainability. Where both insects and plant-based foods have their unique advantages and challenges, their economic viability can vary based on specific contexts and local conditions.

In line with the interest of researchers, stakeholders in Western countries recognise the importance of such products and invest millions of dollars in developing them. The interest and investment in alternative protein sources, such as plant-based food, and insect-based food alternatives, have garnered significant attention from both the public and private sectors, as shown in Figure 1.2. Regarding plant-based alternatives, the Canadian government took the lead in investing over $127 million in the plant-based food sector in 2022, underscoring the substantial support for plant-based alternatives in Western countries (the Good Food Institute, 2022). Notably, the insect food sector attracted much interest in Europe, with the largest farming European company receiving substantial funding of over $175 million in 2023 from public and private investors in France (Marston, 2023). These developments reflect the increasing recognition of and investment in alternative protein sources, signifying a shift towards sustainable and innovative food production.

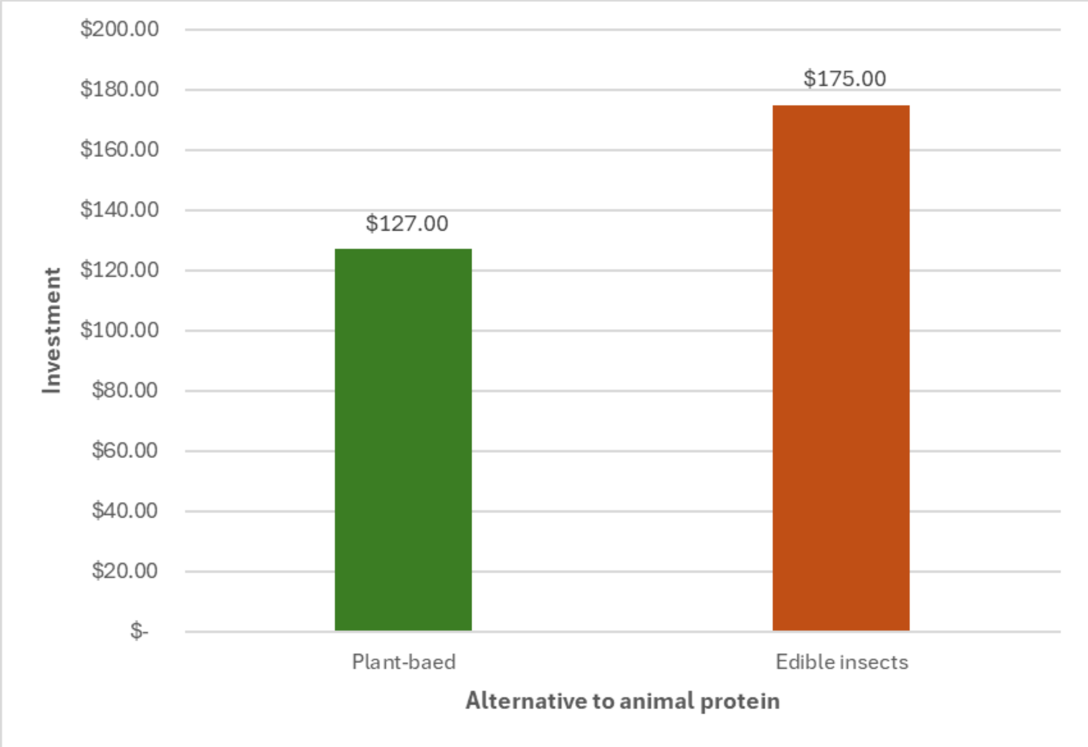


Figure 1. 2 Leading investments in alternatives to animal protein in selected countries. Adapted from Marston (2023) and the Good Food Institute (2022).

The introduction of these alternatives to the market differed in terms of time scale and development process. Plant-based food is produced mainly from ingredients such as vegetables, fruit, seeds, and legumes (Lea, Crawford and Worsley, 2006), and has been developed from traditional foods such as tofu and tempeh to form advanced plant-based products meant to mimic the taste and texture of meat, such as Beyond Burger[1] and Impossible Burger[2] (Ismail, Hwang and Joo, 2020). Whereas for insects, in the world, about 2 billion people consume insects over 2,000 species of edible insects and the majority of these people are located in developing countries (Costa-Neto, 2015; Tao and Li, 2018a; Imathiu, 2020), such as Lepidoptera species in China (Feng *et al.*, 2018), Hymenoptera species in Mexico (Ramos-Elorduy and Pino Moreno, 2002), and termites (Isoptera) and crickets (Orthoptera) in Nigeria (Ebenebe *et al.*, 2017). However, this food is rarely consumed in Western countries, and it has recently become available in a processed form in some Western countries through Aspire[3] in the US, Essento[4] in Switzerland, and Beneto

[1] https://www.beyondmeat.com/en-US/products/the-beyond-burger
[2] https://impossiblefoods.com/products/burger
[3] https://aspirefg.com/about-us.aspx
[4] https://essento.ch/en/

Foods[5] and Bug foundation[6] in Germany; these companies offer insect-based food as a healthy and sustainable protein alternative.

Despite that the prospect of consuming insects as an animal protein alternative has attracted the substantial interest of both stakeholders and researchers due to its purported sustainability and environmental benefits, in addition to insects' nutritional value compared with conventional meat, the consumption of insects is still controversial in many societies, as it is often viewed as culturally inappropriate or disgusting, especially in Western countries (Mancini, Moruzzo, *et al.*, 2019; Onwezen *et al.*, 2021; Kröger *et al.*, 2022; Alhujaili, Nocella and Macready, 2023; Mina, Peira and Bonadonna, 2023). To overcome these barriers, it is vital to evaluate the pros and cons of such promising alternatives, in addition to exploring consumers' perspectives, in order to provide stakeholders and policy makers with the right tools to help with establishing policies, setting prices and designing insect-based products.

Considering the significant interest in insects as an alternative source of protein, it is vital to explore the potential of this novel food. The EU defines novel foods as any food that was not significantly consumed by humans within the EU prior to May 15, 1997, which marks the date when the initial regulation on novel foods was established[7]. This definition encompasses a wide range of food products. It includes entirely new foods that have been recently developed or discovered, as well as foods derived from new sources that were previously not used for human consumption. Additionally, it covers new substances that are added to existing foods and innovative methods or technologies used in the production and processing of food. This broad categorization ensures that any food item or production technique that is unfamiliar to the EU market is subject to rigorous safety assessments and regulatory oversight before it can be approved for consumer use. In the context of insect-based food, EU Regulation 2015/2283 lays out the procedures for authorizing and placing novel foods, including insect-based foods, on the EU market which requires safety assessments by the European Food Safety Authority (EFSA)[8]. EFSA evaluates various factors, such as the nutritional value, potential health risks, and overall safety of insect-based food. This rigorous evaluation process ensures the safety standards, thereby protecting consumer

[5] https://www.benetofoods.com/
[6] https://bugfoundation.com/home-en.html
[7] https://food.ec.europa.eu/safety/novel-food_en
[8] https://food.ec.europa.eu/safety/novel-food/legislation_en

health and building trust in the new and innovative food products entering the EU market. Interest in insects for food and feed in the UK shows significant potential due to its environmental benefits, such as food security, lower greenhouse gas emissions and efficient resource use[9]. In addition to the UK government's commitments to the world global issues include poverty, inequality, climate change, inclusive societies and access to health and education by participating in the Sustainable Development Goals[10].

This market is growing, supported by increasing investment in insect-farming companies such as Entocycle[11] and Better Origin[12]. For instance, funding the start-up company Entocycle with £10 million which works on converting food waste into sustainable animal feed[13]. This company solely focuses on Black soldier fly larvae, because they provide high protein yields and can be produced rapidly and cost-effectively. The dry weight of black soldier fly larvae contains up to 55% crude protein, and up to 35% lipids and has an amino acid profile that is similar to that of fishmeal. Supporting such companies not only contributes to waste management but also creates jobs, enhancing both economic viability and environmental sustainability in the UK. However, at the same time, there is a growing concern by scientists and policymakers concerning the decrease in insect species in the UK (House of Commons, 2024), urging the need to carefully evaluate the efficacy and the current regulations to manage this sector.

In the context of insects as food, the UK has made progress in approving certain insect species for human consumption, which could open up new market opportunities. However, the UK lags behind the EU in this aspect due to revisions and limitations in the approved species post-Brexit, resulting in only five approved species in the UK compared to 9 in the EU. Additionally, British consumer acceptance issues, although only seven studies were conducted in the UK compared with the other European countries, suggest the need for further investigations to explore the preferences further as different carriers have different acceptances. For instance, Italy has been the focus of twenty studies on this topic, while Denmark and Germany have each been the subject of ten studies, highlighting the disparity with the five studies conducted in the UK, four identified by Alhujaili, Nocella and Macready (2023), and a further study conducted by Michel and Begho (2023). Additionally, the

[9] https://agfundernews.com/uk-government-earmarks-10m-for-industrial-insect-farming
[10] https://www.gov.uk/government/news/what-is-the-voluntary-national-review
[11] https://entocycle.com/
[12] https://betterorigin.co.uk/
[13] https://www.ukri.org/news/using-insects-to-convert-food-waste-into-sustainable-animal-feed/

comparatively lower willingness to try edible insects in the UK, as opposed to plant-based and cultured meat alternatives (26%, 60%, and 34% respectively), as reported by the UK Food Standards Agency Ibrahimi, Jarchlo and King (2022), aligns with the findings from an earlier study by Circus and Robison (2019). In particular, the latter study consistently shows a similar hierarchy of preferences, with a substantial 90.6% expressing openness to consuming plant-based meat alternatives, followed by 41% willing to try cultured meat, and 25.9% expressing a willingness to try edible insects. It is interesting to observe that a comparison of the two studies from 2019 and 2022 reveals a significant shift in the willingness to try, particularly regarding plant-based alternatives, where there appears to be a decrease over time. While there is a slight variance in the willingness to try cultured meat, the readiness to try edible insects remains relatively consistent, despite the notable difference in sample sizes—139 participants in 2019 and 1930 participants in 2022. These results underscore the need for a more comprehensive understanding of consumer preferences and attitudes towards insect-based products in the UK market to increase acceptance.

1.2 Aim, research questions and objectives of the study

In light of these considerations, this study aims to investigate UK consumers' attitudes, preferences and willingness to pay for bread and pasta made with insects. This study provides insights for stakeholders of the food industry and policy makers to facilitate the introduction of these products in the UK market, addressing the existing gap in research and contributing to a more nuanced understanding of factors influencing consumer purchasing behaviour regarding insect-based foods.

Table 1.1 illustrates how this thesis fulfils the research aim by addressing the research questions and achieving the stated objectives by employing qualitative and quantitative research methods.

The research questions:

1. What are the primary factors influencing consumers' acceptance of insects as a food source?
2. What marketing strategies are effective in promoting insect-based burgers in the UK market?
3. How do psychological factors (e.g., attitude and subjective norms) influence British consumers' preferences for bread and pasta made with insect flour?

4. What is the average price that British consumers are willing to pay for bread and pasta made with cricket flour?

Four research objectives have been derived, as follows:

1. To explore the factors influencing consumers' acceptance of insects as food.
2. To investigate the potential market for insect-based food, particularly insect-based burgers, in the UK.
3. To examine how psychological factors (e.g., attitude and subjective norms) influence British consumers' preferences for bread and pasta made with insect flour.
4. To elicit British consumers' willingness to pay for insect-based products, specifically bread and pasta made with insect flour.

1.3 Methods of the study

The approach taken by the study is as follows:

First, for consumers' acceptance of insect-based food, we conducted a systematic review utilising PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guideline (Moher *et al.*, 2009), the SPIDER (Sample, Phenomenon of Interest, Design, Evaluation, and Research type) tool (Cooke, Smith and Booth, 2012), and the 4Ps (Product, Price, Promotion, and Place) (McCarthy, 1960), when developing a framework for consumer acceptance of insect-based food. In addition, we applied SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis to the marketing strategies (Helms and Nixon, 2010).

Second, regarding the potential market for insect-based food, we conducted interviews with stakeholders in the UK to get a better understanding of the opportunities and challenges that might face insect-based food development. Then we conducted focus groups, applying the model devised by Fishbein and Ajzen (1975) when developing burgers made with insects.

Third, concerning British consumers' preferences for insect-based products (bread and pasta made with cricket flour), and how background and psychological factors can influence their preferences, we performed a multinomial logistic regression (MNL) (Shabbir, 1993), applying an extended version of the theory of planned behaviour (TPB) (Ajzen, 1991).

Fourth, in eliciting British consumers' willingness to pay (WTP) for bread and pasta made with cricket flour, we used two different methods, double-bounded dichotomous choice analysis (DBDC) (Hanemann, Loomis and Kanninen, 1991), and application of the price sensitivity meter (PSM) (Van Westendorp, 1976).

Table 1. 1: Research questions, objectives, and methods used in this study

Research questions	Objectives	Methods
1. What are the primary factors influencing consumers' acceptance of insects as a food source?	1. Explore the factors influencing consumers' acceptance of insects as food.	Systematic review utilising PRISMA guideline, the SPIDER tool, the 4Ps and SWOT analysis.
2. What marketing strategies are effective in promoting insect-based burgers in the UK market?	2. Investigate the potential market for insect-based food, particularly insect-based burgers, in the UK.	Interviews and Focus groups utilising the Fishbein model.
3. How do background (e.g., age and sex) and psychological factors (e.g., attitude and subjective norms) influence British consumers' preferences for bread and pasta made with insect flour?	3. Examine how background variables (e.g., age and sex) and psychological factors (e.g., attitude and disgust) influence British consumers' preferences for bread and pasta made with insect flour.	Survey by performing MNL utilising an extended version of TPB.
4. What is the average price that British consumers are willing to pay for bread and pasta made with cricket flour?	4. Elicit British consumers' willingness to pay for insect-based products, specifically bread and pasta made with insect flour.	Survey by performing DBDC and PSM analysis.

1.4 Thesis structure

The thesis consists of six chapters.

Chapter 1 introduces the research outlining the problem, addressing the existing gap in knowledge, specifying the research focus, and providing justifications for undertaking the study. It articulates the aim, research questions, and objectives of the study with a concise overview of the methods employed in each subsequent chapter.

Chapter 2 presents the results of a systematic review where the PRISMA guideline and SPIDER tool were utilized in examining consumers' acceptance of insects as food, delving into the challenges and motivations influencing this acceptance. It offers insights into the development of marketing strategies aimed at enhancing overall acceptance, applying the 4Ps and SWOT analysis.

Chapter 3 offers detailed insights into the potential market for insect-based food in the UK by evaluating both its benefits and risks, in addition to insights on British consumers' attitudes and their preferences regarding burgers made with insects, employing the Fishbein model (Fishbein and Ajzen, 1975).

Chapter 4 offers detailed insights into the theoretical and conceptual framework that underpins the survey: it was developed employing an extended version of the theory of planned behaviour. Additionally, it outlines the statistical and econometric models used to analyse consumers' preferences and willingness to pay for bread and pasta made with cricket flour.

Chapter 5 presents the results and discussion of an investigation into the differences between individual British consumers, using elements of the extended version of the theory of planned behaviour. It provides insights into their preferences for bread and pasta made with cricket flour, along with the factors influencing these preferences, and sheds light on the willingness of British consumers to pay for these products.

Chapter 6 summarises the thesis and presents detailed insights drawn from the entire study. This chapter synthesizes the key discoveries, explores their implications, and places them within the broader context of the research. It also addresses the limitations of the study and proposes avenues for future research.

CHAPTER 2. Consumers' acceptance and marketing of insects as food: a systematic literature review[14]

2.1 Introduction

The dramatic increase in food insecurity globally is affecting around 2 billion people, with the COVID-19 pandemic projected to add 83-132 million individuals (OECD/FAO, 2020). Food insecurity will also be exacerbated by the growth in the world population, which is projected to rise from 7.7 billion in 2019 to 9.7 billion in 2050 (United Nations, 2019). These issues are accompanied by an increase in the demand for livestock production which is associated with environmental, economic, and ethical problems (Steinfeld *et al.*, 2006; Westhoek *et al.*, 2011; Rojas-Downing *et al.*, 2017; OECD/FAO, 2020; FAO, 2022). Therefore, identifying alternative sources of protein can be helpful for policy makers and stakeholders tackling these issues. Offsetting the predicted food shortages and mitigating the consequences of increased food production by using meat alternatives will be critical to reducing negative consequences for human beings and the environment. Some of these alternatives exist in the global market (e.g., plant-based meat), others exist in more specialized markets (e.g., insect-based food), while the rest are not yet commercially available (e.g., cultivated meat).

Insects, due to their high protein, healthy fat, calcium, iron and zinc content, are considered a promising alternative to protein obtained from farm animals (Rumpold and Schlüter, 2013; van Huis *et al.*, 2013). Unlike plants, they provide food with complete animal protein (Orkusz, 2021). Insect production, such as mealworms, releases fewer greenhouse gas (GHG) emissions and their use requires fewer natural resources (e.g. water, land, energy) than conventional meat protein sources (Oonincx and de Boer, 2012; Miglietta *et al.*, 2015). Moreover, insects are highly efficient at converting their own food intake into protein. For example, crickets’ feed conversion ratio is twice that of chickens, 4 times that of pigs and 12 times that of cattle (van Huis, 2013). Thus, if livestock production is partially replaced by insect production, more land and grain for livestock feed would be available for crop production and human consumption respectively. However, the sustainability of insects as

[14] This chapter was published as an article on February 19th, 2023: Alhujaili, A., Nocella, G. and Macready, A. (2023) ‘Insects as Food : Consumers ’ Acceptance and Marketing’, *Foods*, 12(4), pp. 1–21. Available at: https://doi.org/10.3390/foods12040886
Author Contributions: Conceptualization, methodology, formal analysis, investigation, data curation, writing—original draft preparation, and visualization, A.A.; validation, A.A. and G.N.; writing—review and editing, A.A., G.N. and A.M.; supervision, G.N. and A.M.

food depends on many factors, such as the species used, the type of feed required and the energy consumed when producing insect-based products (Dagevos, 2021). In addition, as with other novel foods, insect production requires the development of new value chains and attention to issues such as production costs, food safety, and consumer acceptance (van Huis, 2013; Henchion *et al.*, 2017; Cadinu *et al.*, 2020).

Researchers' interest in exploring consumer acceptance of insects as food has increased rapidly in the past decade (van Huis, 2020), encompassing empirical studies and various types of reviews. While empirical studies are essential for providing primary data and insights into consumer behaviour and attitudes, reviews are important for summarizing and synthesizing existing knowledge, identifying gaps in the literature, and guiding future research directions. Systematic reviews are more rigorous than other types of reviews (e.g. narrative and scoping reviews) due to their precise methodological approach, which involves developing a structured, pre-defined protocol (Smith and Duncan, 2022)(Grant and Booth, 2009). This leads to reliable and comprehensive outcomes because the process is transparent and reproducible when reporting the results. We identified four systematic reviews of this topic with different focuses, aims, and criteria (Hartmann and Siegrist, 2017; Mancini, Moruzzo, *et al.*, 2019; Onwezen *et al.*, 2021; Kröger *et al.*, 2022). The previous systematic reviews have targeted developed countries, with no consistent framework used in reporting the results. Exceptionally, Onwezen *et al.* (2021) adopted the framework of Siegrist (2008) framework for consumer acceptance of novel food.

To the best of our knowledge, only two specific frameworks have been developed to analyse the factors that influence consumer acceptance of entomophagy (Lensvelt and Steenbekkers, 2014; Kauppi, Pettersen and Boks, 2019). Lensvelt and Steenbekkers (2014) identified three categories: 1) product attributes (e.g. price, quality, health benefits/risks, naturalness, convenience); 2) trust and social norms; and 3) psychological factors (attitudes, culture). Kauppi, Pettersen and Boks (2019) identified two categories: consumer factors, and the product's commercial potential. Based on the above, we aimed to develop a framework solely for the factors that influence consumers' acceptance of insect-based food based on a systematic review to get a comparative understanding of these factors. To achieve this aim, the following questions were explored. Would the factors influencing the acceptance of insect-based food identified from previous frameworks be reshaped? Do these factors influence consumers in developed and developing countries in the same way?

Which marketing strategies might best benefit retailers and food industries to increase consumer acceptance of these products?

2.2 Materials and Methods

2.2.1 Identification of the relevant articles

In August 2021, a literature search was conducted in selected bibliographic databases to collect information from 2010-2020 necessary to answer our research questions. Bibliographic databases are broadly defined as digital collections of references to published sources (e.g. journal articles, books, conference proceedings) tagged with specific titles, author names, affiliations, and abstracts (Gasparyan, Ayvazyan and Kitas, 2013). We performed a search in three major multidisciplinary bibliographic databases (ScienceDirect, Web of Science and Scopus) combining Boolean operators (AND, OR and NOT) and keywords identified by researchers involved in this study. The main keywords relating to the product included "Insect", "edible", "entomophagy". Keywords relating to the consumer included "acceptance, "preferences", "perception", "values", "attitudes", "reaction", "knowledge", "behavio*", "consumption", "liking", "intention". We also searched for "willingness to…", "adopt", "purchase", "pay", "buy", "try", "eat", "consume".

To improve the reporting of this systematic review, we followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher *et al.*, 2009), as illustrated in Figure 2.1, Steps 1 and 2 were developed by exploring the databases, while steps 3 and 4 implemented the Sample, Phenomenon of Interest, Design, Evaluation and Research type (SPIDER) tool which is recommended for answering research questions from both qualitative and mixed methods research studies (Cooke, Smith and Booth, 2012). The English language was selected to identify original papers researching insects as food in consumer studies published in peer-reviewed journals from 2010-2020. We applied the SPIDER tool to categorize the inclusion/exclusion criteria as indicated in Table 2.1

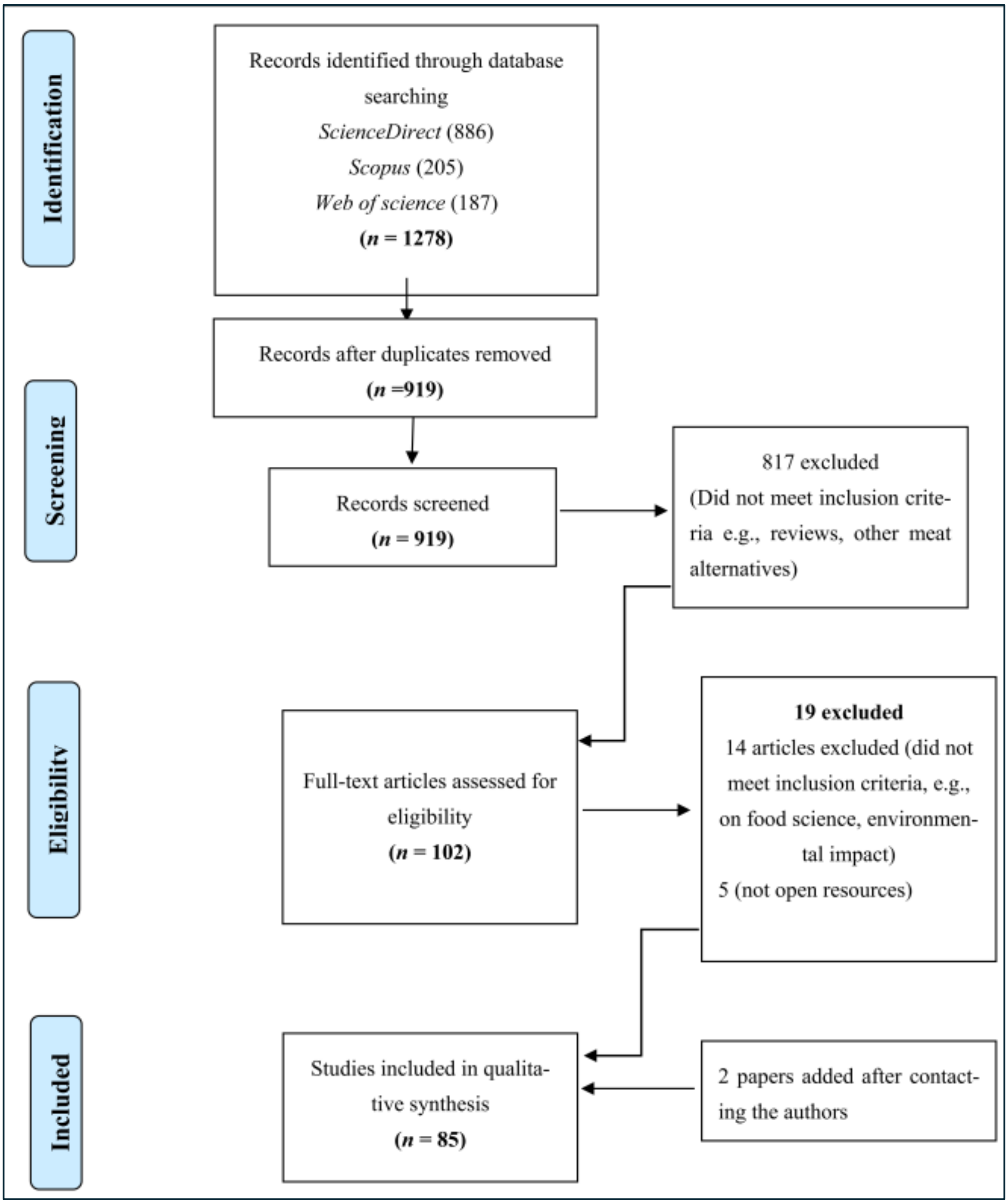


Figure 2. 1: Flow chart of the systematic review of insects as food

In total, 1278 articles were selected: 886 from ScienceDirect, 205 from Scopus, and 187 from Web of Science. A total of 359 duplicate articles were eliminated using Mendeley, and 817 further articles did not meet the inclusion criteria. Nineteen articles were excluded because they did not answer research questions, and where the study's details were unclear, authors were contacted, with two articles subsequently included. Overall, 85 studies were included in the final sample.

Table 2. 1: The inclusion and exclusion criteria for article selection using the SPIDER tool

Criteria	**Inclusion**	**Exclusion**
S: Sample	Consumer studies	Publications not in English
PI: Phenomenon of Interest	Focus on consumer acceptance of insects as food	Focus on consumer acceptance of other alternatives (e.g., artificial meat, plant-based)
D: Design	Choice experiment/ survey/ interview/ focus group/ questionnaire/ case study	-
E: Evaluation	Acceptance/ preferences/ perception/ values/ attitudes/ reaction/ behavior/ consumption/ liking/ willingness to accept/ willingness to purchase/ willingness to pay/ willingness to buy/ willingness to try	-
R: Research type	Qualitative/quantitative/ mixed method	-
Other criteria		Reviews/books

2.2.2 Data extraction process

Data from the reviewed papers were extracted and checked by two reviewers; disparity was resolved by discussion and consensus. Information extracted from studies included in this systematic review has highlighted aspects such as the country in which the research was conducted, sample characteristics, methods used, product details, insect type and main findings, as illustrated in Appendix 2.1 and 2.2.

2.3 Results

2.3.1 Overview of studies included in this review

Four main observations emerged from the analysis of the included studies. First, 85 studies were conducted in 32 countries, of which 22 are developed and 10 developing[15]. There were 78 studies that referred to at least one developed country and only 14 investigated this topic in a developing country. For developed countries, there was a significant upward trend over the years in the number of studies conducted. This is possibly due to the growing interest of researchers, food industries, and policy makers in insects as an alternative

[15] The development status identification is based on the United Nations classification 2022.

source of protein to provide solutions for food insecurity and the unsustainability of meat production (Figure 2.2). Furthermore, possible reasons for the discrepancy in the number of studies conducted in developed and developing countries could be identified by their disparity of economic resources and by the fact that in some developing countries people already consume insects. The decreased number of studies observed in 2020 may have been caused by the COVID-19 pandemic.

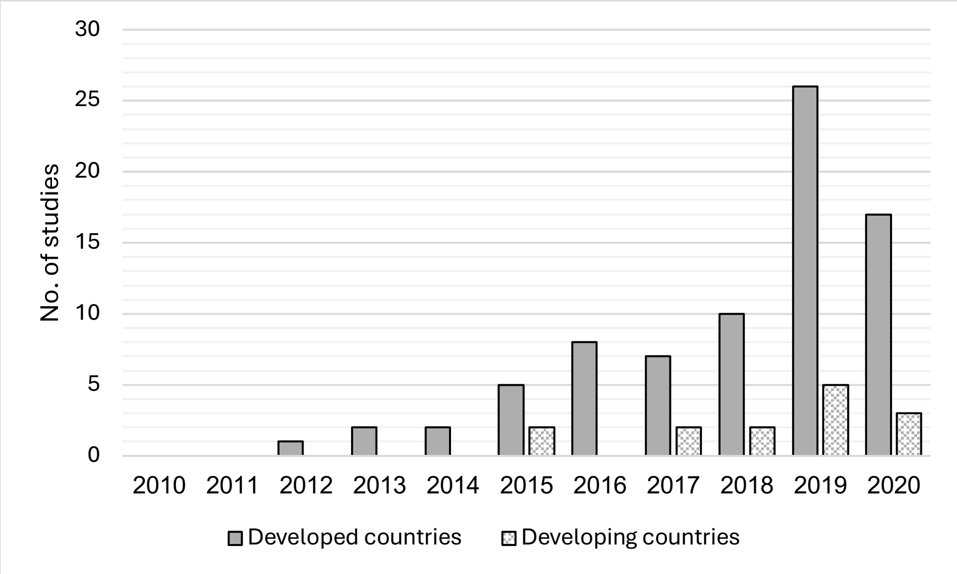


Figure 2. 2: Comparison of the number of studies conducted in developed and developing countries.

Second, 79 studies used quantitative techniques and 10 used qualitative methods such as in-depth interviews and focus groups, with some studies using both techniques. These studies varied in reporting the results in relation to the sample such as many did not report the effect size, education level, age and gender. Where age was reported, we noted a bias towards younger participants, with an average age of 37.41 (s=9.12) across all studies. This may be due to the online nature of the studies, but also to the difficulty of interviewing older people. The average age for participants in experiments was 27.48 (s=8.21). These were only conducted in developed countries, and many involved university students (e.g., Cicatiello, Vitali and Lacetera, 2020; Modlinska, Adamczyk and Goncikowska, 2020). Women were better represented than men in both surveys and experiments (55 and 53 countries respectively) which is interesting because the literature suggests that females' acceptance of insects as food is lower than males (Mancini, Moruzzo, *et al.*, 2019; Onwezen *et al.*, 2021; Kröger *et al.*, 2022); thereby, we would expect them to be less willing to participate in studies involving insects as food.

Third, many studies explored consumer acceptance of insects as food in general without mentioning the types of insects (e.g., Vanhonacker *et al.*, 2013; Le Goff and Delarue, 2017; Myers and Pettigrew, 2018; Verneau *et al.*, 2020), which could lead to misinterpretation of consumers' acceptance (Hartmann and Siegrist, 2017). When the insect type was specified, the most investigated were crickets in 36 studies (e.g., Sogari, Menozzi and Mora, 2018; Wilkinson *et al.*, 2018; Barton, Richardson and McSweeney, 2020), followed by mealworms in 35 studies (e.g., Rumpold and Schlüter, 2013; Tuccillo, Marino and Torri, 2020), and grasshoppers in 15 studies, (e.g., Séré *et al.*, 2018; Collins, Vaskou and Kountouris, 2019; La Barbera *et al.*, 2020). The popularity of these species may be because they are already used as feed for pets (van Huis, 2020), and they are more currently available in western markets (Berger *et al.*, 2018; Ardoin and Prinyawiwatkul, 2020; Barton, Richardson and McSweeney, 2020; Petersen, Olson and Rao, 2020), and are the most likely growth markets in the future. Two studies included spiders and scorpions which belong to the subphylum of arachnids. Even if arachnids belong to the phylum of arthropod like insects, they are not the same, but they are often considered to be edible (Wilkinson *et al.*, 2018).

Fourth, while many researchers did not specify the product details, most of those who did specify them considered insects when they were invisible in the products being discussed. This could be because Western consumers may be more willing to eat insects when they are invisible and highly processed in the food (Dagevos, 2021). The most thoroughly investigated insect-based products were burger patties in 20 studies (e.g., Harms and Pirolet, 2018; Poortvliet *et al.*, 2019), protein bars in 15 studies (e.g., Berger *et al.*, 2019; Ardoin and Prinyawiwatkul, 2020), and cookies in 8 studies (e.g., Sogari, Menozzi and Mora, 2017; Roma, Palmisano and De Boni, 2020). Where insects were visible in the product, they were mostly described as fried in 10 studies (e.g., Woolf *et al.*, 2019; Tuccillo, Marino and Torri, 2020); whole in 7 studies (e.g., Bartkowicz and Babicz-Zielińska, 2020; Orkusz *et al.*, 2020), or dried in 5 studies (e.g., Balzan *et al.*, 2016; Nyberg, Olsson and Wendin, 2020).

Results emerging from this systematic review are predominantly concerned with consumer acceptance of insects as food in Western and developed countries. This indicates a need for more studies in developing countries because the increase in livestock demand will make meat production in these countries unsustainable, therefore, exploring meat alternatives can contribute to mitigating this problem (Upton, 2004; McLeod, 2011). Due to the lack of consistent reporting of participants and product characteristics, our ability to form reliable general conclusions is limited and highlights the need for greater precision in the construction, administration, and reporting of future studies in this area. Bearing this in mind, Figure 2.3 illustrates that the factors influencing consumer acceptance and buying behaviour of insect food can be classified as (i) personal factors (socio-demographic, psychological, and familiarity) and (ii) the elements of the marketing mix (product, price, promotion, and place). Factors highlighted in green and red can influence consumer acceptance positively and negatively respectively, while the influence of those highlighted in yellow is undetermined. Furthermore, when the identified factors appear in bold their influence on consumer acceptance of insect food, concerning both personal factors and the elements of the marketing mix, is strong.

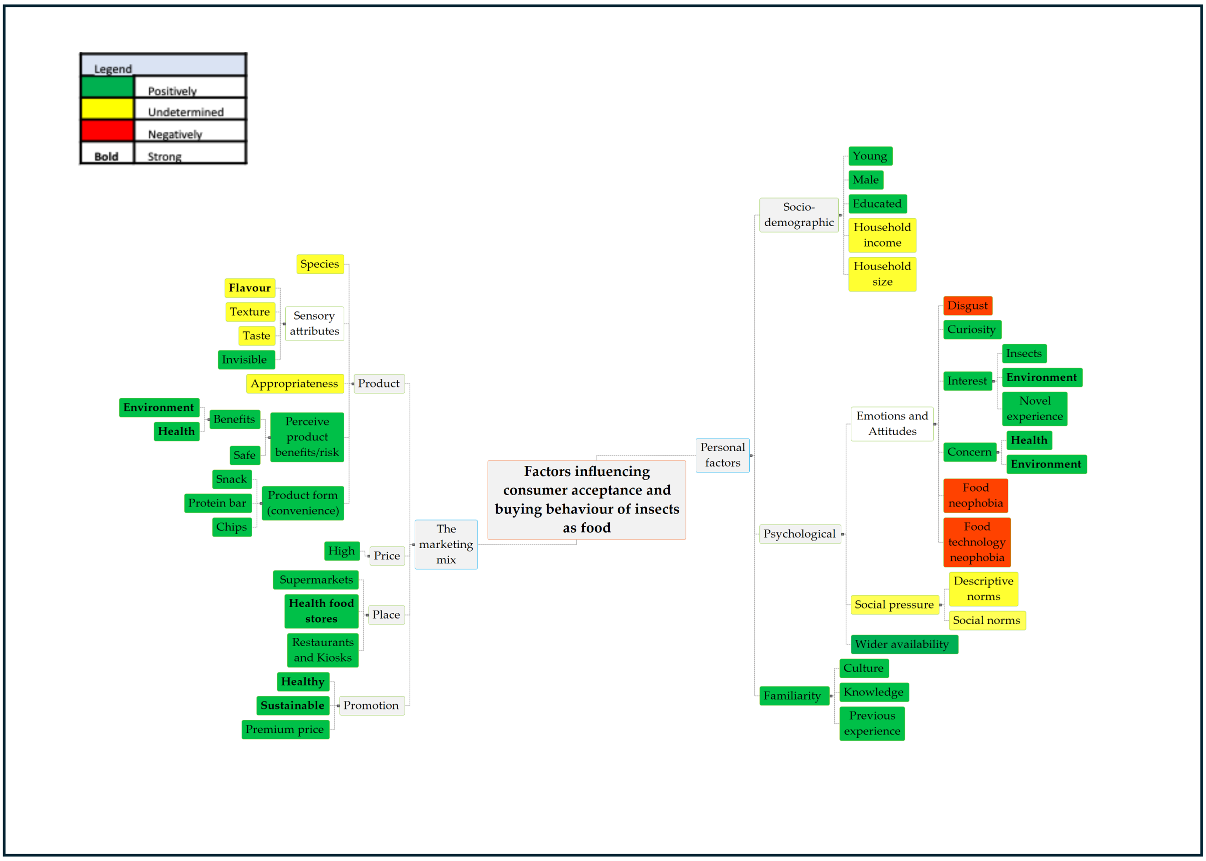


Figure 2. 3: Factors influencing consumer acceptance and buying behaviour of insects as food.

2.3.2 Personal factors

Several personal factors appeared to be significant predictors of consumer acceptance of insects as food.

2.3.2.1 Sociodemographic characteristics

Results of this systematic review show that gender was the most investigated consumer characteristic, followed by age, level of education, household income and family size, with comparisons being made between different regions of the same countries. However, for developing countries, only five studies report information about gender and age.

The majority of studies found that gender is a significant predictor with males more willing than females to accept insects in various products regardless of the visibility of insects in the food (Verbeke, 2015; Caparros Megido *et al.*, 2016; Verneau *et al.*, 2016, 2020; Cicatiello *et al.*, 2016; Laureati *et al.*, 2016; Sogari, Menozzi and Mora, 2019; Menozzi *et al.*, 2017; Sogari, Menozzi and Mora, 2017; Wilkinson *et al.*, 2018; Pambo *et al.*, 2018; Schlup and Brunner, 2018; Woolf *et al.*, 2019; Palmieri *et al.*, 2019; Schäufele, Barrera Albores and Hamm, 2019; Ardoin and Prinyawiwatkul, 2020; Szendrő, Tóth and Nagy, 2020; Tuccillo, Marino and Torri, 2020; Videbæk and Grunert, 2020). For instance, an online survey conducted in Italy found that males were 2.55 times more willing than females to try fried insects and meat burgers with larvae on the top (Cicatiello *et al.*, 2016). Other studies found that gender was not significantly important (Hartmann *et al.*, 2015; La Barbera *et al.*, 2018; Sogari, Menozzi and Mora, 2018; Mancini, Sogari, *et al.*, 2019; Rumpold and Langen, 2019; Simion *et al.*, 2019; Sogari, Bogueva and Marinova, 2019; Dupont and Fiebelkorn, 2020).

In many studies, age was a significant factor, with younger individuals showing more positive attitudes than older individuals towards insect-based food (Verbeke, 2015; Laureati *et al.*, 2016; Wilkinson *et al.*, 2018; Pambo *et al.*, 2018; Collins, Vaskou and Kountouris, 2019; Orsi, Voege and Stranieri, 2019; Palmieri *et al.*, 2019; Simion *et al.*, 2019; Sogari, Bogueva and Marinova, 2019; Sogari, Menozzi and Mora, 2019; Szendrő, Tóth and Nagy, 2020; Videbæk and Grunert, 2020; Olum *et al.*, 2020; Roma, Palmisano and De Boni, 2020). For example, Sogari, Bogueva and Marinova (2019) found that younger individuals were more open to trying insects as food due to their increased awareness of the environmental benefits associated with replacing more conventional animal-based protein with insect-based protein. Their food culture was also less firmly established, suggesting that they would be more willing to try new foods. In contrast, two studies showed that older participants in Japan and China were more likely to eat insects than the younger ones because older people in these countries had previous experience eating insects (Payne, 2015; Liu, Li and Gómez, 2020), highlighting the importance of long-standing habits. Other studies found that age was not a significant predictor of consumers' acceptance of insect food (Caparros Megido *et al.*, 2014; Hartmann *et al.*, 2015; Cicatiello *et al.*, 2016; Menozzi *et al.*, 2017; Lammers, Ullmann and Fiebelkorn, 2019; Mancini, Sogari, *et al.*, 2019;

Rumpold and Langen, 2019; Schäufele, Barrera Albores and Hamm, 2019; Woolf *et al.*, 2019).

Individuals with a higher level of education were more inclined to consume insects as food (Cicatiello *et al.*, 2016; Pambo *et al.*, 2018; Brunner and Nuttavuthisit, 2019; Olum *et al.*, 2020; Szendrő, Tóth and Nagy, 2020; Verneau *et al.*, 2020). Pambo *et al.* (2018) showed that with increasing education levels, Kenyans' intentions to consume food made from edible insects became firmer, in comparison to those of their less educated compatriots. Interestingly, Brunner and Nuttavuthisit, (2019), in Switzerland and Thailand, found that educational influence differed between cultures, where early adopters of insects as food in Switzerland were more educated, while in Thailand they were less educated. This was explained by that more highly educated people in Switzerland appeared to care about sustainability and health aspects of entomophagy, while in Thailand, educated individuals instead associated entomophagy with Thailand's rural traditions. Again, other studies found no link between education and willingness to accept insects as food (Hartmann *et al.*, 2015; Verbeke, 2015; Schlup and Brunner, 2018; Lammers, Ullmann and Fiebelkorn, 2019; Rumpold and Langen, 2019; Schäufele, Barrera Albores and Hamm, 2019; Woolf *et al.*, 2019).

Only a few studies found a significant influence on household income and size. Households with higher incomes were more willing to accept insects as food in China (Liu, Li and Gómez, 2020), and to consume edible insects in Poland (Orkusz *et al.*, 2020). The greater household size in China increased the acceptability of insects as food (Liu, Li and Gómez, 2020), while, in Kenya, the greater household size decreased the acceptability (Pambo *et al.*, 2018). Interestingly, the rate of acceptance can differ in the same country, as illustrated in three studies. Respondents from the northern regions of Italy showed a higher willingness to accept insects as food than those from the southern regions (Menozzi *et al.*, 2017; Sogari, Menozzi and Mora, 2019), and respondents from Nanjing, China, were more willing to buy edible insects than consumers in Beijing (Liu, Li and Gómez, 2020).

2.3.2.2 Psychological factors

2.3.2.2.1 Emotions and attitudes

Emotions can influence attitudes, and both are evaluations of objects. However, while emotions are the evaluation of a state that ceases after the person is no longer in the situation that gave rise to them, attitudes can be temporary or enduring, as they do not necessarily vanish after the person is no longer in that situation (Clore and Schnall, 2005). Regarding consumer acceptance of insects as food, these studies showed that the influence of emotions is linked to disgust and curiosity, while that of attitudes is linked more closely to consumers' concern and interest, food neophobia, and food technology neophobia.

Disgust could generally accrue towards unknown food (Rozin and Fallon, 1980), and in the case of insects as food, it is generally seen as the key negative determinant of consumer acceptance, especially in developed countries. For example, disgust was associated with an unwillingness to accept, try, and pay for both processed and unprocessed edible insects (Sogari, Menozzi and Mora, 2017; Menozzi *et al.*, 2017; Fischer and Steenbekkers, 2018; La Barbera *et al.*, 2018, 2020; Castro and Chambers, 2019a; Circus and Robison, 2019; Orsi, Voege and Stranieri, 2019; Powell, Jones and Consedine, 2019; Ruby and Rozin, 2019; Woolf *et al.*, 2019; Kornher, Schellhorn and Vetter, 2019; Lammers, Ullmann and Fiebelkorn, 2019; Szendrő, Tóth and Nagy, 2020; Tuccillo, Marino and Torri, 2020; Videbæk and Grunert, 2020; Liu, Li and Gómez, 2020; Orkusz *et al.*, 2020).

There is a difference in the sense of disgust that varied across countries, ranging from 26% to 82%. We have observed that it is lower when consumers have been exposed to insect-based products previously. For instance, in Belgium, Van Thielen *et al.* (2019) conducted a study two years after selling insect-based products in the market where they found that 57% of Belgian participants reported not eating food containing insects. There were many reasons given for this rejection, including price, religion, and diet, however, disgust/feeling dirty were the most important, accounting for 26% of these reasons. In a cross-cultural study (Gómez-Luciano, Vriesekoop and Urbano, 2019), only 4% of Dominicans and 25% of Spaniards were willing to accept insect-based protein. For Dominicans, disgust accounted for 82.7% of the reasons given. Notably, this study included other sources of protein (plant-based proteins, mycoproteins, and cultured meat proteins), and insect protein was the least preferred in both countries.

Curiosity about insects revolved around the taste, texture, and novelty of insects, which was a motivator for consumer acceptance of this food type in their diet. For example, curiosity about insects motivated Swiss and Dutch consumers to try insect-based food (House, 2016; Harms and Pirolet, 2018). For Italian consumers, curiosity also increased their likelihood of future consumption (Sogari, 2015), and curiosity relating to taste and texture was a significant factor in encouraging Italian consumers to try cookies made with cricket flour (Sogari, Menozzi and Mora, 2017). Moreover, due to the novelty of insects as food, Dutch consumers previously exposed to insects as food were willing to try novel insect products as long as these met their expectations of insect preparation for optimal flavour (Tan *et al.*, 2015).

Interest in insects as food was found by Videbæk and Grunert (2020) to motivate Dutch consumers to eat insects in both visible and invisible forms. Those consumers were influenced by interest rather than disgust, suggesting that increasing consumers' interest to encourage the willingness to try insects as food could help to overcome the barriers surrounding entomophagy, for instance stimulating interest in the health and environmental aspects of eating insects (Ruby and Rozin, 2019; Nyberg, Olsson and Wendin, 2020). In addition to the interest in having variety and novel food experiences which were found to increase acceptance of insects as food (House, 2016; Gere *et al.*, 2017; Myers and Pettigrew, 2018; La Barbera *et al.*, 2020; Modlinska, Adamczyk and Goncikowska, 2020; Nyberg, Olsson and Wendin, 2020).

Concerns about the impact of food on one's health and the environment can influence acceptance. For instance, Italians who are concerned about the health and environmental impacts of insects as food are, on average, approximately 22% more likely to be willing to consume insects than those who are not (Palmieri *et al.*, 2019). Those intending to reduce their conventional meat intake are also more likely to adopt insects as food (Verbeke, 2015; Gere *et al.*, 2017).

Food neophobia is a strong predictor of aversion to novel foods where a high level of food neophobia, negatively influences willingness to taste and cook novel food even in young people who are skilled in cookery (Muhammad *et al.*, 2016); vice versa, when food neophobia is low, the willingness to try novel food will be higher (Olabi *et al.*, 2009). In the case of insect-based food, Modlinska, Adamczyk and Goncikowska (2020) found that people with lower general neophobia and a higher tendency to seek variety tried the insect-labelled samples sooner than people from the other groups. Concerning the studies included in this review, the negative effect of food neophobia on consumer acceptance of insects as food was observed in both developed and developing countries. For example, in Italy (Laureati *et al.*, 2016; La Barbera *et al.*, 2018; Lombardi *et al.*, 2019; Mancini, Sogari, *et al.*, 2019; Palmieri *et al.*, 2019; Sogari, Menozzi and Mora, 2019; Cicatiello, Vitali and Lacetera, 2020; Tuccillo, Marino and Torri, 2020), Germany (Lammers, Ullmann and

Fiebelkorn, 2019; Orsi, Voege and Stranieri, 2019; Schäufele, Barrera Albores and Hamm, 2019; Dupont and Fiebelkorn, 2020), Poland (Orkusz *et al.*, 2020), Switzerland (Schlup and Brunner, 2018), Australia (Sogari, Bogueva and Marinova, 2019), and Hungary (Gere *et al.*, 2017) and Taiwan (Chang, Ma and Chen, 2019), China (Liu, Li and Gómez, 2020), Uganda (Olum *et al.*, 2020). In addition, cross-country studies concluded similar results (Hartmann *et al.*, 2015; Piha *et al.*, 2018; Brunner and Nuttavuthisit, 2019; de Koning *et al.*, 2020).

Consumer rejection of food produced using new technology (food technology neophobia) was a significant predictor of consumer acceptance in four studies. Schlup and Brunner (2018) found that food technology neophobia negatively affected Swiss consumers' willingness to accept mealworms, locusts, and caterpillars. It was also likely to decrease Belgians' readiness to adopt edible insects by 55% (Verbeke, 2015), their willingness to eat insect burgers and buffalo worms (Lammers, Ullmann and Fiebelkorn, 2019), and to discourage Italians from eating insect-based food (Palmieri *et al.*, 2019).

2.3.2.2.2 Social pressure

Generally, social influence can change an individual's decisions, as people usually tend to follow others because they like to conform (Thaler and Sunstein, 2021). While few studies have explored the influence of social pressure exerted by peers on consumers' acceptance of insects as food, there is some evidence from studies analysing social norms (influence based on others' evaluations/opinions) and descriptive norms (influence of beliefs about what others do) (Cialdini and Trost, 1998). Social norms are shown to predict consumer acceptance of edible insects positively or negatively, with low social acceptance and negative social influence from family and friends decreasing consumers' acceptance and willingness to try insects as food (Sogari, 2015; Sogari, Menozzi and Mora, 2017; Schäufele, Barrera Albores and Hamm, 2019). Conversely, when peers and experts highly rated the taste of a bar and burger made with mealworms, consumers expected the subjective taste of the products to be of high quality, however, the influence of experts was stronger for those who had low disgust sensitivity toward insect food (Berger *et al.*, 2019). Regarding descriptive norms, 53% of students in a tasting session conducted in a study by Jensen and Lieberoth (2019) were willing to try roasted mealworms. However, when they thought their colleagues had tried them, the number of students who tried the foods increased to 81%. Interestingly, authors from one study argued that the enjoyment derived from eating with friends can also increase the acceptance of insect-based food when it is associated with fun (Motoki *et al.*, 2020).

2.3.2.2.3 Wider availability

The lack of food retailers and specialized shops in which consumers cannot easily find these products is an often-cited barrier to increasing consumption of insects as food. When consumers believed they could easily obtain insect-based products, their determination to purchase or consume them increased (Pambo *et al.*, 2018; Chang, Ma and Chen, 2019; Verneau *et al.*, 2020). Conversely, the difficulty in finding these products frustrated intentions to eat insect-based food (Menozzi *et al.*, 2017) and was the main reason for not regularly buying insect-based products (House, 2016) or eating insects regularly (Collins, Vaskou and Kountouris, 2019). However, this was not always the case, as observed by Van Thielen *et al.* (2019) in Belgium two years after the introduction of insect-based food to the market. Only 11% of consumers had tried them, 32% of consumers did not eat them despite their interest in trying them, and 57% did not eat them or show any interest in doing so. This suggests that acceptance may take time, even when products are available in the market and thus perceived behavioural control can be an important psychological element to take into account when investigating consumers' acceptance towards these products.

2.3.2.3 Familiarity

Familiarity with insects seems to influence consumers' acceptance positively. Familiarity could arise from entomophagy being rooted in the national culture such as becoming an indigenous practice or from food insecurity (Looy and Wood, 2006; Raheem *et al.*, 2019). Association of familiarity with the concept of entomophagy, and with food from foreign countries can increase consumer acceptance. When entomophagy is well received from a cultural point of view, as in western regions of Kenya, participants have positive attitudes towards insect-based food (Pambo *et al.*, 2018). When people become familiar with the concept of entomophagy, by learning or hearing about it in a way that builds knowledge about its nature and advantages (such as environmental and nutritional benefits), they are more likely to accept the idea of insects as food (Verbeke, 2015; Laureati *et al.*, 2016; Myers and Pettigrew, 2018; Piha *et al.*, 2018; Woolf *et al.*, 2019; Ardoin and Prinyawiwatkul, 2020). Not knowing how to prepare and eat insects at home negatively influences acceptance (Balzan *et al.*, 2016; Clarkson, Mirosa and Birch, 2018). Additionally, familiarity with food from foreign cuisines creates a positive attitude toward eating insects (Cicatiello *et al.*, 2016), and the lack of previous experience induces a lower willingness to eat insects in China and Germany (Hartmann *et al.*, 2015). This familiarity could differ according to the species of insect that people are accustomed to eating. For example, consumers in Northern Uganda accepted the insects proposed in the study (long-horned grasshoppers, flying African termites, and wingless red termites), while in Central Uganda, participants only accepted long-horned grasshoppers due to their specific familiarity with the species (Olum *et al.*, 2020). In contrast, a lack of familiarity can evoke the idea that eating insects is unnecessary, thereby causing the rejection of insect food. There are various reasons for this, including belief in the sufficiency of meat production (Clarkson, Mirosa and Birch, 2018), cultural rejection based on the idea that insects are vermin or famine food (Myers and Pettigrew, 2018), a strong food culture whose participants prefer traditional ingredients over novel ingredients, such as Italy (Verneau *et al.*, 2016; Iannuzzi, Sisto and Nigro, 2019), or a preference for foods that are familiar to them (Schlup and Brunner, 2018).

2.3.3 Elements of the Marketing Mix

Analyses in these studies provide interesting commercial insights into the efforts of food technologists and marketers to develop and promote insect-based products. The marketing of edible insects could be facilitated by developing strategies based on an understanding of how marketers can take advantage of the 4Ps of the marketing mix (product, price, promotion, and place), to encourage consumer acceptance of these products (McCarthy, 1960).

2.3.3.1 Product

Several studies included in this review have explored aspects of product development, investigating consumers' acceptance of selected species of insects, sensory attributes, perception of the appropriateness of different food products (carriers), convenience, perception of product benefits, risk and safety.

The insect species used in the insect-based product can affect the taste, thereby influencing its acceptance (van Huis, 2020). A few studies have explored consumer preferences for insect-based products developed using different insect species, however, the preferred species differed between countries. In Italy, Tuccillo, Marino and Torri (2020) found that crickets, bee larvae, grasshoppers, mealworms, silkworms, and giant water bugs were the most preferred insects. The authors also explored the role of the insect life stage on consumers' acceptance of insect-based snacks and found that insects in the adult stage were more acceptable than those in the larval stage. In contemporary rural Japan, wasp larvae and grasshoppers were found to be the most acceptable insect types (Payne, 2015). In Romania, consumers who were willing to eat insects preferred locusts and ants to a variety of products based on other species, including crickets and worms (Simion *et al.*, 2019). Finally, the development of insect-based products that are based on species already marketed, such as grasshoppers, mealworms and crickets, can influence consumers' acceptance positively (Fischer and Steenbekkers, 2018).

Sensory attributes are crucial in influencing consumer acceptance of new products (Dagevos, 2021). Appearance, taste, texture, and colour are the most thoroughly explored sensory attributes of the product identified in this review, while the flavour was found in three studies only and results were undetermined. In terms of appearance, several studies have found that consumer acceptance increased when insects were processed and invisible in the final product (Schösler, Boer and Boersema, 2012; Pascucci and De-Magistris, 2013; Cicatiello *et al.*, 2016; Schlup and Brunner, 2018; Wilkinson *et al.*, 2018; Cavallo and Materia, 2018; Clarkson, Mirosa and Birch, 2018; Castro and Chambers, 2019a; Simion *et al.*, 2019; Orsi, Voege and Stranieri, 2019; Schäufele, Barrera Albores and Hamm, 2019; Bartkowicz and Babicz-Zielińska, 2020; Tuccillo, Marino and Torri, 2020; Cicatiello, Vitali and Lacetera, 2020; Orkusz *et al.*, 2020). Balzan *et al.* (2016) conducted five focus groups to explore the readiness of young Italians to consume insects and found that consumers' willingness to eat insect-based food decreased when insect parts appeared in the food. However, this may not be the case where entomophagy is common. For instance, in a study conducted in Germany and China, no difference was observed in the willingness of Chinese people to eat both processed and unprocessed insects (e.g., deep-fried crickets, drinks containing silkworm protein, and cookies based on cricket flour), while German participants were more willing to eat processed insect-based food (Hartmann *et al.*, 2015).

Taste and texture are critical factors that shape product development and thus consumers' decisions regarding unfamiliar food (Rozin and Fallon, 1980). Taste is a significant predictor whether it is concerned with the conventional meat or insects' taste. The high importance of the meat's taste decreases the willingness to adopt insects as an alternative (Verbeke, 2015). The taste expectation and experience can determine consumers' acceptance of edible insects as an alternative source of protein to meat, where individuals' expectations about the taste of insects can affect their reaction because a good or bad taste expectation can respectively increase or decrease the chance that they will eat the insects (Cicatiello *et al.*, 2016). Powell, Jones and Consedine (2019) found that British consumers' willingness to pay for insect-based burgers can decrease when they perceive that the taste of insects is bad. Instead, a good taste experience is important for regular consumption (Lensvelt and Steenbekkers, 2014; House, 2016; Tan, Verbaan and Stieger, 2017). For instance, in the Netherlands, House (2016) revealed that taste was a significant factor influencing Dutch participants' repeated consumption. In this study, one-third of respondents reported that a good taste would be their reason to buy the product again, one-third indicated that a bad taste experience was the reason for not buying it again, and the remaining participants were ambivalent about the taste.

Texture can also influence individuals' acceptance of insect-based food positively or negatively (Harms and Pirolet, 2018; Cicatiello, Vitali and Lacetera, 2020). For example, the crispy texture of baked insects was preferred by Belgium consumers over the texture of boiled insects (Caparros Megido *et al.*, 2014). Participants were also more willing to try insect-based food if it was flavoured (Wilkinson *et al.*, 2018). For example, although Italian participants showed little willingness to accept insect-based food, sweet insect-based products, such as chocolate-coated grasshoppers and cereal bars containing insects, were more attractive than savoury alternatives, such as maggot cheese and risotto containing maggots (Laureati *et al.*, 2016). In Germany, Schäufele, Barrera Albores and Hamm (2019) concluded that grasshoppers were better liked than mealworms. However, in this study, participants did not try the product. Instead, their preferences were based on a brief description of the way the insects tasted, where grasshoppers were described as neutral-flavoured, and mealworms were described as having a flavour similar to nuts. Participants' decisions may have been shaped by associations between the description and their general taste preferences, not by the actual taste of the insects. Colour can also influence acceptance. Bartkowicz and Babicz-Zielińska (2020) found that the ground mealworms bar was preferred over the ground crickets bar which was attributed to the colour of the ground crickets bar. Willingness to eat insects as food was found to be influenced by the product's perceived appropriateness for consumption (Tan *et al.*, 2016; Tan, Tibboel and Stieger, 2017). In the Netherlands, Tan, Tibboel and Stieger (2017) found that acceptance of mealworm products can be influenced by consumers' perceptions of the appropriateness of the insect-based food product(carriers). The study found that Dutch participants considered meatballs to be appropriate and dairy drinks inappropriate. On that basis, developers of an insect-based product should consider this when choosing food carriers, as different carriers elicited different willingness to pay. According to Lombardi *et al.* (2019), Italians' willingness to pay differed among three insect-based products in different carriers (pasta, cookies, and chocolate bars), as participants preferred insect-based pasta over insect-based cookies and chocolate bars. This was explained by the likelihood that consumers are more willing to accept insect-based products in savoury foods than sweet foods. Food carriers can also influence the intentions of participants in trials. Ardoin and Prinyawiwatkul (2020) found that US participants were more willing to try protein bars, chips, snack crackers, or protein shakes, as they perceived these to be the most appropriate of 30 products that included hamburgers, crab cakes, and cheese. Poortvliet *et al.* (2019) showed that consumers were less willing to try a common product made with insects (burger), as it was perceived as less healthy and more disgusting, compared to an uncommon product made with insects (skewers). However, we cannot assume that the insect-based burger is an unsuitable product, as it was the third most preferred insect product among 17 insect-based products, following energy shakes and energy bars (Van Thielen *et al.*, 2019). In a Belgian study, 37% of participants saw insect-based food as an appetizer, 26% as an addition to the main dish, and 23% saw it as a dessert (Caparros Megido *et al.*, 2014).

The convenience of insect-based food is perceived by consumers as satisfying their desire for a product that is easy to access and cook, and fits well with their needs (Lensvelt and Steenbekkers, 2014; Schlup and Brunner, 2018). For instance, Verbeke (2015) found that consumers were more likely to accept insects as food when these were introduced as snacks because convenience increased their readiness to accept them by 75%.

The perception of the product's beneficial attributes such as its healthiness, nutritional value, and environmental benefits can influence consumer acceptance. Perceived healthiness and nutritional value can to some extent enhance consumers' eagerness to try insect-based food (Pascucci and De-Magistris, 2013; Lensvelt and Steenbekkers, 2014; House, 2016; Alemu *et al.*, 2017; Menozzi *et al.*, 2017; Schlup and Brunner, 2018; Van Thielen *et al.*, 2019; Gómez-Luciano *et al.*, 2019; Palmieri *et al.*, 2019; Dupont and Fiebelkorn, 2020; Liu, Li and Gómez, 2020; Petersen, Olson and Rao, 2020). However, perceiving conventional meat as nutritious and healthy can also decrease the willingness to consume insects as food (Schlup and Brunner, 2018). Perceived environmental benefits of insects as food could increase their acceptance (Lensvelt and Steenbekkers, 2014; Petersen, Olson and Rao, 2020; Dagevos, 2021) and enhance subsequent consumption (Sogari, 2015). Regarding the sustainability of insect food production, seven studies found this to be a potential driver of entomophagy (Verbeke, 2015; House, 2016; Palmieri *et al.*, 2019; Nyberg, Olsson and Wendin, 2020; Petersen, Olson and Rao, 2020; Tuccillo, Marino and Torri, 2020). Two other studies, however, found it to be one of the least effective means of motivating acceptance (Wilkinson *et al.*, 2018; Orkusz *et al.*, 2020), while two further studies found it to be an insignificant factor (Chang, Ma and Chen, 2019; Lammers, Ullmann and Fiebelkorn, 2019). According to Cavallo and Materia (2018), sustainability was only influential for highly educated consumers. Nevertheless, the increase in the younger generation's awareness of the unsustainability of food production and consumption may positively influence the perception of the benefits of insect-based products (Sogari, Bogueva and Marinova, 2019).

As far as the novelty of insect-based food is concerned, Clarkson, Mirosa and Birch (2018) found that the perception of eating insects as new and frightening was the main driver for 16% of participants. Iannuzzi, Sisto and Nigro (2019) concluded that the novelty of ingredients (pizza made with insect flour) could decrease acceptance, as Italian participants tended to prefer traditional ingredients.

Perceptions of product safety or the potential risk of eating insects could also influence consumer acceptance. Increased perceptions of safety can decrease the sense of disgust (Modlinska, Adamczyk and Goncikowska, 2020) and increase the willingness to buy insect-based food (Gómez-Luciano *et al.*, 2019). Safety concerns can prevent consumers from eating insects frequently (Liu, Li and Gómez, 2020), but providing information about the products' safety can have a positive influence on consumers' willingness to eat (Alemu *et al.*, 2017), and is important even for regular consumption (Collins, Vaskou and Kountouris, 2019). If consumers associate eating insects with the risk of contamination and contracting diseases, their acceptance will decrease (Lensvelt and Steenbekkers, 2014; Castro and Chambers, 2019a), resulting in a lower willingness to pay for insect-based products (Lombardi *et al.*, 2019). Moreover, it could reduce consumers' willingness to try insect-based food or eat them frequently (Wilkinson *et al.*, 2018; Liu, Li and Gómez, 2020).

2.3.3.2 Price

Price can shape consumers' decisions, and is often positively associated with consumers' perception of the product's quality (Dodds and Monroe, 1985). However, this element of the marketing mix has mainly been explored in developed countries. In the Netherlands, House (2016) interviewed 33 individuals to explore their acceptance of insect-based food, where the price of an insect-based burger (€4) was higher than those of vegetarian (€2–€3) and meat burgers (€1–€3). Although 64% of the participants declared that the price alone would not prevent them from buying the product, it could, in combination with other important factors such as taste, availability, and 'fit' with established eating practices, prevent future consumption. Both price and quality were found to have significantly influenced consumers' acceptance of entomophagy (Lensvelt and Steenbekkers, 2014). In an experiment conducted in Germany by Berger *et al.* (2018), 76 participants were exposed to insect-based burgers at two different prices, €2.99 versus €14.99. The higher price had a positive influence on participants' expectations and willingness to pay for the insect-based burger, as it was associated with the quality of the product and even showed an influence on the later consumption of unprocessed insects (mealworms with truffles), although the price of the truffles was not disclosed. Moreover, price reduction negatively influenced the willingness to pay for the insect-based burger, as it decreased consumers' expectations of the product's quality. It was also found that quality alone could influence willingness to try insects such as cockroaches because they were perceived by the participants as poor in quality and spoiled (Wilkinson *et al.*, 2018).

2.3.3.3 Promotion

Adapting the design and promotion of insect-based food to consumers' needs, emotions, and attitudes is crucial to increasing their acceptability. Promotional communication can be developed on the perception of the product's benefits, safety and risks. Communicating with consumers about the benefits of eating insect-based food (e.g. chocolate bars made with protein from crickets), whether delivered as social or individual benefits, increases their willingness to eat these products (Verneau *et al.*, 2016). Moreover, advertising insects as healthy and sustainable can gain favourable attention from consumers Van Thielen *et al.* (2019). In New Zealand, Clarkson, Mirosa and Birch (2018) ran focus groups with 32 participants, aimed at designing the ideal insect-based product, with the attributes that consumers would most strongly prefer. The participants designed it to be promoted as a convenience food (e.g., in snacks), emphasizing the idea that insects are healthy, and recommending that it should be sold at a premium price, in sustainable packaging that would support the idea of insect sustainability. Van Thielen *et al.* (2019) concluded that it should be declared on the packaging that the product contained insects, as this could increase the willingness to pay for the insect-based product (Pascucci and De-Magistris, 2013). It has been suggested that insect-based products should be promoted by affective messages, such as an invocation of the positive emotions that arise from choosing insect-based food, as it is good for one's health, instead of cognitive messages stating that research shows that insect-based products are healthy and environmentally friendly (Onwezen *et al.*, 2019). However, three studies found that nutritional claims, for example, that it was high in protein, decreased consumers' acceptance of insect-based food (Cavallo and Materia, 2018; Sogari, Bogueva and Marinova, 2019), and communication of environmental benefits was considered one of the least powerful motivations for accepting insects as food (Orkusz *et al.*, 2020). Therefore, when insect-based food is promoted, it should be clearly established that these products are safe to eat (Alemu *et al.*, 2017; Khalil *et al.*, 2021) as they can positively influence consumers' willingness to eat them, which is important for regular consumption (Collins, Vaskou and Kountouris, 2019).

2.3.3.4 Place

In terms of locations for buying these products, the availability of insect-based products is one of the important factors that can determine consumer acceptance (Halonen *et al.*, 2022). Participants in different studies appear to prefer supermarkets, followed by health food stores, restaurants and kiosks (Alemu *et al.*, 2017; Clarkson, Mirosa and Birch, 2018; Van Thielen *et al.*, 2019).

2.4 Discussion

2.4.1 General discussion

The current systematic review offers a comprehensive overview of consumer acceptance of insects as food, as it includes research on developed and developing countries, covers both quantitative and qualitative studies, and uses the SPIDER tool when developing the inclusion/exclusion criteria. Our study contributes to previous studies (Siegrist, 2008; Lensvelt and Steenbekkers, 2014; Kauppi, Pettersen and Boks, 2019) by developing a framework that helps to discuss in detail the impact of psychographics and marketing aspects on consumer acceptance of insects as food and thus providing insights to marketers and other stakeholders of the food industry.

Our results confirm most of the results of previous systematic reviews even if we observe that they varied in the number of factors identified, and in the level of significance of two important factors, age, and education. According to Mancini, Moruzzo *et al.* (2019) and Onwezen *et al.* (2021), younger and more educated people were more willing to accept insects as food, while another systematic review Kröger *et al.* (2022) concluded that age and level of education were non-significant in the majority of studies. Our findings support that younger and more educated people are more likely to accept insects as food, but we also observe that in several surveys the distribution of participants' age was biased towards young people. We also observe that although males were found to be more willing than females to accept insects as food, this difference varied between countries (Onwezen *et al.*, 2021) and many studies showed it was not significant (Kröger *et al.*, 2022). We concur with findings that question the influence of these socio-demographic characteristics on consumer acceptance and suggest that future research further explores their role, especially in developing countries where only a few studies have investigated this aspect.

The inclusion of developing countries has revealed that consumers from these nations are more willing to accept insect-based food than people in developed countries. However, we observed the opposite in two cases which were due to the influence of familiarity and religion. Familiarity plays a significant role in Japan: although it is a developed country, insect-based products were more acceptable to the older citizens, who were familiar with eating insects. This suggests that developed countries can learn from developing countries where people are more familiar with the consumption of insects as food and thus more studies could be conducted in these areas of the world. Multiple cross-sectional studies involving developed and developing countries can help to understand both cross-cultural differences and how familiarity can increase consumers' acceptance of this food. Religion is another important factor: for example, although India is a developing country, the acceptance rate among Indians was lower than that of participants from the USA. This was attributed to the perception that insects are prohibited from eating in India from a religious perspective where (74% are Hindu, 10% Catholic, 10% Muslim, and 6% other), while 16% of the American participants had previous experience of eating insects (Ruby and Rozin, 2019).

Furthermore, the relevance and importance of insect-based foods vary significantly with the context. In regions facing food security and malnutrition such as Haiti, Mali, Sudan, Occupied Palestinian[16], the nutritional and resource-efficient benefits of insects can provide a critical solution not only for feeding people but also for creating job opportunities that do not require high technology or professional training. However, addressing regulatory, cultural, and educational challenges is essential for the broader adoption of insect-based foods. Trusted global organizations such as FAO must work with policymakers in these countries on the regulatory aspects to ease the introduction of insect-based products. Additionally, choosing a familiar food carrier can ease the acceptance. For instance, in the review by (Tao and Li, 2018b), they suggested that incorporating insect flour into staple foods like rice is a practical and effective strategy to address food security and malnutrition. This approach leverages the widespread consumption of rice which is consumed by over 1 billion people to deliver essential nutrients carried by edible insects, enhancing the nutritional profile of a staple food. Additionally, disguising insects in familiar food forms can overcome cultural barriers and promote consumer acceptance. This strategy is particularly relevant in regions where rice is a dietary staple and where there is either existing cultural acceptance of insect consumption or significant nutritional deficiencies that need to be addressed.

In cultures where insects are traditionally consumed, they offer a readily acceptable and sustainable food source. These cultures, which span many parts of Africa, Asia, and Latin America, have long recognized the nutritional benefits of insects. Incorporating edible insects into these traditional diets can further enhance nutritional intake without necessitating significant dietary changes.

Moreover, the environmental benefits of insect farming, including lower greenhouse gas emissions and reduced resource use compared to conventional livestock, align well with global sustainability goals. This makes insect-based foods not only a viable solution for regions facing immediate food security challenges but also a strategic component of a sustainable global food system.

In summary, the integration of insect-based foods into the diets of different regions should be tailored to local contexts. In areas with high malnutrition and food insecurity, insects can provide a critical nutritional boost and economic opportunities. In regions with cultural

[16] https://www.actionagainsthunger.org.uk/our-impact/stories/the-hungriest-countries-in-the-world

acceptance of insect consumption, they can seamlessly enhance food security and sustainability. The support from global organizations and the strategic use of familiar food carriers like rice can significantly promote the adoption and acceptance of insect-based foods.

Regarding methods of marketing insect-based products, first, it is important when designing a product, to bear in mind attributes that will increase the likelihood of acceptance. Second, marketing strategies must be developed to communicate the benefits of insects as food to specific groups of consumers. Consequently, the rest of the discussion is centred on the two previous dimensions.

2.4.2 Insights to develop insect-based products

Our results show that consumers are attracted by products that contain processed insects in a convenient form. Developing products that consumers find familiar in terms of food carriers and taste (e.g., cake, muffin, pasta) can enhance their acceptance because they decrease the sense of novelty of the product which in turn may reduce food neophobia (Modlinska, Adamczyk and Goncikowska, 2020; Halonen *et al.*, 2022).

The marketing of these products should take advantage of health and environmental benefits which could be communicated with voluntary labels and using sustainable packaging. In addition, it should be clear on the packaging that the product contains insects. We could not draw any conclusion regarding preferred sensory attributes, insect species and appropriateness of food carriers because of consumers' heterogeneity of preferences observed in different cultures. This means that insect-based products should be developed in accordance with consumers' preferences in their respective countries (Yen, 2009).

Price is a crucial factor that can influence consumer purchasing decisions. High prices usually lead to lower demand for these products especially in poor countries that suffer from food insecurity (Green *et al.*, 2013). The marketing of insects as food with high prices could also reduce repeat consumption, but studies included in this review suggest that high prices will not prevent consumer acceptance. This could be attributed to the fact that the majority of studies included were conducted in developed countries and that some consumers associate high prices with high quality (Dodds and Monroe, 1985). Although only a few studies have explored the role of the purchasing place, the promotion of insect-based food on a large scale could be facilitated by multiple retailers, where consumers can easily access the product.

2.4.3 Marketing strategies

Based on the evidence presented in our review, we suggest four strategies when promoting insect-based food. First, these products should be initially marketed as processed safe, healthy and environmentally friendly food and promoted by public campaigns, scientists and experts because trust towards these sources of information can enhance consumer acceptance. Thus, the Western food industry and retailers should invest more in research and development to produce insect-processed food which is familiar to food items that are more palatable than unprocessed insects. This could be a winning product development marketing strategy that creates new products that firms can target in their existing markets. Instead, food companies in developing countries could opt for a market development strategy promoting their processed insect food products into new foreign markets using existing offerings with minimal product development. Despite risks that companies might face in pushing these marketing strategies, lessons of diversification from the past show that protein initially seen as unconventional may become popular as for example sushi in the West and the American experience of lobster (Collins, Vaskou and Kountouris, 2019).

Second, when marketing insect-based products, it is important to distinguish between different segments of consumers (Dagevos, 2021). One key result of the present review is that early adopters of insect-based food are a specific segment of consumers consisting of young males and well-educated people. Marketing strategies targeted at early adopters could help marketers generate social pressure on other groups of consumers who might accept the consumption of these products. Our findings are in line with those of Mancini, Moruzzo, *et al.* (2019), and Onwezen *et al.* (2021) and with the characteristics of early adopters of Rogers' innovation adoption curve (2003), as they include young educated people. In addition, well-educated people show more concern about the environment (Cavallo and Materia, 2018) and thus they are more open to the consumption of insect-based foods as opposed to conventional meat-based foods. Regarding gender, while males are more willing to accept novel food, females seem to have a stronger aversion than males to insect-based foods as they might be more concerned about the safety of novel food (Bäckström, Pirttilä-Backman and Tuorila, 2003). However, in other studies, the influence of gender is indeterminate. For example, during the COVID-19 pandemic, (Khalil *et al.*, 2021) found that consumers in favour of eating insects before and during the pandemic were young, highly educated people who were employed with a low level of income, but no difference between males and females was observed in terms of willingness to consume insect-based products. Thus age and education appear to be more stable factors in affecting consumer acceptance as they did not change their influence even during the pandemic. Our findings also indicate that individuals who are familiar with entomophagy are early adopters, in addition to those who care about making food choices that are healthy and environmentally friendly are curious people, who seek novel experiences. Our results are in line with (Olabi *et al.*, 2009), who found that those who were exposed to other ethnic foods and had travelled outside their home countries have less food neophobia than those who did not have these experiences. That being said, the opposite was observed by (Onwezen *et al.*, 2019), who concluded that people with weak personal norms on health and the environment are more likely to try insect-based food when adopting affective messages.

Third, encouraging unwilling consumers by creating a positive experience can increase their willingness to try these products, can increase future consumption and can even mitigate the feeling of disgust which is one of the major barriers to entomophagy. This is a marketing strategy that the food industry and policy makers could push with children as their food preferences may be more pliable than other segments of consumers. Targeting children with food school programmes could be a good way to change the attitudes of new generations towards the consumption of insects, but our systematic review has shown that while many studies have interviewed higher education students there is a lack of studies where scholars have investigated consumer acceptance of children (Collins, Vaskou and Kountouris, 2019; Chow *et al.*, 2021; Erhard *et al.*, 2023).

Fourth, educating consumers by providing them with information about insect-based food can enhance their willingness to try it (Looy and Wood, 2006). Information campaigns about the benefits of entomophagy can increase not only consumers' willingness to try insects (Rumpold and Langen, 2019) but even their willingness to pay a premium price (Lombardi *et al.*, 2019). More research is needed on the role of informative sessions, as the conflicting results in the existing studies may depend on the kind of information with which participants were provided. Creating familiarity in unwilling consumers can increase their acceptance by creating awareness of insects as food, which can be created by exposing consumers to insects as food by educating them about the potential benefits of insects, in addition to giving them the chance to try it (Mishyna, Chen and Benjamin, 2020; Dagevos, 2021). Familiarity can be created by exposing people to insects as food in a way that can build memories, though whether or not this will lead to acceptance of the food will depend on the nature of the remembered experience, which may be good or bad (Tan *et al.*, 2015). A positive experience of trying insects can increase willingness to consume them later (Caparros Megido *et al.*, 2016; Pambo *et al.*, 2017; Schlup and Brunner, 2018; Lammers, Ullmann and Fiebelkorn, 2019; Palmieri *et al.*, 2019; Sogari, Menozzi and Mora, 2019). For instance, 85% of Australian consumers who had tried insects as food before were willing to try them again (Lensvelt and Steenbekkers, 2014).

Fifth, using nudge strategies would "alert people's behaviour in a predictable way without forbidding any option or significantly changing their economic incentives" (Thaler and Sunstein, 2021) which is especially useful when it comes to making decisions in unfamiliar situations. This strategy was found to be effective in changing students' food choices when it came to healthy food such as whole wheat bread (Cesareo *et al.*, 2022). This was found to be the case in one study by Bao and Song (2022), where they concluded that the willingness to try edible insects can be increased by using a combination of social norms (providing information about social responsibility regarding environmental protection and sustainability) and environmental boost (providing information regarding the benefits and the positive aspects of entomophagy such as food security). Therefore, we suggest nudging consumers to accept insects as food by exposing them to the product via tasting or informative sessions. However, using nudging is just one way to motivate people and encourage them to make better decisions from the policy maker's perspective. In addition, we should not be overoptimistic about the role of nudges because DellaVigna and Linos (2022) conducted a meta-analysis of 26 studies published in academic journals and they question the effectiveness of using nudges because of reasons such as the chance that these studies used different kinds of trials, and publication bias as it easier to publish significant statistical findings.

Finally, a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis can provide insights to decision-makers to better plan marketing strategies that can shape the development of an insect-based food market. This analysis could be applied to the development of both traditional and novel foods (Blanco-Gutiérrez, Varela-Ortega and Manners, 2020). For the internal factors of the SWOT analysis, our results and other studies indicate that food processors who wish to develop insect-based food can take advantage of the strengths of these products i.e. a healthy alternative to meat rich in protein, environmentally friendly, which needs less land and water than conventional meat production. However, insect-based food is a novel product, and this can be considered a weakness for producers as the development of new supply is a risky, long and challenging process, especially in the light of low consumer acceptance. Concerning external factors, developers need to take the opportunity to market these products by targeting early adopters with processed products resembling well-known food carriers. However, despite the fact that the development of these products is a risky activity because other alternative sources of protein (plant-based food and cultured meat) seem to be preferred by the consumer over insect-based food, the threat of not investing in these products can be dangerous both for the food industry in terms of competitiveness and for our planet in relation to sustainability. Therefore, it is necessary to conduct more interdisciplinary research to obtain a better understanding of consumer acceptance of insect-based food and more effort on behalf of policy makers to develop standards and regulations which can facilitate the commercialization of these products.

2.4.4 Limitations

Our study has three limitations. First, although we aimed to provide a comprehensive analysis in this review, our findings can mostly be applied to consumers from developed countries. In addition, we included only English-language publications, and consequently, our results are limited in scope. Second, the articles included in this review focused more on socio-demographic, and psychological factors, in relation to product attributes and promotion. Future research should focus on the other factors that can influence acceptance (i.e., price and place), thereby improving the developed framework so that it can be more widely applied. Third, the focus of this review was on consumer acceptance, but other challenges should be taken into consideration, such as safety and production costs, as insect-based food is a novel product. Therefore, it will be important to conduct studies that tackle more than one aspect, to give a comprehensive view that will be more helpful to stakeholders.

Despite these limitations, our findings have implications that are useful for policy makers, producers, and retailers who seek to encourage consumers to change their choices. Policy makers have a responsibility to mitigate such a major issue by considering that people tend to trust authorities more than companies. For policy makers, particularly in Islamic countries, it is important to investigate the acceptability of insects as food from a religious point of view, as some insects (e.g., crickets and mealworms) are not religiously acceptable according to various schools of Islamic thought, such as Al-Shafi'i and Al-Hanbali (Al-Fawzan, 2011). Producers and retailers can benefit from the outcomes of this study by designing and developing marketing strategies for insect-based products, taking into consideration the potential concerns and heterogeneity of preferences that appear to be associated with consumer acceptance.

2.5 Conclusion

Edible insects could contribute to solving major global issues, such as food insecurity and global warming. However, consumer acceptance remains low, at least in Western and developed countries where most reviewed studies were conducted. As a result of this review, we were able to develop a framework that highlights factors increasing consumer acceptance of insects as food. Findings also allowed us to argue about marketing strategies that can be developed to promote the growth of these new food markets. However, the implementation of these strategies is challenging because they must be tailored to specific groups of consumers, vary from country to country and are risky from an economic point of view. More research is needed to explore the potential market for this alternative source of protein in different contexts, both in developed and especially in developing countries that are more likely than rich countries to be severely affected by food insecurity and climate change.

In the next chapter, we delve into the potential market for insect-based food through stakeholder interviews, seeking to uncover insights into the opportunities and challenges linked to the development of such products. Following these discussions, we carried out focus groups, utilizing the framework introduced by Fishbein and Ajzen (1975) to explore UK consumers' preferences for burgers made with insects.

CHAPTER 3. Potential market of insect burger in the UK stakeholders' and consumers' perspectives

3.1 Introduction

While meat consumption is projected to increase worldwide, the rate of increase in developing countries is approximately five times higher than that in developed countries, due to increases in both population and growth rates (OECD/FAO, 2020); obviously, this indicates a need to increase meat production. However, increases in meat production have been found to be associated with ethical, health, economic, and environmental concerns. Ethical concerns primarily involve animal welfare. For instance, increased meat production generally involves intensive production systems that can cause pain and deprivation to poultry and cattle (Neindre *et al.*, 2009; FAO, 2022)[17]. The results of this process can affect human health by increasing the frequency of communicable and non-communicable diseases (NCDs).

To tackle these issues the food industry and researchers have been prompted to explore alternative sources of protein such as plant-based meat, insect-based food, and cultured meat. Public and private interest in finding alternative sources of protein and the development rates of these products continue to increase in an effort to satisfy the meat consumption needs of a growing world population (OECD/FAO, 2020). Despite this interest, there is uncertainty about investment in markets for alternative sources of protein. For example, doubts about the sustainability of meat production and consumers' acceptance of these alternatives continue to challenge their development (Lee *et al.*, 2020). In addition, consumer acceptance of meat alternatives was found to be a challenge especially, due to such reasons as sensory attributes, food neophobia, disgust, cultural norms, familiarity, and food technology neophobia (Hocquette, 2016; Kornher, Schellhorn and Vetter, 2019; Dupont and Fiebelkorn, 2020; Wendin and Nyberg, 2021; Rosenfeld and Tomiyama, 2022; Siddiqui *et al.*, 2022; Alhujaili, Nocella and Macready, 2023).

