

Social Psychology Research for the Measurement of Attitudes, Beliefs and Perceptions about Insects Consumption





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Introduction to the Research

This research on insect consumption is part of the Erasmus+ Project, "Insects Innovation in Gastronomy." The project aims to explore the potential of insects as an alternative and sustainable source of protein. By examining the social, cultural, and psychological factors that shape attitudes towards entomophagy (insect consumption), the research offers valuable insights into how this practice can be integrated into modern European diets.

The research focuses on multiple European countries, including Spain, Italy, Turkey, Cyprus, Greece, and Romania. Through a detailed study involving chefs, professionals in the hospitality industry (HoReCa), and consumers, the project seeks to understand how ready people are to adopt insects as a viable food source. A key part of this study involves a questionnaire that measures factors like food neophobia (fear of new foods), awareness of insects' nutritional benefits, and perceptions of their environmental impact.

This research will play a role in developing strategies to introduce insect-based foods into European markets, considering both societal readiness and the regulatory frameworks of different countries. The findings will inform future campaigns aimed at educating consumers about the benefits of insect consumption and overcoming cultural resistance.

1. Desk research

The desk research component of this study provides an overview of the existing social, technological, and psychological research regarding insect consumption in several European countries. The aim is to explore the historical context, technological advancements, consumer perceptions, and regulatory policies surrounding entomophagy in Italy, Spain, Turkey, Cyprus, Greece, and Romania.

This section delves into the history of insect consumption, highlighting cultural practices and traditions associated with eating insects in different countries. For instance, while entomophagy has deep historical roots in some regions, it remains relatively new or unfamiliar in others. The research also reviews current technological innovations in insect farming and processing, along with social research that examines public attitudes towards insects as a food source.

In addition to historical and cultural analysis, this research evaluates the policies governing insect consumption in the European Union, including food safety standards, labeling, and marketing regulations. By comparing the various approaches across countries, the desk research aims to identify opportunities and challenges for the future development of the edible insect industry in Europe.

The outcomes of this research will inform the project's recommendations on how to enhance societal acceptance, improve consumer education, and streamline regulatory

processes to promote insects as a sustainable and nutritious alternative to traditional protein sources.

1.1. Italy

1.1.1. History of insect consumption in Italy

Insect consumption, known as entomophagy, has deep historical roots in many cultures around the world. Italy, with its rich culinary heritage and diverse regional diets, offers a unique perspective on the practice. Though not as prevalent as in other parts of the world, the tradition of consuming insects in Italy has evolved over centuries, reflecting the country's changing social, economic, and environmental landscapes.

The history of insect consumption in Italy can be traced back to ancient times. The Romans, known for their expansive culinary repertoire, were documented to have consumed certain types of insects, particularly beetles and locusts, which were often considered delicacies. These insects were sometimes fattened on special diets to enhance their flavor before being roasted or incorporated into more elaborate dishes.

During the Middle Ages and the Renaissance, Italy's culinary practices were heavily influenced by the availability of ingredients and the socioeconomic status of individuals. Insect consumption during these periods was less documented but was likely practiced in rural areas where traditional foods were more closely tied to the natural environment. Insects would have been a valuable protein source, especially in times of scarcity.

In recent years, there has been a growing interest in entomophagy in Italy as part of a global movement towards sustainable and alternative protein sources. This renewed interest is driven by environmental concerns, food sustainability, and the nutritional value of insects. Modern Italian chefs and food innovators are exploring ways to incorporate insects into

contemporary dishes, blending traditional flavors with new ingredients. A first taste of insects in contemporary Italy was made in the Belgian pavilion of the EXPO, in fact, in addition to being offered characteristic beer, insect-based products were also eaten. Belgian entrepreneurs Sophie and Géraldine Goffard brought fresh pasta and pâtés made from *Tenebrio Molitor* (flour moth) to Italy. Moreover, in some regions of Italy, particularly in the countryside, the use of insects in traditional dishes can still be found. For example, in Sardinia, the cheese *casu marzu*, which contains live insect larvae, is a testament to the island's unique culinary traditions. This cheese is considered a delicacy and is a clear example of how insects have been integrated into Italian cuisine in specific local contexts.

We now know that eating insects is good for the planet, because producing them requires fewer resources, primarily water. And it's good for your health, because they contain twice as much protein as meat. But Italy remains last among European countries in terms of popularity of crickets and locusts and in terms of number of companies.

From a survey conducted by the University of Bergamo, a vision emerges interested in novel food, in full technical and economic development. The ones most likely to introduce this new food are kids.

Until now, discussions on food and insects could only rely on the experiences of Italians passionate about street food (very exotic) or super gourmets who had tasted the extreme dishes of great chefs such as the Danish Rene Redzepi or the Brazilian Alex Atala.

Although Italy is a little behind, however, we are certain that one Italian in three is willing to eat insects or foods made from insect flour, this is the result – perhaps unexpected - that emerged from *Insect Food and Consumers*, a survey by the University of Bergamo, the first to offer a profiling of Italians on this matter. The research, conducted on a representative sample of the Italian population between October 2021 and September 2022, shows that 70% of those interviewed still declare themselves reluctant to consume insect food, but the remaining 30% are divided between those who are highly inclined (9%) and those who are on average inclined (21%).

1.1.2. Psychological or social research existing in Italy.

As emerges from many researches of the Department of Business Sciences of the University of Bergamo, consumers are driven by curiosity and an innovative spirit. Studies show that those who have already experimented with insect-based foods are more inclined to repeat the experience and that men are more willing than women.

Research by Cicatiello et al., (2016) performed a study about human consumption of insects and showed that the growing recognition of insects as an alternative protein source, there is increasing interest in their potential to address environmental concerns related to animal protein production and food security issues. While studies in other European nations suggest consumer resistance to incorporating insect-based products into their diets, individuals with greater environmental and health consciousness show some inclination towards insect consumption. A survey employing a 14-item questionnaire was administered to 201 consumers selected through systematic sampling at a shopping mall. Logistic regression analysis was utilized to examine the factors influencing respondents' attitudes towards insect consumption. Findings reveal that 31 percent of respondents were open to trying insects as food, with 5 percent having already done so. Factors such as familiarity with foreign cuisines, higher levels of education, and male gender were found to positively influence consumer attitudes towards entomophagy. Conversely, concerns about insects and apprehensions regarding taste were identified as primary barriers to willingness to try entomophagy, particularly among individuals lacking direct experience with insect consumption. This study represents an initial exploration of entomophagy within the Italian context. While many findings align with previous research conducted in other countries, certain barriers to insect consumption appear to be more pronounced in Italy compared to elsewhere.

Another study by Tuccillo et al., (2020) analyzed the Italian consumers' attitudes towards entomophagy and perception of the general consumers. This research showed that Recent studies examining consumer attitudes towards entomophagy have gained momentum. However, the broad classification of "insects" in previous research presents a constraint,

underscoring the need for more nuanced terminology. This research sought to address this limitation by assessing attitudes towards specific insect varieties, their culinary preparations, their interaction with human factors, and their attributes as a food source. Through a survey administered to 400 Italian participants, data on socio-demographics, personality traits, willingness to consume six edible insect species, along with their respective insect-based products or dishes (IBPD), and the emotional responses associated with entomophagy were gathered. In comparison to females, males exhibited greater positivity towards insects, were less influenced by insect species and processing levels, and showed a greater willingness to consume insects based on taste preferences. Consumption of insects elicited feelings of adventure, daring, and wildness, while disgust and food neophobia emerged as primary factors inhibiting insect consumption. Preferences for specific insects ranked as follows: crickets > bee larvae and grasshoppers > mealworms and silkworms > giant water bugs. This ranking was consistent when considering the respective IBPD. Additionally, adult insects were generally preferred over larvae. The study identified three distinct consumer groups: "In favor of eating insects" (41%), "Picky towards eating insects" (32%), and "Against eating insects" (27%).

Furthermore, a sensory evaluation conducted with 52 Italian participants on three cricket-based samples revealed a preference for minimal insect visibility. These findings offer novel insights into the factors influencing entomophagy acceptance, shedding light on both the characteristics of potential consumers and the attributes of insect products likely to succeed in the market.

A University of Bergamo's study is the first large-scale analysis of Italian consumers' attitudes towards insect food. It found that 9% are highly inclined to consume insect-based foods, 21% are somewhat inclined, and 70% are little to not inclined. The research categorized respondents into four groups: hedonists (young and open to buying), progressives (middle-aged with high education), invincibles (mostly young women), and followers (those who conform to others' opinions and resist changing their dietary habits). Key findings include previous insect consumption experience, gender differences favoring men, and openness to change as significant factors in adopting insect food.

Research by Toti et al (2020) showed that in recent years, there has been a growing interest among scientists and ecologists in entomophagy, the consumption of insects, as a potential source of animal protein. The appeal of eating insects lies in their low greenhouse gas emissions and minimal land use.

While tropical countries have long embraced the consumption of approximately 2000 edible insect species, Western culture, including Italy, is relatively new to the concept. In the Mediterranean region, particularly Italy, cultural norms and culinary traditions heavily influence perceptions of what is edible. This narrative paper aims to provide an overview of entomophagy, covering topics such as nutrient content, safety aspects, global cultural acceptance of insects, and the impact of food neophobia on Italian attitudes toward insect consumption. Drawing upon previous studies, it becomes evident that Italian dietary preferences remain deeply rooted in local traditions. To introduce insects into the Italian diet, efforts to enhance psychological motivation are essential.

Research by Moruzzo et al., (2021) highlighted the importance to standardize a scale for measuring “insects phobia” as a “neophobia” of eating insects. As the world's population grows and concerns over the environmental impact of food production intensify, international organizations are seeking more sustainable food options. Edible insects are emerging as a potential solution to these challenges.

While some cultures have embraced entomophagy, the practice of eating insects, others, like Western countries, have historically shied away from it. This paper examines the attitudes of Italian consumers towards consuming insects as food.

The findings reveal a certain reluctance among Italians, which could be addressed through effective marketing strategies. In Europe, insect-based food remains uncommon due to prevailing perceptions of insects as threats to health rather than viable food sources. This apprehension, known as food neophobia, manifests as a reluctance to try new foods, hindering the adoption of insect-based products.

Despite growing interest in this emerging sector, research on the relationship between rejection, food neophobia, and consumer behavior regarding insect consumption is lacking. This study administered 420 questionnaires, incorporating an experimental scale

for insect acceptance alongside a neophobia scale, to gauge respondents' willingness to consume insects and insect-containing foods.

The analysis revealed disparities between the two scales, underscoring the necessity for a dedicated measure of "insect phobia." This insight is crucial, given the limited understanding of consumer preferences and barriers surrounding insect consumption, essential for formulating effective commercial strategies. The development of insect-based foods not only offers potential health benefits but also enhances the sustainability of the food industry.

1.1.3. Existing technological or social research in Italy.

Technological research in Italy regarding insect consumption focuses on developing sustainable food solutions and addressing consumer acceptance challenges. Studies explore innovative processing methods to enhance the palatability and nutritional value of insect-based foods, aiming to integrate them into the Italian diet. However, this research is still emerging, and broader acceptance might require addressing cultural perceptions and regulatory frameworks. For example, with the entry into force in 2018 of the European legislation that legitimizes the consumption of insects, Alia Insect Farm was born in Italy, an agricultural start-up specialized in the production of flavored cricket powder 100% made in Italy: "These foods have the potential rule to have a positive impact on people's health by contributing to the well-being of the planet - says the founder of Alia Insect Farm, Carlotta Totaro Fila - The Italian mastery in creating foods with excellent taste and the food safety that will characterize our products, when authorized, These are the starting requirements for creating new and interesting prospects for the entire Italian agro-food sector. Furthermore, a great pasta with cricket flour is hypothesized.

Moreover, in Italy, companies like Entonero are actively involved in the field of insect consumption technology. These companies are part of a growing industry focused on sustainable food solutions, exploring the potential of insects as alternative protein sources.

Again, research and surveys, such as the one conducted by Mattia Serranò from the Faculty of Food Science and Technology of Catania, investigates consumer attitudes towards insect-based foods in Southern Italy. This study highlighted a general awareness of the nutritional benefits of edible insects and an understanding of their lower environmental impact. However, it also revealed a strong food neophobia among consumers, with a preference for insect-based products where insects are not visible, such as flours or biscuits made from insect flour.

1.1.4. Existing enterprises restaurant case scholars and examples

After the green light from the EU, many companies are gearing up to enter this market. Italians should consider insects as an opportunity in the food field: a completely natural alternative food, a sustainable protein source. Not a threat to traditional agriculture, which is also affected by the effects of climate change, but a potential ally that will be impossible to do without".

Carlotta Totaro Fila, from Salento who moved to Milan in 2002, with a degree in Food Science and Technology, has no doubts. And this is why you have invested the last few years in the creation of ALIA insect farm, an innovative agricultural startup that aims, in an ever-closer future, to produce foods based on 100% Italian edible crickets, respecting maximum safety, quality and innovation.

Thanks to the new EU regulation on novel foods from 1 January 2018 it is in fact possible to produce and sell insects also in Italy and, research has shown that at least 7 out of 10 Italians are ready to taste this unusual protein-rich food.

In Corciano, in one of the most beautiful villages in Italy it is in fact possible to taste insect-based dishes in the Bugs Gourmet restaurant, an exclusive and refined place where they serve tagliatelle made with cricket flour, spit-roasted scorpions, baked larvae, grasshoppers fried and many other typical specialties of oriental cuisine.

Moreover, in Italy we have other specific examples:

1) Pizzeria Almiro a Osteria Grande (Bologna) offers the possibility of ordering a pizza made with partially defatted flour from *Acheta domesticus*, the house cricket.

2) Pane e Trita that offer: The "Grillo Cheeseburger" features a unique combination of green artisan bread, cricket powder burger, melted scamorza cheese, purple cabbage, crispy sweet potato, and a special "Pane & Trita" sauce. It's a kaleidoscope of flavors that's not only a delight to eat but also perfect for sharing on Instagram. This burger is high in protein and low in fats and carbs, made with 100% Italian, high- quality ingredients including cannellini beans, steamed potatoes, breadcrumbs, sunflower oil, yeast, salt, barley malt extract, house cricket flour (1.6%), and salt.

3) Entonote, With the offer of "Entoexperience" that is a unique journey that introduces participants to the concept of insects in cuisine through a one-of-a-kind gastronomic and interactive experience. Each Entoexperience includes multiple courses where insects are creatively incorporated into a surprise, seasonal menu.

4) Barefood, "Hop for the Future" symbolizes a leap towards a new future in nutrition, starting with insects, embodied by the cricket logo of the project and promoted by Supernaturale and Small Giants. At Vinificio, from October 20th to 24th, a special themed menu will feature Small Giants' products in every course, from appetizers to desserts, including cricket flour snacks, chocolate Crispy Bakes, and the versatile Easy Mix for creating burgers, meatballs, and nuggets with alternative, sustainable proteins like Buffalo Worm flour.

5) Palapa, the first bar that sells sweets made with insect flour." Enrica Abati and her pastry chef husband from Friuli, Michele Taddio, own Il Palapa in Via San Leonardo in Parma. It's on the counter of their establishment where they've recently displayed brioche, cookies, and tarts made specifically using cricket flour.

6) Bugsolutely: it is an Italian company focused on producing pasta made from insect flour. They source insect flours from Thailand and Vietnam to create high-quality products. Bugsolutely's pasta offers an alternative protein source and is an innovative addition to the Italian food industry.

7) ALIA. Founded in 2020 in Italy, the company aims to provide high- quality, innovative insect-based foods to a wide audience, promoting the culture and benefits of entomophagy as a new frontier in food for human well-being and environmental sustainability, with an eye on international markets

1.1.5. Existing policies about consumption of insects, and existing policies about consumers lines and information

The Official Gazette of December 29, 2023, published four decrees known as the "insect decrees," aimed at regulating the labeling and marketing of food products containing insects four insects: yellow larva, migratory locust, house cricket and lesser mealworm like house crickets and mealworms. The products may contain frozen, dried or powdered insects as is already the case in other EU countries.

These decrees align with EU regulations from 2021 that authorized certain insect species as new food sources. Key provisions include clear labeling of insect content, allergy warnings, and separate retail sections for insect-based products. The decrees introduce new requirements for labeling the insect type and origin, overseen by various Italian authorities, with specific penalties for non-compliance. However, these decrees largely overlap with existing EU regulations, adding specific provisions for insect species labeling and product placement in stores. It is important that the regulation is open to that innovation, since with other situation (cultivated meat) in Italy there is much more debate.

The four authorization decrees - signed by the Minister of Agriculture Francesco Lollobrigida, the Ministry of Business and Made in Italy and the Ministry of Health - derive from as many implementing regulations binding for the Member States.

The packages containing products based on insect flours must present the following information: type of insect present, with scientific name, "but also, by will of the Italian Government, with the translation into Italian", explained Lollobrigida.

The labels also report the quantity of insects used and present in food products and the country of origin of the insect must also be expressed.

Lollobrigida then specified what is now recognized by the international scientific community that "insects are natural elements present in the diet of other populations. We do not have them among the main elements of our diet and I believe that they do not endanger our model."

Finally, in order to avoid mixing with other foods, the Government has decided to regulate the sale, providing separate compartments, specifically indicated with specific signs.

1.1.6. Conclusions and suggestions for improvements

The consumption of insects could become very important in Italy given that it is a sustainable, high-protein, tasty food and has already been consumed for millennia in the East, Oceania and Africa. Even if it is a product that is partially present in Italy, it is a candidate to soon become our future.

Although it might seem strange in Italy, as a country with consolidated culinary traditions and cradle of some delicacies that characterize us as world excellence, the growth of this figure is hoped for by both scientific researchers and the United Nations Food Organization and agriculture. The latter in particular urged everyone to make greater use of this resource to differentiate our diet and, above all, to adopt it as an excellent sustainable alternative to the animal foods consumed today.

Part of the population has already decided to eat proteins that are alternatives to meat or derivatives (during the months of the pandemic, meat consumption dropped by 30%), demonstrating that our habits can change.

In Italy, breaking down the wall of insect waste is not impossible. Italians would accept crickets, grasshoppers, woodworms, mealworms and cicadas on their plate, as long as they are served in a form that is not directly recognizable. A real turning point for novel food

could be when insects enter school canteen menus because it would be the way to educate this new habit.

If today's children grow up with the awareness of having to make sustainable choices to ensure a healthy life and that eating edible insects is one of these, we will move towards a progressive normalization of this new food. In short, Italy could easily accept good and sustainable food from all points of view.

Next steps:

- Processing will increase consumer acceptance of insects, and processed insects are used in the production of various types of bread, pasta, chips, protein bars and other products in the rapidly growing insect industry.
- Nutrient extraction is an important consideration because high chitin and concentration may adversely affect the digestibility of insect-based products insects constitute an excellent source of nutrients.
- The growing number of shop and restaurants that are trying to offer insects in the menu and shelves will pave the way to probably many other players.
- Others innovation might arrive from the use of new technologies adapted to valorize ingredients from insects, for example 3D printing, ultrasound extraction, protein electrospinning, enzymatic extraction, and transformations.

2.1. Cyprus

2.1.1. History of insect consumption in Cyprus

In Cyprus, the history of insect consumption can be traced back through centuries, with intermittent instances of locust plagues leaving a mark on the island's landscape. The historical roots of insect consumption in Cyprus are deeply intertwined with both necessity

and occasional abundance. Old records document plagues of locusts dating back to 1881 when 1.6 billion egg pods were destroyed on the island. This happened often even in ancient times, in neighbouring countries too, such as Ancient Egypt and Palestinian lands. Such historical events from time to time showcased the potential for substantial protein resources derived from locusts, reaching approximately 80 million pounds. Over time, the periodic occurrence of locust accumulations became a part of the island's historical narrative.

The cultural significance of insect consumption in Cyprus is multifaceted. While the consumption of insects might not have been a daily practice, the periodic inclusion of insects in the diet during times of abundance or necessity has shaped cultural perceptions. Locust plagues, for instance, have left a lasting imprint on cultural memory, becoming symbolic of both challenges and opportunities. Understanding this cultural context is crucial when exploring attitudes and perceptions towards insect consumption in Cyprus.

Economically, the enduring tradition of insect consumption in Cyprus has emerged as a pragmatic response to the island's unique environmental conditions. The periodic prevalence of locusts, which can be abundant and potentially devastating to agriculture, is viewed not only as a threat but as a distinctive economic opportunity. Locusts, when harnessed during their cyclic plagues, represent a viable and versatile economic resource, offering a dual benefit of mitigating agricultural losses and providing a sustainable protein source.

The economic considerations intricately woven into insect consumption practices are deeply connected to the recurrent nature of locust plagues, urging communities to develop adaptive strategies that capitalize on these periodic phenomena. As the world increasingly recognizes the ecological advantages of incorporating insects into the human diet, the economic viability of insect farming in Cyprus becomes paramount. Striking a delicate balance between reaping economic benefits and acknowledging cultural and environmental nuances is crucial for the successful modern exploration of insect farming on the island. This necessitates innovative approaches that not only address economic considerations but also respect the cultural heritage and environmental sustainability,

thereby fostering a harmonious integration of insect farming into Cyprus' culinary and economic landscape.

Despite its historical and cultural significance, insect consumption in Cyprus has not been without its share of stereotypes and taboos. In modern times, changing food habits, globalization, and urbanization have led to a decline in the consumption of insects. Many people now associate insect consumption with poverty or consider it outdated, leading to a reluctance to embrace this traditional practice.

In recent years, there has been a growing interest in reintroducing insect consumption in Cyprus due to its potential environmental benefits. Insects are highly sustainable and have a low ecological footprint compared to traditional livestock. Efforts to promote entomophagy as an eco-friendly alternative are challenging existing stereotypes and taboos associated with insect consumption.

2.1.2. Existing Psychological and Social Research in Cyprus

Exploring contemporary attitudes towards insect consumption in Cyprus reveals a complex interplay of factors. The historical roots, cultural significance, economic considerations, and existing stereotypes collectively shape how Cypriots view insect-based foods. While some may still harbour traditional attitudes influenced by historical practices, others may approach the idea with curiosity or scepticism due to modern influences and Western dietary norms.

Despite the UNESCO recognition of the Mediterranean diet, which emphasizes sustainability and local produce, insect consumption remains largely unexplored in modern Cyprus. The challenge lies in bridging the historical gap and reshaping perceptions to align with the potential benefits of incorporating insects into the diet. Consumer education and awareness campaigns become crucial tools in dispelling myths, addressing concerns, and fostering a more positive outlook on insect-based products.

Some research has significantly contributed to understanding the decision-making processes of consumers in relation to insect-based products, providing valuable insights into the factors that influence purchasing behaviour. However, a prevalent weakness across the majority of studies lies in their cross-sectional nature, offering snapshots of consumer behaviour at specific moments in time. The limitations of this approach underscore the need for longitudinal research, which has the potential to more effectively capture changes in attitudes and behaviours over an extended period of sustained exposure to insect-based foods. Such longitudinal insights would offer a more comprehensive understanding of the evolving dynamics surrounding the consumer acceptance of insect-based products.

Cyprus, as a member of the EU, is obliged to compliance with the specifications of regulation EU 2015/2283 of the European Parliament and of the Council of 25 November 2015 on novel foods. The Novel Food Regulation applies to certain categories of foods, including foods originating from plants, animals, microorganisms, cell cultures or minerals (e.g. botanical extracts, insects, vitamins, minerals, food supplements, etc.) that were not used for human consumption to a significant degree within the EU before 15 May 1997, or resulting from production processes or practices not commonly used before that date. Under EU Regulation 2015/2283, whole insects and their preparations are considered as novel food and must thus be authorised under the new EU novel food system with the view to be lawfully marketed within the EU. The qualification of whole insects as novel foods was legally uncertain under Regulation No 258/97, and this has led to diverging approaches among EU Member States thereby generating a contrasted impact of the transitional provisions.

To overcome challenges associated with insect consumption, Cyprus can explore innovations in insect farming. Sustainable practices in insect farming can address environmental concerns, ensure economic viability, and align with the cultural context. Innovations may include efficient waste recycling systems, advanced farming techniques, and partnerships between the government and private sectors to promote insect farming as a sustainable industry.

Developing and implementing such innovations requires a multidisciplinary approach involving agriculture, environmental science, and cultural studies. Additionally, engaging local communities and incorporating traditional knowledge into modern practices can contribute to the success of insect farming initiatives. As Cyprus navigates the complexities of reintroducing insect consumption, embracing innovation becomes a key element in creating a sustainable and culturally sensitive entomophagy industry.

Cyprus boasts a rich Mediterranean cuisine, infused with influences from neighbouring countries, bestowing upon its inhabitants a culinary tradition and cultural heritage of great diversity. This rich tapestry, however, contributes to a current reluctance among consumers to embrace insect consumption in their diets. The intricacies of Cyprus' culinary and cultural landscape play a pivotal role in shaping negative attitudes and behaviours towards incorporating insects into human nutrition. By delving into these social and cultural factors that contribute to the resistance, the Cyprus market has the opportunity to gain valuable insights. Understanding these dynamics is essential for devising effective strategies that can navigate and eventually alter these perceptions, fostering a more widespread acceptance of insect-based foods within Cypriot society.

2.1.3. Existing enterprises, restaurants, case studies and examples related to insects' consumptions in Cyprus

Currently, there seems to be a notable absence of dedicated insect-based restaurants, catering services, or widely available insect-infused products in Cypriot supermarkets or eateries catering to human consumption. The concept of incorporating insects into the daily diet for nutritional benefits and sustainability reasons appears to be an untapped market or a niche that has not gained significant traction among consumers in Cyprus.

One peculiar aspect where insect-based products have gained a foothold in Cyprus recently is within the realm of pet food. Imported pet food brands that incorporate insect-based proteins are available in supermarkets, pet shops, and veterinary clinics. These products, often formulated with ingredients like cricket flour or mealworms, represent a niche market segment within the broader context of insect consumption. However, it is important to note that this involvement is currently limited to the pet food industry, and these products are not produced locally but rather imported from abroad.

The absence of prominent examples in the human food sector may indicate a potential opportunity for entrepreneurs to explore and pioneer the introduction of insect-based products in various culinary and dietary contexts within Cyprus. The challenge lies in navigating regulatory frameworks, consumer perceptions, and fostering awareness about the nutritional and environmental benefits associated with insect consumption. As the global landscape continues to evolve, it will be interesting to observe how Cyprus may embrace and contribute to the growing movement of insect-based food innovation.

2.1.4. Existing Policies on the Consumption of Insects and Consumer Rights

In terms of food safety and regulations, Cyprus has implemented standards to govern insect-based products, ensuring compliance with necessary hygiene and safety benchmarks.

However, a notable weakness lies in the limited specificity of regulations pertaining to insect consumption. There is a pressing need for more comprehensive guidelines addressing various facets, including insect farming, processing, and labelling, to uphold the safety and quality of insect-based foods.

Turning to agricultural and environmental policies, Cyprus boasts regulations that potentially influence insect farming practices, particularly concerning aspects like land use and waste management. Despite this, the lack of a well-defined integration of insect

farming into existing agricultural policies remains a weakness. The establishment of clear guidelines and incentives for insect farmers becomes imperative to foster environmentally friendly practices within the industry. In the context of promoting sustainable food sources, Cyprus, akin to other European nations, has demonstrated an interest in endorsing alternative protein sources, including insects. Nevertheless, the industry faces a hindrance due to the absence of specific incentives or subsidies for insect farmers, underscoring the necessity for a targeted approach within existing agricultural policies to stimulate sustainable insect farming practices.

In terms of product labelling and information in Cyprus, the existing consumer protection laws mandate accurate and informative labelling for all food products, encompassing those incorporating insects. However, weaknesses emerge in the form of a necessity for more detailed requirements tailored specifically to insect-based foods. This includes explicit indications of insect content, species identification, and potential allergens, ensuring transparency and aiding consumer decision-making.

On the front of consumer education and awareness, Cyprus demonstrates strength through consumer rights policies emphasizing the significance of education and awareness regarding food choices. Despite this, there remains room for improvement in launching public awareness campaigns, particularly focused on insect consumption. Bridging this gap by educating consumers about the nutritional benefits and environmental sustainability of insect-based foods is pivotal for fostering acceptance and changing perceptions. Regarding the legal framework for novel foods, Cyprus aligns with European Union regulations, encompassing insects in this category. Nonetheless, weaknesses surface in the lack of clarity within national legislation concerning the approval process for novel insect-based foods. Establishing more explicit guidelines would streamline the market access process for producers, facilitating the growth and development of the insect-based food industry in Cyprus.

2.1.5. Conclusions

The exploration of insect consumption in Cyprus unveils a rich tapestry of historical, cultural, economic, and regulatory dimensions. The historical roots of insect consumption, dating back to ancient times and documented instances of locust plagues, have embedded this practice in the island's cultural memory. Despite its historical significance, the practice faces modern challenges influenced by stereotypes and taboos, shifting food habits, and a lack of contemporary culinary integration.

Cyprus demonstrates cultural resilience in its historical reliance on insect consumption as a response to locust plagues. The economic considerations tied to this practice reveal a dual benefit of mitigating agricultural losses and providing a sustainable protein source. This resilience, rooted in necessity, has the potential to serve as a foundation for innovative solutions that balance economic opportunities with cultural and environmental considerations.

While historical practices showcase the economic and cultural importance of insect consumption, contemporary Cypriot society grapples with stereotypes and taboos. The reluctance to embrace insect-based foods is influenced by changing societal norms, globalization, and misconceptions associated with this traditional practice. Initiatives aimed at dispelling myths, promoting the environmental benefits of insect consumption, and integrating insect-based foods into modern culinary practices could challenge prevailing stereotypes.

Psychological research in Cyprus highlights a complex interplay of historical roots, economic considerations, and cultural significance in shaping attitudes towards insect consumption. Bridging the gap between historical practices and modern perceptions necessitates strategic consumer education and awareness campaigns. The challenge lies in aligning the UNESCO-recognized Mediterranean diet with contemporary attitudes, emphasizing sustainability and local produce.

The existing policy landscape in Cyprus reflects a commitment to food safety and consumer rights but lacks specificity regarding insect-based foods. Clear guidelines, incentives for insect farmers, and a streamlined process for approving novel insect-based foods are essential components for fostering a sustainable and regulated insect farming industry.

Addressing these gaps would contribute to a more supportive environment for the emergence of insect-based products.

To overcome barriers associated with insect consumption, Cyprus has the potential to explore innovative solutions in insect farming. Sustainable practices, efficient waste recycling systems, and a multidisciplinary approach involving agriculture, environmental science, and cultural studies could pave the way for a modern and sustainable entomophagy industry in Cyprus. Engaging local communities and incorporating traditional knowledge into these practices will be crucial for success.

While Cyprus has consumer protection laws in place, the need for more detailed requirements specific to insect-based foods is evident. Transparent labelling, species identification, and allergen information are vital for ensuring consumer trust. Public awareness campaigns focusing on the nutritional benefits and environmental sustainability of insect-based foods are necessary to bridge the information gap and facilitate wider acceptance.

In conclusion, the journey towards mainstreaming insect consumption in Cyprus involves navigating historical roots, challenging stereotypes, fostering innovation, and establishing supportive policies. By embracing the cultural resilience embedded in historical practices and addressing contemporary challenges, Cyprus has the opportunity to contribute to the global movement towards sustainable and culturally accepted entomophagy.

3.1. Greece

3.1.1. History of Insect Consumption in Greece

The history of insect consumption in Greece is deeply ingrained in its cultural heritage and culinary traditions, dating back thousands of years. Archaeological excavations and historical records provide compelling evidence of the widespread consumption of insects

by ancient Greeks, showcasing their significance as a source of sustenance and culinary delight (Olivadese & Dindo, 2023).

Ancient Greek texts, including works by renowned philosophers such as Aristotle and Herodotus, offer insights into the cultural attitudes towards entomophagy and the diverse range of insects consumed. Aristotle, in his work "Historia Animalium," discusses the best methods for sampling various types of insects, highlighting grasshoppers as nutritious and delicious snacks. He also elaborates on the different stages of insect development and their influence on taste, with a preference for female adults after copulation and mature cicada nymphs.

Herodotus, the great historian, introduced the use of insect-derived spices and powders into Greek cuisine during his travels. He documented a drying process for locusts, resulting in a fine powder used for flavoring milk, resembling what we now refer to as "animal spice." While direct evidence of this practice in ancient Greek culture is limited, it underscores the culinary ingenuity and resourcefulness of ancient Greeks (Olivadese & Dindo, 2023).

Insects featured prominently in various aspects of ancient Greek cuisine, showcasing their culinary versatility and nutritional value. Commonly consumed insects included cicadas, locusts, beetles, and grasshoppers, harvested from fields, forests, and coastal regions. During times of scarcity or famine, insects served as an important protein source, supplementing diets and providing essential nutrients. Their abundance in nature made them readily accessible, contributing to their widespread consumption (Olivadese & Dindo, 2023).

Insect consumption held cultural significance in ancient Greek society beyond mere sustenance. Certain insects, such as cicadas, were revered for their symbolic associations with rebirth and immortality, featuring prominently in myths, rituals, and artwork. Feasts and celebrations often incorporated insects as delicacies, reflecting their status as prized culinary ingredients enjoyed by royalty and commoners alike (Olivadese & Dindo, 2023).

3.1.2. Existing Psychological or Social Research in Greece

In recent years, as the trend of insect-based food consumption has gained momentum across Europe, including Mediterranean countries, such as Greece, there has been a notable exploration of the societal attitudes towards this emerging dietary practice. While entomophagy holds a longstanding history in Greek cuisine, contemporary perceptions are shaped by a complex interplay of cultural, environmental, and psychological factors.

Psychological and social research in Greece has sought to unravel these intricate dynamics, shedding light on the evolving attitudes of Greek consumers toward insect-based foods (Papastavropoulou et al., 2021).

Surveys and focus groups conducted within Greek society have revealed a growing curiosity and interest in exploring insect-based foods. This heightened intrigue is often attributed to an increased awareness of environmental sustainability and the recognized nutritional benefits of insects as a viable protein source (Papastavropoulou et al., 2021; Giotis & Drichoutis, 2020). However, amid this burgeoning curiosity, significant barriers to widespread acceptance persist, primarily rooted in cultural resistance and skepticism (Kamenidou et al., 2023).

Despite the recognition of the environmental and nutritional advantages offered by insect-based foods, many Greeks remain hesitant to embrace this novel dietary option due to deeply ingrained cultural perceptions and social norms surrounding food consumption.

The notion of consuming insects as a regular part of the diet challenges traditional culinary practices and triggers feelings of unfamiliarity and apprehension among consumers (Kamenidou et al., 2023).

Therefore, while the rise of insect-based food consumption presents a promising avenue for addressing sustainability and nutritional concerns, its integration into Greek society may encounter resistance and reluctance. Bridging this gap between curiosity and acceptance will require targeted efforts to educate and familiarize consumers with the benefits and

culinary potential of insect-based foods, while also addressing cultural and psychological barriers to adoption.

Psychological studies have identified factors such as disgust and aversion towards insects as significant hurdles to widespread adoption. Moreover, cultural norms deeply ingrained in traditional Greek cuisine, which emphasizes familiar ingredients and flavor profiles, further complicate the introduction of insect-based foods. Recognizing these challenges, researchers advocate for targeted educational interventions and awareness campaigns to acquaint Greek consumers with the nutritional and environmental merits of insect consumption. By highlighting the sustainability and health advantages of insect-based foods, such initiatives aim to mitigate negative perceptions and foster greater acceptance.

Additionally, social marketing strategies that underscore the cultural significance of entomophagy in Greek history and cuisine hold promise for shifting consumer attitudes.

Looking ahead, ongoing research endeavors seek to explore the underlying psychological mechanisms shaping Greek consumers' attitudes towards insect consumption.

Collaborative efforts between researchers, policymakers, and industry stakeholders are essential for developing evidence-based strategies that promote the integration of insect-based foods into the Greek diet. Longitudinal studies tracking changes in consumer attitudes and behaviors over time will provide valuable insights into the trajectory of entomophagy in Greece and its broader implications for sustainability and public health.

An interesting trend in Greece is that the surveys and focus groups targeting Generation Z have revealed a growing curiosity and interest in insect-based foods. This trend is often attributed to heightened awareness of environmental sustainability and the recognized nutritional benefits of insects as a protein source, resonating particularly with environmentally conscious and health-aware individuals within this cohort. Furthermore there has been a significant relation with the net family income and the willingness to try insect-based food, together with the visibility of the insect within the food.

However, alongside this curiosity exists a formidable barrier to acceptance: cultural resistance and skepticism, which may be more pronounced among younger generations less familiar with traditional insect consumption practices. Psychological studies have

identified factors such as disgust and aversion towards insects as significant hurdles to widespread adoption, with Generation Z individuals exhibiting varying degrees of openness to novel food experiences. Moreover, cultural norms deeply ingrained in traditional Greek cuisine, which emphasizes familiar ingredients and flavor profiles, further complicate the introduction of insect-based foods among Generation Z.

Lastly, in Greece, gender and education have been found to play critical roles in shaping consumer attitudes toward insect-based foods. Studies have shown that women are generally more resistant to the idea of consuming insects compared to men, possibly due to greater food neophobia. Additionally, those with lower educational levels tend to be more reluctant to try insect-based foods, suggesting that targeted educational campaigns could help address these gaps. However, net family income does not appear to significantly influence the willingness to try insect-based products, indicating that cultural factors may be more important than economic ones (Skendi et al., 2022). Moreover, the visibility of insects in food strongly correlates with a consumer's willingness to try these products, as highly visible insects often trigger a stronger disgust response, particularly among younger generations like Generation Z, who show curiosity but face psychological barriers rooted in traditional Greek culinary norms.

3.1.3. Existing Technological or Social Research in your country

In recent years, Greece has witnessed a burgeoning interest in technological and social research aimed at exploring the feasibility and implications of integrating insects into the food system. This research encompasses a wide range of disciplines, including food science, agriculture, environmental studies, and sociology, reflecting a multidisciplinary approach to understanding the opportunities and challenges associated with entomophagy.

Technological research in Greece has focused on innovative methods for insect cultivation, processing, and product development. In particular, advancements in insect farming techniques, such as vertical farming and automated systems, have garnered attention for their potential to optimize resource efficiency and scalability (Giotis & Drichoutis, 2020). Additionally, research efforts have explored the nutritional composition of various insect species, identifying their suitability as sustainable protein sources and functional food ingredients.

Social research in Greece has delved into consumer perceptions, preferences, and behaviors regarding insect-based foods, shedding light on the cultural and psychological dimensions of entomophagy. Surveys, focus groups, and experimental studies have provided valuable insights into factors influencing consumer acceptance, including sensory attributes, food neophobia, and environmental attitudes. Moreover, sociocultural analyses have examined the historical and contemporary significance of insect consumption within Greek society, elucidating its cultural embeddedness and potential for revival.

One notable area of research pertains to the role of education and communication in promoting insect consumption. Collaborative initiatives between academia, government agencies, and non-profit organizations have sought to raise awareness about entomophagy through public outreach campaigns, educational programs, and culinary events. These efforts aim to dispel myths, debunk misconceptions, and foster a greater appreciation for insects as a sustainable and nutritious food source.