When developing meat alternatives, it is vital to take into consideration the product characteristics (Gómez-Luciano *et al.*, 2019) and to ensure that consumer preferences guide its development (Grunert, Bredahl and Brunsø, 2004). Product characteristics are important for consumers when making decisions about food as they determine their expectations and

[17] https://www.fao.org/poultry-production-products/production/animal-welfare/zh/

perceptions (Ng, Chaya and Hort, 2013; Symmank, 2019) in addition to the quality of the product (Richardson, Dick and Jain, 1994; Acebrón and Dopico, 2000; Hansen, 2005; Henchion *et al.*, 2014). Grunert, Bredahl and Brunsø (2004) argue that this is essential for preventing marketing errors and reducing failure rates, which range from 60% to 80% for new products. This emphasis on consumer-driven development is crucial because consumer choices are more affected by barriers than motivation, as highlighted by (Verbeke *et al.*, 2021). Consequently, comprehending and giving priority to these factors is a pivotal aspect of product development and marketing, (Enneking, Neumann and Henneberg, 2007).

When it comes to the products' characteristics, there are intrinsic and extrinsic attributes. Intrinsic attributes are the physical characteristics that are derived from the product itself, such as its sensory attributes (colour and taste), while extrinsic attributes are the non-physical characteristics that are influenced by external factors such as the price and packaging of the product (Steenkamp, 1990; Bernués, Olaizola and Corcoran, 2003). Thus for the development of alternative sources of protein, the importance of the intrinsic and extrinsic attributes for consumers must be evaluated (Steenkamp, 1990). The intrinsic attributes, most preferred by consumers appear to be taste, smell, texture, natural ingredients, freshness and colour (Chung, Yu and Pysarchik, 2006; Lawless and Heymann, 2010; Brečić, Mesić and Cerjak, 2017). For extrinsic attributes appear to be price (Dodds and Monroe, 1985; Brečić, Mesić and Cerjak, 2017) packaging (Lefebvre *et al.*, 2010; Pramudya and Seo, 2019) and availability in the shops/supermarkets (Brečić, Mesić and Cerjak, 2017). For meat in general, consumers rate the quality and taste of well-known brands higher than those of unknown brands (Makens, 1965). In an experimental study by Acebrón and Dopico (2000), where the researchers evaluated the visual and sensory impression of the quality of beef, the price was one of the most valued extrinsic cues where it was associated positively with the quality of beef. The preferred colour is pinkish to light red, as darker colours are perceived as a sign of lower quality (Acebrón and Dopico, 2000), and less freshness (Steenkamp and Van Trijp, 1996). However, in a study by Soohyun *et al.* (2007) of Korean consumers' preference for pork chops, dark red with less fat was the most preferred (Acebrón and Dopico, 2000; Ardeshiri and Rose, 2018), although Soohyun *et al.* (2007) suggested that non drip marbled pork meat was more preferred. In addition, white fat is preferred to yellow fat (Ardeshiri and Rose, 2018), and less freshness means lower quality (Acebrón and Dopico, 2000). The labelling information about the beef's origin influenced

Australian consumers, who preferred beef from Australia to that from China, for reasons associated with food safety and quality (Ardeshiri and Rose, 2018). Few studies have explored consumers' preferences with relation to a conventional burger. Cardona *et al.* (2023) found that the most important attributes for hamburgers were price, expiration date (shelf life), colour, meat type and appearance respectively. Furthermore, Viana, dos Santos Silva and Trindade (2014) found that taste and healthiness of the burger are important when it comes to conventional burger.

According to Onwezen *et al.* (2021), only four studies on similar topics regarding insects as food have involved interviews, and four involved focus groups. Therefore, this study focuses on insects as an alternative source of protein due to their potential in addressing the drawbacks of meat production highlighted above, and because the marketing aspects of these products are under investigation in the UK. We aimed to explore the potential market for insect-based food, particularly insect-based burgers, in the UK driven by views of experts and consumers which is a crucial factor for successful market entry (MacFie, 2007; P. F. Guiné, C. D. Ramalhosa and Paula Valente, 2016). To achieve this aim two studies were conducted. In the first study, we explore the potential market for insects as food by conducting semi-structured interviews with experts who were challenged with the following six research questions: Is there a real need for alternative sources of protein to tackle environmental, economic, and ethical issues linked to the consumption of conventional meat? What are the advantages of insects as an alternative to meat? What are the challenges that stakeholders face in developing and marketing insects as food? What are the most important attributes that stakeholders should consider when developing insect-based food products? Who could be the early adopters of these products? How could these products be promoted?

In the second study, we explored consumer acceptance by conducting focus groups to get insights on both the development of insect-based food burgers and consumers' attitudes to them.

3.2 Study one: The in-depth interviews

The nature of this study required collecting detailed, informative, and comprehensive data, so a qualitative method was adopted to achieve a deeper understanding of participants' experiences and perspectives regarding the products and to explore the reasons behind their interest in these products (Ritchie & Lewis, 2003). We used semi-structured interviews as interviews are the most common method for qualitative data collection (Mason, 2002; Braun & Clarke, 2013). Using this method the interviewer can obtain information from the interviewee through a verbal interchange by asking direct questions and participants answer using their own words (Waltz, Strickland and Lenz, 2010; Braun and Clarke, 2014). Semi-structured interviews are suitable for this study for many reasons. First, they combine structure with flexibility. Second, the interactions between the interviewer and interviewees facilitate the use of prompts which can encourage the interviewees to explain their views freely. Third, they also offer participants the opportunity to raise points beyond the interviewer's prescribed questions (Ritchie and Lewis, 2003; Berg and Lune, 2014; Braun and Clarke, 2014). Interviews have often been used to explore perceptions of new products, such as insect-based proteins (House, 2016; Myers and Pettigrew, 2018), which indicates the suitability of this method for investigating insect-based products.

3.2.1 Recruitment of participants

It has been suggested that a sufficient number of interviews in small projects is between six and ten (Braun & Clarke, 2013), and 92% of the themes could be identified within the first 12 interviews (Guest, Namey and McKenna, 2017). In addition, twelve interviews were sufficient to explore experts' and stakeholders' attitudes toward cultured meat in the study by Böhm, Ferrari and Woll (2018). In our study, in total, we interviewed twelve participants. Eight were from the UK: two owners of conventional meat farms (P1 and P2), two marketing managers in retailing companies (RT1 and RT2), two food scientists (S1 and S2), and two fast-food restaurant owners RS1 and RS2). One person responsible for E-Commerce & Communications in an insect-based food company (I), and two researchers with expertise in novel alternative sources of protein, i.e. insects and cultured meat (EX1 and EX2). We were not able to interview a policy maker because contacting policy makers in the UK proved too difficult. After conducting the interviews with the previous participants, however, we sensed the need to interview an Islamic scholar (IS) because a Muslim participant had expressed his concerns regarding the acceptability of consuming insect-based food from a religious point of view[18].

[18] Ethical clearance was submitted to and approved by the Ethical Committee of the University of Reading in July 2019. (See Appendix 3.1 for stakeholders, and Appendix 3.2 for the Islamic scholar)

We achieved two models of saturation: inductive thematic saturation where no new code or theme emerged, and data saturation where there was data redundancy (Saunders *et al.*, 2018). As the aim of this study was to generate a deep understanding of the topic at hand (Patton, 2002; Berg and Lune, 2014), we needed participants with particular relevant experience (Ritchie & Lewis, 2003). Therefore, participants were recruited by purposive non-probability samples. The snowballing sampling technique was implemented to take advantage of the interviewees' networks and to recruit participants with specific expertise (Berg and Lune, 2014; Braun and Clarke, 2014). Initial contacts were made through phone calls, emails, and/or letters. Participants who accepted our invitation then received the information sheet and demographic form via email. Due to COVID-19 restrictions, the interviews were conducted through virtual meeting platforms, particularly Microsoft Teams and Zoom. Virtual interviews generally involve some disadvantages, including difficulties in establishing access to a stable internet connection, technical issues, and, in some cases, increased difficulties with managing emotional situations (Lewit & Gosain, 2021; Braun & Clarke, 2013), but in this study, we had minimal technical issues and its nature precluded any intentional questioning on sensitive matters. On the other hand, we derived several benefits from conducting virtual interviews, as they were less costly than in-person ones and we were able to overcome geographical barriers, as people were able to participate in the interviews from the location of their choice (Braun and Clarke, 2014; Hagedorn *et al.*, 2021; L. and Do Tran, 2021). The audio from the interviews was recorded, and notes were taken as well. The interviews were conducted in English; transcriptions were created. The interviews began in September 2020 and finished in September 2021.

3.2.2 The interview schedule and procedure

The basic interview schedule covered four main topics through open-ended questions, organised into four sections. Section 1 was designed to collect information about current meat market issues and the need to find alternative sources of protein, such as insect-based food. Section 2 examined potential advantages and expected barriers to the introduction of insect-based food to the UK market. Section 3 attempted to discover potential consumers of insect-based burgers, while Section 4 discussed the future of the meat market. Considering the diversity of the experts' backgrounds, some specific questions were added for particular interviewees. The producer of insect-based food, for example, was asked specific questions about the products, such as the production process.

Interviews were conducted as follows. The participants were welcomed, and then the interviewers introduced themselves and emphasised the confidentiality of the participants' information. As a warmup, interviewees were asked to introduce themselves and explain their areas of interest. The interviews concluded with requests to the participants for both their final thoughts and any recommendations for further interviews'; on average, the interviews lasted between 50 and 120 minutes.

3.2.3 Data analysis

Inductive thematic analysis is the most suitable method for our purpose because it facilitates the generation of ideas from the data, as opposed to the reinforcement of an existing theory, whilst the grounded theory "focuses on building theory from data" and the interpretative phenomenological analysis "focuses on how people make sense of their lived experience" (Braun & Clarke, 2013). According to Braun & Clarke (2006), inductive thematic analysis is "a method for identifying, analysing, and reporting patterns (themes) within data", where the themes are defined as the ideas that appear most frequently in the given text (Kiger and Varpio, 2020). Thematic analysis (TA) was conducted in accordance with the 6 phases identified by Braun & Clarke (2006). Phase 1, created familiarity with the data while we were transcribing the interviews and reading and rereading the transcript: this process generated an initial mind map of the main ideas. In Phase 2, we generated the initial codes across all the transcripts. Phase 3 involved searching for potential themes among the codes, and in Phase 4 we reviewed the themes by checking on their relationship with the extracted codes. Phase 5 included defining and naming themes while analysing the data, and the final report was generated in Phase 6. The initial inductive coding resulted in nine themes which were then reduced to three -because of the redundancy- when the transcript was analysed using the software MAXQDA 2020 (https://www.maxqda.com/what-is-maxqda).

To ensure the quality of the research findings, we took the validity and reliability of the data into account. Data validity is defined by Mason (2002) as the ability to observe and identify what the researchers are aiming to do, while Stenbacka (2001) states that the validity of a qualitative research project can be achieved by collecting "good data". Good data are obtained both by giving participants the opportunity to reflect on their opinions freely and by the interaction between the researcher and the participants. On the other hand, reliability was defined by Mason (2002) as the accuracy of the techniques and methods used to analyse the data. To ensure reliability, we followed the suggestions of Cavanagh (1997) by arranging for one coder to repeat the coding process two months after the first coding took place: This process was applied to 50% of the data; in addition, another coder (a researcher) then worked independently on classifying the materials before results were compared.

3.2.4 Results

This section presents the results emerging from the analysis of the three themes exploring the meat market, insect-based food, and prospective consumers; the views of the interviewees will be illustrated by excerpts from their interviews.

3.2.4.1 The meat market

Participants were concerned about the sustainability of the meat market. This problem was examined from a variety of angles, with mass consumption and production of meat emerging as the most prominent as they impact natural resources negatively, especially in developing countries.

Interviewees were concerned about the increase in meat consumption at the international level, the use of intensive and mass production methods, food safety, and the conservative nature of the market because changing the production process will take time. Rising meat consumption has not just been due to global population growth. Some countries, like China and Brazil, are moving toward stages of economic development that will allow their citizens to afford more meat products than before, inducing health issues associated with the increase in meat consumption, such as higher blood cholesterol. This increase in demand is largely being met through production methods that are not sustainable for humans, animals, or the planet, as they involve the excessive exploitation of farm animals and the simultaneous use of increasing amounts of land and water. The supply chains give rise to food safety issues that are difficult to control, such as zoonoses. They were also concerned about the conditions in which the animals are raised and about environmental issues like increasing GHG emissions and the ecological deterioration resulting from the continuous increase of livestock products from limited natural resources.

> *If you consider all the countries that are, you know, they're becoming more developed, and now countries like, you know, China, Brazil, are becoming richer. And, as we know, as soon as a country becomes richer, it starts using its money to buy more protein. Usually, that is in the form of meat products.*

(S1)

It was also suggested that even when these issues in the meat market are acknowledged, changing the production systems takes time: it is difficult to modify practices in meat production that have been employed for years.

The discussion about the meat market issues provides support for the argument that alternative sources of protein, such as insects, must be explored to mitigate them. However, some participants argued that other cheaper solutions already exist, but these alternatives require the construction of new supply chains. Developing and approving the validity of an alternative product would also take more time, while the current solutions can be applied faster.

Six main solutions have also been suggested for the issues in the meat market. The first is decreasing food waste, which means that more food will be available for human consumption. The second is transparency in terms of providing facts to consumers by fairly presenting all the possible solutions for the issues in the meat market and not solely focusing on novel solutions. The third would be shifting livestock production away from dry land, as that could decrease production costs. Fourthly, research could be conducted to evaluate both the economic benefits and consumer acceptance of insects as an alternative protein. The fifth solution would be increasing consumer awareness regarding the potential benefits of insects, not just for people but also for the planet, although people tend to care about themselves more than social/collective issues like climate change. The last solution would be using an effective marketing strategy by introducing the product through trusted communication channels (i.e., authorities and social media), selling the products through special offers, and introducing them in a way that makes people interested in trying them.

> *Reducing food waste and losses which represents 1/3 of our food production so it's a matter of organisation. It's a matter of behaviour of producers and of consumers to reduce the food losses and waste. It has been demonstrated by scientific papers that it will have a huge impact on the problem of the food security because we will increase food availability for consumers. And in the same way, we will reduce the overall impact of food production because waste will be reduced. And this type of solution doesn't need so much research because it's immediately available.*

(Ex2)

3.2.4.2 Evaluation of insect-based food as meat alternatives

To explore the topic of insect-based food products as meat alternatives, the interviewees were asked to give their opinions on the advantages and challenges arising from these products. As a result, the discussion about evaluating insect-based food developed to a point where the interviewees, bearing these aspects in mind, provided suggestions on how to promote these products. Table 3.1 shows participants evaluation of insect-based food.

Table 3. 1: Evaluation of insects as food

Aspects	**Insect-based food**	
	Advantages	**Challenges**
Health	Rich in protein	
Safety	No known zoonosis	Allergy
Production methods	Emits hardly any greenhouse gases	
Price	Low cost	
Sensory		Resemble convention meat e.g., taste and texture
Availability of conventional meat		The need for insects as alternative to meat
Consumers		Consumers ignorance
		Cultural barrier
		Regular consumption
		Lack of familiarity with entomophagy
Psychological		Disgust
Animal welfare		Insects still animals
Religious		Acceptability in Islamic religion
Regulations		Unclear regulations

Participants generally agreed that insect-based products should resemble conventional meat in taste and texture, be safe for human consumption, and be competitively priced. In addition, the availability of conventional meat raises questions about the need for insect-based food as an alternative to meat. The consumers' ignorance of the insect-based food products' nature or existence presents a further challenge to their acceptance of them. Furthermore, as suggested by the expert in insects as food, even if consumers had tried these products, it might still be difficult to induce them to buy or consume these products regularly.

I think it's always a matter of price at the end of the day because, you know… there might be obviously the younger generation and might be more open, more willing to try new things, but, again, if a burger cost you 20 pounds … how many people are able to afford that? So, will they be able to lower the price point to the level where it is accessible to everybody?

(S1)

I mean, the repeated consumption, the repeated purchasing of these products, will be the challenge, not to mention creating acceptance; perhaps we will have people accepting them as food but not buying them.

(EX1)

Furthermore, interviewees expected that many challenges to insect-based food might be reported by consumers. Such issues include the feeling of disgust aroused by eating insects, even if they are processed, the fact that insects are still animals, concerns regarding allergies to insects, cultural barriers arising from the lack of familiarity with entomophagy, and, finally, concerns regarding whether eating some kinds of insects is permitted in Islam.

I think a lot of people will just reject that idea, because they think, "You know, if I can get my protein from chickpeas, why should I get it from insects?" You know, because at the end of the day an insect is still an animal so you're still killing the animal.

(S2)

Insects such as crickets and mealworms are Islamically prohibited, but the locust is definitely acceptable.

(IS)

It is also worth noting that the insect food producer highlighted a major challenge facing insect-based meat producers regarding the clarity of the regulations concerning insects as food, which consequently raises more issues affecting such matters as the pricing and categorising of the product on the stores' shelves. So far, the price of insect-based food is still expensive as start-up companies still have not achieved economies of scale (Reverberi, 2021).

> *Legal restrictions, or unclear regulations on selling insects as food, therefore: unclear customs & VAT regulations, which often leads to increased costs, hence pricing. Different retail systems within every European country! And the product category; insects are not really meat, nor vegan/vegetarian, nor fish. Their place on the supermarket shelf still needs to be found.*

(I)

On the other hand, only a few positive attributes were mentioned. These included the health-related benefits of eating insects in terms of protein intake and the claim that there is no record of insects suffering from any disease that they have passed on to humans. However, this is insufficient motivation for consumers, as people tend to be quick to forget crises like Avian Influenza and return to their usual eating behaviour. Some environmental and sustainability-related benefits were also mentioned, including the low cost of cultivating insects, which means that they could be a valuable source of protein for low-income countries, and the emission of much less greenhouse gas than more traditional livestock. Another interesting point is that insect-based food is not often introduced as a replacement for meat: a meat producer and an expert on insects as food had the same view on this. They both saw them as different products with different properties. The researcher suggested that insect food could be more useful for other applications, such as animal feed and industrial usage, than for human consumption alone.

> *Um, insects are very good at turning, you know, very small quantities of intakes or inputs into quite, um, high protein, I know that there's a lot of protein to be had from insects, um, and I know that by adding different things to them, you can achieve, um, quite interesting flavours.*

(P1)

> *Insects cannot and will never replace meat 1:1. It's a new product, a new ingredient with its own textures and taste. Therefore, no, it will not replace the conventional burger patty. BUT it is a great alternative for people who want to eat less meat but not less protein.*

(I)

After the interviewees had evaluated insect-based food products, they suggested some strategies that could be applied to marketing the insect-based products. They recommended introducing its novelty, educating people on the benefits of eating insects, and emphasizing the safety of this product as well as providing facts on the environmental benefits of consuming insect food. Additionally, offering insect food in processed, convenient forms and giving consumers the chance to try it can assist in overcoming disgust, which is a big barrier for consumers. Familiar species should also be used when producing insect food, and the insects should not be visible, though consumers should, of course, know that the product contains insects.

> *The only barrier I see is that people perceive insects as not safe, but this can be tackled through well-distributed information. Also, consumers need to be informed that the product is available, where to find it in the supermarket, and how / when to eat insects.*

(IP)

> *I'd say, you know, my number one thought would be, in terms of getting these huge markets, is that you need to get customers, you need to get people believing in it, and trying it and, like…talking about it.*

(RT2)

An interesting outcome of this study is the revelation of the most important attributes of the product, based on the participants' experiences when buying a burger patty. Consumers value three main attributes: safety, health, and environmental benefits. Consumers tend to care about the safety of products, actively seeking foods that do not adversely affect their health. The participants' tendency to try to improve their health by looking for protein-rich products indicates that the high protein content is a vital attribute of the meat alternatives. We also noticed that, although insect-based food appeared to produce environmental benefits, consumers expressed no interest in this issue, as people tend to be selfish and think about benefits for themselves rather than for the environment.

Although insect-based food is promising in terms of contributing to food security, with less use of resources and less impact on the environment, there are concerns about consumer safety and animal welfare that need to be addressed. Insect-based food presents problems which are in line with the studies that have shown that consuming various types of insects, including mealworms, locusts, bees and crickets, can cause allergies, and that processing these insects and adding them to other ingredients does not mitigate the allergic effect (de Gier and Verhoeckx, 2018). Insect food also raised concerns about animal welfare. The argument for ensuring animal welfare in conventional meat production was based on the fact that animals feel pain when they are raised in uncomfortable conditions. As insects are also animals, and sensitive to pain, these facts should be taken into consideration when farming and killing insects (van Huis, 2019).

3.2.4.3 Potential consumers and their preferred attributes

Participants believed that both older and younger people and highly educated people. Young people could be open to trying new things as they follow fashionable trends and are influenced by advertisements and social media. Well-educated people could be more aware of global issues, such as food security and sustainability, and they likely have higher incomes than less educated people, and thus they can afford expensive products like insect food.

They also believed that older consumers could potentially be more willing to eat insects if they are familiar with entomophagy. An additional category of potential consumers of insect burgers could be characterised as people who are familiar with insects, interested in trying insect-based food, and open to foreign food. Familiarity could cancel out any gender-based differences, although females in general could be less likely to be consumers due to a perceived general fear of insects as also suggested by Cicatiello *et al.* (2016).

When participants were asked to define, based on their experience, what consumers look for in a burger patty, the most common attributes listed were sensory attributes, price, and quality: a high price is associated with high quality by some people while others will go for the cheaper product, health benefits, and ease of preparation.

> *Um, you know, I think consumers actually are blinded by cheap food.*
>
> (Conventional meat producer, UK)

To get a comprehensive overview of consumers' preferences for a burger made with insects, we extend the findings of Study one by further exploring consumers' preferences by conducting focus groups as shown in Study two.

3.3 Study two: The focus groups

The focus group is a direct approach managed by a moderator in an unstructured but guided discussion to gain information from participants by involving them in the discussion to get a deep understanding of participants' thoughts about the topic under study (Ritchie and Lewis, 2003; Smithson, 2007; Malhotra, 2010; Braun and Clarke, 2014). Focus groups are found to be useful in developing new/novel products and exploring consumers' attitudes, in addition to designing novel products such as insect-based products (Clarkson, Mirosa and Birch, 2018). Therefore, we utilised focus groups to comprehensively explore the participants' perspectives concerning the preferred attributes for insect-based burger patties by following the elements of the marketing mix (product, promotion, place, and price) in developing the products McCarthy (1960) which indicated that we applied deductive coding; however, when finalizing the results, we grouped them into intrinsic and extrinsic attributes.

As it is crucial to engage consumers in designing the ideal product that meets their needs, we applied the "consumer idealized design" method in developing the products (Ciccantelli and Magidson, 1993). According to Ciccantelli and Magidson (1993), this method is similar to conducting focus groups, however, it differs in some ways such as choosing the targeted segment, and the session could take an entire day. We also followed six principles to ensure the success of this technique: engaging participants in developing the product at an early stage, focusing on what they want rather than what they do not want, thinking beyond what is available in the market, designing the product rather than telling them what they want, concentrating on the desirability of the product rather than the chance of the feasibility of the product, and thinking about the reasons behind their preferences. This method was applied in developing new products such as insect-based products and functional foods (Clarkson, Mirosa and Birch, 2018; Cong *et al.*, 2020). However, we contributed to this method by also employing the Fishbein model (Fishbein and Ajzen, 1975), to measure the strength of participants' attitudes towards the attributes of this new product. By utilising consumers' idealized design method, we explored consumers' preferences, and by applying the Fishbein model we confirmed these preferences, as this model indicates the strength of the attitude towards each attribute, where the stronger the attitude, the more important the attribute.

Because of the COVID-19 pandemic, it was difficult to conduct the focus groups in person, so synchronous online focus group (OFG) discussions were conducted with all participants joining the session at the same time (Ritchie and Lewis, 2003; Smithson, 2007; Fox, 2017). The use of virtual focus groups has increased in recent years in many contexts, including social science (Ritchie and Lewis, 2003; Smithson, 2007; Braun and Clarke, 2014), for good reason. Many advantages are associated with virtual focus groups, such as the convenience for participants, as they can join from their comfort place, the absence of any geographical barrier, which eases the recruiting, and thus engaging a variety of participants, cheap as there is no need for travel or booking locations, and anonymity can encourage participants to feel free to share their opinions (Smithson, 2007; Malhotra, 2010; Braun and Clarke, 2014; Fox, 2017). However, there are many disadvantages to virtual focus groups, like the chance of having a technical issue during the discussion, the limitation of participants to those who know and can access the internet, and the inability to observe the participants' body language (Malhotra, 2010; Braun and Clarke, 2014; Fox, 2017). In addition, there is the chance that participants will give short answers as a result of perceived competitive pressure to answer quickly (Smithson, 2007).

To enhance the quality of the obtained data and the study findings, we have audio recorded the sessions during the focus groups (Biggerstaff, 2012), and notes were taken by the note taker; in addition, we used Miro (https://miro.com/), an interactive platform with a whiteboard, because it allows us to build a map of the attributes preferred by the participants.

3.3.1 Participants and recruitment

The acceptable number for focus groups is between two and six (Coenen *et al.*, 2012; Braun and Clarke, 2014). Guest *et al.* (2017) found that three focus groups were sufficient to reach the saturation point for identifying the most relevant themes. Having three to twelve participants in each group has been found to be good enough to generate a rich discussion and engage all participants in the discussion, as some members in a large group of participants can be silent (Ritchie and Lewis, 2003; Smithson, 2007; Malhotra, 2010; Braun and Clarke, 2014). Furthermore, in the case of the virtual focus group, three to six is considered enough to avoid the confusion that can arise if too many voices are engaged in the discussion (Malhotra, 2010). In fact, Fox (2017) found that three participants are enough to be manageable by the moderator as well as to achieve sufficient wide-ranging and in-depth discussion.

Based on the above, we conducted three focus groups, we invited six to eight participants in each group to allow for dropout and ran a pilot FG to test the efficacy of the chosen number. Some researchers argue that the homogeneity of the sample can ease the discussion as it is based on the similarity between participants (Braun & Clarke, 2013). However, we aimed to have a heterogeneous sample in each group as the variety of speakers can generate interesting and diverse discussions (Smithson, 2007; Braun and Clarke, 2014).

We utilized a snowball sampling starting with social media platforms. The consent form and demographic information sheet were sent to the participants in advance[19]. The eligibility criteria specified individuals living in the UK, between the ages of 18 and 65, while excluding experts and stakeholders in the meat market. This exclusion was necessary to prevent any potential conflicts of interest that could introduce bias into our findings. Participants were rewarded with £30 Amazon vouchers. The sessions took place in June-July 2022.

3.3.2 The focus group schedule and procedure

We utilized a variety of techniques including projective techniques which are an indirect method of gaining data from participants where the purpose of the question is disguised to explore their underlying attitudes (Malhotra, 2010). For instance, for label generation participants were asked to share three words that came to their minds when they thought of insect-based burger following (Colucci, 2007). In addition to applying the Fishbein model (Fishbein and Ajzen, 1975), we asked participants to evaluate the importance of selected attributes of the product and then evaluate the probability of seeing the product containing these attributes.

To achieve the stated objectives and to use these techniques, the focus group research protocol consisted of five sections. Section one introduced the topic and the discussion schedule. Section two asked participants to share the first three words that came to their minds when thinking of a burger made of insects. Section three asked participants to imagine that they were about to design a burger patty made of insects and that they were developing this product for themselves or others. This section had the view of encouraging interviewees to design the product, thinking of the four elements of the marketing mix. Section four asked participants again about the first three words that come to their minds when thinking of the product emerging from the activity conducted in section three. Section five asked interviewees to freely share their thoughts about the products, going beyond their previous discussion of the 4Ps of the marketing mix.

---

[19] The ethical clearance was submitted and approved by the Ethical Committee of the University of Reading on 30/3/2022. See Appendix 3.3)

3.3.3 Data analysis

For the analysis of the data, we applied a mixed method where we performed the analysis in two phases. In phase one we employed thematic analysis and in phase two we applied the Fishbein model to work out the scores of the multi-attribute model.

3.3.3.1 Qualitative analysis: thematic analysis

Thematic analysis is used for "identifying, analysing, and reporting patterns (themes) within data," (Braun & Clarke, 2006). We applied the thematic analysis following the six phases identified by Braun & Clarke (2006) in Study one, taking into consideration individual perspectives in addition to the group interaction (Berg and Lune,2014). MAXQDA 2020 was used to analyse qualitative data. Participants were encouraged to share their thoughts freely as that would enhance the interaction between them to ensure the validity of the data obtained (Stenbacka, 2001). The coding process was conducted by one researcher and another coder worked independently in coding the data and then results compared to ensure the reliability of the results (Cavanagh, 1997).

3.3.3.2 Quantitative analysis: the strength of the consumers' attitudes towards insect-based burger

To evaluate participants' attitudes, we applied the Fishbein model Fishbein & Ajzen (1975) in which each attribute was evaluated by participants and then multiplied by their belief that it would occur. Each participant was assigned a number to ensure anonymity, followed by the participant's sex e.g., (11, M) indicates that this was participant number 11 and male.

As illustrated in Figure 3.1, we asked participants to evaluate each attribute twice. The first time was on an 11-point bipolar scale to evaluate the desirability of the attribute; then they evaluated their belief in terms of the likelihood that this attribute would occur on a 6-point unipolar scale. Then the Fishbein model was applied by multiplying each evaluation by the belief. This allowed us to understand participants' overall attitude toward the insect-based burger, which was useful for developing and marketing the product.

$$\boldsymbol{A_o = \sum_{i=1}^{n} b_i e_i} \qquad \textbf{(3.1)}$$

Where: A_o Is the attitude toward object o;

b_i is belief i about object o;

e_i is the evaluation of attribute i.

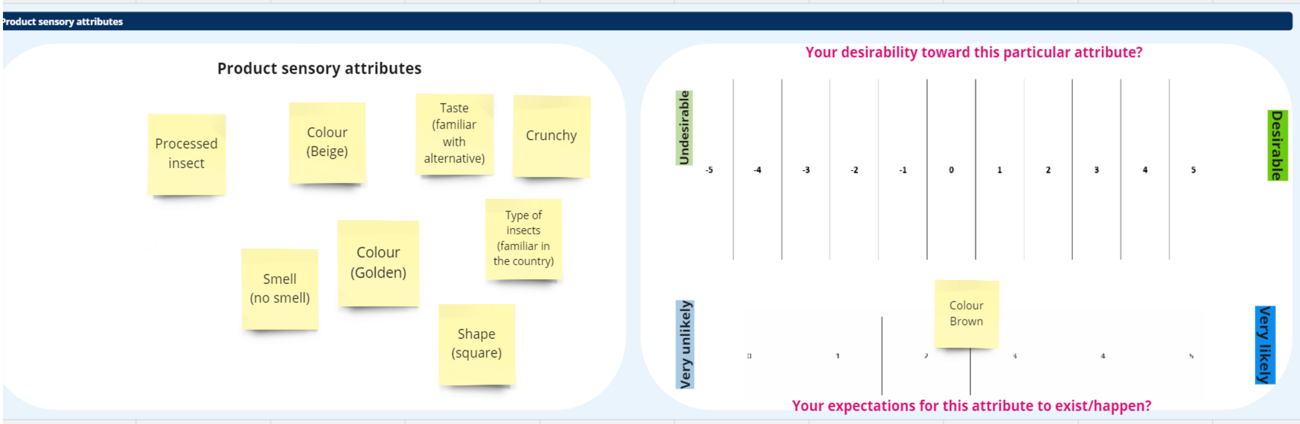


Figure 3. 1: An example of using Miro during a focus group

As the sample size was small, we did not have the statistical power to test the significance level, therefore, we only commented on descriptive statistics by integrating the results of the thematic analysis with the results of the quantitative analysis as discussed in section 3.4.2.

3.3.4 Results

3.3.4.1 Participants characteristics

In total, 14 participants were interviewed in three focus groups. Table 3.2 shows that the sample was biased toward female, young and highly educated individuals. This composition was determined by the snowball sampling, but it is also acceptable because the literature on insect-based products indicates that young and highly educated people are more open to new foods and females care more about them (Hartmann and Siegrist, 2017; Kröger *et al.*, 2022; Alhujaili, Nocella and Macready, 2023).

Table 3. 2: Participants' characteristics

Socio-demographic characteristics	**FG1 (N=5)**	**FG2 (N=5)**	**FG3 (N=4)**	**Total N=14**
Gender				
Male	1	1	1	3
Female	4	4	3	11
Age				
18-45	4	3	2	9
Older than 45	1	2	2	5
Ethnicity				

Arabic/ Arabic British	0	1	1	2
Asian /Asian British	0	1	1	2
Black/ African/ Caribbean/ Black British	2	0	0	2
White/ White British/ White Irish	3	3	2	8
Marital status				
Single	2	1	2	5
Married	3	3	2	8
Prefer not to say	0	1	0	1

It was interesting to observe that participants focused more on the discussion of the extrinsic attributes than the intrinsic attributes. In addition to that, participants had different views on insect-based burgers because some of them were more inclined to have a burger similar to a conventional meat burger, e.g., in colour. On the other hand, the opposite perspective was directed toward the uniqueness of the product and introducing it as a different product, not only in colour but also for its texture and messages of wider cultural significance

3.3.4.2 Consumers' preferences for intrinsic and extrinsic attributes of the product

Figure 3.2 shows that the most discussed intrinsic attributes in the three groups were the type of insects used in the product, colour, and smell. In terms of the type of insect, the general preference was for a type that was common in the country where the interviews took place. The Fishbein score was 10.57: this is because familiarity with the type can increase the acceptance of the product. For example, the African participants suggested ants and caterpillars because they were commonly consumed in their countries. The most preferred colour for patties is a shade of brown that turns golden when cooked, followed in order of preferences by similarity to a conventional meat burger. The Fishbein score was 2.63 for the brown colour and 2.43 for similarity to a conventional burger. The smell of the burger appears to be important because there was a lot of discussion about it in the three groups, but no preference for one particular smell was common to all the groups.

Another important intrinsic attribute that was discussed in two focus groups was the preference for the insects to be processed so they did not see any parts of them. The Fishbein score for this attribute was 8.43.

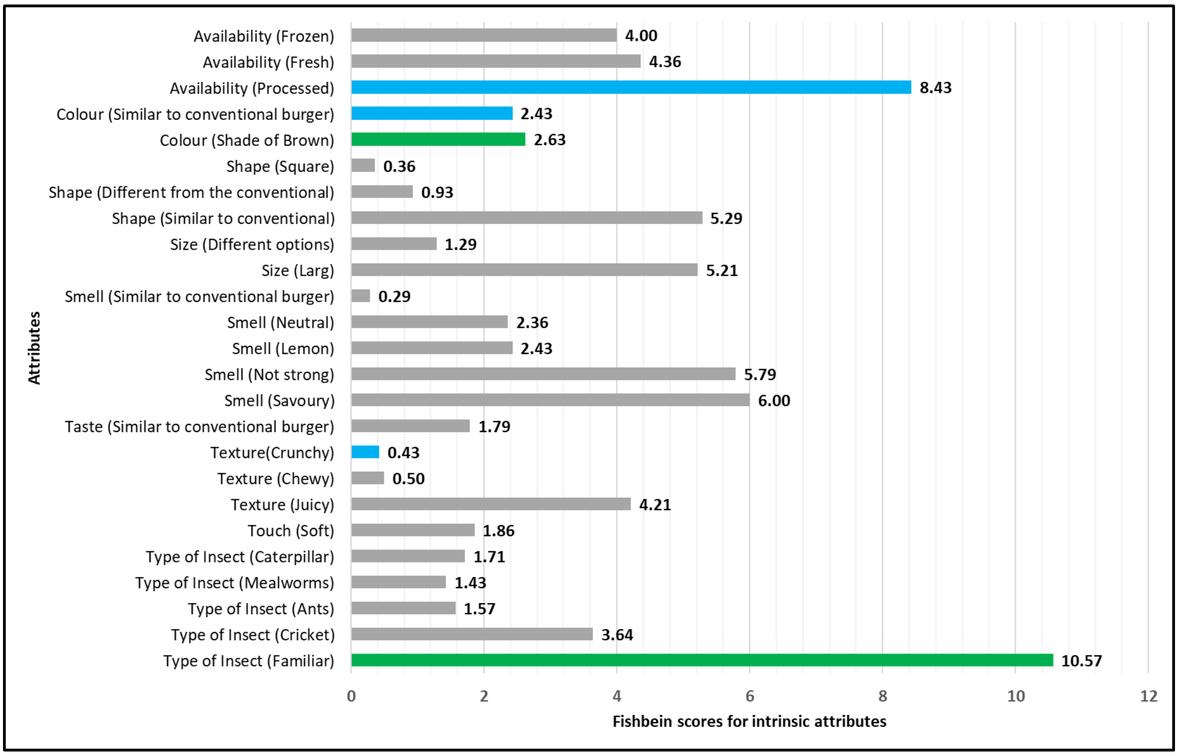


Figure 3. 2: Integration of qualitative and quantitative analysis - intrinsic attributes
Note: Green for attribute levels that were discussed in three focus groups, Blue for what was discussed in two focus groups, and Grey for what was discussed in one focus group. Fishbein score ranged from -25 to +25

Concerning the extrinsic attributes, the most discussed attributes by all groups were the promotion, followed by the packaging of the product, then the place where the product could be offered and its price.

In relation to promotion (see Figure 3.3), the most frequently discussed aspect was the promotion channel through social media platforms as the most effective channel of communication for introducing the product, with a Fishbein score of 16.57 because most people have access to these platforms. Participants also highly rated the influence of trusted figures during the introduction of the product, particularly chefs, who scored 15.93. The preferred messages when communicating the product to consumers: the strongest message was believed to be about the environmentally friendliness of insect-based products: it scored 9.36. It is worth noting that the messages are important as a variety of messages where discussed in different groups.

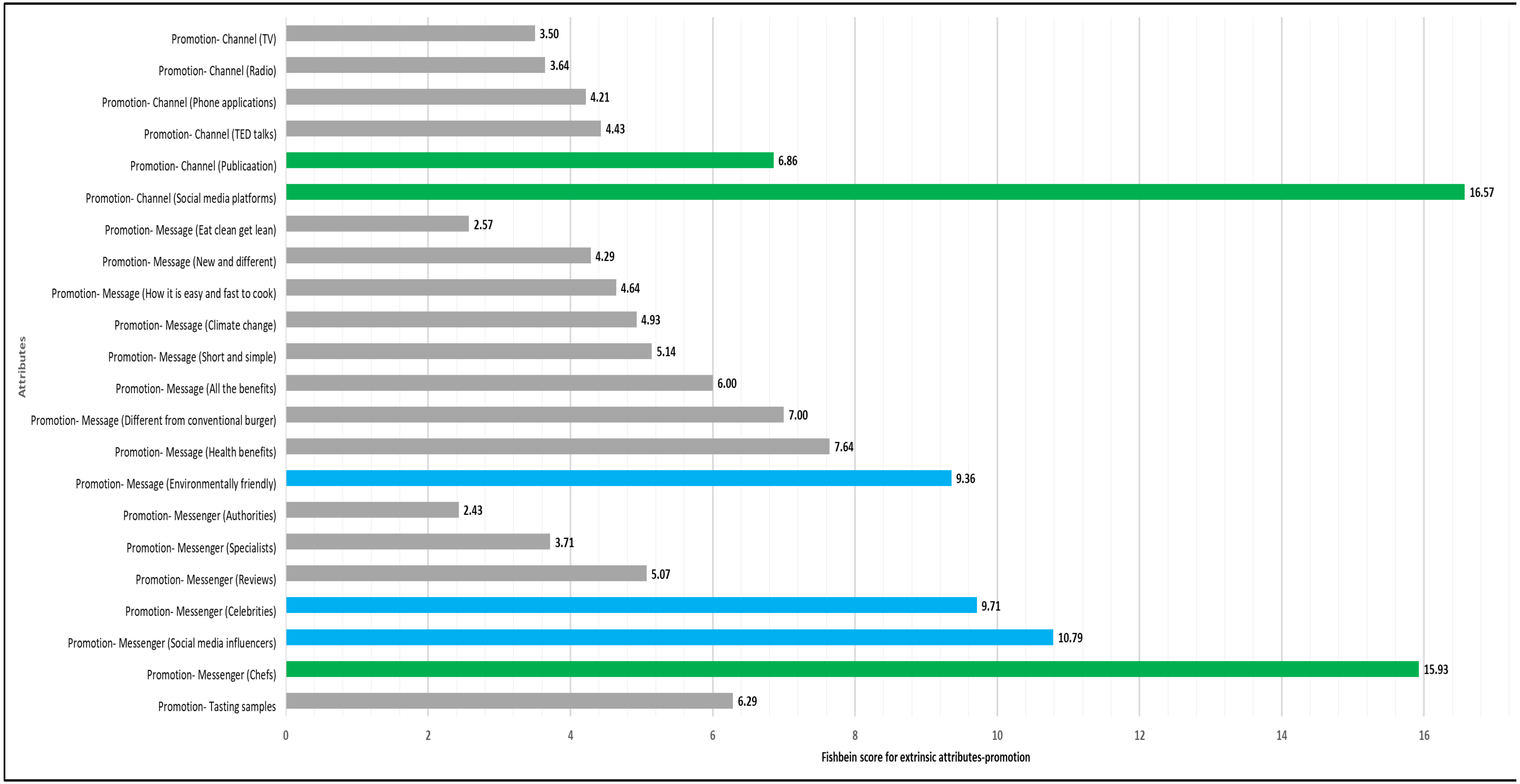


Figure 3. 3: Integration of qualitative and quantitative analysis -extrinsic attributes (promotion)

Note: Green for attribute levels that were discussed in three focus groups, Blue for what was discussed in two focus groups, and Grey for what was discussed in one focus group. Fishbein score ranged from -25 to +25

When discussing packaging (see Figure 3.4), the importance of transparency was emphasized strongly, with a score of 16.29, so that customers could see the product and how it looked in order not to be disappointed when they returned home. The packaging material and the name of the product were the most discussed aspects of packaging: where the most highly preferred material was recyclable, with a score of 15.21. Emphasizing the benefits of insects on the labelling is important as was discussed in two focus groups with a score of 12.36. The most preferred name should be associated with the protein enrichment, with a score of 6.64, but the preference for a name that referred to the fact that the product contained insects was high, considering that different names were suggested (e.g. bug burger, insect burger).

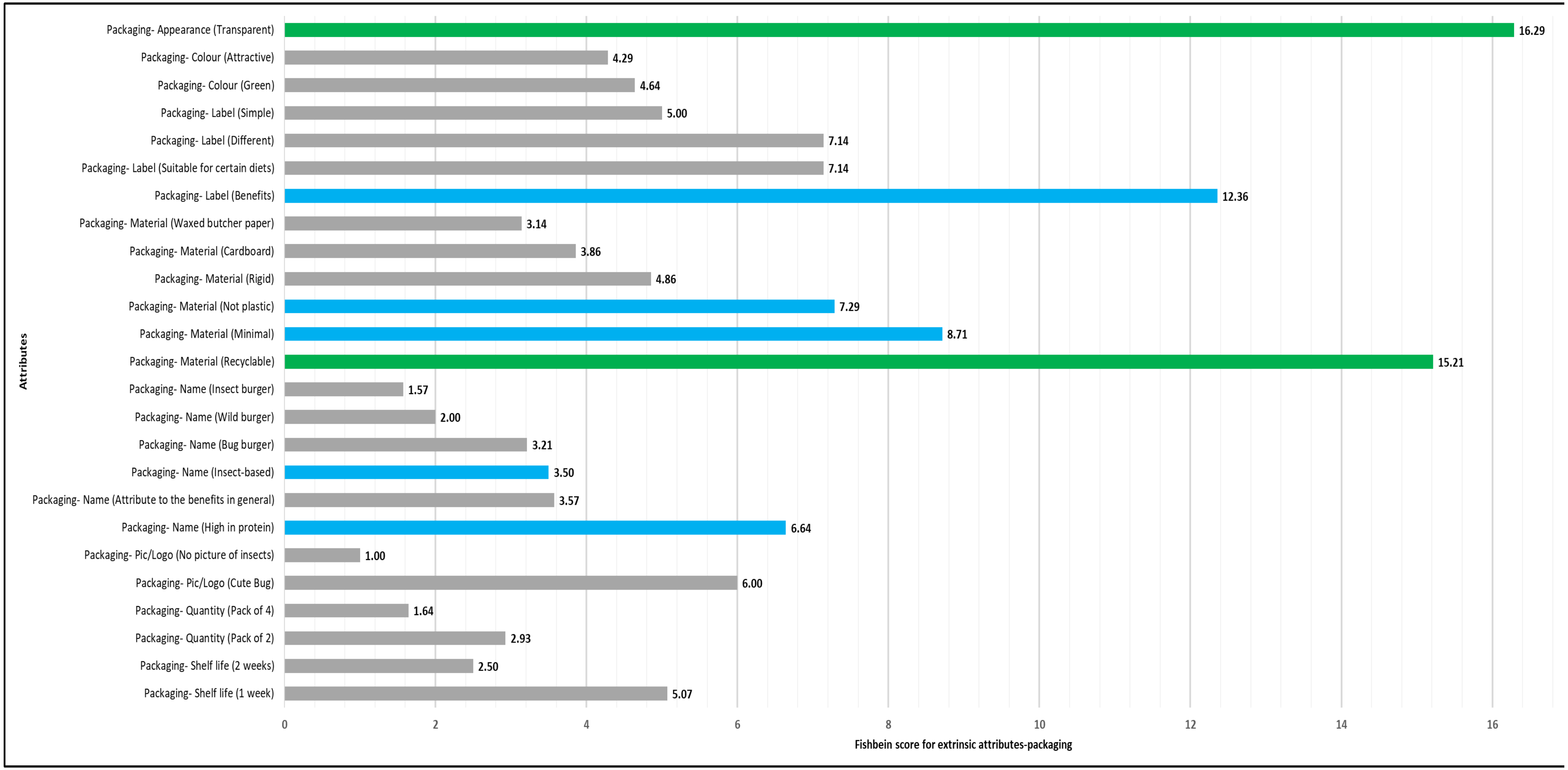


Figure 3. 4: Integration of qualitative and quantitative analysis -extrinsic attributes (packaging)

Note: Green for attribute levels that were discussed in three focus groups, Blue for what was discussed in two focus groups, and Grey for what was discussed in one focus group. Fishbein score ranged from -25 to +25.

Figure 3.5 shows integrated results for the preferred place and price. As regards the shopping place, participants expected to find this product in high-end department stores, with a score of 10.14. This choice was motivated by the fact that these stores usually feature rare products, so adding an insect burger would make potential consumers feel that they were buying a unique item, which would encourage them to buy and try it. Support for the view that the product should be offered in supermarkets was strong with a score of 15.57 in two focus groups: this is because the ease with which the product could be seen and accessed could encourage consumers to try it.

The preferred price was similar to that of conventional meat burger patties, with a score of 9.71, or lower, with a score of 6.71. This could encourage consumers to take the first step and try the product and ensure that everyone could do so. This was followed by the preference for a higher price, with a score of 4.64, as it was a new product that needed to develop a new market chain; in addition, it could be associated with the quality of the product:

> *"I agree with the same. I think if it's too low then you know you might question is it a bit duchy something like that. You don't want it to be higher. You want to get people into it, and I think you can't try to convince people to try it so compared to a normal burger it would be difficult if it was higher".*
>
> *(1, M)*

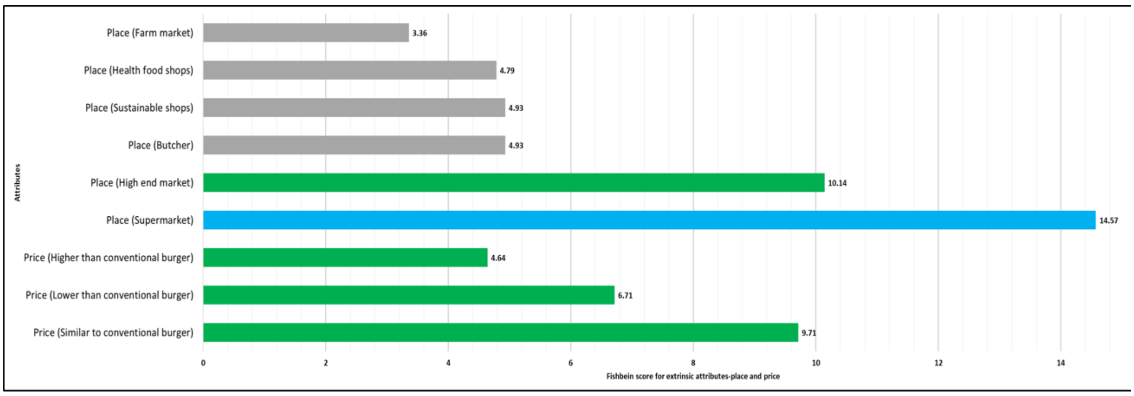


Figure 3.5: Integration of qualitative and quantitative analysis -extrinsic attributes (place and price)

Note: Green for attribute levels that were discussed in three focus groups, Blue for what was discussed in two focus groups, and Grey for what was discussed in one focus group. Fishbein score ranged from -25 to +25.

3.4 Discussion

Results of in-depth interviews offer insights into actions that could be taken along supply chains to foster the development of these products, while findings of focus groups are useful to understand how to develop and market these products. Thus, we will discuss the findings of these two studies taking into account the voice of stakeholders and consumers.

3.4.1. Insights from the voice of stakeholders

Issues highlighted by stakeholders' interviews in relation to intensive production methods implemented in conventional animal breeding systems have also been debated publicly in an effort to understand whether alternative proteins could be one of the solutions to generate innovative sustainable food systems (Broad, 2023). However, stakeholders' views regarding the development of insect food products appear to be challenging because of consumers' ignorance and low acceptance of these products. They believe that one of the reasons why consumers continue to neglect insect food products or other alternative sources of protein may be their ignorance. This argument, or rather the notion of "consumer affected ignorance", has been highlighted in other studies dealing with meat consumption (Williams, 2008). Affected ignorance can be explained by the fact that, even if many consumers already know about these products, they do not want to hear about them and do not make any effort to try them even if they are ignoring something that is morally important such as animal welfare. Affected ignorance can occur due to factors influenced by the market or industry practices such as debates regarding the consumption of alternative proteins (e.g. using labels and marketing strategies that downplay or obscure welfare issues, contributing to consumer ignorance)(Schwartz, 2020). One possible way to address this challenge along these innovative supply chains is to educate consumers about the sources and consequences of their choices and to encourage them to seek reliable and relevant information. From this point of view, policy makers could launch social marketing campaigns aimed at increasing people's awareness about both current environmental and health challenges caused by the mass consumption of meat, and the potential benefits of consuming insects (Barsics *et al.*, 2017). Social marketing campaigns could also influence consumers if communication appeals to their moral values and social norms, and shows them how their actions can benefit others or harm themselves. Such an approach can change people's behaviour and encourage them to talk about issues related to the meat market. For example, educating consumers about food waste could prevent 7.41 million tons of greenhouse gas emissions a year.[20] They should be aware of the importance of being committed to the Paris agreement: "By 2030, zero-carbon solutions could be competitive in sectors representing over 70% of global emissions" (United Nations, 2015).[21]

Stakeholders also emphasized the importance of regulations to lower the price of these products and to make these markets more transparent. Also, in this context, policy makers could facilitate the introduction of alternative sources of protein by updating regulations, supporting producers and speeding up evaluation processes to decrease the cost of developing insect-based products. Specific legislation for the production and sale of edible insects can help both producers to improve the safety of these products with clear names on product packaging and consumers to make more informed decisions. Enhancing consumers' trust in these products can also help retailers to increase sales and move towards economies of scale which could reduce costs and lower the price of these products.

Stakeholders also remarked that the acceptability of insects as food can be limited by religious observance. For consumers following Islamic food regulations, edible insects are acceptable only if products are labelled "Halal". This is a challenge for Muslims because insect consumption, apart from certain species such as locusts, is generally forbidden. For example, even if mealworms and crickets are among the insects most frequently eaten worldwide (FAO, 2014; Cortes Ortiz *et al.*, 2016), and were widely used in insect-based products such as cricket cookies and mealworm burgers,[22] their consumption is prohibited by Islam. Therefore, in certain cultural contexts, the development of insect food products is a challenging barrier.

3.4.2. Insights from the voice of consumers

The analysis of focus group interviews on consumers' acceptance of insect-based burger patties offers insights about both the 4Ps of the marketing mix (product, price, place, and promotion) as applied to these products, and the potential consumers' characteristics. Our results corroborate the findings of several studies exploring preferences for burgers made with insects in Western countries (Schouteten *et al.*, 2016; Tan *et al.*, 2016; Caparros Megido *et al.*, 2016; Cicatiello *et al.*, 2016; Berger *et al.*, 2018, 2019; Orsi, Voege and Stranieri, 2019; Van Thielen *et al.*, 2019; Collins, Vaskou and Kountouris, 2019; Kornher,

[20] https://www.worldwildlife.org/stories/fight-climate-change-by-preventing-food-waste 1
[21] https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement 1
[22] https://www.bugfarmfoods.com/ & https://www.bug.recipes/recipe-info/burger

Schellhorn and Vetter, 2019; Lammers, Ullmann and Fiebelkorn, 2019; Onwezen *et al.*, 2019; Dupont and Fiebelkorn, 2020; Motoki *et al.*, 2020).

In relation to the product, sensory attributes such as taste, smell, colour and texture are the most challenging for food producers because consumers view insect burgers either as an alternative to conventional meat burgers or as a novel product (Barrena and Sánchez 2013; Tan, Tibboel, and Stieger 2017; Kornher, Schellhorn, and Vetter 2019). These aspects were also confirmed by our interviewees, and they influenced their expectations of sensory attributes. When participants felt that the insect-based burger was an alternative to conventional meat burgers, sensory attributes were perceived to be similar to the latter. For food developers, this can be a challenge, due to differences in the properties of insects and meat. Consumers seek products that resemble those they are used to consuming therefore making the development of these products even more challenging because if they do not like the taste, they will not try it again. On the other hand, when insect-based burgers were viewed as a new or different product, their preferences for perceived sensory attributes were less strict than those of participants who expected to consume burgers that resembled conventional meat. In this case, participants were more open to changes, such as the crunchy texture and the golden-brown colour. Even if the brownish colour of the insect-based burger was preferred by our participants, Bartkowicz and Babicz-Zielińska (2020) suggested that the brown colour of crickets was less popular than that of mealworms because it might evoke disgust. Although participants' preferences for perceived smell varied, the fact that there was a lot of discussion about it reflects the importance of this attribute and more studies need to be carried out to further explore the importance of smell. Taste and colour of insect-based food were considered significant sensory attributes; therefore, to increase consumers' acceptance of insect-based burgers, it is important to expose them to the consumption of these products (Caparros Megido *et al.*, 2016; Schouteten *et al.*, 2016; Tan *et al.*, 2016; Castro and Chambers, 2019a; Dupont and Fiebelkorn, 2020). Moreover, the insect burger had to be processed and insect parts had to be invisible as observed in other studies (Caparros Megido *et al.*, 2016; Cicatiello *et al.*, 2016; Collins, Vaskou and Kountouris, 2019; Orsi, Voege and Stranieri, 2019). Another aspect that needs to be taken into consideration is the type of insect used as the main ingredient to replace conventional meat. Preferences appear to be centred on the type of insect that is common in a particular country, e.g. ants should be used if they are already consumed there. This supports the significant influence of familiarity when it comes to insect-based food, as confirmed in other studies because familiarity can increase consumers' acceptance by decreasing disgust and food neophobia (Hartmann and Siegrist, 2017; Mancini, Moruzzo, *et al.*, 2019; Kröger *et al.*, 2022; Alhujaili, Nocella and Macready, 2023).

As regards price, our results confirm previous literature, as it seems that high prices were associated with the high quality of the burger, as with food products in general (Dodds and Monroe, 1985; Acebrón and Dopico, 2000; Brečić, Mesić and Cerjak, 2017; Berger *et al.*, 2018; Cardona *et al.*, 2023). However, some participants stated that the price for insect-based burgers had to be lower than or at least similar to that of traditional meat burgers. Thus, in this case, also, more research is needed to establish t the price at which these products should be marketed to encourage prospective consumers to try them (Kornher, Schellhorn and Vetter, 2019).

On the matter of promotion, the majority of interviewees suggested that insect-based burgers should be advertised virtually via social media platforms and involve trusted figures such as nutritionists, media influencers and celebrity chefs. The product should be marketed using messages that could attract potential consumers by emphasizing its health benefits (e.g. rich in protein), safety for human consumption, and environmental and sustainability benefits: similar findings have emerged from other studies (Berger *et al.*, 2019; Kornher, Schellhorn and Vetter, 2019; Motoki *et al.*, 2020). Some participants also recommended advertising the insect-based burger directly in stores to reach all age groups and encourage those already consuming this product to transmit their positive reactions by word of mouth.

Supermarkets were considered an important distribution point for these products without neglecting the possibility of selling insect-based burgers at fast food festivals and encouraging butchers to offer prospective consumers the opportunity to learn about and try the product. Furthermore, high-end department stores could attract potential consumers by distributing a high-quality novel product.

3.5 Conclusion

The small sample sizes of these two studies do not allow us to generalize from their results. However, the findings discussed so far shed light on the market prospects and development of these products from general and specific points of view. The development of the UK market for these products appears to be challenging, at least in the short-medium term, raising questions linked to consumers' ignorance and the lack of a regulatory framework enabling all economic agents involved in these new food supply chains to make informed decisions from farm to fork. There is an urgent need both for policy makers to address these issues and for researchers to assess consumers' preferences and specific segments of British consumers' willingness to pay for different insect-based products. This requires more collaboration in terms of interdisciplinary communication and research, in order to bypass barriers created by ignorance and the lack of regulations and to encourage the development of new products, the implementation of the marketing mix and, ultimately, consumers' acceptance of edible insects.

The next two chapters concern the online survey on UK consumers' preferences and their willingness to pay for sliced bread and pasta made with cricket flour. The development of the online survey was based on the insights emerging from the systematic review in Chapter 2 and the results of this chapter's investigation of stockholders' and consumers' perceptions. In Chapter 4 I present a detailed overview of the research methods employed in the online survey. This includes the development of the conceptual framework based on the Theory of Planned behaviour (TPB). Consumers' preferences concerning insect-based products will be assessed by the statistical and economic modelling of Multinominal Logistic Regression (MNL) analysis, while Double-bounded Dichotomous Choice analysis (DBDC) and the Price Sensitivity Meter (PSM) will be used to elicit consumers' WTP. Chapter 4 will also consider the design of the survey, data collection and sampling. That will be followed by the survey results and discussion in Chapter 5.

CHAPTER 4. Methodology of Consumers' preferences and willingness to pay for insect-based food

4.1 Introduction

The main objective of this chapter is to highlight methods used to explore consumers' preferences and willingness to pay for two insect-based products: sliced bread and pasta made with cricket flour.[23] These methods were used to answer the following research questions: How do attitudes, social pressure, perceived behavioural control, intention to try insects in the next 12 months, disgust, and neophobia towards insect-based food vary across different consumer segments? How do the elements of the theory of planned behaviour, along with factors such as disgust, neophobia, and socio-demographic and economic characteristics, influence consumer preferences for sliced bread and pasta made with cricket flour? Are British people willing to pay a premium What is the influence of psychological and non-psychological factors on consumers' willingness to pay for sliced bread and pasta made with cricket flour? Are the willingness-to-pay estimates obtained through contingent valuation techniques comparable to estimates obtained from Van Westendorp's price sensitivity meter? What are consumers' preferences regarding the logo of products such as sliced bread and pasta made with cricket flour? These research questions are linked to the following objectives:

a) To discover how attitudes, social pressure and perceived behavioural control, disgust and neophobia towards food insects vary across segments of consumers;

b) To assess how the elements of the theory of planned behaviour, disgust, neophobia can influence consumer's preferences towards sliced bread and pasta made with cricket flour;

[23] The initial products chosen for this study were burger made with mealworms and pasta made with cricket flour, but we have changed them to sliced bread and pasta made with crickets (see section 4.4 for the explanation of why we changed them). The choice of products was based on the results of the systematic review (see Chapter 3), which revealed that burgers are the most investigated processed products in the literature. Therefore, we aimed to explore British acceptance of this product, especially since only two studies have examined it in the UK. However, Collins, Vaskou and Kountouris (2019) studies explored the role of the visibility of insects in different products but did not focus on the acceptance of the carrier. In contrast, Powell, Jones and Consedine (2019) conducted an experiment on the role of sensory attributes (e.g., taste, naturalness) on a specific segment of consumers with the highest disgust ratings. As we aimed to compare the acceptance of two products for regular consumers, we opted for pasta instead of protein bars and cookies, despite them being the next most investigated products after burgers. This decision was made because protein bars and cookies are primarily considered snacks, while pasta, like burgers, is part of a main meal. Additionally, both burgers and pasta are savoury products. Therefore, we believe that comparing these similar products is more reasonable.

c) To estimate how the elements of the theory of planned behaviour, disgust, neophobia influence consumers' willingness to pay for sliced bread and pasta made with cricket flour;

d) To evaluate whether willingness to pay estimates obtained with contingent valuation techniques are comparable with estimates obtained from Van Westendorp's price sensitivity meter;

e) To explore consumers' preferences towards the logo of these products.

The remainder of this chapter is organised as follows. Section 4.2 will introduce the theoretical framework used in this study. Section 4.3 how the survey design was developed to incorporate both the theoretical framework, contingent valuation methods and marketing techniques. Section 4.4 will describe data collection methods and sampling. Section 4.5 will illustrate statistical techniques and econometric analysis used to analyse data.

4.2 The theoretical framework: an extended version of the theory of planned behaviour

In order to answer research questions and achieve stated objectives we employed the theory of planned behaviour. The Theory of Planned Behaviour (TPB) is a widely used social psychological model that aims to predict and understand human behaviour in various fields, including applied science (Ajzen, 1991; Pavlou and Fygenson, 2006; Si *et al.*, 2019; Pourmand *et al.*, 2020). It is an extension of the Theory of Reasoned Action (Ajzen, 1991), and includes measures of control belief and perceived behavioural control (Armitage and Conner, 2001).

As shown in figure 4.1 and equations 4.1 – 4.3, the TPB suggested that performing a behaviour (B) towards a certain object (o) is determined by the intention to perform the behaviour (I) and perceived behavioural control (PBC)). The intention to perform the behaviour is influenced by attitudes (ATT), subjective norms (SN) and PBC. Thus, PBC influences directly and indirectly the behaviour towards a certain object (Ajzen, 1991).

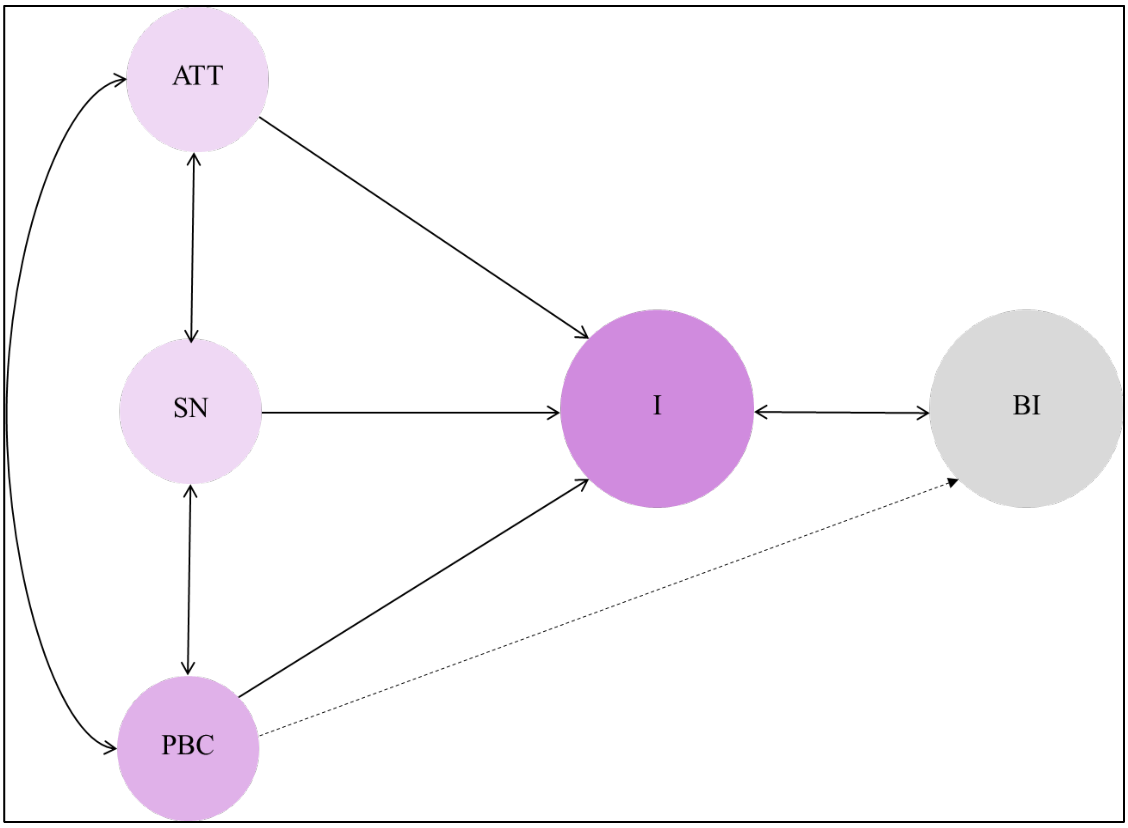


Figure 4. 1: TPB (Ajzen, 1991)

According to Ajzen (1991), attitude towards the behaviour refers to a person's positive or negative evaluation of the behaviour, whereas a more positive attitude towards the behaviour is associated with a higher likelihood of performing the behaviour. The attitude component of this theoretical model is evaluated taking into account the expectancy-value principle, which assumes that the evaluation of an attitude object is obtained by the sum of the expected outcomes weighted by their subjective probability (beliefs) as follows:

$$ATT = \sum_{j=1}^{n} b_{ik} c_{ik} \qquad (4.1)$$

Where:

- *j* is an index ranging from 1 to *n*, with n being the number of attitudes items used to evaluate the object i.e. attitudes towards the consumption of food made with insects;
- *k* is an index ranging from 1 to *z* and *z* is the number of participants;
- c_{ik} is the ith expected outcome evaluated by participant *k*;

- b_{ik} is the ith belief strength evaluated by participant *k*.

Also, the evaluations of SN and PBC are assessed using the expectancy-value principle, which is a feature of several theories in motivation and attitude-behavioural research (Bohner and Wänke, 2002).

Subjective norms (SN) refer to a person's perception of social pressure on them to perform or not perform a particular behaviour, the more important to an individual the belief that others approve/perform the behaviour, the more likely a person is to perceive social pressure to engage in the behaviour, the greater the subjective norms, the stronger the intention to perform the behaviour (Ajzen, 1991).

$$SN = \sum_{q=1}^{n} d_{ik} e_{ik} \tag{4.2}$$

- q is an index ranging from 1 to *n*, with n being the number of subjective norms items used to evaluate the object e.g., subjective norms towards the influence of family on the consumption of food made with insects;
- *k* is an index ranging from 1 to *z* and *z* is the number of participants;
- d_{ik} is the ith expected outcome evaluated by participant *k*;
- e_{ik} is the ith belief strength evaluated by participant *k*.

Perceived behavioural control (PBC) refers to the person's perception regarding the ease or difficulty of performing a behaviour, the greater the perceived control, the stronger the intention to perform the behaviour (Ajzen, 1991).

$$PBC = \sum_{r=1}^{n} g_{ik} h_{ik} \tag{4.3}$$

- r is an index ranging from 1 to *n*, with n being the number of perceived behavioural control items used to evaluate the object e.g., perceived the availability of insect-based food products in the preferred supermarket on consumption of food made with insects;
- *k* is an index ranging from 1 to *z* and *z* is the number of participants;
- g_{ik} is the ith expected outcome evaluated by participant *k*;
- h_{ik} is the ith belief strength evaluated by participant *k*.

The TPB has been widely used in understanding and predicting consumers' behaviour towards sustainable and novel food and many of these studies further extended the theory by examining the influence of additional variables. For instance, Alam *et al.* (2020) conducted a study applying the TPB to examine consumers' consumption of sustainable food. The researchers found that all the theoretical constructs of TPB were positively significant predictors of sustainable food consumption. Moreover, the study delved into the influence of the perceived value of sustainable food concerning its quality and the perceived value for consumers. Findings indicated that the perceived value of sustainable food also positively influenced consumption. In relation to meat alternatives, two studies have been conducted on plant-based food and cultured meat. The study conducted by Dupont, Harms and Fiebelkorn (2022) aimed to investigate the applicability of the TPB in predicting consumers' willingness to consume novel foods, specifically plant-based food and cultured meat. The researchers found that while attitude did not have a significant impact, both subjective norms and perceived behavioural control positively influenced consumers' willingness to try these novel food alternatives. Furthermore, the study extended the TPB by examining the influence of four additional factors: food technology neophobia, food disgust, sensation seeking (e.g. the need for adventure and tendency to take risks), and green consumption value. Results indicated that food technology neophobia, food disgust, and sensation seeking had a negative influence on consumers' willingness to try novel food alternatives. Conversely, green consumption value was found to have a positive influence on consumers' willingness to try these alternatives. Stollar *et al.* (2022) also applied this theory to plant-based food and cultured meat to evaluate current and future purchasing behaviour, specifically insect-based food and future consumption of cultured meat. Researchers found that all the TPB constructs were positive predictors of current and future purchasing behaviour towards plant-based food. Additionally, both attitudes and subjective norms emerged as significant predictors for the future purchasing behaviour of cultured meat. It is noteworthy that the researchers did not explore the influence of perceived behavioural control on the purchasing behaviour of cultured meat because of the unavailability of the product in the market, rendering the assessment of this element unfeasible. Malavalli *et al.* (2021) specifically investigated the impact of attitudes on consumers' willingness to try and purchase cultured meat. The researchers explored attitudes in relation to consumers' perspectives on the environment and sustainability, health and safety, as well as the purchasing and consumption of conventional meat. Their findings revealed that all the attitudinal measures were positively correlated with the purchasing and consumption of cultured meat.

In regard to insects as food, nine studies have been found that applied the TPB constructs to consumers' behaviour towards insects as food. In their research, (Pambo *et al.*, 2016) and a subsequent study (Pambo *et al.*, 2018) delved into the influence of the TPB constructs on the intention to consume insect-based food in Kenya. Findings from both studies indicated that all the TPB elements positively influenced the intention to try insect-based food. Furthermore, Pambo *et al.* (2018) expanded their investigation to include the influence of self-identity and familiarity with eating insects. The self-extended component of the TPB had the scope to understand how individuals perceive themselves concerning insect-based food. Results revealed that self-identity and familiarity with eating insects were positively associated with consuming insect-based food. Menozzi *et al.* (2017) investigated the influence of TPB constructs on consumers' intention to eat insect-based food. Findings revealed that both attitude and perceived behavioural control had a positive influence on the intention to consume insect-based food, while subjective norms did not exert an influence. Additionally, the study explored the influence of disgust when seeing insects and background factors. It was found that disgust negatively influenced the willingness to try insect-based food. Moreover, males exhibited a higher intention than females, and individuals involved in food and environmental science were more willing to eat products containing insect flour than those who were not. The study conducted by Chang, Ma and Chen (2019) investigated the influence of TPB constructs on the intention to purchase insect-based food. Findings revealed that consumer attitudes and perceived behavioural control significantly influenced the intention to purchase insect food. Additionally, the study included food neophobia, which was found to have a significant negative impact on purchase intention. However, subjective norms and environmental concerns did not show a significant effect on the intention to buy insect food. Mancini, Sogari, *et al.* (2019) focus on the influence of perceived behavioural control on the intention to try insect-based food, as well as personal rejection (e.g., the belief that eating insects is not a part of their diet) and food neophobia. The findings indicate that perceived behavioural control and personal rejection positively predict the willingness to try insect-based food, while food neophobia has a negative impact on the intention to try insect-based food. Lucchese-Cheung *et al.* (2020) investigated the influence of TPB constructs on the intention to consume edible insects. The findings revealed that attitude was not a significant predictor of the intention to consume edible insects. However, subjective norms were found to negatively influence the intention, while perceived behavioural control had a positive impact on it. Additionally, the study explored the influence of social demographics and economic factors, including gender, high education, and income, which were found to not be significant in relation to the intention to consume edible insects.

The study conducted by Vartiainen *et al.* (2020) investigated the influence of TPB constructs on the intention to eat insect-based food. The findings show that all the TPB constructs positively influenced the willingness to eat insect-based food. Additionally, the study explored the influence of being female, having food neophobia, and lack of previous experience, which was found to have a negative impact on the intention to eat insect-based food. Bae & Choi, (2021) expanded the TPB, the study revealed that attitude and perceived behavioural control positively influence the willingness to accept insect-based food, whereas subjective norms did not exert a significant influence. They further include food neophobia and previous experience with eating insects. Their findings indicated that food neophobia negatively influences the acceptance of edible insects, while previous experience with eating insects has a positive impact. Hwang & Kim, (2021) conducted a study with slight differences in terms of the scope where they focused on visiting restaurants that offer insect-based food. Their findings revealed that all the constructs positively influenced the willingness to visit these restaurants. Furthermore, the researchers extended the theory by incorporating the concept of knowledge about the product as a moderator for the influence of the constructs. This addition was shown to moderate only the relationship between subjective norms and behavioural intentions to visit these restaurants.

In understanding consumer behaviour towards novel foods, such as insect-based products, it is essential to explore the intricate interplay between socio-demographic factors (i.e. sex, age, and education), food neophobia, and disgust, and how these elements interact with the constructs of the Theory of Planned Behaviour.

Attitudes: Sex differences suggest that men typically display more adventurous eating behaviours, including a higher propensity to try novel foods like insects than women (Verbeke, 2015; Cicatiello *et al.*, 2016; Sogari, Menozzi and Mora, 2019; Orkusz *et al.*, 2020; Tuccillo, Marino and Torri, 2020). Age also plays a crucial role, with younger individuals typically exhibiting more openness to new food experiences compared to older consumers, who may be more resistant to changing their established dietary habits (Verbeke, 2015; Liu, Li and Gómez, 2020; Tuccillo, Marino and Torri, 2020; Mopendo Mwisomi *et al.*, 2023). Furthermore, Education and income levels further influence consumer attitudes. Higher education levels are often associated with greater awareness of environmental and sustainability issues, leading to more positive attitudes towards consuming insects (Cicatiello *et al.*, 2016; Thu Thu Aung *et al.*, 2023). Similarly, higher-income individuals might have more access to a variety of food options and a greater willingness to experiment with novel foods, including insects (Liu, Li and Gómez, 2020; Orkusz *et al.*, 2020). Psychological factors such as food neophobia and disgust also significantly affect consumer attitudes. High food neophobia, characterized by a reluctance to try new foods, and high disgust, often driven by cultural perceptions of insects as unclean, can lead to negative attitudes towards insect consumption in comparison with individuals with lower levels of food neophobia and disgust (Verbeke, 2015; Clarkson, Mirosa and Birch, 2018; Sogari, Menozzi and Mora, 2019; Dupont and Fiebelkorn, 2020; Liu, Li and Gómez, 2020; Orkusz *et al.*, 2020; Tuccillo, Marino and Torri, 2020; Bae and Choi, 2021). It is important to consider that there is an interaction between food neophobia, disgust, and socio-demographic variables, creating a complex web of influences on consumer attitudes towards insects as food. For example, a young , educated male is likely to have lower food neophobia (Mascarello *et al.*, 2020; Okumus, Dedeoğlu and Shi, 2021; Szakály *et al.*, 2021; Mopendo Mwisomi *et al.*, 2023) leading to more positive attitudes towards insect consumption. Males might experience less food disgust compared to females (Rohrmann, Hopp and Quirin, 2008; Al-Shawaf, Lewis and Buss, 2018) and younger have lower disgust towards insect-based food than older (Sheppard and Frazer, 2014) which also suggests more positive attitudes towards consuming insects. It worth noting that some studies found these variables not to be significant, for instance, sex (Dupont and Fiebelkorn, 2020; Mopendo Mwisomi *et al.*, 2023; Thu Thu Aung *et al.*, 2023), age (Thu Thu Aung *et al.*, 2023) (Cicatiello *et al.*, 2016), education (Mopendo Mwisomi *et al.*, 2023), and food neophobia (Mopendo Mwisomi *et al.*, 2023).

Despite the growing interest in the factors influencing consumer attitudes towards novel foods like insects, there remains a relative limited number of studies that have conclusively examined the relationship between socio-demographic variables and subjective norms, as well as perceived behavioural control towards insect consumption. Existing research tends to focus more on direct attitudes towards insect consumption, leaving gaps in our understanding of how these socio-demographic factors shape social pressure and perceived ease or difficulty of consuming such foods.

Subjective norms: studies suggest that generally, males seems to be less influenced by social pressure than females when it comes to food choices (Grogan, Bell and Conner, 1997; Chung, Ersig and McCarthy, 2017) possibly due to different social pressures or personal attitudes towards food and health. Though, regarding insects, females may be less significantly influenced by social pressures. For example, (Pambo *et al.*, 2018) found that males more influenced than females in the regions that were not familiar with insect consumption. Conversely, Mopendo Mwisomi *et al.* (2023) and Thu Thu Aung *et al.* (2023) found it not to be significant. As for age, adolescents are generally more likely to be socially influenced regarding food consumption (Dennison and Shepherd, 1995). This pattern seems to extend to insect consumption as well; (Chung, Ersig and McCarthy, 2017) found that adolescents' diets are likely influenced by their close friends. However, (Mopendo Mwisomi *et al.*, 2023) and (Pambo *et al.*, 2018) suggested that older individuals experience higher subjective norms. Additionally, Thu Thu Aung *et al.* (2023) found no significant age-related differences in social influence on insect consumption. Regarding education, higher education levels are often associated with greater awareness and openness to novel foods. This association is typically attributed to a broader exposure to diverse ideas, greater access to information, and a heightened understanding of the benefits of alternative food sources. Therefore, educated individuals may be more likely to appreciate the advantages of consuming insects, such as reduced environmental impact and high nutritional value. However, despite this general trend, Pambo *et al.* (2018) and Thu Thu Aung *et al.* (2023) found no significant impact of education on subjective norms regarding insect consumption. This suggests that educational attainment alone may not be a strong determinant of social pressure or acceptance in the context of entomophagy. It may also indicate that awareness and knowledge do not necessarily translate into behavioural change, particularly if deeply ingrained cultural and psychological barriers, like disgust, are at play. Therefore, while the direct influence of education on social pressure towards insect consumption remains unclear, its indirect effects and the interplay with other factors warrant further exploration.

The roles of food neophobia and disgust in shaping these perceptions are not well-documented. While high food neophobia and disgust can negatively influence attitudes towards novel foods, their interaction with sociodemographic factors and resultant social pressures needs further investigation to draw more definitive conclusions. Higher food neophobia generally corresponds to lower influence of subjective norms towards insects (Bae and Choi, 2021), though Mopendo Mwisomi *et al.* (2023) did not find this significant. Regarding disgust, Social influence can mitigate disgust towards insects (Jensen and Lieberoth, 2019b; Russell and Knott, 2021). For instance, Sheppard and Frazer (2015) concluded that observing others, especially influential or admired individuals, consuming insects can reduce feelings of disgust and leading to higher intention towards entomophagy. Furthermore, Berger *et al.* (2019) found that the influence of experts is moderated by disgust, such that experts have the strongest influence on consumers with less disgust sensitivity towards insects.

Perceived behavioural control: Pambo *et al.* (2018) found that the higher the level of education, the lower the perceived behavioural control towards consuming insects. This negative relationship may seem counterintuitive, given that higher education often correlates with greater awareness and openness to novel ideas. One explanation could be that educated individuals are more aware of potential risks associated with consuming insects, such as concerns about food safety, allergies, or contamination. However, (Mopendo Mwisomi *et al.*, 2023; Thu Thu Aung *et al.*, 2023) found no significant impact of education on perceived behavioural control. Concerning sex, it is likely that males have higher perceived behavioural control towards consuming edible insects, as suggested by (Pambo *et al.*, 2018). However, this finding was not corroborated by (Mopendo Mwisomi *et al.*, 2023; Thu Thu Aung *et al.*, 2023) who found no significant differences. Regarding age, Pambo *et al.* (2018) found that older individuals exhibit higher perceived behavioural control towards consuming insects. Nevertheless, this finding was not supported by the studies of Thu Thu Aung *et al.* (2023) which did not find significant age-related differences in perceived behavioural control. The people with low neophobia, perceived behavioural control was higher than people with low neophobia group (Bae and Choi, 2021). Onwezen *et al.* (2019) found that that high levels of disgust are associated with lower perceived behavioural control. This means that individuals who experience strong feelings of disgust towards insects are more likely to perceive that they cannot overcome these feelings to consume insect-based foods. However, Menozzi *et al.*, (2017) found it not associated with perceived behavioural control (Menozzi *et al.*, 2017), meaning that the feeling of disgust that individuals experience when they see insects does not have a significant relationship with their perceived ability to control their behaviour towards eating insects. In other words, even if someone feels a strong sense of disgust upon seeing insects, this does not necessarily affect their perception of whether they can manage to consume insects as food. Their level of disgust in encountering insects does not predict how much control they feel they have over the act of eating insects.

The exploration of consumer attitudes towards insect consumption reveals a complex interplay of socio-demographic and psychological factors. While higher education, sex, and age influence these attitudes, the roles of food neophobia and disgust are particularly significant. Social pressures and perceived behavioural control are also shaped by these factors, though existing research highlights the need for further investigation to fully understand these dynamics. Overall, while some studies suggest that socio-demographic factors may not always significantly impact attitudes towards insect consumption, the interaction between these factors and psychological influences like neophobia and disgust underscores the multifaceted nature of consumer acceptance of novel foods.

Based on the aforementioned previous studies, it is clear that the TPB constructs are strong predictors of consumer behaviour towards insect-based food, as demonstrated by their significant influence in the majority of the studies. These studies have extended the TPB by incorporating a variety of factors, including food neophobia, disgust towards food, previous experience with insects as food, and gender. However, due to the diverse range of these factors, it is challenging to conclusively identify a single factor that strongly predicts consumer behaviour towards this type of food. Moreover, several recent studies have explored factors influencing behaviour towards insect-based products without explicitly incorporating the TPB constructs, as concluded by some reviews (Mancini, Moruzzo, *et al.*, 2019; Onwezen *et al.*, 2021; Kröger *et al.*, 2022; Alhujaili, Nocella and Macready, 2023). These studies strongly suggest that food neophobia and disgust, as well as background factors, are strong predictors of consumer behaviour towards insects as food.

In light of these findings, we extend the conceptual framework as shown in Figure 4.2 and Equations 4.5, and 4.6 show that our TPB model also includes food neophobia (FN), disgust (DISG). Our revised model also shows that *B* is captured by the preferences for i.e., bread and pasta made with cricket flour, and their willingness to pay for these (B_{IBF}).