Furthermore, Greece has seen the emergence of interdisciplinary research consortia and industry partnerships aimed at bridging the gap between scientific knowledge and practical application. By integrating insights from technological and social research, these collaborations aim to develop innovative insect-based food products, cultivate consumer demand, and promote sustainable food systems.

Despite these advancements, challenges persist in scaling up insect-based food production and overcoming regulatory barriers. Continued investment in research and development, coupled with supportive policy frameworks, is essential for realizing the full potential of entomophagy in Greece.

Existing enterprises, restaurants, case studies and examples related to insects consumptions (supermarket, catering, restaurants, etc)

In Greece, the adoption of insect-based foods is still in its infancy, with limited availability of insect-based products in the market. While the concept of entomophagy has gained traction globally, Greece has been relatively slow to embrace this trend compared to other countries. As of now, there are no dedicated insect food enterprises, restaurants, or mainstream culinary establishments offering insect-based dishes or products in Greece.

However, despite the absence of established insect food businesses, there have been sporadic initiatives and events showcasing insect-based cuisine in the country. These initiatives are often driven by individual chefs, food enthusiasts, or organizations seeking to raise awareness about entomophagy and explore its culinary potential. Such events may include pop-up dinners, culinary workshops, or educational sessions that introduce consumers to insect-based ingredients and recipes.

Additionally, while not widely available, some niche stores or specialty food shops may occasionally offer imported insect-based products or ingredients for consumers interested in experimenting with entomophagy at home. These products are typically sourced from international suppliers and may include items like cricket flour, insect protein bars, or dried edible insects.

Lastly, while Greece currently lacks a robust market for insect-based foods, there is potential for growth and innovation in this space as awareness and acceptance of entomophagy continue to evolve.

3.1.4. Existing policies about consumption of insects, existing policies about consumers rights and information

Existing policies regarding the consumption of insects in Greece, as in many other Western countries, reflect a complex interplay of regulatory frameworks, consumer attitudes, and

market dynamics. Since the approval of the new Regulation on Novel Food (Regulation (EU) No 2015/2283) by the European Commission, insect-based products have gradually become available in some EU countries, including the Netherlands, Belgium, and Germany, after January 2018. However, insect-based products are still not widely available in countries like Greece, Cyprus, and Hungary, primarily due to limited consumer acceptability.

Consumer acceptance plays a pivotal role in the wider availability of insect-based products in Western markets. Studies on consumer acceptance of insect-based products provide valuable insights into the factors influencing adoption rates. For example, research by Lensvelt and Steenbekkers (2014) revealed that approximately 35% of Dutch and

Australian consumers surveyed had tasted insect-based products before. Similarly, Van Thielen et al. (2018) found that curiosity was a significant motivator for consumers to try insect-based products, with taste being a critical factor influencing repeat consumption.

However, taste preferences alone do not determine consumer acceptance. Disgust and food neophobia also significantly impact willingness to try insect-based products. Rozin and Fallon (1987) highlighted the role of disgust in food rejection, with a portion of consumers perceiving insects as inherently disgusting. Additionally, prior consumption of insect-based foods and exposure to information can mitigate feelings of disgust and increase acceptance levels (Barsics et al., 2017).

Environmental and nutritional concerns also influence consumer attitudes towards insect-based products. Kornher et al. (2019) found that consumers who prioritize environmental and nutrition issues are more likely to try foods containing processed insects. However, skepticism remains regarding whether the perceived benefits of insect consumption in terms of environmental sustainability and nutrition are sufficient to drive widespread adoption (Laureati et al., 2016; Wilkinson et al., 2018).

In Greece, the lack of comprehensive data on consumer attitudes towards insect-based products underscores the need for further research and targeted interventions (Papastavropoulou et al., 2021). Policy initiatives aimed at promoting consumer education, addressing regulatory barriers, and fostering innovation in the insect-based food industry

can facilitate wider acceptance and availability of these products in Greek markets (Kamenidou et al., 2023).

To overcome the cultural resistance to insect consumption in Greece, targeted educational campaigns should emphasize both the nutritional and environmental benefits of entomophagy, while also addressing deep-rooted cultural misconceptions. Research indicates that creating social contexts where consumers can observe and engage with insect-based foods can significantly reduce feelings of disgust and food neophobia. For example, introducing bug banquets or community tastings that align with traditional Greek social dining customs could help normalize entomophagy. Additionally, leveraging social media platforms such as Instagram, where food-related content thrives, could further enhance the visibility of insect-based cuisine. Endorsements from local influencers or chefs familiar with Greek gastronomy would be especially powerful in reducing aversion and sparking curiosity. These campaigns should not merely focus on the product's novelty but instead relate it to familiar textures, flavors, and sustainable lifestyle choices that resonate with Greek values. By addressing the multifaceted challenges, and integrating both educational and social strategies, Greece has the opportunity to embrace insect-based foods as a sustainable and nutritious alternative protein source (McDade & Collins, 2019).

3.1.5. Conclusions

The exploration of insect consumption in Greece offers a rich narrative spanning from ancient traditions to contemporary innovations. Entomophagy, deeply embedded in Greek history, reflects the resilience and adaptability of its culinary heritage. However, despite these historical roots, modern Greek society is confronted with cultural resistance, psychological barriers, and regulatory challenges, which impede the mainstream acceptance of insect-based foods.

Key barriers include deeply ingrained cultural aversions and food neophobia, which manifest as disgust or reluctance towards the idea of consuming insects. These challenges are particularly evident among younger generations who, while showing curiosity, remain

hesitant to incorporate insect-based foods into their diets due to unfamiliarity. Also, there is a tendency among women population in Greece to be more resistant to the idea of consuming insects compared to men. Additionally, individuals with lower educational levels are generally more reluctant to try insect-based products. This is compounded by the lack of widespread availability of insect-based products in the Greek market, as the industry remains nascent.

Nevertheless, Greece holds significant potential to adopt entomophagy as part of its efforts towards sustainable food systems. The benefits of insect-based foods in addressing environmental and nutritional challenges are well-documented, making them a viable alternative protein source in the face of global sustainability concerns. Strategic interventions, particularly consumer education campaigns, are necessary to bridge the gap between curiosity and acceptance.

Looking ahead, fostering collaborative efforts between government bodies, industry stakeholders, and research institutions is vital. These partnerships can help to develop innovative insect-based products while promoting consumer awareness of their nutritional and environmental benefits by integrating social media. Targeted marketing strategies, social media campaigns, and community-based tastings that align with Greek culinary customs can play a pivotal role in shifting cultural perceptions. Furthermore, Generation Z's heightened awareness of sustainability presents a unique opportunity. Leveraging this demographic's openness to environmental causes, combined with educational initiatives that emphasize the historical relevance of entomophagy in Greece, may serve as a catalyst for broader acceptance. Long-term research, particularly longitudinal studies on changing consumer attitudes, will also be crucial in tracking the societal integration of insect-based foods.

In conclusion, while challenges remain, Greece stands poised to capitalize on the transformative potential of entomophagy. Through sustained efforts in education, policy development, and innovation, Greece can not only revive its historical relationship with insect consumption but also lead the way in integrating sustainable food practices into its future culinary landscape.

4.1. Spain

4.1.1. History of Insect Consumption in Spain: A Detailed Overview

The consumption of insects, or entomophagy, in Spain has deep historical roots, going back thousands of years. This practice has been a part of various cultures throughout Europe, including Spain, and has served as a source of sustenance, particularly during periods of scarcity. While today insect consumption is not mainstream in most Western cultures, Spain's historical relationship with entomophagy highlights its cultural and nutritional significance over time.

In Spain, evidence of insect consumption can be traced back to prehistoric times. Cave paintings found in Altamira, Northern Spain, dating from 90,000 to 30,000 BC, offer some of the earliest known depictions of insect consumption in the region (Simeone & Scarpato, 2022). These paintings suggest that prehistoric communities relied on insects as a significant protein source, particularly during periods when other food sources were scarce. In those times, hunting larger animals was often unpredictable, so insects provided a reliable and readily available form of sustenance.

The practice of consuming insects persisted into the medieval and Renaissance periods in Spain and across Europe. During these times, food shortages and famines were relatively common, which encouraged people to diversify their diets. Insects, including cockchafers, were often stewed and added to soups, especially in central and southern Europe, where such practices were regarded as not only practical but, in some cases, a culinary treat (FAO, 2013).

While not universally embraced, entomophagy during these periods highlights how necessity often shaped food habits. Insects were a valuable resource when conventional

crops and livestock were unavailable. This practical approach to food consumption was essential for survival in a society that frequently faced food insecurity (FAO, 2013).

In contemporary Spain, the consumption of insects is not widespread and remains largely outside mainstream food culture. However, recent trends are beginning to change perceptions, particularly as the world grapples with the environmental impact of meat production and the need for sustainable protein sources. Some Spaniards have expressed growing interest in including insects in their diets, recognizing their potential as a sustainable and nutrient-dense food option (FAO, 2013).

Insects are not only considered for food but also for their purported medicinal and therapeutic benefits. For instance, the Spanish fly (*Lytta vesicatoria*), a type of beetle, has been historically used in traditional medicine and was even believed to possess aphrodisiac properties (FAO, 2013). Although insect consumption is still not a major part of the Spanish diet, these examples demonstrate its ongoing cultural relevance and the potential for a broader acceptance of insects as a food source in the future.

Spain's history of insect consumption, from prehistoric cave dwellers to modern explorations of sustainable food practices, reflects a deep, though often overlooked, aspect of European food culture (Ros-Baró, et al., 2022). Although the practice has dwindled in modern times, growing concerns about food sustainability may lead to a resurgence of entomophagy in Spain and other Western societies. The historical context provided by cave paintings, medieval food practices, and contemporary scientific interest suggests that insects may once again play a larger role in the Spanish diet as awareness of their ecological and nutritional benefits increases.

In conclusion, while the consumption of insects in Spain may not be as prevalent today as it was in ancient times or during specific historical periods, the practice has deep cultural roots and continues to be a topic of interest due to its nutritional value and sustainability benefits.

4.1.2. Existing Psychological or Social Research in your country

Studies on insect consumption in Spain indicate that there is a growing interest in exploring the acceptance and perception of edible insects as a protein source among consumers in Mediterranean Europe, including Spain. A cross-sectional study involving 1034 participants revealed that only 13.15% had tried insects, with reasons for avoidance including disgust, lack of custom, and food safety concerns. To improve acceptance, it is suggested that visually appealing insect preparations, such as flours, should be offered. Informing people about the health, environmental, and economic benefits of consuming insects could increase willingness to include them in the diet (Ros-Baró, et al., 2022; FAO, 2023).

While Western Europe has been slower to adopt insect consumption compared to regions like Asia-Pacific, efforts are being made to introduce insects as a sustainable protein source into the future diet. Factors such as neophobia, social norms, familiarity, experiences of consumption, and knowledge of benefits play a role in consumer acceptability. It is noted that the 40-59-year-old age group showed the most willingness to consume insects (FAO, 2023).

Further research on Spanish consumers' willingness to consume animal products fed with insects highlights the importance of sustainable animal-feed alternatives and consumer attitudes towards such products (Simeone & Scarpato, 2022). Additionally, studies have focused on barriers to edible insect purchase in Spain and identified possible consumer segments interested in insect-made snacks (Agroberichten Buitenland, 2023).

Some of the insights of the Spanish studies such as “Consumers’ Acceptability and Perception of Edible Insects as an Emerging Protein Source” (Ros-Baró et al., 2022), study population are adults who resided in Catalonia (Spain), are show in the following graphics:

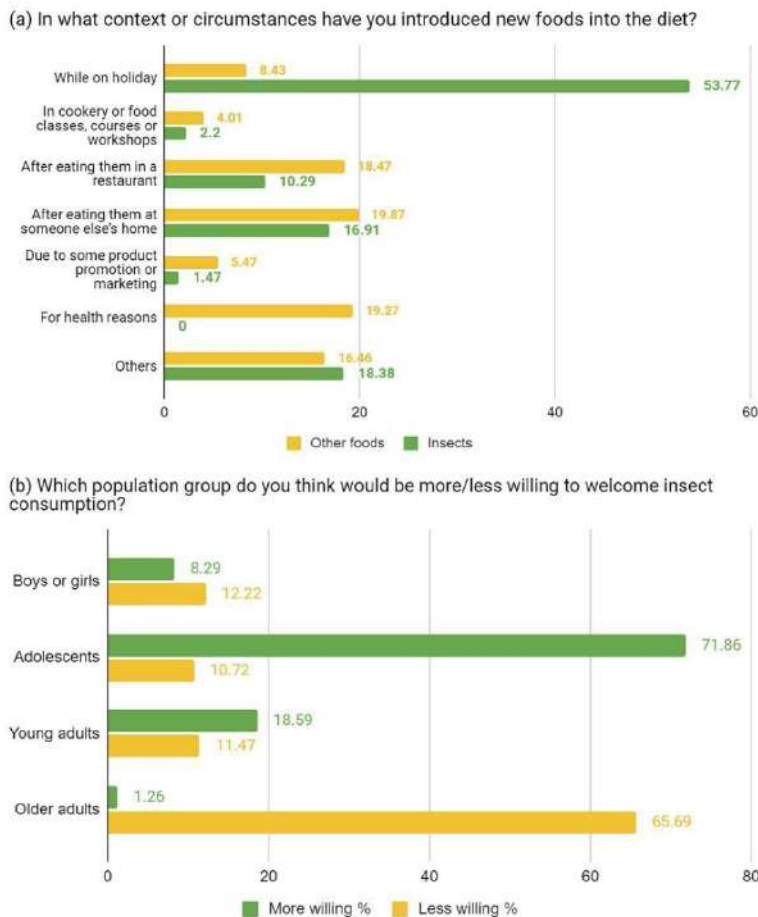


Figure 1. Source: Marta Ros-Baró Consumers' Acceptability and Perception of Edible Insects as an Emerging Protein Source (nih.gov)

4.1.3. Existing Technological or Social Research in your country

Research on edible insects in Spain has been part of a global trend exploring the potential of insects as sustainable food and feed sources. Studies have highlighted the benefits of edible insects, such as their high nutritional value and environmental sustainability. In Spain, companies like Entomotech have been involved in the international market of edible

insects for animal feed. While there is growing interest in insect consumption, challenges remain in consumer acceptance, regulatory frameworks, and cultural attitudes towards insect consumption (FAO, 2023; Liceaga, 2022). The EU Novel Food Regulation and the FDA in the United States regulate the sale of edible insects to ensure safety and quality standards are met (Siddiqui et al., 2023). The market for edible insects is expected to increase rapidly, with projections indicating significant growth in the coming years (Siddiqui et al., 2023).

Despite challenges, the future of insects as human food and animal feed in Spain appears promising due to recent trends and advancements in processing technologies (FAO, 2023).

Commercializing edible insects in Spain faces several challenges, including consumer acceptance, regulatory frameworks, and cultural attitudes towards insect consumption. Research has shown that despite efforts by major retailers in Spain like Carrefour to introduce edible insect products, sales remain low due to barriers preventing consumption (Acosta-Estrada et al., 2021).

Factors such as food neophobia, disgust at eating insects, and the perception of entomophagy as taboo or unnatural in Western countries contribute to the reluctance of consumers to adopt insect-based foods (Acosta-Estrada et al., 2021).

Additionally, allergens present in some insects pose safety concerns that need to be addressed (Acosta-Estrada et al., 2021). Regulatory bodies in countries like the Netherlands and Switzerland are taking more ambitious steps to ensure the safety of insect consumption (Acosta-Estrada et al., 2021). Overcoming these challenges requires strategies to increase consumer familiarity with insect-based foods and address concerns related to safety and cultural perceptions (Acosta-Estrada et al., 2021). Despite these obstacles, the growing interest in alternative protein sources and the environmental sustainability of insect consumption indicate a potential for increased acceptance and commercialization of edible insects in Spain in the future (Acosta-Estrada et al., 2021).

The consumption of edible insects in Spain, while still emerging, is gaining traction due to the rising awareness of sustainable food practices and the environmental benefits of insect-based protein. This shift is being reflected in various sectors such as supermarkets, catering, restaurants, and local enterprises. Below is a more detailed exploration of the growing edible insect market in Spain, including case studies, restaurants, and supermarket examples.

Although there is limited direct evidence of specific restaurants exclusively serving insect-based dishes in Spain, the overall trend towards sustainable and environmentally friendly food choices is creating opportunities for edible insects to be introduced in Spanish cuisine. Increasing public awareness around sustainable protein alternatives, such as insects, suggests that Spanish restaurants could soon follow the lead of other European nations where insect-based dishes are already appearing on menus (Businesscoot, 2023).

The edible insect market in Spain is experiencing growth, driven by local companies dedicated to the production of insect-based foods, primarily focusing on species like crickets, mealworms, and larvae. In regions such as Aragon, several enterprises have emerged, contributing to the market's expansion (Businesscoot, 2023).

A study conducted in Mediterranean Europe examined the perceptions and acceptance of insect consumption, offering insights into the factors that influence consumer choices. The study highlighted the key drivers of acceptance, such as environmental sustainability and protein content, as well as factors that deter consumption, such as cultural norms and the "yuck factor" associated with eating insects (Ros-Baró et al., 2022).

In Catalonia, another study explored how the COVID-19 pandemic impacted consumer attitudes toward insect-based products. The research found that factors like income level, education, and food expenditure influenced the willingness to try insect-based food. Those with higher education and awareness of sustainability were more open to incorporating insects into their diets (Khalil et al., 2021).

Regarding some examples in supermarkets and retail, in Spain, Carrefour has taken significant steps in promoting insect-based products by introducing a wide range of items such as snacks, energy bars, pasta, and granola. These products, made in Europe, adhere to strict quality standards and are marketed as environmentally friendly, with a reduced carbon footprint compared to traditional meat production (ThinkSpain, 2023). Insects are valued for their high protein content, along with essential vitamins and minerals like iron, omega fatty acids, and B vitamins (ThinkSpain, 2023).

Carrefour's products include various insect-based snacks priced around €4.50 for cereals and €2 for snack bars. Despite some initial skepticism, the company aims to educate consumers about the nutritional and environmental benefits of consuming insects (The Guardian, 2018). This marks a notable development, as Carrefour is the first major European supermarket chain to offer a complete range of insect-based products, positioning them as a sustainable alternative to traditional protein sources (Jimini's, 2018).

The edible insect market in Spain is poised for further growth, bolstered by the opening of the world's largest mealworm farm for human and animal consumption in Salamanca. Slated for completion by 2024, this mega-farm represents a €100 million investment and will span 90,000 square meters (Agroberichten Buitenland, 2023). The farm will produce 100,000 tonnes of insects per year, aiming to address the global protein deficit projected by the United Nations and FAO (Agroberichten Buitenland, 2023). The Spanish company Tebrio, which leads this initiative, is at the forefront of global insect production with a focus on mealworms (*Tenebrio molitor*), used for both human consumption and animal feed (Xataka, 2023).

The edible insect industry is also gaining momentum in Spain due to increasing recognition of its environmental and nutritional benefits. Insects are a rich source of protein, unsaturated fatty acids, and essential micronutrients, offering a more sustainable alternative to conventional animal farming (Skotnicka et al., 2021). With the European Union classifying insects as a "new food," Spain's market for edible insects is expected to expand, driven by both consumer interest and environmental considerations (Carrefour, 2018).

One prominent example of international influence is the French start-up Jimini's, which has expanded its reach into Spain by supplying insect-based products to 300 Carrefour stores. This collaboration reflects the growing interest in insect consumption across Europe, with Jimini's aiming to educate consumers on the nutritional and ecological advantages of incorporating insects into daily diets (Food Navigator, 2018).

To conclude, Spain's edible insect market is steadily growing, driven by factors like increased consumer awareness of sustainability, investments in local production, and the introduction of insect-based products in mainstream retail outlets. While there is still reluctance among some consumers, the efforts of supermarkets like Carrefour and companies like Tebrio are paving the way for broader acceptance of insects as a valuable protein source. As public awareness of environmental sustainability and food security increases, Spain is likely to see further development in this innovative sector.

4.1.5. Existing policies about consumption of insects, existing policies about consumers rights and information

The landscape of edible insect consumption in Spain is shaped by several policy and regulatory factors, each with its strengths and weaknesses. The growing global interest in insects as a sustainable protein source has prompted discussions on how to address both the opportunities and challenges in this emerging market. Below is a detailed analysis of the key strengths and weaknesses of Spain's current policies on edible insects.

Strengths

1. **Nutritional and Environmental Benefits:** insects are recognized for their excellent nutritional value, as they are rich in proteins, healthy fats, vitamins, fiber, and essential minerals. From an environmental perspective, edible insects are far more sustainable than traditional livestock farming. They require significantly less land, water, and feed while producing fewer greenhouse gases. This positions insects as an eco-friendly food source that can contribute to reducing the environmental

footprint of food production (Businesscoot, 2023). In Spain, growing awareness of the sustainability benefits of insect consumption is helping to stimulate market interest, making this a key strength of the current regulatory environment, even if in its infancy (IPS News, 2013).

2. **Potential Market Growth:** the edible insect market in Spain is steadily growing, driven by the increasing demand for sustainable and environmentally friendly food alternatives. Consumers are beginning to explore the use of edible insects as a viable substitute for traditional animal proteins, which can be energy-intensive to produce. The introduction of insect-based products in mainstream supermarkets like Carrefour, and the emergence of insect farms like Tebrio, indicate that Spain's edible insect sector has the potential for rapid expansion, which could further drive demand and innovation in the sector (Businesscoot, 2023).

Weaknesses

1. **Legal Barriers:** despite the growing interest, Spain's regulatory framework regarding the consumption of edible insects remains underdeveloped. While other European countries have established clearer guidelines for the marketing and consumption of insects as food, Spain still faces a legal vacuum that complicates the broader adoption of insect-based products (IPS News, 2013). This lack of legal clarity poses a significant hurdle for companies looking to enter the market, as they must navigate unclear regulations and potential legal risks. Moreover, the absence of formal policies slows down innovation and the ability to scale the industry domestically (Food Navigator Asia, 2017).
2. **Cultural Aversion:** another critical weakness is the strong cultural aversion to insect consumption in Spain. Unlike regions where entomophagy is a common practice, many Spaniards view insects as undesirable food sources, driven largely by cultural perceptions and historical dietary patterns. Overcoming this "yuck factor" is essential to increasing consumer acceptance. This cultural resistance presents a

challenge, as even with the potential health and environmental benefits, consumer reluctance could hinder market growth (Kröger et al., 2021). Education campaigns and innovative ways of presenting insect-based foods will be necessary to shift these deeply rooted perceptions (Businessscoot, 2023).

Addressing these weaknesses will be crucial for Spain to unlock the full potential of its edible insect market. First, developing clear and supportive regulations for insect-based products will provide legal certainty for businesses and consumers alike. These regulations could also harmonize Spain's policies with broader European Union guidelines on insect consumption.

Secondly, public education campaigns focused on the nutritional and environmental benefits of edible insects could help overcome the cultural aversion to their consumption. Introducing insect-based foods in more familiar and appealing formats—such as energy bars, snacks, or pasta—could also make them more acceptable to Spanish consumers. As the market matures, Spain has the potential to become a leader in sustainable food practices, leveraging the environmental and nutritional advantages of edible insects to drive both consumer demand and business innovation.

4.1.6. Conclusions

The acceptance of edible insects in Spain remains low, with consumer attitudes largely shaped by a lack of awareness about their benefits, sustainability aspects, and perceived health implications. In regions like Spain, where there is no long-standing tradition of entomophagy, many consumers express reluctance toward insect consumption, driven primarily by feelings of disgust, unfamiliarity, and concerns about food safety. Cultural aversion plays a significant role, as many Spaniards have never tried edible insects and are skeptical of their safety and hygiene, further compounding the challenge of introducing these products into the mainstream market.

Despite these challenges, the environmental advantages of insect consumption are undeniable. Insects produce fewer greenhouse gas emissions, require significantly less water, and convert food to energy more efficiently than traditional livestock farming. This makes them a critical part of the solution to reducing the environmental impact of global food production. Additionally, insects represent a sustainable source of high-quality protein, which can help meet the growing global demand for food without exacerbating resource-intensive agricultural practices.

Research suggests that certain demographic groups in Spain, particularly middle-aged adults between the ages of 40 and 59, show the highest willingness to experiment with insect-based foods. This trend may be due to growing awareness among this group of the health and environmental concerns surrounding traditional protein sources. However, increasing overall consumer knowledge about the nutritional, environmental, and economic benefits of insects will be crucial in promoting wider acceptance. Public campaigns, led by governmental and health institutions, can play a significant role in educating consumers about the safety and preparation of insect-based products, helping to dispel myths and reduce misconceptions.

Improving product presentation is another key strategy for enhancing consumer acceptance. Edible insects introduced in familiar forms, such as processed foods or flour-based products, could mitigate the "yuck factor" commonly associated with whole insects. Disguising insects in formats like energy bars, pasta, or snacks, and pairing them with familiar flavors and textures, can help bridge the gap between novelty and acceptability. These efforts would allow consumers to benefit from the nutritional value of insects without confronting their unfamiliar appearance.

For the insect market to thrive in Spain, it is essential to establish a clear and supportive regulatory framework. Ensuring that insect-based products meet food safety and hygiene standards will help build consumer confidence in the products' safety. Comprehensive labeling guidelines can also increase transparency about the origins and processing methods of edible insects, further fostering trust. A robust regulatory environment would not only protect consumers but also facilitate the entry of new insect-based products into the market.

Targeted marketing strategies will also be crucial in cultivating consumer interest. Efforts should focus on younger generations and environmentally conscious groups who are already inclined toward innovative and sustainable food options. By emphasizing the environmental benefits of insect consumption, such as reduced resource usage, brands can resonate with consumers who prioritize sustainability in their purchasing decisions.

In conclusion, increasing the acceptance and consumption of edible insects in Spain requires a multifaceted approach. Education on the health and environmental benefits, innovative product presentations, and the development of strong regulatory frameworks are essential to overcoming current barriers. Targeted marketing and a focus on sustainability can further help position edible insects as a viable alternative to traditional proteins. As Spain continues to invest in insect farming and sustainable agriculture, it has the potential to become a leader in this emerging food sector, driving a shift toward more eco-friendly and resource-efficient food production.

5.1. Romania

5.1.1. History of Insects Consumption in Romania

The consumption of insects, known as entomophagy, has a long history in various cultures around the world, including in parts of Asia, Africa, and Latin America. However, the practice has not been as widespread or culturally significant in most European countries, including Romania. The history of insect consumption in Romania is not well-documented or widely recognized as a traditional practice, in contrast to other regions where entomophagy is part of the cultural heritage.

In Romania, as in much of Europe, the consumption of insects has historically been viewed with skepticism and is not a significant part of the culinary tradition. This perspective is

largely influenced by cultural norms and preferences that favor other sources of protein, such as livestock and fish. However, it's important to note that the absence of a documented tradition of insect consumption does not necessarily mean that insects were never consumed in the region, especially in times of scarcity or by indigenous communities before modern records.

In recent years, there has been a growing interest in entomophagy in Romania, as in many other parts of the world, driven by sustainability concerns and the search for alternative protein sources. This interest is part of a global trend that recognizes the environmental benefits of insect farming, including lower greenhouse gas emissions, reduced water usage, and efficient feed conversion rates compared to traditional livestock farming. Insects such as crickets, mealworms, and grasshoppers are being explored as sustainable and nutritious food sources, rich in proteins, vitamins, and minerals.

The European Union has been progressively regulating the use of insects in food, which has paved the way for the introduction and commercialization of insect-based products in Romania and other member states. These products include snacks, protein bars, flours, and other items made from insects, targeting the growing market of consumers interested in sustainable and alternative diets.

While the modern interest in entomophagy in Romania is part of a broader, global movement towards sustainability and dietary diversity, it does not necessarily reflect a revival of traditional practices, but rather an adoption of new ideas and attitudes towards food and nutrition. As such, the history of insect consumption in Romania is more a reflection of contemporary changes in dietary preferences and environmental awareness than a continuation of historical dietary practices.

5.1.2. Existing Psychological or Social Research in Romania

Specific, in-depth psychological or social research focusing on the acceptance and perceptions of insect consumption in Romania is limited. This reflects a broader gap in the

literature regarding entomophagy in Eastern Europe, where cultural acceptance of insects as food is still an emerging area of interest. However, the growing global and European focus on sustainable diets and alternative proteins has sparked some interest in the attitudes and perceptions towards entomophagy in various contexts, including Romania.

Research conducted in other European countries can offer insights into potential psychological and social barriers to insect consumption, which may also apply to Romania. Common themes include:

- A significant barrier to the acceptance of insects as food in Western cultures is the feeling of disgust and food neophobia (fear of trying new foods). These psychological factors are deeply ingrained and can be challenging to overcome without targeted educational and marketing strategies.
- Individuals with higher levels of environmental awareness and concern for sustainable food sources are more likely to view insect consumption positively. This suggests that educational campaigns highlighting the environmental benefits of entomophagy could shift perceptions.
- The lack of a tradition of insect consumption in many cultures, including Romanian, means there is little familiarity or cultural acceptance, which can hinder adoption. Introducing insects in more familiar forms, such as flours or incorporated into familiar dishes, may help overcome this barrier.

Moreover, a 2022 cross-European survey found that only 13% of Eastern European respondents were willing to try insect-based foods, compared to 28% in Western Europe.

The global push towards sustainable food sources has increased interest in entomophagy research, potentially benefiting countries like Romania by providing a framework for exploring consumer attitudes and acceptance. Research in other European contexts can offer valuable comparisons and insights that might be applicable to the Romanian context, especially regarding strategies to increase acceptance.

However, the absence of Romania-specific research on entomophagy means there is a gap in understanding the unique cultural, historical, and social factors that could influence

acceptance in the Romanian context. Applying findings from other European or Western studies to Romania carries the risk of overlooking specific cultural nuances and attitudes unique to Romanian consumers.

To address these gaps, future research in Romania could focus on understanding specific cultural attitudes towards food and novelty, the role of traditional diets in shaping food acceptance, and the potential for educational campaigns to shift perceptions. Such research would not only contribute to the global understanding of entomophagy's potential but also offer tailored strategies for introducing insects as a sustainable food source in Romania and similar cultural contexts.

5.1.3. Existing Technological or Social Research in Romania

When discussing the existing technological and social research in Romania, especially in the context of entomophagy (insect consumption), it is important to note that this area is still emerging. The focus on entomophagy from a technological standpoint often revolves around the development of farming techniques, processing methods, and product innovation, while social research tends to explore consumer acceptance, cultural perceptions, and potential market growth. Given the nascent stage of this field in Romania, the discussion on strengths and weaknesses will be somewhat speculative but informed by broader trends observed in similar contexts.

Regarding the technological research, Romania, with its growing tech sector and emphasis on agricultural innovation, has the potential to become a leader in the technological aspects of insect farming and processing. This includes developing efficient farming techniques, processing methods, and creating new, palatable insect-based products. As a member of the European Union, Romania benefits from access to EU funding for research and innovation, including projects related to sustainable agriculture and food technology. This could support advancements in the entomophagy sector.

However, the insect farming industry is still at an early stage in Romania, which means there might be limited existing infrastructure and expertise specifically geared towards entomophagy. This can slow down technological advancements and product development. While the EU has started to regulate insects as food, navigating these regulations can be challenging for new enterprises. Ensuring compliance and adapting to evolving standards can require significant resources and expertise.

On the other hand, regarding Social Research, there is a global shift towards sustainable food sources, and Romania is part of this trend. Social research can tap into this interest, exploring how environmental concerns might influence consumer acceptance of insect-based foods. Romanian cuisine is diverse and has adapted over centuries to include a variety of influences. Social research could explore how insect-based foods might be incorporated into traditional dishes or presented in ways that align with local culinary preferences. There may be a lack of detailed, Romania-specific research on consumer attitudes towards entomophagy. This makes it challenging to design targeted interventions or marketing strategies to increase acceptance.

Despite the potential for adaptability, there are significant cultural barriers to the acceptance of insects as food. Overcoming these barriers requires in-depth understanding and strategic educational efforts, which are currently limited.

The field of entomophagy in Romania, from both technological and social research perspectives, is ripe with potential but faces significant challenges. Technologically, the focus should be on developing efficient, scalable farming and processing methods that can produce high-quality, palatable insect-based foods. Socially, research needs to delve deeper into understanding consumer attitudes, cultural perceptions, and potential market strategies to increase acceptance and demand. Addressing these challenges requires a multidisciplinary approach, combining technological innovation with strategic social science research to understand and influence consumer behavior. As interest in sustainable food sources continues to grow, Romania has the opportunity to position itself as a leader in the entomophagy sector, leveraging its technological capabilities and cultural adaptability to overcome current weaknesses.

5.1.4. Existing enterprises, restaurants, case studies and examples related to insect consumptions (supermarket, catering, restaurants)

In Romania, the presence of insects in the food market, including supermarkets, restaurants, and catering services, is relatively limited compared to countries with a more established culture of entomophagy or those with more aggressive sustainability initiatives. However, there's a growing interest in sustainable and alternative protein sources, which has led to the gradual introduction of insect-based products in some niche markets and online platforms.

Insect-based products in Romanian supermarkets are not yet commonplace. When available, these products are more likely to be found in specialty health food stores or through online retailers that cater to niche dietary preferences, offering products like cricket flour, protein bars, or snacks made from insects.

As for restaurants serving dishes that include insects, they remain a novelty and are not widely found. However, with the global culinary scene increasingly embracing insects as a sustainable and innovative ingredient, it's possible that some forward-thinking chefs and restaurants in urban centers like Bucharest might experiment with insect-based dishes as part of special menus or gastronomic events aimed at the more adventurous diner. These would likely be marketed as exotic or sustainable dining experiences, emphasizing the environmental benefits and nutritional value of insects.

Regarding the existing policies about consumption of insects, in Romania, as in other EU countries, the acceptance and integration of insect-based foods into the market are relatively new phenomena. The specific application of EU policies within Romania means that:

- Enterprises looking to produce or sell insect-based products must navigate the EU's Novel Food application process, which can be resource-intensive, potentially posing a challenge for smaller or start-up companies.

- Consumers are protected by stringent food safety and labeling standards, ensuring that any insect-based products available have been thoroughly assessed for safety and that products are clearly labeled to inform consumer choice.
 - Romania benefits from the high food safety and consumer protection standards set by the EU. Consumers and businesses alike can trust in the safety and quality of approved insect-based products.
 - The EU's regulatory framework encourages innovation in sustainable food sources, including insect farming. This can position Romania to contribute to and benefit from advancements in sustainable agriculture and food technology.
- Weaknesses and Challenges
- The market for insect-based foods in Romania is still in its infancy. Consumer acceptance may be slow due to cultural perceptions and unfamiliarity with insects as food, which could hinder market growth despite regulatory approval.
 - There may be a lack of awareness and education among Romanian consumers regarding the benefits and safety of insect-based foods. Overcoming this requires targeted information campaigns and efforts to integrate insects into the culinary culture in appealing ways.

However, Romanian consumers are protected under EU law, which mandates clear labeling and transparency about food products, including those made from insects. This ensures that consumers can make informed decisions based on accurate information about ingredients, nutritional content, and any allergens (important for insect foods, as they may cause allergic reactions in some individuals).

5.1.5. Conclusions

For Romania, the path toward the acceptance and integration of insect-based foods is not only about adhering to EU regulations but also about fostering a cultural shift and cultivating a market that embraces this new source of protein. A key aspect of this journey will be raising public awareness of the significant environmental and nutritional benefits of insect consumption. Highlighting how insects can offer a sustainable alternative to traditional protein sources could resonate with eco-conscious consumers. At the same time, encouraging chefs and food innovators to create insect-based dishes that align with Romanian tastes and culinary traditions will be essential to making these products more appealing and accessible.

Supporting research into efficient, sustainable insect farming practices that fit Romania's agricultural landscape is another crucial step. By developing local expertise and innovation in this area, Romania can build a competitive and sustainable insect farming industry that complements its existing agricultural strengths.

While Romania aligns itself with EU regulations, providing clear, localized guidance for businesses entering the insect food market is vital. Many companies may find the approval process complex and intimidating, so simplifying access to relevant information and offering consultancy services on regulatory compliance will help businesses navigate these challenges. Moreover, aligning the promotion of insect-based foods with broader national and EU sustainability goals could enhance public and governmental support, positioning entomophagy as a key component of Romania's environmental and food security strategies.

Framing the role of insect consumption within the context of reducing the environmental impact of food production could also resonate with an increasingly eco-conscious public. As consumers in Romania become more aware of the environmental toll of traditional farming practices, insect-based foods may offer an attractive alternative that aligns with their values. Promoting entomophagy as a sustainable choice could help overcome some of the cultural resistance associated with the idea of eating insects.

As global interest in sustainable food sources continues to grow, Romania has a unique opportunity to be part of this emerging trend. By leveraging EU regulations to ensure safety and consumer protection, Romania can explore the cultural and economic potential of insect-based foods. This journey toward widespread acceptance of entomophagy in Romania will be complex and multifaceted, requiring a coordinated effort from government bodies, businesses, researchers, and the public.

Through a focus on education, sustainability, and culinary innovation, Romania can overcome cultural barriers and consumer hesitation, making insect-based foods a valuable part of the national diet and a contributor to the country's sustainability objectives. The success of this endeavor will not only support Romania's goals for food security and environmental sustainability but also position the country as a forward-thinking member of the EU, committed to innovative and eco-friendly food solutions.

6.1. Turkey

6.1.1. History of Insects Consumption in your Türkiye

In Turkey, the consumption of insects has historical roots dating back to ancient times. While insects may not have been a primary food source throughout Turkish history, they have been consumed in various forms for centuries, particularly in rural areas and among certain ethnic groups. Insects have been part of the diet in Anatolia since ancient times. Historical records suggest that locusts were consumed during periods of famine or as a delicacy. Locusts were mentioned in ancient texts like the Bible and the Quran, indicating their consumption by various civilizations in the region.

Some traditional Turkish dishes incorporate insects or insect-derived products. For example, a dish called "kayseri mantısı" involves dumplings filled with ground meat, traditionally served with a yogurt and tomato sauce. In some regions, dried yogurt (known

as "kurut") is made by straining yogurt and then drying the remaining solid, which can sometimes contain insect larvae. In rural areas, particularly in southeastern Turkey, insects such as grasshoppers and crickets have been consumed as snacks or incorporated into dishes. These practices are often tied to local traditions and cultural practices. In recent years, there has been a growing interest in insect consumption globally due to its environmental sustainability and nutritional benefits. While insect consumption in Turkey may not be as widespread as in some other countries, there has been some exploration of insect-based foods and snacks in urban areas, driven by health and environmental concerns.

The Turkish government has regulations in place regarding food safety and hygiene standards, which would apply to insect-based food products as well. As the interest in insect consumption grows, regulatory frameworks may evolve to accommodate this emerging food trend. Overall, while insect consumption may not be as prominent in Turkish cuisine compared to some other cultures, it does have historical and cultural significance in certain regions and communities, and there is potential for its further exploration and integration into the broader food landscape in Turkey.