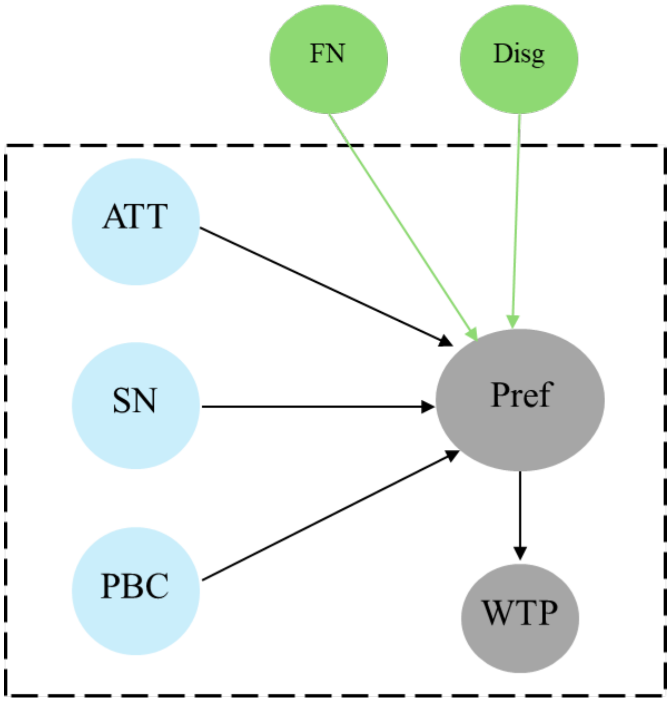


Figure 4. 2: The proposed extended TPB model

$$FN = \sum_{s=1}^{n} m_{ik} \qquad (4.5)$$

- s is an index ranging from 1 to *n*, with n being the number of food neophobia items used to evaluate the object i.e. eating almost everything on consumption of food made with insects;
- *k* is an index ranging from 1 to *z* and *z* is the number of participants;
- m_{ik} is the ith evaluation by participant *k*.

$$DISG = \sum_{t=1}^{n} p_{ik} \qquad (4.6)$$

- *t* is an index ranging from 1 to *n*, with n being the number of disgust towards insects items used to evaluate the object i.e. disgust to eat any dish with insects on consumption of food made with insects;
- *k* is an index ranging from 1 to *z* and *z* is the number of participants;
- p_{ik} is the ith evaluation by participant *k.*

Taking into account the proposed extended TPB model, our model is expressed in equation 4.7 as follows:

$$B_{IBF} = ATT + SN + PBC + FN + DISG \qquad (4.7)$$

Where:

- B_{IBF} is the intentional behaviour (i.e. preferences for bread and pasta made with cricket flour, and willingness to pay for bread and pasta made with cricket flour).
- ATT= Attitudes towards insect-based food in the next 12 months.
- SN= Subjective norms to wards insect-based food in the next 12 months.
- PBC = Perceived behavioural control in the next 12 months.
- FN= Food neophobia.
- $DISG$= Disgust towards insect-based food.

4.3 The survey

The design of this survey was based on the results of the systematic review presented in chapter two and the outcomes of interviews and focus groups discussed in chapter three. These qualitative research methods allow for a deeper understanding of the factors that influence consumer acceptance of insect-based food.[24]

The extended TPB model described in section 4.2 was incorporated within an online questionnaire[25] which consisted of five sections based on the suggestions by the Organisation for Economic Co-operation and Development OECD (2018) and the study by Bateman *et al.* (2002) when developing surveys where willingness to pay has to be estimated. Of these five sections, the first section ensured that respondents understood the aim and the context of the survey. Furthermore, screening questions ensured that we only included eligible participants i.e., British over 18, who consume sliced bread and pasta and are primarily/partially responsible for food purchases. The last section collected information about the socio-demographic characteristics of participants such as sex, age, education, religion, household size and income.

The remaining three sections are the core of the survey, we will discuss them in detail in the following three sub-sections. These sections had the scope to elicit information about

[24] The ethical clearance was submitted and approved by the Ethical Committee of the University of Reading on 30/3/2023 (see Appendix 4.1)
[25] See Appendix 4.2 for the questionnaire

the consumption habits of insect-based food products that we investigated, operationalization of the extended TPB model proposed in section 4.2, consumers' preferences and willingness to pay for sliced bread and pasta made with cricket flour.

4.3.1 Consumption habits

The second section of the questionnaire concerned the use of the good by asking questions related to the consumption habits of conventional sliced bread and pasta by household. In this section, we have asked participants about their consumption habits in regard to the average amount of sliced bread and pasta the household consumes (by grams/kilograms) every month. The amounts ranged from 400g to more than 2.8kg for the bread and 500g to more than 6k for pasta. In addition to the average monthly spend on these two products (by pound). The monthly spend ranged from less than £1 to more than £6 for bread, and from less than £5 to more than £34 for pasta. Participants were able to choose the right answer from a drop-down menu with the options stated above, except when they choose the answer (more than …), they will have the chance to write their specific answer. The amounts in the questions about consumption habits were designed based on the first pilot which consisted of 30 British participants as further explained in section 4.4.

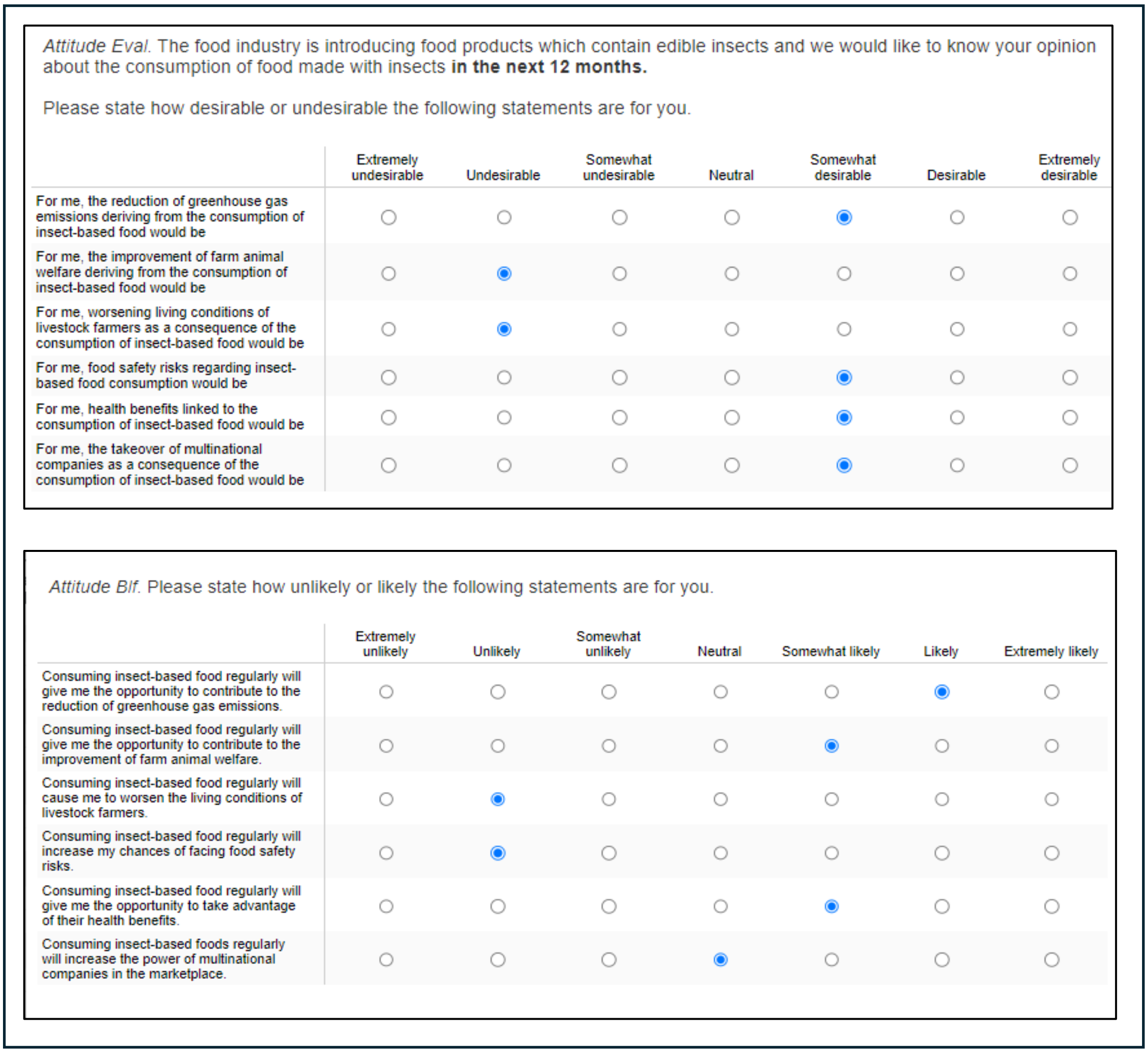
4.3.2 Operationalization of the extended TPB model

The operationalization of the extended TPB model was realised by developing the third and fourth sections of the questionnaire. The third section had the scope to collect information regarding the extended components of the TPB conceptual framework illustrated in Figure 4.2.

When we evaluated participants' attitudes, Figure 4.3 shows that we developed 6 items and used two different rating item scales to measure the evaluative and belief components of attitudes. Four of these items were adapted from existing literature on the influence of these items on insect-based food consumption, i.e. the health benefits (Menozzi *et al.*, 2017; Mancini, Sogari, *et al.*, 2019; Mopendo Mwisomi *et al.*, 2023), environmental and sustainable benefits (Menozzi *et al.*, 2017; Mancini, Sogari, *et al.*, 2019; Lucchese-Cheung *et al.*, 2020; Vartiainen *et al.*, 2020; Mopendo Mwisomi *et al.*, 2023; Thu Thu Aung *et al.*, 2023), food safety risks (Hartmann *et al.*, 2015; Ruby, Rozin and Chan, 2015; Baker, Shin and Kim, 2016; Castro and Chambers, 2019a, 2019b; Gallen, Pantin-Sohier and Peyrat-Guillard, 2019; Orsi, Voege and Stranieri, 2019; Dupont and Fiebelkorn, 2020), the impact on farm animal welfare which was debatable as (Wilkinson *et al.*, 2018; Dupont and Fiebelkorn, 2020) found it to be weak, and (Petrescu-Mag, Rastegari Kopaei and Petrescu, 2022) found it insignificant. However, three studies found that animal welfare is a reason for switching from meat consumption to a more ethical and sustainable diet (House, 2016; Hartmann and Siegrist, 2017; Klink-Lehmann and Langen, 2019), and the results of Chapter 2 suggested that stakeholders see it as one of the reasons to shifting to insect-based food diet. For the fifth and sixth items, we were interested in exploring the economic impact in two different dimensions. The first dimension pertains to how insect food consumption could affect livestock farmers, potentially resulting in job losses due to a shift away from traditional livestock farming towards non-livestock animals, such as insects. The second dimension involves the impact of multinational companies entering the insect-based food industry in the UK. Currently, the UK market lags behind other European countries like France and Germany in this industry. This situation could lead to a reliance on imported insect-based products for a period.

The evaluation component was measured on a 7-point scale ranging from extremely undesirable to extremely desirable, while the belief component was evaluated on a 7-point scale ranging from extremely unlikely to extremely likely.

Each component consisted of three positive and three negative items, resulting in a total of 12 questions. These questions covered six dimensions: three positive (i.e., health benefits, animal welfare, GHG emissions) and three negative (i.e., perceived risk, farm animal welfare, and the takeover by multinational companies). By aggregating responses from these dimensions, we constructed a comprehensive Attitude variable reflecting the overall sentiment towards insect-based foods. This Attitude variable was then used to assess its impact on consumers' preferences and willingness to pay for insect-based foods.



Attitude Eval. The food industry is introducing food products which contain edible insects and we would like to know your opinion about the consumption of food made with insects **in the next 12 months.**

Please state how desirable or undesirable the following statements are for you.

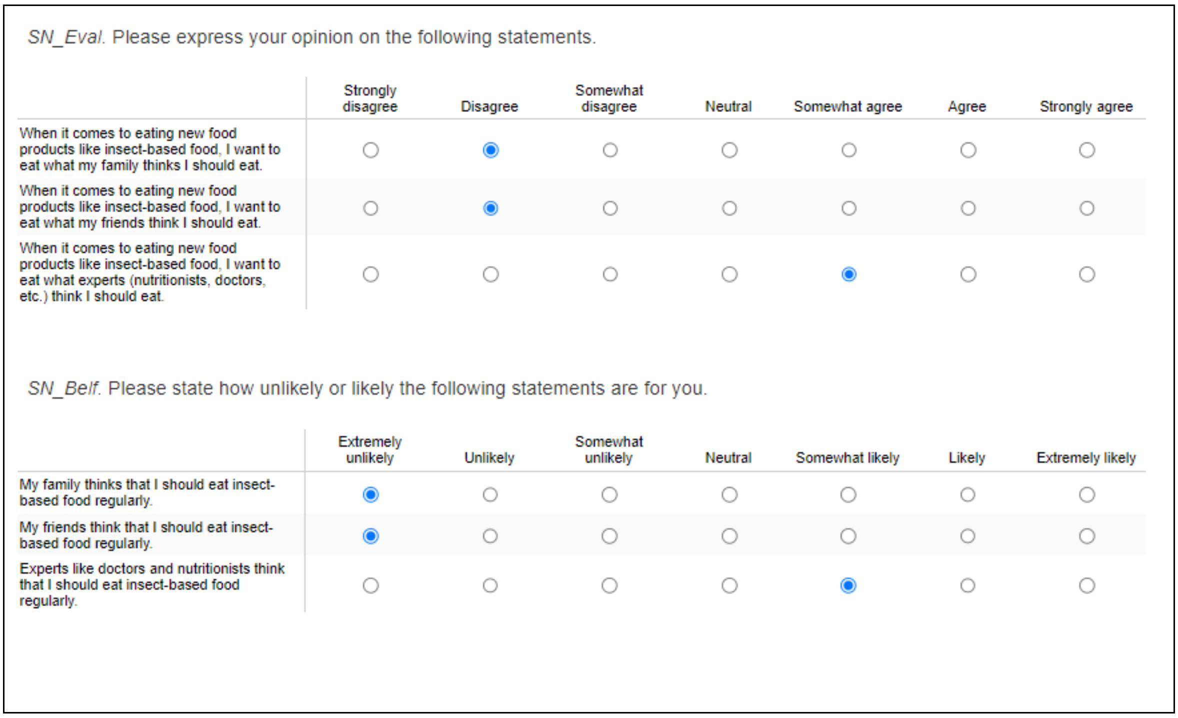
	Extremely undesirable	Undesirable	Somewhat undesirable	Neutral	Somewhat desirable	Desirable	Extremely desirable
For me, the reduction of greenhouse gas emissions deriving from the consumption of insect-based food would be	○	○	○	○	●	○	○
For me, the improvement of farm animal welfare deriving from the consumption of insect-based food would be	○	●	○	○	○	○	○
For me, worsening living conditions of livestock farmers as a consequence of the consumption of insect-based food would be	○	●	○	○	○	○	○
For me, food safety risks regarding insect-based food consumption would be	○	○	○	○	●	○	○
For me, health benefits linked to the consumption of insect-based food would be	○	○	○	○	●	○	○
For me, the takeover of multinational companies as a consequence of the consumption of insect-based food would be	○	○	○	○	●	○	○

Attitude Blf. Please state how unlikely or likely the following statements are for you.

	Extremely unlikely	Unlikely	Somewhat unlikely	Neutral	Somewhat likely	Likely	Extremely likely
Consuming insect-based food regularly will give me the opportunity to contribute to the reduction of greenhouse gas emissions.	○	○	○	○	○	●	○
Consuming insect-based food regularly will give me the opportunity to contribute to the improvement of farm animal welfare.	○	○	○	○	●	○	○
Consuming insect-based food regularly will cause me to worsen the living conditions of livestock farmers.	○	●	○	○	○	○	○
Consuming insect-based food regularly will increase my chances of facing food safety risks.	○	●	○	○	○	○	○
Consuming insect-based food regularly will give me the opportunity to take advantage of their health benefits.	○	○	○	○	●	○	○
Consuming insect-based foods regularly will increase the power of multinational companies in the marketplace.	○	○	○	●	○	○	○

Figure 4. 3: Example of the respondents answering the questions regarding their attitudes toward insects as food. Above is the evaluation of the belief. Below is the belief strength

When we evaluated participants' subjective norms, Figure 4.4 shows that we developed 3 items and used two different rating item scales to measure the evaluative and belief components of subjective norms. These items were adapted from existing literature on the influence of these items on insect-based food consumption, i.e. the influence of family members, friends, and experts (e.g., Menozzi *et al.*, 2017; Mopendo Mwisomi *et al.*, 2023). The evaluation and belief components were evaluated similarly to attitudes.



SN_Eval. Please express your opinion on the following statements.

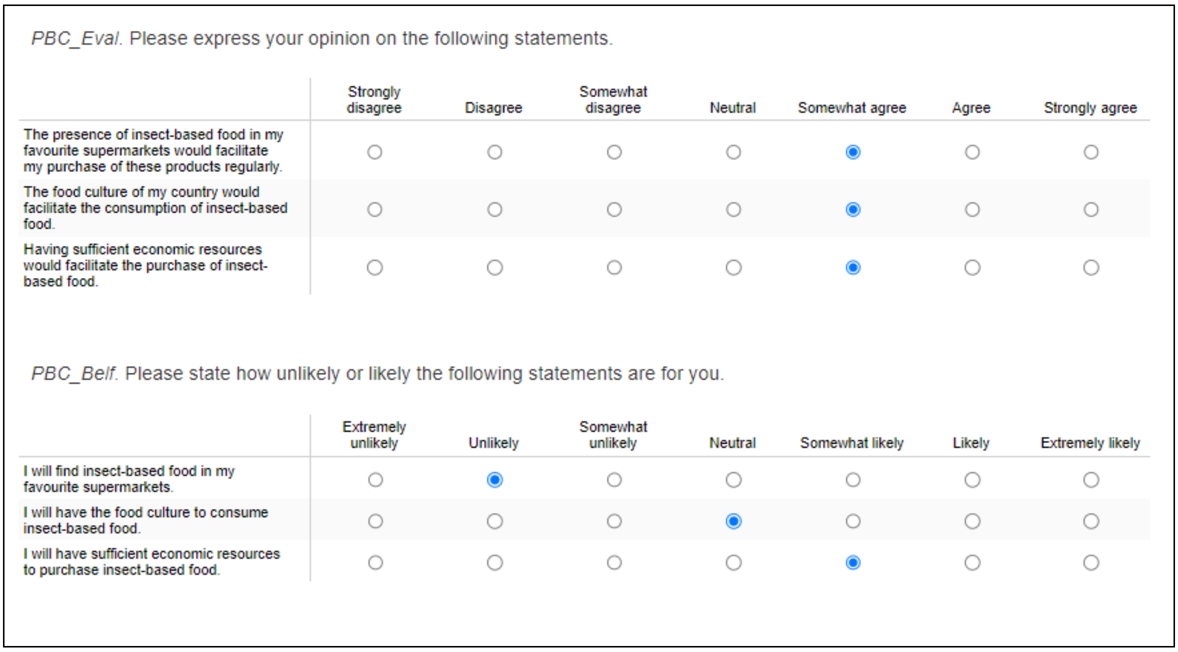
	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
When it comes to eating new food products like insect-based food, I want to eat what my family thinks I should eat.							
When it comes to eating new food products like insect-based food, I want to eat what my friends think I should eat.							
When it comes to eating new food products like insect-based food, I want to eat what experts (nutritionists, doctors, etc.) think I should eat.							

SN_Belf. Please state how unlikely or likely the following statements are for you.

	Extremely unlikely	Unlikely	Somewhat unlikely	Neutral	Somewhat likely	Likely	Extremely likely
My family thinks that I should eat insect-based food regularly.							
My friends think that I should eat insect-based food regularly.							
Experts like doctors and nutritionists think that I should eat insect-based food regularly.							

Figure 4. 4: An example of the respondents answering the questions is regarding subjective norms toward insects as food. Above is the evaluation of the belief. Below is the belief strength.

When we evaluated participants' perceived behavioural control, Figure 4.5 shows that we developed 3 items and used two different rating item scales to measure the evaluative and belief components of perceived behavioural control. Two of these items were adapted from existing literature on the influence of these items on insect-based food consumption, i.e., the influence of having the food culture that can facilitate the consumption of insect food (e.g., Menozzi *et al.*, 2017), the availability in the supermarket (Menozzi *et al.*, 2017; Puteri, Jahnke and Zander, 2023). However, the third item is new as we believe that it interesting to take into account the influence of an economic perspective of perceived behavioural control on insect-based food consumption. The evaluation and belief components were evaluated similarly to attitudes.



PBC_Eval. Please express your opinion on the following statements.

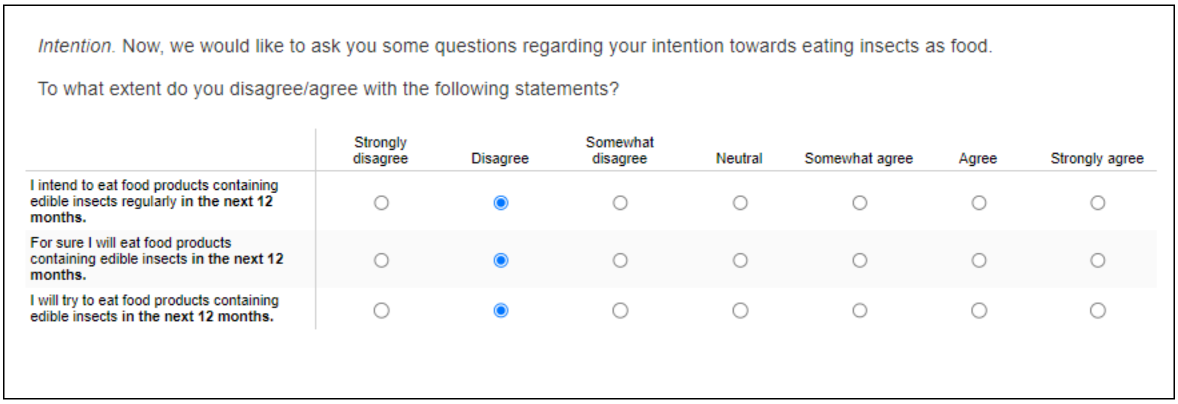
	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
The presence of insect-based food in my favourite supermarkets would facilitate my purchase of these products regularly.	○	○	○	○	●	○	○
The food culture of my country would facilitate the consumption of insect-based food.	○	○	○	○	●	○	○
Having sufficient economic resources would facilitate the purchase of insect-based food.	○	○	○	○	●	○	○

PBC_Belf. Please state how unlikely or likely the following statements are for you.

	Extremely unlikely	Unlikely	Somewhat unlikely	Neutral	Somewhat likely	Likely	Extremely likely
I will find insect-based food in my favourite supermarkets.	○	●	○	○	○	○	○
I will have the food culture to consume insect-based food.	○	○	○	●	○	○	○
I will have sufficient economic resources to purchase insect-based food.	○	○	○	○	●	○	○

Figure 4. 5: Example of the respondents answering the questions in relation to their perceived behavioural control toward insects as food. Above is the evaluation of the belief. Below is the belief strength.

Consumers' intention to eat insect-based food in the next 12 months was captured with three items measured on a 7-point scale ranging from extremely undesirable to extremely desirable as illustrated in Figure 4.6. In particular, eating insect-based food regularly, being sure of the willingness to eat insect-based food, and the willingness to try insect-based products. These items were similar to the existing literature (Mancini, Sogari, *et al.*, 2019; Lucchese-Cheung *et al.*, 2020; Mopendo Mwisomi *et al.*, 2023).



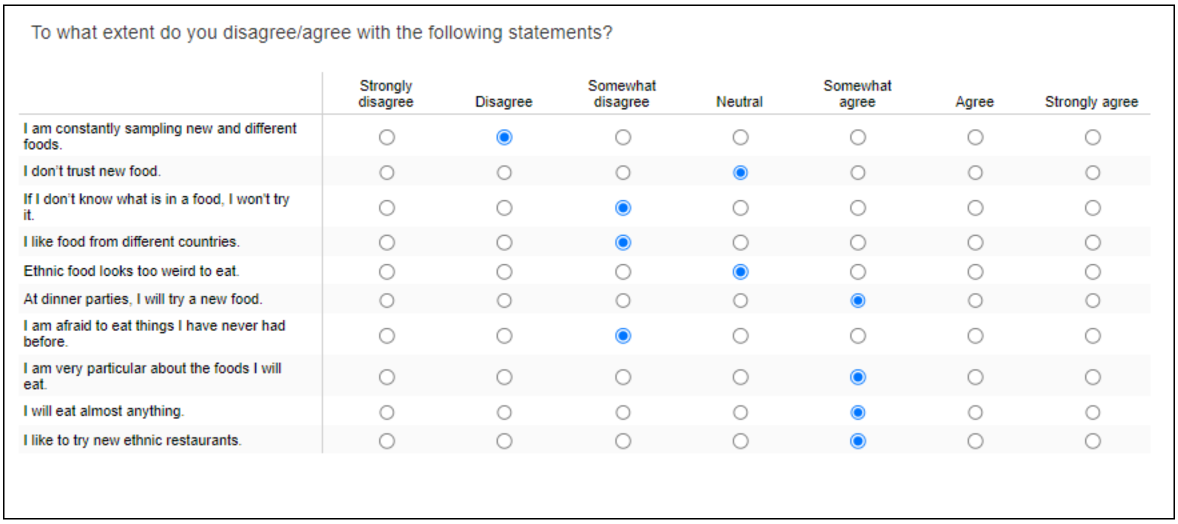
Intention. Now, we would like to ask you some questions regarding your intention towards eating insects as food.

To what extent do you disagree/agree with the following statements?

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
I intend to eat food products containing edible insects regularly **in the next 12 months.**	○	●	○	○	○	○	○
For sure I will eat food products containing edible insects **in the next 12 months.**	○	●	○	○	○	○	○
I will try to eat food products containing edible insects **in the next 12 months.**	○	●	○	○	○	○	○

Figure 4. 6: Example of the respondents answering the questions about their intention to try edible insects in the next 12 months

Figure 4.7 shows the items used for the food neophobia scale. Food neophobia refers to people's fear of trying new food, and it was adapted from (Pliner and Hobden, 1992). The scale measure consists of ten items (five negative to measure food neophobia and five positive to measure food neophilia) evaluated on a 7-point scale ranging from strongly disagree to strongly agree. For the overall food neophobia, the negative statements have been reversed.

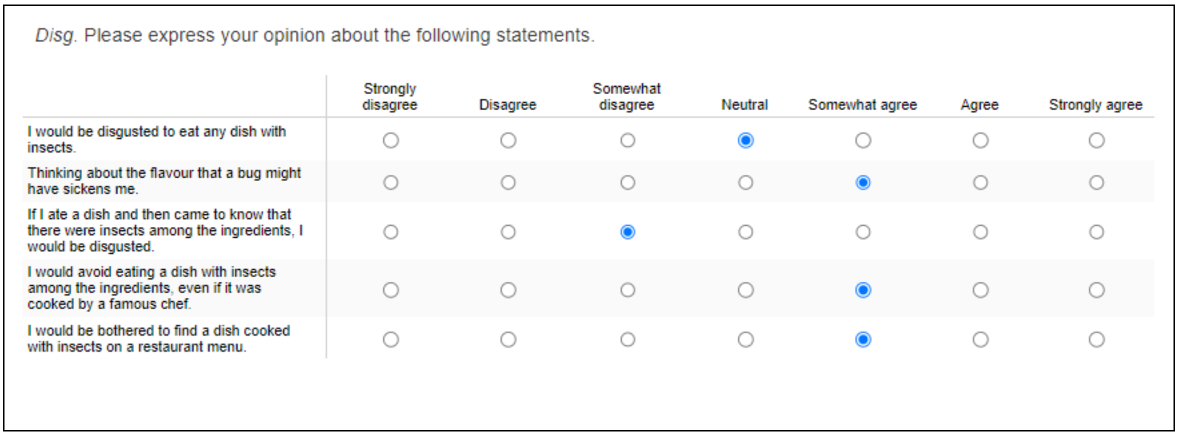


To what extent do you disagree/agree with the following statements?

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
I am constantly sampling new and different foods.	○	●	○	○	○	○	○
I don't trust new food.	○	○	○	●	○	○	○
If I don't know what is in a food, I won't try it.	○	○	●	○	○	○	○
I like food from different countries.	○	○	●	○	○	○	○
Ethnic food looks too weird to eat.	○	○	○	●	○	○	○
At dinner parties, I will try a new food.	○	○	○	○	●	○	○
I am afraid to eat things I have never had before.	○	○	●	○	○	○	○
I am very particular about the foods I will eat.	○	○	○	○	●	○	○
I will eat almost anything.	○	○	○	○	●	○	○
I like to try new ethnic restaurants.	○	○	○	○	●	○	○

Figure 4. 7: Example of the respondents answering the questions concerning food neophobia.

Disgust can be defined as "Revulsion at the prospect of (oral) incorporation of an offensive object. The offensive objects arc contaminants; that is, if they even briefly contact an acceptable food, they tend to render that food unacceptable" (Rozin and Fallon, 1987 pp. 23). In our study, we adapted the measured disgust towards insects -the Entomophagy Attitude Questionnaire (EAQ-D)- was developed by La Barbera *et al.* (2020) following Davis (1992). Figure 4.8 shows the items used for disgust towards insects. The scale has 5 items where the evaluation on a 7-point scale ranging from extremely undesirable to extremely desirable.



Disg. Please express your opinion about the following statements.

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
I would be disgusted to eat any dish with insects.	○	○	○	●	○	○	○
Thinking about the flavour that a bug might have sickens me.	○	○	○	○	●	○	○
If I ate a dish and then came to know that there were insects among the ingredients, I would be disgusted.	○	○	●	○	○	○	○
I would avoid eating a dish with insects among the ingredients, even if it was cooked by a famous chef.	○	○	○	○	●	○	○
I would be bothered to find a dish cooked with insects on a restaurant menu.	○	○	○	○	●	○	○

Figure 4. 8: Example of the respondents answering the questions concerning disgust towards insects.

4.3.3 Preferences and willingness to pay for bread and pasta made with cricket flour

The fourth section had the scope to examine consumers' preferences for bread and pasta made with cricket flour, and then collect information about their willingness to pay for these two products.

The two products were created using Midjourney,[26] an AI tool which enabled us to develop simulations of the products in the market without relying on the imagery associated with a particular brand. This tool was used to avoid any potential bias in participants' choices arising from brand names or images.

Figure 4.9 shows the two products designed using Midjourney. Participants who chose "None" were directed to the last section to collect information about the socio-demographic characteristics.

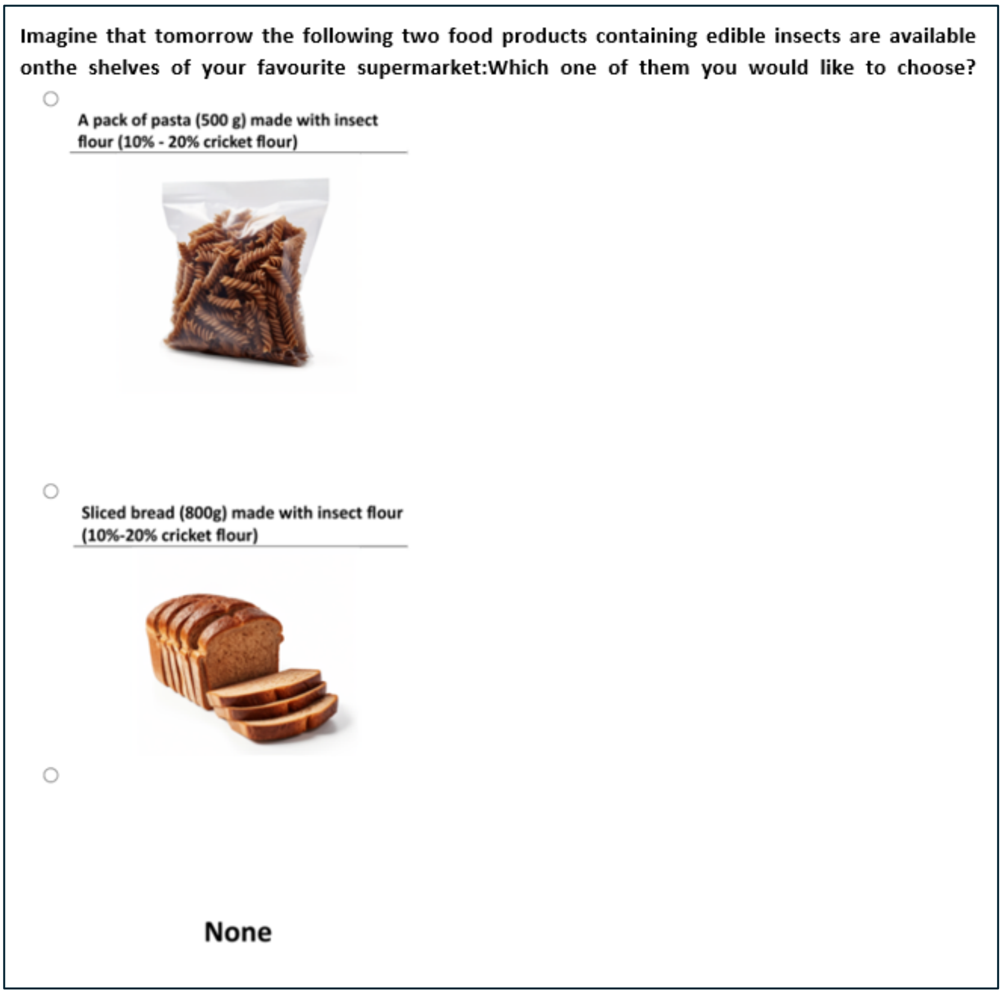


Figure 4. 9: Consumers' preferences question

Whereas for participants who chose an insect-based product, first they were asked to express their preferences on three labels (Figure 4.10); the carbon trust label which communicates that these products have been assessed using internationally recognized

[26] Midjourney is an independent research lab exploring new mediums of thought and expanding the imaginative powers of the human species (https://www.midjourney.com).

standards and validated by the Carbon Trust[27]; high protein label which communicate that the product is high in protein, and insect protein label which communicates that the product contains insect-based protein.

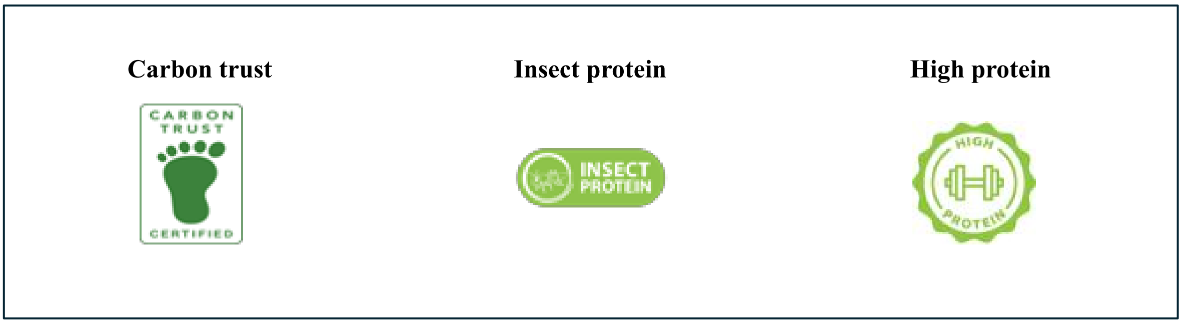


Figure 4. 10: The preferred logo

Second, they were directed to the questions regarding the willingness to pay for their chosen product whether it is sliced bread made with cricket flour or pasta made with cricket flour.

Willingness to pay was elicited using both a contingent valuation (CV) scenario. In addition to the price sensitivity meter (PSM) proposed by Van Westendorp, (1976) for respondents who stated to try one of these two products made with cricket flour.

THE CONTINGENT VALUATION SCENARIO. In order to estimate non-market valuations for a good or service that is not broadly available such as insect-based food in Western countries, we could have applied either the revealed preferences or the stated preferences to measure the willingness to pay (WTP) (Carson, 2000; Loureiro, McCluskey and Mittelhammer, 2003; Breidert, Hahsler and Reutterer, 2006). Revealed preference methods are used to infer an individual's preferences based on their observed behaviour in the market for a particular type of product (Pearce *et al.*, 2002). Whereas stated preference methods are direct, survey-based techniques that can be used to measure people's preferences concerning goods or services (Kroes and Sheldon, 1988).

In this study, we estimated consumer WTP using state preferences techniques, which encompass choice experiments and contingent valuation techniques. These methods are well-established and they estimate the maximum amount of WTP that an individual is willing to pay for a certain product or service. Both methods have been used in several studies. For instance, choice experiments were applied to estimate consumers'

[27] https://www.carbontrust.com/what-we-do/product-carbon-footprint-labelling/product-carbon-footprint-label

heterogeneity of preferences towards plant-based and cultured meat in Spain Escribano *et al.* (2021) and insects as food in European countries (de-Magistris, Pascucci and Mitsopoulos, 2015). CV was applied to estimate the WTP of several products such as carbon-labelled products in Egypt (Mostafa, 2016), insects as food in Greece (Giotis and Drichoutis, 2021), and golden rice in India (Kajale and Becker, 2015).

CV survey-based methods are used to assess the monetary trade-off each person would be willing to make regarding the value of the goods or services that we offer (Carson, 2012). Choosing the most suitable CV technique is significant as "different elicitation formats typically produce different estimates" (OECD, 2018 p.99). This is because the choice of the elicitation format depends on a variety of factors, such as the type of the good/service being surveyed, the cost of conducting the survey, the type of respondents, the method of data collection, and the statistical methodology to be used (Venkatachalam, 2004). The elicitation formats used in CV are mainly bidding games, open-ended questions, payment cards and a dichotomous choice approach. The dichotomous choice approach can be of two types (Carson, Flores and Meade, 2001; Venkatachalam, 2004; OECD, 2018) depending on whether participants are asked to choose between a single price point (single-bounded dichotomous choice or take-it-or-leave-it) or a range of values (double-bounded dichotomous choice or take-it-or-leave-it with follow-up). Each of these methods has its advantages and limitations.

We chose to apply a double-bounded dichotomous choice (DBDC) as it is the most suitable method for this study, and we took into consideration other limitations of this method and how to mitigate them. The dichotomous choice format is often favoured by researchers because of its reliability in predicting the WTP and because the estimations are almost consistent over time (Perni, Barreiro-Hurlé and Martínez-Paz, 2021). It is also easier for participants to understand the question and answer it compared to other **CONTINGENT** valuation models (CVM) question formats that may involve more complex trade-offs or hypothetical scenarios and are also similar to other types of binary choice scenarios that people encounter in their daily lives, such as market choices with non-negotiable prices (Swallow, Opaluch and Weaver, 2001). We opted for this technique due to its user-friendly nature, which we believed would make it easier for respondents to connect with the question, leading to more accurate and reliable responses. Additionally, given our constraints in terms of time and budget, we saw this method as a pragmatic choice that balanced effectiveness with practical considerations. However, this method has three main limitations and biases that should be acknowledged and addressed to obtain credible and reliable results.

First, the hypothetical bias refers to the possibility that the scenario is not consistent with reality in a way that the consumer's WTP can be higher than the actual payments (Arrow *et al.*, 1993). However, the hypothetical nature of the contingent valuation techniques can be counted as an advantage because it can be applied to almost all non-market goods (OECD, 2018). Furthermore, to overcome this bias, some scholars suggest that providing participants with a cheap talk before asking people about their willingness to pay can minimize this bias (Moon, Balasubramanian and Rimal, 2007; Hensher, 2010; Giotis and Drichoutis, 2021). In addition to reminding people how their choices will affect their budget and limit their choices when buying other products. Interestingly, Mohammed (2012) found that including cheap talk did not mitigate the hypothetical bias, instead, he suggested adding follow-up questions is more effective. Therefore, we also asked participants follow-up questions to gather more information that can explain the reasons behind the preferences. In the cheap talk, we further explain the hypothetical bias and the difference between how people usually behave in the questionnaire differently from how they behave in real situations when they walk into the stores and buy food.

> *In a recent study, several different groups of people were asked whether they are willing to purchase a new food product. This purchase was hypothetical for these people, as it will be for you. In that study, no one actually had to pay money when they were willing to purchase the new food product. Over 80% of people said they would buy the new food product. However, when a grocery store actually put the same new food on its shelf, and people really did have to pay money if they decided to purchase the new food product, the result was different: only 43% of people actually bought the new food. That's quite a difference,isn't it?*
> *We call this "hypothetical bias". Hypothetical bias is the difference that we continually see in the way people respond to hypothetical purchase questions as compared to real situations.*
>
> *I think that when we say we will purchase a new food at a particular price in a hypothetical survey we respond according to our best guess of what the food is really worth in the grocery store. But when we are really in the grocery store, and we actually have to spend our money if we decide to purchase the food, we think a different way: If I spend money on this, that's money I can't spend on other things. We shop in a way that takes into account the limited amount*

of money we have. This is just my opinion, of course, but it's what I think maybe going on in hypothetical survey questions.

So, if I were in your shoes, I would ask myself: If I were really shopping in the grocery store and I had to pay a premium of £X if I decide to buy insect-based products, do I really want to spend my money this way? If I really did, I would indicate YES, I would pay a premium of £X to purchase insect-based products; if I didn't want to spend my money this way, I would indicate NO, I would purchase insect-based products at a lower price.

Second, starting point bias, in which the WTP is anchored on the initial bid leads to inaccuracy of the true WTP (Pearce *et al.*, 2002). To overcome that, instead of using a fixed starting point for all participants, we randomized the starting point between participants by creating six different randomized embedded price choices for the initial bid, ensuring variability and eliminating any potential bias associated with a predetermined starting point.

Lastly, the payment vehicle bias. The payment vehicle is "the way in which the respondent is (hypothetically) expected to pay for the good " Pearce *et al.* (2002 pp.49) where there are several payment vehicles (e.g., taxes and fees and donations). The payment vehicle bias refers to how the choice of payment method can potentially influence an individual's stated WTP values for the product, leading to varying WTP estimates. However, this can be mitigated by selecting the payment method that would be used in real situations (Pearce *et al.*, 2002; OECD, 2018). In our study, we used premium pricing as it is the most suitable method for the type of good (insect-based product) and it was used in similar studies for a variety of products (Collins, Vaskou and Kountouris, 2019; Zhang, Li and Bai, 2020; Giotis and Drichoutis, 2021; Chen, Zhang and Bai, 2023). The prices used in our double bound elicitation format were determined by collecting information in May 2023 about the range of prices available in the biggest 4 UK retailers both for a pack of sliced bread 800g and 500 g for traditional pasta as shown in Table 4.1. In addition to the range of prices of sliced bread and pasta made with cricket flour in the European market. This is because, at the time when doing this research, there were no companies that officially offered these products in the UK. Table 4.2 shows prices of the investigated novel products in £ (May 2023)

Table 4. 1: Retailer prices for conventional bread and pasta in £ (May 2023)

Retailer	**Conventional sliced bread (800g)**	**Traditional pasta (500 g)**
Tesco	1.3	0.80
Sainsbury's	0.75	0.95
Asda	0.75	0.95
Waitrose	1	0.95
Average	0.95	0.91

Table 4. 2: Market prices of the investigated novel products in £ (May 2023)

Company	**Sliced bread made with cricket flour (800g)**	***Company***	**Pasta made with cricket flour (500 g)**
Fazer in Helsinki	£3.55 – £4.75	*Nutribug*	£3.50
		Thailand unique	£6.26
		Plumento foods	£6.93
Average	£4.15	***Average***	£5.56

The analysis of these prices helped us to develop the price design for the DBDC and the PSM. Table 4.3 shows an example of the bids for pasta made with cricket flour based on the market prices of conventional and insect-based products. However, it is worth noting that we further revised the price design based on the outcomes of the piloting (see section 4.4).

Table 4. 3: The price design for the DBDC of pasta made with cricket flour

Bid 1	Answer	Bed 2
5	No	3.5
	Yes	6.5
6.5	No	5
	Yes	8
8	No	6.5
	Yes	9.5
9.5	No	8
	Yes	11
11	No	9.5
	Yes	12.5
12.5	No	11
	Yes	14

THE PRICE SENSITIVITY METER. The PSM was first introduced by Van Westendorp (1976) and it is the second method that we used to elicit WTP of these two products. The PSM is a heuristic procedure for eliciting an acceptable price for a new product, accompanied by a simple graphical procedure for finding an optimal price (Lipovetsky, 2006). This method has some limitations such as the lack of theoretical foundation (Van Westendorp, 1976), thereby, it might be limited in its ability to accurately forecast real market dynamics. Another point is that it only focuses on the product's price which may prevent it from accurately reflecting the true nature of consumer behaviour, which is influenced by a range of factors beyond just price (Kintler, Remeňová and Kmety, 2022). Despite these limitations, recent research has demonstrated a growing interest in the application of PSM by researchers. For example, Arru *et al.* (2022) applied it to fish fed with insects, while Weinrich & Gassler, (2021) utilized it for algae-based meat. The increasing attention towards price sensitivity metre can be attributed to its perceived advantages, including its straightforward and cost-effective methodology (Lipovetsky, 2006; Kintler, Remeňová and Kmety, 2022).

To apply this method, we asked participants what they consider in a product price to be too expensive, expensive, cheap, or too cheap. The collection of these four prices is followed by a graphical procedure which allows marketers to find an optimal price.

As illustrated in Figure 4.11, by analysing the data, we will be able to identify four critical price points. First, the Point of Marginal Cheapness (PMC), the price at which respondents feel the product is so cheap that they question its quality. The PMC can be visualised at the point where curves of 'too cheap' and 'expensive' intersect. Second, the Point of Marginal Expensiveness (PME), is the price at which respondents consider the product to be too expensive to purchase. The PME represents the intersection of the curves of 'too expensive' and 'cheap'. Third, the Optimal Price Point (OPP) represents the ideal price, striking a balance between being neither too cheap nor too expensive- an often recommended price point. The OPP is the intersection of the curves of 'too expensive' and 'too cheap' intersect. Lastly, the Indifference Price Point (IPP), is the price where an equal number of respondents view the product as a bargain or starting to get expensive. IPP is the intersection of the curves "cheap" and "expensive prices".

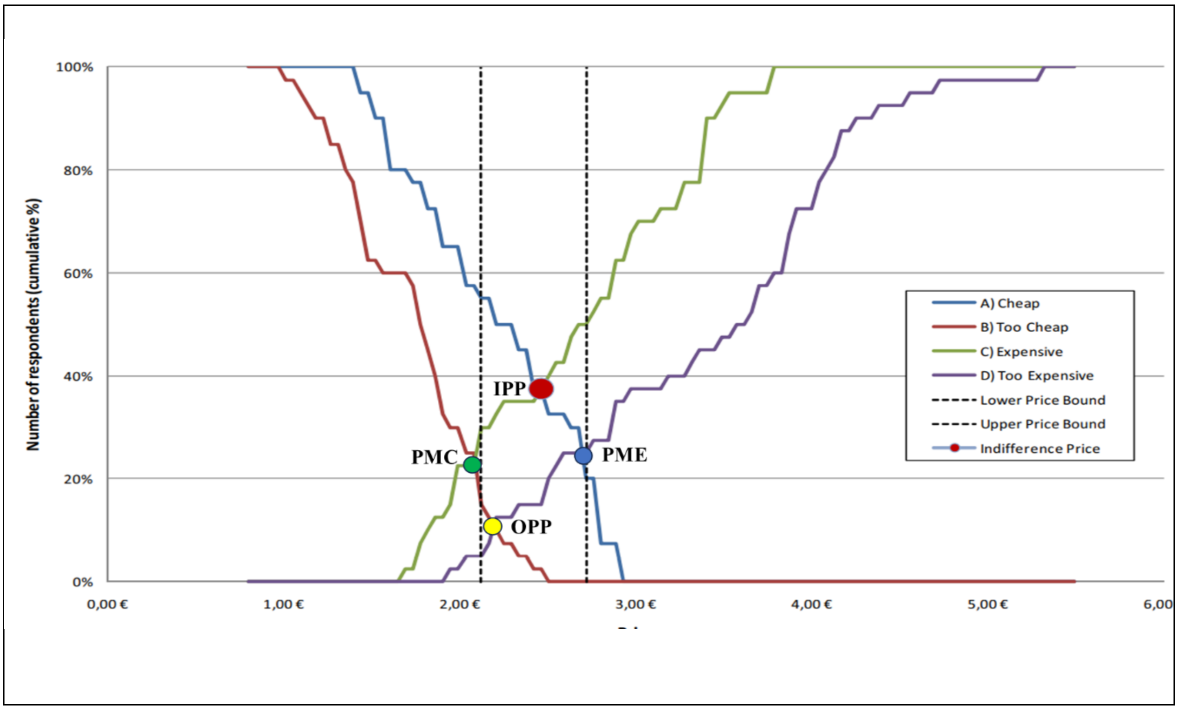


Figure 4. 11: Example of the PSM key points. Source: Roll et al. (2010).

To collect information about the four prices described above, we asked respondents the following four questions:

i. At what price would you consider the bread/pasta to be so expensive that you would not consider buying it? (Too expensive)
ii. At what price would you consider the bread/pasta to be priced so low that you would question its quality? (Too cheap)
iii. At what price would you consider the bread/pasta to be starting to get expensive, but you would still consider buying it? (Expensive)
iv. At what price would you consider the bread/pasta to be a bargain—a great value for the price? (Cheap)

Each question was followed by a range of prices that respondents could select from the QUALTRICS survey using a drop-down menu as illustrated in Figure 4.12. The range of prices was determined in the same way as DBDC illustrated in Tables 4.1 and 4.2. For insect-based sliced bread, the prices ranged from £ 1.5 to £ 9 at a £ 0.3 interval. Whereas for insect-based pasta, the prices ranged from £ 2 to £ 15 at a £ 0.5 interval.

At what price would you consider a sliced bread (800g) made with cricket flour to be starting to get expensive, so it is not out of the question, but you would have to give some thought to buying it?

- ○ £ 1.50
- ○ £ 1.80
- ○ £ 2.10
- ○ £ 2.40
- ○ £ 2.70
- ○ £ 3.00
- ○ £ 3.30
- ○ £ 3.60
- ○ £ 3.90
- ○ £ 4.20
- ○ £ 4.50
- ○ £ 4.80
- ○ £ 5.10
- ○ £ 5.40
- ○ £ 5.70
- ○ £ 6.00
- ○ £ 6.30
- ○ £ 6.60
- ○ £ 6.90
- ○ £ 7.20
- ○ £ 7.50
- ○ £ 7.80
- ○ £ 8.10
- ○ £ 8.40
- ○ £ 8.70
- ○ £ 9.00

Figure 4. 12: Example of the price list options when applying PSM.

4.4 Data collection and sampling

In this study, the survey was developed using Qualtrics[28] (https://www.qualtrics.com/) and distributed by Bilendi[29] (https://www.bilendi.co.uk/) to reach a non-probabilistic quota sample size of 801 respondents. The non-probabilistic method involved setting quotas of certain characteristics such as age and gender to collect the responses until we reach this quota (Martínez-mesa *et al.*, 2016). In the context of our study, we set the quota based on the age and sex of respondents for the UK population according to the Eurostat database[30].

To improve the validity and reliability of the outcomes (Pearce *et al.*, 2002; OECD, 2018), the survey went through three rounds of improvements. For the first round, the survey was

[28] Qualtrics is a widely used online survey platform that allows for the designing surveys in order to collect data for marketing and academic research.
[29] Bilendi is a market research company that can distribute online surveys to reach targeted groups.
[30] https://ec.europa.eu/eurostat/de/data/database?node_code=demo_r_d2jan

shared with 30 British participants in July 2023 giving them the chance to discuss and share their thoughts directly with the researcher, necessarily improvements in terms of the language and prices were made. For the second and third rounds, we piloted the survey to participants as it is a valuable practice in survey research and data analysis, providing opportunities for reflection that can enhance the overall research processes (Brooks, Reed and Savage, 2016). For the second and third rounds, we used the same company “Bilendi” to reach the same targeted group of participants that we reached in the final sample.

During the second round, the survey was piloted with 85 participants for the first time in August 2023 and we observed three issues in the survey design. First, although the price design was based on market data for both conventional and novel products, participants showed a low willingness to pay for the products. Therefore, we changed the initial design lowering the range of prices. Table 4.4 shows how we changed the initial price range for pasta made with cricket flour. Second, we initially chose burgers and pasta made with insects, however, the piloting showed a very low preference for burgers compared with pasta (9 and 21 respectively) and 55 for “None” which is the option for not choosing an insect-based product. In addition, the preferences for burgers were too low (11%) which probably would have not allowed us to estimate WTP for this product. Therefore, we replaced burgers with sliced bread because it is more frequently consumed by British consumers than burgers, so participants would be more familiar with them. This choice is also supported by other literature that suggests that offering insects in a familiar product can increase acceptance (Mancini, Moruzzo, *et al.*, 2019; Onwezen *et al.*, 2021; Kröger *et al.*, 2022; Alhujaili, Nocella and Macready, 2023).

Table 4. 4: The changes in the price design for pasta made with cricket flour based on the first piloting

2nd round			3rd round		
Bid 1	Answer	Bed 2	Bid 1	Answer	Bid 2
5	No	3.5	1.5	No	1
	Yes	6.5		Yes	3
6.5	No	5	3	No	2
	Yes	8		Yes	4.5
8	No	6.5	4.5	No	3.5
	Yes	9.5		Yes	6
9.5	No	8	6	No	4.5
	Yes	11		Yes	7.5
11	No	9.5	7.5	No	6
	Yes	12.5		Yes	9
12.5	No	11	9	No	7.5
	Yes	14		Yes	12
			12	No	9
				Yes	15

Third, we observed two issues that might have impacted the quality of the data collected in online surveys. The first issue pertains to respondents who answer the survey questions rapidly, referred to as “speeders.” The second issue concerns respondents who provide straight-line answers to scale questions, termed “straight-liners” which is associated with the completion of the survey at a fast pace, as indicated (Zhang & Conrad, 2014). The detection of these issues is crucial for maintaining data quality. While online survey platforms such as QUALTRICS and SurveyMonkey mainly detect these problems and report them after respondents complete the survey, researchers can manually address these issues using Excel. However, this process is time-consuming and may necessitate recruiting additional respondents to achieve the desired sample with good quality. Alternatively, researchers can proactively identify and screen out speeders and straight-liners before they complete the survey by setting specific conditions and embedding data in QUALTRICS. In our study, the identification of the Speeders threshold was based on suggestions from Greszki, Meyer and Schoen (2014) and marketing research standards recommended by Bilendi. It was determined that participants who completed the survey in less than 30% of the median time were considered Speeders. As the median time for the second round study was 9 minutes, a condition was created in QUALTRICS to identify "speeders" who finished the survey in less than 6 minutes, as shown in Figure 4.13.

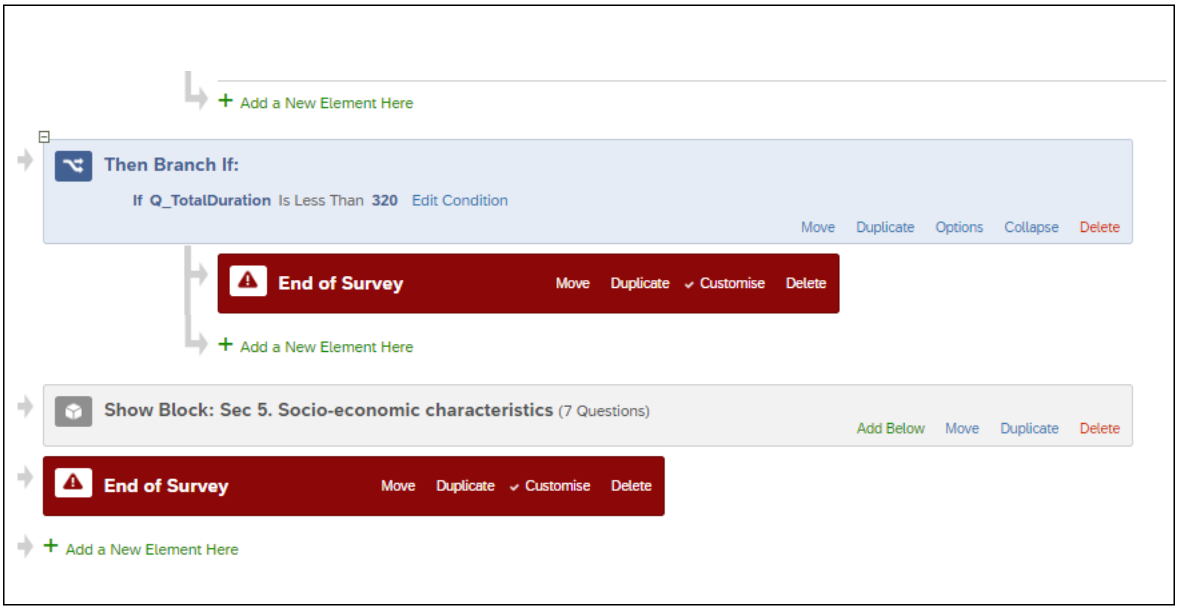


Figure 4. 13: The condition that was created to screen out speeders.

Regarding straightlining responses, after careful examination of the data, it was concluded that it is acceptable to consider responses with straightlining answers in less than 50% of the questions. Consequently, necessary adjustments were made in the survey by creating embedding data in QUALTRICS and with the use of Boolean operators we set conditions to screening out of "straight-liners", as illustrated in Figure 4.14.

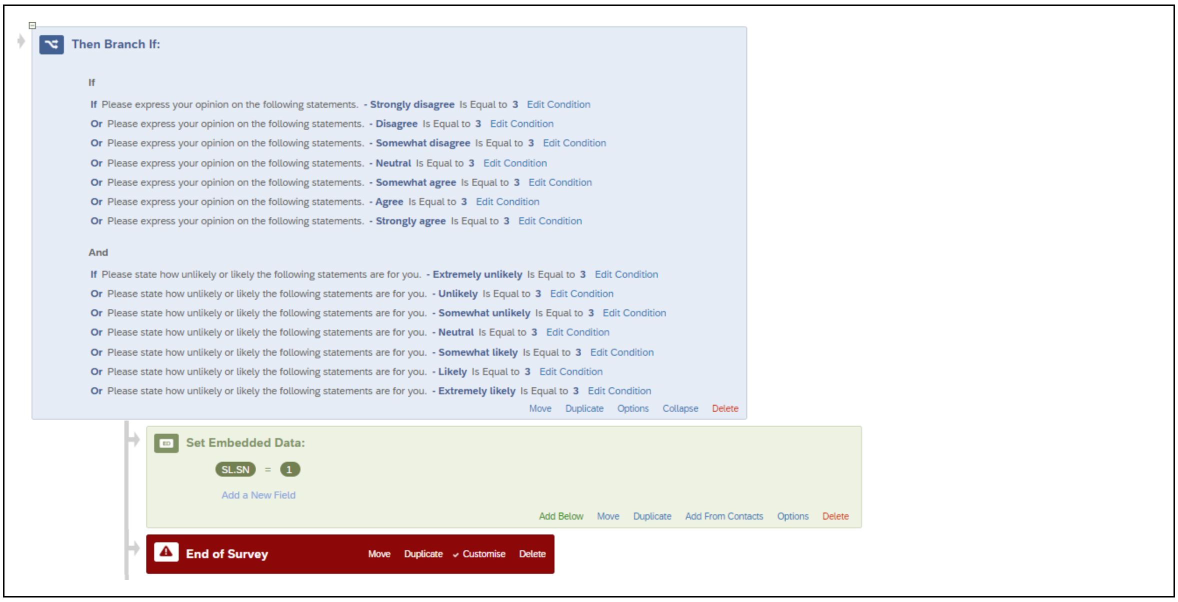


Figure 4. 14: Example of the embedded data to detect strait-liners that were applied for questions on attitudes.

Third round, the survey was piloted for the second time to 88 participants in August 2023 where 51% of participants did not prefer either bread or pasta, however, the preferences for bread and pasta were almost equal, 24% and 25% respectively, thereby, we anticipated that this would have allowed us to estimate WTP for both products. Furthermore, for bread and pasta, when analysing the WTP for PSM, we considered the quality of the results in terms of the logic of pricing (e.g., too cheap is less than cheap). For bread, 28.6% of the results were not valid, and for pasta, 54% of the results were not valid. These invalid responses were excluded manually using Excel. In order to overcome this problem, we first created embedded data in QUALTRICS and then using Boolean operators we set conditions that allowed us to screen out respondents with invalid responses before they completed the survey. For a response to be valid, the logic of the chosen prices should be "low" less than "bargain" less than "starting to get expensive" less than "so expensive". Figure 4.15 shows how these conditions were developed for bread.

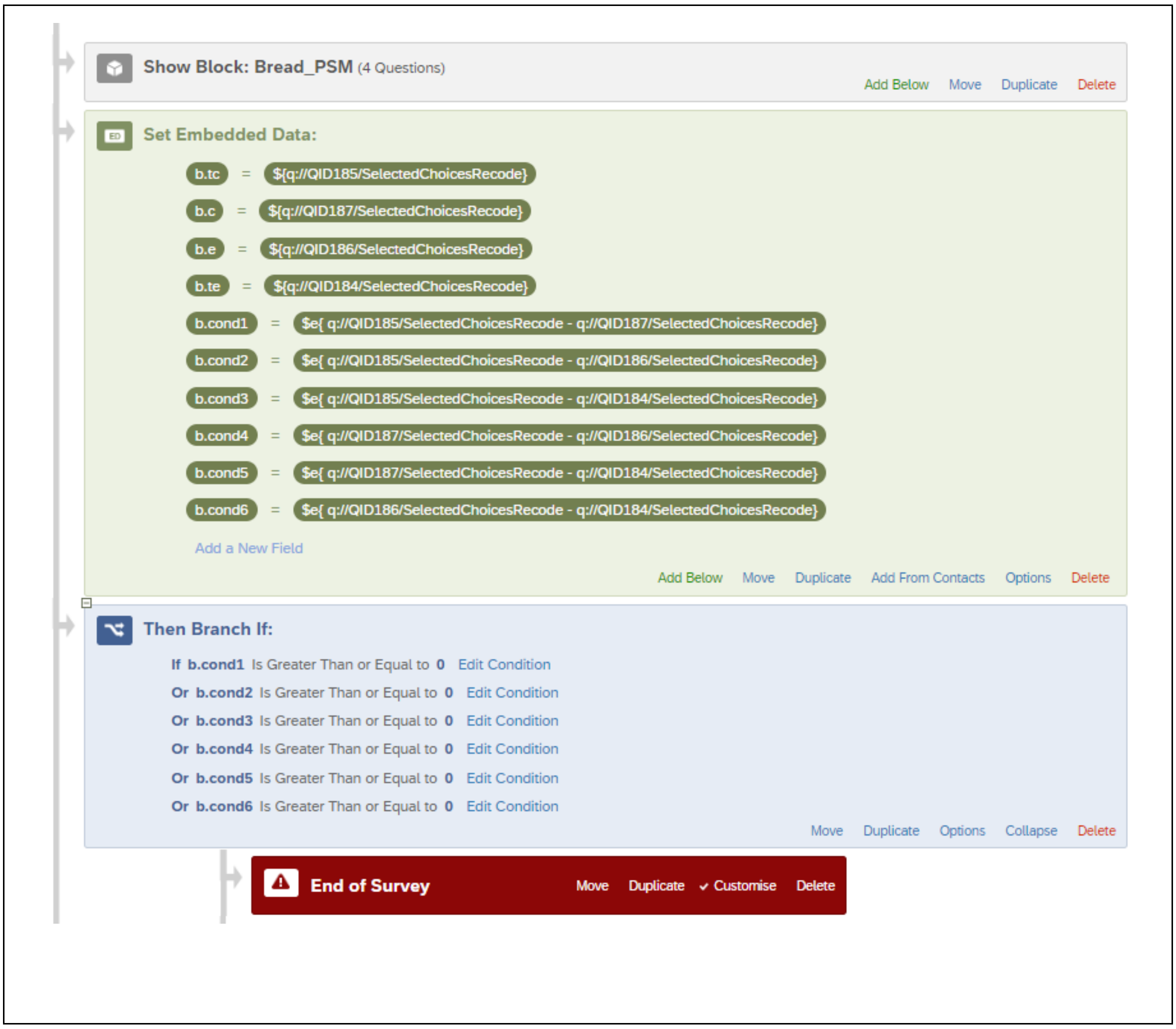


Figure 4. 15: The embedded data was created to exclude invalid responses for bread in QUALTRICS

4.5 Statistical and econometric analysis

A descriptive analysis was conducted to summarize and present the key features of respondents with regard to socio-demographic, and economic characteristics, their consumption habits and psychological constructs of the proposed extended TPB model. The model's constructs of ATT, SN and PBC, FN, and DISG were calculated using equations 1.4 – 4.6 as illustrated in section 4.2 and then tested for reliability along with INTEN, FN and DISG for internal consistency using Cronbach's alpha. In addition, a 4-way ANOVA was performed to explore differences in psychological constructs in relation to socio-demographic and economic characteristics of respondents (e.g., sex, education, age, and income). Furthermore, consumers' preferences for these two products and willingness to pay were estimated using models described in the following two sections.

4.5.1 Estimation of consumers' preferences for insect-based products and effective marketing communication

To assess how psychological and non-psychological factors influence consumers' preferences for bread and pasta made with insects we performed statistical analysis using a multinomial logit model (MNL). The MNL model is useful for predicting discrete outcomes with more than two continuous and categorical predictors (Field, 2018). It is crucial for understanding and predicting consumer behaviour (So and Kuhfeld, 1995; Journal *et al.*, 2021) and it has been used in other studies. For instance, to test the relationship between variations in motivation regarding food preferences and the selection of three snacks crafted from eco-friendly proteins such as lentils, locusts, seaweed, or 'hybrid' meat (De Boer, Schösler and Boersema, 2013)**.** Moreover, Niva & Vainio (2021) examined the changes in consumers' diets of beef, plant-based and insect-passed food.

According to Shabbir (1993), multinomial logistic regression for a set of choices can be specified as follows:

$$P(y = i|X) = \frac{e^{(\alpha_i X)}}{1+\sum_{k=1}^{L} e^{(\alpha_k X)}} \tag{4.7}$$

Where:

- $P(y = i|X)$ is the probability of choosing i given a set of characteristics of feature X;
- α_i is s vector of coefficients attached to X;

- α_k is s vector of coefficients attached to X that influence the choice i which ranges from 1, 2, …, L;

- $P(y = 0|X) = \frac{1}{1+\sum_{k=1}^{L} e^{(\alpha_k X)}}$ (4.8)

The MNL model given by equations (4.7 and 4.8) can be written in the odds form as follows:

- $ln\left[\frac{\Pr(y = i|x)}{\Pr(y = 0|x)}\right] = \alpha_i X = 1, \ldots L$ (4.9)

where 0 is the reference category and ln represents the natural logarithm.

In our study, we performed an MNL model to predict the probability of choosing one of the following three categories: “bread made with cricket flour”, “pasta made with cricket flour”, and “none of these two products”. The reference outcome category is “none of these two products”, while the 12 independent variables included in the model are: sex (SEX), age (AGE), education (EDU), religion (RLG), household size (HHZ), income (INC), attitudes (ATT), subjective norms (SN), perceived behavioural control (PBC), and intention to try insects in the next 12 months (INTEN), food neophobia (FN), disgust (DISG), The estimated models for bread and pasta can be written as follows:

- $ln\left[\frac{\Pr(Bread|x)}{\Pr(None|x)}\right] = \beta_{0(Bread|None)} + \beta_{1(Bread|None)}{}^{SEX} + \beta_{2(Bread|None)}{}^{AGE} + \beta_{3(Bread|None)}\ {}^{EDU} + \beta_{4(Bread|None)}{}^{RLG} + \beta_{5(Bread|None)}{}^{HHZ} + \beta_{6(Bread|None)}{}^{INC} + \beta_{7(Bread|None)}{}^{ATT} + \beta_{8(Bread|None)}\ {}^{SN} + \beta_{9(Bread|None)}{}^{PBC} + \beta_{10(Bread|None)}{}^{INTEN} + \beta_{11(Bread|None)}{}^{FN} + \beta_{12,(Bread|None)}{}^{DISG}$ (4.10)

- $ln\left[\frac{\Pr(Pasta|x)}{\Pr(None|x)}\right] = \beta_{0(Pasta|None)} + \beta_{1(Pasta|None)}{}^{SEX} + \beta_{2(Pasta|None)}{}^{AGE} + \beta_{3(Pasta|None)}\ {}^{EDU} + \beta_{4(Pasta|None)}{}^{RLG} + \beta_{5(Pasta|None)}{}^{HHZ} + \beta_{6(Pasta|None)}{}^{INC} + \beta_{7(Pasta|None)}\ {}^{ATT} + \beta_{8(Pasta|None)}{}^{SN} + \beta_{9(Pasta|None)}{}^{PBC} + \beta_{10(Pasta|None)}{}^{INTEN} + \beta_{11(Pasta|None)}{}^{FN} + \beta_{12(Pasta|None)}{}^{DISG}$ (4.11)

IBM SPSS (Statistical Package for Social Sciences vr, 28) was used to perform MNL analysis for the preferred insect-based products and the preferred insect-based product logo. When building the model, we applied the hierarchical regression method in which we first included the independent variables that have been suggested in the literature as important predictors of the outcomes (Field, 2018), and then we added the new predictors. Thereby, the model developed in three sequential steps taking into consideration the most important variables identified in the literature as significant factors influencing consumer acceptance of insects as food (Mancini, Moruzzo, *et al.*, 2019; Onwezen *et al.*, 2021; Kröger *et al.*, 2022; Alhujaili, Nocella and Macready, 2023). Thus, we assessed the fit of the model to determine if there were improvements after the addition of variables looking at statistics such as deviance, pseudo-R-Square (Cox and Snell), likelihood ratio test, and the model classification. The first model exclusively included socio-demographic and economic characteristics of participants (sex, age, education, religion, household size, and income). In the second model, we added disgust and food neophobia. Finally, the third model integrated the theory of planned behaviour constructs (attitude, subjective norms, perceived behavioural control, and intention to try insects in the next 12 months.

4.5.2 Estimation of WTP for bread and pasta made with cricket flour

Econometric modelling of the DBDC elicitation format. To estimate the WTP for these two products using the DBDC elicitation format we follow the seminal papers of (Hanemann, Loomis and Kanninen, 1991; Harriet *et al.*, 2019) where each participant was presented with two rounds of bids. For the first bid B_i where B_i is the amount of money that respondents would be asked if they would be willing to pay for the products.

The probability of obtaining “yes” or “no” answers is as follows:

- $\pi^n(B_i) = G(B_i; \theta),$ (4.12)
- $\pi^y(B_i) = 1 - G(B_i; \theta),$ (4.13)

where π^n, π^y are the likelihood of these outcomes and $G(B_i; \theta)$ is a statistical distribution with parameter vector θ.

Under the assumption of utility maximization, the formulas for this likelihood are as follows:

- $\Pr\{No\ to\ B_i\} = \Pr\{B_i > \max WTP\},$ (4.14)
- $\Pr\{Yes\ to\ B_i\} = \Pr\{B_i \leq \max WTP\},$ (4.15)

where max is the maximum price and WTP is the willingness to pay.

The second bid’s level is contingent on the response to the first bid B_i, which means that if the individual responds “yes” to the first bid, the second bid is denoted as B_i^h is some amount higher than the first bid $B_i < B_i^h$; On the other hand, if the individual responds “no” to the first bid, the second bid is denoted as β_i^l is some amount lower than the first bid $B_i^l < B_i$.

As a result, we will have four possible outcomes: (a) both answers are "yes"; (b) both answers are "no"; (c) a "yes" followed by a "no"; and (d) a "no" followed by a "yes."

The likelihood of these outcomes is represented by $\pi^{yy}, \pi^{nn}, \pi^{yn}, \pi^{ny}$. Under the assumption that respondents are utility maximisers, the formulas for this likelihood are as follows.

Firstly, we have $B_i^h > B_i$,

- $\pi^{yy}\left(B_i, B_i^h\right) = \Pr\{B_i \leq \max WTP \ and \ B_i^h \leq \max WTP\}$ (4.16)
- $= \Pr\{B_i \leq \max\ WTP | B_i^h \leq \max WTP\} \Pr\ \{B_i^h \leq \max WTP\}$ (4.17)
- $= \Pr\{B_i^h \leq \max WTP\} = 1 - G\left(B_i^h; \theta\right),$ (4.18)

since, with $B_i^h > B_i$,

- $\Pr\{B_i \leq max\ WTP | B_i^h \leq \max WTP\} \equiv 1.$ (4.19)

Similarly, with $B_i^l < B_i$,

- $\Pr\{B_i^l \leq max\ WTP | B_i \leq \max WTP\} \equiv 1.$ (4.20)

Hence,

- $\pi^{nn}\left(B_i, B_i^l\right) = \Pr\{B_i > \max WTP;\ \ B_i^l > \max WTP\} = G(B_i^l, \theta).$ (4.21)

When a "yes" is followed by a "no", we have $B_i^h > B_i$,

- $\pi^{yn}\left(B_i, B_i^h\right) = \Pr\{B_i \leq \max WTP\ \ \leq B_i^h = G\left(B_i^h; \theta\right) - G(B_i; \theta)$ (4.22)

And when a "no" is followed by a "yes", we have $B_i^l < B_i$ and

- $\pi^{ny}\left(B_i, B_i^l\right) = \Pr\{B_i \geq \max WTP\ \ \geq B_i^l\} = G(B_i; \theta) - G(B_i^l; \theta).$ (4.23)

Given a sample of N respondents, where B_i, B_i^h and B_i^l are the bids used for the ith respondent, the log-likelihood function takes the form:

- $\ln L^D(\theta) = \sum_{i=1}^{N}\{d_i^{yy} \ln \pi^{yy}(B_i, B_i^h) +\ d_i^{nn} \ln \pi^{nn}\left(B_i, B_i^l\right) +\ d_i^{yn} \ln \pi^{yn}\left(B_i, B_i^h\right) +$
  $d_i^{ny} \ln \pi^{ny}(B_i, B_i^l)\}$ (4.24)

where $d_i^{yy}, d_i^{nn}, d_i^{ny}$ and d_i^{ny} are binary-valued indicator variables and the formulas for the corresponding response probabilities are given by (4.18 – 4.23).

The maximum likelihood estimator for the double-bounded model, $\hat{\theta}^D$, is the solution to the equation $\frac{\partial \ln L^D(\hat{\theta}^D)}{\partial \theta} = 0$.

The assumption variance-covariance matrix for $\hat{\theta}^D$

$$V^D(\hat{\theta}^D) = [-E\frac{\partial^2 \ln L^D(\hat{\theta}^D)}{\partial\theta\partial\theta'}]^{-1} = I^D(\hat{\theta}^D)^{-1} \quad (4.25)$$

$$I^D(\theta) = \sum_i I\left(B_i, B_i^h, B_i^l;\, \theta\right),$$

Where for the ith observation,

- $$I^D\left(B_i, B_i^h, B_i^l;\, \theta\right) = \frac{G_\theta(B_i^h;\theta)G_\theta(B_i^h;\theta)'}{\pi^{yy}} + \frac{G_\theta(B_i^l;\theta)G_\theta(B_i^l;\theta)'}{\pi^{nn}} + \frac{QQ'}{\pi^{yn}} + \frac{RR'}{\pi^{ny}}, \quad (4.26)$$

$\pi^{yy}, \pi^{nn}, \pi^{yn}$ and π^{ny} are the probabilities on the right-hand side of (4.14 - 4.17) and the vectors Q and R are defined by

- $Q \equiv \left[G_\theta\left(B_i^h\right);\theta\right) - G_\theta(B_i;\theta)]$ and $R \equiv [G_\theta(B_i;\theta) - G_\theta(B_i^l;\theta)]$. (4.27)

When estimating equation (4.22) using a double-bounded logit model to determine consumers' WTP for each product the empirical model is as follows:

$$WTP = \beta_0 + \beta_1 SEX + \beta_2 AGE + \beta_3 EDU + \beta_4 RLG + \beta_5 HHZ + \beta_6 INC + \beta_7 ATT + \beta_8 SN$$

$$+ \beta_9 PBC + \beta_{10} INTEN + \beta_{11} FN + \beta_{12} DISG + \varepsilon_i \quad (4.28)$$

Rstudio was used to run the DBDC analysis using the package “Dcchoice” (Nakatani, Aizaki and Sato, 2023). In the DBDC analysis, we had three models similar to the three models developed in the MNL.

WTP ESTIMATION VIA PSM ANALYSIS. In order to identify the optimal price area graphically, we used Excel in six steps as suggested by Luptak (2021) as follows: A) organize the columns with responses in the order of “Cheap”, “Too cheap”, “Expensive”, and “Too Expensive” prices; B) ensure that nonsensical entries, such as instances where the value for “Cheap” exceeds that for “Expensive”; C) consolidate all values from each of the four columns and paste them into a new single column, positioning each column's values beneath the preceding set; D) remove any duplicate entries and arrange the monetary values in ascending order; E) calculate the frequency of each value in the dataset to understand the distribution of responses; F) determine the number of respondents who consider the given monetary value (and all values below or above it) as denoting “Cheap”, “Too cheap”, “Expensive”, or “Too expensive”; G) finally, create the Van Westendorp graph based on the calculated data, following the guidelines outlined in Appendix 4.3 – 4.4, as depicted in Figure 4.11.

In this chapter, we provide a detailed overview of the research methods employed in the online survey. This includes the development of the conceptual framework based on the TPB. The statistical and economic modelling of MNL analysis that used for assessing consumers' preferences for insect-based products, DBDC and PSM methods for eliciting consumers' WTP. In addition to the design of the survey, data collection and sampling.

The subsequent chapter will present the findings of the online survey, encompassing a descriptive analysis of participant demographics, consumption patterns, and their evaluation of the conceptual framework constructs. It will delve into the variations in these framework elements concerning age, sex, education, and income. Furthermore, the results of consumers' preferences for sliced bread and pasta, and the factors influencing these preferences. Finally, the results of consumers' WTP for these products and the factors influencing their WTP decisions.

CHAPTER 5. Results and Discussion of Consumers' preferences and willingness to pay for insect-based food

5.1 Results

In total, 801 participants completed the survey, out of the initial 4062 individuals who entered the survey but did not finish either because they were not interested or due to quality control measures explained in Chapter 4, section 4.4 The subsequent sections of this chapter will first present the results of participants included in the final sample in terms of socioeconomic and demographic characteristics, and consumption habits of conventional bread and pasta. It will then present the results comparing participants' differences in elements of the proposed extended TPB variables. This is followed by the evaluation regarding preferences and willingness to pay for bread and pasta made with insects and preferences towards marketing communication of these products.

5.1.1 Socioeconomic, and demographic characteristics of participants and their consumption habits for conventional bread and pasta

The final sample of participants reflects the structure of the UK population in terms of sex and age because of the quota sampling described in Chapter Four, section 4.4. Table 5.1 shows that most participants are females (52.2%) and fall within the age range of 40-59 (35.1%), followed by the age groups "60 and older" (31%), "25-39" (27.2%) and "18-24" (6.7%). Most participants reside in urban areas (71.5%) and about 54.1% hold a degree, indicating a bias towards highly educated consumers. In terms of occupation, a considerable proportion are employed (57.1%) and retired (23.6%). As regards religion and ethnicity 48.3% identify themselves as Christians, and 42.9% do not follow any religion,89.5% stated to be White/White British/White Irish. The majority of participants have a household size of one person (35.5%) or two people (28.2%), three or more (36.3%), and the majority have low to middle income (41.4% have a gross income of less than £30k, and 30.9% range from 30,000 to less than £60k.

Table 5. 1: Descriptive statistics of the socioeconomic and demographic characteristics of respondents (*N* = 801)

Characteristics	Count	%	Characteristics	Count	%	
Sex			**Ethnicity**			
Female	418	52.2	*Asian/ Asian British*	44	5.5	
Male	383	47.8	*Black/ African/ Caribbean/ Black British*	15	1.9	
Age			*Mixed/ Multiple ethnic groups*	14	1.7	
18-24	54	6.7	*White/ White British/ White Irish*	717	89.5	
25-39	218	27.2	*Prefer not to say*	10	1.2	
40-59	281	35.1				
60 or older	248	31.0	**Household size**			
			1	284	35.5	
Place of living			*2*	226	28.2	
Urban	573	71.5	*3*	127	15.9	
Rural	228	28.5	*4*	113	14.1	
			5	42	5.2	
Education			*More than 5*	9	1.1	
Below GSCE's	6	0.7				
GSCE's	144	18.0	**Income**			
A levels / BTEC	218	27.2	*Less than £10,000*	35	4.4	
Degree	234	29.2	*10,000 - 19,999*	132	16.5	
Postgraduate Degree/ Professional	180	22.5	*20,000 - 29,999*	164	20.5	
Doctorate	19	2.4	*30,000 - 39,999*	111	13.9	
			40,000 - 49,999	82	10.2	
Occupation			*50,000 - 59,999*	56	7.0	
Employed	457	57.1	*60,000 - 69,999*	48	6.0	
Self-employed	53	6.6	*70,000 - 79,999*	26	3.2	
Unemployed	82	10.2	*80,000 - 89,999*	24	3.0	
Student	20	2.5	*90,000 - 99,999*	29	3.6	
Retired	189	23.6	*100,000 - 149,999*	34	4.2	
			150,000 or more	9	1.1	
Religion			*I do not want to declare/I do not know.*	51	6.4	
Buddhist	4	0.5				
Christian	387	48.3				
Hindu	9	1.1				
Jewish	4	0.5				
Muslim	26	3.2				
Sikh	4	0.5				
No religion	344	42.9				
Other, please specify	4	0.5				
Prefer not to say	19	2.4				

Table 5.2 shows that 52.2% of participants consume between 0.8 and under 2kg of conventional sliced bread, and 65.9% spend between £2 to less than £6 a month. For conventional pasta, there is an overall lower consumption and expenditure as 56.2% consume less than 1kg of pasta, and 53.7% of respondents spend less than 5£.

Table 5. 2: Household consumption habits of conventional sliced bread and pasta

Conventional sliced bread					
Monthly consumption in kg	**Counts**	**%**	**Monthly expenditure in £**	**Counts**	**%**
Less than 0.4	54	6.7	*Less than 1*	28	3.5
0.4 – Less than 0.8	121	15.1	*1 - 1.4*	63	7.9
0.8 – Less than 1.2	161	20.1	*1.5 - 1.9*	72	9.0
1.2 – Less than 1.6	130	16.2	*2 - 2.9*	125	15.6
1.6 – Less than 2	127	15.9	*3 - 3.9*	106	13.2
2 – Less than 2.4	83	10.4	*4- 4.9*	137	17.1
2.4 –2.8	72	9.0	*5 - 5.9*	160	20.0
More than 2.8	53	6.6	*6 or more*	110	13.7
Conventional pasta					
Monthly consumption in kg	**Counts**	**%**	**Monthly expenditure in £**	**Counts**	**%**
Less than 0.5	194	24.2	*Less than 5*	430	53.7
0.5 - 1	256	32.0	*5 - 9*	199	24.8
1.5 - 2	155	19.4	*10 - 14*	74	9.2
2.5 – 3	110	13.7	*15 - 19*	45	5.6
3.5 - 4	53	6.6	*20 - 24*	34	4.2
4.5 – 5	18	2.2	*25 - 29*	12	1.5
5.5 - 6	12	1.5	*30 - 34*	6	0.7
More than 6	3	0.4	*More than 34*	1	0.1

5.1.2 Exploring participants' differences in elements of the proposed extended TPB

In the following sections, we presented the results of the evaluation of the proposed extended TPB components towards insect-based products which were measured on a 7-point scale. However, the term undesirable is the sum of the three levels (extremely undesirable, undesirable, and somewhat undesirable), and the term desirable is the sum of the three levels (extremely desirable, desirable, and somewhat desirable). The term unlikely is the sum of the three levels (extremely unlikely, unlikely, and somewhat unlikely), and the term likely is the sum of the three levels (extremely likely, likely, and somewhat likely). The term disagree, is the sum of the three levels (extremely disagree, disagree, and somewhat disagree), and the term agree is the sum of the three levels (extremely agree, agree, and somewhat agree). Furthermore, A 4-way ANOVA was performed to explore the effect of sex, age, education, and income on the TPB components, in addition to food neophobia and disgust. Table 5.3 demonstrates the variable levels when running the 4-way ANOVA.