In light of the historical and cultural significance of insect consumption in Turkey, particularly in certain regions and among specific communities, there is potential for incorporating edible insects into the menus of food and beverage establishments to cater to the preferences of Chinese, Korean, and Japanese tourists. These tourists may be familiar with and even appreciate insect-based dishes due to their own culinary traditions. By offering such menu options, Turkish establishments can enhance the satisfaction of these tourists, potentially increasing their likelihood of returning and positively influencing others through word-of-mouth recommendations. This approach not only aligns with the growing global interest in insect consumption but also leverages the cultural diversity present in Turkey's tourism sector to enhance the overall visitor experience (İpar ve Doğan, 2013).

6.1.2. Existing Psychological or Social Research in your country

Existing Psychological or Social Research in Türkiye (comments on Strengths and weaknesses)? "Entomophagy (entomophagy) is a word of Greek origin and was formed by combining the words "entomo" (insect) and "phagein" (food). It refers to the characterisation and consumption of insects as food (Kurgun, 2017). In short, entomophagy, defined as edible insects, is actually not a new concept. Because people have consumed various plants, animals and insects to satisfy their hunger for centuries (Kurgun, 2017). The provided statement outlines the existing psychological and social research on entomophagy (insect consumption) in Turkey, along with its strengths and weaknesses.

Strengths of the research:

Contribution to Tourism Development: the research highlights that introducing insect foods to restaurant menus in regions with high tourist activity can contribute to the development of tourism in Turkey. This suggests that catering to the culinary preferences of tourists, including offering insect-based dishes that align with their cultures, can enhance their overall satisfaction and influence their decisions to revisit Turkey.

Cultural Specificity: The research underscores the importance of offering insect foods that are specific to the cultures of tourists, such as Chinese, Korean, and Japanese visitors. By doing so, it acknowledges the cultural diversity within the tourist demographic and emphasizes the potential for enhancing their experience by providing familiar culinary options.

Weaknesses of the research:

Negative Psychological Effects: the research indicates that participants' perceptions about insects negatively affect the flavor when consuming insect-based foods. This suggests a psychological barrier to entomophagy in Turkish culture, likely stemming from societal attitudes and preconceptions about insects as food. Addressing these negative perceptions could be crucial for promoting wider acceptance of insect consumption.

Social Reactions and Cultural Acceptance: The research highlights that insect consumption is not common in Turkish culture and is infrequently included in menus, leading to negative psychological effects and social reactions that reduce consumption. This underscores the

importance of addressing cultural norms and societal attitudes towards entomophagy to foster greater acceptance and integration of insect-based foods into Turkish cuisine. While the research underscores the potential benefits of introducing insect foods to cater to tourists and acknowledges the cultural specificity of culinary preferences, it also highlights existing psychological barriers and social stigmas surrounding insect consumption in Turkish society. Addressing these barriers and promoting wider acceptance of entomophagy could be crucial for leveraging its potential contributions to tourism development and culinary diversity in Turkey.

6.1.3. Existing Technological or Social Research in your country

Research on insect consumption in Turkey presents several strengths that make it a valuable area of study, both from a technological and social perspective. Turkey's rich culinary tradition and diverse cultural heritage offer fertile ground for exploring how historical, social, and cultural factors shape attitudes towards entomophagy. By understanding these dynamics, researchers can develop strategies that promote the wider acceptance of insect-based foods in Turkish society. This approach would be particularly important for integrating insects into the national diet while respecting the cultural context.

Environmental sustainability is another key strength of this research area. As the global spotlight turns to insect consumption as a sustainable protein source with a significantly lower environmental impact compared to traditional livestock farming, Turkish research could assess the specific environmental benefits for the region. Exploring how insects can address both food security and environmental challenges in Turkey would align with global sustainability efforts and provide a local solution to pressing ecological issues.

Additionally, there is potential for economic growth, particularly in Turkey's tourism sector. Given the country's popularity as a tourist destination, integrating insect-based foods into its diverse culinary offerings could appeal to international visitors interested in unique and

sustainable food experiences. This could also foster innovation in local cuisine, blending traditional Turkish flavors with modern insect-based dishes. Research in this area could reveal significant economic benefits for both tourism and local food industries.

In terms of health and nutrition, insects are known to be rich in essential vitamins, minerals, and amino acids. Research in Turkey could focus on the nutritional value of various insect species native to the region and explore their potential role in addressing malnutrition and promoting public health. Understanding the health benefits of insect consumption could contribute to broader public health strategies in Turkey, particularly in terms of providing affordable and nutrient-dense food sources.

However, there are also several challenges that research must address. Cultural taboos and stigma around insect consumption remain a significant hurdle. In many societies, including Turkey, insects are not traditionally seen as food, and this perception could limit public acceptance. Overcoming these deeply ingrained attitudes will require careful research into cultural perceptions and efforts to shift public opinion.

Another challenge is the lack of widespread awareness and education about the benefits of insect consumption. Many people in Turkey may not fully understand the environmental, nutritional, and economic advantages of entomophagy, which underscores the need for educational campaigns and public awareness initiatives. Dispelling myths and misconceptions will be crucial in facilitating broader adoption of insect-based foods.

Regulatory and policy challenges also present obstacles. The regulation of insect-based foods in Turkey is still underdeveloped compared to more conventional food products. Researchers will need to navigate the regulatory landscape, ensuring that food safety standards are met while advocating for policy changes that support the growth and commercialization of insect-based food products.

Additionally, infrastructure and supply chain limitations must be addressed to ensure the sustainable production and distribution of insect-based foods. Establishing reliable sourcing, processing, and distribution networks for these products could prove difficult, particularly in scaling up production to meet market demands. Research into developing

the necessary infrastructure and logistics will be vital to making insect-based foods widely available in Turkey.

6.1.4. Existing enterprises, restaurants, case studies and examples related to insects consumptions (supermarket, catering, restaurants)

There may be research institutions, universities, or laboratories in Turkey conducting studies on insect consumption, exploring its nutritional value, environmental sustainability, and potential applications in food products. With the growing global interest in insect consumption, there may be startups or entrepreneurial ventures in Turkey focusing on insect farming, processing, and product development. These startups could be exploring innovative ways to incorporate insects into food products or creating new markets for insect-based ingredients. While dedicated insect-based restaurants may be scarce in Turkey, some catering services or restaurants may occasionally offer insect-themed menus or incorporate insect-based dishes into their offerings as part of special events, promotions, or themed nights.

Health food stores, specialty markets, or online retailers in Turkey may stock insect-based products such as cricket flour, insect snacks, or protein bars. These products could be sourced locally or imported from international suppliers. Non-profit organizations, educational institutions, or advocacy groups in Turkey may organize events, workshops, or campaigns to raise awareness about the benefits of insect consumption, promote sustainability, and challenge cultural taboos surrounding entomophagy. Turkish institutions may collaborate with international research organizations, universities, or companies on projects related to insect consumption, exchanging knowledge, expertise, and resources to advance the field. While the specific examples of enterprises, restaurants, or supermarkets specializing in insect consumption may be limited in Turkey compared to some other countries, there is potential for growth and innovation in this emerging field. As

awareness of the environmental and nutritional benefits of entomophagy continues to increase, it's possible that more businesses and initiatives related to insect consumption will emerge in Turkey in the future.

6.1.5. Existing policies about consumption of insects, existing policies about consumers rights and information

The provided scenario highlights the dynamic relationship between entrepreneurship in insect production, government policies, and societal readiness in Turkey. While the Turkish government, particularly through the Ministry of Agriculture, seems supportive of alternative food sources like insect farming, there are both strengths and weaknesses in the current policies and societal landscape related to insect consumption and consumer rights.

One of the key strengths is the **supportive government policies**. The Turkish Ministry of Agriculture's permission and incentives for insect farming, especially in tourist-heavy regions like Antalya, demonstrate a proactive governmental approach. This support shows the government's willingness to promote alternative nutritional sources and foster entrepreneurial initiatives within the agricultural sector. Such efforts not only encourage innovation but also indicate the government's recognition of the economic potential of insect farming.

From an economic standpoint, government policies promoting insect production for agricultural and potential culinary purposes can stimulate **economic development**. These policies are particularly beneficial in regions with a strong tourism sector, such as Antalya, where the novelty of insect-based foods could cater to international visitors. This diversification could lead to job creation and broaden Turkey's food industry. Moreover, **diversifying livestock feed** through insect farming aligns with global sustainability goals. Insects offer a more resource-efficient and environmentally friendly alternative to traditional livestock feed, reducing the environmental footprint of agriculture.

However, despite these policy strengths, several challenges exist. **Societal readiness and acceptance** of insect-based foods in Turkey may lag behind government initiatives. The cultural norms and dietary habits of Turkish society, which traditionally does not include insects in its cuisine, could present significant barriers to widespread acceptance. Without addressing these deep-rooted societal attitudes, the sustainability of insect-based enterprises remains uncertain, regardless of government support.

Furthermore, there seems to be a lack of **consumer awareness and information** regarding the benefits of insect consumption. Many consumers in Turkey may not be aware of the nutritional value, safety, and environmental benefits of insects as a food source. Government policies could focus more on educating the public through awareness campaigns that dispel myths and misconceptions about entomophagy. Building public trust through accurate information would be essential in fostering societal acceptance.

Another weakness lies in the **regulatory framework** governing insect production. While the Ministry of Agriculture provides permissions and incentives, there may still be gaps or inconsistencies in the regulations related to insect farming, processing, and marketing. A robust and clear regulatory framework is essential to ensure food safety, quality control, and consumer protection in the insect-based food industry. Without comprehensive regulations, businesses and consumers alike may face uncertainties, which could hinder the development of the sector.

Finally, the **market demand and supply chain** infrastructure for insect-based products in Turkey may pose challenges. For insect-based enterprises to thrive, there must be sufficient consumer demand and a well-established supply chain to distribute products effectively. Logistical issues, such as reaching consumers in different regions, could hinder business viability, even with government support. Additionally, if market demand is insufficient, businesses may struggle to maintain profitability.

In conclusion, while Turkish policies supporting entrepreneurship in insect production show promise, addressing societal readiness, increasing consumer awareness, strengthening regulatory frameworks, and ensuring market demand and a reliable supply chain are critical for the long-term sustainability and success of insect-based enterprises in Turkey. Collaborative efforts involving government, industry stakeholders, and civil society will be

crucial to overcoming these challenges and fully realizing the potential of entomophagy in Turkey.

6.1.6. Conclusions

Government agencies, cultural institutions, and community organizations should highlight the historical significance of insect consumption in Anatolia through educational initiatives, museum exhibits, and cultural festivals. By connecting entomophagy with Turkey's rich culinary heritage, efforts can promote cultural pride and openness to exploring insect-based foods. The cultivation and consumption of insects present significant opportunities for economic growth, particularly in regions with thriving tourism industries like Antalya. Government support and incentives can further stimulate entrepreneurship and job creation in the insect farming sector. Insect farming offers a sustainable alternative to traditional livestock feed, contributing to resource efficiency and reduced environmental impact. Embracing insect-based foods aligns with broader sustainability goals and can help mitigate the ecological footprint of agriculture in Turkey. Despite government encouragement, societal attitudes and cultural norms regarding insect consumption remain a significant barrier. Overcoming these challenges requires targeted efforts to raise awareness, challenge misconceptions, and promote the nutritional and environmental benefits of entomophagy.

Clear and comprehensive regulations are essential to ensure the safety, quality, and labeling standards of insect-based foods. Government agencies should collaborate with industry stakeholders to develop robust regulatory frameworks that protect consumer interests while fostering innovation and entrepreneurship in the insect farming sector.

Government agencies, NGOs, and industry partners should launch comprehensive education and awareness campaigns to inform the public about the nutritional value, safety, and sustainability of insect-based foods. These campaigns should address misconceptions and cultural taboos surrounding entomophagy. Increased investment in research and development can drive innovation in insect farming techniques, product

development, and market strategies. Collaborative research initiatives between academia, government, and industry can generate valuable insights and solutions to overcome technical and logistical challenges. Government support programs should provide financial incentives, technical assistance, and market access opportunities to aspiring entrepreneurs in the insect farming sector. Incubators, accelerators, and business development centers can offer training and mentorship to help insect-based startups succeed. Collaboration among government agencies, industry associations, academic institutions, and civil society organizations is crucial for fostering a conducive ecosystem for insect consumption in Turkey. Multi-stakeholder partnerships can leverage diverse expertise, resources, and networks to address barriers and drive collective action.

Chefs, restaurateurs, and food entrepreneurs play a pivotal role in mainstreaming insect-based cuisine. Government initiatives should encourage culinary innovation, promote chef training programs, and facilitate partnerships between restaurants and insect producers to diversify menu offerings and attract adventurous diners. By implementing these recommendations, Turkey can harness the full potential of insect consumption as a sustainable, nutritious, and culturally relevant food source, contributing to economic development, environmental stewardship, and public health in the country.

2. Field Research

The research on insect consumption and related attitudes, beliefs, and perceptions in Turkey and five EU countries is part of the broader Erasmus+ Project titled "Insects Innovation in Gastronomy". The research involves a detailed investigation across several European countries, including Spain, Italy, Turkey, Cyprus, Greece, and Romania, with a sample comprising chefs, HoReCa professionals, and consumers. The objective is to better

understand public readiness and acceptance of insect-based foods, which is necessary for the successful introduction of these products into the mainstream diet.

Using a questionnaire designed to measure various factors such as the intentions to consume insects, technical knowledge, prejudice, and perceived environmental benefits, this research offers valuable data. The results will inform strategies for promoting insect consumption, such as educational campaigns, culinary innovations, and regulatory frameworks, to overcome cultural resistance and enhance consumer openness. The study's findings will also contribute to policy discussions about how to effectively incorporate insects into sustainable food systems, addressing both local and EU-wide challenges related to food security, environmental sustainability, and public health.

2.1 European Research Report for the Measurement of Attitudes, Beliefs and Perceptions about the Insects Consumption at the EU level

This section aims to investigate the attitudes, beliefs and perceptions of EU citizens and professionals concerning the insect consumption at the EU level. In order to reach this goal, the partners created ex-novo a questionnaire designed to this purpose and administered in the participating countries to a minimum sample of 50 participants per organisation (25 Chefs, HoReCa Professionals and 25 Consumers). The countries involved in the research are the participating countries of the Insects Innovation in Gastronomy: Spain, Italy, Turkiye, Cyprus, Greece and Romania. Overall, the research included a sample of 519 participants including chefs and consumers, demonstrating a high interest in the topic and a wide sample, more numerous than the initial indicator expected in the Erasmus+ Project “Insect Innovation in Gastronomy

2.1.1. Questionnaire for measuring Attitudes, Beliefs and Perceptions about the Insects consumption at the EU level

The structure of the questionnaire adopted and its scoring is described as follows. All partners contributed to the definition of the items and proposed a scale allocation. Igor Vitale International, as Leading organisation of the Work Package connected to this project results, performed a wording review and aggregated the items across scales

Instructions

Dear participant, this questionnaire is designed as a general survey for measuring European citizens and workers attitudes and behaviors concerning the human-based consumption of insects as a novel food. The questionnaire is completely anonymous and data will be measured only in an aggregated way. The questionnaire is part of the Erasmus+ Project “Insects Innovation in Gastronomy”

Scale A - Intentions and Propensity to eat insects			
Nr. Item	Wording of the items: Chefs + Consumers	YES	NO
1	I would eat insects in their original shape and texture	X	
2	I would eat fried insects	X	
3	I would eat insects in form of flour (for burgers, pasta, snacks, etc.)	X	
4	I would eat insects as a protein supplement in my dietary or fitness regimen	X	
5	I am willing to participate in educational workshops or cooking classes focused on insect-based cuisine.	X	

Scale A - Intentions and Propensity to eat insects			
6	I would consider to try innovative pairing between insects, cheeses and wines	X	
7	I would consider to try innovative pairing between insects and desserts	X	

Scale B - Chefs propensity to introduce insects			
Nr. Item	Wording of the items: Chefs	YES	NO
1	I think that introduction of insects in some dishes of my restaurant could have positive impact for my image perceived by customers	X	
2	There is no need of use insects by chefs and restaurants		X
3	I am concern how to communicate and explain in menu the inclusion of insects in the dishes		X
4	I am concern about potential allergies or reactions in my clients consuming insect based dishes		X
5	I think that the adoption of insects in my restaurant could lead to an economical lost		X
6	I am interested in exploring innovative ways to present insect-based dishes	X	
7	I believe incorporating insects into my menu can enhance the sustainability and uniqueness of my culinary offerings.	X	

Scale B - Chefs propensity to introduce insects			
8	I am open to hosting educational events or tastings to introduce your customers to the concept of insect-based cuisine	X	
9	I believe that educating my culinary team about the advantages of using insects in dishes will foster a more innovative and sustainable kitchen culture	X	
10	I am enthusiastic about the potential for insect-based dishes to contribute to global food security and environmental sustainability	X	

Scale C - Technical knowledge about insects (nutrition, flavor and texture)			
Nr. Item	Wording of the items: Chefs + Consumers	YES	NO
1	Insects has a bitter flavor		X
2	Insects protein are low quality proteins		X
3	Insects consumption interferes negatively with digestion		X
4	Ants are source of Omega-3	X	
5	Bees and ants are rich in minerals like iron and calcium	X	
6	Insects should be listed as allergens	X	
7	Dragonflies are low in proteins		X

Scale C - Technical knowledge about insects (nutrition, flavor and texture)			
8	Crickets are high in proteins and include almost all essentials aminoacids	X	
9	Beetles have low levels of fat		X
10	Crickets flavor is similar to chicken	X	
11	Ants has a buttery and sweet flavor	X	
12	Insects has important nutrients like fibers, antioxidants and essential micronutrients	X	
13	Boiling crickets change their texture into gummy texture	X	
14	Termites are crunchy when roasted	X	
15	Edible insects are less than 100		X
16	Different species Insects has a similar texture		X

Scale D - Self-reported cooking insects capacity			
Nr. Item	Wording of the items: Chefs + Consumers	YES	NO
1	I would be able to prepare an insect-based bread	X	
2	I would be able to cook a dish based on fried insects	X	

Scale D - Self-reported cooking insects capacity			
3	I would be able to pair different types of insects with first courses (pasta, rice)	X	
4	I would be able to pair different types of insects with second courses (ordinary meat, fish, vegetables)	X	
5	I am knowledgeable about food safety regulations and best practices when handling and preparing insects	X	
6	I am confident in creating a signature dish that highlights the unique flavor of insect	X	
7	I am capable of designing a full-course meal centered around insect-based ingredients.	X	

Scale E - Prejudice and cognitive biases against insects			
Nr. Item	Wording of the items: Chefs + Consumers	YES	NO
1	I will surely don't like insects even if I never tried	X	
2	Eating insects goes against nature	X	
3	The EU Commission wants to hide insects in our ordinary food	X	
4	I have a fear of insects	X	
5	I agree with supermarket that denied the introduction of insects-based food	X	

Scale E - Prejudice and cognitive biases against insects			
6	The EU Commission introduced insects as cheap food, in order to make it accessible for all	X	
7	To eat insects is dangerous for health	X	
8	The EU Commission introduced insects consumption very recently	X	
9	To cook insects is less hygienic than other types of food	X	
10	Consumption of insects is a extreme option just supported for political reasons	X	
11	I feel a sense of disgust for eating insects	X	

Scale F - Recognizing the environmental role of insects			
Nr. Item	Wording of the items: Chefs + Consumers	YES	NO
1	I believe insects can contribute to global food security.	X	
2	I am supportive of initiatives promoting the acceptance of insect consumption for protecting the environment	X	
3	Insects are a more environmentally sustainable protein supply food than traditional livestock	X	
4	Educational campaigns about the environmental benefits of insect consumption need to be strengthened across Europe	X	

Scale F - Recognizing the environmental role of insects			
5	I am familiar with the environmental benefits of insect farming compared to traditional livestock agriculture	X	

Control variable

1. Have you ever eaten insects
2. Have you ever cooked insects

Demographics

Gender

Age

Status (Chef, catering, waiters vs general population)

Country

Email to receive results

Name

Privacy policy

2.1.2 Technical comment for the scaling and scoring of the Insects Questionnaire

The questionnaire overall includes 7 scales and 56 items. The number of items has been selected according to internal quality checks and content validity, measured through the partners' agreement on the allocation of the items to assigned scales.

In this paragraph are listed the scales adopted and what the scales aims to measure.

Scale A - Intentions and Propensity to eat insects.

This scale includes items based on declaration of intention to eat insects. This measurement of intentions includes descriptions of different condition for eating insects,

according to different formats “whole format”, “fried”, “flour”, or finality “as protein supplement”, “with specific pairing for cheese and wine” or “with specific pairing with desserts”. The measurement of intentions plays a specific role in understanding human behaviors regarding eating insects. The basis behind this scale is named “The Theory of Planned Behavior” (Ajzen, 1985). This theory assumes that one of the strongest predictors of behavior is the intention behind that behavior. Considering that eating insects is unusual despite regulated at the European level, the intention to eat insects at specific condition is a clear. Specifically, the factors explaining behaviors are:

A) Behavioral intention

- A) Attitude toward behavior
- B) The strength of each belief concerning an outcome or attribute
- C) The evaluation of the outcome or attribute

B) Subjective norm

- A) The strength of each normative belief of each referent
- B) The motivation to comply with the referent

C) Perceived behavioral control

- A) The strength of each control belief
- B) The perceived power of the control factor
- C) empirically derived weight/coefficient

Scale B - Chefs propensity to introduce insects

The introduction of insects-based consumption by humans in gastronomy pass through the processing operated by chefs and other professionals who administer food. The willingness of chefs to introduce insects in their menus is investigated by the scale B, which is administered - for obvious reasons only the chefs and other professionals involved in the food system. The overall score indicates the general availability of chefs to introduce insects in their menus. Anyway, also the analysis of single items may allow us to understand specific obstacles and factors to be overcome.

Scale C - Technical knowledge about insects (nutrition, flavor and texture)

Another factor impacting on the possibility to cook insects is certainly the technical knowledge about insects in terms of nutrition, flavor and texture. The measurement of technical knowledge about insect scale has been administered both to chefs and consumers.

In order to create a questionnaire regarding the technical knowledge about insects, we adopted an item-extraction model based on information provided by a Certified Food Technologist, Dr. Francesco Fenga, which is expert of the project for Fenga Food Innovation. Dr. Fenga prepared a table with main organoleptic information and nutrition facts about insects. The information provided has been randomized and questions has been extracted in order to form knowledge questions about insects' properties.

In this sense, the questionnaire provides correct and wrong answers rather than measurement of opinion, variables of interest, awareness or attitude.

The knowledge-based questionnaire also contributes to specific factors concerning the "food neophobia". Insects' consumption by human, despite is common globally and estimates by FAO shows that approximately 2 billion people globally; insects are novel food in the EU and not part of the food culture in the entire territory.

Therefore, one possible explanation of the repulsion towards insect is named neophobia, which is a phobia of new food. New food lacks of familiarity and leads to distrust to general consumers. Similarly to processes adopted to face prejudice, the theory of contact can be applied also to face cognitive biases that may appear with neophobia. Moreover, like in facing any type of phobia, the familiarization with the stimuli and increasing the knowledge about the insect's consumption can potentially reduce neophobia. It should be noted as well, that different phobia reduction methodologies are based on the familiarization with the phobic stimuli; therefore, increasing the knowledge about insects may potentially also reduce the connected neophobia.

Scale D - Self-reported cooking insects capacity

Another requirement for the promotion and adoption of insects for human consumption is the self-reported cooking insects capacity. The perceived capacity of transforming insects is a needed passage which can lead to action. The perception of control on behaviors passes through also the sense of efficacy of performing an action, in this case, of cooking insects. Therefore, we created a 7-items scale based on the perceived capacity of cooking insects in different forms (bread, fried insects dish, first and second courses, desserts, etc.)

Scale E - Prejudice and cognitive biases against insects

Considering that eating insects is uncommon in the EU, we identified also a number of items designed to measure cognitive biases concerning the entomophagy. This 11-scale items measuring this variable. The scale includes items concerning the refusal to eat insect also if never tried, entomophagy as an action against nature, admission of fear and disgust towards insects, presumption that insects are less hygienic than other meat etc, and presumption of unhealthiness of insects.

Scale F - Recognizing the environmental role of insects

According to the analysis of scientific research concerning insects consumption by human, value-based variables concerning the sustainability of insects is a key factor to be considered. In fact, insects are a more sustainable protein supply if compared to traditional meat. Research showed that together with perceived healthiness, sustainability is a second motivator to insects consumption.

2.2. Descriptive Statistics and analysis of the sample of consumers

This section includes the descriptive statistics concerning the sample of the 370 consumers involved in the overall sample. The results are grouped by scale. In order to provide a

measurement of the results, we reported the data by measuring the percentage on the total.

2.2.1 Intentions and propensity to eat insects

	Percentage on the total
I would eat insects in form of flour (for burgers, pasta, snacks, etc.	41,08%
I would eat insects as a protein supplement in my dietary or fitness regime	35,40%
I am willing to participate in educational workshops or cooking classes focused on insect-based cuisine.	33,24%
I would consider to try innovative pairing between insects, cheeses and wines	31,89%
I would eat fried insects	30,89%
I would consider to try innovative pairing between insects and desserts	22,43%
I would eat insects in their original shape and texture	10%

2.2.2 Technical knowledge about insects properties

	Percentage of correct answers given
Insects protein are low quality proteins (reverse)	72,32%
Insects consumption interferes negatively with digestion (reverse)	71,62%
Dragonflies are low in proteins (reverse)	68,37%
Edible insects are less than 100 (reverse)	64,86%
Insects should be listed as allergens	62,70%
Different species Insects have a similar texture (reverse)	59,46%
Termites are crunchy when roasted	57,03%
Insects have a bitter flavor (reverse)	56,21%
Beetles have low levels of fat	55,40%
Crickets are high in proteins and include almost all essentials aminoacids	53,51%
Bees and ants are rich in minerals like iron and calcium	51,65%
Insects have important nutrients like fibers, antioxidants and essential micronutrients	51,35%
Beetles have low levels of fat (reverse)	44,59%
Ants are source of Omega-3	43,79%
Boiling crickets change their texture into gummy texture	40,81%

	Percentage of correct answers given
Different species Insects have a similar texture	40,51%
Crickets flavor is similar to chicken	36,75%
Ants have a buttery and sweet flavor	26,21%

2.2.3 Self-rated capacity to cook insects

	Percentage on the total
I would be able to cook a dish based on fried insects	15,40%
I would be able to pair different types of insects with first courses (pasta, rice)	14,59%
I would be able to prepare an insect-based bread	13,51%
I am knowledgeable about food safety regulations and best practices when handling and preparing insects	12,16%
I would be able to pair different types of insects with second courses (ordinary meat, fish, vegetables)	11,08%
I am confident in creating a signature dish that highlights the unique flavor of insect	10,81%

	Percentage on the total
I am capable of designing a full-course meal centered around insect-based ingredients.	7,56%

2.2.4 Prejudice and cognitive biases against insects

	Percentage on the total
I feel a sense of disgust for eating insects	67,84%
The EU Commission introduced insects consumption very recently	65,40%
The EU Commission introduced insects as cheap food, in order to make it accessible for all	55,67%
I will surely don't like insects even if I never tried	52,70%
I agree with supermarket that denied the introduction of insects-based food	48,64%
I am afraid of insects	44,05%
Consumption of insects is an extreme option just supported for political reasons	41,08%
To cook insects is less hygienic than other types of food	39,45%
To eat insects is dangerous for health	35,67%

	Percentage on the total
The EU Commission wants to hide insects in our ordinary food	34,86%
Eating insects goes against nature	31,35%

2.2.5 Recognition of the insects' role in environmental sustainability

	Percentage on the total
Insects are a more environmentally sustainable protein supply food than traditional livestock	53,78%
Educational campaigns about the environmental benefits of insect consumption need to be strengthened across Europe	47,83%
I believe insects can contribute to global food security	47,56%
I am supportive of initiatives promoting the acceptance of insect consumption for protecting the environment	42,97%
I am familiar with the environmental benefits of insect farming compared to traditional livestock agriculture	36,49%

2.3. Scales reliability

In order to measure the reliability of the scales, we calculated the Cronbach's Alpha index for all items. The Cronbach's Alpha is a formula adopted to measure the homogeneity of binary items. It is hypothesized that items which are part of the same scale, measuring the same variable, should have a common variance, a common intercorrelation. In psychometrics, a satisfactory Cronbach's Alpha is over .70. on the identified analysis, we measured the Cronbach's Alpha scale through the software Jasp and identified the following values.

Name of the scale	Cronbach's Alpha
Scale A - Intentions and Propensity to eat insects	0,89
Scale D - Self-reported cooking insects capacity	0,88
Scale E - Prejudice and cognitive biases against insects	0,86
Scale F - Recognizing the environmental role of insects	0,87

2.4. The role of previous experiences

One of the main strategies to fight the neophobia directed towards insects is the role of past experience. According to the Theory of Contact, phobia and prejudice can be faced especially by increasing information and knowledge about the "phobic" stimuli. Therefore, is it possible to hypothesized that people who already had the experience of eating and cooking insects.

In order to demonstrate this, we asked to the sample of participants additional questions for checking if they ever tried before to eat or cook insects. The presupposition is that participants that had a direct experience with insect should also have reduced level of prejudice, higher knowledge, recognize better the environmental role of insects, etc.

In order to check this hypothesis, we calculated a set of 2-samples t-tests across the different variables

2.4.1. Have you ever eaten insects?

In this section we measured if previous experience of eating insects would impact on the psychosocial variables concerning the insects consumption by human. By administering a t-test we found a significant effect of trying insects on their perception for all variables. This means that the exposure to the behavior “eating insects” can change attitudes and perception.

First of all, it's very important to notice that in our sample of 370 participants, 70 of them had the experience to eat insects (18,91%), mostly one out of five.

	Never eaten insects	Already eaten insects	T-test	Cohen's D
Intentions and propensity to eat insects	1,49	4,44	-10,46; $p < .001$	-1,389
Technical knowledge about insects properties	8,18	10,44	-5,49; $p < .001$	-0,729

	Never eaten insects	Already eaten insects	T-test	Cohen's D
Self-reported cooking insects capacity	0,51	2,3	-8,42; $p < .001$	-1,118
Prejudice and cognitive biases against insects	5,81	2,4	8,10; $p < .001$	1,076
Recognizing the environmental role of insects	1,89	3,97	-8,47; $p < .001$	-1,125

2.4.2. Have you ever cooked insects?

Additionally, we measured if the past experience in cooking insects could have an impact on the psychosocial variables connected to insects' consumption. All variables reported significant differences, demonstrating that cooking insects can reduce prejudice and cognitive biases, their technical knowledge, recognizing that insects may have an environmental role and promoting the intention and propensity to eat them. We should consider that only 18 subjects on a sample of 370 EU citizens already cooked insects (4,86%).

	Never cooked insects	Already cooked insects	T-test	Cohen's D
Intentions and propensity to eat insects	1,915	4,44	-4,85; $p < .001$	-1,172
Technical knowledge about food	8,47	11,33	-3,74; $p < .001$	-0,905
Self-reported cooking insects capacity	9,73	3,22	-6,21; $p < .001$	-1,501
Prejudice and cognitive biases against insects	5,30	2,56	3,35; $p < .001$	0,809
Recognizing the environmental role of insects	2,19	4,05	-3,88; $p < .001$	-0,939

2.5. Gender Differences

Previous studies concerning psychological variables related to insects consumption showed that on average scores, females show a stronger rejection towards insects consumption. In this research we aim to identify if the same result is confirmed in our sample or if there are some sub-variables reporting different data. To this end, we calculated a 2-samples t-test across different variables. Consistently with past scientific research, females show more rejection towards insects.

	Male	Female	T-test	Cohen's D
Intentions and propensity to eat insects	3,15	1,44	6,936; $p < .001$	0,753
Technical knowledge about food	9,25	8,26	2,864; $p = .004$	0,311
Self-reported cooking insects capacity	1,21	0,65	2,997; $p = .003$	0,325
Prejudice and cognitive biases against insects	3,93	5,85	-5,298; $p < .001$	-0,575
Recognizing the environmental role of insects	3,06	1,85	5,790; $p < .001$	0,628

2.6. Transnational comparisons

We calculated the Analysis of Variance in order to identify differences among participating countries in the measured variables.

	Number of participants
Italy	121

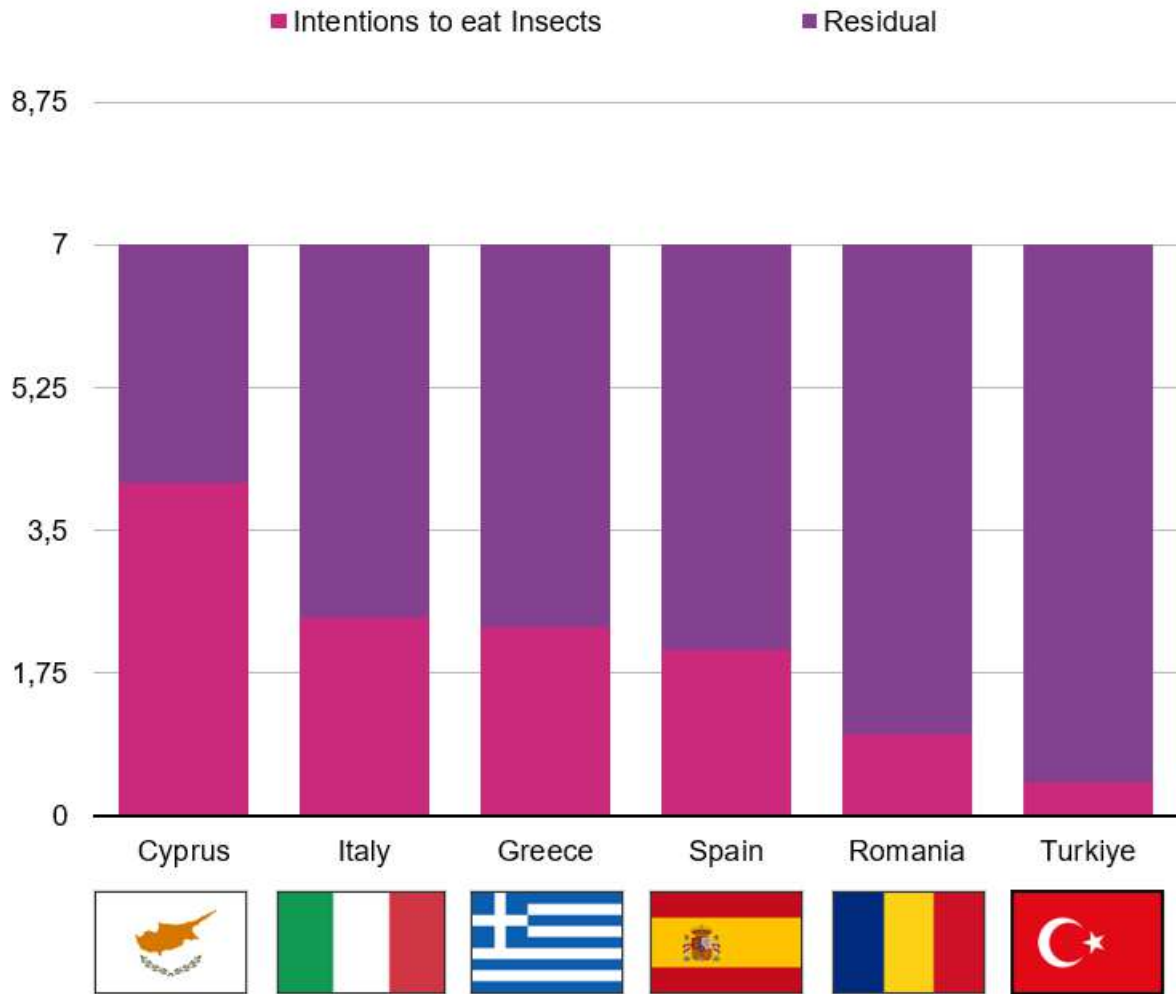
	Number of participants
Romania	62
Cyprus	26
Turkiye	30
Greece	58
Spain	73

2.6.1 Intentions and Propensity to eat insects

In reference to the variable intentions and propensity to eat insects we found that average scores across countries are significantly different ($F = 10,793$; $p < .001$).

	Average Intentions and propensity to eat insects
Cyprus	4,077
Italy	2,430
Greece	2,32

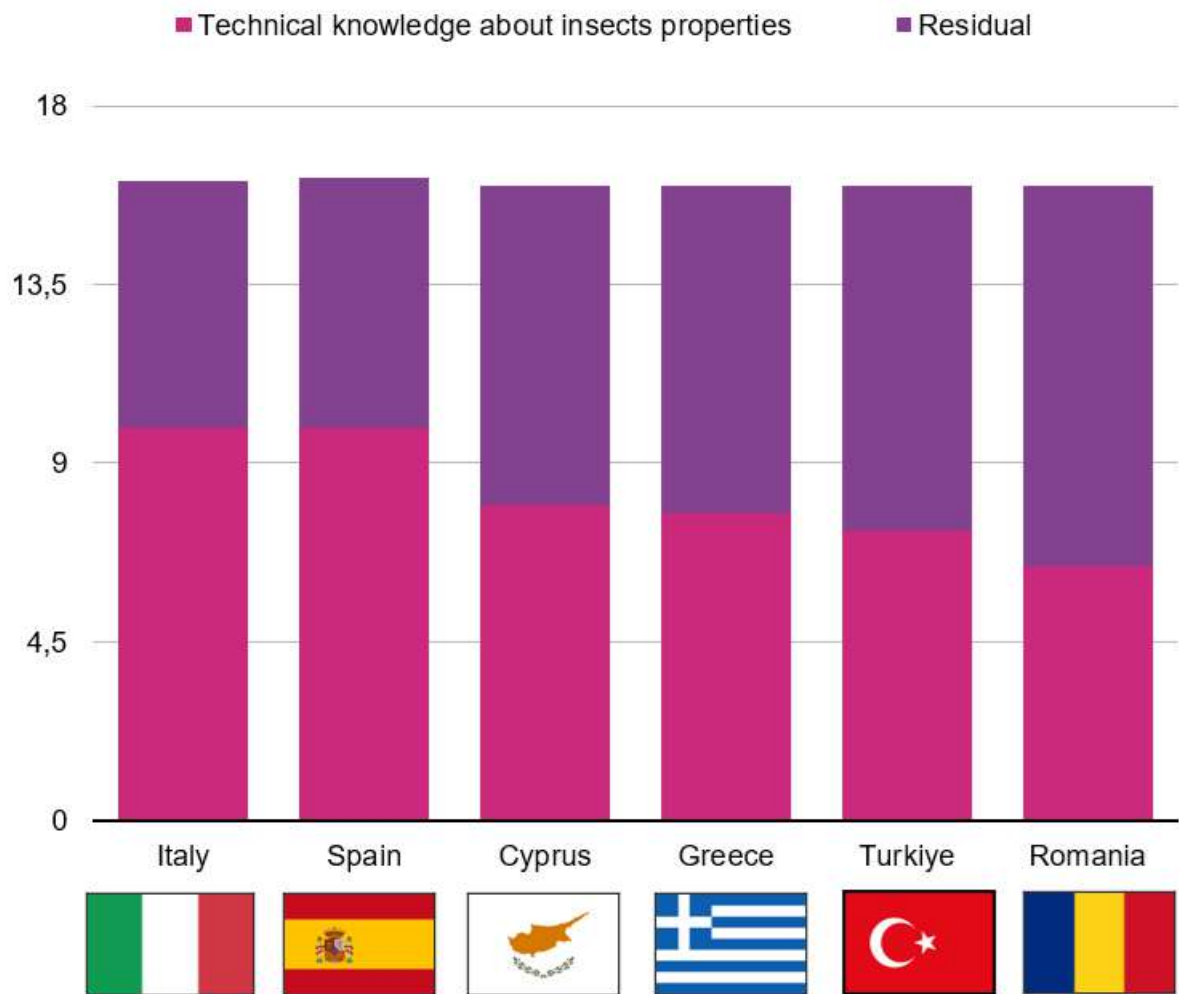
	Average Intentions and propensity to eat insects
Spain	2,041
Romania	1
Turkiye	0,400



2.6.2 Technical knowledge about insects' properties

The Analysis of variance revealed that the technical knowledge about insects properties is significantly different in the participating countries. In fact, the result is $F = 16,461$, $p < .001$).