Table 5. 3: Variables levels

Variable	Level
Sex	Female
	Male
Age	18-39
	40-59
	60 or older
Education	A level or below
	Degree
	Post degree
Income	Less than 30,000
	30,000 - Less than 60,000
	60,000 or more

5.1.2.1 Attitudes, subjective norms, perceived behavioural control, and intention to try insects in the next 12 months

ATTITUDES. The evaluation of positive and negative statements of attitudes regarding ethical (i.e. animal welfare, the living conditions of livestock farmers), and environmental aspects of the consumption of edible insects appears to be more desirable than those concerning the health of people and the economic factors of supply chains[31]. This can be visualised in Figure 5.1 which shows that when respondents were thinking of the consequences of insect-based food consumption, nearly 74% of them considered the worsening living conditions of livestock farmers to be undesirable and about 66% considered the improvement of farm animal welfare and the reduction of greenhouse gas emissions to be desirable. Instead, only 50% of participants evaluated health benefits to be desirable and 44.1% food safety risks to be undesirable. The takeover of multinational companies was rated neutral by the majority of participants (43.6%).

[31] For the detailed breakdown of positive and negative statements of attitudes see Appendix 5.1 and 5.2.

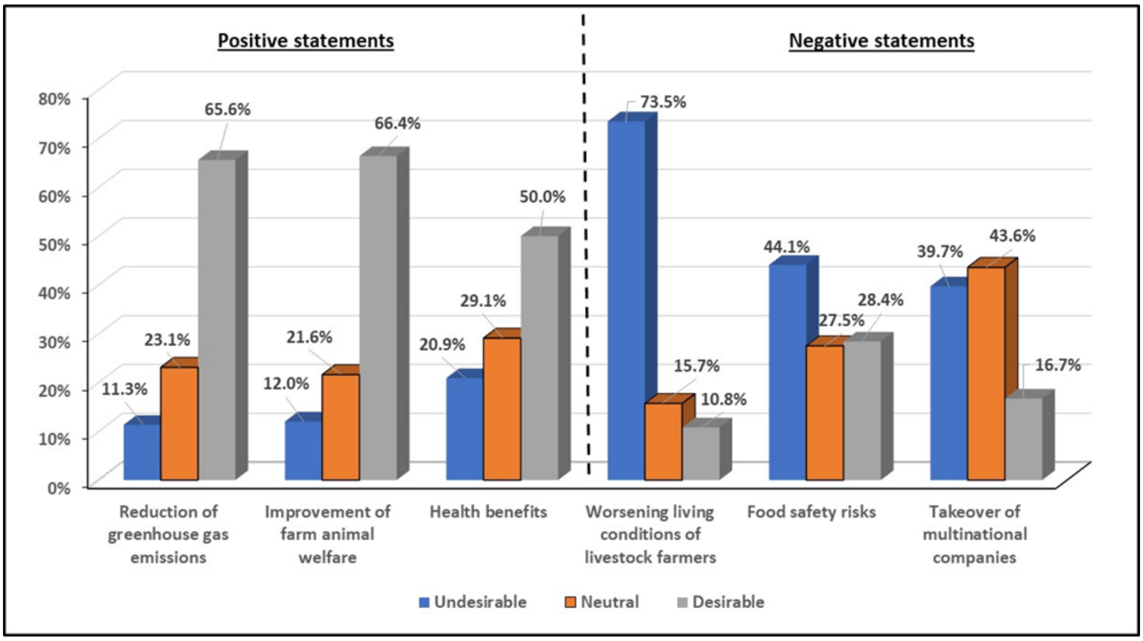


Figure 5. 1: Respondents' rating of positive and negative statements of attitudes

Figure 5.2 shows that the most likely positive belief is that insect-based food can effectively reduce greenhouse gas (GHG) emissions (54.5%) followed by health benefits (43.5%) and improvement of farm animal welfare (39.5%). The most likely negative statement is the worsening living conditions of livestock farmers (39.9%) followed by food safety risks (34.5%) and the takeover by multinational companies (30.3%). Interestingly, the takeover

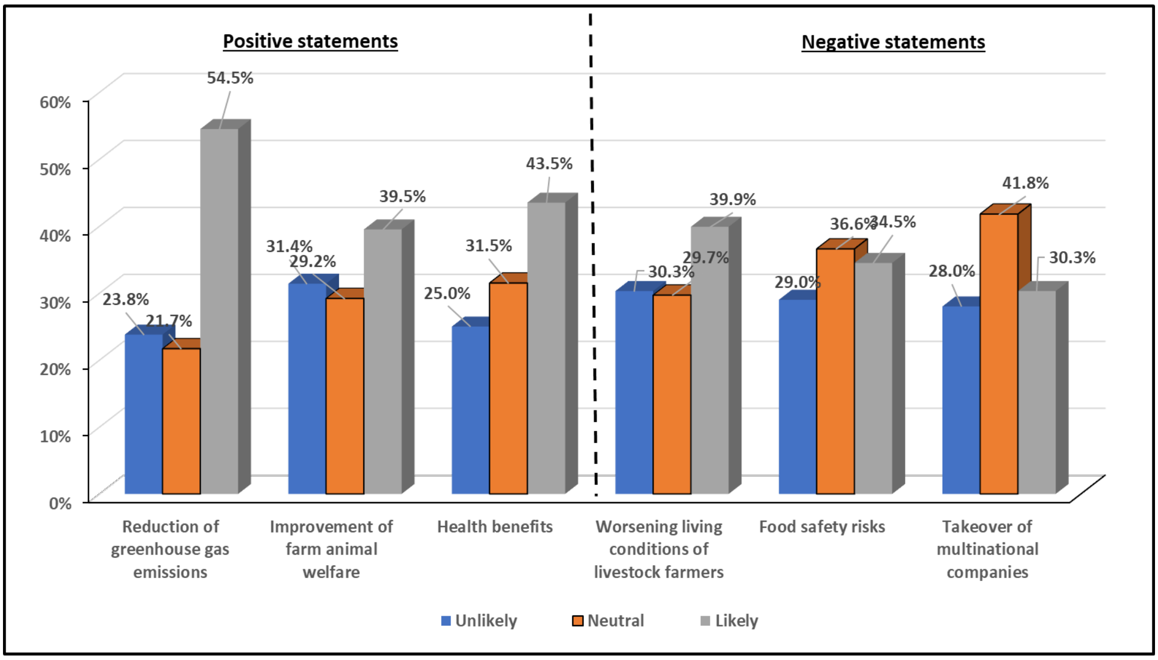


Figure 5. 2: Figure Respondents' beliefs of positive and negative statements of attitudes

by multinational companies was rated by the majority as neutral similar to the desirability suggesting that people are hesitant about this aspect.

Comparing Figure 5.1 with Figure 5.2, the desirability of insect-based food benefits surpasses the corresponding beliefs that they will occur, and the undesirability towards the negative impact of insect-food products surpasses the corresponding beliefs that they will not occur.

We applied equation 4.1 (see Chapter 4) to calculate the expectancy-value score of attitudes (the behavioural belief) which ranged from 1 to 49. Table 5.4 shows that the strongest positive attitude was towards the reduction of GHG emissions (22.07), followed by the improvement of farm animal welfare (20.38), and health benefits (18.52). The strongest negative attitude is food safety risks (15.29), followed by the takeover by multinational companies (14.29) and worsening living conditions of livestock farmers 10.93. The average score for the positive attitudes is (20.32), whereas for the negative attitudes, is (13.5).

Table 5. 4: Attitudes toward insect-based food products

Items	**Belief strength** $(\boldsymbol{b_i})$	**Outcome evaluation** $(\boldsymbol{e_i})$	$\boldsymbol{b_i e_i}$
Positive attitudes			
The reduction of greenhouse gas emissions	4.44	4.97	22.07
Improvement of farm animal welfare	4.06	5.02	20.38
Health benefits linked to the consumption of insect-based food	4.20	4.41	18.52
Negative attitudes			
Worsening living conditions of livestock farmers	4.14	2.64	10.93
Food safety risks regarding insect-based food consumption	4.11	3.72	15.29
The takeover of multinational companies	4.07	3.51	14.29
Note. The scale of b_i and e_i ranged from 1-7. The scale of $b_i e_i$ and e_i ranged from 1-49.			

The mean of the overall score of attitudes[32] towards the consumption of insects is 16.91 (s=5.06), range of 38.17 (MIN=5.33; MAX=43.50) with skewness=0.26 (SE=0.09); kurtosis=0.67 (SE=0.17) (see Appendix 5.3). These findings suggest that negative attitudes have an impact on participants' positive attitudes because the weight reduces the strength of overall attitudes, emphasizing the need for a comprehensive understanding of public

[32] For the overall attitude, the negative score has been reversed.

perceptions towards insect-based food. Thus, considering that the scores of equation 4.1 could have ranged between 1 and 49, the average attitudes of participants are below the middle point of this theoretical distribution and thus do not show strong positive attitudes towards the consumption of food insects.

Table 5.5 shows that attitudes towards insect-based food are influenced significantly by two main effects (education and income), four two-way interaction effects (sex*age, sex*income, age*education and age*income) and one three-way interaction effect (age* education*income)[33]. Thus, we only comment the following interaction effects sex*age (F=5.50; $d.f.$=2; p=0.01), sex*income (F=4.52; $d.f.$=2; p=0.01) and age*education*income (F=1.92; $d.f.$=8; p=0.05)[34].

Table 5. 5: Four-way ANOVA table for attitudes towards the consumption of edible insects

Dependent variable: Attitudes					
Source of variance	SS	*df*	MS	F	*P-value*
Corrected Model	2088.428[a]	53	39.40	1.59	0.01
Intercept	152653.05	1	152653.05	**6148.86**	**0.00**
Sex	13.35	1	13.35	0.54	0.46
Age	93.03	2	46.51	1.87	0.15
Education	**171.53**	**2**	**85.77**	**3.45**	**0.03**
Income	**207.81**	**2**	**103.90**	**4.19**	**0.02**
Sex * Age	**273.09**	**2**	**136.54**	**5.50**	**0.01**
Sex * Education	58.19	2	29.09	1.17	0.31
Sex * Income	**224.19**	**2**	**112.10**	**4.52**	**0.01**
Age * Education	**379.31**	**4**	**94.83**	**3.82**	**0.01**
Age * Income	304.05	4	76.01	**3.06**	**0.02**
Education * Income	127.65	4	31.91	1.29	0.27
Sex * Age * Education	213.95	4	53.49	2.15	0.07
Sex * Age * Income	60.09	4	15.02	0.61	0.66
Sex * Education * Income	66.05	4	16.51	0.67	0.62
Age * Education * Income *	**381.93**	**8**	**47.74**	**1.92**	**0.05**
Sex * Age * Education * Income	236.80	8	29.60	1.19	0.30
Error	17279.05	696	24.83		
Total	308160.81	750			
Corrected Total	19367.48	749			
a. R Squared = 0.108 (Adjusted R Squared = 0.040)					

The following analysis is based on the estimated marginal means (EMM) and the standard error of the mean (SE) for the effects.

[33] Multi-way interaction effects are more important than main effects and thus we only comment on significant multi-way interaction effects (Field, 2018).

[34] See Appendices 5.4 -5.8 for ANOVA analysis.

As regards the two two-way interaction effects, Figure 5.3.a shows that young and old females with EMM=19.92, 21, and SE= 0.5 and 0.84 respectively, are higher than males in the same age groups with EMM=18.41 and SE=0.73 for young males, and EMM=19.64 and SE= 0.59 for old males. However, for respondents aged between 40 and 59 males EMM=20.97 and SE=0.51 have stronger attitudes than females EMM= 19.25 and SE= 0.47. The interaction between sex and income shows that females with high or low income EMM=21.32, and 19.57, respectively, have higher attitudes than males in the same income groups EMM=20.15, SE=0.61 for high income and 18.14, SE=0.73 for low income. Though, males from the middle-income group EMM=20.74, SE=0.47 higher than females from the same age group EMM=19.25, SE=0.47.

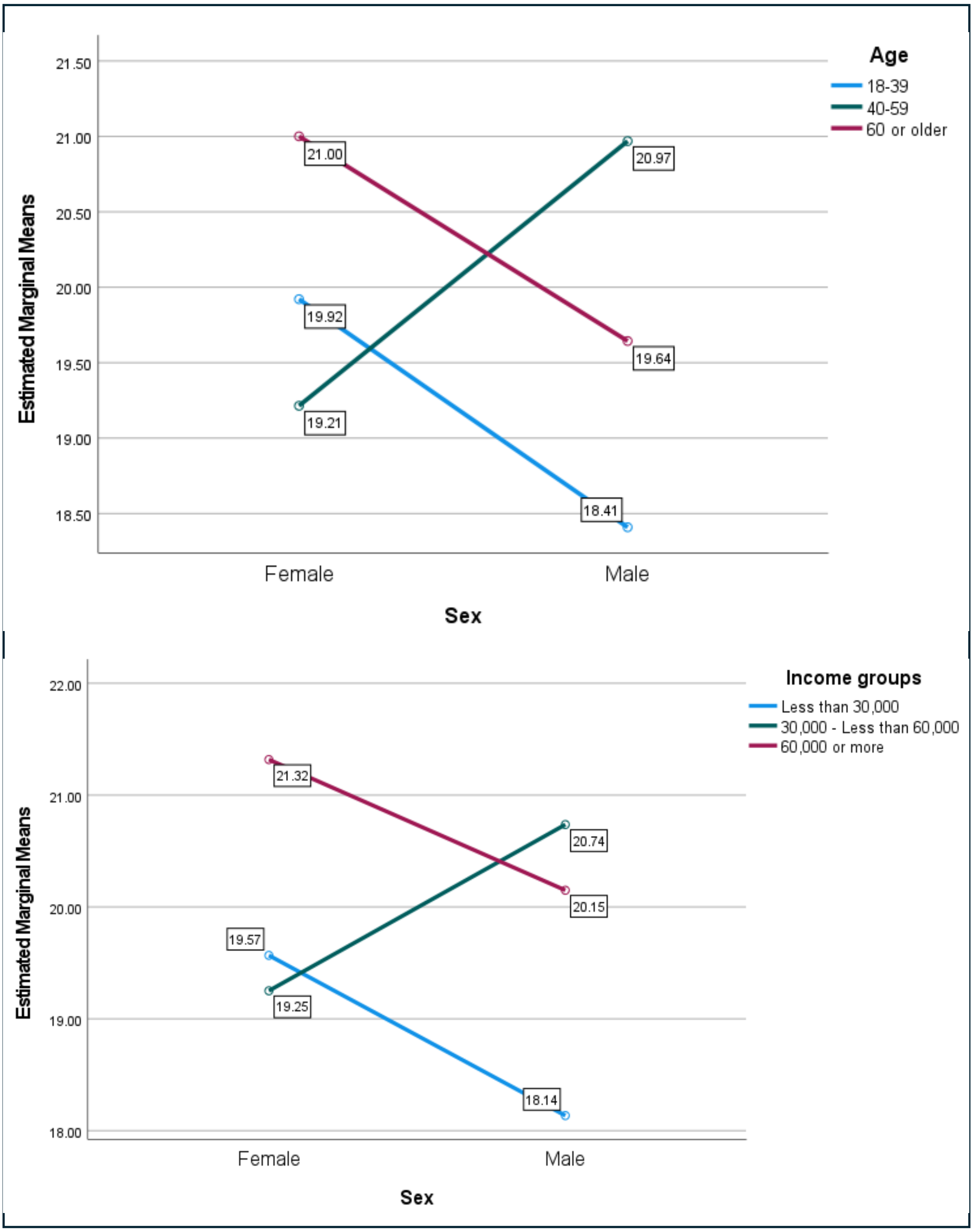


Figure 5. 3.a: Estimated marginal means of attitudes with the significant interaction effects sex*age (up), and sex*income (below)

Finally, for the three-way interaction effect, Figure 5.3.b shows the interaction effect demonstrated based on education levels (A level or below, Degree, Post degree).

For people with A level of education, the young and old participants who have high income (EMM=21.08, SE=1.67, EMM=19.94, SE=2.08) respectively, have higher attitudes than people in the middle age group and high income (EMM=18, SE= 1.39). Moreover, for those who have low income the older they get, the lower their attitude toward insects as food where the estimated marginal mean for young is EMM=20.08, SEM= 0.88, for participants in middle age is EMM=18.53, SEM=0.6, and for old participants EMM=17.84, SEM=0.51.

For participants who have Degrees, and those who have low and high incomes, the older they get the stronger the attitude. Young participants with high incomes have EMM=19.79, SE=0.95, whereas old participants with high-income EMM=21.93, SE=1.9. Similarly, young participants with low-income EMM=18.85, SE=1.17, and old with EMM=21.93, SE=1.9. For participants with the middle-group income, their attitudes are almost stable with the increase in age whereas for young ones EMM=20.35, SE=0.85, and old EMM=20.61, SE=1.18.

Concerning participants with Post-degree, young and old participants the higher the income group the stronger the attitudes. Young participants from the highest to the lowest income group EMM=21.01, SE=0.79, those with middle income EMM= 20.1, SE=1.1, and those with low-income EMM= 11.56, SE=2.59 respectively. Whereas for the old participants, from the highest to the lowest income group, EMM= 23.29, SE=2.69, EMM=20.22, SE=1.09, and EMM=18.04 SE=1.16, respectively.

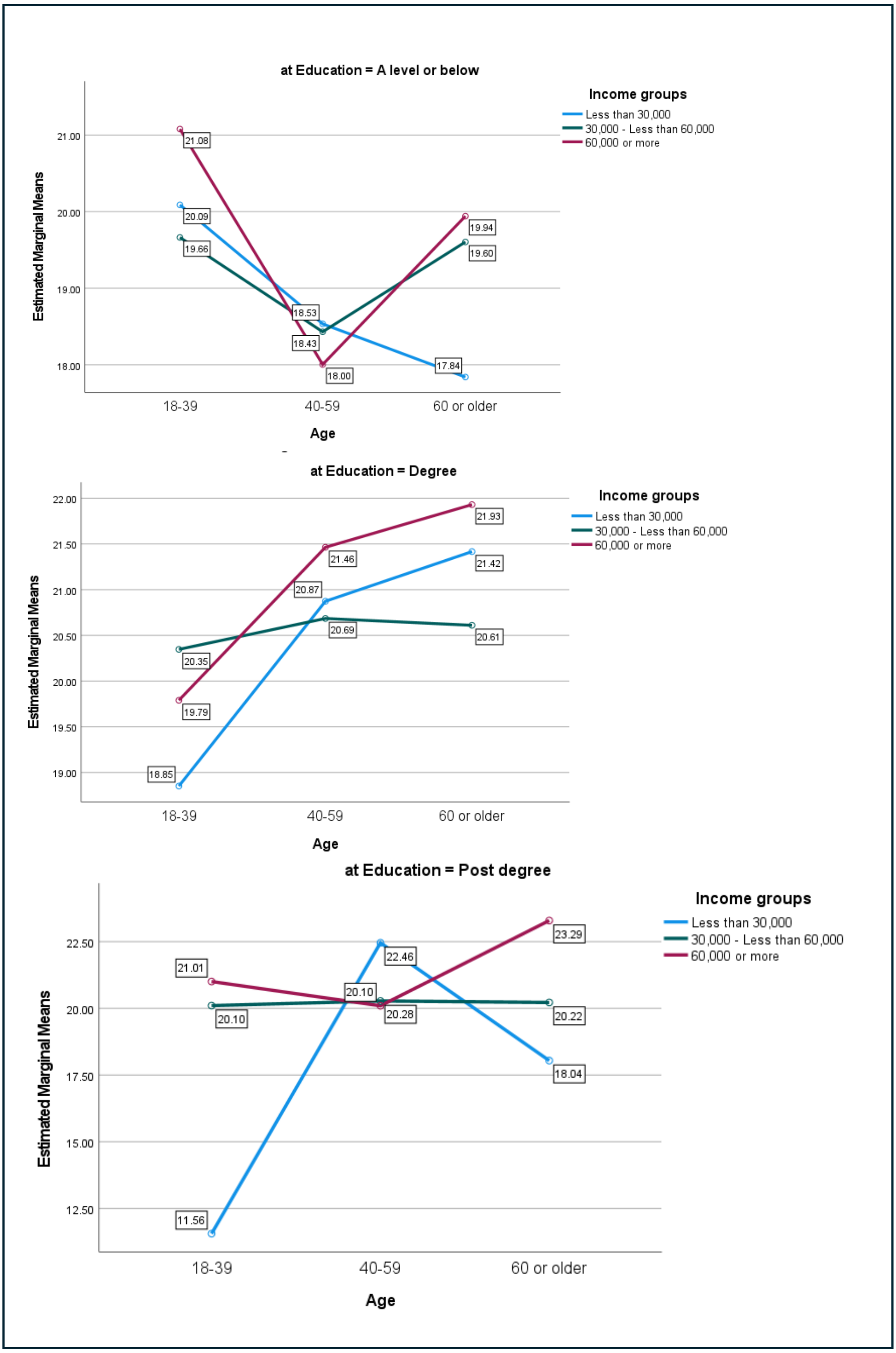


Figure 5.3. a: Estimated marginal means of attitudes with the significant interaction effects (age*education*income)

Subjective norms. Figure 5.4 illustrates that participants show a low level of agreement towards motivation to comply with family, friends, and experts. Additionally, there is a low likelihood that these referents think that they should perform the behaviour. Moreover, they appear to be more influenced by experts as the level of agreement for the motivation to comply with experts (43.3%) is higher than that of family (15.9%) and friends (11.7%), and the same pattern is observed for the beliefs towards the same referents. The belief that individuals are likely to follow the guidance of experts reaches 27%, indicating a considerable preference for expert opinion over the influence of family (8.9%) and friends (7.8%)[35].

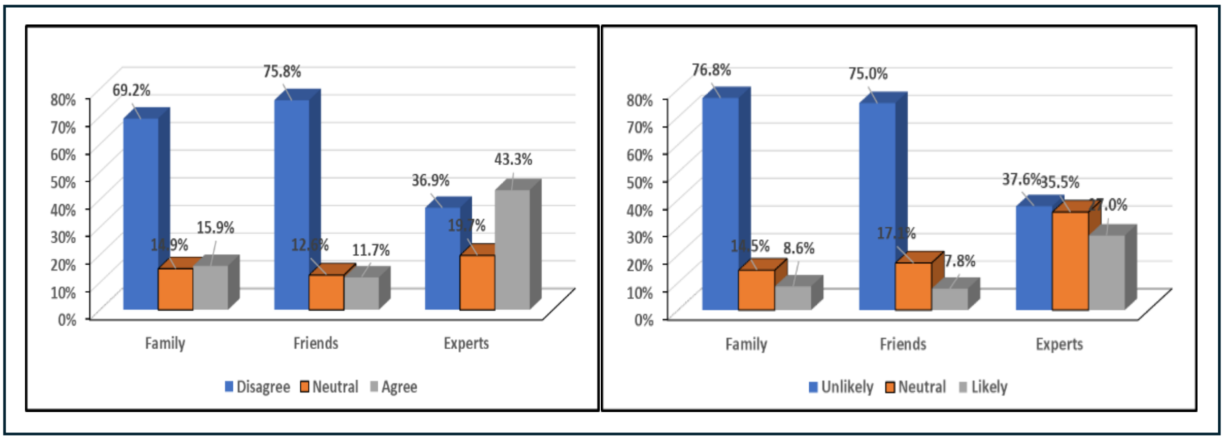


Figure 5. 4: Participants' motivation to comply (left) and beliefs (right) towards these referents

This is confirmed by the application of equation 4.2 (see Chapter 4) where the expectancy scores reported in Table 5.6 show that the strongest influence is by experts (14.27), followed by the influence by family (6.32), and friends (5.85).

Table 5. 6: Subjective norms toward insect-based food products

	Belief strength (b_i)	**Outcome evaluation (e_i)**	$b_i e_i$
Item			
The influence of the family	2.29	2.76	6.32
The influence of the friends	2.35	2.49	5.85
The influence of the experts	3.64	3.92	14.27
Note. The scale of b_i and e_i ranged from 1-7 The scale of $b_i e_i$ and e_i ranged from 1-49			

The participants' overall scores of subjective norms (the normative beliefs) regarding the consumption of insect-based food exhibit a moderately skewed to the right with a mean of 9.97 (s=8.2) and a range of 43.33 (MIN=1.33; MAX=44.67) (see Appendix 5.10). The skewness and kurtosis of the distribution are 1.74 (SE=0.09) and 3.69 (SE=0.17) respectively. Due to the high level of kurtosis, we checked for the outliers in SN where we found 36

[35] For the detailed breakdown of evaluation and beliefs of subjective norms see Appendix 5.9.

extreme cases, by excluding the highest 15 cases[36], we were able to reach an acceptable level of kurtosis (1.9). It is important to note that the scores of equation 4.2 (see Chapter 4) could have theoretically ranged between 1 and 49. Given the observed mean and range, it is evident that the average subjective norms of the participants fall significantly below the midpoint of this theoretical distribution i.e. the influence of referent groups is not very strong.

The results of the 4-way ANOVA revealed significant main effects of sex, age, and income and education on subjective norms, one two-way interaction effect between sex and age, additionally, one three-way interaction effect between sex, age, and income as shown in Table 5.7. We only comment on the main effect of education (*F=4.9, df.=2, p=0.1*), and the interaction effect of sex, age and income (*F=2.39, df=4, p=0.05*)[37].

Table 5. 7: Four-way ANOVA table for subjective norms towards the consumption of edible insects

Dependent variable: Subjective norms					
Source of variance	SS	*df*	MS	F	*P-value*
Corrected Model	11074.174[a]	53	208.95	3.59	0.00
Intercept	43626.20	1	43626.20	749.88	0.00
Sex	**519.66**	**1**	**519.66**	**8.93**	**0.00**
Age	**1289.49**	**2**	**644.75**	**11.08**	**0.00**
Income	**374.92**	**2**	**187.46**	**3.22**	**0.04**
Education	**569.78**	**2**	**284.89**	**4.90**	**0.01**
Sex * Age	**733.57**	**2**	**366.78**	**6.30**	**0.00**
Sex * Income	65.45	2	32.72	0.56	0.57
Sex * Education	43.30	2	21.65	0.37	0.69
Age * Income	379.24	4	94.81	1.63	0.16
Age * Education	337.37	4	84.34	1.45	0.22
Income * Education	304.28	4	76.07	1.31	0.27
Sex * Age * Income	**555.59**	**4**	**138.90**	**2.39**	**0.05**
Sex * Age * Education	323.63	4	80.91	1.39	0.24
Sex * Income * Education	217.67	4	54.42	0.94	0.44
Age_* Income * Education	396.93	8	49.62	0.85	0.56
Sex * Age * Income * Education	302.66	8	37.83	0.65	0.74
Error	40491.77	696	58.18		
Total	126953.11	750			
Corrected Total	51565.95	749			
a. R Squared = 0.215 (Adjusted R Squared = 0.155)					

[36] The exclusion of these 15 cases resulted in a final sample size consists of 786 participants which will discussed further in section 5.1.3.
[37] See Appendix 5.11 – 5.15 for ANOVA analysis.

Figure 5.5.a The main effect of education the higher the level of education, the stronger the subjective norms considering the three levels of education (A-level or below, Degree, and Post-degree) with EMM=8.99, SE=0.61, EMM=10.96, SE=0.586, EMM=11.89, SE=0.8 respectively.

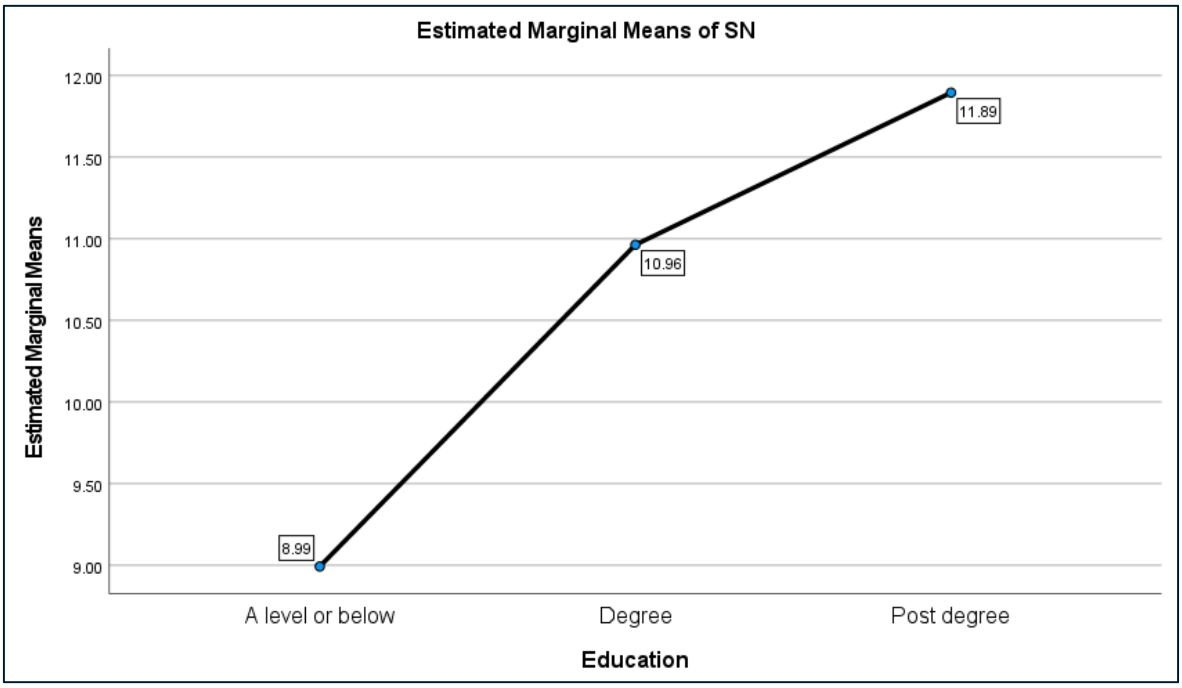


Figure 5.5. a: Estimated marginal means of subjective norms main effect of education.

The three-way interaction effect income varied across different income groups, as depicted in Figure 5.5.b.

For 30k or less income, generally, young and middle-aged females have lower subjective norms compared with males from the same age groups, whereas younger females have stronger subjective norms compared with males from the same age group. Particularly, the older get females, the weakest the subjective norms EMM=9.87, SE=1.2, EMM=9.26, SE=1.08, EMM=5.92, SE= 1.11 for young, middle age, and old, respectively. For males, young participants have stronger subjective norms EMM=15.25, SE= 2.79, whereas middle-aged and older males have close subjective norms EMM=7.54, SE=1.51, EMM=7.77, SEM=1.14, respectively.

For 30k to less than 60k, young EMM 9.89=, SE=1.11, and middle-aged EMM=7.99, SE=1.28 females experience weakened subjective norms compared with males from the same age groups (EMM=17.59, SEM=1.19, EMM=11.95, SE=1.13). Whereas females older than 60 (EMM= 9.42, SE= 1.31, have stronger subjective norms compared with males from the same age group (EMM=7.78, SE= 1.41).

For participants with income higher than 60k, old females (EMM= 15.22, SE=3.44) have stronger subjective norms compared with males (EMM= 11.51, SE=2). However, young (EMM=15.48, SE=1.37) and middle-aged (EMM= 11.11, SE=1.42) male participants have stronger subjective norms compared with females from the same age groups EMM=10.4, SE=1.62 for young, and EMM=7.16, SE=1.38 for middle-aged.

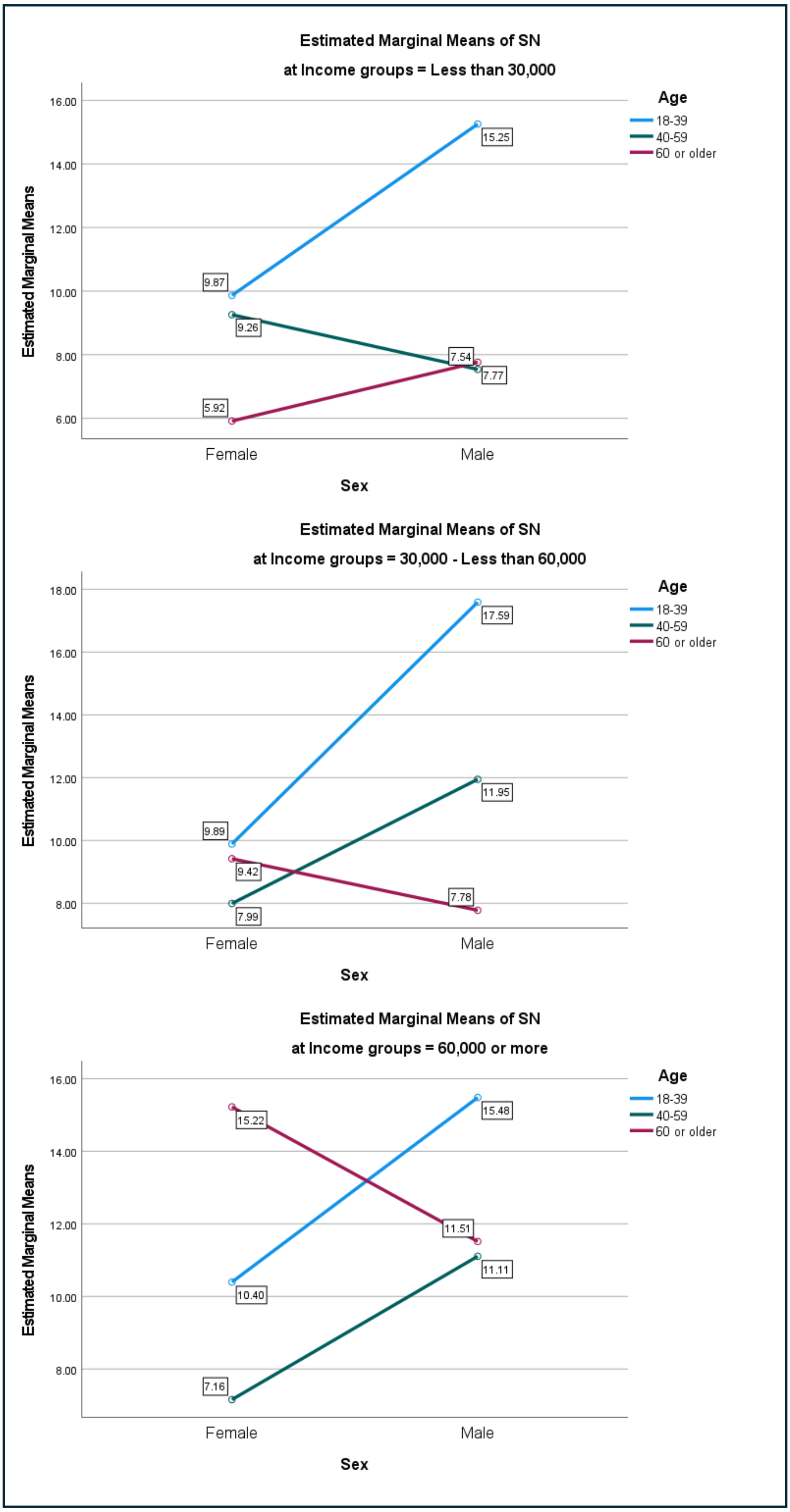


Figure 5. 5.b: Estimated marginal means of subjective norms with the significant interaction effects (sex*age*income

Perceived behavioural control. Figure 5.6 shows how control beliefs (presence of factors that may facilitate or impede the performance of the behaviour) and power of control factors were perceived by participants. Economic factors played a role in participants' evaluations, emphasizing the impact of financial considerations on their perspectives as the agreement that sufficient economic resources would facilitate consumption counted for 38.9 and the belief that the likelihood of having sufficient economic resources would facilitate consumption was higher, with 47.3[38].

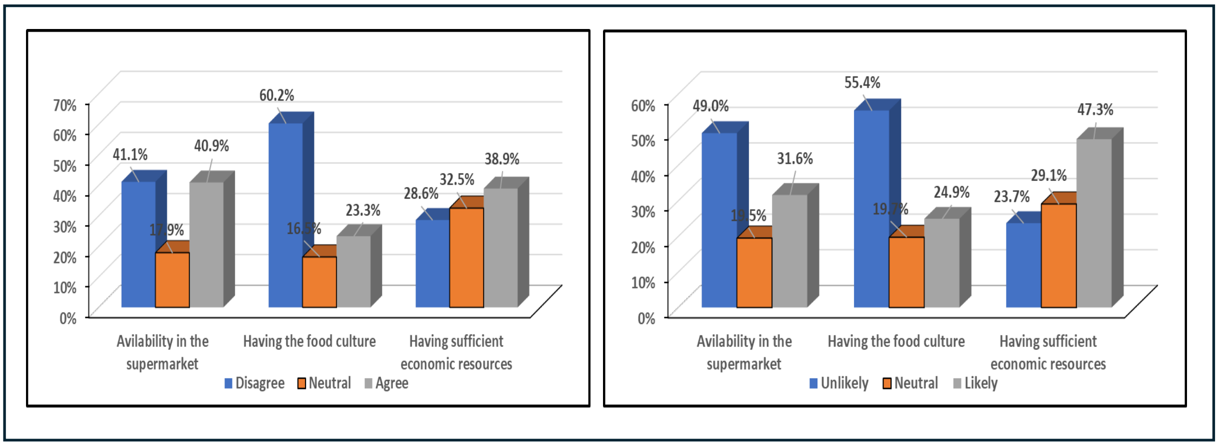


Figure 5. 6: Participants' perception of control factors (left) and power of the control factors (right)

The availability of insect-based products in supermarkets sparked a diverse range of opinions among participants, resulting in a near-equal split between those who disagreed (41.1%) and those who agreed (40.9%) with this statement. However, when considering the likelihood (perceived power) of such products being available in supermarkets 49% stated it is unlikely. The control belief "food culture" appears to be the most challenging factor as participants demonstrated a notable inclination towards the idea that their own food culture would not facilitate the introduction of insect-based with a substantial of 60.2%, similarly, when considering the likelihood of adopting this food culture, a higher percentage (55.4%) expressed scepticism about embracing the food culture. Table 5.8 shows the strength of each aspect separately which was evaluated by applying equation 4.3 (see Chapter 4) taking into consideration that the scale ranged from 1-49. The strongest aspect is having sufficient economic resources. (18.66), followed by the availability in the supermarket (13.42), and having a food culture (13.42).

[38] For the detailed breakdown of evaluation and beliefs of PBC see Appendix 5.16.

Table 5. 8: Perceived behavioural control toward insect-based food products

	Belief strength (b_i)	Control beliefs (e_i)	$b_i e_i$
Item			
Availability in supermarket	3.56	3.77	13.41
Having the food culture	3.21	3.14	10.08
Having sufficient economic resources	4.34	4.3	17.5
Note. The scale of b_i and e_i ranged from 1-7. The scale of $b_i e_i$ and e_i ranged from 1-49			

The mean score of perceived behavioural control is 14.78 (s=9.47), and the range spans 43.33 (MIN=1.33; MAX=44.67) with skewness of 0.86 (SE=0.09) and kurtosis is 0.38 (SE= 0.17) (see Appendix 5.17). Considering that the scores of equation 4.6 could theoretically range between 1 and 49, it is evident that the average perceived behavioural control of the participants falls below the midpoint of this theoretical distribution. Indicates a relatively weak perceived behavioural control towards the consumption of insect-based food among the participants.

The results of the 4-way ANOVA analysis are illustrated in Table 5.9 revealing four main effects of sex, age, education and income, and one two-way effect by sex and age[39]. We only commented on the main effect of education (*F=8.54, df.=2, p<0.01*), and income (*F=4.2, df.=2, p=0.02*), in addition to the two-way effect by sex and age (*F=8.93, df.=2, p<0.01*).

Table 5. 9: Four-way ANOVA table for PBC towards the consumption of edible insects

Source of variance	SS	*df*	MS	F	*P-value*
Corrected Model	13958.756[a]	53	263.37	3.34	0.00
Intercept	96905.10	1	96905.10	1229.60	0.00
Sex	**737.88**	**1**	**737.88**	**9.36**	**0.00**
Age	**1009.81**	**2**	**504.90**	**6.41**	**0.00**
Income	**662.55**	**2**	**331.27**	**4.20**	**0.02**
Education	**1346.65**	**2**	**673.33**	**8.54**	**0.00**
Sex * Age	**1407.27**	**2**	**703.64**	**8.93**	**0.00**
Sex * Income	312.81	2	156.41	1.98	0.14
Sex * Education	12.52	2	6.26	0.08	0.92
Age * Income	333.80	4	83.45	1.06	0.38
Age * Education	360.23	4	90.06	1.14	0.34
Income * Education	576.70	4	144.18	1.83	0.12
Sex * Age * Income	556.81	4	139.20	1.77	0.13
Sex * Age * Education	566.15	4	141.54	1.80	0.13

[39] See Appendix 5.18 – 5.22 for ANOVA analysis.

Sex * Income * Education	320.15	4	80.04	1.02	0.40
Age * Income * Education	812.01	8	101.50	1.29	0.25
Sex * Age * Income * Education	671.83	8	83.98	1.07	0.39
Error	54851.75	696	78.81		
Total	234098.44	750			
Corrected Total	68810.50	749			
a. R Squared = 0.203 (Adjusted R Squared = 0.142)					

Figure 5.7.a shows the main effect of education and income. For education, the higher the level of education, the stronger the perceived behavioural control; A-level or less EMM=13.31 (SE=0.71), Degre EMM=16.49 (SE=0.68), Post-degree EMM=17.67 (SE=0.93). Income has a similar trend to education where the higher the income, the stronger is perceived behaviour control, for less than 30k EMM= 14.14 (SE= 0.76), 30k to less than 60k EMM=15.67, (SE=0.59), 60k or more EMM=17.66 (SE=0.96).

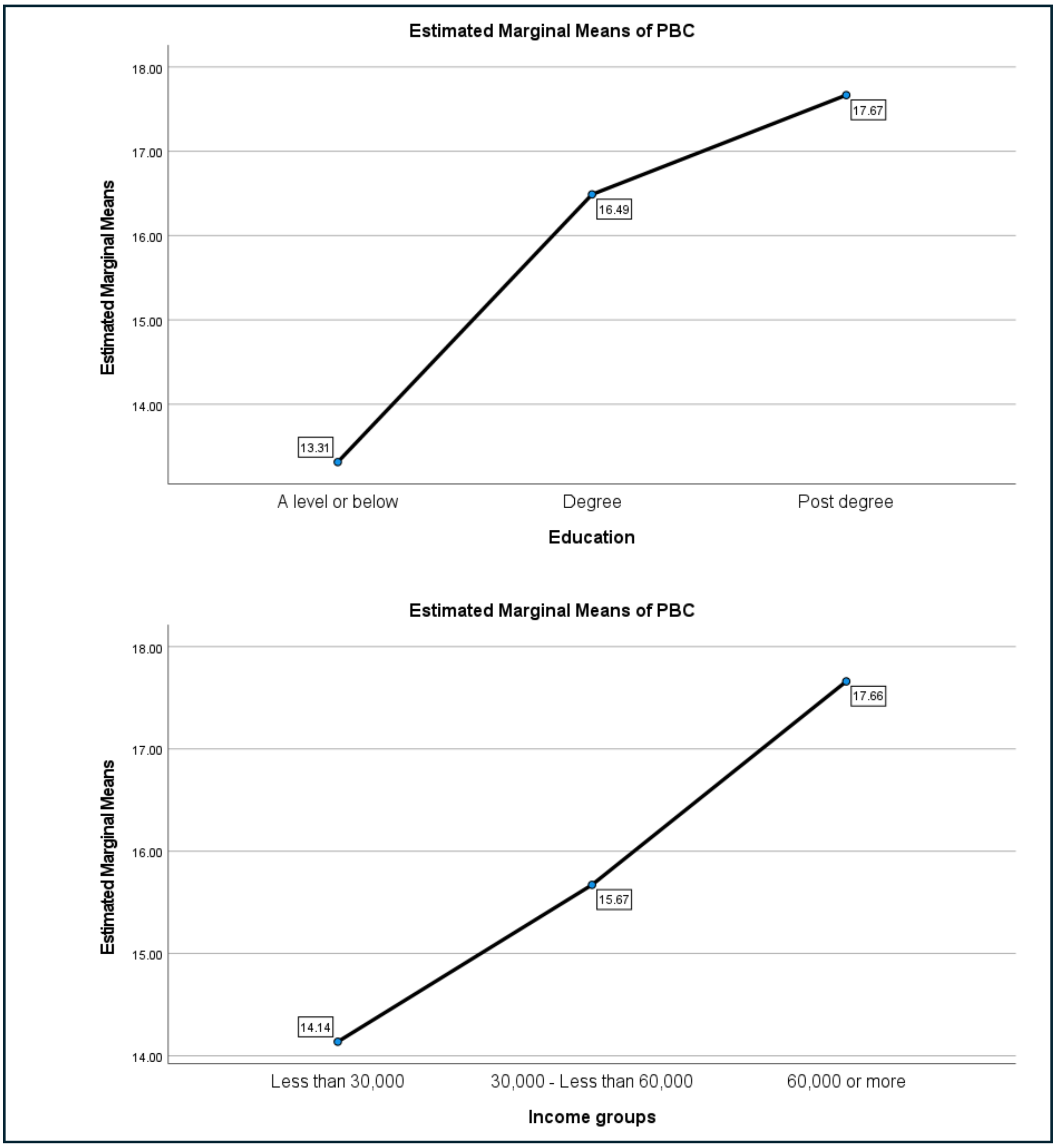


Figure 5.7. a: Estimated marginal means of perceived behavioural control with the significant main effect of education (up) and income (below).

Concerning the two-way interaction effect between sex and age, Figure 5.7.b shows that older females EMM=16.07, (SE=1.49), exhibited stronger perceived behavioural control compared with males EMM=14.15 (SE=1.05) from the same age group. However, young EMM=21.94 (SE=1.29), and middle-aged EMM=15.53 (SE=0.91) males have higher perceived behavioural control compared with females from the same age groups EMM=13.94 (SE=0.89) for young, and EMM=13.31 (SE= 0.84) for middle-aged.

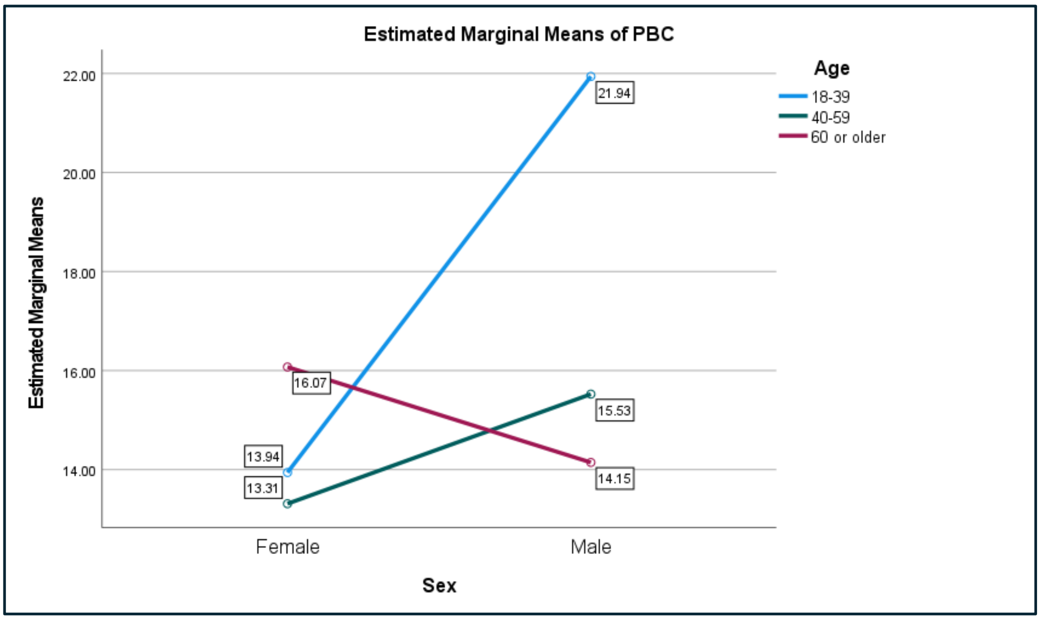


Figure 5. 7.b: Estimated marginal means of perceived behavioural control with the significant interaction effects (sex * age).

INTENTION TO TRY. Results presented in Figure 5.8 and Table 5.10 show the strength of each aspect separately which was evaluated by applying equation 4.4 (see Chapter 4) taking into consideration that the scale ranged from 1-7.

indicate that participants generally have a very low intention to try insects in the next 12 months as the majority of them disagreed with the three statements regarding their intention to consume edible insects.[40] The test of reliability is very good with a Cronbach's alpha of 0.95 (see Appendix 5.24, and 5.25).

[40] For the detailed breakdown of intention to try insects in the next 12 months, see Appendix 5.23.

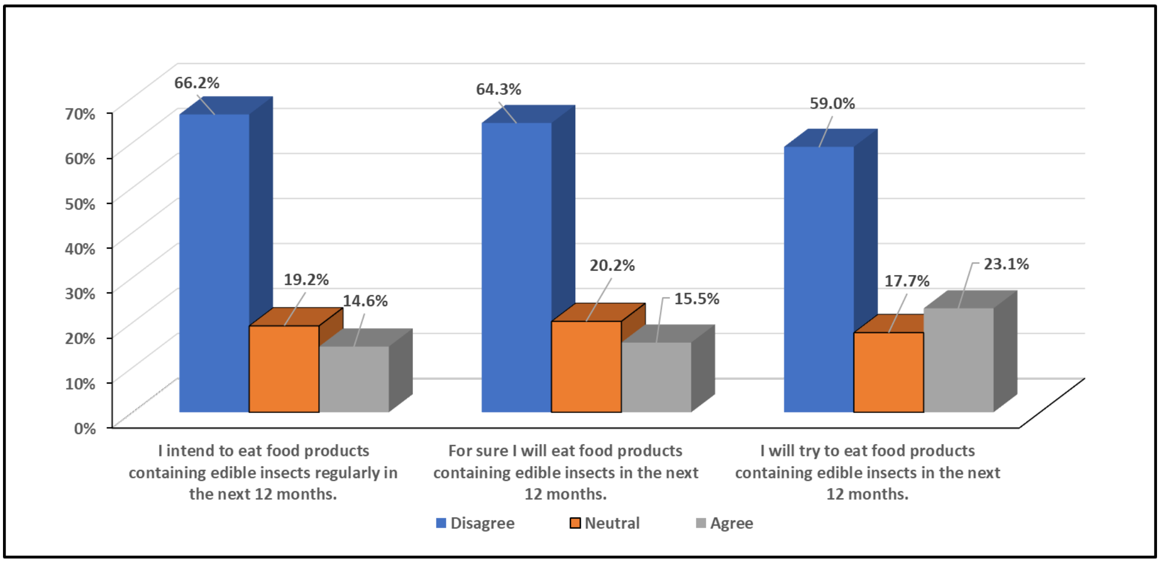


Figure 5. 8: Intention to try insects in the next 12 months

Table 5. 10: Intention to try insects in the next 12 months

	Evaluation
Statement	
I intend to eat food products containing edible insects regularly in the next 12 months.	2.63
For sure I will eat food products containing edible insects in the next 12 months.	2.71
I will try to eat food products containing edible insects in the next 12 months.	2.93
Note. The scale ranged from 1-7.	

The participants' intention to try insects in the next 12 months, as assessed through the rating of the 3 statements there the range spans 6 (MIN=1; MAX=7) range between 1 and 7. The mean intention score is 2.76 (s=1.63) with skewness of 0.47 (SE=0.09) and kurtosis of -0.96 (SE=0.17) indicating a relatively low level of willingness to try edible insects in the next 12 months among the participants (see Appendix 5.26).

The results of the 4-way ANOVA illustrated in Table 5.11 shows three main effects of sex (*F=11.45, df.=1, p<0.01*), age (*F=7.21, df.=2, p<0.01*), and education (*F=3.93, df.=2, p=0.02*). And two two-way interaction effects between sex and age (*F=4.3, df.=2, p=0.01*), and age with education (*F=2.9, df.=4, p=0.02*).

Table 5. 11: Four-way ANOVA table for intention to try insects in the next 12 months

Dependent Variable:					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	320.570[a]	53	6.05	2.48	0.00
Intercept	3091.21	1	3091.21	1265.95	0.00
Sex	**28.03**	**1**	**28.03**	**11.48**	**0.00**
Age	**35.22**	**2**	**17.61**	**7.21**	**0.00**
Income	8.78	2	4.39	1.80	0.17
Education	**19.17**	**2**	**9.58**	**3.93**	**0.02**
Sex * Age	**20.98**	**2**	**10.49**	**4.30**	**0.01**
Sex * Income	2.68	2	1.34	0.55	0.58
Sex * Education	1.65	2	0.82	0.34	0.71
Age* Income	5.73	4	1.43	0.59	0.67
Age * Education	**28.31**	**4**	**7.08**	**2.90**	**0.02**
Income* Education	17.99	4	4.50	1.84	0.12
Sex * Age * Income	12.91	4	3.23	1.32	0.26
Sex * Age* Education	15.10	4	3.77	1.55	0.19
Sex * Income * Education	6.87	4	1.72	0.70	0.59
Age * Income* Education	7.12	8	0.89	0.36	0.94
Sex * Age * Income* Education	16.48	8	2.06	0.84	0.56
Error	1699.508	696	2.442		
Total	7670.889	750			
Corrected Total	2020.078	749			
a. R Squared = .159 (Adjusted R Squared = .095)					

Figure 5.9 shows the interaction effect between sex and age where young females (EMM= 2.66, SE=0.16) and middle-aged (EMM= 2.4, SE=0.15) have a lower intention to try insects in the next 12 months compared with young (EMM= 3.84, SE=0.23) and middle-aged (EMM=2.8 SE=0.16) males. Whereas for old participants, females have slightly higher intention (EMM=2.62, SE=0.26) than old males (EMM=2.59, SE=0.18). As for the interaction effect between age and education, for participants with A-level and Post-degree, the older they become, the lower the willingness to try. Particularly, participants with A-level, young particularly (EMM=2.82, SE=0.21), middle-aged (EMM=2.52, SE=0.18), old (EMM=2.28, SE=0.25). For participants with Post degree, young (EMM=3.9, SE=0.31) less than middle

(EMM=2.55, SE=0.21), and old (EMM=2.39, SE=0.33). Whereas for participants with Degree, old (EMM=3.16, SE=0.25) have the highest willingness to try, followed by young (EMM=3.02, SE=0.18) and middle-aged participants (EMM=2.18, SE=0.0.18).

5.1.2.2 Food neophobia, disgust towards insects

FOOD NEOPHOBIA. When assessing participants' tendencies to be neophiliac or neophobic, a distinct pattern emerged after analysing the 10 statements proposed by Pliner & Hobden (1992). Figure 5.10 and Table 5.12 shows the strength of each aspect separately which was

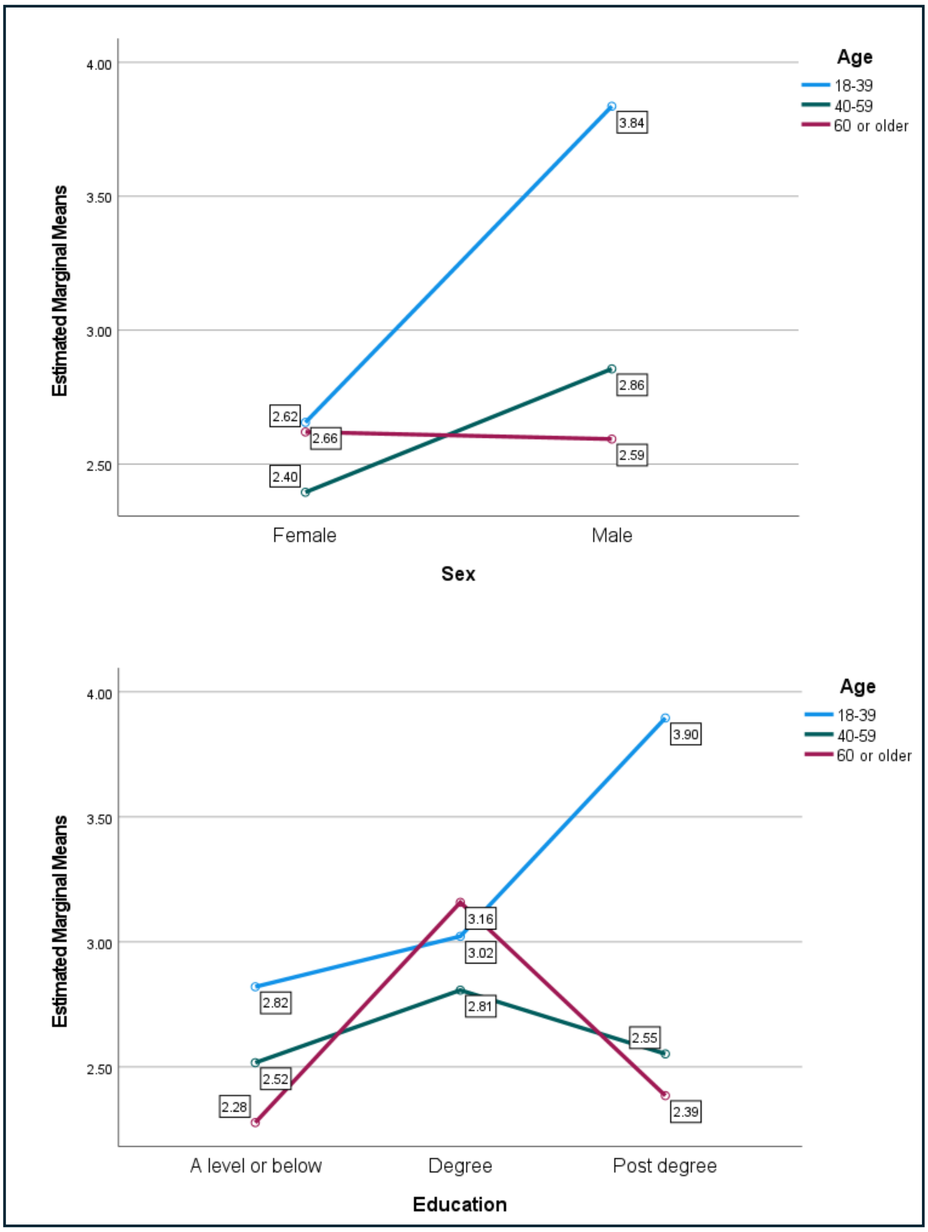


Figure 5. 9: Estimated marginal means of intention to try insects with the significant interaction effects (up) for sex * age, and (below) for age * education.

evaluated by applying equation 4.5 (see Chapter 4) taking into consideration that the scale ranged from 1-7 shows that the agreement with statements related to food neophilia exhibited a notable prevalence, ranging from 50.2% to 88.3%, while disagreements were comparatively lower, fluctuating between 6% and 37.6%.

This robust agreement with food neophilia suggests an overall inclination among

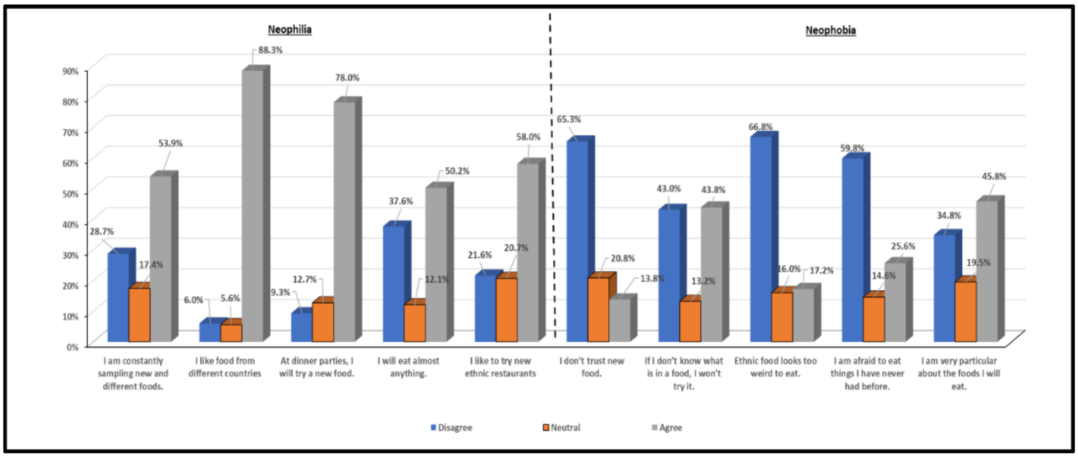


Figure 5. 10: Participants' opinions on neophilia and neophobia statements.

participants towards embracing new and

novel food experiences. Conversely, in the domain of food neophobia, participants displayed a notable inclination towards disagreement with statements, ranging from 34.8% to 66.8%, while agreement levels varied between 13.8% and 45.8%. These results indicate that when participants were prompted with general statements about food neophobia they appeared to be more neophiliac than neophobic[41].

Table 5. 12: Evaluation of positive and negative statements of food neophobia

	Statement	Evaluation
Neophilia	*I am constantly sampling new and different foods.*	4.42
	I like food from different countries.	5.67
	At dinner parties, I will try a new food.	5.24
	I will eat almost anything.	4.14
	I like to try new ethnic restaurants.	4.68
	Mean	4.83
Neophobia	*I don't trust new food.*	2.96

[41] For the detailed breakdown of food neophobia scale scores see Appendix 5.27.

	If I don't know what is in a food, I won't try it.	3.99
	Ethnic food looks too weird to eat.	2.86
	I am afraid to eat things I have never had before.	3.26
	I am very particular about the foods I will eat.	4.16
Note. Scores range from 1-7.		

The overall food neophobia scale[42] utilized in the study has been demonstrated to yield reliable and valid measures, as indicated by their respective Cronbach's alpha (α) coefficients. The overall food neophobia scale, comprising 10 items, exhibits a high level of internal consistency with an α = 0.774. (see Appendixes 5.28 and 5.29). Our findings show that participants' food neophobia is relatively weak (M= 3.31; SD=1.08) with skewness = 0.28 (SE=0.09) and a kurtosis = 0.07 (SE=0.17) (see Appendix 5.30). This suggests that, on average, the participants exhibit a moderate level of openness or willingness to try new food.

The results of the 4-way ANOVA (Table 5.13) show that only income has a main significant effect on food neophobia[43] (*F=3.85, df.=2, p=0.02*). The higher the income, the lower the level of neophobia as illustrated in Figure 5.11 where for participants with less than 30k EMM= 3.46 (SE=0.09), 30k to less than 60k EMM=3.2 (SE=0.07), 60k or more EMM=3.09 (SE=0.12).

Table 5. 13: Four-way ANOVA table for the overall food neophobia towards the consumption of edible insects

Dependent variable: Overall food neophobia					
Source of variance	SS	*df*	MS	F	*P-value*
Corrected Model	81.160[a]	53	1.53	1.35	0.05
Intercept	4079.54	1	4079.54	3588.81	0.00
Sex	0.06	1	0.06	0.06	0.81
Age	3.56	2	1.78	1.57	0.21
Education	3.88	2	1.94	1.71	0.18
Income	**8.74**	**2**	**4.37**	**3.85**	**0.02**
Sex * Age	2.27	2	1.14	1.00	0.37
Sex * Education	0.33	2	0.17	0.15	0.86
Sex * Income	0.05	2	0.02	0.02	0.98
Age * Education	8.42	4	2.10	1.85	0.12

[42] For the overall neophobia, the positive score (neophilia) has been reversed.
[43] See Appendix 5.31 and 5.32 for the ANOVA analysis.

Age * Income	9.26	4	2.31	2.04	0.09
Education * Income	0.86	4	0.21	0.19	0.94
Sex * Age * Education	8.51	4	2.13	1.87	0.11
Sex * Age * Income	0.37	4	0.09	0.08	0.99
Sex * Education * Income	2.40	4	0.60	0.53	0.72
Age * Education * Income	4.21	8	0.53	0.46	0.88
Sex * Age * Education * Income	7.18	8	0.90	0.79	0.61
Error	791.17	696	1.14		
Total	9094.04	750			
Corrected Total	872.33	749			
a. R Squared = .093 (Adjusted R Squared = .024)					

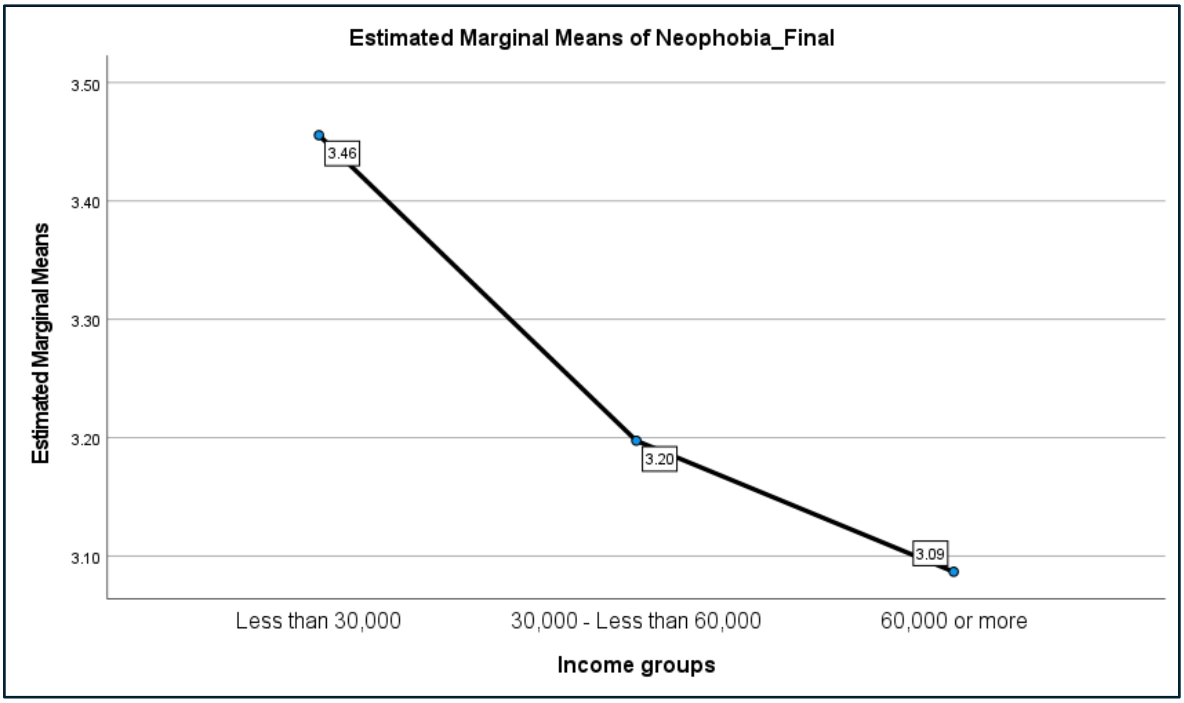


Figure 5. 11: Estimated marginal means of food neophobia with the significant main of income.

DISGUST. Figure 5.12 illustrates how participants rated the 5 statements of the "Entomophagy Attitude Questionnaire" proposed by La Barbera et al. (2020) (see Chapter 4, section 4.3.2). For all statements, the majority of participants agreed that the presence and flavour of insects in dishes would trigger a sense of disgust. The level of agreement for these disgust statements ranged from 44.8% to 54.9%, while the level of disagreement ranged from 14% to 28.8%[44]. Table 5.14 shows the strength of each aspect separately which was evaluated by applying equation 4.3 (see Chapter 4) taking into consideration that the scale ranged from 1-49.

[44] For the detailed breakdown of disgust towards insects scale scores see Appendix 5.33

This finding implies not only an overall sense of aversion among participants towards the consumption of edible insects. The test of reliability is very good with a Cronbach's alpha of 0.93 (see Appendix 5.34 and 5.35).

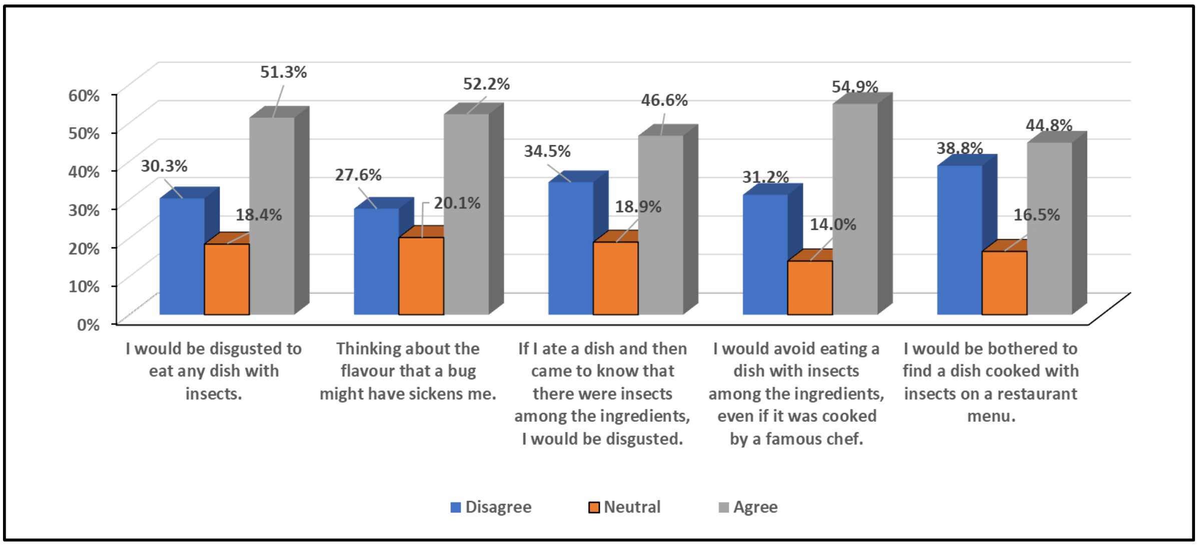


Figure 5. 12: Disgust towards insects as food

Table 5. 14: Evaluation of disgust

Statement	**Evaluation**
I would be disgusted to eat any dish with insects.	4.42
Thinking about the flavour that a bug might have sickens me.	4.42
If I ate a dish and then came to know that there were insects among the ingredients, I would be disgusted.	4.24
I would avoid eating a dish with insects among the ingredients, even if it was cooked by a famous chef.	4.54
I would be bothered to find a dish cooked with insects on a restaurant menu.	4.13
Average	4.35
Note: Score ranged from 1-7.	

Our findings show that participants' disgust towards insects is relatively strong. The mean score is 4.35 (s=1.61), and the range spans 6 (MIN=1; MAX=7); skewness -0.18 (SE=0.09) and kurtosis of -0.77 (SE=0.17) (see Appendix 5.36). Table 5.15 shows the results of a 4-way ANOVA analysis which revealed a significant main effect on sex (*F=7.34, df.=1, p=0.01*), and two two-way interactions between age and education (*F=3.33, df.=4, p=0.01*), and age and income (*F=3.46, df.=4, p=0.01*).

Table 5. 15: Four-way ANOVA table for disgust towards the consumption of edible insects

Dependent variable: Disgust					
Source of variance	SS	*df*	MS	F	*P-value*
Corrected Model	239.769[a]	53	4.52	1.83	0.00
Intercept	7063.60	1	7063.60	2853.55	0.00
Sex	**18.17**	**1**	**18.17**	**7.34**	**0.01**
Age	0.24	2	0.12	0.05	0.95
Education	**16.38**	**2**	**8.19**	**3.31**	**0.04**
Income	3.96	2	1.98	0.80	0.45
Sex * Age	2.42	2	1.21	0.49	0.61
Sex * Education	4.31	2	2.15	0.87	0.42
Sex * Income	0.87	2	0.44	0.18	0.84
Age * Education	**33.00**	**4**	**8.25**	**3.33**	**0.01**
Age * Income	**34.22**	**4**	**8.55**	**3.46**	**0.01**
Education * Income	5.70	4	1.42	0.58	0.68
Sex * Age * Education	14.68	4	3.67	1.48	0.21
Sex * Age * Income	5.36	4	1.34	0.54	0.71
Sex * Education * Income	12.98	4	3.24	1.31	0.26
Age * Education * Income	25.62	8	3.20	1.29	0.24
Sex * Age * Education * Income	9.97	8	1.25	0.50	0.85
Error	1722.86	696	2.48		
Total	16428.12	750			
Corrected Total	1962.63	749			
a. R Squared = 0.122 (Adjusted R Squared = 0.055)					

Figure 13.a shows for sex, females (EMM=4.49, SE=0.11) have higher disgust towards insects than males (EMM=4.06, SE=0.11). As for the interaction effect between age and education, Figure 5.13.b shows for young participants, the higher the education level, the higher the disgust towards insects with EMM=3.93, SE= for A-level, EMM=4.27, SE= for Degree, and EMM=4.66, SE= for Post-degree).

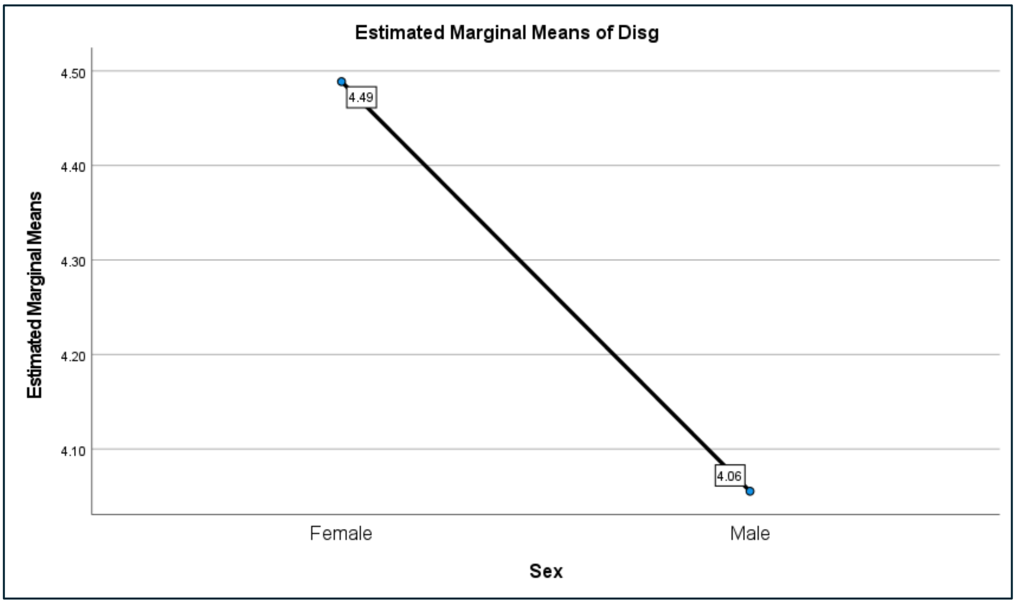


Figure 5.13. a: Estimated marginal means of disgust towards insects with the significant main of income.

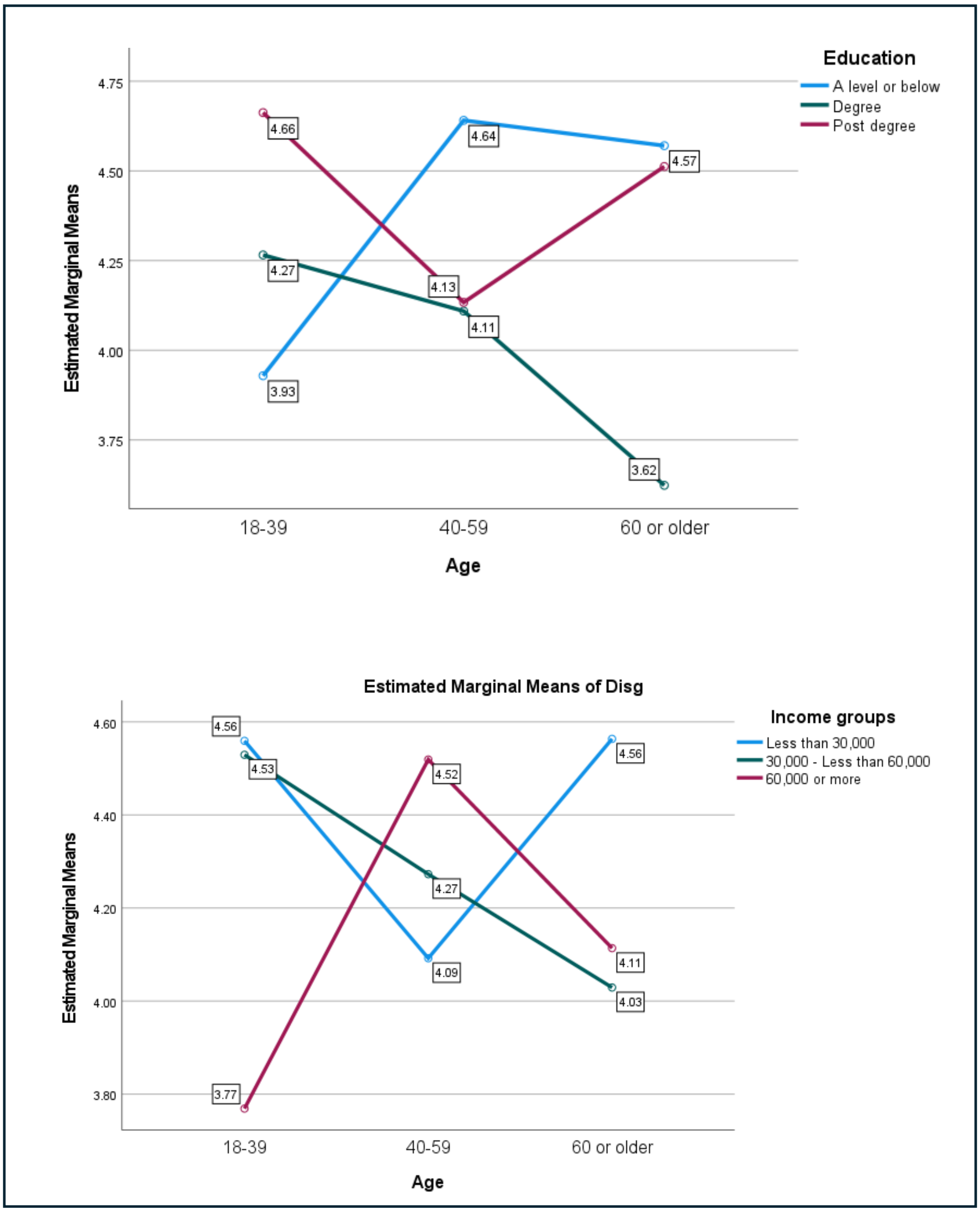


Figure 5. 13.b: Estimated marginal means of disgust towards insects with the significant interaction effects between age and education, age and income.

5.1.3 Consumers' preferences for bread and pasta made with insects.

The final sample size is 786 participants because we removed from the initial sample 15 outliers with high levels of kurtosis for subjective norms. Of these 15 participants 10 chose insect-based bread, 3 chose insect-based pasta, and 2 one of these products. The removal of these outliers did not change the patterns or the significance of the results of the initial analysis. However, we present the results of the models after removing the outliers.

The analysis of preferences shows that 510 (65%) participants chose none of the two insect-based products and 276 (35%) chose either bread or pasta made with insects.

Table 5.16 shows that of the 510 participants who opted for the "None" option, the majority of them (70.84%) justified their choice with their satisfaction with the greatest selection of conventional products, it also shows that about 10.02% of them did not trust the novel products and 19.14% motivated their choice with restrictions such as to religious or dietary aspects.

Table 5. 16: Reasons for choosing none.

	Frequency[45]
I'm satisfied with the conventional products.	396
It is a novel product.	56
Other	107

5.1.3.1 Factors influencing consumers' preferences for bread and pasta made from cricket flour.

Of the 276 participants who chose insect-based products, 171 chose insect-based bread, and 105 chose insect-based pasta. Table 5.17 shows the sociodemographic and economic characteristics of participants who chose one of these two products[46].

Table 5. 17: Sociodemographic characteristics of participants who chose the insect-based

Variable	Level	Bread N=171	%	Pasta N=105	%
Sex	*Female*	63	36.84	53	50.48
	Male	108	63.16	52	49.52
Age	*18-39*	65	38.01	39	37.14
	40-59	62	36.26	37	35.24
	60 or older	44	25.73	29	27.62
Education	*A level or below*	63	36.84	38	36.19
	Degree	61	35.67	43	40.95
	Post degree	47	27.49	24	22.86
Religious	*Religious*	100	58.48	55	52.38
	Non-Religious	67	39.18	48	45.71
	Prefer not to say	4	2.34	2	1.90%
Household size	*Single*	57	33.33	31	29.52
	Household consists of 2 people	40	23.39	23	21.90
	Household consists of 3 people or more	74	43.27	51	48.57
Income	*Less than 30,000*	54	31.58	33	31.43
	30,000 - Less than 60,000	59	34.50	37	35.24
	60,000 or more	47	27.49	28	26.67

[45] Participants were giving the chance to choose more than one option.
[46] For the final variables and the response scale, see Appendix 5.37

Table 5.18 reports the results of the multinomial logit analysis for bread and Table 5.19 for pasta made with cricket flour where the reference category is "none" of these two options.[47]

The difference in the -2LL statistics between the "intercept only" and the "final" model shows that by including the predictor variables the fit of the model is improved. X^2(10, N = 801) = 356.88, Cox and Snell R^2= 0.365; McFadden= 0.26, p=<.001. For the goodness of fit, the deviance was not statistically significant. For the classification in terms of correctly predicting the cases (92.2%, 48.5%, and 4.8% respectively). Furthermore, there are no issues of collinearity as all values of VIF are lower than 10, and Tolerance values are above 0.1 (Field, 2018), for the model improvement (see Appendix 5.39 to 5.44).

Table 5. 18: Factors influencing consumer preferences for bread made with cricket flour

	B	*P* value	Exp (B)
Intercept	-0.453	0.532	
Attitudes	0.020	0.429	1.020
SN	**0.069*** **	**< 0.001**	**1.072**
PBC	**0.071*** **	**< 0.001**	**1.074**
Neophobia	-0.037	0.755	0.963
Disgust	**-0.662*** **	**< 0.001**	**0.516**
Note: The reference category is None. **Note**: Sig: * p < 0.05, ** P < 0.01, *** P < 0.001			

Table 5. 19: Factors influencing consumer preferences for pasta made with cricket flour

	B	*P* value	Exp (B)
Intercept	-0.393	0.644	
Attitudes	0.020	0.492	1.020
SN	**0.054** **	**0.017**	**1.055**
PBC	**0.079*** **	**< 0.001**	**1.082**
Neophobia	0.024	0.866	1.025
Disgust	**-0.883*** **	**< 0.001**	**0.414**
Note: The reference category is None. **Note**: Sig: * p < 0.05, ** P < 0.01, *** P < 0.001			

[47] For the full research output of this analysis see Appendix 5.38.

The results of the multinomial logistic regression revealed three significant predictors (i.e. subjective norms, perceived behavioural control, and disgust) of the choice between both insect-based products and "None".