	Average technical knowledge about insects properties
Italy	9,876
Spain	9,836
Cyprus	7,96
Greece	7,74
Turkiye	7,300
Romania	6,435

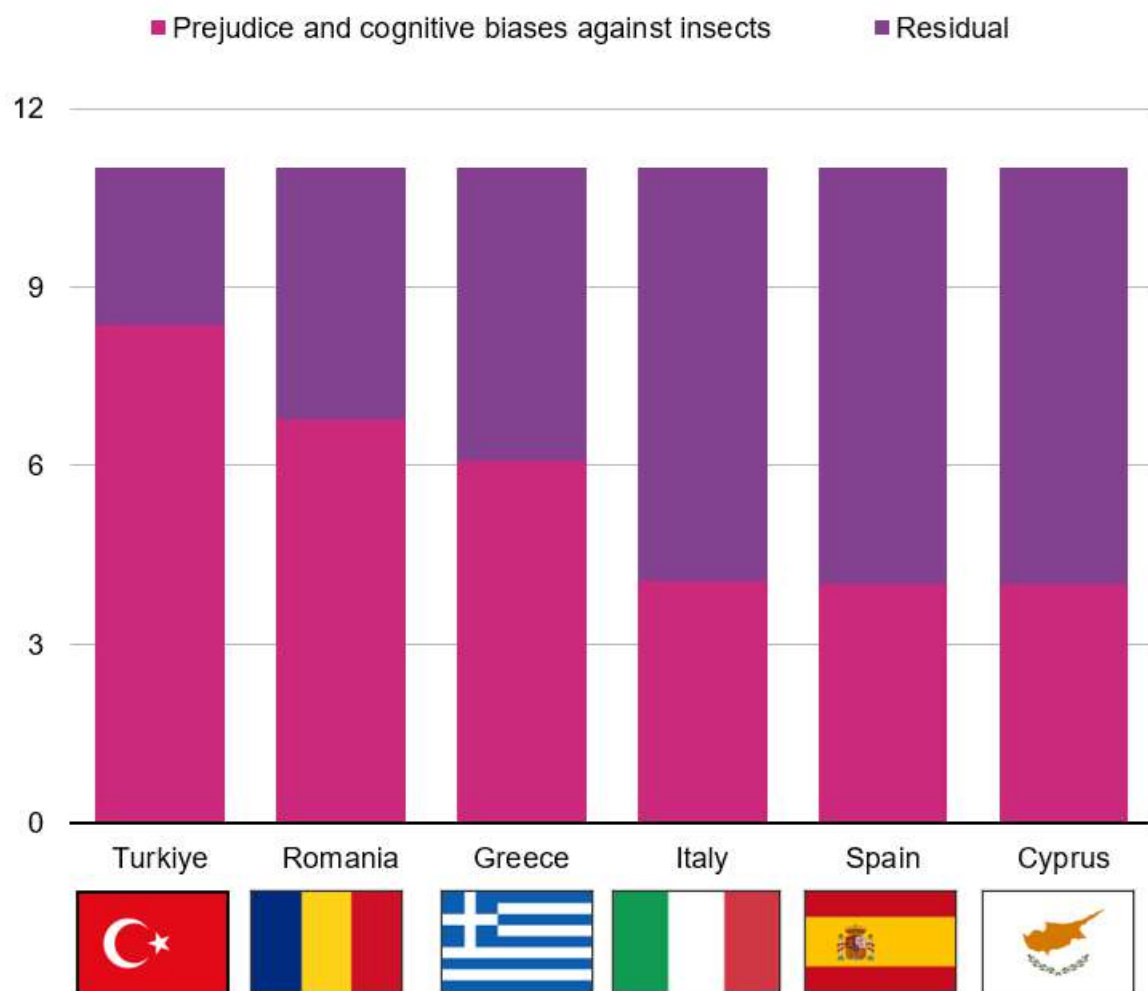


2.6.4 Prejudice and cognitive biases against insects

The Analysis of variance revealed that the Prejudice and cognitive biases against insects is significantly different in the participating countries. In fact, the result is $F = 16,166$, $p < .001$).

	Average prejudice and cognitive biases against insects
Türkiye	8,367

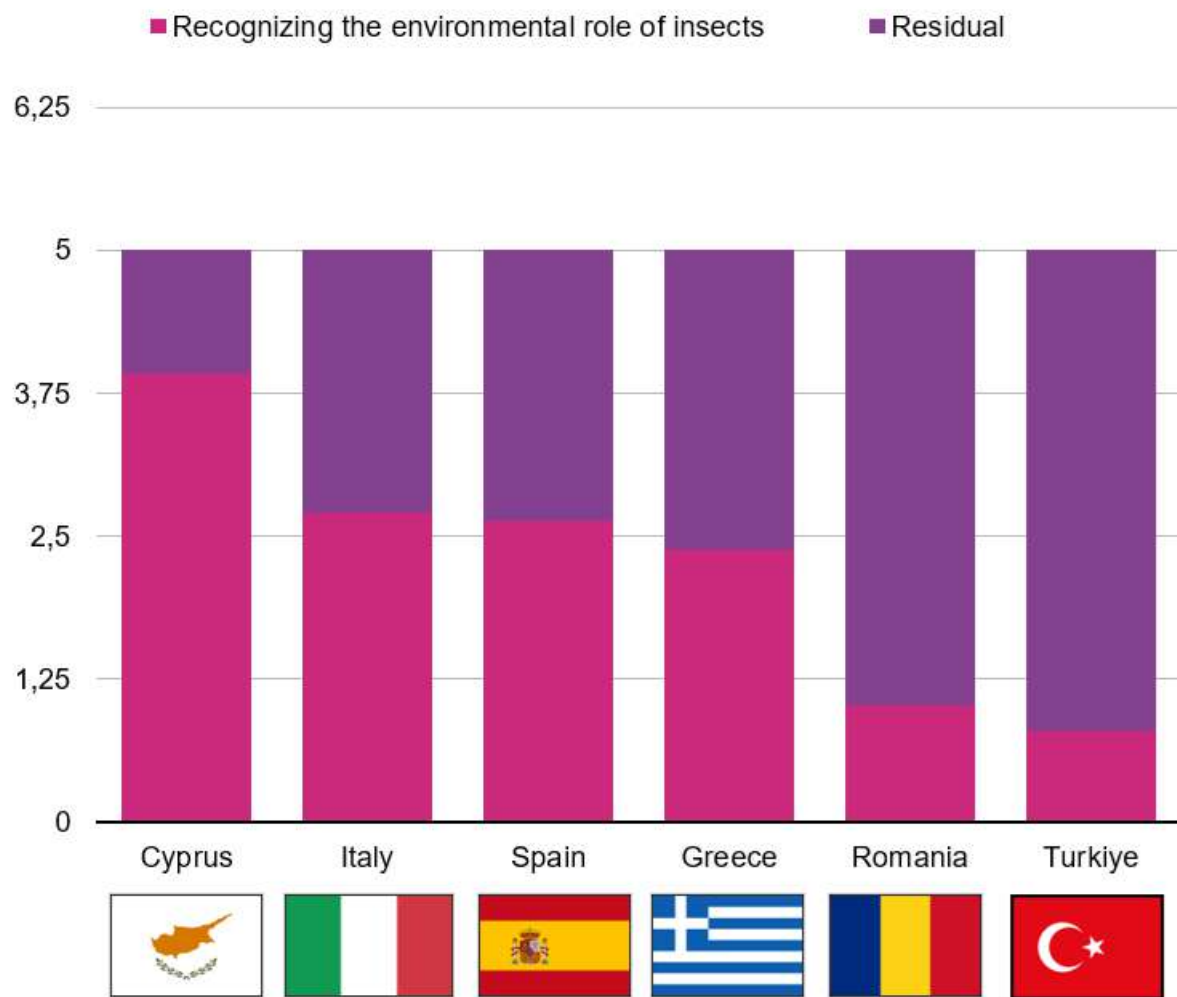
	Average prejudice and cognitive biases against insects
Romania	6,774
Greece	6,069
Italy	4,066
Spain	4,014
Cyprus	4,000



2.6.5 Recognizing the environmental role of insects

The Analysis of variance revealed that recognizing the environmental role of insects is significantly different in the participating countries. In fact, the result is $F = 15,675$, $p < .001$).

	Average technical knowledge about insects properties
Cyprus	3,923
Italy	2,702
Spain	2,630
Greece	2,379
Romania	1,016
Turkiye	0,800



2.7. Correlational analysis

In order to further validate the questionnaire, we calculated the internal correlations between measured variables and identified consistent correlations contributing to internal validity.

	Correlations with intentions and propensity to eat insects
Technical knowledge about insects properties	$r = 0,459 \text{ } p < .001$
Self-report capacity to cook insects	$r = 0,468 \text{ } p < .001$
Prejudice and cognitive biases against insects	$r = -0,557 \text{ } p < .001$
Recognizing the environmental value of insects	$r = 0,679 \text{ } p < .001$

	Correlations with Technical knowledge about insects properties
Self-report capacity to cook insects	$r = 0,168 \text{ } p < .001$
Prejudice and cognitive biases against insects	$r = -0,533 \text{ } p < .001$
Recognizing the environmental value of insects	$r = 0,573 \text{ } p < .001$

	Correlations with self-reported cooking capacity
Prejudice and cognitive biases against insects	$r = -0,254 \text{ } p < .001$
Recognizing the environmental value of insects	$r = 0,387 \text{ } p < .001$
Age	$r = -0,124 \text{ } p = .017$

	Correlations with prejudice and cognitive biases against insects
Prejudice and cognitive biases against insects	$r = -0,566, p < .001$

2.8. Perception and attitudes of EU Chefs on the insect consumption and introduction in the menus

As stated, our overall sample of 519 participants, also introduced a sub-sample of chefs, professionals preparing food in restaurant and catering, in order to measure their perceptions and attitudes towards the introduction of insects in the cuisine. An overall number of

2.9. Statistical comparisons with the sample of consumers

Considering the presence of 2 wide sample (370 consumers and 149 chefs), one of the statistical analysis performed aimed to identify similarities and differences with the sample of consumer, assuming that chefs and other professionals of food should have a more technical and detailed knowledge than the general consumer and assuming the presence of some difference between the two samples. In order to reach this goal, we performed 2-samples t-test statistics for the identification of possible significant different means at the statistical level.

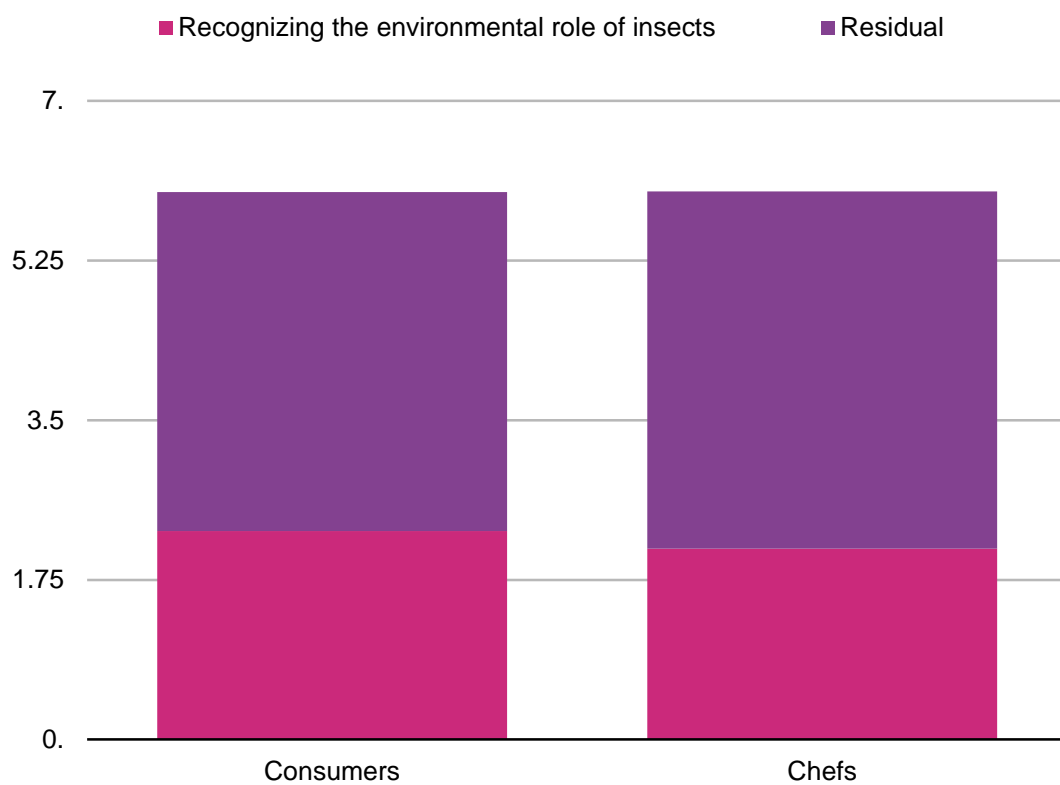
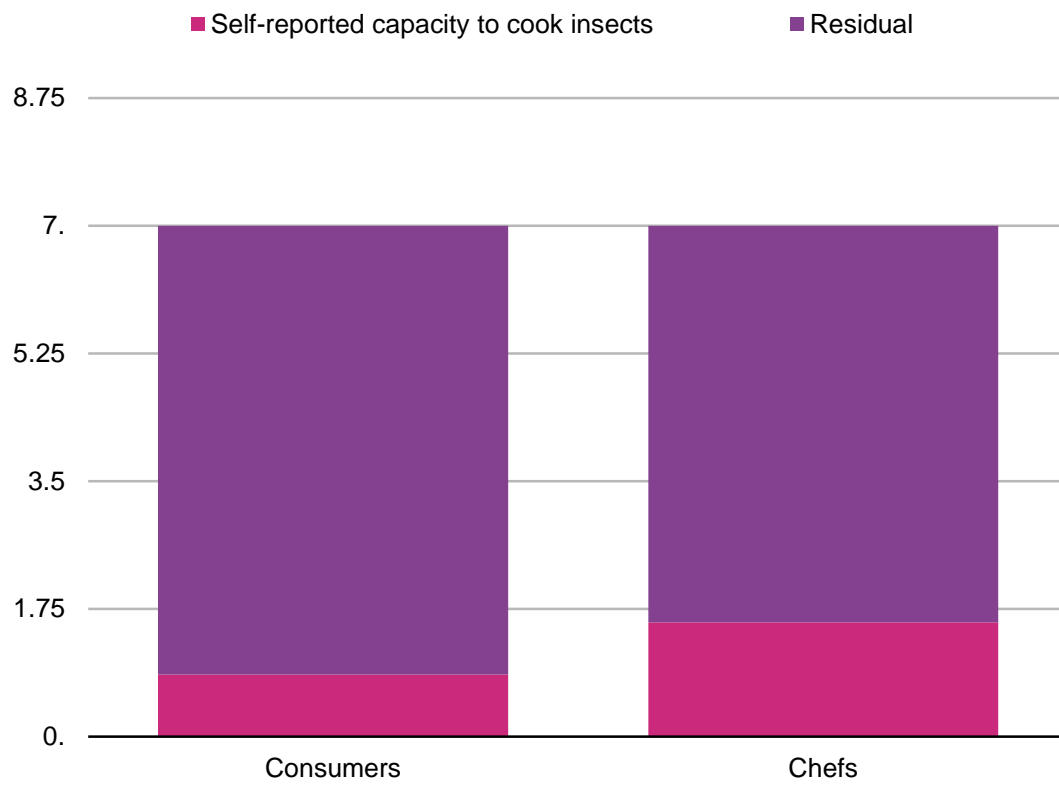
	Consumers Average	Chefs Average	T-test (P-value)	Cohen's d
Intentions and propensity to eat insects	2,049	2,497	T = -1,847 (p = 0,065)	-0,179
Technical knowledge about food	8,614	8,698	T = -0,275 (p = 0,783)	-0,027
Self-reported cooking insects capacity	0,851	1,564	T = -3,833 (p <.001)	-0,372
Prejudice and cognitive biases against insects	5,168	5,027	T = 0,423 (p = 0,672)	0,041
Recognizing the environmental role of insects	2,286	2,094	T = 1,003 (p = 0,316)	0,097