Regarding bread, with controlling the other variables, 1 unit increase in the score of subjective norms (range from 1 to 49), increases the odds of choosing “Bread” over “None” 1.1 times ($P < 0.001$). Additionally, a 1 unit increase in the score of perceived behavioural control (range from 1 to 49), increases the odds of choosing “Bread” over “None” 1.1 times ($P < 0.001$). Conversely, controlling the other variables, 1 unit increase in disgust towards insects (ranging from 1 to 7) decreases the odds of choosing “Bread” over “None” 0.52 times ($P < 0.001$). Concerning pasta, with controlling the other variables, 1 unit increase in the score of subjective norms (range from 1 to 49), increases the odds of choosing “Pasta” over “None” 1.1 times ($P < 0.01$). Additionally, a 1 unit increase in the score of perceived behavioural control (range from 1 to 49), increases the odds of choosing “Pasta” over “None” 1.1 times ($P < 0.001$). Conversely, controlling the other variables, 1 unit increase in disgust towards insects (ranging from 1 to 7) decreases the odds of choosing “Pasta” over “None” 0.41 times ($P < 0.001$).

5.1.3.2 Consumers preferences of the communication for bread and pasta made with cricket flour

Table 5.20 shows participants’ marketing communication preferences for those who opted for bread or pasta made with insects. The 'Insect protein' logo emerged as the most preferred option by 58% of respondents, indicating that transparency about insects in the product packaging could be the primary reason for selection rather than its high protein content. The 'High protein' logo was the second preferred option (21%). It is likely that this logo appeals to individuals adhering to specific dietary regimes and those participating in fitness activities, as they focus on food rich in protein. The "Carbon Trust" logo was selected by 20% of participants. Preferences for this logo can indicate a strong environmental consciousness which can be attributed to participants’ values and priorities to live in a better world and to protect the lives of future generations. These findings underscore the importance of logos in influencing consumer perceptions and choices, particularly in the context of sustainability and environmental responsibility. We additionally explored the determinants of preferred logos, but none of the predictors used in the multinomial logit model were insignificant (see Appendix 5.45 for the full results of this analysis).

Table 5. 20: The preferred logo

	Frequency	%
Insect protein	160	58
High protein	58	21
Carbon trust	55	20
Other	3	1

5.1.4 Consumers' WTP for bread and pasta made with cricket flour.

To estimate consumers' willingness to pay for bread and pasta made with cricket flour, we conducted a double-bounded dichotomous choice (DBDC) analysis. Subsequently, we analysed the acceptable price range using the price sensitivity meter (PSM). Additionally, we compared the DBDC results with those of the PSM to determine whether the mean price obtained from the DBDC analysis falls within the optimal range identified by the PSM analysis.

5.1.4.1 WTP estimates obtained using the DBDC format.

The analysis of the responses to the first and second bids for both bread and pasta is shown in Tables Table 5.21 and Table 5.22. For bread, the majority of participants said "Yes" to the first and second bids (62.57%% and 76.44% respectively). Similarly, the majority of participants said "Yes" to the first and second bids for pasta (76.19% and 79.01% respectively).

Table 5. 21: Responses on the first and second bids of the insect-based bread

Bid 1 £	Yes	%	No	%	Bid 2 £	Yes	%	No	%
2	11	6.43	19	11.11	*1.5*	5	2.92	6	3.51
2.5	18	10.53	10	5.85	*2*	14	8.19	4	2.34
3	18	10.53	12	7.02	*2.5*	24	14.04	13	7.60
3.5	18	10.53	8	4.68	*3*	26	15.20	2	1.17
4	21	12.28	7	4.09	*3.5*	26	15.20	7	4.09

6	21	12.28	8	4.68	*4*	25	14.62	4	2.34
Total	**107**	62.57	**64**	37.43	*6*	5	2.92	2	1.17
					8	4	2.34	4	2.34
					Total	**129**	75.44	**42**	24.56
Note: N=171									

Table 5. 22: Responses on the first and second bids of the insect-based pasta

Bid 1	**Yes**	**%**	**No**	**%**	**Bid 2**	**Yes**	**%**	**No**	**%**
1.5	11	10.48	5	4.76	*1*	9	8.57	2	1.90
3	9	8.57	8	7.62	*2*	4	3.81	5	4.76
4.5	15	14.29	9	8.57	*3*	4	3.81	1	0.95
6	18	17.14	0	0.00	*3.50*	13	12.38	2	1.90
7.5	13	12.38	2	1.90	*4.50*	19	18.10	7	6.67
9	14	13.33	1	0.95	*6*	18	17.14	4	3.81
Total	**80**	76.19	**25**	23.81	*7.50*	**14**	13.33	**0**	0.00
					9	2	1.90	0	0.00
					12	0	0.00	1	0.95
					Total	**83**	79.05	**22**	20.95
Note: N=105									

Further analysis was conducted to explore participants' answers and clustered them into four different groups where the first group represented participants who accepted both bids (Yes-Yes), the second group consisted of those who rejected the first bid but accepted the second one (No-Yes), the third group is for those who accepted the first bid but accepted the second bid (Yes-No), and last group is for those who rejected both bids (No-No)[48]. Table 5.23 shows that the majority of participants accepted both bids (56% for bread and 64% for pasta) and the minority rejected both, suggesting that participants are open to accepting insect-based products with prices that are higher than the conventional products in the market[49] £ 0.95 and £ 0.91 for bread and pasta respectively.

[48] For breakdown of responses towards the bids for bread made with cricket flour according to the sociodemographic, Appendix 5.46

[49] The prices for the conventional products in May 2023.

Table 5. 23: Responses to the bids by groups

Group	Bread	Pasta
Group 1 (Yes-Yes)	56%	64%
Group 2 (No-Yes)	19%	15%
Group 3 (Yes-No)	6%	12%
Group 4 (No-No)	18%	9%

Participants' willingness to pay for bread and pasta was estimated using the double-bounded dichotomous choice analysis.

For bread made with cricket flour, Table 5.24 shows that a one-unit increase in subjective norms (ranging from 1-49) corresponds to a £0.1 increase in WTP (p < 0.001); log(bid) is negative indicating that the higher the first bid, the lower the willingness to pay (p < 0.001). The mean WTP for insect-based bread is £2.75 which is 2.9 times higher than the average price of conventional bread (£0.95). However, the median is less than the mean (£2.25) which means that there are respondents with a very high willingness to pay values resulting in a higher mean compared to the median. By comparing the median with the average price of the conventional product, the median WTP is 2.4 times higher than the average price of the conventional product. It is worth noting that even with the lower median score, the price of insect-based bread is still higher than conventional bread.

Table 5. 24: Willingness to pay for bread made with cricket flour using the DBDC analysis

	B	SE	z value	Pr(>|z|)
(Intercept)	0.884	1.252	0.706	0.480
ATT	-0.076	0.044	-1.713	0.087
SN	**0.101*** **	**0.027**	**3.747**	**< 0.001**
PBC	0.044	0.028	1.562	0.118
Food neophobia	0.086	0.205	0.419	0.675
Disgust	0.194	0.149	1.298	0.194
log (bid)	-2.930***	0.352	-8.313	< 0.001
Log-likelihood:	-173.11			
AIC	360.217			
BIC	382.209			
WTP (Mean)	£2.749			
CI (95% Lower bound)	£2.469			
CI (95% Higher bound)	£3.248			
WTP (Median)	£2.252			
CI (95% Lower bound)	£1.965			
CI (95% Higher bound)	£2.522			
AIC	360.217			
Note: Sig: * p < 0.05, ** P < 0.01, *** P < 0.001				

As for pasta made with cricket flour, Table 5.25 shows that attitudes and price were statistically significant. For attitudes, a one-unit increase in attitudes (ranging from 1 to 49) corresponds to a £0.14 decrease in WTP (p = 0.04). Regarding the price, that the higher the bid, the lower the WTP (*p* ≤ 0.001). The mean WTP for insect-based pasta is £2.75 which is 3 times higher than the conventional bread (0.91). However, the median is £2.25 which is 2.47 times higher than the average price of conventional pasta. Similar to insect-based bread, the median is still higher than the average price of the conventional product.

Table 5. 25: Willingness to pay for pasta made with cricket flour using the DBDC analysis

	B	SE	z value	Pr(>|z|)
(Intercept)	2.533	1.595	1.587	0.112
ATT	**-0.136***	**0.065**	**-2.086**	**0.037**
SN	0.073	0.041	1.769	0.077
PBC	0.054	0.042	1.284	0.199
Food neophobia	-0.251	0.237	-1.059	0.289
Disgust	0.222	0.208	1.071	0.284
log (bid)	**-2.037*****	**0.292**	**-6.965**	**< 0.001**
Log-likelihood:	-100.739			
AIC	215.478			
BIC	234.056			
WTP (Mean)	£3.24			
CI (95% Lower bound)	£2.56			
CI (95% Higher bound)	£4.83			
WTP (Median)	£2.10			
CI (95% Lower bound)	£1.57			
CI (95% Higher bound)	£2.65			
AIC	-100.739			

Note: Sig: * p < 0.05, ** P < 0.01, *** P < 0.001

5.1.4.2 PSM

The analysis of willingness to pay using PSM provides valuable insights into optimal pricing strategies for bread and pasta made with cricket flour as illustrated in Figure 5.14 and Figure 5.15.

The results summarised in Table 5.26, indicate that for bread, price points ranging from marginal cheapness (£3.3) to expensiveness (£ 5.4) are viable. However, the optimal price point identified by the PSM is higher at £ 4.5 compared with the average DBDC (£2.63). Similarly, for pasta, price points between £ 3.10 and £ 5 are deemed feasible, encompassing the price point identified by the DBDC method (£2.98), which is lower than the optimal price point determined by the PSM (£ 4.20).

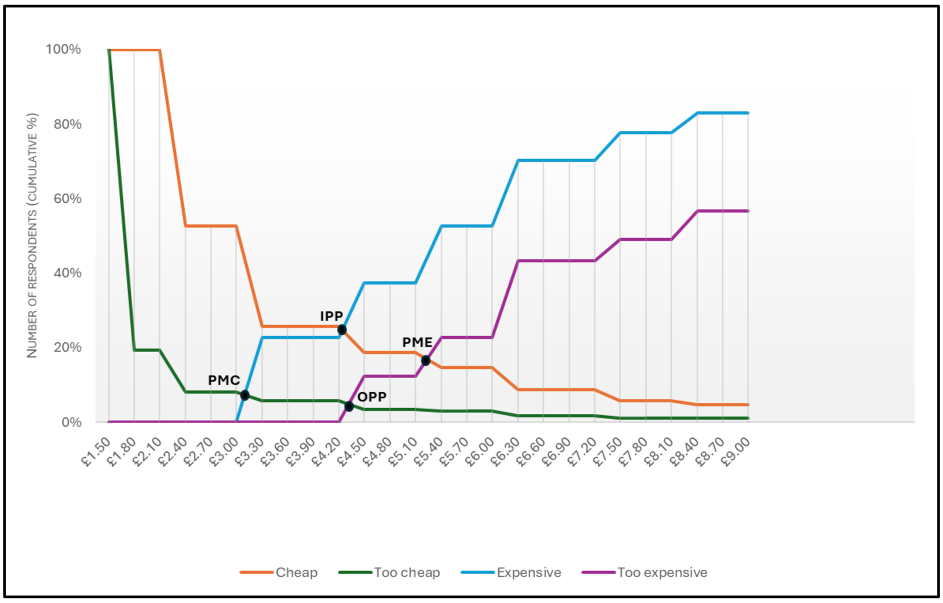


Figure 5. 14: WTP for bread using PSM

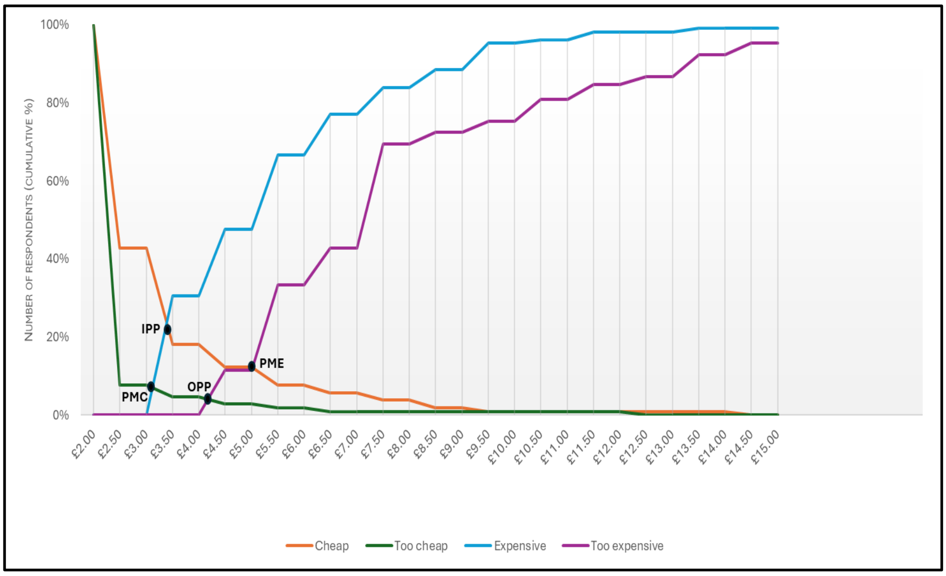


Figure 5. 15: WTP for pasta using PSM

Table 5. 26: WTP for bread and pasta using PSM

	Bread	**Pasta**
IPP *(Indifference Price Point (cheap=expensive))*	£4.20	£3.40
PMC *(Point of Marginal Cheapness (too cheap=expensive))*	£3.30	£3.10
PME *(Point of Marginal Expensiveness (cheap=too expensive))*	£5.40	£5.00
OPP *(Optimal Price Point (too cheap=too expensive))*	£4.50	£4.20

5.2 Discussion and conclusion

5.2.1 Marketing insights on TPB constructs

Descriptive statistics indicate that the average scores of TPB constructs fall below the midpoint of the scale and thus the elements of the proposed conceptual framework should have a relatively weak influence on the consumption of insect-based products, especially subjective norms and perceived behavioural control. Focusing on the strength of attitudes, positive attitudes prevail over negative ones with the environmental benefits of transitioning to insect-based food being the most desirable aspect of edible insects. This confirms the results of the systematic review (see Chapter two, section 2.4.2 and 2.4.3) where environmental benefits are among the strongest predictors for consumers' acceptance of insect-based food. Also in Chapter three, stakeholders associated environmental benefits with insect-based food consumption (section 3.4.1), and consumers preferred (section 3.4.2) the insect-based burger to be sold in recyclable packaging. These findings corroborate numerous studies that suggest to pay attention to consumers' environmental concerns for the commercialisation of these products (Lensvelt and Steenbekkers, 2014; House, 2016; Barsics *et al.*, 2017; Menozzi *et al.*, 2017; Mancini, Sogari, *et al.*, 2019; Nyberg, Olsson and Wendin, 2020; Naranjo-Guevara *et al.*, 2021; Mopendo Mwisomi *et al.*, 2023; Thu Thu Aung *et al.*, 2023). Positive attitudes are also influenced by the animal welfare dimension of edible insects. In our study, this aspect was also highlighted by stakeholders but not by the focus groups participants (see Chapter Three, section 3.2.4.2) confirming the indeterminateness of animal welfare. The lack of attention towards animal welfare in our focus groups aligns with the literature, where most recent systematic reviews did not identify animal welfare as a predictor of insect-based food consumption (Dagevos, 2021; Onwezen *et al.*, 2021; Florença *et al.*, 2022; Kröger *et al.*, 2022; Alhujaili, Nocella and Macready, 2023). However, other studies suggest that animal welfare is a motivation for transitioning from meat consumption to an ethical and sustainable diet in general, though specific mention of insects is lacking in studies (House, 2016; Hartmann and Siegrist, 2017; Klink-Lehmann and Langen, 2019). The indeterminateness towards animal welfare can be explained by the fact that consumers' concern is based on their perception of animals' intelligence, with larger mammals receiving more attention than insects (Cornish, Raubenheimer and McGreevy, 2016). The contribution of health benefits to positive attitudes is in line with the results of our qualitative studies and existing literature which indicates that consumer acceptance is influenced by the protein-related benefits of insects' nutrient profile (Lensvelt and Steenbekkers, 2014; Barsics *et al.*, 2017; Mancini, Sogari, *et al.*, 2019; Orsi, Voege and Stranieri, 2019; Naranjo-Guevara *et al.*, 2021).

In relation to negative attitudes, food safety risk was perceived as the strongest concern by participants confirming the results of other studies (Hartmann *et al.*, 2015; Ruby, Rozin and Chan, 2015; Baker, Shin and Kim, 2016; Castro and Chambers, 2019a, 2019b; Gallen, Pantin-Sohier and Peyrat-Guillard, 2019; Orsi, Voege and Stranieri, 2019; Dupont and Fiebelkorn, 2020). Regarding the negative aspect of the takeover by multinational companies, it was interesting to observe that the majority of respondents were neutral regarding their adverse economic impact on supply chains. To the best of our knowledge, this aspect has never been investigated and certainly has implications for consumers, potentially leading to increased product prices because multinational companies could act as a monopolist for niche markets of edible insects. Finally, the impact of transitioning to a more insect-based diet as an alternative to meat protein on livestock farmers could lead to a decrease in demand for livestock products, given that insect-based products are seen as an alternative source of meat protein. Also, this aspect, to the best of our knowledge, has not been explored in other studies and participants' concerns can be explained by farmers' job losses.

Despite participants' attitudes towards edible insects were not very strong, the analysis of differences taking into account sex, age, education and income simultaneously is interesting from a research and marketing point of view. To the best of our knowledge, we have found many studies exploring only the main effects of socio-demographic and economic aspects on consumer attitudes towards edible insects (Caparros Megido *et al.*, 2014; Hartmann *et al.*, 2015; Verbeke *et al.*, 2015; Cicatiello *et al.*, 2016; Bartkowicz, 2017; Alemu and Olsen, 2019; Mancini, Sogari, *et al.*, 2019; Roma, Palmisano and De Boni, 2020), and just one study investigating the interaction effect between sex and age, but this was not significant (Tuccillo, Marino and Torri, 2020). Instead, our study appears to be the only one to explore also three and four-interaction effects and thus offer marketing insights for profiles of consumers because significant interaction effects are more important than main ones. For example, marketers could facilitate the introduction of edible insects targeting males from the middle-age group and those with middle income have stronger attitudes than females from the same age and income. In addition to people with degrees, the older they get, the stronger the attitude toward insects. It is worth noting that for the middle-aged participants from all education levels, there is a deviation between the three income groups suggesting more investigation on this age group.

In terms of subjective norms, experts appear to be the most influential group in increasing consumers' acceptance of edible insects. This confirms the results of the in-depth interview (see Chapter 2, section 2.3.2.2.2) where participants preferred experts (nutritionists, chefs) to be the ones who introduced new edible insect products to consumers. Also, for subjective norms, the lack of studies exploring differences across different segments of consumers makes our results interesting from a marketing point of view. Interaction effects indicated that young males, from all income groups are more likely to feel social pressure compared to females having the same age and income. Additionally, participants with higher levels of education (degree and post-degree) are more socially influenced than participants with A-level qualifications. This is a remarkable finding for marketers because in these segments there are participants with weak attitudes towards the consumption of edible insects. Thus, consumer persuasion, using the social marketing campaigns mentioned above, should be designed to include the voices of experts like nutritionists and chef celebrities.

For perceived behavioural control, the ability to afford insect-based products and the possibility of finding these products in supermarkets do not appear to be strong barriers towards the consumption of edible insects. However, food culture seems to be a clear obstacle towards the consumption of insect-based food. This finding confirms the results of our focus groups and those of other studies (Onwezen *et al.*, 2021; Kröger *et al.*, 2022). Yet, to the best of our knowledge, no studies examined how perceived behavioural control varies across different segments of consumers. Our results indicate that the higher the income and the level of education, the stronger is the stronger the perceived behavioural control. Additionally, middle-age males, have stronger perceived behavioural control compared with females of the same age and income. This is another interesting aspect for marketers and policy makers who can think of extending the food knowledge of this segment of consumers with a modern food culture which can be used for health promotion. For example, the production of documentaries released on YouTube, dedicated websites or other social networks, where experts such as nutritionists and chef celebrities can talk and teach about the consumption of edible insects from different angles, can help these segments of consumers reconsider the way they eat building a positive food culture.

Concerning intention to try insects in the next 12 months, participants show which was also confirmed in our results in chapter three where one of the characteristics of the potential consumers of insect-based food is those who are willing to try insect-based food. This is also in line with others (e.g., (Florença *et al.*, 2022; Thu Thu Aung *et al.*, 2023). The interaction effects indicated that for males, the older they the less they are willing to try insects in the next 12 months, whereas for young participants, the higher the education the higher the willingness to try.

The extended TPB components show that while participants' food neophobia is just below the average point thus indicating a certain degree of openness to new foods in general, the specific disgust towards insects above the average point suggests that even if consumers may be open to novel foods, they might not necessarily be receptive to the consumption of edible insects. The influence of food neophobia and disgust was confirmed in our qualitative studies (see Chapters two, section 2.3.2.2.1) and it is well known in the literature (Onwezen *et al.*, 2021; Kröger *et al.*, 2022). For food neophobia, we only observed a negative relationship between income and the level of food neophobia with participants having an income below £30,000 showing a slightly high level of aversion for new food products compared with the higher income groups. Our result is in line with that of Siegrist et al. (2013) and Szakály et al. (2021), but other studies found that neophobia is also influenced by sex, age, and education but the direction of these factors is undetermined (Pliner and Hobden, 1992; Frank and Van Der Klaauw, 1994; Pelchat and Pliner, 1995; Mcfarlane and Pliner, 1997; Bäckström, Pirttilä-Backman and Tuorila, 2003; Caparros Megido *et al.*, 2014; van den Heuvel, Newbury and Appleton, 2019; Sahrin *et al.*, 2023).

Concerning disgust toward insects, our results corroborate those of other studies (Haidt, McCauley and Rozin, 1994; Oaten, Stevenson and Case, 2009; Al-Shawaf and Lewis, 2013; Berger and Anaki, 2014; Lorenz, Libarkin and Ording, 2014; Egolf, Siegrist and Hartmann, 2018; Tuccillo, Marino and Torri, 2020; Azil *et al.*, 2021; Fukano and Soga, 2021; Kocabas and Sanlier, 2024) where females experience higher levels of aversion than males. Among young individuals, a positive correlation was observed between well-educated participants and disgust, and participants with a degree older the less disgust. Young participants with an income less than 60k showed lower levels of disgust in comparison to other groups of participants. To the best of our knowledge, no studies were found to have explored these interaction effects. The simultaneous analysis of neophobia also offers interesting marketing insights because it seems clear that marketers need to advertise these products more taking into account specific disgust scale towards edible insects rather than neophobia for food in general. A notable observation is that when examining the interaction effects in attitudes, and intention to try and disgust, participants in the middle age group show a remarkable shift compared to the other groups, which can involve a sharp increase or decrease.

5.2.2 What can we learn from consumers' preferences for bread and pasta made with cricket flour?

In Chapter 1, we posed our third research question to investigate the influence of psychological factors (i.e., attitudes, subjective norms, perceived behavioural control, food neophobia, and disgust) on British consumers' preferences for bread and pasta made with cricket flour. The analysis revealed two significant results.

Firstly, participants' preference for insect-based products is low as only 35% of respondents accepted to try one of the two insect products, thus confirming the weak psychological predisposition towards the consumption of these products emerging from the analysis and discussion of the TPB elements above. Secondly, our study found that, among the psychological variables examined, only subjective norms, perceived behavioural control, and disgust significantly impacted consumer preferences for bread and pasta made with insect flour. Attitudes and food neophobia did not significantly affect consumer preferences.

Subjective norms positively influence the preference for insect-based products, indicating that increased social influence from family members, friends, and experts significantly increases the likelihood of choosing insect-based products over non-insect-based ones. This finding aligns with the results presented in Chapter 2, section 2.3.2.2.2, which identified subjective norms as a critical factor in shaping consumer decisions regarding insect-based foods. Additionally, Chapter 3, section 3.3.4.2, which suggested that experts such as chefs, are among the trusted figures when promoting insect-based products. Similarly, perceived behavioural control also positively influences preferences for insect-based products. Our results suggest that the easier consumers perceive the ease of trying insect-based products, the more likely they are to choose them over non-insect-based alternatives. This observation is consistent with the findings in Chapter 2, section 2.3.2.2.3, which highlighted that wider availability and ease of access to insect-based products significantly predict the willingness to try edible insects. Furthermore, Chapter 3, section 3.3.4.2, supermarkets are among the places where consumers can easily reach out to these products, which increases the chances of trying them.

On the other hand, the association between disgust towards insects and the likelihood of choosing insect-based products is negative, indicating that as disgust towards insects increases, the odds of choosing insect-based products over non-insect-based products significantly decrease. This finding is consistent with the results in Chapter 2, section 2.3.2.2.1, which identified disgust as one of the primary barriers to accepting insect-based food. Additionally, our findings in chapter three highlighted disgust as one of the key challenges for UK consumers. This observation is further supported by a substantial body of robust studies, as even documented in systematic reviews (Onwezen *et al.*, 2021; Kröger *et al.*, 2022).

5.2.3 Are consumers willing to pay for edible insects?

In Chapter 1, we outlined our fourth research question, which aimed to elicit British consumers' willingness to pay for bread and pasta made with cricket flour. Four main results have emerged from the analysis.

First, price estimates of DBDC analysis participants' WTP for pasta is higher than that for bread, which might suggest that different food carriers can influence how much consumers are willing to pay for edible insects. Our results are in line with Lombardi *et al.* (2019) where Italian consumers were willing to pay different premium prices for three insect-based products (pasta, cookies, and dark chocolate) made with mealworms. In our study, participants who chose insect-based products were, on average, willing to pay a premium price for both bread (£2.75) and pasta (£3.24) made with cricket flour. Price estimates of bread and pasta are higher than the price of conventional products by 2.9 and 3.56 times respectively. This willingness to pay is supported by the analysis of the bids responses by groups (see table 5.23) as the majority of participants across all the sociodemographic variables who choose both products accepted the first and second bid. That could be attributed to the outcomes of the results. However, the higher the bid, the lower the willingness to pay, which is also supported by (Berger *et al.*, 2018) on German consumers where the high price was associated with the quality of the product. Second, prices estimated with DBDC are not in line with prices assessed by the PSM, as they fall below the optimal price range of £3.3 to £5.4 for bread and £3.1 to £5 for pasta. This raises the question of whether consumers' stated willingness to pay in a controlled survey setting reflects their actual WTP in a market context. To the best of our knowledge, no studies have compared WTP estimates using these two techniques. Thus, our findings highlight the need for further research to understand the discrepancies between these methods and to determine which approach provides a more reliable measure of consumer WTP for insect-based products. Third, for bread, in addition to price, subjective norms appeared to influence consumers' willingness to pay, where the higher the perception of the social pressure, the higher the participant's willingness to pay. This result is also supported by our previous studies in by a Kenyan study where participants were willing to pay more when the insect-based products were recommended by officials (Alemu *et al.*, 2015). Understanding these dynamics in subjective norms sheds light on the nuanced factors influencing individuals' behaviours and the sources they rely on for guidance in making informed decisions. Fourth, for pasta, attitudes emerged as a significant predictor of consumers' willingness to pay, aligning with the theory of planned behaviour. Interestingly, this relationship was negative, indicating that lower attitudes towards the product corresponded to a higher willingness to pay. This result challenges theoretical expectations and may be attributed to the small, self-selected sample size of 105 participants who preferred pasta. Such a sample might not adequately represent the broader population. This unexpected finding could also result from other dimensions of attitudes that we didn't consider. Therefore, future research with larger, more representative samples is necessary to understand these relationships better and determine whether similar patterns are observed in different contexts or with other insect-based products.

Other studies found that food neophobia (Lombardi *et al.*, 2019) and disgust (Kornher, Schellhorn and Vetter, 2019) can significantly decrease the willingness to pay for insect-based products, while high levels of safety of insect-based products can increase the WTP (Alemu *et al.*, 2015). Another factor influencing WTP is the type of information displayed. Michel and Begho (2023) found that in the UK participants exposed to environmental information exhibited an increased WTP for sausage made with cricket powder. This highlights the potential impact of environmental messages and health on consumer preferences and WTP for insect-based products.

The observed variation in consumer willingness to pay and significant predictors may stem from the diverse geographic and socioeconomic contexts in which these studies were conducted, ranging from developed to developing countries. Therefore, there is a need for further research, particularly in the UK, which is the primary focus of our study.

5.2.4 What information should insect food labels convey?

Descriptive analysis indicates that among participants who selected insect-based products, the insect protein logo with a picture of insects was preferred to the Carbon Trust and High Protein logos. This preference contrasts with the findings of Pascucci & De-Magistris, (2013), who suggested that visualizing an insect on the packaging can negatively influence the WTP. One potential reason for this difference is that in our study the insect depicted in the logo was not a real picture of an insect, but a graphical representation which was created on the basis of focus group discussion using artificial intelligence. Focus groups participants supported the idea of having a logo for a “cute bug”. The impact of the logo that can be used on insect-based food has rarely been investigated as shown in the systematic reviews (Onwezen *et al.*, 2021; Kröger *et al.*, 2022) and thus highlight the importance of exploring how different logos should be taken into account when developing marketing strategies for these products.

In summary, the presented study has tested a conceptual framework that extends the theory of planned behaviour to examine how these factors can predict consumers' preferences and willingness to pay for insect-based products (i.e., bread and pasta) in the UK. Out of the theory constructs, subjective norms appear to be the strongest predictor as it was significant in predicting the preferences for both products, in addition to the willingness to pay for bread made with cricket flour. Following by perceived behavioural control which was a significant predictor for the preferences for both products. This suggested the strength of these two constricts. However, attitude was not significant predictor for the presences, additionally, it was significantly negatively predictors of the willingness to pay for pasta, which does not make a theoretical sense. Which might be attributed to the possibility that disgust might mediate the influence of attitudes, or the fact that we have small, self-selected samples. These results suggest that it is worth conducting qualitative research, such as focus groups, to explore whether there are different factors that can influence consumers' behavioural intentions or to explore the impact of the TPB constructs from a different perspective. For instance, regarding subjective norms, we explored the influence of the opinions of family, friends, and experts; other studies could explore the impact of the influence or belief about what others do. In addition to the TPB constructs, the extended component to the theory (i.e., disgust) appears as valid extension as it was significant in predicting the preferences for both products. This result confirm the findings of Chapter 2, section 2.3.2.2.1), in many aspects. Disgust towards insects remains a significant barrier to the acceptance of insects as food. However, creating familiarity with insect-based products by exposing consumers to tasting or learning about these products, as well as making insects invisible in the final product, can mitigate the effect of disgust to some extent which was confirmed in Chapter 2, section 2.3.2.3, and Chapter 3. Sections 3.3.4.2 and 3.4.2. It is worth noting that familiarity can also mitigate the cultural barrier for UK consumers. Additionally, the environmental and health benefits of consuming insects are valued by UK consumers and can be leveraged in various ways. For instance, educating people about the health and environmental benefits can increase acceptance. Emphasizing these benefits in the product packaging (labels and logos), as well as using sustainable packaging, can also be effective.

To the best of our knowledge, only seven studies have been conducted in the UK concerning insects as food (i.e. (Castro and Chambers, 2019a; Circus and Robison, 2019; Collins, Vaskou and Kountouris, 2019; Gómez-Luciano *et al.*, 2019; Powell, Jones and Consedine, 2019; de Koning *et al.*, 2020; Michel and Begho, 2023)). However, none of these studies applied the theory of planned behaviour. This highlights a significant gap in the literature and strongly suggests the need for more research not only to explore the effect of these psychological factors but also to examine interaction effects, as there are few studies worldwide that consider these interactions. Additionally, given the limited number of studies that applied the Price Sensitivity Meter in evaluating the willingness to pay for insect-based food and the fact that our findings using this technique were not in line with evaluations by the Double-Bounded Dichotomous Choice method, this study underscores the importance of further research to test these hypotheses. Further investigation is essential to reconcile these methodological discrepancies and provide a more comprehensive understanding of consumer behaviour towards insect-based products.

CHAPTER 6. Conclusion

6.1 Research summary

Despite the fact that edible insects are consumed in several parts of the world, the results of three studies presented in this PhD thesis seem to converge on the challenge to introduce these products in markets of industrialised countries and of the UK. Findings of the systematic review, the two qualitative studies and the survey contribute to the literature of this topic showing the complexity of the many factors that influence consumers' acceptance and willingness to pay for edible insects at the international level and in particular in the UK.

In the systematic review, we explored the challenges associated with insect-based food, mainly regarding consumer acceptance and commercialization. In this systematic review, by reviewing 85 papers from 2010 to 2020, were selected following the PRISMA methodology. Additionally, we applied the SPIDER (Sample, Phenomenon of Interest, Design, Evaluation, and Research type) tool for developing the inclusion criteria. Furthermore, we utilised SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) to develop the marketing strategy. Our analysis adds new knowledge to previous systematic reviews on this topic.

The main results of the systematic review are both a comprehensive framework of factors influencing consumers' acceptance of insects as food and aspects of the marketing mix of these products. Disgust, food neophobia, familiarity, visibility of insects, and taste appear to be the most significant factors that can prevent consumers from consuming insects as food. The motivations for acceptance are found to be familiarity and exposure. The results of this review provide insights for policy makers and stakeholders who wish to develop marketing strategies that can increase consumer acceptance of insects as food.

The qualitative study shed light on the future of insects as food from stakeholders' and consumers' perspectives by conducting two studies that have been analysed using thematic analysis. Study one explored the potential market for the insect-based burger and its benefits and risks by conducting 12 semi-structured interviews with experts and stakeholders in the United Kingdom. Study two examined consumer attitudes and preferred attributes of burgers made with insects. Miro was used to conduct three focus groups with 14 participants to determine their preferences for insect-based burger patties. This allowed me to interact with participants to create a map of preferred attributes employing the Fishbein model.

The main finding of the qualitative study is the imperative to evaluate the efficacy of insects as an alternative source of protein on an environmental, social, and economic level. Additionally, it provided insights for experts and stakeholders that can be used to tackle food insecurity and global warming, and design products based on experts' experience before scaling up production and marketing them. Two of the most significant intrinsic characteristics of the insect-based burger for consumers were taste and colour. Whereas the packaging material and communication channels/messages are among the significant extrinsic attributes.

The quantitative study was designed based on an extended version of the theory of planned behaviour (TPB) by adding food neophobia and disgust towards insects. This study was conducted to identify British consumers' preferences for insect-based products (i.e. bread and pasta made with cricket flour) using (MNL) multinominal logistic regression. In addition, we elicit British consumers' willingness to pay (WTP) for insect-based products utilising the double-bounded dichotomous choice analysis (DBDC) and price sensitivity metre (PSM).

Results of the quantitative study show that the extended TPB model used in this study contributes to the literature on this topic providing useful information about how the elements of the proposed conceptual framework vary across different segments of the UK population. In addition to the extent of its explanation of the factors influencing British consumers' preferences and how they can influence the willingness to pay for insect-based products.

The finding from the multinomial logistic regression revealed that British consumers have a low preference for insect-based products as out of 801 respondents, only 289 (36%) chose an insect-based product and 512 (64%) preferred not to choose the insect-based product. The main reason for not choosing insect-based products is the satisfaction with the conventional products. Furthermore, bread made with cricket flour is more preferred than pasta made with cricket flour which is 181 respondents (23%) and 108 and (13%) respectively. For those who chose insect-based products, the preferred logo was “Insect protein” over “High protein” and “Carbon trust”.

For both insect-based products, subjective norms was a significant predictor where one unit decrease in the subjective norms increases the odds of choosing bread over none 1.7 times, and pasta over non 1.05 times. Additionally, perceived behavioural control as one unit decrease in the subjective norms increases the odds of choosing bread over none 1.7 times, and pasta over none 1.08 times. Finally, disgust is another significant predictor with one unit increase in disgust towards insects decreasing the odds of choosing bread over none 0.52 times and 0.41 times for pasta.

The DBDC analysis revealed that most participants were willing to pay a premium for both insect-based products. Specifically, 56% of bread choosers and 64% of pasta choosers accepted the first and second bids. However, the higher the price, the less they are willing to pay. For bread, the mean price that they are willing to pay is £2.75 which is 2.9 times higher than the average price of the conventional (£0.95). While for pasta, the mean price that they are willing to pay is £3.24 which is 3.56 times higher than the average price of the conventional (£0.91). The prices identified by DBDC do not falls in the optimal pricing area identified by the PSM which are £3.30 to £5.40 and £3.10 to £5.50 for bread and pasta respectively.

6.2 Implications for the food industry

The food industry in the UK has several compelling incentives to take up insect-based food production on a large scale, driven by economic, environmental, and market-related factors. From an economic perspective, the lower production costs associated with insect farming are a significant incentive. Insects require substantially less feed, water, and land compared to traditional livestock, leading to cost savings. Their high feed conversion efficiency further reduces overall feed costs. The growing consumer demand for sustainable and alternative protein sources presents a lucrative market opportunity. The insect-based food market is expanding, offering early entrants the chance to capture significant market share. Additionally, there is substantial export potential, particularly to regions where insects are already a dietary staple. This new industry development can also create jobs and stimulate local economies, especially in rural areas, contributing to broader economic growth.

Environmental sustainability is another powerful incentive. Insect farming has a much lower environmental impact than traditional livestock farming, producing fewer greenhouse gases and requiring less water and land. This aligns well with the UK's sustainability goals and commitments to reducing its carbon footprint. Insects can be fed organic waste byproducts, integrating well into circular economy practices and contributing to waste reduction. Government initiatives supporting sustainable agricultural practices could provide subsidies, grants, and other financial incentives to encourage the development of insect farming. Establishing a supportive regulatory framework for insect-based foods can further stimulate investment and innovation in this sector.

Market trends and consumer behaviour also play a crucial role in incentivizing the food industry. Insects offer significant nutritional benefits, being rich in protein, vitamins, and minerals, which appeals to health-conscious consumers. The potential to diversify product offerings with insect-based ingredients—from snacks and protein bars to flours and supplements—can cater to various consumer preferences. Effective marketing and educational campaigns highlighting the health benefits and safety of insect-based foods can increase consumer acceptance and demand. Developing tasty and appealing products can help overcome the 'yuck' factor associated with eating insects and attract a broader consumer base.

Moreover, there is a competitive advantage to be gained from early adoption. Companies that invest in insect-based foods early can establish themselves as leaders in this emerging sector, gaining a first-mover advantage as the market grows. This can enhance their brand image and appeal to environmentally conscious consumers, providing a unique selling point in a competitive market. Partnerships and collaborations with research institutions, government bodies, and other companies can drive innovation and reduce the risks associated with entering a new market. In summary, the economic benefits, sustainability goals, and evolving consumer preferences provide strong incentives for the food industry in the UK to scale up insect-based food production. By capitalizing on these opportunities, the industry can enhance its profitability and competitiveness while contributing to a more sustainable and secure food system.

Findings from this PhD thesis underscore the significance of developing products based on consumers' preferred attributes. This highlights the imperative for the food industry to invest in research on both food technology and market analysis to better understand consumer preferences and address potential acceptance barriers. In the food technology domain, while sensory attributes are crucial when developing insect-based products, it is essential to recognize that preferences vary across cultures. For instance, participants from countries where insect consumption is common may be more willing to accept visible insects in food compared to those in regions where entomophagy is less common, such as the UK. Furthermore, familiarity with the product is key; introducing insect-based food products in familiar carriers (e.g., bread in the UK) can enhance consumer preference.

Regarding market research, packaging emerges as a vital factor not only in attracting consumers but also in conveying the quality of the product and production process. This aspect holds significant potential for engaging consumers with the product. Through packaging, the food industry can certify the quality of both the production process and the product itself. The quality of the process includes aspects related to the manufacturing process that may influence the final quality and characteristics of the product such as the production methods, adherence to safety and hygiene standards, and sustainability practices. Conversely, the quality of the product includes the actual physical characteristics and attributes of the product itself such as taste, colour, freshness, and nutritional value. These packaging characteristics align with the preferences of UK consumers, thereby positively influencing purchasing decisions

6.3 Implications for marketers and retailers

Marketing insect-based food products in the UK can be highly effective when targeted at specific consumer segments. For instance, emphasizing the health benefits of insect food consumption can be attractive for health-conscious consumers such as athletes and those looking to improve their overall health. Packaging can highlight these health benefits and include endorsements from nutritionists or fitness experts to build credibility. Consumers who are concerned about the environment and sustainability represent another key segment. Marketing campaigns can focus on the sustainability aspect, emphasizing how insect-based foods contribute to reducing carbon footprints and supporting sustainable agricultural practices. Collaborations with environmental organizations and certifications from eco-friendly bodies can also help in appealing to this segment. Appealing to vegetarian and vegan consumers with insect-based foods is challenging due to their ethical stance against consuming animals. However, there is potential to target flexitarians, individuals who predominantly eat plant-based foods but occasionally consume meat. Insect-based foods can be marketed as a sustainable and ethical protein source for flexitarians and vegetarians who are open to non-traditional protein sources but avoid conventional meat. Highlighting the minimal environmental impact and humane aspects of insect farming can resonate with this group. Additionally, offering insect-based products as meat alternatives in familiar formats like burgers, sausages, and meatballs can make the transition easier for these consumers.

While insect-based food production is generally seen as a more sustainable and ethical alternative to traditional livestock farming, scaling up production will inevitably bring about new ethical and welfare concerns. This is crucial because many studies suggest that insects are likely to feel pain (Gibbons, Crump and Chittka, 2022; Crump *et al.*, 2023), moreover, a study by (Russell and Knott, 2021) suggested that moral concerns regarding insects (i.e. they feel pain and have thoughts) decrease the willingness to eat insects for 600 UK participants. Therefore welfare practices should be taken into consideration when farming insects such as the freedom from hunger and thirst, discomfort, pain, and freedom to express normal behaviour (IPIFF, 2022). Addressing these proactively through the development of industry standards, humane farming and slaughter practices, effective health management, and transparent, accountable practices will be crucial. Engaging with scientific research, regulatory bodies, and advocacy groups can help ensure that the growth of the insect farming industry is both sustainable and ethically sound.

When promoting insect-based products, it is recommended to highlight their benefits, such as being environmentally friendly and healthy, while also ensuring the safety of the products for human consumption. Although animal welfare was mentioned as one of the benefits of shifting to insect-based sites. It is crucial to recognize that animal welfare remains a concern, as insects, being classified as animals, have the potential to experience pain and discomfort. Therefore, comprehensive measures should be implemented to ensure ethical and humane practices throughout the production and harvesting processes of insect-based products, aligning with consumer expectations and ethical standards.

Developing familiarity with insect-based products is a key strategy that can be effectively stimulated by introducing consumers to these products through various channels, thus creating a sense of comfort and familiarity. Through marketing campaigns, educating consumers about the potential benefits associated with insect consumption, and sampling opportunities, consumers can gradually become familiar with insect-based foods, helping to normalize their consumption. Moreover, creating a positive experience with these products can significantly mitigate the disgust often associated with insects.

It is important to introduce insect-based food as a new and different product rather than a competitor to conventional meat. This strategic approach is essential due to the overall perception that conventional meat options are implanted in dietary habits, posing a challenge to the overall acceptance of insect-based alternatives. By emphasizing the distinctiveness and novelty of insect-based cuisine, marketers can effectively capture consumer interest and curiosity.

Edible insects remain a niche market in the UK, and their introduction poses challenges to consumers' preferences and pricing considerations. This is because when we administered our survey, the majority of respondents (64%) did not opt for insect-based products. Despite this, 36% of respondents expressed a willingness to pay a premium price for bread and pasta made with cricket flour (£2.63 for 800g of bread and £2.98 for 500g of pasta). Yet, the average price of insect-based bread and pasta currently available in the market is considerably higher (£4.15 and £5.56 respectively for equivalent quantities), surpassing the price points preferred by our participants. Retailers can decrease the prices of insect-based products by increasing people's consumption. This can be achieved through various ways, leveraging the influence of the TPB elements on preferences and willingness to pay. For instance, endorsements from experts such as doctors, nutritionists, and chefs can enhance consumer trust. Targeting early adopters, such as young, educated males, and utilising the social influence of family and peers can also be effective strategies. Additionally, offering these products in supermarkets can facilitate product trials due to ease of access.

6.4 Implications for policy makers

Research findings can provide policy makers with valuable insights into potential policy implications or the need for regulatory changes, grounded in empirical evidence.

While there is a growing interest in insects as an alternative source of protein driven by food security, concerns about safety risks temper this enthusiasm. Food safety is an important component of the development of insect-based products. Establishing food standards necessitates collaboration between authorities and the food industry to assure consumers of the safety of these products. Governments must introduce policies to regulate this sector effectively. Presently, since 1 January 2024, only four types of insects have received approval in the UK, namely Yellow mealworm, House cricket, Banded cricket, and Black soldier fly[50]. In contrast, other EU countries have approved four additional insect species, including Lesser mealworm, Bird grasshopper/desert locust, and Migratory locust.

[50] https://www.food.gov.uk/print/pdf/node/21821

Conducting safety assessments on more edible species in the UK will facilitate the introduction of a greater variety of products.

Regulatory hurdles in the UK pose a challenge for insect-based food companies, slowing their introduction into the market. Clarifying and streamlining these regulations could smooth the path for these products, addressing challenges faced by the conventional meat market. Additionally, policy makers have a vital role in supporting and enabling local companies to enter the market, which is currently dominated by multinational corporations. This shift can significantly impact consumers and foster a more diverse marketplace.

6.5 Implications for researchers

The research findings contribute to theoretical frameworks by expanding the TPB and its application to consumers' preferences. This may pave the way for the development of novel theoretical frameworks within the research domain of consumers' preferences for edible insects. In our study, although attitude was not significant predictor of consumers preferences and a negative predictor for the willingness to pay, while the extended component disgust was statistically significant and thus implying interaction among the constructs used in the proposed conceptual framework. This suggests that the impact of the core components of the TPB model can be moderated and/or mediated by the extended components. This aspect could have been explored using other advanced statistical models like moderation and mediation analysis using structural equation modelling (Sarstedt, Ringle and Hair, 2021) or conditional process (Hayes, 2013).

Researchers can utilize the pricing design in both DBDC and PSM to assess the range of prices consumers are willing to pay. Additionally, our findings indicate even if PSM is a technique used more by practitioners this method deserves more attention in academic research.

Further comprehensive research is important for edible insect products, necessitating collaborative efforts between food scientists and social scientists as little is known about British preferences for this type of product. Insights gleaned from interdisciplinary studies can illuminate various aspects, including cultural perceptions, consumer behaviour dynamics, and market trends, thereby providing valuable insights for stakeholders in the food industry and policy makers alike.

The study sheds light on the pivotal role of religious factors in the domain of insect consumption, urging researchers to delve deeper into the influence of religious beliefs and practices on consumer decision-making processes. Understanding the interplay between religious doctrines and dietary preferences is essential for comprehensively exploring the complexities surrounding the acceptance and adoption of insect-based foods.

6.6 Limitation and direction for future research

Despite the rich insights obtained from the focus groups, the sample size remains relatively small (14 participants), highlighting the need for additional studies with larger sample sizes. While the sample size in the quantitative study is substantial (801 respondents), only 289 (36%) opted for an insect-based product (bread or pasta) in the multinomial logistic regression analysis. Of these, 181 participants (63%) chose bread, while 108 (37%) chose pasta. Given this sample size, generalizing the results poses challenges. Therefore, future research could build upon our findings by recruiting more participants, considering the preferences of British consumers for insect-based products.

Results from both the focus groups and the survey should be interpreted cautiously due to potential biases toward highly educated individuals, who may have a greater awareness of the benefits and drawbacks of meat consumption. This heightened awareness might explain why consumers in our study were willing to pay a premium for insect-based products. Future research could focus specifically on less educated individuals to gain a deeper understanding of consumer preferences and willingness to pay.

In our survey, the primary reason participants did not choose insect-based products was their satisfaction with conventional products. Future research could delve into the specific attributes that make conventional products preferable over insect-based alternatives. Additionally, bread made with cricket flour is preferred over pasta made with cricket flour, primarily due to the familiarity and preference of bread among British consumers. Future studies could explore the specific attributes shaping British consumers' preferences for insect-based bread. Moreover, regarding insect-based bread, our inquiry focused solely on sliced bread. Further investigation into different types of bread in the UK could yield varying results and is thus worth exploring.

References

Acebrón, L.B. and Dopico, D.C. (2000) 'The importance of intrinsic and extrinsic cues to expected and experienced quality: an empirical application for beef', *Food Quality and Preference*, 11(3), pp. 229–238.

Ajzen, I. (1991) 'The theory of planned behavior', *Organizational Behavior and Human Decision Processes*, 50(2), pp. 179–211.

Alam, S.S., Ahmad, M., Ho, Y.H., Omar, N.A. and Lin, C.Y. (2020) 'Applying an extended theory of planned behavior to sustainable food consumption', *Sustainability (Switzerland)*, 12(20), pp. 1–14.

Alemu, M.H., Olsen, S.B., Vedel, S.E., Pambo, K.O. and Owino, V.O. (2015) 'Consumer acceptance and willingness to pay for edible insects as food in Kenya : the case of white winged termites', *IFRO Working Paper*, pp. 1–27. Available at: http://okonomi.foi.dk/workingpapers/WPpdf/WP2015/IFRO_WP_2015_10.pdf. (Accessed: 1 March 2024).

Alemu, M. H., Olsen, S.B., Vedel, S.E., Pambo, K.O. and Owino, V.O. (2017) 'Combining product attributes with recommendation and shopping location attributes to assess consumer preferences for insect-based food products', *Food Quality and Preference*, 55, pp. 45–57.

Alemu, M.H. and Olsen, S.B. (2019) 'Linking Consumers' Food Choice Motives to their Preferences for Insect-based Food Products: An Application of Integrated Choice and Latent Variable Model in an African Context', *Journal of Agricultural Economics*, 70(1), pp. 241–258.

Alemu, M. and Olsen, S.B. (2020) 'An analysis of the impacts of tasting experience and peer effects on consumers' willingness to pay for novel foods', *Agribusiness*, 36(4), pp. 653–674.

Alexandratos, N. (2006) *World agriculture : towards 2030/2050 Interim report,* Food and Agriculture Organization of the United Nations (FAO). Rome: Food and Agriculture Organization of the United Nations (FAO). Available at: https://doi.org/http://www.fao.org/fileadmin/user_upload/esag/docs/Interim_report_AT2050web.pdf. (Accessed: 21 February 2024)

Acebrón, L.B. and Dopico, D.C. (2000) 'The importance of intrinsic and extrinsic cues to expected and experienced quality: an empirical application for beef', *Food Quality and Preference*, 11(3), pp. 229–238.

Ajzen, I. (1991) 'The theory of planned behavior', *Organizational Behavior and Human Decision Processes*, 50(2), pp. 179–211. Available at: https://doi.org/10.1080/10410236.2018.1493416.

Al-Fawzan, S. (2011) *Food and rules of hunting and slaughter*. 3rd edn. Maktaba Al-Maarif, Riyadh, Saudi Arabia.

Al-Shawaf, L. and Lewis, D.M.G. (2013) 'Exposed intestines and contaminated cooks: Sex, stress, & satiation predict disgust sensitivity', *Personality and Individual Differences*, 54(6), pp. 698–702. Available at: https://doi.org/10.1016/j.paid.2012.11.016.

Al-Shawaf, L., Lewis, D.M.G. and Buss, D.M. (2018) 'Sex Differences in Disgust: Why Are

Women More Easily Disgusted Than Men?', *Emotion Review*, 10(2), pp. 149–160. Available at: https://doi.org/10.1177/1754073917709940.

Alam, S.S., Ahmad, M., Ho, Y.H., Omar, N.A. and Lin, C.Y. (2020) 'Applying an extended theory of planned behavior to sustainable food consumption', *Sustainability (Switzerland)*, 12(20), pp. 1–14. Available at: https://doi.org/10.3390/su12208394.

Alemu, M.H. and Olsen, S.B. (2019) 'Linking Consumers' Food Choice Motives to their Preferences for Insect-based Food Products: An Application of Integrated Choice and Latent Variable Model in an African Context', *Journal of Agricultural Economics*, 70(1), pp. 241–258. Available at: https://doi.org/10.1111/1477-9552.12285.

Alemu, M.H., Olsen, S.B., Vedel, S.E., Pambo, K.O. and Owino, V.O. (2015) 'Consumer acceptance and willingness to pay for edible insects as food in Kenya : the case of white winged termites', *IFRO Working Paper*, pp. 1–27. Available at: http://okonomi.foi.dk/workingpapers/WPpdf/WP2015/IFRO_WP_2015_10.pdf.

Alemu, M.H., Olsen, S.B., Vedel, S.E., Pambo, K.O. and Owino, V.O. (2017) 'Combining product attributes with recommendation and shopping location attributes to assess consumer preferences for insect-based food products', *Food Quality and Preference*, 55, pp. 45–57. Available at: https://doi.org/10.1016/j.foodqual.2016.08.009.

Alexandratos, N. (2006) *World agriculture : towards 2030/2050 Interim report*, *Food and Agriculture Organization of the United Nations (FAO)*. Rome. Available at: https://doi.org/http://www.fao.org/fileadmin/user_upload/esag/docs/Interim_report_AT2050web.pdf.

Alhujaili, A., Nocella, G. and Macready, A. (2023) 'Insects as Food : Consumers ' Acceptance and Marketing', *Foods*, 12(4), pp. 1–21. Available at: https://doi.org/10.3390/foods12040886.

Ardeshiri, A. and Rose, J.M. (2018) 'How Australian consumers value intrinsic and extrinsic attributes of beef products', *Food Quality and Preference*, 65(March 2017), pp. 146–163. Available at: https://doi.org/10.1016/j.foodqual.2017.10.018.

Ardoin, R. and Prinyawiwatkul, W. (2020) 'Product appropriateness, willingness to try and perceived risks of foods containing insect protein powder: A survey of U.S. consumers', *International Journal of Food Science and Technology*, 55(9), pp. 3215–3226. Available at: https://doi.org/10.1111/ijfs.14612.

Armitage, C.J. and Conner, M. (2001) 'Efficacy of the Theory of Planned Behaviour : A Meta-Analytic Review', *The British Psychological Society*, 40(4), pp. 471–499. Available at: https://doi.org/10.1348/014466601164939.

Arrow, K., Solow, R., Portney, P.R., Leamer, E.E., Radner, R. and Schuman, H. (1993) 'Report of the NOAA Panel on Contingent Valuation', *Federal Register*, 58(10), pp. 4601–4614. Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.129.2114&rep=rep1&type=pdf.

Arru, B., Furesi, R., Pulina, P. and Madau, F.A. (2022) 'Price Sensitivity of Fish Fed with Insect Meal: An Analysis on Italian Consumers', *Sustainability (Switzerland)*, 14(11). Available at: https://doi.org/10.3390/su14116657.

Azil, A.H., Yakub, M.A., Hassan, N. and Sharip, S. (2021) ‘Fear towards insects and other arthropods: A cross sectional study in a Malaysian university’, *Malaysian Journal of Society and Space*, 17(1), pp. 69–80. Available at: https://doi.org/10.17576/geo-2021-1701-06.

Bäckström, A., Pirttilä-Backman, A.M. and Tuorila, H. (2003) ‘Dimensions of novelty: A social representation approach to new foods’, *Appetite*, 40(3), pp. 299–307. Available at: https://doi.org/10.1016/S0195-6663(03)00005-9.

Bae, Y. and Choi, J. (2021) ‘Consumer acceptance of edible insect foods: An application of the extended theory of planned behavior’, *Nutrition Research and Practice*, 15(1), pp. 122–135. Available at: https://doi.org/10.4162/nrp.2021.15.1.122.

Baker, M.A., Shin, J.T. and Kim, Y.W. (2016) ‘An Exploration and Investigation of Edible Insect Consumption: The Impacts of Image and Description on Risk Perceptions and Purchase Intent’, *Psychology and Marketing*, 33(2), pp. 94–112. Available at: https://doi.org/10.1002/mar.20847.

Balzan, S., Fasolato, L., Maniero, S. and Novelli, E. (2016) ‘Edible insects and young adults in a north-east Italian city an exploratory study’, *British Food Journal*, 118(2), pp. 318–326. Available at: https://doi.org/10.1108/BFJ-04-2015-0156.

Bao, H.X.H. and Song, Y. (2022) ‘Improving Food Security through Entomophagy: Can Behavioural Interventions Influence Consumer Preference for Edible Insects?’, *Sustainability (Switzerland)*, 14(7). Available at: https://doi.org/10.3390/su14073875.

La Barbera, F., Verneau, F., Amato, M. and Grunert, K. (2018) ‘Understanding Westerners’ disgust for the eating of insects: The role of food neophobia and implicit associations’, *Food Quality and Preference*, 64(September 2017), pp. 120–125. Available at: https://doi.org/10.1016/j.foodqual.2017.10.002.

La Barbera, F., Verneau, F., Videbæk, P.N., Amato, M. and Grunert, K.G. (2020) ‘A self-report measure of attitudes toward the eating of insects: construction and validation of the Entomophagy Attitude Questionnaire’, *Food Quality and Preference*, 79(March 2019), p. 103757. Available at: https://doi.org/10.1016/j.foodqual.2019.103757.

Barrena, R. and Sánchez, M. (2013) ‘Neophobia, personal consumer values and novel food acceptance’, *Food Quality and Preference*, 27(1), pp. 72–84. Available at: https://doi.org/10.1016/j.foodqual.2012.06.007.

Barsics, F., Caparros Megido, R., Brostaux, Y., Barsics, C., Blecker, C., Haubruge, E. and Francis, F. (2017) ‘Could new information influence attitudes to foods supplemented with edible insects?’, *British Food Journal*, 119(9), pp. 2027–2039. Available at: https://doi.org/10.1108/BFJ-11-2016-0541.

Bartkowicz, J. (2017) ‘Tri-City Consumers Attitudes towards Eating Edible Insect as an Alternative Source of Food’, *Handel Wewnętrzny*, 366(1), pp. 156–166. Available at: https://www.researchgate.net/publication/327381837%0Ahttp://yadda.icm.edu.pl/yadda/element/bwmeta1.element.desklight-e900b1dd-2e59-4276-bb05-44af9c2e9e0b.

Bartkowicz, J. and Babicz-Zielińska, E. (2020) ‘Acceptance of bars with edible insects by a selected group of students from Tri-City, Poland’, *Czech Journal of Food Sciences*, 38(3), pp. 192–197. Available at: https://doi.org/10.17221/236/2019-CJFS.

Barton, A., Richardson, C.D. and McSweeney, M.B. (2020) ‘Consumer attitudes toward entomophagy before and after evaluating cricket (Acheta domesticus)-based protein powders', *Journal of Food Science*, 85(3), pp. 781–788. Available at: https://doi.org/10.1111/1750-3841.15043.

Berg, B.L. and Lune, H. (2014) *Qualitative research methods for the social sciences*. 8th edn. Pearson Education Limited.

Berger, S., Christandl, F., Bitterlin, D. and Wyss, A.M. (2019) 'The social insectivore: Peer and expert influence affect consumer evaluations of insects as food', *Appetite*, 141. Available at: https://doi.org/10.1016/j.appet.2019.104338.

Berger, S., Christandl, F., Schmidt, C. and Baertsch, C. (2018) 'Price-based quality inferences for insects as food', *British Food Journal*, 120(7), pp. 1615–1627. Available at: https://doi.org/10.1108/BFJ-08-2017-0434.

Berger, U. and Anaki, D. (2014) 'Demographic influences on disgust: Evidence from a heterogeneous sample', *Personality and Individual Differences*, 64, pp. 67–71. Available at: https://doi.org/10.1016/j.paid.2014.02.016.

Bernués, A., Olaizola, A. and Corcoran, K. (2003) 'Extrinsic attributes of red meat as indicators of quality in Europe: An application for market segmentation', *Food Quality and Preference*, 14(4), pp. 265–276. Available at: https://doi.org/10.1016/S0950-3293(02)00085-X.

Biggerstaff, D. (2012) 'Qualitative Research Methods in Psychology', *Psychology - Selected Papers* [Preprint]. Available at: https://doi.org/10.5772/38931.

Blanco-Gutiérrez, I., Varela-Ortega, C. and Manners, R. (2020) 'Evaluating animal-based foods and plant-based alternatives using multi-criteria and SWOT analyses', *International Journal of Environmental Research and Public Health*, 17(21), pp. 1–26. Available at: https://doi.org/10.3390/ijerph17217969.

De Boer, J., Schösler, H. and Boersema, J.J. (2013) 'Motivational differences in food orientation and the choice of snacks made from lentils, locusts, seaweed or "hybrid" meat', *Food Quality and Preference*, 28(1), pp. 32–35. Available at: https://doi.org/10.1016/j.foodqual.2012.07.008.

Böhm, I., Ferrari, A. and Woll, S. (2018) 'Visions of In Vitro Meat among Experts and Stakeholders', *NanoEthics*, 12(3), pp. 211–224. Available at: https://doi.org/10.1007/s11569-018-0330-0.

Bohner, G. and Wänke, M. (2002) *Attitudes and Attitude Change*. 1st Editio. London: Psychology Press. Available at: https://doi.org/10.4324/9781315784786.

Braun, V. and Clarke, V. (2006) 'Using thematic analysis in psychology', *Qualitative Research in Psychology*, 3(2), pp. 77–101. Available at: https://doi.org/10.1191/1478088706qp063oa.

Braun, V. and Clarke, V. (2014) *Successful Qualitative Research: A Practical Guide for Beginners*. First. Edited by M. Carmichael. London: SAGE Publications Ltd. Available at: https://books.google.com/books?id=EV_Q06CUsXsC&pgis=1.

Brečić, R., Mesić, Ž. and Cerjak, M. (2017) 'Importance of intrinsic and extrinsic quality food characteristics by different consumer segments', *British Food Journal*, 119(4), pp. 845–862. Available at: https://doi.org/10.1108/BFJ-06-2016-0284.

Breidert, C., Hahsler, M. and Reutterer, T. (2006) 'A review of methods for measuring willingness-to-pay', in *Innovative Marketing*, pp. 8–32.

Broad, G.M. (2023) 'Understanding the (Fake) Meat Debates: The Alternative Protein Ideological Circle', *Nutrition Today*, 58(4), pp. 181–188. Available at: https://doi.org/10.1097/NT.0000000000000617.

Brooks, J., Reed, D.M. and Savage, B. (2016) 'Taking off With a Pilot : The Importance of Testing Research Instruments', *European Conference on Research Methodology for Business and Management Studies*, pp. 51–59.

Brunner, T.A. and Nuttavuthisit, K. (2019) 'A consumer-oriented segmentation study on edible insects in Switzerland and Thailand', *British Food Journal*, 122(2), pp. 482–488. Available at: https://doi.org/10.1108/BFJ-08-2018-0526.

Cadinu, L.A., Barra, P., Torre, F., Delogu, F. and Madau, F.A. (2020) 'Insect rearing: Potential, challenges, and circularity', *Sustainability (Switzerland)*, 12(11). Available at: https://doi.org/10.3390/su12114567.

Caparros Megido, R., Gierts, C., Blecker, C., Brostaux, Y., Haubruge, É., Alabi, T. and Francis, F. (2016) 'Consumer acceptance of insect-based alternative meat products in Western countries', *Food Quality and Preference*, 52, pp. 237–243. Available at: https://doi.org/10.1016/j.foodqual.2016.05.004.

Caparros Megido, R., Sablon, L., Geuens, M., Brostaux, Y., Alabi, T., Blecker, C., Drugmand, D., Haubruge, É. and Francis, F. (2014) 'Edible insects acceptance by Belgian consumers: Promising attitude for entomophagy development', *Journal of Sensory Studies*, 29(1), pp. 14–20. Available at: https://doi.org/10.1111/joss.12077.

Cardona, M., Hernández, M., Fuentes, A., Barat, J.M. and Fernández-Segovia, I. (2023) 'Assessment of the attributes that most affect the choice of minced meat and hamburgers', *Meat Science*, 198(December 2022). Available at: https://doi.org/10.1016/j.meatsci.2022.109089.

Carson, R.T. (2000) 'Contingent Valuation: A User's Guide', *Environmental Science & Technology*, 34(8), pp. 1413–1418. Available at: https://doi.org/https://doi.org/10.1021/es990728j.

Carson, R.T. (2012) 'Contingent valuation: A practical alternative when prices aren't available', *Journal of Economic Perspectives*, 26(4), pp. 27–42. Available at: https://doi.org/10.1257/jep.26.4.27.

Carson, R.T., Flores, N.E. and Meade, N.F. (2001) 'Contingent valuation: Controversies and evidence', *Environmental and Resource Economics*, 19(2), pp. 173–210. Available at: https://doi.org/10.1023/A:1011128332243.

Castro, M. and Chambers, E. (2019a) 'Consumer avoidance of insect containing foods: Primary emotions, perceptions and sensory characteristics driving consumers considerations', *Foods*, 8(8). Available at: https://doi.org/10.3390/foods8080351.

Castro, M. and Chambers, E. (2019b) 'Willingness to eat an insect based product and impact on brand equity: A global perspective', *Journal of Sensory Studies*, 34(2). Available at: https://doi.org/10.1111/joss.12486.

Cavallo, C. and Materia, V.C. (2018) 'Insects or not insects? Dilemmas or attraction for young generations: A case in Italy', *International Journal on Food System Dynamics*, 9(3), pp. 226–239. Available at: https://doi.org/10.18461/ijfsd.v9i3.932.

Cavanagh, S. (1997) 'Content analysis: concepts, methods and applications', *Nurse Researcher*, 4(3), pp. 5–16. Available at: https://doi.org/10.7748/nr.4.3.5.s2.

Cesareo, M., Sorgente, A., Labra, M., Palestini, P., Sarcinelli, B., Rossetti, M., Lanz, M. and Moderato, P. (2022) 'The effectiveness of nudging interventions to promote healthy eating choices: A systematic review and an intervention among Italian university students', *Appetite*, 168(August 2021), p. 105662. Available at: https://doi.org/10.1016/j.appet.2021.105662.

Chang, H.P., Ma, C.C. and Chen, H.S. (2019) 'Climate change and consumer's attitude toward insect food', *International Journal of Environmental Research and Public Health*, 16(9). Available at: https://doi.org/10.3390/ijerph16091606.

Chen, J., Zhang, M. and Bai, J. (2023) 'How information affects consumers' attitudes toward and willingness to pay for cultured meat: evidence from Chinese urban consumers', *British Food Journal*, 125(10), pp. 3748–3765. Available at: https://doi.org/10.1108/BFJ-12-2022-1133.

Chow, C.Y., Riantiningtyas, R.R., Sørensen, H. and Bom Frøst, M. (2021) 'School children cooking and eating insects as part of a teaching program – Effects of cooking, insect type, tasting order and food neophobia on hedonic response', *Food Quality and Preference*, 87(December 2019), p. 104027. Available at: https://doi.org/10.1016/j.foodqual.2020.104027.

Chung, J.E., Yu, J.P. and Pysarchik, D.T. (2006) 'Cue utilization to assess food product quality: A comparison of consumers and retailers in India', *International Review of Retail, Distribution and Consumer Research*, 16(2), pp. 199–214. Available at: https://doi.org/10.1080/09593960600572233.

Chung, S.J., Ersig, A.L. and McCarthy, A.M. (2017) 'The Influence of Peers on Diet and Exercise Among Adolescents: A Systematic Review', *Journal of Pediatric Nursing*, 36, pp. 44–56. Available at: https://doi.org/10.1016/j.pedn.2017.04.010.

Cialdini, R.B. and Trost, M.R. (1998) 'Social influence: Social norms, conformity, and compliance', in *Contemporary Sociology*, pp. 151–193. Available at: https://doi.org/10.2307/2654253.

Cicatiello, C., De Rosa, B., Franco, S. and Lacetera, N. (2016) 'Consumer approach to insects as food: barriers and potential for consumption in Italy', *British Food Journal*, 118(9), pp. 2271–2286. Available at: https://doi.org/10.1108/BFJ-01-2016-0015.

Cicatiello, C., Vitali, A. and Lacetera, N. (2020) 'How does it taste? Appreciation of insect-based snacks and its determinants', *International Journal of Gastronomy and Food Science*, 21(October 2019), p. 100211. Available at: https://doi.org/10.1016/j.ijgfs.2020.100211.

Ciccantelli, S. and Magidson, J. (1993) 'From experience: Consumer idealized design: Involving consumers in the product development process', *The Journal of Product Innovation Management*, 10(4), pp. 341–347. Available at: https://doi.org/10.1111/1540-5885.1040341.

Circus, V.E. and Robison, R. (2019) 'Exploring perceptions of sustainable proteins and meat attachment', *British Food Journal*, 121(2), pp. 533–545. Available at: https://doi.org/10.1108/BFJ-01-2018-0025.

Clarkson, C., Mirosa, M. and Birch, J. (2018) 'Consumer acceptance of insects and ideal product attributes', *British Food Journal*, 120(12), pp. 2898–2911. Available at: https://doi.org/10.1108/BFJ-11-2017-0645.

Clore, G.L. and Schnall, S. (2005) 'The influence of affect on health decisions', in *Handbook of attitudes*, pp. 437–489. Available at: https://doi.org/10.1007/978-1-4939-3486-7_8.

Coenen, M., Stamm, T.A., Stucki, G. and Cieza, A. (2012) 'Individual interviews and focus groups in patients with rheumatoid arthritis: A comparison of two qualitative methods', *Quality of Life Research*, 21(2), pp. 359–370. Available at: https://doi.org/10.1007/s11136-011-9943-2.

Collins, C.M., Vaskou, P. and Kountouris, Y. (2019) 'Insect Food Products in the Western World: Assessing the Potential of a New "Green" Market', *Annals of the Entomological Society of America*, 112(6), pp. 518–528. Available at: https://doi.org/10.1093/aesa/saz015.

Colucci, E. (2007) '"Focus groups can be fun": The use of activity-oriented questions in focus group discussions', *Qualitative Health Research*, 17(10), pp. 1422–1433. Available at: https://doi.org/10.1177/1049732307308129.

Cong, L., Mirosa, M., Kaye-Blake, W. and Bremer, P. (2020) 'Ideal Attributes of Functional Foods Helping the Immune System Recover From the Impact of Air Pollution: A Consumer-Led Product Design', *Journal of International Food and Agribusiness Marketing*, 32(5), pp. 482–502. Available at: https://doi.org/10.1080/08974438.2020.1750528.

Cooke, A., Smith, D. and Booth, A. (2012) 'Beyond PICO: The SPIDER tool for qualitative evidence synthesis', *Qualitative Health Research*, 22(10), pp. 1435–1443. Available at: https://doi.org/10.1177/1049732312452938.

Cornish, A., Raubenheimer, D. and McGreevy, P. (2016) 'What we know about the public's level of concern for farm animal welfare in food production in developed countries', *Animals*, 6(11), pp. 1–15. Available at: https://doi.org/10.3390/ani6110074.

Cortes Ortiz, J.A., Ruiz, A.T., Morales-Ramos, J.A., Thomas, M., Rojas, M.G., Tomberlin, J.K., Yi, L., Han, R., Giroud, L. and Jullien, R.L. (2016) *Insect Mass Production Technologies*, *Insects as Sustainable Food Ingredients*. Available at: https://doi.org/10.1016/b978-0-12-802856-8.00006-5.

Costa-Neto, E.M. (2015) 'Anthropo-entomophagy in Latin America: An overview of the importance of edible insects to local communities', *Journal of Insects as Food and Feed*, 1(1), pp. 17–23. Available at: https://doi.org/10.3920/JIFF2014.0015.

Crump, A., Gibbons, M., Barrett, M., Birch, J. and Chittka, L. (2023) 'Is it time for insect researchers to consider their subjects' welfare?', *PLoS Biology*, 21(6 June), pp. 8–11. Available at: https://doi.org/10.1371/journal.pbio.3002138.

Dagevos, H. (2021) 'A Literature Review of Consumer Research on Edible Insects: Recent Evidence and New Vistas from 2019 Studies', *Journal of Insects as Food and Feed*, 7(3), pp. 249–259. Available at: https://doi.org/10.3920/JIFF2020.0052.

Davis, L.L. (1992) 'Instrument review: Getting the most from a panel of experts', *Applied*

Nursing Research, 5(4), pp. 194–197. Available at: https://doi.org/10.1016/S0897-1897(05)80008-4.

de-Magistris, T., Pascucci, S. and Mitsopoulos, D. (2015) 'Paying to see a bug on my food: How regulations and information can hamper radical innovations in the European Union', *British Food Journal*, 117(6), pp. 1777–1792. Available at: https://doi.org/10.1108/BFJ-06-2014-0222.

DellaVigna, S. and Linos, E. (2022) 'RCTs to Scale: Comprehensive Evidence From Two Nudge Units', *Econometrica*, 90(1), pp. 81–116. Available at: https://doi.org/10.3982/ecta18709.

Dennison, C.M. and Shepherd, R. (1995) 'Adolescent food choice: an application of the Theory of Planned Behaviour', *Journal of Human Nutrition and Dietetics*, 8(1), pp. 9–23. Available at: https://doi.org/10.1111/j.1365-277X.1995.tb00292.x.

Dodds, W.B. and Monroe, K.B. (1985) 'The Effect of Brand and Price Information on Subjective Product Evaluations', *Advances in Consumer Research*, 12, pp. 85–90. Available at: http://eds.a.ebscohost.com/eds/pdfviewer/pdfviewer?sid=75f9f6fc-d5ac-4520-817e-16a065fc1f11%40sessionmgr4010&vid=1&hid=4203.

Dupont, J. and Fiebelkorn, F. (2020) 'Attitudes and acceptance of young people toward the consumption of insects and cultured meat in Germany', *Food Quality and Preference*, 85(May), p. 103983. Available at: https://doi.org/10.1016/j.foodqual.2020.103983.

Dupont, J., Harms, T. and Fiebelkorn, F. (2022) 'Acceptance of Cultured Meat in Germany—Application of an Extended Theory of Planned Behaviour', *Foods*, 11(3). Available at: https://doi.org/10.3390/foods11030424.

Ebenebe, C.I., Amobi, M.I., Udegbala, C., Ufele, A.N. and Nweze, B.O. (2017) 'Survey of edible insect consumption in south-eastern Nigeria', *Journal of Insects as Food and Feed*, 3(4), pp. 241–252. Available at: https://doi.org/10.3920/JIFF2017.0002.

Egolf, A., Siegrist, M. and Hartmann, C. (2018) 'How people's food disgust sensitivity shapes their eating and food behaviour', *Appetite*, 127(October 2017), pp. 28–36. Available at: https://doi.org/10.1016/j.appet.2018.04.014.

Enneking, U., Neumann, C. and Henneberg, S. (2007) 'How important intrinsic and extrinsic product attributes affect purchase decision', *Food Quality and Preference*, 18(1), pp. 133–138. Available at: https://doi.org/10.1016/j.foodqual.2005.09.008.

Erhard, A.L., Águas Silva, M., Damsbo-Svendsen, M., Menadeva Karpantschof, B. El, Sørensen, H. and Bom Frøst, M. (2023) 'Acceptance of insect foods among Danish children: Effects of information provision, food neophobia, disgust sensitivity, and species on willingness to try', *Food Quality and Preference*, 104(August 2022). Available at: https://doi.org/10.1016/j.foodqual.2022.104713.

Escribano, A.J., Peña, M.B., Díaz-Caro, C., Elghannam, A., Crespo-Cebada, E. and Mesías, F.J. (2021) 'Stated preferences for plant-based and cultured meat: A choice experiment study of spanish consumers', *Sustainability (Switzerland)*, 13(15). Available at: https://doi.org/10.3390/su13158235.

FAO (2014) *The contribution of insects to food security, livelihoods and the environment*, *Food and Agriculture Organization of the United Nations*. Food and Agriculture

Organization of the United Nations. Available at: https://www.researchgate.net/publication/264623953_The_contribution_of_insects_to_food_security_livelihoods_and_the_environment/link/53e9b8090cf2dc24b3cac3be/download.

FAO (2022) *Animal welfare. Gateway to Poultry Production and Products*. Available at: https://www.fao.org/poultry-production-products/production/animal-welfare/en/ (Accessed: 9 March 2022).

Feng, Y., Chen, X.M., Zhao, M., He, Z., Sun, L., Wang, C.Y. and Ding, W.F. (2018) 'Edible insects in China: Utilization and prospects', *Insect Science*, 25(2), pp. 184–198. Available at: https://doi.org/10.1111/1744-7917.12449.

Field, A. (2018) *Discovering statistics using IBM SPSS statistics*. 5th ed. SAGE Publications Ltd.

Fischer, A.R.H. and Steenbekkers, L.P.A. (Bea. (2018) 'All insects are equal, but some insects are more equal than others', *British Food Journal*, 120(4), pp. 852–863. Available at: https://doi.org/10.1108/BFJ-05-2017-0267.

Fishbein, M. and Ajzen, I. (1975) 'Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research', in, pp. 20–52.

Florença, S.G., Guiné, R.P.F., Gonçalves, F.J.A., Barroca, M.J., Ferreira, M., Costa, C.A., Correia, P.M.R., Cardoso, A.P., Campos, S., Anjos, O. and Cunha, L.M. (2022) 'The Motivations for Consumption of Edible Insects: A Systematic Review', *Foods*, 11(22). Available at: https://doi.org/10.3390/foods11223643.

Fox, F. (2017) *Meeting in virtual spaces: Conducting online focus groups*, *V. Braun, V. Clarke, & D. Gray (Eds.), Collecting Qualitative Data: A Practical Guide to Textual, Media and Virtual Techniques*. Cambridge: Cambridge University Press. Available at: https://doi.org/10.1017/9781107295094.014.

Frank, R.A. and Van Der Klaauw, N.J. (1994) 'The contribution of chemosensory factors to individual differences in reported food preferences', *Appetite*, pp. 101–123. Available at: https://doi.org/10.1006/appe.1994.1011.

Frezal, C., Nenert, C. and Gay, H. (2022) 'Meat Protein Alternatives Opportunitties and Challenges For Food Systems' Transformation', *OECD Food, Agriculture and fisheries*, (182), p. 53. Available at: https://www.oecd-ilibrary.org/content/paper/387d30cf-en.

Fukano, Y. and Soga, M. (2021) 'Why do so many modern people hate insects? The urbanization–disgust hypothesis', *Science of the Total Environment*, 777, p. 146229. Available at: https://doi.org/10.1016/j.scitotenv.2021.146229.

Gallen, C., Pantin-Sohier, G. and Peyrat-Guillard, D. (2019) 'Cognitive acceptance mechanisms of discontinuous food innovations: The case of insects in France', *Recherche et Applications en Marketing*, 34(1), pp. 48–73. Available at: https://doi.org/10.1177/2051570718791785.

Gasparyan, A.Y., Ayvazyan, L. and Kitas, G.D. (2013) 'Multidisciplinary Bibliographic Databases Armen', *Jornal of Korean Medical Science*, 28(9), pp. 1270–1275. Available at: https://doi.org/10.3346/jkms.2013.28.9.1270.

Gere, A., Székely, G., Kovács, S., Kókai, Z. and Sipos, L. (2017) 'Readiness to adopt insects in

Hungary: A case study', *Food Quality and Preference*, 59, pp. 81–86. Available at: https://doi.org/10.1016/j.foodqual.2017.02.005.

Gibbons, M., Crump, A. and Chittka, L. (2022) 'Insects may feel pain, says growing ecidence-here's what this means for animal welfare laws', *The Conversation*, pp. 1–4.

de Gier, S. and Verhoeckx, K. (2018) 'Insect (food) allergy and allergens', *Molecular Immunology*, 100(May), pp. 82–106. Available at: https://doi.org/10.1016/j.molimm.2018.03.015.

Giotis, T. and Drichoutis, A.C. (2021) 'Consumer acceptance and willingness to pay for direct and indirect entomophagy', *Q Open*, 1(2), pp. 1–18. Available at: https://doi.org/10.1093/qopen/qoab015.

Le Goff, G. and Delarue, J. (2017) 'Non-verbal evaluation of acceptance of insect-based products using a simple and holistic analysis of facial expressions', *Food Quality and Preference*, 56, pp. 285–293. Available at: https://doi.org/10.1016/j.foodqual.2016.01.008.

Gómez-Luciano, C.A., de Aguiar, L.K., Vriesekoop, F. and Urbano, B. (2019) 'Consumers' willingness to purchase three alternatives to meat proteins in the United Kingdom, Spain, Brazil and the Dominican Republic', *Food Quality and Preference*, 78(December 2018). Available at: https://doi.org/10.1016/j.foodqual.2019.103732.

Gómez-Luciano, C.A., Vriesekoop, F. and Urbano, B. (2019) 'Towards food security of alternative dietary proteins: A comparison between Spain and the Dominican Republic', *Amfiteatru Economic*, 21(51), pp. 393–407. Available at: https://doi.org/10.24818/EA/2019/51/393.

Grant, M.J. and Booth, A. (2009) 'A typology of reviews: An analysis of 14 review types and associated methodologies', *Health Information and Libraries Journal*, 26(2), pp. 91–108. Available at: https://doi.org/10.1111/j.1471-1842.2009.00848.x.

Green, R., Cornelsen, L., Dangour, A.D., Honorary, R.T., Shankar, B., Mazzocchi, M. and Smith, R.D. (2013) 'The effect of rising food prices on food consumption:systematic review with meta-regression', *BMJ (Online)*, 347(7915), pp. 1–9. Available at: https://doi.org/10.1136/bmj.f3703.

Greszki, R., Meyer, M. and Schoen, H. (2014) 'The impact of speeding on data quality in nonprobability and freshly recruited probability-based online panels', in *Online Panel Research: Data Quality Perspective, A*, pp. 238–262.

Grogan, S.C., Bell, R. and Conner, M. (1997) 'Eating sweet snacks: Gender differences in attitudes and behaviour', *Appetite*, 28(1), pp. 19–31. Available at: https://doi.org/10.1006/appe.1996.0067.

Grunert, K.G., Bredahl, L. and Brunsø, K. (2004) 'Consumer perception of meat quality and implications for product development in the meat sector - A review', *Meat Science*, 66(2), pp. 259–272. Available at: https://doi.org/10.1016/S0309-1740(03)00130-X.

Guest, G., Namey, E. and McKenna, K. (2017) 'How Many Focus Groups Are Enough? Building an Evidence Base for Nonprobability Sample Sizes', *Field Methods*, 29(1), pp. 3–22. Available at: https://doi.org/10.1177/1525822X16639015.

Hagedorn, J.C., Chen, J., Weiss, W.M., Fredrickson, S.W. and Faillace, J.J. (2021) 'Interviewing in the Wake of COVID-19: How Orthopaedic Residencies, Fellowships, and

Applicants Should Prepare for Virtual Interviews', *The Journal of the American Academy of Orthopaedic Surgeons*, 29(7), pp. 271–277. Available at: https://doi.org/10.5435/JAAOS-D-20-01148.

Haidt, J., McCauley, C. and Rozin, P. (1994) 'Individual differences in sensitivity to disgust: A scale sampling seven domains of disgust elicitors', *Pergamon*, 16(5), pp. 701–713. Available at: https://doi.org/10.1016/0191–8869(94)90212–7.

Halonen, V., Uusitalo, V., Levänen, J., Sillman, J., Leppäkoski, L. and Claudelin, A. (2022) 'Recognizing Potential Pathways to Increasing the Consumption of Edible Insects from the Perspective of Consumer Acceptance: Case Study from Finland', *Sustainability (Switzerland)*, 14(3), pp. 7–9. Available at: https://doi.org/10.3390/su14031439.

Hanemann, M., Loomis, J. and Kanninen, B. (1991) 'Statistical Efficiency of Double-Bounded Dichotomous Choice Contingent Valuation', *American Journal of Agricultural Economics*, 73(4), pp. 1255–1263. Available at: https://doi.org/10.2307/1242453.

Hansen, T. (2005) 'Rethinking consumer perception of food quality', *Journal of Food Products Marketing*, 11(2), pp. 75–93. Available at: https://doi.org/10.1300/J038v11n02_05.

Harms, E. and Pirolet, N. (2018) 'Consumer acceptance of insect-based burgers', *Appetite*, 130, pp. 296–306. Available at: https://doi.org/10.1016/j.appet.2018.05.195.

Harriet, M., Mburu, J., Irungu, P., Diiro, G., Tanga, C.M., Subramanian, S., Fiaboe, K.K.M., Loon, J.J.A. van, Dicke, M. and Ekesi, S. (2019) 'Consumer Preference and Willingness to Pay for Meat derived from Chicken fed on Insect-based feed in Kenya', *African Association of Agricultural Economists (AAAE)* [Preprint]. Available at: https://doi.org/10.22434/IFAMR2022.0047.

Hartmann, C., Shi, J., Giusto, A. and Siegrist, M. (2015) 'The psychology of eating insects: A cross-cultural comparison between Germany and China', *Food Quality and Preference*, 44, pp. 148–156. Available at: https://doi.org/10.1016/j.foodqual.2015.04.013.

Hartmann, C. and Siegrist, M. (2017) 'Consumer perception and behaviour regarding sustainable protein consumption: A systematic review', *Trends in Food Science and Technology*, 61, pp. 11–25. Available at: https://doi.org/10.1016/j.tifs.2016.12.006.

Hayes, A.F. (2013) *Introduction to Mediation , Moderation , and Conditional Process Analysis*.

Helms, M.M. and Nixon, J. (2010) *Exploring SWOT analysis – where are we now?: A review of academic research from the last decade*, *Journal of Strategy and Management*. Available at: https://doi.org/10.1108/17554251011064837.

Henchion, M., Hayes, M., Mullen, A., Fenelon, M. and Tiwari, B. (2017) 'Future Protein Supply and Demand: Strategies and Factors Influencing a Sustainable Equilibrium', *Foods*, 6(7), p. 53. Available at: https://doi.org/10.3390/foods6070053.

Henchion, M., McCarthy, M., Resconi, V.C. and Troy, D. (2014) 'Meat consumption: Trends and quality matters', *Meat Science*, 98(3), pp. 561–568. Available at: https://doi.org/10.1016/j.meatsci.2014.06.007.

Hensher, D.A. (2010) 'Hypothetical bias, choice experiments and willingness to pay', *Transportation Research Part B: Methodological*, 44(6), pp. 735–752. Available at:

https://doi.org/10.1016/j.trb.2009.12.012.

van den Heuvel, E., Newbury, A. and Appleton, K.M. (2019) 'The psychology of nutrition with advancing age: Focus on food neophobia', *Nutrients*, 11(1), pp. 6–8. Available at: https://doi.org/10.3390/nu11010151.

Hocquette, J.F. (2016) 'Is in vitro meat the solution for the future?', *Meat Science*, 120, pp. 167–176. Available at: https://doi.org/10.1016/j.meatsci.2016.04.036.

House, J. (2016) 'Consumer acceptance of insect-based foods in the Netherlands: Academic and commercial implications', *Appetite*, 107, pp. 47–58. Available at: https://doi.org/10.1016/j.appet.2016.07.023.

House of Commons (2024) *Science, Innovation and Insect decline and UK food security*.

van Huis, A. (2013) 'Potential of insects as food and feed in assuring food security', *Annual Review of Entomology*, 58, pp. 563–583. Available at: https://doi.org/10.1146/annurev-ento-120811-153704.

van Huis, A. (2019) 'Welfare of farmed insects', *Journal of Insects as Food and Feed*, 5(3), pp. 159–162. Available at: https://doi.org/10.3920/JIFF2019.x004.

van Huis, A. (2020) 'Insects as food and feed, a new emerging agricultural sector: A review', *Journal of Insects as Food and Feed*, 6(1), pp. 27–44. Available at: https://doi.org/10.3920/JIFF2019.0017.

van Huis, A., Van Itterbeeck, J., Klunder, H., Mertens, E., Halloran, A., Muir, G. and Vantomme, P. (2013) *Edible insects: Future prospects for food and feed security*, *Food and Agriculture Organization of the United Nations (FAO)*. Available at: https://doi.org/https://www.fao.org/3/i3253e/i3253e.pdf.

Hwang, J. and Kim, J.J. (2021) 'Edible insects: How to increase the sustainable consumption behavior among restaurant consumers', *International Journal of Environmental Research and Public Health*, 18(12). Available at: https://doi.org/10.3390/ijerph18126520.

Iannuzzi, E., Sisto, R. and Nigro, C. (2019) 'The willingness to consume insect-based food: An empirical research on italian consumers', *Agricultural Economics (Czech Republic)*, 65(10), pp. 454–462. Available at: https://doi.org/10.17221/87/2019-AGRICECON.

Ibrahimi, Jarchlo, A. and King, L. (2022) *Survey of consumer perceptions of alternative, or novel, sources of protein*. Available at: https://doi.org/10.46756/sci.fsa.ncn554.

Imathiu, S. (2020) 'Benefits and food safety concerns associated with consumption of edible insects', *NFS Journal*, 18(August 2019), pp. 1–11. Available at: https://doi.org/10.1016/j.nfs.2019.11.002.

IPIFF (2022) *Ensuring high standards of animal welfare in insect production*. Available at: https://ipiff.org/wp-content/uploads/2022/11/Insect-welfare-factsheet-final.pdf.

Ismail, I., Hwang, Y.H. and Joo, S.T. (2020) 'Meat analog as future food: A review', *Journal of Animal Science and Technology*. Korean Society of Animal Sciences and Technology, pp. 111–120. Available at: https://doi.org/10.5187/jast.2020.62.2.111.

Jensen, N.H. and Lieberoth, A. (2019a) 'We will eat disgusting foods together – Evidence of the normative basis of Western entomophagy-disgust from an insect tasting', *Food Quality* *and Preference*, 72(October 2017), pp. 109–115. Available at: https://doi.org/10.1016/j.foodqual.2018.08.012.

Jensen, N.H. and Lieberoth, A. (2019b) 'We will eat disgusting foods together – Evidence of the normative basis of Western entomophagy-disgust from an insect tasting', *Food Quality and Preference*, 72(September 2018), pp. 109–115. Available at: https://doi.org/10.1016/j.foodqual.2018.08.012.

Journal, P.S., Sciences, F., Journal, P.S. and Sciences, F. (2021) 'Social demographic factors influencing consumer ' s preferences on rice attributes in indonesia : a multinomial logistic approach', 15(December 2020), pp. 235–244.

Kajale, D.B. and Becker, T.C. (2015) 'Willingness to Pay for Golden Rice in India: A Contingent Valuation Method Analysis', *Journal of Food Products Marketing*, 21(4), pp. 319–336. Available at: https://doi.org/10.1080/10454446.2012.726946.

Kauppi, S.M., Pettersen, I.N. and Boks, C. (2019) 'Consumer acceptance of edible insects and design interventions as adoption strategy', *International Journal of Food Design*, 4(1), pp. 39–62. Available at: https://doi.org/10.1386/ijfd.4.1.39_1.

Khalil, R., Kallas, Z., Haddarah, A., El Omar, F. and Pujolà, M. (2021) 'Impact of COVID-19 pandemic on willingness to consume insect-based food products in Catalonia', *Foods*, 10(4), pp. 1–15. Available at: https://doi.org/10.3390/foods10040805.

Kiger, M.E. and Varpio, L. (2020) 'Thematic analysis of qualitative data: AMEE Guide No. 131', *Medical Teacher*, 42(8), pp. 846–854. Available at: https://doi.org/10.1080/0142159X.2020.1755030.

Kintler, J., Remeňová, K. and Kmety, B. (2022) 'Price sensitivity testing as a basic tool for strategic pricing decisions', *Strategic Management*, XX(00), pp. 30–30. Available at: https://doi.org/10.5937/straman2200028k.

Klink-Lehmann, J. and Langen, N. (2019) 'Illuminating the "animal welfare" consumer via different elicitation techniques', *Meat Science*, 157(May). Available at: https://doi.org/10.1016/j.meatsci.2019.05.032.

Kocabas, S. and Sanlier, N. (2024) 'Exploring the intricacies of food disgust: Unveiling links between gender, healthy eating obsession, and disgust propensity', *Food Quality and Preference*, 113(June 2023), p. 105043. Available at: https://doi.org/10.1016/j.foodqual.2023.105043.

de Koning, W., Dean, D., Vriesekoop, F., Aguiar, L.K., Anderson, M., Mongondry, P., Oppong-Gyamfi, M., Urbano, B., Luciano, C.A.G., Jiang, B., Hao, W., Eastwick, E., Virgil, Z.J. and Boereboom, A. (2020) 'Drivers and inhibitors in the acceptance of meat alternatives: The case of plant and insect-based proteins', *Foods*, 9(9). Available at: https://doi.org/10.3390/foods9091292.

Kornher, L., Schellhorn, M. and Vetter, S. (2019) 'Disgusting or innovative-consumer willingness to pay for insect based burger patties in Germany', *Sustainability (Switzerland)*, 11(7), pp. 1–20. Available at: https://doi.org/10.3390/su11071878.

Kroes, E.P. and Sheldon, R.J. (1988) 'Stated Preference Methods: An Introduction', *Journal of Transport Economics and Policy*, 22(1), pp. 11–25. Available at: https://www.jstor.org/stable/20052832.

Kröger, T., Dupont, J., Büsing, L. and Fiebelkorn, F. (2022) 'Acceptance of Insect-Based Food Products in Western Societies: A Systematic Review', *Frontiers in Nutrition*, 8. Available at: https://doi.org/10.3389/fnut.2021.759885.

L. and Do Tran, A.M.K.G.-T.B.H.H.A.B.A.H.A.S.E.A.-W.C.J.D. (2021) 'Virtual interviews during COVID-19: perspectives of female pelvic medicine and reconstructive surgery program directors', *Female Pelvic Medicine & Reconstructive Surgery*, 27(9), pp. 575–580. Available at: https://doi.org/10.1097/SPV.

Lammers, P., Ullmann, L.M. and Fiebelkorn, F. (2019) 'Acceptance of insects as food in Germany: Is it about sensation seeking, sustainability consciousness, or food disgust?', *Food Quality and Preference*, 77, pp. 78–88. Available at: https://doi.org/10.1016/j.foodqual.2019.05.010.

Laureati, M., Proserpio, C., Jucker, C. and Savoldelli, S. (2016) 'New sustainable protein sources: Consumers' willingness to adopt insects as feed and food', *Italian Journal of Food Science*, 28(4), pp. 652–668.

Lawless, H.T. and Heymann, H. (2010) *Sensory Evaluation of Food Principles and Practices*. Second. New York: Springer. Available at: https://doi.org/10.1007/978-1-4419-6488-5.

Lea, E.J., Crawford, D. and Worsley, A. (2006) 'Public views of the benefits and barriers to the consumption of a plant-based diet', *European Journal of Clinical Nutrition*, 60(7), pp. 828–837. Available at: https://doi.org/10.1038/sj.ejcn.1602387.

Lee, H.J., Yong, H.I., Kim, M., Choi, Y.S. and Jo, C. (2020) 'Status of meat alternatives and their potential role in the future meat market - A review', *Asian-Australasian Journal of Animal Sciences*, 33(10), pp. 1533–1543. Available at: https://doi.org/10.5713/ajas.20.0419.

Lefebvre, A., Bassereau, J.F., Pensé-Lheritier, A.M., Rivère, C., Harris, N. and Duchamp, R. (2010) 'Recruitment and training of a sensory expert panel to measure the touch of beverage packages: Issue and methods employed', *Food Quality and Preference*, 21(1), pp. 156–164. Available at: https://doi.org/10.1016/j.foodqual.2009.08.020.

Lensvelt, E.J.S. and Steenbekkers, L.P.A. (2014) 'Exploring Consumer Acceptance of Entomophagy: A Survey and Experiment in Australia and the Netherlands', *Ecology of Food and Nutrition*, 53(5), pp. 543–561. Available at: https://doi.org/10.1080/03670244.2013.879865.

Lipovetsky, S. (2006) 'Van westendorp price sensitivity in statistical modeling', *International Journal of Operations and Quantitative Management*, 12(2), pp. 141–156.

Liu, A.-J., Li, J. and Gómez, M.I. (2020) 'Factors Influencing Consumption of Edible Insects for Chinese Consumers', *Insects*, 11(1), p. 10. Available at: https://doi.org/10.1007/978-981-10-8992-3.

Lombardi, A., Vecchio, R., Borrello, M., Caracciolo, F. and Cembalo, L. (2019) 'Willingness to pay for insect-based food: The role of information and carrier', *Food Quality and Preference*, 72(July 2018), pp. 177–187. Available at: https://doi.org/10.1016/j.foodqual.2018.10.001.

Looy, H. and Wood, J.R. (2006) 'Attitudes toward invertebrates: Are educational "bug banquets" effective?', *Journal of Environmental Education*, 37(2), pp. 37–48. Available at:

https://doi.org/10.3200/JOEE.37.2.37-48.

Lorenz, A.R., Libarkin, J.C. and Ording, G.J. (2014) ‘Disgust in response to some arthropods aligns with disgust provoked by pathogens’, *Global Ecology and Conservation*, 2, pp. 248–254. Available at: https://doi.org/10.1016/j.gecco.2014.09.012.

Loureiro, M.L., McCluskey, J.J. and Mittelhammer, R.C. (2003) ‘Are stated preferences good predictors of market behavior?’, *Land Economics*, 79(1), pp. 44–55. Available at: https://doi.org/10.2307/3147104.

Lucchese-Cheung, T., Aguiar, L.K. De, Da Silva, R.F.F. and Pereira, M.W. (2020) ‘Determinants of the Intention to Consume Edible Insects in Brazil’, *Journal of Food Products Marketing*, 26(4), pp. 297–316. Available at: https://doi.org/10.1080/10454446.2020.1766626.

Luptak, M. (2021) *A complete guide to van westendorp + how to graph it in Excel*. Available at: https://themaykin.com/blog/a-complete-guide-to-van-westendorp-how-to-graph-it-in-excel (Accessed: 8 July 2023).

MacFie, H. (ed.) (2007) *Consumer-led food product development*. 1st edn. CRC Press.

Makens, J.C. (1965) ‘Effect of brand preference upon consumers perceived taste of turkey meat’, *Journal of Applied Psychology*, 49(4), pp. 261–263. Available at: https://doi.org/10.1037/h0022455.

Malavalli, M.M., Hamid, N., Kantono, K., Liu, Y. and Seyfoddin, A. (2021) ‘Consumers’ perception of in-vitro meat in New Zealand using the theory of planned behaviour model’, *Sustainability (Switzerland)*, 13(13), pp. 1–16. Available at: https://doi.org/10.3390/su13137430.

Malhotra, N.K. (2010) *Marketing research: an applied orientation*. 6th edn. New Jersey: Pearson.

Mancini, S., Moruzzo, R., Riccioli, F. and Paci, G. (2019) ‘European consumers’ readiness to adopt insects as food. A review’, *Food Research International*. Elsevier Ltd, pp. 661–678. Available at: https://doi.org/10.1016/j.foodres.2019.01.041.

Mancini, S., Sogari, G., Menozzi, D., Nuvoloni, R., Torracca, B., Moruzzo, R. and Paci, G. (2019) ‘Factors predicting the intention of eating an insect-based product’, *Foods*, 8(7). Available at: https://doi.org/10.3390/foods8070270.

Maningat, C.C., Jeradechachai, T. and Buttshaw, M.R. (2022) ‘Textured wheat and pea proteins for meat alternative applications’, *Cereal Chemistry*, 99(1), pp. 37–66. Available at: https://doi.org/10.1002/cche.10503.

Marston, J. (2023) *Brief: Ÿnsect raises $175M, cuts 20% of workforce as part of profitability strategy*. Available at: https://agfundernews.com/ynsect-raises-175m- cuts-20-of-workforce-as-part-of-profitability-strategy (Accessed: 17 January 2024).

Martínez-mesa, J., González-chica, D.A., Pereira Duquia, R., Luiz Bastos, J. and Bonamigo3, Rangel, R. (2016) ‘Sampling : how to select participants in my research study ?’, *An Bras Dermatol*, 91(3), pp. 326–330.

Mascarello, G., Pinto, A., Rizzoli, V., Tiozzo, B., Crovato, S. and Ravarotto, L. (2020) ‘Ethnic food consumption in Italy: The role of food neophobia and openness to different cultures’, *Foods*, 9(2), pp. 5–7. Available at: https://doi.org/10.3390/foods9020112.

Mason, J. (2002) *Qualitative Researching*. 2nd edn. London: Sage Publications.

McCarthy, E.J. (1960) *Basic marketing: a managerial approach*. 1st edn. Richard. D. Irwin.

Mcfarlane, T. and Pliner, P. (1997) 'Increasing willingness to taste novel foods: Effects of nutrition and taste information', *Appetite*, 28(3), pp. 227–238. Available at: https://doi.org/10.1006/appe.1996.0075.

McLeod, A. (2011) *World Livestock 2011 Livestock in food security World*, *World*.

Menozzi, D., Sogari, G., Veneziani, M., Simoni, E. and Mora, C. (2017) 'Eating novel foods: An application of the Theory of Planned Behaviour to predict the consumption of an insect-based product', *Food Quality and Preference*, 59, pp. 27–34. Available at: https://doi.org/10.1016/j.foodqual.2017.02.001.

Michel, P. and Begho, T. (2023) 'Paying for sustainable food choices: The role of environmental considerations in consumer valuation of insect-based foods', *Food Quality and Preference*, 106(October 2022), p. 104816. Available at: https://doi.org/10.1016/j.foodqual.2023.104816.

Miglietta, P.P., De Leo, F., Ruberti, M. and Massari, S. (2015) 'Mealworms for food: A water footprint perspective', *Water (Switzerland)*, 7(11), pp. 6190–6203. Available at: https://doi.org/10.3390/w7116190.

Mina, G., Peira, G. and Bonadonna, A. (2023) 'The Potential Future of Insects in the European Food System: A Systematic Review Based on the Consumer Point of View', *Foods*, 12(3). Available at: https://doi.org/10.3390/foods12030646.

Mishyna, M., Chen, J. and Benjamin, O. (2020) 'Sensory attributes of edible insects and insect-based foods – Future outlooks for enhancing consumer appeal', *Trends in Food Science and Technology*, 95(September 2019), pp. 141–148. Available at: https://doi.org/10.1016/j.tifs.2019.11.016.

Modlinska, K., Adamczyk, D. and Goncikowska, K. (2020) 'The Effect of Labelling and Visual Properties on the Acceptance of Foods Containing Insects', *Nutrients*, 12, pp. 1–19.

Mohammed, E.Y. (2012) 'Contingent valuation responses and hypothetical bias: mitigation effects of certainty question, cheap talk, and pledging', *Environmental Economics*, 3(3), pp. 62–71.

Moher, D., Liberati, A., Tetzlaff, J. and Altman, D.G. (2009) 'Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement', *BMJ (Online)*, 339(7716), pp. 332–336. Available at: https://doi.org/10.1136/bmj.b2535.

Moon, W., Balasubramanian, S.K. and Rimal, A. (2007) 'Willingness to pay (WTP) a premium for non-GM foods versus willingness to accept (WTA) a discount for GM foods', *Journal of Agricultural and Resource Economics*, 32(2), pp. 363–382.

Mopendo Mwisomi, E., Luminet, O., Chang, B., Manwanina Kiumba, N. and Schmitz, M. (2023) 'Psychosocial determinants of intentions and behaviour towards edible insects in the South-Western part of the Democratic Republic of Congo', *Cogent Psychology*, 10(1). Available at: https://doi.org/10.1080/23311908.2023.2216053.

Mostafa, M.M. (2016) ‘Egyptian consumers’ willingness to pay for carbon-labeled products: A contingent valuation analysis of socio-economic factors’, *Journal of Cleaner Production*, 135, pp. 821–828. Available at: https://doi.org/10.1016/j.jclepro.2016.06.168.

Motoki, K., Ishikawa, S. ichi, Spence, C. and Velasco, C. (2020) ‘Contextual acceptance of insect-based foods’, *Food Quality and Preference*, 85(May), p. 103982. Available at: https://doi.org/10.1016/j.foodqual.2020.103982.

Muhammad, R., Ibrahim, M.A., Ahmad, R. and Hanan, F. (2016) ‘Psychological Factors on Food Neophobia among the Young Culinarian in Malaysia: Novel Food Preferences’, *Procedia - Social and Behavioral Sciences*, 222, pp. 358–366. Available at: https://doi.org/10.1016/j.sbspro.2016.05.180.

Myers, G. and Pettigrew, S. (2018) ‘A qualitative exploration of the factors underlying seniors’ receptiveness to entomophagy’, *Food Research International*, 103, pp. 163–169. Available at: https://doi.org/10.1016/j.foodres.2017.10.032.

Nakatani, T., Aizaki, H. and Sato, K. (2023) ‘Analyzing dichotomous choice contingent valuation data’. R package version 0.2.0.

Naranjo-Guevara, N., Fanter, M., Conconi, A.M. and Floto-Stammen, S. (2021) ‘Consumer acceptance among Dutch and German students of insects in feed and food’, *Food Science and Nutrition*, 9(1), pp. 414–428. Available at: https://doi.org/10.1002/fsn3.2006.

Neindre, P. Le, Guatteo, R., Guémené, D., Guichet, J., Latouche, K. and Leterrier, C. (2009) ‘Animal pain: identifying and minimising pain in farm animals.’, *Multidisciplinary scientific assessment, Summary of the expert report.* [Preprint], (October 2009).

Ng, M., Chaya, C. and Hort, J. (2013) ‘The influence of sensory and packaging cues on both liking and emotional, abstract and functional conceptualisations’, *Food Quality and Preference*, 29(2), pp. 146–156. Available at: https://doi.org/10.1016/j.foodqual.2013.03.006.

Niva, M. and Vainio, A. (2021) ‘Towards more environmentally sustainable diets? Changes in the consumption of beef and plant- and insect-based protein products in consumer groups in Finland’, *Meat Science*, 182(October 2020), p. 108635. Available at: https://doi.org/10.1016/j.meatsci.2021.108635.

Nyberg, M., Olsson, V. and Wendin, K. (2020) ‘Reasons for eating insects? Responses and reflections among Swedish consumers’, *International Journal of Gastronomy and Food Science*, 22(August), p. 100268. Available at: https://doi.org/10.1016/j.ijgfs.2020.100268.

Oaten, M., Stevenson, R.J. and Case, T.I. (2009) ‘Disgust as a Disease-Avoidance Mechanism’, *Psychological Bulletin*, 135(2), pp. 303–321. Available at: https://doi.org/10.1037/a0014823.

OECD/FAO (2016) *OECD-FAO OECD-FAO Agricultural outlook 2016-2025*. Available at: https://doi.org/https://doi.org/10.1787/agr_outlook-2016-10-en.

OECD/FAO (2020) *OECD-FAO Agricultural Outlook 2020-2029, FAO, Rome/OECD Publishing*. Paric. Available at: https://doi.org/https://doi.org/10.1787/1112c23b-en.

OECD (2018) *Cost-Benefit Analysis and the Environment: Further Developments and Policy Use*, *OECD Publishing, Paris*. Available at: https://doi.org/http://dx.doi.org/10.1787/9789264085169-en.

Okumus, B., Dedeoğlu, B.B. and Shi, F. (2021) 'Gender and generation as antecedents of food neophobia and food neophilia', *Tourism Management Perspectives*, 37(April 2020). Available at: https://doi.org/10.1016/j.tmp.2020.100773.

Olabi, A., Najm, N.E.O., Baghdadi, O.K. and Morton, J.M. (2009) 'Food neophobia levels of Lebanese and American college students', *Food Quality and Preference*, 20(5), pp. 353–362. Available at: https://doi.org/10.1016/j.foodqual.2009.01.005.

Olsen, R.L. and Hasan, M.R. (2012) 'A limited supply of fishmeal: Impact on future increases in global aquaculture production', *Trends in Food Science and Technology*, 27(2), pp. 120–128. Available at: https://doi.org/10.1016/j.tifs.2012.06.003.

Olum, S., Wesana, J., Mawadri, J., Nakiranda, J.K. and Odongo, W. (2020) 'Insects as food: Illuminating the food neophobia and socio-cultural dynamics of insect consumption in Uganda', *International Journal of Tropical Insect Science* [Preprint]. Available at: https://doi.org/10.1007/s42690-020-00309-2.

Onwezen, M.C., Bouwman, E.P., Reinders, M.J. and Dagevos, H. (2021) 'A Systematic Review on Consumer Acceptance of Alternative Proteins: Pulses, Algae, Insects, Plant-based Meat Alternatives, and Cultured Meat', *Appetite*, 159, p. 105058. Available at: https://doi.org/10.1016/j.appet.2020.105058.

Onwezen, M.C., van den Puttelaar, J., Verain, M.C.D. and Veldkamp, T. (2019) 'Consumer acceptance of insects as food and feed: The relevance of affective factors', *Food Quality and Preference*, 77(April), pp. 51–63. Available at: https://doi.org/10.1016/j.foodqual.2019.04.011.

Oonincx, D.G.A.B. and de Boer, I.J.M. (2012) 'Environmental Impact of the Production of Mealworms as a Protein Source for Humans - A Life Cycle Assessment', *PLoS ONE*, 7(12), p. 51145. Available at: https://doi.org/10.1371/journal.pone.0051145.

Orkusz, A. (2021) 'Edible insects versus meat—nutritional comparison: Knowledge of their composition is the key to good health', *Nutrients*, 13(4). Available at: https://doi.org/10.3390/nu13041207.

Orkusz, A., Wolańska, W., Harasym, J., Piwowar, A. and Kapelko, M. (2020) 'Consumers' attitudes facing entomophagy: Polish case perspectives', *International Journal of Environmental Research and Public Health*, 17(7), pp. 1–15. Available at: https://doi.org/10.3390/ijerph17072427.

Orsi, L., Voege, L.L. and Stranieri, S. (2019) 'Eating edible insects as sustainable food? Exploring the determinants of consumer acceptance in Germany', *Food Research International*, 125(April), p. 108573. Available at: https://doi.org/10.1016/j.foodres.2019.108573.

P. F. Guiné, R., C. D. Ramalhosa, E. and Paula Valente, L. (2016) 'New Foods, New Consumers: Innovation in Food Product Development', *Current Nutrition & Food Science*, 12(3), pp. 175–189. Available at: https://doi.org/10.2174/1573401312666160608120727.

Palmieri, N., Perito, M.A., Macrì, M.C. and Lupi, C. (2019) 'Exploring consumers' willingness to eat insects in Italy', *British Food Journal*, 121(11), pp. 2937–2950. Available at: https://doi.org/10.1108/BFJ-03-2019-0170.

Pambo, K.O., Mbeche, R.M., Okello, J.J., Kinyuru, J.N. and Mose, G.N. (2016) 'Consumers' salient beliefs regarding foods from edible insects in Kenya: A qualitative study using concepts from the theory of planned behaviour', *African Journal of Food, Agriculture, Nutrition and Development*, 16(4), pp. 11366–11385. Available at: https://doi.org/10.18697/ajfand.76.16810.

Pambo, K.O., Mbeche, R.M., Okello, J.J., Mose, G.N. and Kinyuru, J.N. (2018) 'Intentions to consume foods from edible insects and the prospects for transforming the ubiquitous biomass into food', *Agriculture and Human Values*, 35(4), pp. 885–898. Available at: https://doi.org/10.1007/s10460-018-9881-5.

Pambo, K.O., Okello, J.J., Mbeche, R.M. and Kinyuru, J.N. (2017) 'Exploring the Influence of Differentiated Nutrition Information on Consumers' Mental Models Regarding Foods from Edible Insects: A Means-End Chain Analysis', *Ecology of Food and Nutrition*, 56(6), pp. 530–551. Available at: https://doi.org/10.1080/03670244.2017.1392944.

Pascucci, S. and De-Magistris, T. (2013) *Information bias condemning radical food innovators? The case of insect-based products in the Netherlands*, *International Food and Agribusiness Management Review*.

Patton, M. (2002) *Qualitative research evaluation methods*. 3rd edn. London: Sage Publications.

Pavlou, P.A. and Fygenson, M. (2006) 'Understanding and predicting electronic commerce adoption: An extension of the theory of planned behavior', *MIS Quarterly: Management Information Systems*, 30(1), pp. 115–143. Available at: https://doi.org/10.2307/25148720.

Payne, C.L.R. (2015) 'Wild harvesting declines as pesticides and imports rise: The collection and consumption of insects in contemporary rural Japan', *Journal of Insects as Food and Feed*, 1(1), pp. 57–65. Available at: https://doi.org/10.3920/JIFF2014.0004.

Pearce, D., O¨ zdemiroglu, E., Bateman, I.J., Carson, R.T., Day, B., Hanemann, M., Hanley, N., Hett, T., Jones-Lee, M. and Loomes, G. (2002) *Economic Valuation with Stated Preference Techniques*, *Ecological Economics*. Edward Elgar Publishing. Available at: https://doi.org/10.4337/9781781009727.

Pelchat, M.L. and Pliner, P. (1995) '"Try it. You'll like it". Effects of information on willingness to try novel foods', *Appetite*, 24(2), pp. 153–165. Available at: https://doi.org/10.1016/S0195-6663(95)99373-8.

Perni, Á., Barreiro-Hurlé, J. and Martínez-Paz, J.M. (2021) 'Contingent valuation estimates for environmental goods: Validity and reliability', *Ecological Economics*, 189(June). Available at: https://doi.org/10.1016/j.ecolecon.2021.107144.

Petersen, M., Olson, O. and Rao, S. (2020) 'University student perspectives of entomophagy: Positive attitudes lead to observability and education opportunities', *Journal of Insect Science*, 20(5), pp. 1–6. Available at: https://doi.org/10.1093/jisesa/ieaa120.

Petrescu-Mag, R.M., Rastegari Kopaei, H. and Petrescu, D.C. (2022) 'Consumers' acceptance of the first novel insect food approved in the European Union: Predictors of yellow mealworm chips consumption', *Food Science and Nutrition*, 10(3), pp. 846–862. Available at: https://doi.org/10.1002/fsn3.2716.

Piha, S., Pohjanheimo, T., Lähteenmäki-Uutela, A., Křečková, Z. and Otterbring, T. (2018) 'The effects of consumer knowledge on the willingness to buy insect food: An exploratory cross-regional study in Northern and Central Europe', *Food Quality and Preference*, 70, pp. 1–10. Available at: https://doi.org/10.1016/j.foodqual.2016.12.006.

Pliner, P. and Hobden, K. (1992) 'Development of a scale to measure the trait of food neophobia in humans', *Appetite*, 19(2), pp. 105–120. Available at: https://doi.org/10.1016/0195-6663(92)90014-W.

Poortvliet, P.M., Van der Pas, L., Mulder, B.C. and Fogliano, V. (2019) 'Healthy, but Disgusting: An Investigation into Consumers' Willingness to Try Insect Meat', *Journal of Economic Entomology*, 112(3), pp. 1005–1010. Available at: https://doi.org/10.1093/jee/toz043.

Pourmand, G., Doshmangir, L., Ahmadi, A., Noori, M., Rezaeifar, A., Mashhadi, R., Aziminia, R., Pourmand, A. and Gordeev, V.S. (2020) 'An application of the theory of planned behavior to self-care in patients with hypertension', *BMC Public Health*, 20(1), pp. 1–8. Available at: https://doi.org/10.1186/s12889-020-09385-y.

Powell, P.A., Jones, C.R. and Consedine, N.S. (2019) 'It's not queasy being green: The role of disgust in willingness-to-pay for more sustainable product alternatives', *Food Quality and Preference*, 78(July), p. 103737. Available at: https://doi.org/10.1016/j.foodqual.2019.103737.

Pramudya, R.C. and Seo, H.S. (2019) 'Hand-feel touch cues and their influences on consumer perception and behavior with respect to food products: A review', *Foods*, 8(7). Available at: https://doi.org/10.3390/foods8070259.

Puteri, B., Jahnke, B. and Zander, K. (2023) 'Booming the bugs: How can marketing help increase consumer acceptance of insect-based food in Western countries?', *Appetite*, 187(March). Available at: https://doi.org/10.1016/j.appet.2023.106594.

Quang Tran, H., Van Doan, H. and Stejskal, V. (2022) 'Environmental consequences of using insect meal as an ingredient in aquafeeds: A systematic view', *Reviews in Aquaculture*, 14(1), pp. 237–251. Available at: https://doi.org/10.1111/raq.12595.

Raheem, D., Carrascosa, C., Oluwole, O.B., Nieuwland, M., Saraiva, A., Millán, R. and Raposo, A. (2019) 'Traditional consumption of and rearing edible insects in Africa, Asia and Europe', *Critical Reviews in Food Science and Nutrition*, 59(14), pp. 2169–2188. Available at: https://doi.org/10.1080/10408398.2018.1440191.

Ramos-Elorduy, J. and Pino Moreno, J.M. (2002) 'Edible insects of Chiapas, Mexico', *Ecology of Food and Nutrition*, 41(4), pp. 271–299. Available at: https://doi.org/10.1080/03670240214081.

Reverberi, M. (2021) 'The new packaged food products containing insects as an ingredient', *Journal of Insects as Food and Feed*, 7(5), pp. 901–908. Available at: https://doi.org/10.3920/JIFF2020.0111.

Richardson, P.S., Dick, A.S. and Jain, A.K. (1994) 'Extrinsic and Intrinsic Cue Effects on Perceptions of Store Brand Quality', *Journal of Marketing*, 58(4), p. 28. Available at: https://doi.org/10.2307/1251914.

Ritchie, J. and Lewis, J. (2003) *Qualitative research practice a guide for social science students and researchers*. 1st edn. London: SAGE Publications Ltd.

Rohrmann, S., Hopp, H. and Quirin, M. (2008) 'Gender differences in psychophysiological responses to disgust', *Journal of Psychophysiology*, 22(2), pp. 65–75. Available at: https://doi.org/10.1027/0269-8803.22.2.65.

Rojas-Downing, M.M., Nejadhashemi, A.P., Harrigan, T. and Woznicki, S.A. (2017) 'Climate change and livestock: Impacts, adaptation, and mitigation', *Climate Risk Management*, 16, pp. 145–163. Available at: https://doi.org/10.1016/j.crm.2017.02.001.

Roll, O., Achterberg, L.-H. and Herbert, K.-G. (2010) *Innovative approaches to analyzing the Price Sensitivity Meter: Results of an international comparative study*, *Laurea Publications A• 72*.

Roma, R., Palmisano, G.O. and De Boni, A. (2020) 'Insects as novel food: A consumer attitude analysis through the dominance-based rough set approach', *Foods*, 9(4), pp. 1–19. Available at: https://doi.org/10.3390/foods9040387.

Rosenfeld, D.L. and Tomiyama, A.J. (2022) 'Would you eat a burger made in a petri dish? Why people feel disgusted by cultured meat', *Journal of Environmental Psychology*, 80(December 2021), p. 101758. Available at: https://doi.org/10.1016/j.jenvp.2022.101758.

Rozin, P. and Fallon, A. (1980) 'The psychological categorization of foods and non-foods: A preliminary taxonomy of food rejections', *Appetite*, 1(3), pp. 193–201. Available at: https://doi.org/10.1016/S0195-6663(80)80027-4.

Rozin, P. and Fallon, A.E. (1987) 'A Perspective on Disgust', *Psychological Review*, 94(1), pp. 23–41. Available at: https://doi.org/10.1037/0033-295X.94.1.23.

Ruby, M.B. and Rozin, P. (2019) 'Disgust, sushi consumption, and other predictors of acceptance of insects as food by Americans and Indians', *Food Quality and Preference*, 74(January), pp. 155–162. Available at: https://doi.org/10.1016/j.foodqual.2019.01.013.

Ruby, M.B., Rozin, P. and Chan, C. (2015) 'Determinants of willingness to eat insects in the USA and India', *Journal of Insects as Food and Feed*, 1(3), pp. 215–225. Available at: https://doi.org/10.3920/JIFF2015.0029.

Rumpold, B.A. and Langen, N. (2019) 'Potential of enhancing consumer acceptance of edible insects via information', *Journal of Insects as Food and Feed*, 5(1), pp. 45–53. Available at: https://doi.org/10.3920/JIFF2018.0041.

Rumpold, B.A. and Schlüter, O.K. (2013) 'Nutritional composition and safety aspects of edible insects', *Molecular Nutrition and Food Research*, 57(5), pp. 802–823. Available at: https://doi.org/10.1002/mnfr.201200735.

Russell, P.S. and Knott, G. (2021) 'Encouraging sustainable insect-based diets: The role of disgust, social influence, and moral concern in insect consumption', *Food Quality and Preference*, 92(January), pp. 1–9. Available at: https://doi.org/10.1016/j.foodqual.2021.104187.

Sahrin, S., Banna, M.H. Al, Rifat, M.A., Tetteh, J.K., Ara, T., Hamiduzzaman, M., Spence, C., Kundu, S., Abid, M.T., Hasan, M.M.M., Akter, N., Biswas, A. and Jharna, D.E. (2023) 'Food neophobia and its association with sociodemographic factors and food preferences among Bangladeshi university students: Evidence from a cross-sectional study', *Heliyon*, 9(5), p. e15831. Available at: https://doi.org/10.1016/j.heliyon.2023.e15831.

Sarstedt, M., Ringle, C. and Hair, J.F. (2021) 'Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R', in *Handbook of market research*. Cham: Springer

International Publishing, pp. 587–632.

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H. and Jinks, C. (2018) ‘Saturation in qualitative research: exploring its conceptualization and operationalization’, *Quality and Quantity*, 52(4), pp. 1893–1907. Available at: https://doi.org/10.1007/s11135-017-0574-8.

Schäufele, I., Barrera Albores, E. and Hamm, U. (2019) ‘The role of species for the acceptance of edible insects: evidence from a consumer survey’, *British Food Journal*, 121(9), pp. 2190–2204. Available at: https://doi.org/10.1108/BFJ-01-2019-0017.

Schlup, Y. and Brunner, T. (2018) ‘Prospects for insects as food in Switzerland: A tobit regression’, *Food Quality and Preference*, 64, pp. 37–46. Available at: https://doi.org/10.1016/j.foodqual.2017.10.010.

Schösler, H., Boer, J. de and Boersema, J.J. (2012) ‘Can we cut out the meat of the dish? Constructing consumer-oriented pathways towards meat substitution’, *Appetite*, 58(1), pp. 39–47. Available at: https://doi.org/10.1016/j.appet.2011.09.009.

Schouteten, J.J., De Steur, H., De Pelsmaeker, S., Lagast, S., Juvinal, J.G., De Bourdeaudhuij, I., Verbeke, W. and Gellynck, X. (2016) ‘Emotional and sensory profiling of insect-, plant- and meat-based burgers under blind, expected and informed conditions’, *Food Quality and Preference*, 52, pp. 27–31. Available at: https://doi.org/10.1016/j.foodqual.2016.03.011.

Schwartz, B. (2020) ‘The animal welfare battle: the production of affected ignorance in the Swedish meat industry debate’, *Culture and Organization*, 26(1), pp. 75–95. Available at: https://doi.org/10.1080/14759551.2018.1513937.

Séré, A., Bougma, A., Ouilly, J.T., Traoré, M., Sangaré, H., Lykke, A.M., Ouédraogo, A., Gnankiné, O. and Bassolé, I.H.N. (2018) ‘Traditional knowledge regarding edible insects in Burkina Faso’, *Journal of Ethnobiology and Ethnomedicine*, 14(1), pp. 1–11. Available at: https://doi.org/10.1186/s13002-018-0258-z.

Shabbir, T. (1993) ‘Multinomial Logit Model of Occupational Choice: A Latent Variable Approach’, *The Pakistan Development Review*, 32(4II), pp. 687–698. Available at: https://doi.org/10.30541/v32i4iipp.687-698.

Sheppard, B. and Frazer, P. (2014) ‘Insect disgust : comparing influence types, gender differences and the relationships with right-wing authoritarianism and age’, *Dublin Business School* [Preprint], (March). Available at: https://esource.dbs.ie/handle/10788/1964.

Sheppard, B. and Frazer, P. (2015) ‘Comparing Social and Intellectual Appeals to Reduce Disgust of Eating Crickets’, *Studies in Arts and Humanities*, 1(2), pp. 4–23. Available at: https://doi.org/10.18193/sah.v1i2.29.

Si, H., Shi, J.G., Tang, D., Wen, S., Miao, W. and Duan, K. (2019) ‘Application of the theory of planned behavior in environmental science: a comprehensive bibliometric analysis’, *International Journal of Environmental Research and Public Health*, 16(15). Available at: https://doi.org/10.3390/ijerph16152788.

Siddiqui, S.A., Alvi, T., Sameen, A., Khan, S., Blinov, A.V., Nagdalian, A.A., Mehdizadeh, M., Adli, D.N. and Onwezen, M. (2022) ‘Consumer Acceptance of Alternative Proteins: A Systematic Review of Current Alternative Protein Sources and Interventions Adapted to

Increase Their Acceptability', *Sustainability (Switzerland)*, 14(22). Available at: https://doi.org/10.3390/su142215370.

Siegrist, M. (2008) 'Factors influencing public acceptance of innovative food technologies and products', *Trends in Food Science and Technology*, 19(11), pp. 603–608. Available at: https://doi.org/10.1016/j.tifs.2008.01.017.

Siegrist, M., Hartmann, C. and Keller, C. (2013) 'Antecedents of food neophobia and its association with eating behavior and food choices', *Food Quality and Preference*, 30(2), pp. 293–298. Available at: https://doi.org/10.1016/j.foodqual.2013.06.013.

Simion, V.E., Bucea-Manea, R.Ţ., Adriana, A., Dourado Martins, O.M., Sekovska, B. and Dijmărescu, I. (2019) 'Entomofagy - a viable solution for supporting food security', *Amfiteatru Economic*, 21(51), pp. 462–479. Available at: https://doi.org/10.24818/EA/2019/51/462.

Smith, S.A. and Duncan, A.A. (2022) 'Systematic and scoping reviews: A comparison and overview', *Seminars in Vascular Surgery*, 35(4), pp. 464–469. Available at: https://doi.org/10.1053/j.semvascsurg.2022.09.001.

Smithson, J. (2007) *Using focus groups in social research. In the Sage Handbook of Social Research Methods*, *The Sage Handbook of Social Research Methods*. Edited by & J.B. In P. Alasuurtari, L. Bickman. Sage.

So, Y. and Kuhfeld, W.F. (1995) 'Multinomial Logit Models Ying So', in *SUGI 20 conference proceedings*, pp. 665–680.

Sogari, G. (2015) 'Entomophagy and Italian consumers: An exploratory analysis', *Progress in Nutrition*, 17(4), pp. 311–316.

Sogari, G., Bogueva, D. and Marinova, D. (2019) 'Australian consumers' response to insects as food', *Agriculture (Switzerland)*, 9(5), pp. 1–15. Available at: https://doi.org/10.3390/agriculture9050108.

Sogari, G., Menozzi, D. and Mora, C. (2017) 'Exploring young foodies' knowledge and attitude regarding entomophagy: A qualitative study in Italy', *International Journal of Gastronomy and Food Science*, 7, pp. 16–19. Available at: https://doi.org/10.1016/j.ijgfs.2016.12.002.

Sogari, G., Menozzi, D. and Mora, C. (2018) 'Sensory-liking expectations and perceptions of processed and unprocessed insect products', *International Journal on Food System Dynamics*, 9(4), pp. 314–320. Available at: https://doi.org/10.18461/ijfsd.v9i4.942.

Sogari, G., Menozzi, D. and Mora, C. (2019) 'The food neophobia scale and young adults' intention to eat insect products', *International Journal of Consumer Studies*, 43(1), pp. 68–76. Available at: https://doi.org/10.1111/ijcs.12485.

Soohyun, C.H.O., Park, B., Ngapo, T., Jinhyoung, K.I.M., Dransfield, E., Hwang, I. and Jongmoon, L.E.E. (2007) 'Effect of meat appearance on south korean consumers' choice of pork chops determined by image methodology', *Journal of Sensory Studies*, 22(1), pp. 99–114. Available at: https://doi.org/10.1111/j.1745-459X.2007.00098.x.

Steenkamp, J.-B.E.M. (1990) 'Conceptual Model of the Quality Formation Process', *Journal of Business Research*, 21, pp. 309–333.

Steenkamp, J.B.E.M. and Van Trijp, H.C.M. (1996) ‘Quality guidance: A consumer-based approach to food quality improvement using partial least squares’, *European Review of Agricultural Economics*, 23(2), pp. 195–215. Available at: https://doi.org/10.1093/erae/23.2.195.

Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M. and de Haan, C. (2006) *Livestock’s long shadow: environmental issues and options*, *Food and Agriculture Organization of the United Nations (FAO)*. Rome. Available at: https://doi.org/https://www.fao.org/3/a0701e/a0701e.pdf.

Stenbacka, C. (2001) ‘Qualitative research requires quality concepts of its own’, *Management Decision*, 39(7), pp. 551–556. Available at: https://doi.org/10.1108/EUM0000000005801.

Stollar, M., Rumble, J.N., Buck, E.B., Specht, A.R., Hu, W. and Knipe, C.L. (2022) ‘Consumers’ Purchasing Intent Regarding Conventional, Plant-Based, and Cultured Meats’, *Journal of Applied Communications*, 106(1). Available at: https://doi.org/10.4148/1051-0834.2407.

Swallow, S.K., Opaluch, J.J. and Weaver, T.F. (2001) ‘Strength-of-preference indicators and an ordered-response model for ordinarily dichotomous, discrete choice data’, *Journal of Environmental Economics and Management*, 41(1), pp. 70–93. Available at: https://doi.org/10.1006/jeem.2000.1125.

Symmank, C. (2019) ‘Extrinsic and intrinsic food product attributes in consumer and sensory research: literature review and quantification of the findings’, *Management Review Quarterly*, 69(1), pp. 39–74. Available at: https://doi.org/10.1007/s11301-018-0146-6.

Szakály, Z., Kovács, B., Soós, M., Kiss, M. and Balsa-Budai, N. (2021) ‘Adaptation and validation of the food neophobia scale: The case of hungary’, *Foods*, 10(8). Available at: https://doi.org/10.3390/foods10081766.

Szendrő, K., Tóth, K. and Nagy, M.Z. (2020) ‘Opinions on Insect Consumption in Hungary’, *Foods*, 9(12), p. 1829. Available at: https://doi.org/10.3390/foods9121829.

Tan, H.S.G., Fischer, A.R.H., Tinchan, P., Stieger, M., Steenbekkers, L.P.A. and van Trijp, H.C.M. (2015) ‘Insects as food: Exploring cultural exposure and individual experience as determinants of acceptance’, *Food Quality and Preference*, 42, pp. 78–89. Available at: https://doi.org/10.1016/j.foodqual.2015.01.013.

Tan, H.S.G., Fischer, A.R.H., van Trijp, H.C.M. and Stieger, M. (2016) ‘Tasty but nasty? Exploring the role of sensory-liking and food appropriateness in the willingness to eat unusual novel foods like insects’, *Food Quality and Preference*, 48, pp. 293–302. Available at: https://doi.org/10.1016/j.foodqual.2015.11.001.

Tan, H.S.G., Tibboel, C.J. and Stieger, M. (2017) ‘Why do unusual novel foods like insects lack sensory appeal? Investigating the underlying sensory perceptions’, *Food Quality and Preference*, 60(March), pp. 48–58. Available at: https://doi.org/10.1016/j.foodqual.2017.03.012.

Tan, H.S.G., Verbaan, Y.T. and Stieger, M. (2017) ‘How will better products improve the sensory-liking and willingness to buy insect-based foods?’, *Food Research International*, 92, pp. 95–105. Available at: https://doi.org/10.1016/j.foodres.2016.12.021.

Tao, J. and Li, Y.O. (2018a) ‘Edible insects as a means to address global malnutrition and food insecurity issues', *Food Quality and Safety*, 2(1), pp. 17–26. Available at: https://doi.org/10.1093/fqsafe/fyy001.

Tao, J. and Li, Y.O. (2018b) 'Edible insects as a means to address global malnutrition and food insecurity issues', *Food Quality and Safety*, 2(1), pp. 17–26. Available at: https://doi.org/10.1093/fqsafe/fyy001.

Thaler, R.H. and Sunstein, C.R. (2021) *Nudge: Improving decisions about health, Wealth, happiness*. New Haven & London: Yale University Press.

the Good Food Institute (2022) 'State of Global Policy'.

Van Thielen, L., Vermuyten, S., Storms, B., Rumpold, B. and Van Campenhout, L. (2019) 'Consumer acceptance of foods containing edible insects in Belgium two years after their introduction to the market', *Journal of Insects as Food and Feed*, 5(1), pp. 35–44. Available at: https://doi.org/10.3920/JIFF2017.0075.

Thu Thu Aung, M., Dürr, J., Klink-Lehmann, J. and Borgemeister, C. (2023) 'Predicting consumers' intention towards entomophagy using an extended theory of planned behavior: evidence from Myanmar', *International Journal of Tropical Insect Science*, 43(4), pp. 1189–1206. Available at: https://doi.org/10.1007/s42690-023-01016-4.

Tuccillo, F., Marino, M.G. and Torri, L. (2020) 'Italian consumers' attitudes towards entomophagy: Influence of human factors and properties of insects and insect-based food', *Food Research International*, 137(August), p. 109619. Available at: https://doi.org/10.1016/j.foodres.2020.109619.

United Nations (2019) *World population prospects 2019*, *Department of Economic and Social Affairs. World Population Prospects 2019.* New York. Available at: http://www.ncbi.nlm.nih.gov/pubmed/12283219.

Upton, M. (2004) *The role of livestock in economic development and poverty reduction*, *PPLPI Working paper N^{o} 10*. Rome, Italy. Available at: https://www.fao.org/3/bp224e/bp224e.pdf.

Vanhonacker, F., Van Loo, E.J., Gellynck, X. and Verbeke, W. (2013) 'Flemish consumer attitudes towards more sustainable food choices', *Appetite*, 62, pp. 7–16. Available at: https://doi.org/10.1016/j.appet.2012.11.003.

Vartiainen, O., Elorinne, A.L., Niva, M. and Väisänen, P. (2020) 'Finnish Consumers' Intentions to Consume Insect-Based Foods', *Journal of Insects as Food and Feed*, 6(3), pp. 261–272. Available at: https://doi.org/10.3920/jiff2019.0042.

Venkatachalam, L. (2004) 'The contingent valuation method: A review', *Environmental Impact Assessment Review*, 24(1), pp. 89–124. Available at: https://doi.org/10.1016/S0195-9255(03)00138-0.

Verbeke, W. (2015) 'Profiling consumers who are ready to adopt insects as a meat substitute in a Western society', *Food Quality and Preference*, 39, pp. 147–155. Available at: https://doi.org/10.1016/j.foodqual.2014.07.008.

Verbeke, W., Hung, Y., Baum, C.M. and De Steur, H. (2021) 'The power of initial perceived barriers versus motives shaping consumers' willingness to eat cultured meat as a substitute for conventional meat', *Livestock Science*, 253(June), p. 104705. Available at: https://doi.org/10.1016/j.livsci.2021.104705.

Verbeke, W., Spranghers, T., De Clercq, P., De Smet, S., Sas, B. and Eeckhout, M. (2015) 'Insects in animal feed: Acceptance and its determinants among farmers, agriculture sector stakeholders and citizens', *Animal Feed Science and Technology*, 204, pp. 72–87. Available at: https://doi.org/10.1016/j.anifeedsci.2015.04.001.

Verma, A.K., Kumar, S., Das, M. and Dwivedi, P.D. (2013) 'A comprehensive review of legume allergy', *Clinical Reviews in Allergy and Immunology*, 45(1), pp. 30–46. Available at: https://doi.org/10.1007/s12016-012-8310-6.

Verneau, F., Barbera, F. La, Amato, M., Riverso, R. and Grunert, K.G. (2020) 'Assessing the role of food related lifestyle in predicting intention towards edible insects', *Insects*, 11(10), pp. 1–12. Available at: https://doi.org/10.3390/insects11100660.

Verneau, F., La Barbera, F., Kolle, S., Amato, M., Del Giudice, T. and Grunert, K. (2016) 'The effect of communication and implicit associations on consuming insects: An experiment in Denmark and Italy', *Appetite*, 106, pp. 30–36. Available at: https://doi.org/10.1016/j.appet.2016.02.006.

Viana, M.M., dos Santos Silva, V.L. and Trindade, M.A. (2014) 'Consumers' perception of beef burgers with different healthy attributes', *Lwt*, 59(2P2), pp. 1227–1232. Available at: https://doi.org/10.1016/j.lwt.2014.05.009.

Videbæk, P.N. and Grunert, K.G. (2020) 'Disgusting or delicious? Examining attitudinal ambivalence towards entomophagy among Danish consumers', *Food Quality and Preference*, 83(November), p. 103913. Available at: https://doi.org/10.1016/j.foodqual.2020.103913.

Waltz, C.F., Strickland, L.O. and Lenz, E.R. (2010) *Measurement in Nursing and Health Research, Fourth Edition*. 4th edn, *Angewandte Chemie International Edition, 6(11), 951–952.* 4th edn. New York: Springer publishing company.

WCRF/AICR (2007) *Food, Nutrition, Physical Activity, and the Prevention of Cancer_a Global Perspective*.

Weinrich, R. and Gassler, B. (2021) 'Beyond classical van Westendorp: Assessing price sensitivity for variants of algae-based meat substitutes', *Journal of Retailing and Consumer Services*, 63(July), p. 102719. Available at: https://doi.org/10.1016/j.jretconser.2021.102719.

Wendin, K.M. and Nyberg, M.E. (2021) 'Factors influencing consumer perception and acceptability of insect-based foods', *Current Opinion in Food Science*, 40, pp. 67–71. Available at: https://doi.org/10.1016/j.cofs.2021.01.007.

Van Westendorp, P. (1976) 'A New Approach to Study Consumer Perception of Price | Research World', *Proceedings of the 29th ESOMAR Congress*, pp. 139–167. Available at: https://archive.researchworld.com/a-new-approach-to-study-consumer-perception-of-price/.

Westhoek, H., Rood, T., van den Berg, M., Janse, J., Nijdam, D., Reudink, M. and Stehfest, E. (2011) *The Protein Puzzle*. The Hague: PBL, Netherlands Environmental Assessment Agency. Available at: http://www.pbl.nl/sites/default/files/cms/publicaties/Protein_Puzzle_web_1.pdf.

Wilkinson, K., Muhlhausler, B., Motley, C., Crump, A., Bray, H. and Ankeny, R. (2018)

‘Australian consumers’ awareness and acceptance of insects as food’, *Insects*, 9(2), pp. 1–11. Available at: https://doi.org/10.3390/insects9020044.

Williams, N.M. (2008) ‘Affected ignorance and animal suffering: Why our failure to debate factory farming puts us at moral risk’, *Journal of Agricultural and Environmental Ethics*, 21(4), pp. 371–384. Available at: https://doi.org/10.1007/s10806-008-9087-8.

Woolf, E., Zhu, Y., Emory, K., Zhao, J. and Liu, C. (2019) ‘Willingness to consume insect-containing foods: A survey in the United States’, *LWT*, 102, pp. 100–105. Available at: https://doi.org/10.1016/j.lwt.2018.12.010.

Yen, A.L. (2009) ‘Edible insects: Traditional knowledge or western phobia?’, *Entomological Research*, 39(5), pp. 289–298. Available at: https://doi.org/10.1111/j.1748-5967.2009.00239.x.

Yuliarti, O., Kiat Kovis, T.J. and Yi, N.J. (2021) ‘Structuring the meat analogue by using plant-based derived composites’, *Journal of Food Engineering*, 288(May 2020), p. 110138. Available at: https://doi.org/10.1016/j.jfoodeng.2020.110138.

Zhang, C. and Conrad, F.G. (2014) ‘Speeding in web surveys: The tendency to answer very fast and its association with straightlining’, *Survey Research Methods*, 8(2), pp. 127–135. Available at: https://doi.org/10.18148/srm/2014.v8i2.5453.

Zhang, M., Li, L. and Bai, J. (2020) ‘Consumer acceptance of cultured meat in urban areas of three cities in China’, *Food Control*, 118(May), p. 107390. Available at: https://doi.org/10.1016/j.foodcont.2020.107390.

Appendices

Appendix 1: Systematic review

Appendix 1.1: The characteristics of the samples and the main factors of the reviewed articles

Authors	Country	Sample size: female; mean age (age range)	The technique (year)	Main factors
1. Alemu *et al.* (2017)	Kenya	611: 51%; 40.02 (18-85)	Choice experiment (Dec 2014-Jan2015)	Preferences for nutritional value and food safety information, recommendations by officials, shopping places
2. Ardoin and Prinyawiwatkul (2020)	US	1005: 68.4%; ns (over 18)	Online survey (ns)	Product appropriateness, unfamiliarity with insects as food
3. Balzan *et al.* (2016)	Italy	32: 65.6%; 24.5 (20-35)	5 focus groups (ns)	The form in which the products are presented, lack of practice in preparation
4. Barsics *et al.*(2017)	Belgium	135: 23%; 19.4 (17-25)	Experiment (ns)	The information session about entomophagy (encompassing ecological, health, and gastronomic aspects of entomophagy)
5. Bartkowicz and Babicz-Zielińska (2020)	Poland	101: 73%; ns (ns)	Experiment (ns)	Visibility of insects, the colour of the ground crickets in the bars
6. Barton, Richardson and McSweeney(2020)	Canada	Survey 107: 57%; ns (19-69) Experiment 102: 58.8%; ns (19-69)	Survey Experiment (ns)	Tasting session

Authors	Country	Sample size: female; mean age (age range)	The technique (year)	Main factors
7. Berger *et al.* (2018)	Germany	Total 240 **S1** 80: 40%; 22.61 (ns) **S2** 160: 40%; 23.3 (ns)	Experiments (ns)	Price and expected quality
8. Berger *et al.* (2019)	Switzerland and Germany	**S1** 120: 50%; ns (ns) **S2** 90: 45%; 21.39 (ns)	Experiments (ns)	Peer and expert rating of insect food
9. Brunner and Nuttavuthisit (2019)	Switzerland and Thailand	Total 1042 Switzerland 542: 56%; 54 (ns) Thailand 500: 54%; 44 (ns)	Questionnaire (ns)	The level of education and food neophobia
10. Caparros Megido *et al.* (2014)	Belgium	189: 44.4%; ns (<13 ≥ 45)	Experiment (ns)	The texture, types of meal
11. Caparros Megido *et al.* (2016)	Belgium	79: 56%; ns (18-25)	Experiment (2014)	Gender, previous knowledge of entomophagy and previous experience
12. Castro and Chambers (2019)	USA, England, Mexico, India, Japan, China, Russia, Spain, South Africa, Australia, Brazil, Peru, Thailand	Total 7560: ns; ns (18 to more than 55)	Online survey (ns)	The appearance of insects' body parts, the idea is disgusting
13. Cavallo and Materia (2018)	Italy	135: 46%; ns (18-35)	Experiment (ns)	Visibility of the insect's shape, high-protein claim
14. Chang, Ma and Chen (2019)	Taiwan	316: 41.1%; ns (31-50)	Survey (ns)	Consumers' attitudes, perceived behavioural control, food neophobia
15. Cicatiello *et al.* (2016)	Italy	201: 55%; 43 (14-78)	Survey (2015)	Familiarity with food from a foreign cousin, gender, education

Authors	Country	Sample size: female; mean age (age range)	The technique (year)	Main factors
16. Cicatiello, Vitali and Lacetera (2020)	Italy	62:47%: 24 (18-35)	Experiment (ns)	The importance of the taste of food, familiarity with foreign food, gender, education
17. Circus and Robison (2019)	UK	Interviews 7: (sociodemographic not collected) Survey: number not reported (sociodemographic not collected)	Interviews and an online survey (ns)	Disgust, environmental friendliness
18. (Clarkson, Mirosa and Birch (2018)	New Zealand	32: 71.8%; ns (18-75)	Focus groups (ns)	Culture, lack of need for an alternative to meat, and lack of knowledge about how to prepare and eat them at home
19. Collins, Vaskou and Kountouris (2019)	UK	161 children: 35%; ns (6-15) 114 children's parents: 58%; 45 (33-75) 1020: 65%; 21 (12-90)	Group activity (ns) Questionnaire(ns) Choice experiment (2015)	Visibility of insects

Authors	Country	Sample size: female; mean age (age range)	The technique (year)	Main factors
20. de Koning *et al.* (2020)	China, US, France UK, New Zealand, The Netherlands, Brazil, Spain, The Dominican Republic	Total: 3091: 59.3%; 34.1 (16-83) China 571: 60.8%; 31.2 (19-72) US 539: 75.4%; 44.1 (18-71) France 484: 31.8%; 29 (18-68) UK 366: 76.2%; 32 (19-67) New Zealand 268: 53.2; 37.9 (18-70) The Netherlands 231: 62.3%; 29.6 (17-70) Brazil 216: 56.9%; 38.2 (17-77) Spain 210: 48.1%; 35.1 (19-83) The Dominican Republic 206: 66%; 26.2 (16-96)	Survey digital and hard copy (2018-2019)	Food neophobia
21. Dupont and Fiebelkorn (2020)	Germany	718: 57.5%; 13.67 (9-19)	Questionnaire in a paper-pencil format (2018)	Age, food neophobia, attitudes
22. Fischer and Steenbekkers (2018).	The Netherlands	140: 54%; 24.9 (ns)	Online survey (2014)	The most marketed insects, affective attitude component and disgust
23. Gere *et al.* (2017)	Hungary	400: 65%; 25.5 (ns)	Online survey (2016)	Food neophobia, seeking new food choice options, intention to reduce their intake of fresh meat in the coming year
24. Gómez-Luciano, Vriesekoop and Urbano (2019)	Dominican Republic and Spain	Total 401 Dominican Republic 201: 31.5%; 25 (16-70) Spain 200: 47%; 35.5 (16-83)	Online and face to face survey (2017)	Disgust

Authors	**Country**	**Sample size: female; mean age (age range)**	**The technique (year)**	**Main factors**
25. Gómez-Luciano *et al.* (2019)	UK, Spain, Brazil, Dominican Republic	Total 729: UK 180: 51.7 %; ns (>24 ≥ 65) Spain 200: 47%; ns (>24 ≥ 65) Brazil 216: 56.9%; ns (>24 ≥ 65) The Dominican Republic 133: 50.4%; ns (>24 ≥ 65)	Survey (2017)	Disgust
26. Hartmann and Siegrist (2017)	Switzerland	Total 104 Control group 53: 41.5%; 32.3 (18-65) Experimental group 51: 45.1%; 35.4 (18-65)	Experiment (2015)	Exposure to processed insect products
27. Hartmann *et al.* (2015)	Germany and China	Germany 502: 52%; 44.3 (20-69) China 443: 51%; 44.2 (20-69)	Survey (2014)	Food neophobia, taste expectations, social acceptance, and past experience of eating insects
28. House (2016)	The Netherlands	33: ns; ns (ns)	semi-structured interviews (2015)	Taste, availability, degree of fit with current eating patterns
29. Iannuzzi, Sisto and Nigro (2019)	Italy	587: ns; ns (18-56)	Online survey (ns)	Disclosed product ingredients
30. Jensen and Lieberoth (2019)	Denmark	189: 84%; 21.7 (ns)	Online survey, sensory test (ns)	Perceived social norms
31. Kornher, Schellhorn and Vetter (2019)	Germany	311: 73.2%; 30.85 (ns)	Choice experiment (2016)	Disgust, food neophobia. Interest in consuming climate-friendly products
32. La Barbera *et al.* (2018)	Italy	118: 49%; 23.95 (ns)	Experiment (ns)	Food Neophobia and disgust

Authors	Country	Sample size: female; mean age (age range)	The technique (year)	Main factors
33. La Barbera *et al.* (2020)	Denmark and Italy	**S1** Denmark 975: 51%; ns (18-75) **S2** Italy: 543: 60%; 28 (ns)	Focus groups (32), then online questionnaire (2017) Online survey (ns)	Disgust, individuals' interest in trying novel experiences and eating novel foods
34. Lammers, Ullmann and Fiebelkorn (2019)	Germany	516: 51.6%; 47 (18-87)	Online survey (2018)	Disgust, previous insect consumption and food neophobia
35. Laureati *et al.* (2016)	Italy	Survey 314: 65.4%; 31.9 (18-80) Experiment (68 of the above): 61.8%; 21.4 (ns)	Online survey, experiment (ns)	Food neophobia, age, gender, cultural background
36. Le Goff and Delarue (2017)	France	100: 67%; ns (18-64)	Nonverbal evaluation (videotape before and after taste evaluation) (ns)	Tasting
37. Lensvelt and Steenbekkers (2014)	The Netherlands and Australia	**S1** 209: 134 Netherlands & 75 Australia; ns; ns (ns) **S2** 133: Australians 63.3%; ns (<10 > 80)	Online survey Experiment (ns)	Previous experience, price, quality, perceived product benefits and risk, convenience, trust
38. Liu, Li and Gómez(2020)	China	614: ns; ns (18 - more than 65)	Survey (2012)	Disgust, insect phobia, safety concerns, age, income, region, household size
39. Lombardi *et al.* (2019)	Italy	200: 40%; 20.5; (ns)	Experiment (2017)	Different carriers, disclosing information concerning the benefits, food neophobia, beliefs and attitudes about insects

Authors	Country	Sample size: female; mean age (age range)	The technique (year)	Main factors
40. Mancini, Moruzzo, *et al.* (2019)	Italy	165: 83.3%; ns (ns)	Experiment (2018)	Food neophobia, the intention to eat products containing insect powder in the coming months
41. Menozzi *et al.* (2017)	Italy	231: 61.9%; 23.6 (young adults)	Online survey (ns)	Attitude, perceived behavioural control, beliefs regarding health and the environment, disgust arising from seeing insects around
42. Modlinska, Adamczyk and Goncikowska (2020)	Poland	99: 81.8%; 22 (18-45)	Experiment: Trying food containing insects and semi-structured individual interview (2019)	Labelling, general neophobia, and variety-seeking tendency in food consumption
43. Motoki *et al.* (2020)	Japan	**S1** 96: 32.3%; 41.1 (ns) **S2** 104: 30.7%; 42.9 (ns) **S3** 104: 49%; 39.9 (ns)	Online survey (2020)	Social companions (friends), location (pubs and food festivals)
44. Myers and Pettigrew (2018)	Western Australia	77: 87%; 73 (60-100)	Interviews (April 2015-February 2016)	Perceived cultural norms, lack of necessity for eating insect food, and concerns about the natural balance
45.Nyberg, Olsson and Wendin (2020)	Sweden	Questionnaire 82: 64.6%; ns (more than18) Workshop 15: 40%; ns (ns)	Questionnaire (2018) Workshop discussion (2019)	Concerns about the environment and health, willingness to try something “exciting"
46. Olum *et al.* (2020)	Uganda	310: ns; ns (ns)	Face-to-face interview using structured questionnaire (ns)	Culture, familiarity with edible insects, age, education, food neophobia

Authors	Country	Sample size: female; mean age (age range)	The technique (year)	Main factors
47. Onwezen *et al.* (2019)	The Netherlands	**S1** 2461: 41.1%; 46 (ns) **S2** 2771: 50.2%; 45.9 (ns) **S3** 1001: 48.9%; 49.6 (ns)	Experiment (ns)	Weak personal norms regarding personal health and being environmental-friendly, affective communication
48. Orkusz *et al.* (2020)	Poland	Total: 866 Survey 464: 64.8%; ns (18-24) Sensory test 402: ns; ns (18-78)	Survey Sensory test (2019)	Food neophobia
49. Orsi, Voege and Stranieri (2019)	Germany	393: 51%; 36 (13-82)	Online survey (Dec 2018-Jan 2019)	Visibility of the insects. Food neophobia and disgust
50. Palmieri *et al.* (2019)	Italy	456: 67.9%; 41 (18-65)	Web-based survey (2018)	Taste expectations, concerns about the health and environmental impact of insect food, previous experiences with edible insects, neophilia, food technology neophobia
51. Pambo *et al.* (2017)	Kenya	54: 53.7%; 45 (ns)	Laddering interviews (ns)	Providing information, tasting cricket buns
52. Pambo *et al.* (2018)	Kenya	432: 55.6%; 28.1 (ns)	Survey (ns)	Trust in government and industry, perceived availability of insect-based foods, household size, level of formal education
53. Pascucci and De-Magistris (2013)	The Netherlands	122: 51% (18 - over 64)	Choice Experiment (2011/2012)	Visibility, logo showing insects, nutritional claims, information about the health and environmental benefits

Authors	Country	Sample size: female; mean age (age range)	The technique (year)	Main factors
54. Payne (2015)	Japan	Survey 220: 42%; ns (ns) Interviews number not reported: ns; ns (ns)	Sequential mixed methods approach (2013)	Age, availability of the species
55. Petersen, Olson and Rao (2020)	US	Survey 98: 51%; 20 (18-24) Tasting test 61: ns; ns (ns)	Experiment (ns)	Environmental and nutritional benefits associated with insect food products
56. Piha *et al.* (2018)	(Northern and Central Europe- Finland, Sweden, Germany, and the Czech Republic)	Total 887: Northern Europe 430: 60%; 37.5 (17-96) Central Europe 457: 61%; 39.7 (17-96)	Online survey (2016)	Consumer knowledge (subjective and objective). Product-related experiences, food neophobia. general attitudes
57. Poortvliet *et al.* (2019)	The Netherlands	130: 68%; ns; (18-65)	Experiment (ns)	Use of insects in common product type
58. Powell, Jones and Consedine (2019)	UK	510: 50%; 34.33 (18-70)	Experiment (ns)	Disgust propensity, perceive taste and naturalness
59. Roma, Palmisano and De Boni (2020)	Italy	310: 61.1%; 33 (18-81)	Online survey (2019)	Age
60. Ruby and Rozin (2019)	US India	275: 55%; 35.9 (ns) 201: 34%; 32 (ns)	Questionnaire (ns)	Disgust, religion, sushi consumption, benefits
61. Rumpold and Langen (2019)	Germany	149: 55%; 31.9 (10-69)	Survey Sensory test (2017)	Providing participants with information about edible insects
62. Schösler, Boer and Boersema (2012)	The Netherlands	1083: 50%; 49.5 (18- 92)	Online survey (2010)	Visibility of insects

Authors	**Country**	**Sample size: female; mean age (age range)**	**The technique (year)**	**Main factors**
63. Schäufele, Barrera Albores and Hamm(2019)	Germany	342: ns; ns (under 18-over 65)	Survey (ns)	Species, low social and cultural acceptance, visibility of insects
73. Tan *et al.* (2015)	The Netherlands and Thailand	Total 54: 64.8%; 38 (20-65) Dutch 29: 62%; ns (ns) Thailand: 25; 59%; ns (ns)	8 Focus groups (ns)	Cultural exposure, individual eating experience
74. Tan *et al.* (2016)	The Netherlands	103: 39.8%;22.9 (ns)	Experiment (ns)	Perceived food appropriateness
75. Tan, Tibboel and Stieger (2017)	The Netherlands	100: 34%; 23.3 (ns)	Experiment (ns)	Perceived food appropriateness
76. Tan, Verbaan and Stieger (2017)	The Netherlands	Total 214 135 willing tasters: 80%;33 (18-65) 79 unwilling tasters: 65.8%; 50.9 (18-65)	Experiment (ns)	Perceive food preparation appropriateness, satisfied with the taste experience
77. Tuccillo, Marino and Torri (2020)	Italy	The survey 400: 53.7%; 39 (18-75) The sensory evaluation 58: 36%; 38.3 (19-67)	Survey Sensory evaluation (2020)	Gender, food neophobia, disgust, visibility
78. Van Thielen *et al.* (2019)	Belgium	388: 50%;43.5;(18-69)	Telephone survey (2016)	Packaging, place, promotion
79. Vanhonacker *et al.* (2013)	Belgium	221: 64.3%; 41.3 (18->60)	Online survey (2011)	NA (there were other substitutes in the survey and all respondents were negative toward insects)

Authors	**Country**	**Sample size: female; mean age (age range)**	**The technique (year)**	**Main factors**
80. Verbeke (2015)	Belgium	368: 61%; 42 (18-79)	Online survey (2013)	Food neophobia, convenience orientation, the importance of the environmental impact of food choices
81. Verneau *et al.* (2016)	Denmark and Italy	Total 264 Denmark 136: 44.8%; 23.33 (ns) Italy 128: 55.4%; 23.94 (ns)	Experiment (ns)	Communicating with consumers with different messages (about the benefits for society and individuals)
82. Verneau *et al.* (2020)	Italy and Denmark	280: 49%; 23.61 (ns)	computer-based questionnaires (ns)	Perceived behavioural control, gender, education
83. Videbæk and Grunert (2020)	Denmark	975: 50.9%: ns (18-75)	Choice experiment (2017)	Interest in edible insects as food. Disgust, age, gender
84. Wilkinson *et al.* (2018)	Australia	820: 45%; ns (18-65)	Online survey (ns)	Taste/flavour, the appearance of insects, safety, quality
85. Woolf *et al.*,(2019)	USA	397: 65.7%; ns;(18-94)	Online survey (2017)	Familiar with the concept (heard, seen, learned), knowledgeable about the benefits
Note: **ns**: not specified.				

Appendix 1.2: Details of the products reviewed

Authors	Country	Products Details	Visible/invisible	Insect type
1. Alemu *et al.* (2017)	Kenya	Termite powder, whole termites fried and salted. Both presented with Ugali (stiff porridge)	Visible and invisible	Termites
2. Ardoin and Prinyawiwatkul (2020)	US	A list of 30 products includes protein, energy bars, chips, snack crackers, protein shakes, bakery, cereal products, snacks, candy	Visible and invisible	NS
3. Balzan *et al.* (2016)	Italy	Cheddar cheese larvets, lollipops, chocolate-covered scorpion, worm salt, dried crickets, baked grasshoppers, toasted scorpions	Visible and invisible	Larvae, scorpions, worms, crickets, grasshoppers
4. Barsics *et al.* (2017)	Belgium	Bread faux-labelled as containing 10% mealworm flour,	Invisible	Mealworms
5. Bartkowicz and Babicz-Zielińska (2020)	Poland	Insect bar with whole mealworms, another with ground mealworms, and a bar with crushed crickets	Visible and invisible	Mealworms, house crickets
6. Barton, Richardson and McSweeney (2020)	Canada	Drink contains cricket-based protein powder	Invisible	Crickets
7. Berger *et al*. (2018)	Germany	Mealworm burger and mealworms with truffles	Visible and invisible	Mealworms

Authors	Country	Products Details	Visible/invisible	Insect type
8. Berger *et al.* (2019)	S1 Switzerland S2 Germany	**S1** mealworm nutrition bar **S2** mealworm nutrition bar and mealworm burgers	Invisible	Mealworms
9. Brunner and Nuttavuthisit (2019)	Switzerland, Thailand	Insect burger, crunchy larvae and chips made with cricket flour, muesli with insects for breakfast and sweet insect mousse as a dessert	Visible and invisible.	Larvae, crickets
10. Caparros Megido *et al.* (2014)	Belgium	Edible insects (baked/boiled/flavoured or dunked in chocolate)	NS	Mealworms, house crickets
11. Caparros Megido *et al.* (2016)	Belgium	4 burgers: beef, lentils, mealworms and beef, mealworms and lentils	Invisible	Mealworms
12. Castro and Chambers (2019)	13 countries: USA, England, Mexico, India, Japan, China, Russia, Spain, South Africa, Australia, Brazil, Peru, Thailand	Foods containing insect powder as an ingredient	Invisible	NS
13. Cavallo and Materia (2018)	Italy	Snacks with the shape of an insect, and snacks made with insect flour	Visible and invisible	NS
14. Chang, Ma and Chen (2019)	Taiwan	Cricket biscuits, cricket bread, fried insects (e.g., grasshoppers, pupae, mealworms)	Visible and invisible	Crickets, grasshoppers, pupae, mealworms
15. Cicatiello *et al.*(2016)	Italy	Preparation comparable to sushi, street food stands with different types of fried insects, skewers with pupae, plate with	Visible.	Pupae, larvae

Authors	Country	Products Details	Visible/invisible	Insect type
		larvae and pupae with some vegetables, meat burger with some larvae on the top		
16. Cicatiello, Vitali and Lacetera (2020)	Italy	Chocolate bar with insect flour, whole crickets, tortilla chips containing insect flour, and dried whole mealworms with caramel	Visible and invisible.	Crickets, mealworms
17. Circus and Robison (2019)	UK	Edible insects	NS	NS
18. Clarkson, Mirosa and Birch (2018)	New Zealand	Variety of products developed by participants (i.e., sweet snack, drink, or breakfast options)	Visible and invisible	Locusts, crickets
19. Collins, Vaskou and Kountouris (2019)	UK	Variety of insect-based products: e.g., insect bar, cookies with cricket powder, bug salad, fried rice with larvae and insect quiche, mealworm protein with rice, insect burger, mealworm mince, grasshopper mince	Visible and invisible	Mealworms, locusts, crickets, larvae, bugs, grasshoppers
20. de Koning *et al.* (2020)	China, US, France UK, New Zealand, The Netherlands, Brazil, Spain, The Dominican Republic	Insect-based protein	NS	NS
21. Dupont and Fiebelkorn (2020)	Germany	Insects as food, insect-based burger	NS	NS
22. Fischer and Steenbekkers (2018)	The Netherlands	17 species of insects	NS	Grasshoppers, mealworms, butterflies, dragonflies, caterpillars, crickets, beetles,

Authors	Country	Products Details	Visible/invisible	Insect type
				moths, bees, termites, worms, water bugs, cockroaches, ants, wasps, insect eggs, slantface.
23. Gere *et al.* (2017)	Hungary	Insects as a substitute for meat	NS	NS
24. Gómez-Luciano, Vriesekoop and Urbano (2019)	Dominican Republic and Spain	Insect proteins	NS	NS
25. Gómez-Luciano *et al.* (2019)	The United Kingdom Spain, Brazil Dominican Republic	Insect-based proteins	NS	NS
26. Hartmann and Siegrist (2017)	Switzerland	Control group: Insects, deep-fried silkworms, deep-fried crickets Experimental group: Tortilla chips (corn meal vs. cricket flour)	Visible and invisible	Silkworms, crickets
27. Hartmann *et al.* (2015)	Germany and China	Different food contexts (insects as a meat substitute, deep-fried silkworms, deep-fried crickets, drinks containing silkworm protein, cookies based on cricket flour and chocolate chip cookies based on cricket flour	Visible and invisible	Silkworms, crickets
28. House (2016)	The Netherlands	Burgers, nuggets, schnitzel and pittige punten, all of which are made with vegetables and 13-15% ground-up buffalo worms, the larvae of the beetle	Invisible	Buffalo worms, larvae of the beetle

Authors	Country	Products Details	Visible/invisible	Insect type
29. Annuzzi, Sisto and Nigro, (2019)	Italy	Pizza with cricket flour and pizza with cricket flour and spirulina	Invisible	Crickets
30. Jensen and Lieberoth (2019)	Denmark	Roasted mealworms, spring rolls sprinkled with visible roasted mealworms, spring rolls with mealworm flour, buttermilk soup sprinkled with roasted mealworms, buttermilk soup with processed mealworms	Visible and invisible.	Mealworms.
31. Kornher, Schellhorn and Vetter (2019)	Germany	Beef burger patty fortified with insect flour	Invisible	NS
32. La Barbera *et al.* (2018)	Italy	Chocolate bar with peanuts enriched with protein from crickets	Invisible	Crickets
33. La Barbera *et al.* (2020)	Denmark and Italy	**S1** Mealworms, grasshoppers, ants **S2** Insect products	NS	Mealworms, grasshoppers, ants
34. Lammers, Ullmann and Fiebelkorn (2019)	Germany	Buffalo worms, buffalo worm burger	Visible and invisible	Buffalo worms
35. Laureati *et al.* (2016)	Italy	Biscuits made using insect flour, chocolate-coated grasshoppers, cereal bars containing insects, apple salad containing insects, tequila containing a larva, risotto containing maggots, maggot cheese, lollipops containing larvae	Visible and invisible	Grasshopper, larvae, maggots

Authors	Country	Products Details	Visible/invisible	Insect type
36. Le Goff and Delarue (2017)	France	Potato chips claimed to be insect-based with 4 different flavours: strawberry, blackcurrant, chicken, barbecue	Invisible	NS
37. Lensvelt and Steenbekkers (2014)	The Netherlands and Australia	Roasted crickets and a savoury biscuit made with insect flour which contained a combination of ground crickets, mealworms, and pupae	Visible and invisible.	Crickets, mealworms, pupae
38. Liu, Li and Gómez (2020)	China	Edible insects	NS	NS
39. Lombardi *et al.* (2019)	Italy	Pasta, cookies, chocolate bars with non-visible mealworms and their conventional counterparts	Invisible	Mealworms
40. Mancini, Moruzzo, *et al.* (2019)	Italy	Bread with insect powder	Invisible	NS
41. Menozzi *et al.* (2017)	Italy	Chocolate chip cookies (containing 10% cricket flour)	Invisible	Cricket
42. Modlinska, Adamczyk and Goncikowska (2020)	Poland	Cricket flour cookies, mealworm flour cupcakes, beetle flour date balls, cookies with crickets, cupcakes with particles of mealworm larvae, date balls with May beetle particles	Visible and invisible	Mealworms, crickets, beetles
43. Motoki *et al.* (2020)	Japan	**S1** Insect-based food **S2** Insect-based food	Invisible	Mealworms, crickets

Authors	Country	Products Details	Visible/invisible	Insect type
		S3 Insect-based foods (mealworm burger, cricket chocolate bar)		
44. Myers and Pettigrew (2018)	Western Australia	Entomophagy	NS	NS
45. Nyberg, Olsson and Wendin (2020)	Sweden	Dried mealworms and crickets, bread with added cricket flour	Visible and invisible	Mealworms, crickets
46. Olum *et al.* (2020)	Uganda	Long-horned grasshoppers, flying African termites and the wingless red termites	Visible	Long-horned grasshoppers, flying African termites, and wingless red termites.
47. Onwezen *et al.* (2019)	The Netherlands	**S1** Grasshoppers, mealworms and beetles **S2** Fresh insects, dried insects, fried insects, processed insects **S3** Insect-based burger made from buffalo worms	**S1** Visible **S2** Visible and invisible **S3** Invisible	Grasshoppers, mealworms and beetles, buffalo worms
48. Orkusz *et al.* (2020)	Poland	Whole insects, bread with a 20% addition of powder from crickets	Visible and invisible	Crickets
49. Orsi, Voege and Stranieri (2019)	Germany	Snack of buffalo worms, locusts, mealworms; granola mixed with buffalo worms; protein bar made with cricket powder; pasta made with buffalo worms; burger made with buffalo worms mixed with egg, soy and other ingredients	Visible and invisible	Buffalo worms, locusts, mealworms, crickets
50. Palmieri *et al.* (2019)	Italy	Insect-based food	NS	NS

Authors	Country	Products Details	Visible/invisible	Insect type
51. Pambo *et al.* (2017)	Kenya	Cricket buns	Invisible	Crickets
52. Pambo *et al.* (2018)	Kenya	Cricket-flour buns	Invisible	Crickets
53. Pascucci and De-Magistris (2013)	The Netherlands	Insect-based product that looks like sushi	Visible and invisible.	NS
54. Payne (2015)	Japan	Edible insects	NS	Wasp larvae, grasshoppers
55. Petersen, Olson and Rao (2020)	US	Chocolate brownie made with cricket powder	Invisible	Crickets
56. Piha *et al.* (2018)	(Northern and Central Europe- Finland, Sweden, Germany, and the Czech Republic)	Crunchy crickets for a snack with dipping sauce, a mix of ground ants and blueberries, cricket-rye snacks, giant mealworm wok, chicken-mealworm nuggets, crushed mealworms with chili	Visible and invisible	Crickets, ground ants, mealworms
57. Poortvliet *et al.* (2019)	The Netherlands	Insect burgers made from buffalo worms, mealworms, locusts; insect cube skewers from buffalo worms, locusts	Invisible	Buffalo worms, mealworms, locusts
58. Powell, Jones and Consedine (2019)	UK	Insect-based burgers	Invisible	NS
59. Roma, Palmisano and De Boni (2020)	Italy	Cricket flour, cookies made from wheat and insect flour, cookies containing visible insects	Visible and invisible	Crickets
60. Ruby and Rozin (2019)	US	Tacos with grasshoppers clearly displayed inside; a dosa (an Indian crepe made of rice	Visible and invisible	Mealworms and grasshoppers

Authors	Country	Products Details	Visible/invisible	Insect type
	India	and lentil flour) rolled up with a (non-visible, but verbally described) filling of potatoes and grasshoppers; six transparent lollipops, half containing a mealworm and half containing a grasshopper		
61. Rumpold and Langen (2019)	Germany	Whole mealworms, locusts	Visible	Mealworms, locusts
62. Schösler, Boer and Boersema,(2012)	The Netherlands	Variety of meat substitutes including pizza containing protein derived from insects, fried locusts with chocolate coating, locust salad, salad with fried mealworms	Visible and invisible	Mealworms, locusts
63. Schäufele, Barrera Albores and Hamm(2019)	Germany	Grasshoppers and mealworms (meatballs, whole, crushed)	Visible and invisible	Grasshoppers, mealworms
64. Schlup and Brunner (2018)	Switzerland	Mealworms, locusts, caterpillars	Visible and invisible	Mealworms, locusts, caterpillars
65. Séré *et al.* (2018)	Burkina Faso (Sudanian zone)	Edible insects (fried, roasted, ingredients)	Visible and invisible	Winged termites, caterpillars, grasshoppers, field crickets, beetles, palm weevil, Oryctes
66. Simion *et al.* (2019)	Romania	Variety of insects including locusts, ants, and crickets.	NS	Variety but the most preferred are locusts and ants
67. Sogari, Menozzi and Mora (2017)	Italy	Cookie made with cricket flour	Invisible	Crickets
68. Sogari, Menozzi and Mora (2018)	Italy	Cricket-based jelly	Visible and invisible	Crickets

Authors	Country	Products Details	Visible/invisible	Insect type
69. Sogari, Menozzi and Mora (2019)	Italy	Whole cricket in a jelly sweet and cricket flour in a jelly sweet	Visible and invisible	Crickets
70. Sogari (2015)	Italy	Crickets, honeycomb moths, wax moth larvae, and grasshoppers	Visible.	Crickets, honeycomb moths, wax moth larvae, and grasshoppers
71. Sogari, Bogueva and Marinova (2019)	Australia (Sydney)	Edible insects, cricket flour or edible insect-filled chocolate bars	Visible and invisible	Crickets
72. Szendrő, Tóth and Nagy (2020)	Hungary	Fried locusts and crickets, cakes containing insect flour	Visible and invisible	Locusts, crickets
73. Tan *et al.* (2015).	The Netherlands and Thailand	Ant larvae, big-butt ants, grasshoppers, giant water bugs, mopane worms, witchetty grubs, mealworms, bamboo worms, fried grasshoppers with chili and salt, mealworm muffins with chocolate pieces, cricket fritters with roasted peanuts, giant water bug chili paste, chocolate coated grasshoppers, butter cookies with ground beetles	Visible and invisible	Ant larvae, big-butt ants, grasshoppers, giant water bugs, mopane worms, witchetty grubs, mealworms, bamboo worms, crickets, ground beetles
74. Tan *et al.* (2016)	The Netherlands	Burger labelled as mealworms (75% beef 25% mealworms)	Invisible	Mealworms
75. Tan, Tibboel and Stieger (2017)	The Netherlands	Burger described as containing ground mealworms	Invisible	Mealworms

Authors	Country	Products Details	Visible/invisible	Insect type
76. Tan, Verbaan and Stieger (2017)	The Netherlands	Mealworm meatballs, mealworm drink	Invisible	Mealworms
77. Tuccillo, Marino and Torri (2020)	Italy	Variety of insects and insect-based products such as crickets, grasshoppers, and three insects at the larval stage (bee, mealworm and silkworm larvae), cricket flour pasta, giant water bug chili paste, chocolate-covered grasshoppers, muffins with mealworms, fried rice with silkworms, focaccia bread with bits of dried crickets.	Visible and invisible	Crickets, giant water bugs, grasshoppers, three insects at the larval stage (bee, mealworm and silkworm larvae)
78. Van Thielen *et al.* (2019)	Belgium	Variety of products including energy shakes, energy bars, burgers, soup, sandwich spreads, snacks	Invisible	Mealworms
79. Vanhonacker *et al.* (2013)	Belgium	Protein from insects	NS	NS
80. Verbeke (2015)	Belgium	Insects as a meat substitute	NS	NS
81. Verneau *et al.* (2016)	Denmark and Italy	Chocolate bar enriched with proteins from crickets	Invisible	Crickets
82. Verneau *et al.* (2020)	Italy and Denmark	Insect based food	NS	NS
83. Videbæk and Grunert (2020)	Denmark	Variety of products, e.g., baked, baguette baked with cricket flour, purée of mushy peas and cricket flour,	Visible and invisible	Crickets and mealworms

Authors	Country	Products Details	Visible/invisible	Insect type
		seasoned with garlic and lemon.		
84. Wilkinson *et al.* (2018)	Australia	Flavoured insects, chocolate-coated insects, biscuits made with insect flour, and a meal containing insects included as options, crickets, ants, witchetty grubs, mealworms, grasshoppers, scorpions, spiders, cockroaches.	Visible and invisible	Crickets, ants, witchetty grubs, mealworms, grasshoppers, scorpions, spiders, cockroaches
85. Woolf *et al.* (2019)	USA	Fried/grilled/toasted whole insects, chocolate coated insects, ground insects in sauces, chutneys, ground insects in burgers/nuggets/meatballs, bakery products, chips containing insect flour, rice/pasta enriched with insect flour, protein bars containing insect protein isolate.	Visible and invisible	NS
Note: **ns**: not specified.				

Appendix 3: Qualitative analysis

Appendix 3.1 Interviews Ethical clearance

School of Agriculture, Policy and Development

ETHICAL CLEARANCE GRANTED

University of Reading

Form 2. MSc PhD Staff Ethical Clearance Submission Form

PLEASE allow a minimum of 3 weeks for this process.
You must not begin your research until you have obtained consent as evidenced by this form returned from the APD student Office signed and dated. Ethical Clearance cannot be granted retrospectively.

This form can only be used if the application :

- Does not involve participants who are patients or clients of the health or social services
- Does not involve participants whose capacity to give free and informed consent may be impaired within the meaning of the Mental Capacity Act 2005
- Does not involve patients who are 'vulnerable'
- Does not involve any element of risk to the researchers or participants
- Does not involve any participants who have a special relationship to the researchers/investigators

If any of the above apply, please refer to the APD Ethics Chair to decide whether an application can be made through the APD review process or whether the application needs to be referred to the full University Committee.

It is the applicant's responsibility to check for any particular requirements of a funder regarding ethical review. Some funders may require that the application is reviewed by full University Committee and not the devolved School committee.

Full details of the University Research Ethics procedures are available at http://www.reading.ac.uk/internal/res/ResearchEthics/reas-REethicshomepage.aspx and you are encouraged to access these pages for a fuller understanding. Some helpful advice is available on this link http://www.reading.ac.uk/internal/res/ResearchEthics/reas-REwhatdoIneedtodo.aspx and the FAQs are particularly relevant.

ALL QUESTIONS MUST BE COMPLETED.

APD Ethical Clearance Application Reference Number : 001481

1. **APPLICANT DETAILS:**

Main applicant name:	Asmaa Alhujaili
Name of academic supervisor/project investigator:	Dr Giuseppe Nocella & Dr Anna Macready
Email Address (decision will be emailed here):	a.s.alhujaili@pgr.reading.ac.uk
MSc Student	☐
PhD Student	☒
Staff Member	☐
Other (please specify)	Click here to enter text.

2. **PROJECT DETAILS:**

Title of project: Consumer acceptance and Willingness to pay for alternative sources of protein: a country comparison between KSA and the UK.

Please provide a lay summary of the project, including what is being investigated and why: The project aims to explore consumers' acceptance and willingness to pay for novel meat substitutes (i.e. insect-based meat, cultured meat and plant-based meat) in a country comparison between devloping and developed countries. By conducting in-depth interviews with food scientists, retailers, marketing managers and policymakers we are aiming to; get a deep understanding of these novel products, explore the readiness of the market and the consumers' reaction and preferences.

Procedure. Please outline the project's research protocol (what procedures, research methods and analysis methods are being used) : In-depth interviews will be adopted as a research method in this phase of the study in both

Form 1. APD MScPhDStaff Ethical Clearance Application Version 1.0 Last updated 30/11/15

languages (English and Arabic). The Arabic transcript will be translated into English, then the interviews in both languages will be transcribed and analysed using Nvivo software.

Period over which the data collection is to be undertaken (note: data collection CANNOT commence until ethical approval has been granted as evidenced by this form signed and returned).

Proposed Start Date:	11/09/2020
Proposed End Date:	24/03/2021

3. THE RESEARCH:

a) **Nature and number of participants** who are expected to take part in your survey/focus group. Please estimate if uncertain. As ethical clearance involving minors is more complex because of safeguarding and consent issues, please consider carefully whether you need to involve minors under the age of 16 in your research.

Participants	**Number participating**
Minors under 16 years of age	0
Students	0
Other members of the University	0
Members of the general public	0
Businesses	14
Government officials	2 policy makers
Other *If other please specify:*	2 Food scientists/ 2 organization representatives

b) **Funding.** Is the research supported by funding from a research council or other external sources for example a charity or business?

Yes ☐ If yes, please specify funder : Click here to enter text.
No ☒

If yes, it is the responsibility of the applicant to check for any particular requirements of the funder regarding ethical review. Some funders may require that the application is reviewed by full University Committee and not the devolved School committee.

c) **Recruitment.** Please describe recruitment procedures. How have participants been selected? Are there any inclusion/exclusion criteria? Participants must be told on the Participant Information Sheet how and why they have been selected. You should attach ay recruitment materials to this application. Participants will be recruited using different ways (e.g personal, social media, recommendations, snowball). They will be selected depending on their relation to the novel/conventional meat whether they are food scientists, businesses or policymakers.

d) **Exceptions.** Does the research involve minors, medical patients, individuals with learning difficulties, vulnerable adults, participants recruited through social service departments, or anyone in a special relationship with yourself/data collectors? E.g. Supervisor; lecturer to a group of students; or person in a position of responsibility for participants.

Yes ☐
No ☒

If yes, this may result in referral to the University Research Ethics Committee (please note their deadlines). Please provide extra detail here: Click here to enter text.

e) **Where is the data collection to be undertaken?** Specify country(ies) and specific location(s) The interviews will be conducted face to face or remotely (whether video or audio calls) via online platforms (e.g. Skype, Microsoft Teams, etc), phone calls. Based on the interviewee preferences.

f) What forms of data collection does the research involve?

Group discussion/ workshop	☐
Personal interviews	☒
Telephone interviews	☒
Questionnaire/paper survey	☐
Postal survey	☐
Email/ online survey	☐
Which software tool will be used, if any?	Click here to enter text.
Other *(specify)*:	Click here to enter text.

g) Who will undertake the collection and/or analysis of data?

Myself	☒
Other MSc students	☐
Other Higher degree students	☐
Other contract research and/or academic staff	☐
Individuals outside University	☐
External organisations	☐

If individuals outside the University and/or external organisations are involved in the collection or analysis of data, give brief details below. Indicate how the ethical procedures and standards of the University will be satisfied: Click here to enter text.

h) Does the research require participants to consume any food products?

No ☒
Yes ☐

If yes, please provide full details and indicate measures in place to ensure excellent food hygiene standards and ensure participant safety. Click here to enter text.

i) Do you consider there are any potential ethical issues in this project? Does the research require collection of information that might be considered sensitive in terms of confidentiality, potential to cause personal upset, etc.?

No ☒
Yes ☐

If yes, please provide full details and indicate how these issues will be addressed, how researchers will manage participant reaction. Support and de-brief sheets should be attached if relevant. Click here to enter text.

j) Will the research involve any element of intentional deception at any stage? (i.e. providing false or misleading information about the study, or omitting information)?

No ☒
Yes ☐

If yes, this must be justified here. You should also consider including debriefing materials for participants which outline the nature and justification of the deception used. Click here to enter text.

k) Are participants offered a guarantee of anonymity and/or that the information they supply will remain confidential?

Yes ☒
No ☐

If yes, give brief details of the procedures to be used to ensure this and particularly if the data has 'linked' or 'keyed' anonymity (eg. where published results are anonymous but participant details are recorded and held separately to the responses but keyed with reference number) : A reference number for each participant will be held in order to Keyed the answers to the participant.

l) **Will participants be required to complete a separate consent form?** Many APD applications do not require participants to complete a separate consent form. Please see the templates provided.

☐ Yes. Names, addresses and copies of completed forms will be given to APD student office
☒ No. The data collection is anonymous and a combined information/consent sheet supplied
☐ Neither of the above, or the research involves participants under the age of 16

If 'neither of the above' selected, or the research involves participants under the age of 16, please outline the specific circumstances. Click here to enter text.

m) **Will participants be offered any form of incentive for undertaking the research?**

No ☒
Yes ☐

If yes, give brief details, including what will happen to the incentive should the participant later withdraw their input or decide not to proceed : Click here to enter text.

4. **DATA PROTECTION**

Data Storage, data protection and confidentiality. Please make sure you are familiar with the University of Reading's guidelines for data protection and information security. http://www.reading.ac.uk/internal/imps/

Please outline plans for the handling of data to ensure data protection and confidentiality. Covering the following issues: Will any personal information be stored? How and where will the data be stored? Who will have access to the data? When will it be deleted?

Personal details will be linked to a reference number and kept separately for research reasons only. Participant responses will be recorded by myself and translated and transcribed anonymosly by a specialist agency. The data will be analysed by my self, and the records will be permanently deleted. All electronic materials will be stored in a protected computer, my supervisors and I will be the only ones who can have access to them.

Applicants: Please now scroll to Section 7 to input your :

- Information Sheet(s) for Participants (mandatory)
- Data Collection Tools, for example: recruitment materials, interview/focus group protocols (how you are conducting the process), interview/focus group questions, questionnaires, online survey questions, debriefing and fact sheets
- Consent Forms (optional, may not be necessary if consent assumed in Information Sheet)

If the text boxes do not allow input in the desired format, please append documents separately to the email when sending this form.

Please then email your completed form (and any separate supporting documents) to your supervisor/project investigator. Project investigators or independent academics may return form directly to sapdethics@reading.ac.uk

A decision on whether ethical clearance has been granted will be emailed to you via the APD Student Office along with your authorised form.

You may NOT proceed with your data collection until ethical approval has been granted as evidenced by return of this approved form.

Note: The process of obtaining ethical approval does not include an assessment of the scientific merit of the questionnaire. That is the separate responsibility of your supervisor/project investigator in discussion with yourself.

5. Supervisor/project investigator review. Section to be completed by supervisor/PI where relevant.

Participant information sheet(s), data collection tools and any other supporting information may be pasted in section 7 below. Alternatively they may be attached to this email. Please review these documents and then complete the checklist below.

Checklist. Does this application and supporting documents adequately address the following ?

- ☒ The safety of the researcher(s) and those collecting data, the safety of the participant(s)
- ☒ Is the language /grammar/content appropriate (i.e. University standards and reputation upheld)
- ☒ There are no questions that might reasonably be considered impertinent or likely to cause distress to the participants
- ☒ The researcher has provided the participant information sheet (mandatory)
- ☒ The researcher has provided the questionnaire or survey/ workshop, focus group or interview questions (mandatory)
- ☒ The Participant Information Sheet gives sufficient information for the participants to give their INFORMED consent
- ☐ A separate consent form has been included (optional)
- ☒ Data will be handled, stored and deleted appropriately according to University guidelines, and the participants have been adequately informed about this in the Participant Information Sheet
- ☒ The Participant Information Sheet contains all relevant sections

- ☒ **I am satisfied that this application meets the minimum standards for APD Ethical Clearance to be granted**

Supervisor/Project Investigator, please forward this form as a WORD document and any separate supporting documents to sapdethics@reading.ac.uk. The form will be logged by the student office and allocated to an APD ethics committee reviewer. The APD ethics reviewer will review the application and complete section 6.

6. APD ethics committee review. Section to be completed by APD Ethics Committee member.

Decision

Clearance refused	☐ Resubmission required
Clearance granted as presented ☐	
Clearance granted subject to revisions suggested	☒ No need to resubmit once amended
Referred to APD Research Ethics Chair	☐ May require further information

Ethics Committee Member please enter comments, reasons for rejection, summary of revisions required before proceeding (if applicable):

To minimize health risks to the researcher and the participants, face-to-face interviews should be avoided. If this is not possible and the activity is allowed by local regulations, all precautions should be taken to avoid viral transmissions (wearing face masks, use of hand sanitisers, meeting in well-aired places, etc).

Committee Member Name: Giacomo Zanello **Date Reviewed :** 14/01/2021

APD Ethics Committee member electronic signature (For signature, save document as pdf, then open pdf and use 'sign' option. Alternatively check here if no electronic signature used ☒)

APD Ethics Committee Member : Now please email this completed form (as signed pdf) to sapdethics@reading.ac.uk together with any separate supporting documents . The student office will record the outcome and return the completed form to the applicant with the decision.

7. Supporting Documents.

Please cut and paste the following documents into the text boxes below.

- Participant Information Sheet(s),
- Protocols (the procedures, how you will conduct and administer the data collection, interviews, surveys)
- Data Collection Instruments (interview questions and survey questions)
- Consent Forms (if Participant Information Sheet does not assume consent)
- Recruitment Materials (if relevant)

It is preferable that all information connected to this application is contained in one document. However, if you find that the text boxes below are not adequate, you may attach and email these supporting documents separately.

Supporting Documents for this application are pasted below. The text boxes cannot accept some types of formatting when pasting in documents. If this is the case, append them separately to the email with this form.

Reference number:

Participant Information Sheet

Project name: Consumer acceptance and Willingness to pay for alternative sources of protein: a country comparison between KSA and the UK

I am a PhD student in consumer behaviour and food marketing at the University of Reading. As part of my degree, I am conducting research into novel meat substitutes. This research project aims to find out consumer acceptance and willingness to pay or novel meat substitutes (i.e. insect-based meat, cultured meat and plant-based meat). We are interested in exploring the readiness of the market and the consumers' reaction towards these alternatives.

To undertake this research, we are currently contacting you, and we would like to invite you to participate in an in-depth interview face to face or remotely; via Skype, Microsoft teams or phone call, which will take approximately one hour of your time. We are interested in your prospective regarding novel meat substitutes. You are encouraged to freely express your opinions and please be assured that your views are valued and that there are no right or wrong answers to the questions asked.

We will not collect any names or personal details as part of the interview. Your identity will not be revealed to anyone other than the researchers conducting this survey. Participation is entirely voluntary, and you are free to withdraw from the interview at any time you feel uncomfortable or unwilling to participate, and you do not have to specify a reason. Any in-part or total contribution can be withdrawn up until the point at which the data is aggregated before 31/3/2021 date. After 31/3/2021 date it will not be possible to withdraw your contribution from the results of the research. If you wish to withdraw, please contact details below, quoting the reference at the top of this page. The reference will only be used to identify your questionnaire/interview transcript and will not reveal any other information about you.

The discussion will be audio recorded if you agree, and the anonymised transcripts of the audio recordings will be used by the researchers working on the project. Once transcribed the original recording will be deleted. Your anonymity will not be compromised as only the reference number above will be used to identify the transcript.
If at any stage you wish to receive further information about this research project please do not hesitate to contact Asmaa Alhujaili before 1/7/2021 date. The findings will be written up into my thesis and it will be published in academic journals. This will not affect your anonymity.

All data I collect will be stored securely electronically on a password-protected computer. The data will be destroyed at the end of the research project no later than 29/12/2023 date.
By participating in this interview, you are acknowledging that you understand the terms and conditions of participation in this study and that you consent to these terms.

This research project has been reviewed according to the procedures specified by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.

Thank you very much for taking time to take part in this survey!
Asmaa Alhujaili

Student Contact Details

Asmaa Alhujaili
PhD researcher in consumer behaviour and food marketing
School of Agriculture, Policy and Development
Agriculture Building
Earley Gate, Whiteknights Road
PO Box 237
Reading RG6 6AR
United Kingdom
E-Mail: a.s.alhujaili@pgr.reading.ac.uk

Supervisors Contact Details

Name: Dr Giuseppe Nocella
Associate Professor of Consumer Research and Policy
School of Agriculture, Policy and Development
University of Reading
Reading RG6 6BZ
E-Mail: g.nocella@reading.ac.uk

Name: Dr Anna Macready
Associate Professor in Consumer Behaviour and Marketing
School of Agriculture, Policy and Development
University of Reading
Reading RG6 6AR
E-Mail: a.l.macready@reading.ac.uk

The in-depth interview questions		
Objectives:	**Note**	**Food scientists / Retailers and restaurants/ Policy makers**

Intro		Do you think that we have a problem with conventional meat production? If any, what are they?
		In your opinion, how can we tackle these issues?
To explore the alternatives (Plant based, insect based, cultured meat)	<u>**Additional**</u> questions for inventors/ start-ups	Could you tell me what is special in the novel alternative/why we need them? Could you please tell me about your product and describe the production process? Could you tell me about the ingredients? Could you tell me about the future development in the product? What is your targeted market? • Global/ local ... etc Who are your targeted Consumers? • Age • Gender • Diet What is the potential competitor for your product?
	<u>**Additional**</u> questions for Food scientists	What do you think about novel meat alternatives? Hwy? • Advantages • Drawbacks Could you tell me about the current status of research regarding meat alternatives?
To explore the Drivers (problems)		What are the drivers toward novel meat substitutes (insect-based meat, plant-based meat and cultured meat)? • Environmental • Animal welfare • Health • Economic (food safety/demand, opportunity cost e.g. using water/land)
		In your opinion, what is the main one?
To explore the Barriers		In your opinion, what are the expected barriers for adapting these alternatives on the country level and consumers level? • Regulations /restrictions • Disgust • Food neophobia • Food Technology Neophobia • Sensis (Flavour/texture/ appearance etc.) • Food contaminant • Price • Food Safety
	<u>**Additional**</u> questions for Policy makers	What are the procedures to allow novel foods (Insect/cultured)? What are the government standards for novel food?
	<u>**Additional**</u> questions for inventors/ start-ups	Can you tell me more about the regulations regarding production and selling?
		In your opinion, what is the main barrier, and how we can overcome it? How long we need to overcome it?
To expect the consumers' reactions		In your opinion, how do you think the consumers will respond/react toward these alternatives? • Accept/reject • WTT

Form 1. APD MScPhDStaff Ethical Clearance Application Version 1.0 Last updated 30/11/15

		• WTB • WTP
		In your opinion, what is the main driver for that?
To expect the potential consumers		In your opinion, who are the potential consumers? And why? • Male/Female • Young/Old • Marital status • High/low educated • Region • Financial status • Eating habits • Attitudes
To explore the most interesting alternative		In your opinion, what is the most interesting alternative to adapt for consumers/ start-ups? Why? What about further developing the product/ what you are going to change?
	<u>Additional</u> questions for inventors/ start-ups	What is special in your product? In your opinion what could be the preferred attributes for the novel alternative? • Taste • Texture • Price • Form(processed/non) • Carrier
To get a further expectation and recommendations		Do you think the market and the consumers are ready to adopt these alternatives? Why? If not, then when?
		How do you imagen the KSA/UK meat market in the next 5 years?
	<u>Additional</u> questions for Food scientists	Could you give me suggestions for future research on meat alternatives? • Marketing • development

Click here to paste your supporting documents into a text box

Click here to paste your supporting documents into a text box

Click here to paste your supporting documents into a text box

Return to top of form

Appendix 3.2.Ethical clearance for the interview with Islamic scholar

School of Agriculture, Policy and Development **ETHICAL CLEARANCE GRANTED** University of Reading

Form 2. MSc PhD Staff Ethical Clearance Submission Form

PLEASE allow a minimum of 3 weeks for this process.
You must not begin your research until you have obtained consent as evidenced by this form returned from the APD student Office signed and dated. Ethical Clearance cannot be granted retrospectively.

This form can only be used if the application :
- Does not involve participants who are patients or clients of the health or social services
- Does not involve participants whose capacity to give free and informed consent may be impaired within the meaning of the Mental Capacity Act 2005
- Does not involve patients who are 'vulnerable'
- Does not involve any element of risk to the researchers or participants
- Does not involve any participants who have a special relationship to the researchers/investigators

If any of the above apply, please refer to the APD Ethics Chair to decide whether an application can be made through the APD review process or whether the application needs to be referred to the full University Committee.

It is the applicant's responsibility to check for any particular requirements of a funder regarding ethical review. Some funders may require that the application is reviewed by full University Committee and not the devolved School committee.

Full details of the University Research Ethics procedures are available at http://www.reading.ac.uk/internal/res/ResearchEthics/reas-REethicshomepage.aspx and you are encouraged to access these pages for a fuller understanding. Some helpful advice is available on this link http://www.reading.ac.uk/internal/res/ResearchEthics/reas-REwhatdoIneedtodo.aspx and the FAQs are particularly relevant.

ALL QUESTIONS MUST BE COMPLETED.

APD Ethical Clearance Application Reference Number : 001548

1. **APPLICANT DETAILS:**

Main applicant name:	Asmaa Alhujaili
Name of academic supervisor/project investigator:	Dr. Giuseppe Nocella & Dr. Anna Macready
Email Address (decision will be emailed here):	Click here to enter text.
MSc Student	☐
PhD Student	☒
Staff Member	☐
Other (please specify)	Click here to enter text.

2. **PROJECT DETAILS:**

Title of project: Consumer acceptance and Willingness to pay for alternative sources of protein: a country comparison between KSA and the UK.

Please provide a lay summary of the project, including what is being investigated and why: The project aims to explore consumers' acceptance and willingness to pay for novel meat substitutes (i.e. insect-based meat, cultured meat and plant-based meat) in a country comparison between devloping and developed countries. By conducting an interview with Islamic scholar, we are aiming to insure that that the proposed product religiously acceptable in Kingdom of Saudi Arabia.

Procedure. Please outline the project's research protocol (what procedures, research methods and analysis methods are being used) : an interview will be adopted as a research method in this phase of the study. The interview will be in Arabic. The Arabic transcript will be translated into English, and analysed using MAXQDA software.

Form 1. APD MScPhDStaff Ethical Clearance Application Version 1.0 Last updated 30/11/15

Period over which the data collection is to be undertaken (note: data collection CANNOT commence until ethical approval has been granted as evidenced by this form signed and returned).

Proposed Start Date:	19/03/2021
Proposed End Date:	31/12/2021

3. THE RESEARCH:

a) Nature and number of participants who are expected to take part in your survey/focus group. Please estimate if uncertain. As ethical clearance involving minors is more complex because of safeguarding and consent issues, please consider carefully whether you need to involve minors under the age of 16 in your research.

Participants	Number participating
Minors under 16 years of age	0
Students	0
Other members of the University	0
Members of the general public	0
Businesses	0
Government officials	0
Other *If other please specify:*	1 Islamic scholar

b) Funding. Is the research supported by funding from a research council or other external sources for example a charity or business?

Yes ☐ If yes, please specify funder : Click here to enter text.
No ☒

If yes, it is the responsibility of the applicant to check for any particular requirements of the funder regarding ethical review. Some funders may require that the application is reviewed by full University Committee and not the devolved School committee.

c) Recruitment. Please describe recruitment procedures. How have participants been selected? Are there any inclusion/exclusion criteria? Participants must be told on the Participant Information Sheet how and why they have been selected. You should attach ay recruitment materials to this application. The participant will be recruited through recommendation.

d) Exceptions. Does the research involve minors, medical patients, individuals with learning difficulties, vulnerable adults, participants recruited through social service departments, or anyone in a special relationship with yourself/data collectors? E.g. Supervisor; lecturer to a group of students; or person in a position of responsibility for participants.

Yes ☐
No ☒

If yes, this may result in referral to the University Research Ethics Committee (please note their deadlines). Please provide extra detail here: Click here to enter text.

e) Where is the data collection to be undertaken? Specify country(ies) and specific location(s) The interviews will be conducted remotely via online platforms (e.g. Skype, Microsoft Teams, etc), or phone call. Based on the interviewee preferences.

f) What forms of data collection does the research involve?

Group discussion/ workshop ☐
Personal interviews ☒

Telephone interviews ☒
Questionnaire/paper survey ☐
Postal survey ☐
Email/ online survey ☐
Which software tool will be used, if any? Click here to enter text.
Other *(specify)*: Click here to enter text.

g) **Who will undertake the collection and/or analysis of data?**

Myself ☒
Other MSc students ☐
Other Higher degree students ☐
Other contract research and/or academic staff ☐
Individuals outside University ☐
External organisations ☐

If individuals outside the University and/or external organisations are involved in the collection or analysis of data, give brief details below. Indicate how the ethical procedures and standards of the University will be satisfied: Click here to enter text.

h) **Does the research require participants to consume any food products?**

No ☒
Yes ☐

If yes, please provide full details and indicate measures in place to ensure excellent food hygiene standards and ensure participant safety. Click here to enter text.

i) **Do you consider there are any potential ethical issues in this project? Does the research require collection of information that might be considered sensitive in terms of confidentiality, potential to cause personal upset, etc.?**

No ☐
Yes ☒

If yes, please provide full details and indicate how these issues will be addressed, how researchers will manage participant reaction. Support and de-brief sheets should be attached if relevant. There is a chance that the partecepant do not accept the idea behind the questions for religios reasons. The interviewer will overcome that by providing the interviewee with explanation for the whole process for the products production (cultured meat and insect food).

j) **Will the research involve any element of intentional deception at any stage?** (i.e. providing false or misleading information about the study, or omitting information)?

No ☒
Yes ☐

If yes, this must be justified here. You should also consider including debriefing materials for participants which outline the nature and justification of the deception used. Click here to enter text.

k) **Are participants offered a guarantee of anonymity and/or that the information they supply will remain confidential?**

Yes ☒
No ☐

If yes, give brief details of the procedures to be used to ensure this and particularly if the data has 'linked' or 'keyed' anonymity (eg. where published results are anonymous but participant details are recorded and held separately to the responses but keyed with reference number) : A reference number for each participant will be held in order to Keyed the answers to the participant.

l) **Will participants be required to complete a separate consent form?** Many APD applications do not require participants to complete a separate consent form. Please see the templates provided.

☐ Yes. Names, addresses and copies of completed forms will be given to APD student office
☒ No. The data collection is anonymous and a combined information/consent sheet supplied
☐ Neither of the above, or the research involves participants under the age of 16

If 'neither of the above' selected, or the research involves participants under the age of 16, please outline the specific circumstances. Click here to enter text.

m) **Will participants be offered any form of incentive for undertaking the research?**

No ☒
Yes ☐

If yes, give brief details, including what will happen to the incentive should the participant later withdraw their input or decide not to proceed : Click here to enter text.

4. **DATA PROTECTION**

Data Storage, data protection and confidentiality. Please make sure you are familiar with the University of Reading's guidelines for data protection and information security. http://www.reading.ac.uk/internal/imps/

Please outline plans for the handling of data to ensure data protection and confidentiality. Covering the following issues: Will any personal information be stored? How and where will the data be stored? Who will have access to the data? When will it be deleted?

Personal details will be linked to a reference number and kept separately for research reasons only. Participant responses will be recorded by myself and translated and transcribed anonymosly by a specialist agency. The data will be analysed by my self, and the records will be permanently deleted. All electronic materials will be stored in a protected computer, my supervisors and I will be the only ones who can have access to them.

Applicants: Please now scroll to Section 7 to input your :

- Information Sheet(s) for Participants (mandatory)
- Data Collection Tools, for example: recruitment materials, interview/focus group protocols (how you are conducting the process), interview/focus group questions, questionnaires, online survey questions, debriefing and fact sheets
- Consent Forms (optional, may not be necessary if consent assumed in Information Sheet)

If the text boxes do not allow input in the desired format, please append documents separately to the email when sending this form.

Please then email your completed form (and any separate supporting documents) to your supervisor/project investigator. Project investigators or independent academics may return form directly to sapdethics@reading.ac.uk

A decision on whether ethical clearance has been granted will be emailed to you via the APD Student Office along with your authorised form.

You may NOT proceed with your data collection until ethical approval has been granted as evidenced by return of this approved form.

Note: The process of obtaining ethical approval does not include an assessment of the scientific merit of the questionnaire. That is the separate responsibility of your supervisor/project investigator in discussion with yourself.

5. Supervisor/project investigator review. Section to be completed by supervisor/PI where relevant.

Participant information sheet(s), data collection tools and any other supporting information may be pasted in section 7 below. Alternatively they may be attached to this email. Please review these documents and then complete the checklist below.

Checklist. Does this application and supporting documents adequately address the following ?

- ☒ The safety of the researcher(s) and those collecting data, the safety of the participant(s)
- ☒ Is the language /grammar/content appropriate (i.e. University standards and reputation upheld)
- ☒ There are no questions that might reasonably be considered impertinent or likely to cause distress to the participants
- ☒ The researcher has provided the participant information sheet (mandatory)
- ☒ The researcher has provided the questionnaire or survey/ workshop, focus group or interview questions (mandatory)
- ☒ The Participant Information Sheet gives sufficient information for the participants to give their INFORMED consent
- ☐ A separate consent form has been included (optional)
- ☒ Data will be handled, stored and deleted appropriately according to University guidelines, and the participants have been adequately informed about this in the Participant Information Sheet
- ☒ The Participant Information Sheet contains all relevant sections

- ☐ **I am satisfied that this application meets the minimum standards for APD Ethical Clearance to be granted**

Supervisor/Project Investigator, please forward this form as a WORD document and any separate supporting documents to sapdethics@reading.ac.uk. The form will be logged by the student office and allocated to an APD ethics committee reviewer. The APD ethics reviewer will review the application and complete section 6.

6. APD ethics committee review. Section to be completed by APD Ethics Committee member.

Decision

Clearance refused ☐ Resubmission required

Clearance granted as presented ☒

Clearance granted subject to revisions suggested ☐ No need to resubmit once amended

Referred to APD Research Ethics Chair ☐ May require further information

Ethics Committee Member please enter comments, reasons for rejection, summary of revisions required before proceeding (if applicable):

Please note that after you have 'destroyed' the data, you cannot use the data for any publications (unless the results had been finalised before that date). In case, please amend the date (December 2023).

The interview guidelines seem to contain only two questions. Please double-check this is the intended questionnaire (you will need to resubmit another application in case additional questions were included).

Committee Member Name: Giacomo Zanello **Date Reviewed :** 05/03/2021

APD Ethics Committee member electronic signature (For signature, save document as pdf, then open pdf and use 'sign' option. Alternatively check here if no electronic signature used ☒)

APD Ethics Committee Member : Now please email this completed form (as signed pdf) to sapdethics@reading.ac.uk together with any separate supporting documents . The student office will record the outcome and return the completed form to the applicant with the decision.

7. Supporting Documents.

Please cut and paste the following documents into the text boxes below.

- Participant Information Sheet(s),
- Protocols (the procedures, how you will conduct and administer the data collection, interviews, surveys)
- Data Collection Instruments (interview questions and survey questions)
- Consent Forms (if Participant Information Sheet does not assume consent)
- Recruitment Materials (if relevant)

It is preferable that all information connected to this application is contained in one document. However, if you find that the text boxes below are not adequate, you may attach and email these supporting documents separately.

Supporting Documents for this application are pasted below. The text boxes cannot accept some types of formatting when pasting in documents. If this is the case, append them separately to the email with this form.

Reference number:

Participant Information Sheet

Project name: Consumer acceptance and Willingness to pay for alternative sources of protein: a country comparison between KSA and the UK.

I am a PhD student in consumer behaviour and food marketing at the University of Reading. As part of my degree, I am conducting research into novel meat substitutes. This research project aims to find out consumer acceptance and willingness to pay or novel meat substitutes (i.e. insect-based meat, cultured meat and plant-based meat). We are interested in exploring the readiness of the market and the consumers' reaction towards these alternatives.

To undertake this research, we are currently contacting you, and we would like to invite you to participate in an in-depth interview remotely; via Skype, Microsoft teams or phone call, which will take approximately one hour of your time. We are interested in exploring your opinion about whether this study can raise a problem for Islamic culture. You are encouraged to freely express your opinions and please be assured that your views are valued and that there are no right or wrong answers to the questions asked.

We will not collect any names or personal details as part of the interview. Your identity will not be revealed to anyone other than the researchers conducting this survey. Participation is entirely voluntary, and you are free to withdraw from the interview at any time you feel uncomfortable or unwilling to participate, and you do not have to specify a reason. Any in-part or total contribution can be withdrawn up until the point at which the data is aggregated before 31/12/2021 date. After 31/12/2021 date it will not be possible to withdraw your contribution from the results of the research. If you wish to withdraw, please contact details below, quoting the reference at the top of this page. The reference will only be used to identify your questionnaire/interview transcript and will not reveal any other information about you.

The discussion will be audio recorded if you agree, and the anonymised transcripts of the audio recordings will be used by the researchers working on the project. Once transcribed the original recording will be deleted. Your anonymity will not be compromised as only the reference number above will be used to identify the transcript.
If at any stage you wish to receive further information about this research project please do not hesitate to contact Asmaa Alhujaili before 31/12/2021 date. The findings will be written up into my thesis and it will be published in academic journals. This will not affect your anonymity.

All data I collect will be stored securely electronically on a password-protected computer. The data will be destroyed at the end of the research project no later than 29/12/2023 date.
By participating in this interview, you are acknowledging that you understand the terms and conditions of participation in this study and that you consent to these terms.

This research project has been reviewed according to the procedures specified by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.

Thank you very much for taking time to take part in this survey!
Asmaa Alhujaili

Student Contact Details

Asmaa Alhujaili
PhD researcher in consumer behaviour and food marketing
School of Agriculture, Policy and Development
Agriculture Building
Earley Gate, Whiteknights Road
PO Box 237
Reading RG6 6AR
United Kingdom
E-Mail: a.s.alhujaili@pgr.reading.ac.uk

Supervisors Contact Details

Name: Dr Giuseppe Nocella
Associate Professor of Consumer Research and Policy
School of Agriculture, Policy and Development
University of Reading
Reading RG6 6BZ
E-Mail: g.nocella@reading.ac.uk

Name: Dr Anna Macready
Associate Professor in Consumer Behaviour and Marketing
School of Agriculture, Policy and Development
University of Reading
Reading RG6 6AR
E-Mail: a.l.macready@reading.ac.uk

Cards illustrate the production process of cultured meat /insect food. The cards present cultured meat burger and insect burger as an example for the products. Cultured meat card was developed based on the literature while insect burger card was revised by insect food company.

Questions for topics that will be explored in the research
1) What do you think about cultured meat in Islamic culture? 2) What do you think about insect food in Islamic culture?

Click here to paste your supporting documents into a text box

Click here to paste your supporting documents into a text box

Click here to paste your supporting documents into a text box

Return to top of form
Return to Supervisor Ethical Review, Section 5

Appendix 3.3 Focus groups Ethical clearance

School of Agriculture, Policy and Developm

ETHICAL CLEARANCE GRANTED

University of Reading

Form 2. MSc PhD Staff Ethical Clearance Submission Form

PLEASE allow a minimum of 3 weeks for this process.
You must not begin your research until you have obtained consent as evidenced by this form returned from the APD student Office signed and dated. Ethical Clearance cannot be granted retrospectively.

This form can only be used if the application :

- Does not involve participants who are patients or clients of the health or social services
- Does not involve participants whose capacity to give free and informed consent may be impaired within the meaning of the Mental Capacity Act 2005
- Does not involve patients who are 'vulnerable'
- Does not involve any element of risk to the researchers or participants
- Does not involve any participants who have a special relationship to the researchers/investigators

If any of the above apply, please refer to the APD Ethics Chair to decide whether an application can be made through the APD review process or whether the application needs to be referred to the full University Committee.

It is the applicant's responsibility to check for any particular requirements of a funder regarding ethical review. Some funders may require that the application is reviewed by full University Committee and not the devolved School committee.

Full details of the University Research Ethics procedures are available at http://www.reading.ac.uk/internal/res/ResearchEthics/reas-REethicshomepage.aspx and you are encouraged to access these pages for a fuller understanding. Some helpful advice is available on this link http://www.reading.ac.uk/internal/res/ResearchEthics/reas-REwhatdoIneedtodo.aspx and the FAQs are particularly relevant.

ALL QUESTIONS MUST BE COMPLETED.

APD Ethical Clearance Application Reference Number : 001836

1. **APPLICANT DETAILS:**

Main applicant name:	Asmaa Saud Alhujaili
Name of academic supervisor/project investigator:	Dr Giuseppe Nocella & Dr Anna Macready
Email Address (decision will be emailed here):	a.s.alhujaili@pgr.reading.ac.uk
MSc Student	☐
PhD Student	☒
Staff Member	☐
Other (please specify)	Click here to enter text.

2. **PROJECT DETAILS:**

Title of project: Consumers' preferred attributes of insect and cultured meat burger in the UK and KSA

Please provide a lay summary of the project, including what is being investigated and why: The project aims to explore consumers' preferred attributes of insect and cultured meat burger patties in the United Kingdom and Kingdom of Saudi Arabia. In order to do that we will conduct focus groups in both countries.

Procedure. Please outline the project's research protocol (what procedures, research methods and analysis methods are being used) : Focus groups will be adopted as a research method in this phase of the study in both languages (English and Arabic). After the discussion, the Arabic transcript will be translated into English, then both transcripts will be analyzed using MAXQDA software for the content analysis.

Form 1. APD MScPhDStaff Ethical Clearance Application Version 1.0 Last updated 30/11/15

Period over which the data collection is to be undertaken (note: data collection CANNOT commence until ethical approval has been granted as evidenced by this form signed and returned).

Proposed Start Date: 18/04/2022

Proposed End Date: 31/10/2022

3. THE RESEARCH:

a) Nature and number of participants who are expected to take part in your survey/focus group. Please estimate if uncertain. As ethical clearance involving minors is more complex because of safeguarding and consent issues, please consider carefully whether you need to involve minors under the age of 16 in your research.

Participants	Number participating
Minors under 16 years of age	0
Students	0
Other members of the University	0
Members of the general public	45-50
Businesses	0
Government officials	0
Other *If other please specify:*	0

b) Funding. Is the research supported by funding from a research council or other external sources for example a charity or business?

Yes ☒ If yes, please specify funder : The research funded by King Fisal University, Saudi Arabis

No ☐

If yes, it is the responsibility of the applicant to check for any particular requirements of the funder regarding ethical review. Some funders may require that the application is reviewed by full University Committee and not the devolved School committee.

c) Recruitment. Please describe recruitment procedures. How have participants been selected? Are there any inclusion/exclusion criteria? Participants must be told on the Participant Information Sheet how and why they have been selected. You should attach ay recruitment materials to this application. Participants will be recruited using different ways: in the UK via social research company (https://www.respondent.io/), while in KSA will be via social media platforms due to the high expenses for the social research companies. Partecipants will be selected depending on a certain criteria including age (18-65). In KSA, we will only conduct the focus groups regarding cultured meat because eating some kinds of insects such as mealwarms (which used in insect-based burger) is prohibited in Islam religion. Participants who agreed to participate in the study will be contacted via their emails which will be collected when they fill the electronic registration form.

d) Exceptions. Does the research involve minors, medical patients, individuals with learning difficulties, vulnerable adults, participants recruited through social service departments, or anyone in a special relationship with yourself/data collectors? E.g. Supervisor; lecturer to a group of students; or person in a position of responsibility for participants.

Yes ☐

No ☒

If yes, this may result in referral to the University Research Ethics Committee (please note their deadlines). Please provide extra detail here: Click here to enter text.

e) Where is the data collection to be undertaken? Specify country(ies) and specific location(s) Interviews will be conducted remotely via ZOOM.

f) What forms of data collection does the research involve?

Group discussion/ workshop	☐
Personal interviews	☐
Telephone interviews	☐
Questionnaire/paper survey	☐
Postal survey	☐
Email/ online survey	☒
Which software tool will be used, if any?	Click here to enter text.
Other *(specify)*:	Click here to enter text.

g) Who will undertake the collection and/or analysis of data?

Myself	☒
Other MSc students	☐
Other Higher degree students	☐
Other contract research and/or academic staff	☐
Individuals outside University	☐
External organisations	☐

If individuals outside the University and/or external organisations are involved in the collection or analysis of data, give brief details below. Indicate how the ethical procedures and standards of the University will be satisfied: Click here to enter text.

h) Does the research require participants to consume any food products?

No ☒
Yes ☐

If yes, please provide full details and indicate measures in place to ensure excellent food hygiene standards and ensure participant safety. Click here to enter text.

i) Do you consider there are any potential ethical issues in this project? Does the research require collection of information that might be considered sensitive in terms of confidentiality, potential to cause personal upset, etc.?

No ☒
Yes ☐

If yes, please provide full details and indicate how these issues will be addressed, how researchers will manage participant reaction. Support and de-brief sheets should be attached if relevant. Click here to enter text.

j) Will the research involve any element of intentional deception at any stage? (i.e. providing false or misleading information about the study, or omitting information)?

No ☒
Yes ☐

If yes, this must be justified here. You should also consider including debriefing materials for participants which outline the nature and justification of the deception used. Click here to enter text.

k) Are participants offered a guarantee of anonymity and/or that the information they supply will remain confidential?

Yes ☒
No ☐

If yes, give brief details of the procedures to be used to ensure this and particularly if the data has 'linked' or 'keyed' anonymity (eg. where published results are anonymous but participant details are recorded and held separately to the responses but keyed with reference number) : A reference number for each participant will be held in order to keyed the answers to the participant as well as identify the participants in the transcripts. There will be a separate and secure held file linking the reference number to the identity.

l) **Will participants be required to complete a separate consent form?** Many APD applications do not require participants to complete a separate consent form. Please see the templates provided.

☐ Yes. Names, addresses and copies of completed forms will be given to APD student office
☒ No. The data collection is anonymous and a combined information/consent sheet supplied
☐ Neither of the above, or the research involves participants under the age of 16

If 'neither of the above' selected, or the research involves participants under the age of 16, please outline the specific circumstances. Click here to enter text.

m) **Will participants be offered any form of incentive for undertaking the research?**

No ☐
Yes ☒

If yes, give brief details, including what will happen to the incentive should the participant later withdraw their input or decide not to proceed : Participants will receive an incentive of £30 for their contribution upon completion of the focus group. The incentive will be amazon vouchers of £30 for participants in the UK and vouchers of 150 SAR in KSA. The vouchers will be sent to the participants email. If a participant withdraws from the focus group before completion, they will still be sent the incentive payment and they will be able to retain the payment if they subsequently ask for their data to be withdrawn from the study.

4. DATA PROTECTION

Data Storage, data protection and confidentiality. Please make sure you are familiar with the University of Reading's guidelines for data protection and information security. http://www.reading.ac.uk/internal/imps/

Please outline plans for the handling of data to ensure data protection and confidentiality. Covering the following issues: Will any personal information be stored? How and where will the data be stored? Who will have access to the data? When will it be deleted?

Personal details will be linked to a reference number and kept separately only for the purpose of the current research and will not be shared with 3rd parties. Participants will be asked for permission to record the interview and if they consent responses will be recorded and transcribed by myself and the Arabic transcripts will be translated by myself then back-translated by a specialist agency. Once transcribed the original recording will be deleted. The transcribed data will be analyzed by myself, and the records will be permanently deleted. All electronic materials will be stored on a protected computer, my supervisors and I will be the only ones who can have access to them. The records will be destroyed no later than the 30/6/2027

Applicants: Please now scroll to Section 7 to input your :

- Information Sheet(s) for Participants (mandatory)
- Data Collection Tools, for example: recruitment materials, interview/focus group protocols (how you are conducting the process), interview/focus group questions, questionnaires, online survey questions, debriefing and fact sheets
- Consent Forms (optional, may not be necessary if consent assumed in Information Sheet)

If the text boxes do not allow input in the desired format, please append documents separately to the email when sending this form.

Please then email your completed form (and any separate supporting documents) to your supervisor/project investigator. Project investigators or independent academics may return form directly to sapdethics@reading.ac.uk

A decision on whether ethical clearance has been granted will be emailed to you via the APD Student Office along with your authorised form.

You may NOT proceed with your data collection until ethical approval has been granted as evidenced by return of this approved form.

Note: The process of obtaining ethical approval does not include an assessment of the scientific merit of the questionnaire. That is the separate responsibility of your supervisor/project investigator in discussion with yourself.

5. Supervisor/project investigator review. Section to be completed by supervisor/PI where relevant.

Participant information sheet(s), data collection tools and any other supporting information may be pasted in section 7 below. Alternatively they may be attached to this email. Please review these documents and then complete the checklist below.

Checklist. Does this application and supporting documents adequately address the following ?

- ☒ The safety of the researcher(s) and those collecting data, the safety of the participant(s)
- ☒ Is the language /grammar/content appropriate (i.e. University standards and reputation upheld)
- ☒ There are no questions that might reasonably be considered impertinent or likely to cause distress to the participants
- ☒ The researcher has provided the participant information sheet (mandatory)
- ☒ The researcher has provided the questionnaire or survey/ workshop, focus group or interview questions (mandatory)
- ☒ The Participant Information Sheet gives sufficient information for the participants to give their INFORMED consent
- ☐ A separate consent form has been included (optional)
- ☒ Data will be handled, stored and deleted appropriately according to University guidelines, and the participants have been adequately informed about this in the Participant Information Sheet
- ☒ The Participant Information Sheet contains all relevant sections

- ☒ **I am satisfied that this application meets the minimum standards for APD Ethical Clearance to be granted**

Supervisor/Project Investigator, please forward this form as a WORD document and any separate supporting documents to sapdethics@reading.ac.uk. The form will be logged by the student office and allocated to an APD ethics committee reviewer. The APD ethics reviewer will review the application and complete section 6.

6. APD ethics committee review. Section to be completed by APD Ethics Committee member.

Decision

Clearance refused		☐ Resubmission required
Clearance granted as presented	☒	
Clearance granted subject to revisions suggested	☐	No need to resubmit once amended
Referred to APD Research Ethics Chair		☐ May require further information

Ethics Committee Member please enter comments, reasons for rejection, summary of revisions required before proceeding (if applicable):

For information only:

a. Q4 it is common practice to delete the audio/video recordings after successful transcription – you state this in the participant information sheet so I have added the statement to Q4.
b. You do not state anywhere in the form whether the participants will be asked for their permission to record the interview, but you do state this in the participant information sheet, so I have added this statement to Q4.
c. At Q3M you do not indicate the point at which the gift voucher will be emailed to the respondent. I have assumed that this will be upon completion of the interview and added this statement to Q3M. I have also adde policy on how withdrawal affects eligibility to receive and retain the payment.

Committee Member Name: Philip Jones **Date Reviewed :** 30/03/2022

APD Ethics Committee member electronic signature (For signature, save document as pdf, then open pdf and use 'sign' option. Alternatively check here if no electronic signature used ☒)

APD Ethics Committee Member : Now please email this completed form (as signed pdf) to sapdethics@reading.ac.uk together with any separate supporting documents . The student office will record the outcome and return the completed form to the applicant with the decision.

7. Supporting Documents.

Please cut and paste the following documents into the text boxes below.

- Participant Information Sheet(s),
- Protocols (the procedures, how you will conduct and administer the data collection, interviews, surveys)
- Data Collection Instruments (interview questions and survey questions)
- Consent Forms (if Participant Information Sheet does not assume consent)
- Recruitment Materials (if relevant)

It is preferable that all information connected to this application is contained in one document. However, if you find that the text boxes below are not adequate, you may attach and email these supporting documents separately.

Supporting Documents for this application are pasted below. The text boxes cannot accept some types of formatting when pasting in documents. If this is the case, append them separately to the email with this form.

Reference number:

Participant Information Sheet

Project name: Consumers' preferred attributes of insect and cultured meat burgers in the UK and KSA

I am a PhD student in consumer behaviour and food marketing at the University of Reading. As part of my degree, I am conducting research into novel meat substitutes (i.e insect-based burger and cultured meat burger). This research project aims to find out consumer acceptance and willingness to pay of novel meat substitutes. We are interested in exploring the readiness of the market and consumers' preferences towards these alternatives.

To undertake this research, we are currently contacting you, and we would like to invite you to participate in a remot focus group via ZOOM. Your participation will take approximately two hours of your time. You have been selected due to ease of access and we believe you fit the the desired characteristics of this research. We are interested in your opinon regarding these novel meat substitutes. You are encouraged to freely express your opinions and please be assured that your views are valued and that there are no right or wrong answers to the questions asked.

We will not collect any names or personal details as part of the discussion. Your identity will not be revealed to third parties, and data will only be available to researchers conducting this study. Participation is entirely voluntary, however, you will receive an amazon voutcher of £30 sent to your email for your contribution to our study. You are free to withdraw from the discussion at any time you feel uncomfortable or unwilling to participate, and you do not have to specify any reason. Any in-part or total contribution can be withdrawn up until the point at which the data is aggregated before 31/8/2022 date. After this date it will not be possible to withdraw your contribution from the results of the research. If you wish to withdraw, please contact us quoting the reference at the top of this page. This reference will only be used to identify your interview transcript and will not reveal any other information about you.

The discussion will be audio recorded if you agree, and the anonymised transcripts of the audio recordings will be used by the researchers working on the project. Once transcribed the original recording will be deleted. Your anonymity will not be compromised as only the reference number above will be used to identify the transcript.

If at any stage you wish to receive further information about this research project please do not hesitate to contact Asmaa Alhujaili before 31/8/2022 date (please see my contact details below). The findings of this tudy will be included into my thesis and published in academic journals, but it will not be possible to identify your identity.

All data I collect will be stored securely electronically on a password-protected computer. The data will be destroyed no later than 30/6/2027 date.

By participating in the discussion, you are acknowledging that you understand the terms and conditions of participation in this study and that you consent to these terms.

This research project has been reviewed according to the procedures specified by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.

Thank you very much for taking time to take part in this survey!
Asmaa Alhujaili

Student Contact Details

Asmaa Alhujaili
PhD researcher in consumer behaviour and food marketing
School of Agriculture, Policy and Development
Agriculture Building
Earley Gate, Whiteknights Road
PO Box 237
Reading RG6 6AR
United Kingdom
E-Mail: a.s.alhujaili@pgr.reading.ac.uk

Supervisors Contact Details

Name: Dr Giuseppe Nocella
Associate Professor of Consumer Research and Policy
School of Agriculture, Policy and Development
University of Reading
Reading RG6 6BZ
E-Mail: g.nocella@reading.ac.uk

Name: Dr Anna Macready
Associate Professor in Consumer Behaviour and Marketing
School of Agriculture, Policy and Development
University of Reading
Reading RG6 6AR
E-Mail: a.l.macready@reading.ac.uk

Focus groups (cultured meat burger patty)

- Welcome the participant and introduce myself and explain the research and the focus group procedure including the ground rules (e.g . speaking up, respecting others' opinions and being open-minded). Then participants will be asked to briefly introduce themselves and what is their prefered food.

- During the focus group, we will be asking open ended questions around the marketing mix elements such as:
  - Imagine that you or someone else is going to buy a cultured meat burger patty, what are the sensory attributes that consumers like most? Why?
  - What is the most attractive packaging for consumers when buying a burger patty? Why?
  - What is the most likely preferred place by consumers when buying a burger patty? Why?
  - What is the most attractive price for consumers when buying a burger patty? Why?

- What are the most likely promotion tools that can influence consumers' purchasing behaviour of these products? Why?
- Can you tell me what you liked most about this product? The most important thing that you learned from this discussion? And the most important thing that you would like producers to take into account for this product?
- At the end of the discussion, participants will be asked to provide a summary of their ideal product based on their preferences.

During the discussion, participants will be encouraged to give more details about the reasons behind their preferences. Then they will be encouraged in the discussion to share their thoughts about other attributes not mentioned.

Focus groups (insect-based burger patty)

- Welcome the participant and introduce myself and explain the research and the focus group procedure including the ground riles (e.g . speaking up, respecting others' opinions and being open-minded). Then the participant will be asked to briefly introduce themselves and what is their preffere food.

- In the focus group, we will be asking open ended questions around the marketing mix elements such as:
  - Imagine that you or someone else is going to buy an insect-based burger patty, what are the sensory attributes that consumers like most? Why?
  - What is the most attractive packaging for consumers when buying a burger patty? Why?
  - What is the most likely preferred place by consumers when buying a burger patty? Why?
  - What is the most attractive price for consumers when buying a burger patty? Why?
  - What are the most likely promotion tools that can influence consumers' purchasing behaviour of these products? Why?
  - Please, tell me what is the most thing that you liked about the product? One thing that you learned? And one thing that you wish if the product producers take it into account?
  - At the end, a summary of the ideal product based on the participants' preferences in the discussion will be presented as a scenario. Can you tell me what you liked most about this product? The most important thing that you learned from this discussion? And the most important thing that you would like producers to take into account for this product?
  - At the end of the discussion, participants will be asked to provide a summary of their ideal product based on their preferences.

During the discussion, participants will be encouraged to give more details about the reasons behind their preferences. Then they will be encouraged in the discussion to share their thoughts about other attributes not mentioned.

Return to top of form
Return to Supervisor Ethical Review, Section 5

Appendix 4: Methodology of the survey

Appendix 4.1 Ethical clearance

School of Agriculture, Policy and Development

University of Reading

ETHICAL CLEARANCE GRANTED

Form 2. MSc PhD Staff Ethical Clearance Submission Form

PLEASE allow a minimum of 3 weeks for this process.

You must not begin your research until you have obtained consent as evidenced by this form returned from the APD student **Office signed and dated. Ethical Clearance cannot be granted retrospectively.**

This form can only be used if the application :

- Does not involve participants who are patients or clients of the health or social services
- Does not involve participants whose capacity to give free and informed consent may be impaired within the meaning of the Mental Capacity Act 2005
- Does not involve patients who are 'vulnerable'
- Does not involve any element of risk to the researchers or participants
- Does not involve any participants who have a special relationship to the researchers/investigators

If any of the above apply, please refer to the APD Ethics Chair to decide whether an application can be made through the APD review process or whether the application needs to be referred to the full University Committee.

It is the applicant's responsibility to check for any particular requirements of a funder regarding ethical review. Some funders may require that the application is reviewed by full University Committee and not the devolved School committee.

Full details of the University Research Ethics procedures are available at http://www.reading.ac.uk/internal/res/ResearchEthics/reas-REethicshomepage.aspx and you are encouraged to access these pages for a fuller understanding. Some helpful advice is available on this link http://www.reading.ac.uk/internal/res/ResearchEthics/reas-REwhatdoIneedtodo.aspx and the FAQs are particularly relevant.

ALL QUESTIONS MUST BE COMPLETED.

APD Ethical Clearance Application Reference Number : 002213

1. **APPLICANT DETAILS:**

Main applicant name:	Asmaa Alhujaili
Name of academic supervisor/project investigator:	Dr Giuseppe Nocella
Email Address (decision will be emailed here):	a.s.alhujaili@pgr.reading.ac.uk
MSc Student	☐
PhD Student	☒
Staff Member	☐
Other (please specify)	Click here to enter text.

2. **PROJECT DETAILS:**

Title of project: UK Consumers' preferences and willingness to pay for insects as food

Please provide a lay summary of the project, including what is being investigated and why: This project aims to investigate British consumers' preferences and their willingness to pay for alternative sources of protein (i.e. insect-based burger and pasta made with insects).

Procedure. Please outline the project's research protocol (what procedures, research methods and analysis methods are being used) : Quantitative data from 800 British partecepants will be collected via Qualtrics platform. In the survey, participants will be asked about their preferences and willingness to pay for insect-based products (i.e. burger and pasta). The survey is composed of three treatments based on the preferences of the two insect-based products and the opinion of NONE. All treatments have four sections. Section one, screening questions. In section two, we ask general questions regarding their consumption habits. Section

Form 1. APD MScPhDStaff Ethical Clearance Application Version 1.0 Last updated 30/11/15

three, attitudinal and behavioural questions regarding novel food and particularly insects as food. Section three is the valuation of the willingness to pay will be measured in two different methods, namely double-bounded dichotomous choice (DBDC) and price sensitivity meter (PSM). Section four, socio-economic and demographic characteristics. The information sheet will be given to participants before the beginning of the survey. The constent will be given by clicking on the button "continue".

Period over which the data collection is to be undertaken (note: data collection CANNOT commence until ethical approval has been granted as evidenced by this form signed and returned).

Proposed Start Date:	28/07/2023
Proposed End Date:	30/09/2023

3. THE RESEARCH:

a) Nature and number of participants who are expected to take part in your survey/focus group. Please estimate if uncertain. As ethical clearance involving minors is more complex because of safeguarding and consent issues, please consider carefully whether you need to involve minors under the age of 16 in your research.

Participants	Number participating
Minors under 16 years of age	Click here to enter text.
Students	Click here to enter text.
Other members of the University	Click here to enter text.
Members of the general public	800
Businesses	Click here to enter text.
Government officials	Click here to enter text.
Other *If other please specify:*	Click here to enter text.

b) Funding. Is the research supported by funding from a research council or other external sources for example a charity or business?

Yes ☐ If yes, please specify funder : Click here to enter text.
No ☒

If yes, it is the responsibility of the applicant to check for any particular requirements of the funder regarding ethical review. Some funders may require that the application is reviewed by full University Committee and not the devolved School committee.

c) Recruitment. Please describe recruitment procedures. How have participants been selected? Are there any inclusion/exclusion criteria? Participants must be told on the Participant Information Sheet how and why they have been selected. You should attach ay recruitment materials to this application. Participants must be British, aged over 18, primarily responsible for food purchases in their household, consuming burger and pasta. We will collect respondents equally split based on gender (50% male and 50% female). All participants will receive an information sheet prior to taking part in the study and will be required to give informed consent to take part in the survey. Data will be collected by Bilendi which is a market research agency (https://www.bilendi.co.uk/) where they will check for data quality issues. After that, if all is fine with the data, the respondents will receive their standard reward as common practice by Qualtrics.

d) Exceptions. Does the research involve minors, medical patients, individuals with learning difficulties, vulnerable adults, participants recruited through social service departments, or anyone in a special relationship with yourself/data collectors? E.g. Supervisor; lecturer to a group of students; or person in a position of responsibility for participants.

Yes ☐
No ☒

If yes, this may result in referral to the University Research Ethics Committee (please note their deadlines). Please provide extra detail here: Click here to enter text.

e) **Where is the data collection to be undertaken?** Specify country(ies) and specific location(s) The United Kingdom.

f) **What forms of data collection does the research involve?**

Group discussion/ workshop	☐
Personal interviews	☐
Telephone interviews	☐
Questionnaire/paper survey	☐
Postal survey	☐
Email/ online survey	☒
Which software tool will be used, if any?	Click here to enter text.
Other *(specify)*:	Click here to enter text.

g) **Who will undertake the collection and/or analysis of data?**

Myself	☒
Other MSc students	☐
Other Higher degree students	☐
Other contract research and/or academic staff	☒
Individuals outside University	☐
External organisations	☒

If individuals outside the University and/or external organisations are involved in the collection or analysis of data, give brief details below. Indicate how the ethical procedures and standards of the University will be satisfied: The company Bilendi will recruit consumers and collect the data anonymously.

h) **Does the research require participants to consume any food products?**

No ☒
Yes ☐

If yes, please provide full details and indicate measures in place to ensure excellent food hygiene standards and ensure participant safety. Click here to enter text.

i) **Do you consider there are any potential ethical issues in this project? Does the research require collection of information that might be considered sensitive in terms of confidentiality, potential to cause personal upset, etc.?**

No ☒
Yes ☐

If yes, please provide full details and indicate how these issues will be addressed, how researchers will manage participant reaction. Support and de-brief sheets should be attached if relevant. Click here to enter text.

j) **Will the research involve any element of intentional deception at any stage?** (i.e. providing false or misleading information about the study, or omitting information)?

No ☒
Yes ☐

If yes, this must be justified here. You should also consider including debriefing materials for participants which outline the nature and justification of the deception used. Click here to enter text.

k) Are participants offered a guarantee of anonymity and/or that the information they supply will remain confidential?

Yes ☒
No ☐

If yes, give brief details of the procedures to be used to ensure this and particularly if the data has 'linked' or 'keyed' anonymity (eg. where published results are anonymous but participant details are recorded and held separately to the responses but keyed with reference number) : Information obtained from participants regarding their socio-demographics will be kept confidential and anonymised. In addition, they will be given a randomly assigned ID code at the beginning of the survey that they can use to refer to themselves in case they wish to withdraw from the study without having to disclose any personal information.

l) Will participants be required to complete a separate consent form? Many APD applications do not require participants to complete a separate consent form. Please see the templates provided.

☐ Yes. Names, addresses and copies of completed forms will be given to APD student office
☒ No. The data collection is anonymous and a combined information/consent sheet supplied
☐ Neither of the above, or the research involves participants under the age of 16

If 'neither of the above' selected, or the research involves participants under the age of 16, please outline the specific circumstances. Click here to enter text.

m) Will participants be offered any form of incentive for undertaking the research?

No ☒
Yes ☐

If yes, give brief details, including what will happen to the incentive should the participant later withdraw their input or decide not to proceed :

4. DATA PROTECTION

Data Storage, data protection and confidentiality. Please make sure you are familiar with the University of Reading's guidelines for data protection and information security. http://www.reading.ac.uk/internal/imps/

Please outline plans for the handling of data to ensure data protection and confidentiality. Covering the following issues: Will any personal information be stored? How and where will the data be stored? Who will have access to the data? When will it be deleted?

Participants will be given a randomly assigned ID code that will be used throughout the data collection and analysis processes. Documents linking participants to their ID code will be kept in a locked PC until they are fully analyzed and will not be shared with anyone else outside the research group involved in this study.

Applicants: Please now scroll to Section 7 to input your :

- Information Sheet(s) for Participants (mandatory)
- Data Collection Tools, for example: recruitment materials, interview/focus group protocols (how you are conducting the process), interview/focus group questions, questionnaires, online survey questions, debriefing and fact sheets
- Consent Forms (optional, may not be necessary if consent assumed in Information Sheet)

If the text boxes do not allow input in the desired format, please append documents separately to the email when sending this form.

Please then email your completed form (and any separate supporting documents) to your supervisor/project investigator. Project investigators or independent academics may return form directly to sapdethics@reading.ac.uk

A decision on whether ethical clearance has been granted will be emailed to you via the APD Student Office along with your authorised form.

You may NOT proceed with your data collection until ethical approval has been granted as evidenced by return of this approved form.

Note: The process of obtaining ethical approval does not include an assessment of the scientific merit of the questionnaire. That is the separate responsibility of your supervisor/project investigator in discussion with yourself.

5. Supervisor/project investigator review. Section to be completed by supervisor/PI where relevant.

Participant information sheet(s), data collection tools and any other supporting information may be pasted in section 7 below. Alternatively they may be attached to this email. Please review these documents and then complete the checklist below.

Checklist. Does this application and supporting documents adequately address the following ?

- ☒ The safety of the researcher(s) and those collecting data, the safety of the participant(s)
- ☒ Is the language /grammar/content appropriate (i.e. University standards and reputation upheld)
- ☒ There are no questions that might reasonably be considered impertinent or likely to cause distress to the participants
- ☒ The researcher has provided the participant information sheet (mandatory)
- ☒ The researcher has provided the questionnaire or survey/ workshop, focus group or interview questions (mandatory)
- ☒ The Participant Information Sheet gives sufficient information for the participants to give their INFORMED consent
- ☐ A separate consent form has been included (optional)
- ☒ Data will be handled, stored and deleted appropriately according to University guidelines, and the participants have been adequately informed about this in the Participant Information Sheet
- ☒ The Participant Information Sheet contains all relevant sections

- ☒ **I am satisfied that this application meets the minimum standards for APD Ethical Clearance to be granted**

Supervisor/Project Investigator, please forward this form as a WORD document and any separate supporting documents to sapdethics@reading.ac.uk. The form will be logged by the student office and allocated to an APD ethics committee reviewer. The APD ethics reviewer will review the application and complete section 6.

6. APD ethics committee review. Section to be completed by APD Ethics Committee member.

Decision

Clearance refused		☐ Resubmission required
Clearance granted as presented	☐	
Clearance granted subject to revisions suggested	☒	No need to resubmit once amended
Referred to APD Research Ethics Chair		☐ May require further information

Ethics Committee Member please enter comments, reasons for rejection, summary of revisions required before proceeding (if applicable):

Click here to enter text.

Committee Member Name: Sanzidur Rahman **Date Reviewed :** 12/07/2023

APD Ethics Committee member electronic signature (For signature, save document as pdf, then open pdf and use 'sign' option. Alternatively check here if no electronic signature used ☒)

Form 1. APD MScPhDStaff Ethical Clearance Application Version 1.0 Last updated 30/11/15

APD Ethics Committee Member : Now please email this completed form (as signed pdf) to sapdethics@reading.ac.uk together with any separate supporting documents . The student office will record the outcome and return the completed form to the applicant with the decision.

7. Supporting Documents.

Please cut and paste the following documents into the text boxes below.

- Participant Information Sheet(s),
- Protocols (the procedures, how you will conduct and administer the data collection, interviews, surveys)
- Data Collection Instruments (interview questions and survey questions)
- Consent Forms (if Participant Information Sheet does not assume consent)
- Recruitment Materials (if relevant)

It is preferable that all information connected to this application is contained in one document. However, if you find that the text boxes below are not adequate, you may attach and email these supporting documents separately.

Supporting Documents for this application are pasted below. The text boxes cannot accept some types of formatting when pasting in documents. If this is the case, append them separately to the email with this form.

Project title: UK Consumers' preferences and willingness to pay for insects as food.

This study is being conducted by researchers from the University of Reading. The purpose is to investigate consumers' acceptance and willingness to pay for insect-based food.

Your participation in this online survey should not take more than 15 minutes of your time. Please remember that once you have answered the question, you cannot go back, so please choose the answer carefully. And please be assured that your opinion is valued and that there are no right or wrong answers to the questions asked.

Your name will not be collected as part of your survey response and thus can never be associated with the data. Your responses will not be individually identified or publicized. Participation is entirely voluntary, and you are free to withdraw from the survey at any time you feel uncomfortable and up until the point at which the data is aggregated before the 30/9/2023 date. After this date, it will not be possible to withdraw your contribution to the results of the research. If you wish to withdraw, please contact Asmaa Alhujaili at a.s.alhujaili@pgr.reading.ac.uk quoting the reference number. The findings of this study will be included in my thesis and published in academic journals, but it will not be possible to identify your identity.

This application has been reviewed according to the procedures specified by the University of Reading Research Ethics Committee and has been given a favourable ethical opinion for conduct.

If you have questions at any time about the study or the procedures, (or if you experience adverse effects as a result of participating in this study) you may contact me at a.s.alhujaili@pgr.reading.ac.uk.

Supervisor contact details:
Dr Giuseppe Nocella
Associate Professor
E-mail: g.nocella@reading.ac.uk

Clicking the button to continue will be considered your consent to participate.

SECTION 1. Screening

Thank you for your interest in this survey. To begin, please respond to the following questions to determine your eligibility.

Q1. Which country are you from?

- ☐ The UK
- ☐ Out the UK (screen out)

Q2. Please, indicate your age range:

- ☐ Under 18 (screen out)
- ☐ 18 - 29
- ☐ 30-39
- ☐ 40-49
- ☐ 50-59
- ☐ 60-69
- ☐ 70 or older

Q3. Are you fully or partially responsible for food purchases in your household?

- ☐ I am primarily responsible for food purchases.
- ☐ I am not responsible for food purchases. (Screen out)

Q5. Do you consume meat burgers (e.g., beef burger, chicken burger…etc.)?

- ☐ Yes
- ☐ No (Screen out)

Q6. Do you consume pasta?

- ☐ Yes
- ☐ No (Screen out)

SECTION 2. Consumption habits
Now we would like to ask you some questions regarding your consumption and food purchasing habits of the products mentioned previously.

Q1. How often do you consume the following products? (Please only mark one of the options - the one that best resembles your diet).

	Monthly	Twice a month	Once a week	Two to three times a week	Everyday
Meat burger	☐	☐	☐	☐	☐
Pasta	☐	☐	☐	☐	☐

Q2. On average, how much does your family spend for meat burgers every month?
£ ……………………

Q3. On average, how many meat burgers do you consume every month?
………………

Q4. On average, how much does your family spend for pasta every month?
£……………………

Q5. On average, how many kg of pasta do you consume every month?
………………

SECTION 3. USE OF GOOD

Insect-based food is becoming an attractive alternative to meat-based proteins due to the variety of benefits it offers, from improved food security to reduced environmental impacts and a more sustainable production system. At the same time, new food products are also difficult to accept because of novelty and the way in which consumers perceive and judge new food products. Thus, we would like to ask you your opinion about several aspects regarding insects as food. Before answering these statements, we would like to remind you that there are no right or wrong answers, but what count is only your frank opinion.

Q1. To what extent do you disagree/agree with the following statements?

a. I am constantly sampling new and different foods.								
Strongly disagree	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Strongly agree
b. I do not trust new food.								
Strongly disagree	1	2	3	4	5	6	7	Strongly agree
c. If I do not know what is in a food, I will not try it.								
Strongly disagree	1	2	3	4	5	6	7	Strongly agree
d. I like food from different countries.								
Strongly disagree	1	2	3	4	5	6	7	Strongly agree
e. Ethnic food looks too weird to eat.								
Strongly disagree	1	2	3	4	5	6	7	Strongly agree
f. At dinner parties, I will try new food.								
Strongly disagree	1	2	3	4	5	6	7	Strongly agree
g. I am afraid to eat things I have never had before.								
Strongly disagree	1	2	3	4	5	6	7	Strongly agree
h. I am very particular about the foods I will eat.								
Strongly disagree	1	2	3	4	5	6	7	Strongly agree
i. I will eat almost anything.								
Strongly disagree	1	2	3	4	5	6	7	Strongly agree
j. I like to try new ethnic restaurants.								
Strongly disagree	1	2	3	4	5	6	7	Strongly agree

Q2. What do you think about the following statements.

a. I would be disgusted to eat any dish with insects.			
Not relevant ○	Somewhat relevant ○	Quite relevant ○	Highly relevant ○
b. Thinking about the flavour that a bug might have sickens me.			
Not relevant ○	Somewhat relevant ○	Quite relevant ○	Highly relevant ○
c. If I ate a dish and then came to know that there were insects among the ingredients, I would be disgusted.			
Not relevant ○	Somewhat relevant ○	Quite relevant ○	Highly relevant ○
d. I would avoid eating a dish with insects among the ingredients, even if it was cooked by a famous chef.			
Not relevant	Somewhat relevant	Quite relevant	Highly relevant

○	○	○	○
e. I would be bothered by finding dished cooked with insects on a restaurant menu.			
Not relevant ○	Somewhat relevant ○	Quite relevant ○	Highly relevant ○

The food industry is introducing food products containing edible insects and we would like to know your opinion about the consumption of food insects in the next 12 months.

Q3. What do you think about the following statements.

For me, the reduction of greenhouse gas emissions deriving from the consumption of food insects would be								
Extremely undesirable	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely desirable
Consuming food insects regularly will give me the opportunity to contribute to the reduction of greenhouse gas emissions.								
Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely likely
For me, the improvement of farm animal welfare deriving from the consumption of food insects would be								
Extremely undesirable	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely desirable
Consuming food insects regularly will give me the opportunity to contribute to the improvement of farm animal welfare.								
Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely likely
For me worsening living conditions of livestock farmers as a consequence of the consumption of food insects would be								
Extremely undesirable	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely desirable
Consuming food insects regularly will cause me to worsen the living conditions of livestock farmers.								
Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely likely
For me, food safety risks linked to the consumption of food insects would be								
Extremely undesirable	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely desirable
Consuming food insects regularly will increase my chances of facing food safety risks.								
Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely likely
For me, health benefits linked to the consumption of food insects would be								
Extremely undesirable	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely desirable
Consuming food insects regularly will give me the opportunity to take advantage of their health benefits.								
Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely likely
For me, the takeover of multinational companies as a consequence of the consumption of food insects would be								
Extremely undesirable	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely desirable
Consuming food insects regularly will cause me to trigger the takeover of multinational companies.								
Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely likely

Q4. Please express your opinion on the following statements.

When it comes to eating new food products like food insects, I want to eat what my family thinks I should eat.								
Strongly disagree	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Strongly agree
My family thinks that I should eat food insects regularly.								
Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely likely
When it comes to eating new food products like food insects, I want to eat what my friends think I should eat.								
Strongly disagree	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Strongly disagree
My friends think that I should eat food insects regularly.								
Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely likely
When it comes to eating new food products like food insects, I want to eat what experts (nutritionists, doctors, etc.) think I should eat.								
Strongly disagree	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Strongly disagree
Experts like doctors and nutritionists think that I should eat food insects regularly.								
Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely likely

Q5. Please express your opinion on the following statements.

The presence of food insects in my favourite supermarkets would facilitate my purchase of these products regularly.								
Strongly disagree	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Strongly agree
How likely or unlikely is it that you will find food insects in your favourite supermarkets?								
Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely likely
The food culture of my country would facilitate the consumption of food insects.								
Strongly disagree	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Strongly agree
How likely or unlikely is it that you will have the food culture to consume food insects?								
Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely likely
Having sufficient economic resources would facilitate the purchase of food insects.								
Strongly disagree	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Strongly agree
How likely or unlikely is it that you will have sufficient economic resources to purchase food insects?								
Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Extremely likely

Now, we would like to ask you some questions regarding your intention towards eating insects as food.

Q6. To what extent do you disagree/agree with the following statements?

I intend to eat food products containing edible insects regularly in the next 12 months.								
Strongly disagree	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Strongly agree
For sure I will eat food products containing edible insects in the next 12 months.								
Strongly disagree	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Strongly agree
I will try to eat food products containing edible insects in the next 12 months.								
Strongly disagree	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	7 ○	Strongly agree

Q7. We would like to ask you some questions regarding your previous experience and future intention in relation to this type of food.

Item	Yes	No
a. Have you ever heard about edible insects?	○	○
b. Have you ever tried edible insects?	○	○
c. Have you ever tried a burger made with insects?	○	○
d. Have you ever tried pasta made with insect flour?	○	○
e. Have you ever tried unprocessed insects (e.g., Mealworms, grasshoppers)?	○	○
f. Would you be willing to try a burger made with processed insects?	○	○
g. Would you be willing to try pasta made with processed insects?	○	○
h. Would you be willing to try unprocessed insects?	○	○

[ONLY WHO CHOSE YES FOR Q7b. WILL SEE THE FOLLOWING QUESTION Q18bx2]

Q7b.2 In the past 12 months, I have eaten edible insects				
Never ○	Rarely ○	Sometimes ○	Always ○	Often ○

[ONLY WHO CHOSE NO FOR Q7f. WILL BE DIRECTED TO SECTION FIVE: THE SOCIOECONOMIC AND DEMOGRAPHIC QUESTIONS).

SECTION 4. Economic valuation

Cheap talk

On the following screens, you will see a series of questions about your purchasing considerations for two insect-based products. But before asking you these questions, we are asking you to kindly carefully read the following information.

In a recent study, several different groups of people were asked whether they are willing to purchase a new food product. This purchase was hypothetical for these people, as it will be for you. In that study, no one actually had to pay money when they were willing to purchase the new food product. Over 80% of people said they would buy the new food product. However, when a grocery store actually put the same new food on its shelf, and people really did have to pay money if they decided to purchase the new food product, the result was different: only 43% of people actually bought the new food. That's quite a difference, isn't it? We call this "hypothetical bias." Hypothetical bias is the difference that we continually see in the way people respond to hypothetical purchase questions as compared to real situations.

I think that when we say we will purchase a new food at a particular price in a hypothetical survey we respond according to our best guess of what the food is really worth in the grocery store. But when we are really in the grocery store, and we actually have to spend our money if we decide to purchase the food, we think a different way: If I spend money on this, that's money I can't spend on other things. We shop in a way that takes into account the limited amount of money we have. This is just my opinion, of course, but it's what I think maybe going on in hypothetical survey questions.

So, if I were in your shoes, I would ask myself: If I were really shopping in the grocery store and I had to pay a premium of £X if I decide to buy insect-based products, do I really want to spend my money this way? If I really did, I would indicate YES, I would pay a premium of £X to purchase insect-based products; if I didn't want to spend my money this way, I would indicate NO, I would purchase insect-based products at a lower price.

<u>Please keep this in mind when answering the following questions.</u>

Imagine that tomorrow the following two food products containing edible insects are available on the shelves of your favourite supermarket:

A pack of 2 burger patties (2 x 113.5 g) made of insects containing between 24% and 50% mealworms.	A pack of (500 g) of pasta made with insect flour (10%-20% crickets flour).
	

Q1. Which of them you would like to choose?

Burger	Pasta	None
☐	☐	☐

Based on their choices, they will be directed to two different treatments. **<u>IF</u>** they say BURGER, they go to the BURGER questions, **<u>IF</u>** they say PASTA, they go to the PASTA questions. **<u>IF</u>** they say NONE, they go to the follow-up questions and SED).

TREATMENT 1. IF THEY CHOOSE BURGER

1. **WTP- DBDC**

Participants will be randomly assigned to one of the six different blocks of bids

Q1. BID 1. Would you be willing to pay 4£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?

Q2. IF NO > Would you be willing to pay 3£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?

Q2. IF YES > Would you be willing to pay 5£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?

Q1. BID 2. Would you be willing to pay 5£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?

Q2. IF NO > Would you be willing to pay 4£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?

Q2. IF YES > Would you be willing to pay 6£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?

Q1. BID 3. Would you be willing to pay 6£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?

Q2. IF NO > Would you be willing to pay 5£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?

Q2. IF YES > Would you be willing to pay 7£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?

Q1. BID 4. Would you be willing to pay 7£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?

Q2. IF NO > Would you be willing to pay 6£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?

Q2. IF YES > Would you be willing to pay 8£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?

Q1. BID 5. Would you be willing to pay 8£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?
Q2. IF NO Would you be willing to pay 7£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?
Q2. IF YES > Would you be willing to pay 9£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?

Q1. BID 6. Would you be willing to pay 9£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?
Q2. IF NO > Would you be willing to pay 8£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?
Q2. IF YES > Would you be willing to pay 10£ for a pack of two burger patties (2 x 113.5 g) made with mealworms?

2. WTP- PSM

Because consumers are very sensitive to prices, we would like you to answer these further four questions regarding the price of your chosen product.

Q3. At what price would you consider a pack of two burger patties (2 x 113.5 g) made with mealworms to be so expensive that you would not consider buying it?
[DROP DOWN MENU: 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9]

Q4. At what price would you consider a pack of two burger patties (2 x 113.5 g) made with mealworms to be priced so low that you would feel the quality is inferior?
[DROP DOWN MENU: 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9]

Q5. At what price would you consider a pack of two burger patties (2 x 113.5 g) made with mealworms to be starting to get expensive, so it is not out of the question, but you would have to give some thought to buying it?
[DROP DOWN MENU: 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9]

Q6. At what price would you consider a pack of two burger patties (2 x 113.5 g) made with mealworms to be a bargain—a great buy for the money?
[DROP DOWN MENU: 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9]

Follow-up question:

Q7. Can you indicate the reason/s behind your price preferences?

Please, chose all that apply.

☐ I cannot afford the high price.

- ☐ I'm satisfied with the conventional products.
- ☐ The price addresses the quality
- ☐ It is a novel product.
- ☐ Other, please specify ___

Q8. Imagine that product will be marketed using one of the following three logos, how likely or unlikely that they would encourage you to try your preferred product

Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	Extremely likely

Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	Extremely likely

Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	Extremely likely

- ☐ Other logo, please specify, ____ and how likely or unlikely that they would encourage you to try your preferred product

Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	Extremely likely

Q9. What is the reason behind your previous choice?

____

TREATMENT 2. IF THEY CHOOSE PASTA

1. **WTP-DBDC**

Participants will be randomly assigned to one of the six different blocks of bids

Q1. BID 1. Would you be WTP 5£ a pack of pasta (500 g) made with cricket flour?
Q2. IF NO > BID 1. Would you be WTP 3.5£ a pack of pasta (500 g) made with cricket flour?
Q2. IF YES > BID 1. Would you be WTP 6.5£ a pack of pasta (500 g) made with cricket flour?

Q1. BID 2. Would you be WTP 6.5£ a pack of pasta (500 g) made with cricket flour?
Q2. IF NO > BID 2. Would you be WTP 5£ a pack of pasta (500 g) made with cricket flour?
Q2. IF YES > BID 2. Would you be WTP 8£ a pack of pasta (500 g) made with cricket flour?

Q1. BID 3. Would you be WTP 8£ a pack of pasta (500 g) made with cricket flour?
Q2. IF NO > BID 3. Would you be WTP 6.5£ a pack of pasta (500 g) made with cricket flour?
Q3. IF YES > BID 3. Would you be WTP 9.5£ a pack of pasta (500 g) made with cricket flour?

Q1. BID 4. Would you be WTP 9.5£ a pack of pasta (500 g) made with cricket flour?
Q2. IF NO > BID 4. Would you be WTP 8£ a pack of pasta (500 g) made with cricket flour?
Q2. IF YES > BID 4. Would you be WTP 11£ a pack of pasta (500 g) made with cricket flour?

Q1. BID 5. Would you be WTP 11£ a pack of pasta (500 g) made with cricket flour?
Q2. IF NO > BID 5. Would you be WTP 9.5£ a pack of pasta (500 g) made with cricket flour?
Q2. IF YES > BID 5. Would you be WTP 12.5£ a pack of pasta (500 g) made with cricket flour?

Q1. BID 6. Would you be WTP 12.5£ a pack of pasta (500 g) made with cricket flour?
Q2. IF NO > BID 6. Would you be WTP 11£ a pack of pasta (500 g) made with cricket flour?

Q2. **IF YES > BID 6.** Would you be WTP 14£ a pack of pasta (500 g) made with cricket flour?

2. WTP-PSM

Q3. At what price would you consider a back of pasta (500 g) made with cricket flour to be so expensive that you would not consider buying it?
[DROP DOWN MENU: 3.5, 4.5, 5.5, 6.5, 7.5, 8.5, 9.5, 10.5, 11.5, 12.5, 13.5, 14.5]

Q4. At what price would you consider a back of pasta (500 g) made with cricket flour to be priced so low that you would feel the quality is inferior?
[DROP DOWN MENU: 3.5, 4.5, 5.5, 6.5, 7.5, 8.5, 9.5, 10.5, 11.5, 12.5, 13.5, 14.5]

Q5. At what price would you consider a back of pasta (500 g) made with cricket flour to be starting to get expensive, so it is not out of the question, but you would have to give some thought to buying it?
[DROP DOWN MENU: 3.5, 4.5, 5.5, 6.5, 7.5, 8.5, 9.5, 10.5, 11.5, 12.5, 13.5, 14.5]

Q6. At what price would you consider a back of pasta (500 g) made with cricket flour to be a bargain—a great buy for the money?
[DROP DOWN MENU: 3.5, 4.5, 5.5, 6.5, 7.5, 8.5, 9.5, 10.5, 11.5, 12.5, 13.5, 14.5]

Follow-up question:

Q7. Can you indicate the reason/s behind your price preferences?

Please, chose all that apply.

- ☐ I cannot afford the high price.
- ☐ I'm satisfied with the conventional products.
- ☐ The price addresses the quality
- ☐ It is a novel product.
- ☐ Other, please specify ___

Q8. Imagine that product will be marketed using one of the following three logos, how likely or unlikely that they would encourage you to try your preferred product

Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	Extremely likely

Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	Extremely likely

Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	Extremely likely

- ☐ Other logo, please specify, ____ and how likely or unlikely that they would encourage you to try your preferred product

Extremely unlikely	1 ○	2 ○	3 ○	4 ○	5 ○	6 ○	Extremely likely

Q9. What is the reason behind your previous choice?

____

TREATMENT 3. IF THEY CHOOSE NONE

Follow-up question:

Q1. Can you indicate the reason/s behind your choice?

Please, chose all that apply.

- ☐ I'm satisfied with the conventional products.
- ☐ It is a novel product.
- ☐ Other, please specify ___

SECTION 5. Socio-economic characteristics

Q1. Do you live in rural or urban area?

☐ Rural

☐ Urban

Q2. What sex do you identify with?

☐ Male

☐ Female

Q3. What is the highest level of education you have completed?

☐ Primary school

☐ Secondary/Middle school

☐ High school/College qualification (e.g., Diploma)

☐ University Degree

☐ Post-degree (e.g., Master, PhD, PGCE_

☐ Other, please specify ______

Q4. What is your current occupational status?

☐ Employed

☐ Self-employed

☐ Unemployed

☐ Student

☐ Retired

☐ Other. Please specify _______

Q5. What is your present religion, if any?

- ☐ Buddhist
- ☐ Christian
- ☐ Hindu
- ☐ Jewish
- ☐ Muslim
- ☐ Sikh
- ☐ No religion
- ☐ Other, please specify ______
- ☐ Preface not to say

Q6. As what ethnicity do you identify yourself?

- ☐ Arabic/ Arabic British
- ☐ Asian/ Asian British
- ☐ Black/ African/ Caribbean/ Black British
- ☐ Mixed/ Multiple ethnic groups
- ☐ White/ White British/ White Irish
- ☐ Other, please specify ______
- ☐ Prefer not to say

Q7. How many people live in your household (including yourself):

☐ 1

☐ 2

☐ 3

☐ 4

☐ 5

☐ More than 5

Q8. Please indicate your approximate annual household income before taxes

- ☐ Less than £10,000
- ☐ £10,000 to £19,999
- ☐ £20,000 to £29,999
- ☐ £30,000 to £39,999
- ☐ £40,000 to £49,999
- ☐ £50,000 to £59,999
- ☐ £60,000 to £69,999
- ☐ £70,000 to £79,999
- ☐ £80,000 to £89,999

- ☐ £90,000 to £99,999
- ☐ £100,000 to £149,999
- ☐ £150,000 or more

☐ I do not want to declare/I do not know.

Return to top of form
Return to Supervisor Ethical Review, Section 5

Appendix 4.2 Questionnaire

Project title: UK Consumers' preferences and willingness to pay for insects as food.

Dear Participant,
This study is being conducted by researchers from the University of Reading. The purpose is to investigate consumers' acceptance and willingness to pay for insect-based food.

Your participation in this online survey should not take more than 15 minutes of your time. Please remember that once you have answered the question, you cannot go back, so please choose the answer carefully. And please be assured that your opinion is valued and that there are no right or wrong answers to the questions asked.

Your name will not be collected as part of your survey response and thus can never be associated with the data. Your responses will not be individually identified or publicized. Participation is entirely voluntary, and you will receive an Amazon voucher of £3 sent to your email for your contribution to our study.

You are free to withdraw from the survey at any time you feel uncomfortable or unwilling to participate. You are free to withdraw up until the point at which the data is aggregated before the 30/9/2023 date. After this date, it will not be possible to withdraw your contribution to the results of the research. If you wish to withdraw, please contact Asmaa Alhujaili at: a.s.alhujaili@pgr.reading.ac.uk quoting the reference number. If you decide to withdraw, you would still be qualified for your incentive if the survey is deemed as successfully completed on our conclusion. The findings of this study will be included in my thesis and published in academic journals, but it will not be possible to identify your identity.

This application has been reviewed according to the procedures specified by the University of Reading Research Ethics Committee and has been given a favourable ethical opinion for conduct.

If you have questions at any time about the study or the procedures, (or if you experience adverse effects as a result of participating in this study) you may contact me at a.s.alhujaili@pgr.reading.ac.uk.

Supervisor contact details:
Dr Giuseppe Nocella
Associate Professor
E-mail: g.nocella@reading.ac.uk

Clicking the button to continue will be considered your consent to participate.

- Continue
- Not interested

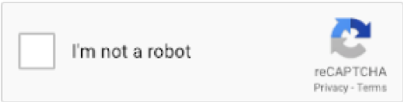
ID
Your ID number is:

Quality check

It is important to us that our survey data is of high quality. In order to obtain the most accurate measures of your opinions, please take the time to answer each question thoughtfully. Do you commit to providing thoughtful answers to the questions in the survey?

- ○ Yes, I will
- ○ No, I will not
- ○ I can't promise either way

Before you proceed to the survey, please complete the captcha below.



SECTION 1. Screening

Thank you for your interest in this survey. To begin, please respond to the following questions to determine your eligibility.

Q1. Which country are you from?

- ☐ The UK
- ☐ Out the UK (screen out)

Q2. Please, indicate your age range:

- ☐ Under 18 (screen out)
- ☐ 18 - 24
- ☐ 25-39
- ☐ 40-59
- ☐ 60 or older

Q3. Are you primarily/partially responsible for food purchases in your household?

- ☐ I am primarily responsible for food purchases.
- ☐ I am not responsible for food purchases. (Screen out)

Q5. Do you consume sliced bread?

1. Yes
2. No (Screen out)

Q6. Do you consume pasta?

- ☐ Yes
- ☐ No (Screen out)

Q7. Sex

Could you state your sex, please

- ○ Male
- ○ Female

SECTION 2. Consumption habits

Now we would like to ask you some questions regarding your consumption and food purchasing habits of the products mentioned previously.

Q1. On average, how many grams/kilograms of loaf bread does your household consume every month? Think of the sliced bread that you purchase from your usual supermarket.

- o Less than 400g
- o 400g - less than 800g
- o 800g - less than 1.2kg
- o 1.2kg - less than 1.6kg
- o 1.6kg - less than 2kg
- o 2kg - less than 2.4kg
- o 2.4kg - 2.8kg
- o More than 2.8kg, please specify …

Q2. On average, how much does your household spend on loaf bread every month? Think of the sliced bread that you purchase from your usual supermarket then cook at home.

- o Less than £ 1
- o £1 - £1.4
- o £1.5 - £1.9
- o £2 - £2.9
- o £3 - £3.9
- o £4- £4.9
- o £5 - £5.9
- o £6 or more, please specify…

Q3. On average, how many grams/kilograms of pasta does your household consume every month? Think of the pasta that you purchase from your usual supermarket then cook at home.

- o Less than 500g
- o 500g - 1kg
- o 1.5g - 2kg
- o 2.5kg - 3kg
- o 3.5kg - 4kg
- o 4.5 - 5kg
- o 5.5kg - 6kg
- o More than 6kg. Please specify …

Q4. On average, how much does your household spend on pasta every month? Think of the pasta that you purchase from your usual supermarket then cook at home.

- o Less than £ 5
- o £5 - £9

- £10 - £14
- £15 - £19
- £20 - £24
- £25 - £29
- £30 - £34
- More than £34, please specify ….

SECTION 3. Psychological constructs

Insect-based food is becoming an attractive alternative to meat-based proteins due to the variety of benefits it offers, from improved food security to reduced environmental impact and a more sustainable production system. At the same time, new food products are difficult to accept because of their perceived novelty and the way in which consumers judge them. Thus, we would like to ask your opinion about several aspects regarding insects as food. Before answering these statements, we would like to remind you that there are no right or wrong answers, but what counts is your own opinion.

To what extent do you disagree/agree with the following statements?

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
I am very particular about the foods I will eat.	○	○	○	○	○	○	○
If I don't know what is in a food, I won't try it.	○	○	○	○	○	○	○
I am afraid to eat things I have never had before.	○	○	○	○	○	○	○
I will eat almost anything.	○	○	○	○	○	○	○
I like food from different countries.	○	○	○	○	○	○	○
I am constantly sampling new and different foods.	○	○	○	○	○	○	○
Ethnic food looks too weird to eat.	○	○	○	○	○	○	○
I don't trust new food.	○	○	○	○	○	○	○
At dinner parties, I will try a new food.	○	○	○	○	○	○	○
I like to try new ethnic restaurants.	○	○	○	○	○	○	○

Digust

Please express your opinion about the following statements.

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
If I ate a dish and then came to know that there were insects among the ingredients, I would be disgusted.	○	○	○	○	○	○	○
I would be disgusted to eat any dish with insects.	○	○	○	○	○	○	○
I would avoid eating a dish with insects among the ingredients, even if it was cooked by a famous chef.	○	○	○	○	○	○	○
I would be bothered to find a dish cooked with insects on a restaurant menu.	○	○	○	○	○	○	○
Thinking about the flavour that a bug might have sickens me.	○	○	○	○	○	○	○

TPB_A1

The food industry is introducing food products which contain edible insects and we would like to know your opinion about the consumption of food made with insects in the next 12 months.

Please state how desirable or undesirable the following statements are for you.

	Extremely undesirable	Undesirable	Somewhat undesirable	Neutral	Somewhat desirable	Desirable	Extremely desirable
For me, health benefits linked to the consumption of insect-based food would be	○	○	○	○	○	○	○
For me, the improvement of farm animal welfare deriving from the consumption of insect-based food would be	○	○	○	○	○	○	○
For me, the reduction of greenhouse gas emissions deriving from the consumption of insect-based food would be	○	○	○	○	○	○	○
For me, worsening living conditions of livestock farmers as a consequence of the consumption of insect-based food would be	○	○	○	○	○	○	○
For me, food safety risks regarding insect-based food consumption would be	○	○	○	○	○	○	○
For me, the takeover of multinational companies as a consequence of the consumption of insect-based food would be	○	○	○	○	○	○	○

TPB_A2

Please state how unlikely or likely the following statements are for you.

	Extremely unlikely	Unlikely	Somewhat unlikely	Neutral	Somewhat likely	Likely	Extremely likely
Consuming insect-based food regularly will cause me to worsen the living conditions of livestock farmers.	○	○	○	○	○	○	○
Consuming insect-based food regularly will give me the opportunity to contribute to the improvement of farm animal welfare.	○	○	○	○	○	○	○
Consuming insect-based food regularly will increase my chances of facing food safety risks.	○	○	○	○	○	○	○
Consuming insect-based foods regularly will increase the power of multinational companies in the marketplace.	○	○	○	○	○	○	○
Consuming insect-based food regularly will give me the opportunity to take advantage of their health benefits.	○	○	○	○	○	○	○
Consuming insect-based food regularly will give me the opportunity to contribute to the reduction of greenhouse gas emissions.	○	○	○	○	○	○	○

TPB_SN

Please express your opinion on the following statements.

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
When it comes to eating new food products like insect-based food, I want to eat what my friends think I should eat.	○	○	○	○	○	○	○
When it comes to eating new food products like insect-based food, I want to eat what experts (nutritionists, doctors, etc.) think I should eat.	○	○	○	○	○	○	○
When it comes to eating new food products like insect-based food, I want to eat what my family thinks I should eat.	○	○	○	○	○	○	○

Please state how unlikely or likely the following statements are for you.

	Extremely unlikely	Unlikely	Somewhat unlikely	Neutral	Somewhat likely	Likely	Extremely likely
Experts like doctors and nutritionists think that I should eat insect-based food regularly.	○	○	○	○	○	○	○
My friends think that I should eat insect-based food regularly.	○	○	○	○	○	○	○
My family thinks that I should eat insect-based food regularly.	○	○	○	○	○	○	○

TPB_PBC (Ajzen, 1991)

Please express your opinion on the following statements.

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
The food culture of my country would facilitate the consumption of insect-based food.	○	○	○	○	○	○	○
Having sufficient economic resources would facilitate the purchase of insect-based food.	○	○	○	○	○	○	○
The presence of insect-based food in my favourite supermarkets would facilitate my purchase of these products regularly.	○	○	○	○	○	○	○

Please state how unlikely or likely the following statements are for you.

	Extremely unlikely	Unlikely	Somewhat unlikely	Neutral	Somewhat likely	Likely	Extremely likely
I will find insect-based food in my favourite supermarkets.	○	○	○	○	○	○	○
I will have the food culture to consume insect-based food.	○	○	○	○	○	○	○
I will have sufficient economic resources to purchase insect-based food.	○	○	○	○	○	○	○

Intention

Now, we would like to ask you some questions regarding your intention towards eating insects as food.

To what extent do you disagree/agree with the following statements?

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
For sure I will eat food products containing edible insects in the next 12 months.	○	○	○	○	○	○	○
I intend to eat food products containing edible insects regularly in the next 12 months.	○	○	○	○	○	○	○
I will try to eat food products containing edible insects in the next 12 months.	○	○	○	○	○	○	○

Previous knowledge and experience

We would like to ask you some questions regarding your previous experience and future intention in relation to this type of food.

	No	Yes
Have you ever tried bread made with insects?	○	○
Have you ever tried unprocessed insects (e.g. mealworms, grasshoppers)?	○	○
Have you ever tried edible insects?	○	○
Have you ever heard about edible insects?	○	○
Have you ever tried pasta made with insect flour?	○	○

[ONLY WHO CHOSE YES FOR the previous Q. WILL SEE THE FOLLOWING QUESTION]

What about the previous experience with eating insects.

	Never	Rarely	Sometime	Always	Often
In the past 12 moths, I have eaten edible insects.	○	○	○	○	○

SECTION 3. Economic valuation

Cheap talk

On the following screens, you will see a series of questions about your purchasing considerations for two insect-based products. Before answering these quistions, we ask you to carefully read the following information.

In a recent study, several different groups of people were asked whether they were willing to purchase a new food product. This purchase was hypothetical for these people, as it will be for you. In that study, no one actually had to pay money when they were willing to purchase the new food product. Over 80% of people said they would buy the new food product. However, when a grocery store actually put the same new food on its shelf, and people really did have to pay money if they decided to purchase the new food product, the result was different: only 43% of people actually bought the new food. That's quite a difference, isn't it? We call this "hypothetical bias." Hypothetical bias is the difference we see in the way people respond to hypothetical purchase questions as compared to real situations.

I think that when we say we will purchase a new food at a particular price in a hypothetical survey we respond according to our best guess of what the food is really worth in the grocery store. But when we are really in the grocery store, and we actually have to spend our money if we decide to purchase the food, we think a different way: if I spend money on this, that's money I can't spend on other things. We shop in a way that takes into account the limited amount of money we have. This is just my opinion, of course, but it's what I think maybe going on in hypothetical survey questions.

So, if I were in your shoes, I would ask myself: if I were really shopping in the grocery store and I had to pay a premium of £X if I decide to buy insect-based products, do I really want to spend my money this way? If I really did, I would indicate YES, I would pay a premium of £X to purchase insect-based products; if I didn't want to spend my money this way, I would indicate NO, I would purchase insect-based products at a lower price.

Please keep this in mind when answering the following questions.

Imagine that tomorrow the following two food products containing edible insects are available on the shelves of your favourite supermarket: Which one of them you would like to choose?

○ **A pack of pasta (500 g) made with insect flour (10% - 20% cricket flour)**

○ **Sliced bread (800g) made with insect flour (10%-20% cricket flour)**

○ **None**

Based on their choices, they will be directed to two different treatments. **<u>IF</u>** they say BREAD, they go to the BREAD questions, **<u>IF</u>** they say PASTA, they go to the PASTA questions. **<u>IF</u>** they say NONE, they go to the follow-up questions and SED).

1. IF THEY CHOOSE BREAD

Bread Bid 1.

BB1-2

Would you be willing to pay £2.00 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £1.50 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £2.50 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

BB1-2.5

Would you be willing to pay £2.50 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £2.00 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £3.00 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

BB1-3

Would you be willing to pay £3.00 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £2.50 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £3.50 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

BB1-3.5

Would you be willing to pay £3.50 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £3.00 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £4.00 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

BB1-4

Would you be willing to pay £4.00 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £3.50 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £6.00 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

BB1-6

Would you be willing to pay £6.00 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £4.00 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £8.00 for sliced bread (800g) made with cricket flour?

- ◯ Yes
- ◯ No

Bread- PSM

Because consumers are very sensitive to prices, we would like you to answer these four questions regarding the price of your chosen product.

<u>Please pay attention to the logic of the prices i.e. "low" less than "bargain" less than "starting to get expensive" less than "so expensive".</u>

At what price would you consider a sliced bread (800g) made with cricket flour to be <u>priced so low</u> that you would feel the quality is inferior?

- ◯ £ 1.50
- ◯ £ 1.80
- ◯ £ 2.10
- ◯ £ 2.40
- ◯ £ 2.70
- ◯ £ 3.00
- ◯ £ 3.30
- ◯ £ 3.60
- ◯ £ 3.90
- ◯ £ 4.20

- £ 4.50
- £ 4.80
- £ 5.10
- £ 5.40
- £ 5.70
- £ 6.00
- £ 6.30
- £ 6.60
- £ 6.90
- £ 7.20
- £ 7.50
- £ 7.80
- £ 8.10
- £ 8.40
- £ 8.70
- £ 9.00

At what price would you consider a sliced bread (800g) made with cricket flour to be starting to get expensive, so it is not out of the question, but you would have to give some thought to buying it?

- £ 1.50
- £ 1.80
- £ 2.10
- £ 2.40
- £ 2.70
- £ 3.00
- £ 3.30
- £ 3.60
- £ 3.90
- £ 4.20
- £ 4.50
- £ 4.80
- £ 5.10
- £ 5.40
- £ 5.70
- £ 6.00
- £ 6.30
- £ 6.60
- £ 6.90
- £ 7.20
- £ 7.50
- £ 7.80
- £ 8.10
- £ 8.40
- £ 8.70
- £ 9.00

At what price would you consider a sliced bread (800g) made with cricket flour to be <u>so expensive</u> that you would not consider buying it?

- ◯ £ 1.50
- ◯ £ 1.80
- ◯ £ 2.10
- ◯ £ 2.40
- ◯ £ 2.70
- ◯ £ 3.00
- ◯ £ 3.30
- ◯ £ 3.60
- ◯ £ 3.90
- ◯ £ 4.20
- ◯ £ 4.50
- ◯ £ 4.80
- ◯ £ 5.10
- ◯ £ 5.40
- ◯ £ 5.70
- ◯ £ 6.00
- ◯ £ 6.30
- ◯ £ 6.60
- ◯ £ 6.90
- ◯ £ 7.20
- ◯ £ 7.50
- ◯ £ 7.80
- ◯ £ 8.10
- ◯ £ 8.40
- ◯ £ 8.70
- ◯ £ 9.00

Liklh_B-Chep/Expns

Using your previous answers, what is the likelihood of buying a sliced bread (800g) made with cricket flour for the following:

	Very unlikely	Unlikely	Likely	Very unlikely
1. Cheap price	◯	◯	◯	◯
2. Expensive price	◯	◯	◯	◯

1. IF THEY CHOOSE BREAD

PB1-3

Would you be willing to pay £3.00 for a pack of pasta (500 g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £2.00 for a pack of pasta (500 g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £4.50 for a pack of pasta (500 g) made with cricket flour?

- ◯ Yes
- ◯ No

PB1-4.5

Would you be willing to pay £4.50 for a pack of pasta (500 g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £3.50 for a pack of pasta (500 g) made with cricket flour?

- ◯ Yes
- ◯ No

Would you be willing to pay £6.00 for a pack of pasta (500 g) made with cricket flour?

◯ Yes
◯ No

PB1-6

Would you be willing to pay £6.00 for a pack of pasta (500 g) made with cricket flour?

◯ Yes
◯ No

Would you be willing to pay £4.50 for a pack of pasta (500 g) made with cricket flour?

◯ Yes
◯ No

Would you be willing to pay £7.50 for a pack of pasta (500 g) made with cricket flour?

◯ Yes
◯ No

PB1-7.5

Would you be willing to pay £7.50 for a pack of pasta (500 g) made with cricket flour?

◯ Yes
◯ No

Would you be willing to pay £6.00 for a pack of pasta (500 g) made with cricket flour?

◯ Yes
◯ No

Would you be willing to pay £9.00 for a pack of pasta (500 g) made with cricket flour?

◯ Yes

○ No

PB1-9

Would you be willing to pay £9.00 for a pack of pasta (500 g) made with cricket flour?

○ Yes
○ No

Would you be willing to pay £7.50 for a pack of pasta (500 g) made with cricket flour?

○ Yes
○ No

Would you be willing to pay £12.00 for a pack of pasta (500 g) made with cricket flour?

○ Yes
○ No

PB1-1.5

Would you be willing to pay £1.50 for a pack of pasta (500 g) made with cricket flour?

○ Yes
○ No

Would you be willing to pay £1.00 for a pack of pasta (500 g) made with cricket flour?

○ Yes
○ No

Would you be willing to pay £3.00 for a pack of pasta (500 g) made with cricket flour?

○ Yes
○ No

PASTA_PSM

Because consumers are very sensitive to prices, we would like you to answer these four questions regarding the price of your chosen product.

Please pay attention to the logic of the prices i.e. "low" less than "bargain" less than "starting to get expensive" less than "so expensive".

At what price would you consider a pack of pasta (500 g) made with cricket flour to be priced so low that you would feel the quality is inferior?

- ○ £ 2.00
- ○ £ 2.50
- ○ £ 3.00
- ○ £ 3.50
- ○ £ 4.00
- ○ £ 4.50
- ○ £ 5.00
- ○ £ 5.50
- ○ £ 6.00
- ○ £ 6.50
- ○ £ 7.00
- ○ £ 7.50
- ○ £ 8.00
- ○ £ 8.50
- ○ £ 9.00
- ○ £ 9.50
- ○ £ 10.00
- ○ £ 10.50
- ○ £ 11.00
- ○ £ 11.50
- ○ £ 12.00
- ○ 12.50
- ○ £ 13.00
- ○ £ 13.50
- ○ £ 14.00
- ○ £ 14.50
- ○ £ 15.00

At what price would you consider a pack of pasta (500 g) made with cricket flour to be a bargain—a great buy for the money?

- ○ £ 2.00
- ○ £ 2.50
- ○ £ 3.00
- ○ £ 3.50
- ○ £ 4.00
- ○ £ 4.50

- £ 5.00
- £ 5.50
- £ 6.00
- £ 6.50
- £ 7.00
- £ 7.50
- £ 8.00
- £ 8.50
- £ 9.00
- £ 9.50
- £ 10.00
- £ 10.50
- £ 11.00
- £ 11.50
- £ 12.00
- £ 12.50
- £ 13.00
- £ 13.50
- £ 14.00
- £ 14.50
- £ 15.00

At what price would you consider a pack of pasta (500 g) made with cricket flour to be starting to get expensive, so it is not out of the question, but you would have to give some thought to buying it?

- £ 2.00
- £ 2.50
- £ 3.00
- £ 3.50
- £ 4.00
- £ 4.50
- £ 5.00
- £ 5.50
- £ 6.00
- £ 6.50
- £ 7.00
- £ 7.50
- £ 8.00
- £ 8.50
- £ 9.00
- £ 9.50
- £ 10.00
- £ 10.50
- £ 11.00
- £ 11.50
- £ 12.00
- £ 12.50
- £ 13.00
- £ 13.50
- £ 14.00
- £ 14.50
- £ 15.00

At what price would you consider a pack of pasta (500 g) made with cricket flour to be <u>so expensive</u> that you would not consider buying it?

- ◯ £ 2.00
- ◯ £ 2.50
- ◯ £ 3.00
- ◯ £ 3.50
- ◯ £ 4.00
- ◯ £ 4.50
- ◯ £ 5.00
- ◯ £ 5.50
- ◯ £ 6.00
- ◯ £ 6.50
- ◯ £ 7.00
- ◯ £ 7.50
- ◯ £ 8.00
- ◯ £ 8.50
- ◯ £ 9.00
- ◯ £ 9.50
- ◯ £ 10.00
- ◯ £ 10.50
- ◯ £ 11.00
- ◯ £ 11.50
- ◯ £ 12.00
- ◯ £ 12.50
- ◯ £ 13.00
- ◯ £ 13..50
- ◯ £ 14.00
- ◯ £ 14.50
- ◯ £ 15.00

Liklh_Chep/Expns

Using your previous answers, what is the likelihood of buying a pack of pasta (500 g) made with cricket flour for the following:

	Very unlikely	Unlikely	Likely	Very unlikely
1. Cheap price	◯	◯	◯	◯
2. Expensive price	◯	◯	◯	◯

Follow up

Imagine that your preferred insect-based product will be marketed through the following three logos.
Which one is your preferred one?

- ○
- ○ If you prefer a different logo, please specify
- ○
- ○

What is the reason behind your previous choices?

Sec 5. Socio-economic characteristics

In this final stage, we would like to collect some socio-demographic information by asking the following seven questions.

Do you live in a rural or urban area?

- ◯ Rural
- ◯ Urban

What is the highest level of education you have completed?

- ◯ GSCE's
- ◯ A levels / BTEC
- ◯ Degree
- ◯ Postgraduate Degree/ Professional Qualification
- ◯ Doctorate
- ◯ Other, please specify

What is your current occupational status?

- ◯ Employed
- ◯ Self-employed
- ◯ Unemployed
- ◯ Student
- ◯ Retired
- ◯ Other, please specify

What is your present religion, if any?

- ◯ Buddhist
- ◯ Christian
- ◯ Hindu
- ◯ Jewish
- ◯ Muslim
- ◯ Sikh
- ◯ No religion
- ◯ Other, please specify ______
- ◯ Prefer not to say

What ethnicity do you identify yourself?

- ◯ Arabic/ Arabic British
- ◯ Asian/ Asian British
- ◯ Black/ African/ Caribbean/ Black British
- ◯ Mixed/ Multiple ethnic groups
- ◯ White/ White British/ White Irish
- ◯ Other, please specify ______
- ◯ Prefer not to say

How many people live in your household (including yourself)?

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ More than 5

Please indicate your approximate annual_household income before taxes

- ◯ Less than £10,000
- ◯ £10,000 to £19,999
- ◯ £20,000 to £29,999
- ◯ £30,000 to £39,999
- ◯ £40,000 to £49,999
- ◯ £50,000 to £59,999
- ◯ £60,000 to £69,999
- ◯ £70,000 to £79,999
- ◯ £80,000 to £89,999
- ◯ £90,000 to £99,999
- ◯ £100,000 to £149,999
- ◯ £150,000 or more
- ◯ I do not want to declare/I do not know.

Appendix 4.3 Identify the optimal price area for Bread

Appendix 4.3.1: 1st step, organise the data and eliminate duplicate

	Cheap	Too cheap	Expensive	Too expensive
1	2	1	3	1
2	4	2	6	2
3	4	1	7	3
4	3	1	6	4
5	2	1	13	5
6	2	1	3	6
7	3	1	6	7
8	2	1	3	8
9	2	1	4	9
10	2	1	4	10
11	3	1	5	11
12	4	1	6	12
13	3	1	7	13
14	2	1	3	14
15	6	1	10	15
16	3	1	4	16
17	2	1	3	17
18	2	1	5	18
19	13	6	22	19
20	6	3	11	20
21	3	1	5	21
22	2	1	3	22
23	2	1	6	23
24	2	1	3	24
25	2	1	3	25
26	6	2	7	26
27	2	1	3	27
28	2	1	3	28
29	6	3	8	29
30	6	1	13	30
31	2	1	8	31
32	2	1	3	32
33	2	1	3	33
34	2	1	5	34
35	2	1	3	35
36	2	1	4	36
37	2	1	3	37
38	3	1	10	38
39	2	1	5	39
40	3	1	6	40

Appendix 4.3.1 (continued): 1st step, organise the data and eliminate duplicate

	Cheap	Too cheap	Expensive	Too expensive
41	2	1	3	6
42	3	2	6	10
43	2	1	6	10
44	2	1	3	4
45	2	1	4	6
46	3	1	6	8
47	3	1	5	6
48	2	1	4	8
49	4	1	7	10
50	3	1	5	7
51	7	4	9	11
52	3	1	5	7
53	4	2	7	11
54	2	1	5	6
55	2	1	5	6
56	2	1	4	6
57	2	1	3	4
58	2	1	4	6
59	4	1	6	10
60	5	1	7	15
61	3	1	6	8
62	3	1	8	12
63	3	1	6	10
64	5	1	9	10
65	2	1	5	6
66	2	1	4	5
67	3	2	5	6
68	2	1	5	10
69	3	1	5	6
70	2	1	6	9
71	6	4	7	9
72	2	1	4	5
73	4	1	13	26
74	2	1	5	7
75	11	5	23	26
76	3	1	6	7
77	3	1	6	8
78	3	1	6	9
79	2	1	6	8
80	2	1	3	5
81	3	1	6	10
82	7	1	21	26
83	5	1	8	10
84	2	1	3	6
85	21	4	24	26

Appendix 4.3.1 (continued): 1st step, organise the data and eliminate duplicate

	Cheap	Too cheap	Expensive	Too expensive
86	2	1	3	5
87	6	2	8	13
88	16	10	23	24
89	3	1	4	6
90	2	1	4	5
91	3	1	5	10
92	3	2	5	10
93	6	2	16	21
94	3	1	5	9
95	7	3	14	25
96	2	1	5	8
97	3	1	6	10
98	2	1	9	12
99	3	1	7	10
100	2	1	3	5
101	5	2	17	26
102	2	1	3	5
103	2	1	4	6
104	3	1	5	6
105	2	1	3	5
106	3	2	8	10
107	2	1	4	5
108	3	1	6	10
109	2	1	3	4
110	5	1	11	16
111	2	1	3	4
112	16	1	23	26
113	2	1	3	5
114	8	6	9	10
115	2	1	4	5
116	2	1	3	4
117	4	2	7	10
118	3	1	23	26
119	2	1	6	11
120	2	1	3	5
121	2	1	3	6
122	3	1	4	5
123	2	1	4	6
124	2	1	4	6
125	2	1	4	6
126	4	1	6	8
127	3	1	5	6
128	3	1	6	13
129	7	1	24	26
130	2	1	4	6

Appendix 4.3.1 (continued): 1st step, organise the data and eliminate duplicate

	Cheap	Too cheap	Expensive	Too expensive
131	2	1	4	7
132	2	1	8	9
133	3	1	5	6
134	5	2	7	13
135	3	1	7	9
136	2	1	3	6
137	2	1	4	6
138	13	2	16	23
139	12	2	24	26
140	3	2	5	7
141	2	1	3	4
142	2	1	6	9
143	4	2	6	7
144	2	1	3	4
145	8	7	9	10
146	2	1	3	4
147	3	1	6	8
148	2	1	5	6
149	3	1	4	5
150	6	1	9	16
151	2	1	3	6
152	4	2	6	8
153	2	1	3	19
154	4	1	8	11
155	2	1	3	6
156	6	3	8	10
157	3	1	7	10
158	2	1	3	4
159	2	1	5	7
160	2	1	3	4
161	15	14	16	17
162	2	1	6	16
163	7	2	25	26
164	3	2	5	6
165	3	1	7	10
166	3	1	6	8
167	5	4	11	13
168	2	1	4	6
169	3	1	4	11
170	3	1	6	8
171	2	1	3	4

Appendix 4.3.2: 2nd step, order, and calculate frequency

Value	Cheap	Too cheap	Expensive	Too expensive
1.5	0	138	0	0
1.8	0	0	0	0
2.1	81	19	0	0
2.4	0	0	0	0
2.7	0	0	0	0
3	46	4	39	0
3.3	0	0	0	0
3.6	0	0	0	0
3.9	0	0	0	0
4.2	12	4	25	21
4.5	0	0	0	0
4.8	0	0	0	0
5.1	7	1	26	18
5.4	0	0	0	0
5.7	0	0	0	0
6	10	2	30	35
6.3	0	0	0	0
6.6	0	0	0	0
6.9	0	0	0	0
7.2	5	1	13	10
7.5	0	0	0	0
7.8	0	0	0	0
8.1	2	0	9	13
8.4	0	0	0	0
8.7	0	0	0	0

Appendix 4.3.3: 3rd step, calculate percentages

Value	Cheap	Too cheap	Expensive	Too expensive
£1.50	100%	100%	0%	0%
£1.80	100%	19%	0%	0%
£2.10	100%	19%	0%	0%
£2.40	53%	8%	0%	0%
£2.70	53%	8%	0%	0%
£3.00	53%	8%	0%	0%
£3.30	26%	6%	23%	0%
£3.60	26%	6%	23%	0%
£3.90	26%	6%	23%	0%
£4.20	26%	6%	23%	0%
£4.50	19%	4%	37%	12%
£4.80	19%	4%	37%	12%
£5.10	19%	4%	37%	12%
£5.40	15%	3%	53%	23%
£5.70	15%	3%	53%	23%
£6.00	15%	3%	53%	23%
£6.30	9%	2%	70%	43%
£6.60	9%	2%	70%	43%
£6.90	9%	2%	70%	43%
£7.20	9%	2%	70%	43%
£7.50	6%	1%	78%	49%
£7.80	6%	1%	78%	49%
£8.10	6%	1%	78%	49%
£8.40	5%	1%	83%	57%
£8.70	5%	1%	83%	57%
£9.00	5%	1%	83%	57%

Appendix 4.4: Identify the optimal price area for Pasta

Appendix 4.4.1: 1st step, organise the data and eliminate duplicate

	Cheap	Too cheap	Expensive	Too expensive
1	2	1	3	4
2	4	1	6	7
3	2	1	4	5
4	2	1	5	6
5	3	2	6	7
6	2	1	3	5
7	3	2	5	7
8	2	1	4	6
9	3	1	4	5
10	4	1	8	10
11	2	1	3	5
12	2	1	3	4
13	5	1	7	13
14	2	1	3	6
15	3	1	9	11
16	2	1	3	5
17	2	1	5	7
18	2	1	5	7
19	2	1	3	5
20	4	1	5	7
21	5	1	7	8
22	2	1	4	5
23	2	1	4	7
24	7	1	11	15
25	3	1	9	13
26	2	1	6	9
27	2	1	3	4
28	3	1	8	17
29	2	1	5	7
30	2	1	6	10
31	6	1	8	17
32	2	1	3	7
33	3	1	4	5
34	3	1	5	7
35	2	1	3	5
36	14	12	17	19
37	2	1	6	7
38	2	1	3	5
39	2	1	4	5
40	3	1	5	7
41	3	1	4	5
42	3	1	5	8

Appendix 4.4.1(continued):: 1st step, organise the data and eliminate duplicate

	Cheap	Too cheap	Expensive	Too expensive
43	2	1	4	6
44	3	1	5	7
45	5	2	9	11
46	7	4	9	14
47	2	1	3	5
48	2	1	3	4
49	8	6	10	14
50	9	3	13	26
51	2	1	5	7
52	2	1	3	5
53	8	5	11	13
54	3	1	5	9
55	6	4	7	9
56	5	2	9	14
57	2	1	5	7
58	3	1	6	8
59	2	1	5	7
60	2	1	7	10
61	3	1	8	11
62	3	1	5	7
63	2	1	3	4
64	5	3	9	11
65	2	1	3	5
66	2	1	3	7
67	2	1	6	7
68	2	1	3	4
69	2	1	3	5
70	3	1	8	13
71	3	1	5	6
72	2	1	3	6
73	2	1	3	7
74	2	1	4	7
75	3	1	4	7
76	2	1	4	5
77	2	1	3	5
78	2	1	3	4
79	2	1	3	6
80	2	1	4	5
81	3	1	5	7
82	4	1	5	7
83	2	1	3	4
84	2	1	6	7
85	2	1	4	12
86	4	3	7	10
87	2	1	3	4

Appendix 4.4.1(continued):: 1st step, organise the data and eliminate duplicate

	Cheap	Too cheap	Expensive	Too expensive
88	2	1	5	7
89	3	1	6	13
90	2	1	4	5
91	2	1	3	5
92	2	1	7	12
93	2	1	3	4
94	3	1	4	6
95	3	1	6	7
96	2	1	3	6
97	2	1	4	6
98	3	1	6	10
99	2	1	3	4
100	3	1	9	13
101	2	1	3	4
102	2	1	4	5
103	3	1	5	7
104	2	1	3	5
105	4	1	7	10

Appendix 4.4.2: 2nd step, order, and calculate frequency

Value	Cheap	Too cheap	Expensive	Too expensive
2.00	60	97	0	0
2.50	0	0	0	0
3.00	26	3	32	0
3.50	0	0	0	0
4.00	6	2	18	12
4.50	0	0	0	0
5.00	5	1	20	23
5.50	0	0	0	0
6.00	2	1	11	10
6.50	0	0	0	0
7.00	2	0	7	28
7.50	0	0	0	0
8.00	2	0	5	3
8.50	0	0	0	0
9.00	1	0	7	3
9.50	0	0	0	0
10.00	0	0	1	6
10.50	0	0	0	0
11.00	0	0	2	4
11.50	0	0	0	0
12.00	0	1	0	2
12.50	0	0	0	0
13.00	0	0	1	6
13.50	0	0	0	0
14.00	1	0	0	3
14.50	0	0	0	0
15.00	0	0	1	5

Appendix 4.4.3: 3rd step, calculate percentages

Value	Cheap	Too cheap	Expensive	Too expensive
£2.00	100%	100%	0%	0%
£2.50	43%	8%	0%	0%
£3.00	43%	8%	0%	0%
£3.50	18%	5%	30%	0%
£4.00	18%	5%	30%	0%
£4.50	12%	3%	48%	11%
£5.00	12%	3%	48%	11%
£5.50	8%	2%	67%	33%
£6.00	8%	2%	67%	33%
£6.50	6%	1%	77%	43%
£7.00	6%	1%	77%	43%
£7.50	4%	1%	84%	70%
£8.00	4%	1%	84%	70%
£8.50	2%	1%	89%	72%
£9.00	2%	1%	89%	72%
£9.50	1%	1%	95%	75%
£10.00	1%	1%	95%	75%
£10.50	1%	1%	96%	81%
£11.00	1%	1%	96%	81%
£11.50	1%	1%	98%	85%
£12.00	1%	1%	98%	85%
£12.50	1%	0%	98%	87%
£13.00	1%	0%	98%	87%
£13.50	1%	0%	99%	92%
£14.00	1%	0%	99%	92%
£14.50	0%	0%	99%	95%
£15.00	0%	0%	99%	95%

Appendix 5: Results of the survey

Appendix 5.1: Attitudes- Descriptive statistics of the evaluation and belief statements of the positive attitudes toward insect-based food products

Evaluation	Extremely undesirable	Undesirable	Somewhat undesirable	Neutral	Somewhat desirable	Desirable	Extremely desirable	Mean (SD)
For me, the reduction of greenhouse gas emissions deriving from the consumption of insect-based food would be	15 (1.90%)	32 (4.00%)	43 (5.40%)	185 (23.10%)	238 (29.70%)	175 (21.80%)	113 (14.10%)	4.97 (1.37)
For me, the improvement of farm animal welfare deriving from the consumption of insect-based food would be	17 (2.10%)	34 (4.20%)	45 (5.60%)	173 (21.60)	216 (27.00%)	186 (23.20%)	130 (16.20%)	5.02 (1.43)
For me, health benefits linked to the consumption of insect-based food would be	38 (4.70%)	65 (8.10%)	65 (8.10%)	233 (29.10)	220 (27.50%)	120 (15.00%)	60 (7.50%)	4.41 (1.49)
Belief	**Extremely unlikely**	**Unlikely**	**Somewhat unlikely**	**Neutral**	**Somewhat likely**	**Likely**	**Extremely likely**	**M (SD)**
Consuming insect-based food regularly will give me the opportunity to contribute to the reduction of greenhouse gas emissions.	39 (4.90%)	66 (8.20%)	86 (10.70%)	174 (21.70%)	242 (30.20%)	135 (16.90%)	59 (7.40%)	4.44 (1.52)
Consuming insect-based food regularly will give me the opportunity to contribute to the improvement of farm animal welfare.	56 (7.00%)	84 (10.50%)	111 (13.90%)	234 (29.20%)	178 (22.20%)	99 (12.40%)	39 (4.90%)	4.06 (1.53)
Consuming insect-based food regularly will give me the opportunity to take advantage of their health benefits.	50 (6.20%)	70 (8.70%)	81 (10.10%)	252 (31.50%)	208 (26.00%)	100 (12.50%)	40 (5.00%)	4.20 (1.48)
Note. The scale ranged from 1-7								

Appendix 5.2: Attitudes**- Descriptive statistics of the evaluation and belief statements of negative attitudes toward insect-based food products**

Evaluation	**Extremely undesirable**	**Undesirable**	**Somewhat undesirable**	**Neutral**	**Somewhat desirable**	**Desirable**	**Extremely desirable**	**Mean (SD)**
For me, worsening living conditions of livestock farmers as a consequence of the consumption of insect-based food would be	197 (24.6%)	242 (30.20%)	150 (18.70%)	126 (15.70%)	49 (6.10%)	22 (2.70%)	15 (1.90%)	**2.64 (1.45)**
For me, food safety risks regarding insect-based food consumption would be	92 (11.50%)	147 (18.40%)	114 (14.20%)	220 (27.50%)	79 (9.90%)	69 (8.60%)	80 (10.00%)	**3.72 (1.78)**
For me, the takeover of multinational companies as a consequence of the consumption of insect-based food would be	73 (9.10%)	134 (16.70%)	111 (13.90%)	349 (43.60%)	76 (9.50%)	48 (6.00%)	10 (1.20%)	**3.51 (1.35)**
Belief	**Extremely unlikely**	**Unlikely**	**Somewhat unlikely**	**Neutral**	**Somewhat likely**	**Likely**	**Extremely likely**	**M (SD)**
Consuming insect-based food regularly will cause me to worsen the living conditions of livestock farmers.	43 (5.40%)	78 (9.70%)	122 (15.20%)	238 (29.70%)	180 (22.50%)	78 (9.70%)	62 (7.70%)	**4.14 (1.52)**
Consuming insect-based food regularly will increase my chances of facing food safety risks.	32 (4.00%)	88 (11.00%)	112 (14.00%)	293 (36.60%)	135 (16.90%)	83 (10.40%)	58 (7.20%)	**4.11 (1.47)**
Consuming insect-based foods regularly will increase the power of multinational companies in the marketplace.	27 (3.40%)	74 (9.20%)	123 (15.40%)	335 (41.80%)	123 (15.40%)	71 (8.90%)	48 (6.00%)	**4.07 (1.37)**
Note. The scale ranged from 1-7								

Appendix 5.3: Attitudes- Descriptive statistics for attitudes score towards insects as food

Attitudes with reversed scores		
N	**Valid**	801
	Missing	0
Mean		19.68
Std. Deviation		5.06
Skewness		0.27
Std. Error of Skewness		0.09
Kurtosis		0.67
Std. Error of Kurtosis		0.17
Range		38.17
Minimum		5.33
Maximum		43.50

Appendix 5.4: Attitudes- ANOVA- two-way interaction effect of sex*age, and sex*income

Sex * Age					
				95% Confidence Interval	
Sex	**Age**	**Mean**	**Std. Error**	**Lower Bound**	**Upper Bound**
Female	*18-39*	19.92	0.50	18.94	20.90
	40-59	19.22	0.47	18.29	20.14
	60 or older	21.00	0.84	19.36	22.65
Male	*18-39*	18.41	0.73	16.99	19.83
	40-59	20.97	0.51	19.96	21.98
	60 or older	19.64	0.59	18.49	20.80
Sex * Income					
Female	*Less than 30,000*	19.57	0.43	18.73	20.41
	30,000 - Less than 60,000	19.25	0.47	18.34	20.17
	60,000 or more	21.32	0.88	19.59	23.05
Male	*Less than 30,000*	18.14	0.73	16.70	19.58
	30,000 - Less than 60,000	20.74	0.47	19.81	21.66
	60,000 or more	20.15	0.61	18.95	21.35

Appendix 5.5: Attitudes- ANOVA- three-way interaction effect of age*education*income

Age * Education * Income						
Age	Education	Income groups	Mean	SE	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
18-39	**A level or below**	*Less than 30,000*	20.09	0.88	18.37	21.81
		30,000 - Less than 60,000	19.66	0.78	18.13	21.20
		60,000 or more	21.08	1.67	17.80	24.36
	Degree	*Less than 30,000*	18.85	1.17	16.55	21.16
		30,000 - Less than 60,000	20.35	0.85	18.68	22.02
		60,000 or more	19.79	0.95	17.93	21.66
	Post degree	*Less than 30,000*	11.56	2.59	6.48	16.63
		30,000 - Less than 60,000	20.10	1.10	17.95	22.26
		60,000 or more	21.01	0.79	19.45	22.56
40-59	**A level or below**	*Less than 30,000*	18.53	0.60	17.35	19.72
		30,000 - Less than 60,000	18.43	0.81	16.84	20.03
		60,000 or more	18.00	1.39	15.28	20.73
	Degree	*Less than 30,000*	20.87	1.10	18.71	23.04
		30,000 - Less than 60,000	20.69	1.00	18.73	22.64
		60,000 or more	21.46	0.90	19.71	23.22
	Post degree	*Less than 30,000*	22.46	1.31	19.88	25.03
		30,000 - Less than 60,000	20.28	1.06	18.19	22.37
		60,000 or more	20.10	1.02	18.09	22.10
60 or older	**A level or below**	*Less than 30,000*	17.84	0.51	16.85	18.83
		30,000 - Less than 60,000	19.61	0.99	17.66	21.55
		60,000 or more	19.94	2.08	15.85	24.03
	Degree	*Less than 30,000*	21.42	0.92	19.61	23.22
		30,000 - Less than 60,000	20.61	1.18	18.29	22.93
		60,000 or more	21.93	1.90	18.20	25.67
	Post degree	*Less than 30,000*	18.05	1.16	15.77	20.32
		30,000 - Less than 60,000	20.22	1.09	18.09	22.36
		60,000 or more	23.29	2.69	18.01	28.58

Appendix 5.6: Attitudes- Bonferroni post hoc test for the effect of age on attitudes

Multiple Comparisons						
Dependent Variable: Attitudes with reversed scores						
Bonferroni						
		Mean			**95% Confidence Interval**	
(I) Age	**(J) Age**	**Difference (I-J)**	**SE**	**Sig.**	**Lower Bound**	**Upper Bound**
18-39	*40-59*	-0.03	0.44	1.00	-1.08	1.03
	60 or older	0.63	0.45	0.49	-0.45	1.72
40-59	*18-39*	0.03	0.44	1.00	-1.03	1.08
	60 or older	0.66	0.45	0.42	-0.41	1.73
60 or older	*18-39*	-0.63	0.45	0.49	-1.72	0.45
	40-59	-0.66	0.45	0.42	-1.73	0.41
Based on observed means. The error term is Mean Square(Error) = 24.826.						

Appendix 5.7: Attitudes- Bonferroni post hoc test for the effect of education on attitudes

Multiple Comparisons						
Dependent Variable: Attitudes with reversed scores						
Bonferroni						
(I)		**Mean**			**95% Confidence Interval**	
Education	**(J) Education**	**Difference (I-J)**	**SE**	**Sig.**	**Lower Bound**	**Upper Bound**
A level or below	*Degree*	-1.8360*	0.43	<.001	-2.87	-0.80
	Post degree	-1.2373*	0.45	0.02	-2.32	-0.15
Degree	*A level or below*	1.8360*	0.43	<.001	0.80	2.87
	Post degree	0.60	0.50	0.68	-0.59	1.79
Post degree	*A level or below*	1.2373*	0.45	0.02	0.15	2.32
	Degree	-0.60	0.50	0.68	-1.79	0.59
Based on observed means. The error term is Mean Square(Error) = 24.826.						
*. The mean difference is significant at the .05 level.						

Appendix 5.8: Attitudes- Bonferroni post hoc test for the effect of income on attitudes

Multiple Comparisons						
Dependent Variable: Attitudes with reversed scores						
Bonferroni						
(I) Income groups	**(J) Income groups**	**Mean Difference (I-J)**	**SE**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Less than 30,000	*30,000 - Less than 60,000*	-0.91	0.42	0.09	-1.92	0.09
	60,000 or more	-1.3970*	0.47	0.01	-2.53	-0.27
30,000 - Less than 60,000	*Less than 30,000*	0.91	0.42	0.09	-0.09	1.92
	60,000 or more	-0.48	0.50	0.99	-1.67	0.71
60,000 or more	*Less than 30,000*	1.3970*	0.47	0.01	0.27	2.53
	30,000 - Less than 60,000	0.48	0.50	0.99	-0.71	1.67
Based on observed means. The error term is Mean Square(Error) = 24.826.						
*. The mean difference is significant at the .05 level.						

Appendix 5.9: SN- Descriptive statistics of the evaluation and beliefs of subjective norms

Evaluation	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	Sample N=801 M (SD)
When it comes to eating new food products like insect-based food, I want to eat what my family thinks I should eat.	212 (26.50%)	211 (26.30%)	131 (16.40%)	119 (14.90%)	74 (9.20%)	38 (4.70%)	16 (2.00%)	2.78 (1.59)
When it comes to eating new food products like insect-based food, I want to eat what my friends think I should eat.	263 (32.80%)	229 (28.60%)	115 (14.40%)	101 (12.60%)	47 (5.90%)	31 (3.9%)	15 (1.90%)	2.49 (1.53)
When it comes to eating new food products like insect-based food, I want to eat what experts (nutritionists, doctors, etc.) think I should eat.	85 (10.6%)	109 (13.60%)	102 (12.70%)	158 (19.70%)	222 (27.70%)	83 (10.40%)	42 (5.20%)	3.92 (1.67)
Strength	**Extremely unlikely**	**Unlikely**	**Somewhat unlikely**	**Neutral**	**Somewhat likely**	**Likely**	**Extremel y likely**	**M (SD)**
My family thinks that I should eat insect-based food regularly.	354 (44.20%)	166 (20.70%)	95 (11.90%)	116 (14.50%)	34 (4.20%)	26 (3.20%)	10 (1.20%)	2.29 (1.50)
My friends think that I should eat insect-based food regularly.	321 (40.10%)	186 (23.20%)	94 (11.70%)	137 (17.10%)	29 (3.60%)	21 (2.60%)	13 (1.60%)	2.35 (1.49)
Experts like doctors and nutritionists think that I should eat insect-based food regularly	88 (11.00%)	116 (14.50%)	97 (12.10%)	284 (35.50%)	149 (18.60%)	48 (6.00%)	19 (2.40%)	3.64 (1.48)
Note. The scale ranged from 1-7								

Appendix 5.10: SN- Descriptive statistics for subjective norms scores towards insects as food

SN		
N	Valid	801
	Missing	0
Mean		9.97
Std. Deviation		8.20
Skewness		1.74
Std. Error of Skewness		0.09
Kurtosis		3.69
Std. Error of Kurtosis		0.17
Range		43.33
Minimum		1.33
Maximum		44.67

Appendix 5.11: SN- ANOVA- one-way effect of education

Education				
Dependent Variable: SN				
Education	Mean	SE	95% Confidence Interval	
			Lower Bound	Upper Bound
A level or below	8.99	0.61	7.80	10.18
Degree	10.96	0.59	9.81	12.11
Post degree	11.90	0.80	10.32	13.47

Appendix 5.12: SN- ANOVA- three-way interaction effect of sex*age*income

Sex * Age * Income groups						
Dependent Variable: SN						
Sex	**Age**	**Income groups**	**Mean**	**SE**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Female	**18-39**	*Less than 30,000*	9.87	1.20	7.52	12.22
		30,000 - Less than 60,000	9.89	1.11	7.71	12.07
		60,000 or more	10.40	1.62	7.22	13.58
	40-59	*Less than 30,000*	9.26	1.08	7.14	11.38
		30,000 - Less than 60,000	7.99	1.28	5.48	10.51
		60,000 or more	7.16	1.38	4.44	9.88
	60 or older	*Less than 30,000*	5.92	1.11	3.73	8.10
		30,000 - Less than 60,000	9.42	1.31	6.84	12.00
		60,000 or more	15.22	3.44	8.46	21.98
Male	**18-39**	*Less than 30,000*	15.26	2.79	9.78	20.73
		30,000 - Less than 60,000	17.59	1.19	15.25	19.93
		60,000 or more	15.48	1.37	12.79	18.17
	40-59	*Less than 30,000*	7.54	1.51	4.58	10.50
		30,000 - Less than 60,000	11.95	1.13	9.74	14.16
		60,000 or more	11.11	1.42	8.33	13.89
	60 or older	*Less than 30,000*	7.77	1.14	5.52	10.01
		30,000 - Less than 60,000	7.78	1.41	5.01	10.54
		60,000 or more	11.52	2.00	7.60	15.44

Appendix 5.13: SN- Bonferroni post hoc test for the effect of age on SN

Multiple Comparisons						
Dependent Variable: SN						
Bonferroni						
(I) Age	**(J) Age**	**Mean Difference (I-J)**	**SE**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
18-39	*40-59*	3.9239*	0.67	<.001	2.31	5.54
	60 or older	5.1936*	0.69	<.001	3.53	6.85
40-59	*18-39*	-3.9239*	0.67	<.001	-5.54	-2.31
	60 or older	1.27	0.68	0.19	-0.37	2.91
60 or older	*18-39*	-5.1936*	0.69	<.001	-6.85	-3.53
	40-59	-1.27	0.68	0.19	-2.91	0.37
Based on observed means. The error term is Mean Square(Error) = 58.178.						
*. The mean difference is significant at the .05 level.						

Appendix 5.14: SN- Bonferroni post hoc test for the effect of education on SN

Multiple Comparisons						
Dependent Variable: SN						
Bonferroni						
(I) Education	**(J) Education**	**Mean Difference (I-J)**	**SE**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
A level or below	*Degree*	-3.1928*	0.66	<.001	-4.77	-1.61
	Post degree	-3.3703*	0.69	<.001	-5.04	-1.71
Degree	*A level or below*	3.1928*	0.66	<.001	1.61	4.77
	Post degree	-0.18	0.76	1.00	-2.00	1.64
Post degree	*A level or below*	3.3703*	0.69	<.001	1.71	5.04
	Degree	0.18	0.76	1.00	-1.64	2.00
Based on observed means. The error term is Mean Square(Error) = 58.178.						
*. The mean difference is significant at the .05 level.						

Appendix 5.15: SN- Bonferroni post hoc test for the effect of income on SN

Multiple Comparisons						
Dependent Variable: SN						
Bonferroni						
(I) Income groups	**(J) Income groups**	**Mean Difference (I-J)**	**SE**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Less than 30,000	*30,000 - Less than 60,000*	-2.6909*	0.64	<.001	-4.23	-1.16
	60,000 or more	-4.2761*	0.72	<.001	-6.00	-2.55
30,000 - Less than 60,000	*Less than 30,000*	2.6909*	0.64	<.001	1.16	4.23
	60,000 or more	-1.59	0.76	0.11	-3.41	0.24
60,000 or more	*Less than 30,000*	4.2761*	0.72	<.001	2.55	6.00
	30,000 - Less than 60,000	1.59	0.76	0.11	-0.24	3.41
Based on observed means. The error term is Mean Square(Error) = 58.178.						
*. The mean difference is significant at the .05 level.						

Appendix 5.16: PBC- Descriptive statistics of the evaluation and beliefs of PBC

Evaluation	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	M (SD)
The presence of insect-based food in my favourite supermarkets would facilitate my purchase of these products regularly.	126 (15.70%)	118 (14.70%)	86 (10.70%)	143 (17.90%)	190 (23.70%)	88 (11.00%)	50 (6.20%)	3.77 (1.82)
The food culture of my country would facilitate the consumption of insect-based food.	151 (18.90%)	189 (23.60%)	142 (17.70%)	132 (16.50%)	112 (14.00%)	53 (6.60%)	22 (2.70%)	3.14 (1.65)
Having sufficient economic resources would facilitate the purchase of insect-based food.	57 (7.10%)	97 (12.10%)	75 (9.40%)	260 (32.50%)	186 (23.20%)	96 (12.00%)	30 (3.70%)	4.03 (1.50)
Strength	**Extremely unlikely**	**Unlikely**	**Somewhat unlikely**	**Neutral**	**Somewhat likely**	**Likely**	**Extremely likely**	**M (SD)**
I will find insect-based food in my favourite supermarkets.	99 (12.40%)	136 (17.00%)	157 (19.60%)	156 (19.50%)	167 (20.80%)	55 (6.90%)	31 (3.90%)	3.56 (1.60)
I will have the food culture to consume insect-based food.	170 (21.22%)	158 (19.73%)	115 (14.40%)	158 (19.73%)	121 (15.10%)	50 (6.20%)	29 (3.62%)	3.21 (1.71)
I will have sufficient economic resources to purchase insect-based food.	56 (7.00%)	66 (8.20%)	67 (8.40%)	233 (29.10%)	187 (23.3%)	125 (15.60%)	67 (8.40%)	4.34 (1.59)
Note. The scale ranged from 1-7								

Appendix 5.17: PBC- Descriptive statistics for PBC scores towards insects as food

PBC		
N	**Valid**	801
	Missing	0
Mean		14.78
Std. Deviation		9.47
Skewness		0.86
Std. Error of Skewness		0.09
Kurtosis		0.38
Std. Error of Kurtosis		0.17
Range		43.33
Minimum		1.33
Maximum		44.67

Appendix 5.18: PBC- ANOVA- one-way effect of education and income

Education				
Education	**Mean**	**Std. Error**	**95% Confidence Interval**	
			Lower Bound	**Upper Bound**
A level or below	13.32	0.71	11.93	14.70
Degree	16.49	0.68	15.15	17.83
Post degree	17.67	0.93	15.84	19.50
Income groups				
Less than 30,000	14.14	0.76	12.65	15.62
30,000 - Less than 60,000	15.67	0.59	14.51	16.83
60,000 or more	17.66	0.96	15.79	19.54

Appendix 5.19: PBC- ANOVA- two-way effect between sex and age

Sex	**Age**	**Mean**	**SE**	**95% Confidence Interval**	
				Lower Bound	**Upper Bound**
Female	*18-39*	13.94	0.89	12.19	15.69
	40-59	13.31	0.84	11.66	14.97
	60 or older	16.07	1.49	13.14	19.01
Male	*18-39*	21.94	1.29	19.41	24.48
	40-59	15.53	0.91	13.73	17.32
	60 or older	14.15	1.05	12.09	16.20

Appendix 5.20: PBC- Bonferroni post hoc test for the effect of age on PBC

Multiple Comparisons						
Dependent Variable: PBC						
Bonferroni						
		Mean			**95% Confidence Interval**	
(I) Age	**(J) Age**	**Difference (I-J)**	**SE**	**Sig.**	**Lower Bound**	**Upper Bound**
18-39	*40-59*	2.9490*	0.78	<.001	1.07	4.83
	60 or older	4.6189*	0.81	<.001	2.69	6.55
40-59	*18-39*	-2.9490*	0.78	<.001	-4.83	-1.07
	60 or older	1.67	0.80	0.11	-0.24	3.58
60 or older	*18-39*	-4.6189*	0.81	<.001	-6.55	-2.69
	40-59	-1.67	0.80	0.11	-3.58	0.24
Based on observed means. The error term is Mean Square(Error) = 78.810.						
*. The mean difference is significant at the .05 level.						

Appendix 5.21: PBC- Bonferroni post hoc test for the effect of education on PBC

Multiple Comparisons						
Dependent Variable: PBC						
Bonferroni						
		Mean			**95% Confidence Interval**	
(I) Education	**(J) Education**	**Difference (I-J)**	**SE**	**Sig.**	**Lower Bound**	**Upper Bound**
A level or below	*Degree*	-4.5712*	0.77	<.001	-6.41	-2.73
	Post degree	-4.2895*	0.81	<.001	-6.23	-2.35
Degree	*A level or below*	4.5712*	0.77	<.001	2.73	6.41
	Post degree	0.28	0.88	1.00	-1.84	2.40
Post degree	*A level or below*	4.2895*	0.81	<.001	2.35	6.23
	Degree	-0.28	0.88	1.00	-2.40	1.84
Based on observed means. The error term is Mean Square(Error) = 78.810.						
*. The mean difference is significant at the .05 level.						

Appendix 5.22: PBC- Bonferroni post hoc test for the effect of income on PBC

Multiple Comparisons						
Dependent Variable: PBC						
Bonferroni						
(I) Income groups	**(J) Income groups**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Less than 30,000	*30,000 - Less than 60,000*	-3.0853*	0.74	<.001	-4.87	-1.30
	60,000 or more	-6.0301*	0.84	<.001	-8.04	-4.02
30,000 - Less than 60,000	*Less than 30,000*	3.0853*	0.74	<.001	1.30	4.87
	60,000 or more	-2.9448*	0.88	0.00	-5.06	-0.83
60,000 or more	*Less than 30,000*	6.0301*	0.84	<.001	4.02	8.04
	30,000 - Less than 60,000	2.9448*	0.88	0.00	0.83	5.06
Based on observed means. The error term is Mean Square(Error) = 78.810.						
*. The mean difference is significant at the .05 level.						

Appendix 5.23: Intention-Descriptive statistics of the evaluation and beliefs of intention to try insects in the next 12 months

Item	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	M (SD)
I intend to eat food products containing edible insects regularly in the next 12 months.	308 (38.50%)	122 (15.20%)	100 (12.50%)	154 (19.20%)	75 (9.4%)	33 (4.10%)	9 (1.10%)	2.63 (1.63)
For sure I will eat food products containing edible insects in the next 12 months.	302 (37.70%)	109 (13.60%)	104 (13.00%)	162 (20.20%)	73 (9.10%)	32 (4.00%)	19 (2.40%)	2.71 (1.69)
I will try to eat food products containing edible insects in the next 12 months.	262 (32.70%)	130 (16.20%)	81 (10.10%)	142 (17.70%)	118 (14.70%)	50 (6.20%)	18 (2.20%)	2.93 (1.78)
Note. The scale ranged from 1-7								

Appendix 5.24: Intention- Overall reliability Statistics

Reliability Statistics		
Cronbach's Alpha	**Cronbach's Alpha Based on Standardized Items**	**N of Items**
0.95	0.95	3.00

Appendix 5.25: Intention-Breakdown of the overall reliability Statistics of intention to try insects in the next 12 months

Item Statistics			
	Mean	Std. Deviation	N
I intend to eat food products containing edible insects regularly in the next 12 months.	2.63	1.64	801
For sure I will eat food products containing edible insects in the next 12 months.	2.71	1.69	801
I will try to eat food products containing edible insects in the next 12 months.	2.93	1.78	801

Appendix 5.26: Intention-Descriptive statistics

Intention		
N	**Valid**	801
	Missing	0
Mean		2.76
Std. Deviation		1.63
Skewness		0.47
Std. Error of Skewness		0.09
Kurtosis		-0.96
Std. Error of Kurtosis		0.17
Range		6
Minimum		1
Maximum		7

Appendix 5.27: Food neophobia - Descriptive statistics of overall food neophobia scale statements

Item	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	M (SD)
I am constantly sampling new and different foods.	29 (3.60%)	94 (11.7%0)	107 (13.40%)	139 (17.40%)	223 (27.80%)	133 (16.60%)	76 (9.50%)	4.42 (1.60)
I don't trust new food.	124 (15.50%)	231 (28.80%)	168 (21.00%)	167 (20.80%)	66 (8.20%)	31 (3.90%)	14 (1.70%)	2.96 (1.44)
If I don't know what is in a food, I won't try it.	68 (8.50%)	133 (16.60%)	143 (17.90%)	106 (13.20%)	174 (21.70%)	104 (13.00%)	73 (9.10%)	4.00 (1.78)
I like food from different countries	6 (0.70%)	18 (2.2)	25 (3.10%)	45 (5.60%)	221 (27.6%)	261 (32.60%)	225 (28.10%)	5.67 (1.23)
Ethnic food looks too weird to eat.	193 (24.10%)	218 (27.20%)	124 (15.50%)	128 (16.00%)	73 (9.10%)	42 (5.20%)	23 (2.90%)	2.86 (1.64)
At dinner parties, I will try a new food.	15 (1.90%)	24 (3.00%)	35 (4.40%)	102 (12.7%)	262 (32.70%)	229 (28.60%)	134 (16.70%)	5.24 (1.33)
I am afraid to eat things I have never had before.	126 (15.70%)	189 (23.60%)	164 (20.50%)	117 (14.60%)	117 (14.60%)	55 (6.90%)	33 (4.10%)	3.26 (1.68)
I am very particular about the foods I will eat.	43 (5.40%)	115 (14.40%)	120 (15.00)	156 (19.50%)	191 (23.80%)	109 (13.60%)	67 (8.40%)	4.16 (1.65)
I will eat almost anything.	78 (9.70%)	106 (13.20%)	118 (14.70)	97 (12.10%)	198 (24.70%)	135 (16.90%)	69 (8.60%)	4.14 (1.80)
I like to try new ethnic restaurants	39 (4.90%)	57 (7.10%)	77 (9.60)	163 (20.70%)	190 (23.70%)	166 (20.70%)	109 (13.60%)	4.68 (1.63)
Note. The scale ranged from 1-7								

Appendix 5.28: Food neophobia -Overall Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.767	0.774	10

Appendix 5.29: Food neophobia -Breakdown of the overall reliability Statistics of food neophobia statements

Item-Total Statistics					
Item	**Scale Mean if Item Deleted**	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Squared Multiple Correlation**	**Cronbach's Alpha if Item Deleted**
I am constantly sampling new and different foods.	29.50	96.590	-0.566	0.499	0.862
I don't trust new food.	30.96	64.517	0.638	0.469	0.722
If I don't know what is in a food, I won't try it.	29.94	62.628	0.552	0.362	0.730
I like food from different countries. (R)	31.59	68.202	0.575	0.534	0.735
Ethnic food looks too weird to eat.	31.06	62.569	0.623	0.473	0.721
At dinner parties, I will try a new food. (R)	31.16	66.948	0.580	0.532	0.732
I am afraid to eat things I have never had before.	30.66	61.189	0.662	0.494	0.714
I am very particular about the foods I will eat.	29.76	63.957	0.557	0.370	0.730
I will eat almost anything. (R)	30.06	63.633	0.505	0.402	0.737
I like to try new ethnic restaurants. (R)	30.60	65.781	0.489	0.547	0.740
Note. R is the reversed item					

Appendix 5.30: Food neophobia - Descriptive statistics for overall food neophobia scores towards insects as food

Overall food neophobia		
N	**Valid**	801
	Missing	0
Mean		3.31
Std. Deviation		1.08
Skewness		0.28
Std. Error of Skewness		0.09
Kurtosis		0.07
Std. Error of Kurtosis		0.17
Range		6
Minimum		1
Maximum		7

Appendix 5.31: Food neophobia -ANOVA- one-way effect of income

			95% Confidence Interval	
Income groups	**Mean**	**Std. Error**	**Lower Bound**	**Upper Bound**
Less than 30,000	3.46	0.09	3.28	3.63
30,000 - Less than 60,000	3.20	0.07	3.06	3.34
60,000 or more	3.09	0.12	2.86	3.31

Appendix 5.32: Food neophobia- Bonferroni post hoc test for the effect of income on overall food neophobia

Multiple Comparisons						
Dependent Variable: Overall neophobia						
Bonferroni						
(I) Income groups	**(J) Income groups**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Less than 30,000	*30,000 - Less than 60,000*	0.2644*	0.09	0.01	0.05	0.48
	60,000 or more	.4281*	0.10	<.001	0.19	0.67
30,000 - Less than 60,000	*Less than 30,000*	-.2644*	0.09	0.01	-0.48	-0.05
	60,000 or more	0.16	0.11	0.37	-0.09	0.42
60,000 or more	*Less than 30,000*	-.4281*	0.10	<.001	-0.67	-0.19
	30,000 - Less than 60,000	-0.16	0.11	0.37	-0.42	0.09
Based on observed means. The error term is Mean Square(Error) = 1.137.						
*. The mean difference is significant at the .05 level.						

Appendix 5.33: Disgust- Descriptive statistics of overall disgust towards insects scale statements

Item	**Strongly disagree**	**Disagree**	**Somewhat disagree**	**Neutral**	**Somewhat agree**	**Agree**	**Strongly agree**	**M (SD)**
I would be disgusted to eat any dish with insects.	49 (6.10%)	100 (12.50%)	94 (11.70%)	147 (18.40%)	169 (21.10%)	114 (14.20%)	128 (16.00%)	4.42 (1.79)
Thinking about the flavour that a bug might have sickens me.	46 (5.70%)	94 (11.70%)	82 (10.20%)	161 (20.10%)	197 (24.60%)	116 (14.50%)	105 (13.10%)	4.42 (1.71)
If I ate a dish and then came to know that there were insects among the ingredients, I would be disgusted.	58 (7.20%)	114 (14.20%)	105 (13.10%)	1510 (18.90%)	159 (19.90%)	105 (13.10%)	109 (13.60%)	4.24 (1.80)
I would avoid eating a dish with insects among the ingredients, even if it was cooked by a famous chef.	57 (7.10%)	96 (12.00%)	97 (12.10%)	112 (14.00%)	147 (18.40%)	128 (16.00%)	164 (20.50%)	4.54 (1.90)
I would be bothered to find a dish cooked with insects on a restaurant menu.	71 (8.90%)	131 (16.40%)	108 (13.50%)	132 (16.50%)	146 (18.20%)	101 (12.60%)	112 (14.00%)	4.13 (1.88)
Note. The scale ranged from 1-7								

Appendix 5.34: Disgust- Overall reliability statistics of disgust statements

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.932	0.933	5

Appendix 5.35: Disgust-Breakdown **of** the overall reliability Statistics of food neophobia statements

Item-Total Statistics					
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Squared Multiple Correlation**	**Cronbach's Alpha if Item Deleted**
I would be disgusted to eat any dish with insects.	17.32	41.430	0.88	0.80	0.91
Thinking about the flavour that a bug might have sickens me.	17.33	43.626	0.82	0.68	0.92
If I ate a dish and then came to know that there were insects among the ingredients, I would be disgusted.	17.51	41.518	0.87	0.76	0.91
I would avoid eating a dish with insects among the ingredients, even if it was cooked by a famous chef.	17.21	40.451	0.86	0.78	0.91
I would be bothered to find a dish cooked with insects on a restaurant menu.	17.62	44.320	0.69	0.48	0.94

Appendix 5.36: Disgust- Descriptive statistics for disgust scores towards insects as food

Disgust		
N	Valid	801
	Missing	0
Mean		4.35
Std. Deviation		1.61
Skewness		-0.18
Std. Error of Skewness		0.09
Kurtosis		-0.77
Std. Error of Kurtosis		0.17
Range		6
Minimum		1
Maximum		7

Appendix 5.37: Final Variables and the response scale

Dependent variable	**Independent variables**	**Response scale**
	Sex	0= Female 1=Male
Type of product **None=0** **Bread=1** **Pasta=2**	***Age***	1= (18-39) 2= (40-59) 3= 60 or older
	Education	1= A level or below 2= Degree 3= Post degree
	Religion	1= Religious 2= Non- Religious
	Household size	1=Single 2= Household consist of 2 people 3= Household consist of 3 people or more
	Income	1= Less than 30K 2= 30 to Less than 60K 3= 60K or more
	Attitude	1-49
	SN	1-49
	PBC	1-49
	Intention to try insects in the next 12 months	1= Strongly disagree 2= Disagree 3= Somewhat disagree 4= Neutral 5= Somewhat agree 6= Agree 7= Strongly agree
	Food neophobia	1= Strongly disagree 2= Disagree 3= Somewhat disagree 4= Neutral 5= Somewhat agree 6= Agree 7= Strongly agree
	Disgust	1= Strongly disagree 2= Disagree 3= Somewhat disagree 4= Neutral 5= Somewhat agree 6= Agree 7= Strongly agree

Appendix 5.38: Factors influencing consumers' preferences of bread and pasta made cricket flour

		B	SE	Wald	df	*p*	Exp (B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Bread	Intercept	-0.453	0.724	0.391	1	0.532			
	ATT	0.020	0.025	0.626	1	0.429	1.020	0.971	1.071
	SN	0.069	0.019	13.086	1	**0.000**	**1.072**	1.032	1.113
	PBC	0.071	0.018	15.679	1	**0.000**	**1.074**	1.036	1.112
	Food neophobia	-0.037	0.120	0.097	1	0.755	0.963	0.761	1.219
	Disgust	-0.662	0.091	52.669	1	**0.000**	**0.516**	0.431	0.617
Pasta	Intercept	-0.393	0.851	0.213	1	0.644			
	ATT	0.020	0.029	0.473	1	0.492	1.020	0.963	1.081
	SN	0.054	0.023	5.679	1	**0.017**	**1.055**	1.010	1.103
	PBC	0.079	0.021	13.866	1	**0.000**	**1.082**	1.038	1.127
	Food neophobia	0.024	0.144	0.028	1	0.866	1.025	0.772	1.360
	Disgust	-0.883	0.114	59.654	1	**0.000**	**0.414**	0.331	0.518

Appendix 5.39: Model Classification

Classification				
Observed	**None**	**Bread**	**Pasta**	**Percent Correct**
None	470	40	0	92.2%
Bread	85	83	3	48.5%
Pasta	43	57	5	4.8%
Overall Percentage	76.1%	22.9%	1.0%	71.0%

Appendix 5.40: Collinearity-preferences of bread and pasta made with cricket flour

Coefficients[a]			
Model		Collinearity Statistics	
		Tolerance	**VIF**
	ATT	0.732	1.365
	SN	0.556	1.8
	PBC	0.417	2.4
	FN	0.745	1.343
	Disg	0.622	1.608
	ATT	0.732	1.365

a. Dependent Variable: Imagine that tomorrow the following two food products containing edible insects are available on the shelves of your favourite supermarket:
Which one of them you would like to choose?

Appendix 5.41: Model fitting information

Model Fitting Information							
	Model Fitting Criteria				Likelihood Ratio Tests		
	AIC	BIC	-2 Log Likelihood	% of the change	Chi-Square	df	Sig.
	Model 1						
Intercept Only	1389.577	1398.910	1385.577	26%			
Final	1052.700	1108.703	1028.700		356.877	10	0

Appendix 5.42: Model improvement- Goodness-of-Fit

Goodness-of-Fit			
	Chi-Square	df	Sig.
Pearson	1960.32	1560.00	0
Deviance	1028.70	1560.00	1

Appendix 5.43: Pseudo R-Square

Pseudo R-Square	
Cox and Snell	0.365
Nagelkerke	0.441
McFadden	0.258

Appendix 5.44: Likelihood Ratio Test

	Model Fitting Criteria			Likelihood Ratio Tests		
Effect	**AIC of Reduced Model**	**BIC of Reduced Model**	**-2 Log Likelihood of Reduced Model**	**Chi-Square**	**df**	**Sig.**
Intercept	1049.134	1095.804	1029.134	0.434	2	0.805
ATT	1049.464	1096.133	1029.464	0.764	2	0.683
SN	1062.530	1109.199	1042.530	13.830	2	0.001
PBC	1068.983	1115.653	1048.983	20.283	2	0.000
FN	1048.894	1095.563	1028.894	0.194	2	0.908
Disg	1146.065	1192.734	1126.065	97.365	2	0.000

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

Appendix 5.45: Factors influencing consumers' preferences for the logos

		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
High protein	Intercept	2.163	1.345	2.587	1	0.108			
	ATT	-0.080	0.047	2.864	1	0.091	0.923	0.842	1.013
	SN	-0.013	0.030	0.193	1	0.660	0.987	0.930	1.047
	PBC	0.019	0.031	0.368	1	0.544	1.019	0.958	1.084
	FN	-0.252	0.230	1.195	1	0.274	0.777	0.495	1.221
	Disg	0.042	0.167	0.064	1	0.800	1.043	0.753	1.446
Insect protein	Intercept	2.454	1.104	4.943	1	0.026			
	ATT	-0.032	0.037	0.724	1	0.395	0.969	0.901	1.042
	SN	-0.020	0.025	0.671	1	0.413	0.980	0.933	1.029
	PBC	0.008	0.026	0.087	1	0.769	1.008	0.958	1.060
	FN	-0.131	0.184	0.510	1	0.475	0.877	0.612	1.257
	Disg	-0.059	0.138	0.184	1	0.668	0.942	0.719	1.236

Appendix 5.46: Responses towards the bids for bread made with cricket flour according to the sociodemographic

		Bread										Pasta									
Variable	**Level**	**Total number**	**%**	**Yes-Yes**	**%**	**No-Yes**	**%**	**Yes-No**	**%**	**No-No**	**%**	**Total number**	**%**	**Yes-Yes**	**%**	**No-Yes**	**%**	**Yes-No**	**%**	**No-No**	**%**
Sex	**Female**	63	37%	39	23%	11	6%	3	2%	10	6%	53	50%	36	34%	10	10%	5	5%	2	2%
	Male	108	63%	57	33%	22	13%	8	5%	21	12%	52	50%	31	30%	6	6%	8	8%	7	7%
Age	**18-39**	65	38%	27	16%	14	8%	2	1%	22	13%	39	37%	22	21%	4	4%	6	6%	7	7%
	40-59	62	36%	37	22%	11	6%	6	4%	8	5%	37	35%	26	25%	7	7%	3	3%	1	1%
	60 or older	44	26%	32	19%	8	5%	3	2%	1	1%	29	28%	19	18%	5	5%	4	4%	1	1%
Education	**A level or below**	63	37%	35	20%	14	8%	9	5%	5	3%	38	36%	27	26%	5	5%	3	3%	3	3%
	Degree	61	36%	37	22%	9	5%	0	0%	15	9%	43	41%	26	25%	6	6%	8	8%	3	3%
	Post degree	47	27%	24	14%	10	6%	2	1%	11	6%	24	23%	14	13%	5	5%	2	2%	3	3%
Religion	**Religious**	100	60%	48	29%	23	14%	7	4%	22	13%	55	53%	33	32%	11	11%	5	5%	6	6%
	Non-Religious	67	40%	46	28%	8	5%	4	2%	9	5%	48	47%	33	32%	5	5%	8	8%	2	2%
Household size	**Single**	57	33%	34	20%	10	6%	6	4%	7	4%	31	30%	21	20%	3	3%	6	6%	1	1%
	Household (2 people)	40	23%	31	18%	7	4%	1	1%	1	1%	23	22%	17	16%	4	4%	1	1%	1	1%
	Household (3 people or more)	74	43%	31	18%	16	9%	4	2%	23	13%	51	49%	29	28%	9	9%	6	6%	7	7%
Income	**Less than 30,000**	54	34%	33	21%	10	6%	5	3%	6	4%	33	34%	23	23%	5	5%	4	4%	1	1%
	30,000 - Less than 60,000	59	37%	33	21%	12	8%	4	3%	10	6%	37	38%	22	22%	5	5%	5	5%	5	5%
	60,000 or more	47	29%	23	14%	10	6%	1	1%	13	8%	28	29%	16	16%	5	5%	4	4%	3	3%