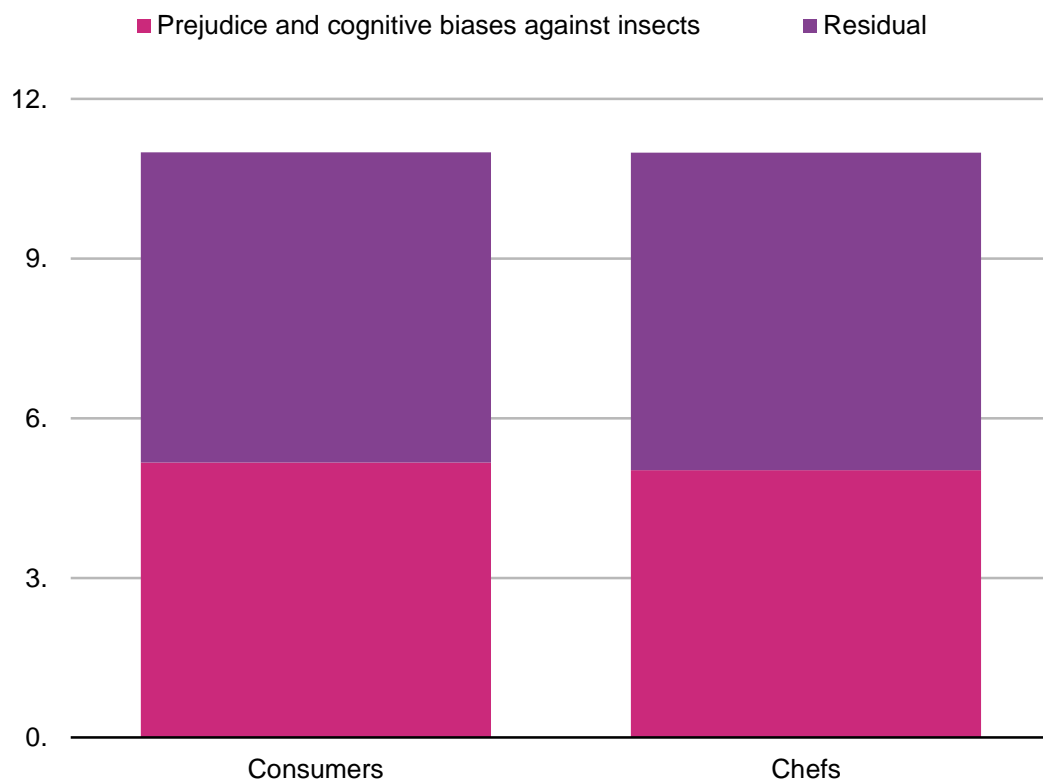
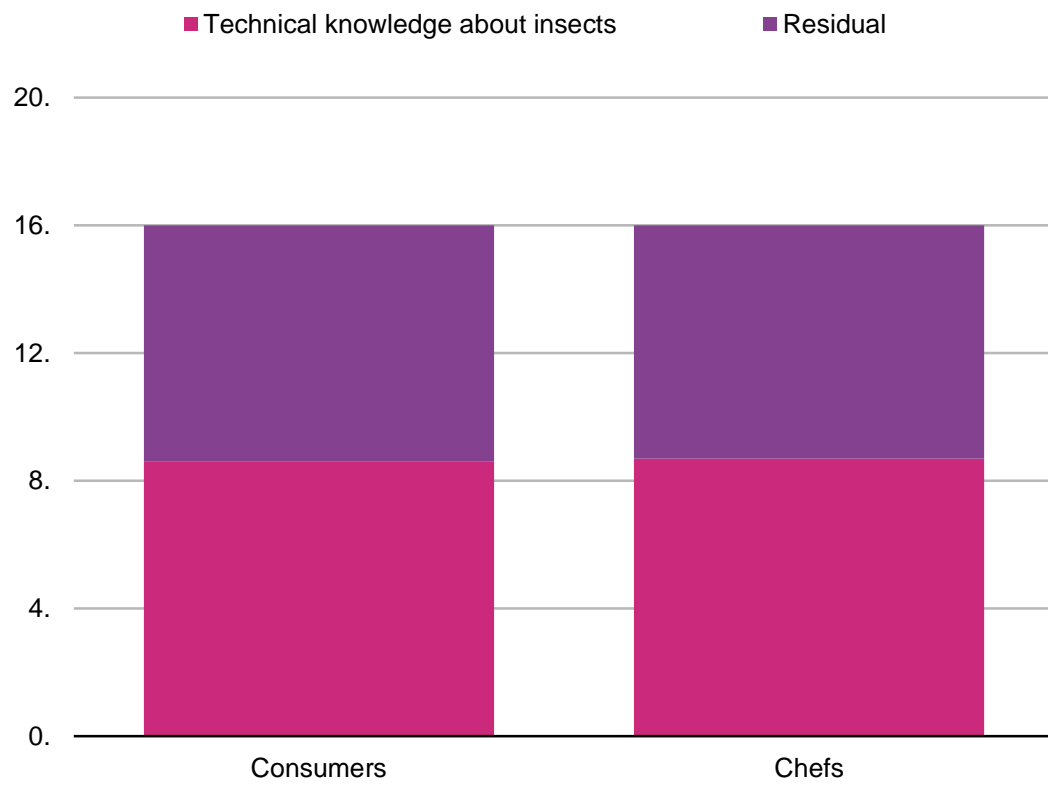
The table shows that the consumers and the chefs samples reported similar value. In order to identify significant values, the third column should have a $p < 0.05$. This is true only for the variable “self-reported cooking insects’ capacity”. Chef state to have a slightly higher capacity to cook insects, which is expected considering that cooking is the profession of chefs and it can be easily imagined a higher capacity to cook.

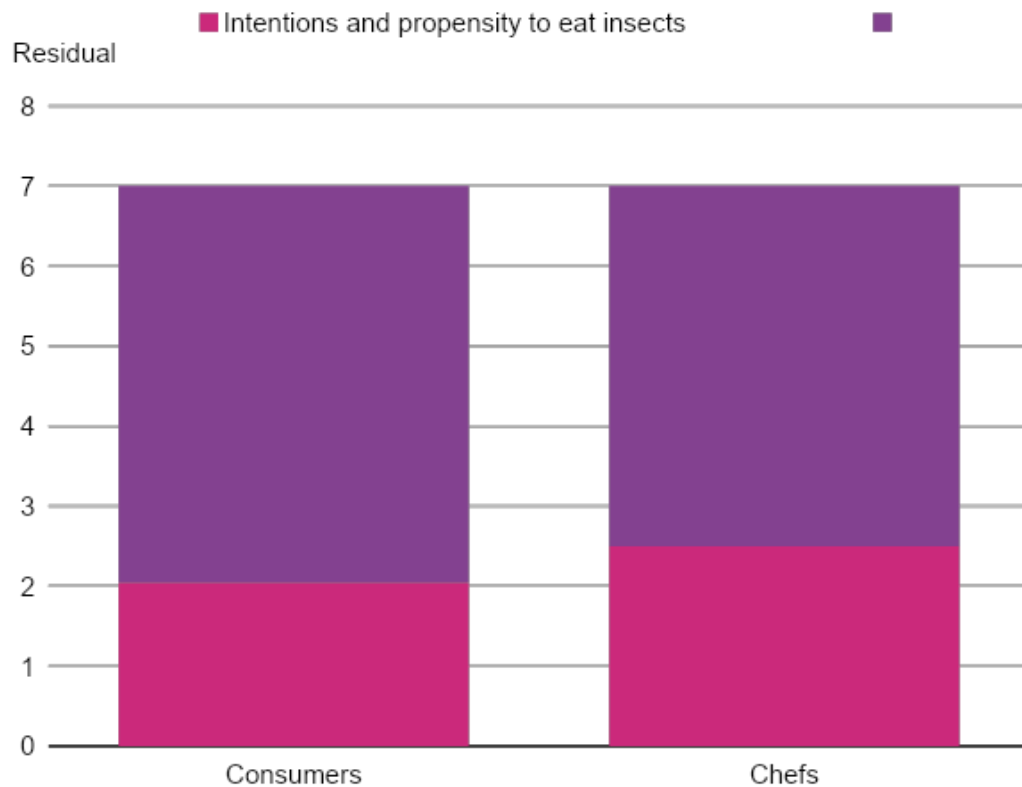
Instead, there is no statistical difference in terms of “technical knowledge about food.” The sample of consumers scores an average of 8,614, the sample of chefs has an average of 8,698. It should be also noticed, that considering that this scale is based on a maximum of 16 points and that all answers have 2 alternatives, an average near to 8 is very similar to the chance rate, demonstrating that both samples has essentially no knowledge concerning the technical elements of nutrition regarding insects.

No differences have been identified in the prejudice and cognitive biases against insects. The data reveals very similar averages in the levels of prejudice identified (consumers = 5,168; chefs = 5,027). These minimal differences are not statistically significant.

A slight difference but still not statistically significant ($p = 0,065$) can be identified in the variable “intentions and propensity to eat insects. Average shows that some minimal differences reveal a slightly higher propensity of chefs to eat insects (consumers = 2,049; chefs = 2,497). Anyhow, it’s not possible to conclude that this difference is statistically appreciable. No difference has been identified in the variable “recognizing the environmental role of insects” where chefs reveal a lower average (consumers = 2,286; chefs = 2,094). The t-test shows anyhow that this difference is not statistically significant ($t = 1,003$; $p = 0,316$). In conclusion, the analysis at the aggregate level, shows that the perceptions of chefs and consumers are essentially comparable. Probably, there are social factors rather than technical that impact on both samples.







2.10. National reports

In addition to the general findings presented in this report, each participating country has contributed a brief **National Report**, detailing their specific results based on responses to comprehensive questionnaires. These national reports offer in-depth insights into the particular attitudes, perceptions, and readiness levels for insect consumption within each country's cultural context. For those interested in further exploring the specific trends, challenges, and opportunities in individual countries, these National Reports serve as a resource, providing country-specific analyses that complement the broader findings of the research.

By combining these individual reports with the general results, this study paints a detailed picture of the factors that will be crucial in promoting the adoption of insect-based foods across Europe.

2.10.1. Turkey

The survey results from Turkey indicate a significant reluctance and resistance among **consumers** towards consuming and preparing insects in various forms. The unanimous response against eating insects in their original shape and texture, alongside predominant disapproval of other consumption methods such as fried insects or as flour, highlights a strong cultural and psychological barrier against entomophagy. Misconceptions or skepticism about the nutritional value and safety of insects are evident, with many respondents doubting the quality of insect protein and expressing concerns about digestion and hygiene. Moreover, there is a prevalent belief that the promotion of insect consumption is politically motivated or hidden within EU policies, indicating a mistrust towards institutional decisions regarding food innovations. Despite these challenges, a small subset recognizes the potential environmental benefits of insect consumption, suggesting a starting point for targeted educational campaigns to shift perceptions and increase acceptance gradually.

On the other hand, the survey results from **chefs** in Turkey reflect a considerable reluctance towards the integration of insects into culinary practices, mirroring broader consumer hesitancy. An overwhelming majority of chefs are hesitant about eating insects in any form, with a slight openness observed towards using insects in educational workshops or in innovative pairings with cheeses, wines, or desserts. There is significant concern among chefs regarding communication challenges, potential allergies, and economic risks associated with introducing insect-based dishes in their restaurants. Despite a few chefs recognizing the sustainability and environmental benefits of using insects, the general sentiment remains wary, with notable misconceptions about the safety and hygiene of cooking with insects. This skepticism is compounded by fears reflected in broader social and cultural attitudes towards entomophagy, suggesting a deep-rooted resistance that educational and promotional efforts need to address more effectively.

2.10.2. Cyprus

The target groups of our two research questionnaires are consumers and food industry professionals, including chefs. Insect consumption in Cyprus has historical roots dating back centuries, notably marked by locust plagues that have periodically affected the island. Historical records indicate that significant locust populations, such as those recorded in 1881, have had both detrimental and opportunistic impacts. These plagues not only posed a threat to agriculture but also highlighted the potential of locusts as a substantial protein resource.

Regarding the **consumers**, the goal was to have 25 participants complete the questionnaire, but we received 39 responses. This discrepancy occurred because the first twelve respondents misunderstood the definition of insects, likely due to the common consumption of snails in Cyprus, which influenced their answers. As a result, the initial numbers were inflated before a sharp decline. This observation highlights the need to provide clearer definitions of what constitutes an insect for consumption purposes.

Among the 39 participants, 46.2% were female and 53.8% male, indicating a relatively balanced gender distribution within the sample (see table 1). The age range of respondents varied between 18 and 58 years, with the majority clustered between 30 and 32 years old. In terms of educational attainment, approximately 85% reported holding either a bachelor's or master's degree, while a small proportion indicated having either a PhD or a high school diploma.

Scale A questions assess participants' openness and willingness to consume insects in various forms and contexts, with responses limited to either "Yes" or "No" as the only options. The questions explore whether individuals are comfortable eating insects in their natural state, fried, or processed into flour for foods like burgers or snacks. They also gauge interest in incorporating insects as a protein supplement in diets or fitness routines. Additionally, the questions evaluate participants' willingness to engage in educational workshops or cooking classes focused on insect-based cuisine, as well as their curiosity about trying innovative pairings of insects with cheeses, wines, or desserts. The results of

Scale A indicate that, for the first question regarding the consumption of insects in their original shape and texture, nearly all participants responded with "No." For the remaining questions, responses were evenly split, with half answering "Yes" and half answering "No." A key observation is that participants from Cyprus are generally open to consuming insects, provided they are not in their original form. It is important to note that, as previously mentioned, many respondents may have mistakenly associated snails with insects due to their prevalence in Cypriot cuisine and culture. This affected the responses of all survey participants.

Scale B questions evaluate participants' knowledge and perceptions of various nutritional, sensory, and health-related aspects of insect consumption, with responses limited to "Yes" or "No." The questions cover topics such as the flavour of insects, the quality of their protein, and their potential impact on digestion. They also inquire about specific nutritional properties of different insects, such as ants being a source of Omega-3, bees and ants being rich in minerals like iron and calcium, and crickets being high in protein with essential amino acids. Additionally, the questions explore participants' understanding of insects as allergens, flavour comparisons (e.g., crickets tasting like chicken, ants having a buttery or sweet flavour), and the texture of various insects when cooked. Finally, the questionnaire addresses the nutritional value of insects, including their fiber, antioxidants, and micronutrients, and the general number of edible insect species. The results of Scale B indicate that nearly 30 participants responded "Yes" to the question regarding whether insect proteins are of low quality. Concerning taste and texture, most participants reported that crickets develop a gummy texture when boiled, while termites are crunchy when roasted. Additionally, the majority indicated that different insect species share a similar texture. In terms of digestion, minerals, Omega-3 content, fat, and protein, a higher proportion of respondents answered "No." This outcome is likely due to a general lack of familiarity with cooking or consuming insects in Cyprus, leading participants to make assumptions about their nutritional properties.

Scale C questions assess participants' confidence and abilities in preparing and cooking insect-based dishes, with responses limited to "Yes" or "No." The questions explore whether individuals feel capable of preparing insect-based bread, cooking dishes with fried

insects, and pairing various types of insects with first courses (like pasta or rice) and second courses (such as meat, fish, or vegetables). Additionally, the questions evaluate participants' knowledge of food safety regulations related to handling insects, their confidence in creating signature dishes that highlight the unique flavors of insects, and their ability to design a full-course meal using insect-based ingredients. The results from Scale C indicate that a significant majority of respondents reported that they do not prepare insect-based bread and are unable to cook dishes featuring fried insects or pair various types of insects with main courses such as pasta, rice, meat, fish, or vegetables. In terms of their familiarity with food safety regulations and best practices for handling and preparing insects, 75% of participants admitted lacking the necessary knowledge and expressed low confidence in creating a signature dish that showcases the unique flavors of insects. Moreover, the majority also indicated that they are not capable of designing a complete meal centered on insect-based ingredients.

Scale D questions include a set of questions designed to assess participants' attitudes and beliefs toward insect consumption. Respondents can answer "yes" or "no" to statements that indicate their pre-emptive dislike for insects, belief that eating insects is unnatural, fear of hidden insect ingredients, and general fear or disgust towards insects. The scale also explores opinions on the EU Commission's motives for promoting insect-based foods, concerns about the hygiene and safety of cooking insects, and whether insect consumption is seen as politically driven or introduced as a low-cost food option. Overall, these questions reflect emotional, cultural, and safety-related perceptions about insects as a food source. The results from Scale D indicate that the majority of respondents are certain they would dislike insects, even without having tried them. Nearly all participants agreed that eating insects goes against nature, and most also expressed a sense of disgust toward the idea of consuming insects. Notably, responses were more divided on questions related to concerns about concealing insects in food, fear of insects, supermarket resistance to insect-based products, the notion of insects as a low-cost food initiative, health and hygiene concerns, the recent introduction of insect consumption by the EU, and potential political motivations. In these areas, participants were roughly split between negative and positive views.

Scale E focuses on assessing participants' awareness and attitudes regarding the environmental sustainability of insect consumption. The questions explore beliefs about the potential of insects to contribute to global food security, support for initiatives promoting insect consumption for environmental protection, and recognition of insects as a more sustainable protein source than traditional livestock. Additionally, the scale addresses the need for stronger educational campaigns across Europe about the environmental benefits of insect consumption and evaluates respondents' familiarity with the advantages of insect farming over conventional livestock agriculture. The majority of respondents expressed positive views regarding the role of insects in global food security, recognizing them as a sustainable protein source and affirming the need for educational campaigns on the environmental benefits of insect consumption. They also indicated familiarity with the environmental advantages of insect farming compared to traditional livestock agriculture. Interestingly, responses were evenly split when it came to supporting initiatives aimed at promoting the acceptance of insect consumption for environmental protection. Finally in response to the question of whether participants had ever eaten insects, the vast majority answered negatively. However, when asked if they had ever cooked insects, all respondents indicated that they had not. Taking into consideration all the above research results highlight a distinct aspect of Cypriot culture regarding insect consumption.

Regarding the **chefs**, although the target sample size was 25 participants, we received only 12 responses from professionals. This shortfall occurred because many professionals declined to participate when approached, limiting our sample size to 12. Among the respondents, some were Product Development Managers and Nutritionists who were already aware that protein shakes they use may contain insects in powdered form.

Of the 12 participants, 25% were female and 75% male, highlighting a significant male representation in this industry. The respondents' ages ranged from 20 to 65 years, with the majority being 42 years old. Professionally, 50% of participants were chefs, while the remaining 50% were employed in catering services and other related sectors. In terms of

educational level, 75% reported holding either a bachelor's or master's degree, while the remained proportion indicated having a high school diploma.

The Scale A questions assess participants' willingness to consume insects in various forms, with responses limited to "Yes" or "No." The questions explore whether participants are open to eating insects in their original shape, fried, or processed into flour for foods like burgers or snacks. They also indicate whether participants would use insects as a protein supplement in their diet or fitness regimen, attend educational workshops or cooking classes on insect-based cuisine, and try innovative pairings of insects with cheeses, wines, or desserts. The results of Scale A show that nearly all participants were unwilling to consume insects in their original shape and texture. A significant portion of the target group also indicated reluctance to eat fried insects or explore innovative pairings with desserts. However, a slightly higher percentage expressed a willingness to consume insects in flour form or participate in educational workshops or cooking classes focused on insect-based cuisine. Responses were evenly split when it came to using insects as a protein supplement or trying innovative pairings between insects, cheeses, and wines.

The Scale B questions assess participants' attitudes toward incorporating insect-based dishes in their restaurants, with responses limited to "Yes" or "No." The questions explore whether participants believe the inclusion of insects could positively impact their restaurant's image, if they feel it is unnecessary for chefs to use insects, and concerns about explaining insect-based dishes on the menu or potential client allergies. Additionally, the questions indicate participants' views on whether adopting insect-based cuisine could result in economic loss, their interest in creatively presenting insect-based dishes, and the perceived benefits for sustainability and uniqueness. The questionnaire also assesses openness to hosting educational events for customers, the value of educating culinary teams about insects, and enthusiasm for the role of insect-based dishes in contributing to global food security and environmental sustainability. A significant majority of participants expressed reluctance to introduce insect-based dishes in their restaurants, likely due to concerns about the potential negative impact on their image as perceived by customers. Additionally, they did not show enthusiasm for the role of insect-based dishes in contributing to global food security and environmental sustainability. Many also responded

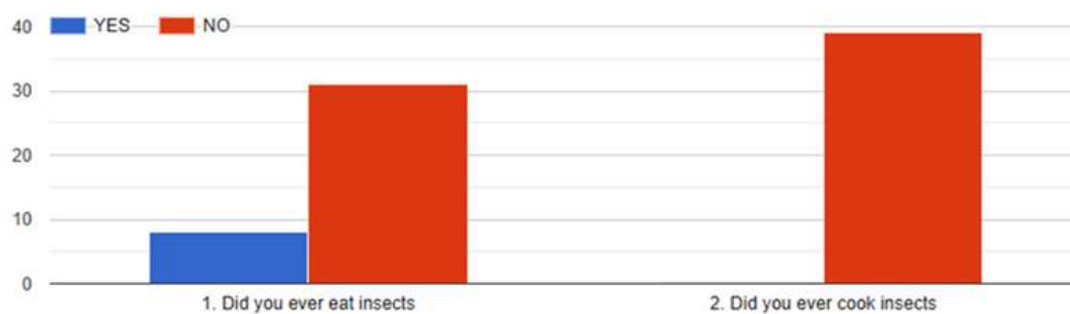
negatively to the idea of exploring innovative ways to present insect-based dishes or enhancing sustainability and uniqueness through their inclusion on the menu. A large portion expressed concerns about how to communicate and explain the inclusion of insects on the menu, as well as worries about potential allergies or adverse reactions in customers. They also indicated that adopting insect-based dishes could lead to financial losses. Interestingly, responses were evenly split on whether chefs and restaurants should use insects at all and whether educating their culinary teams on the benefits of insect-based cuisine would foster a more innovative and sustainable kitchen culture. The positive responses to this last point stand in contrast to the generally negative feeling expressed throughout the other questions.

The Scale C questions evaluate participants' knowledge and perceptions of the nutritional, sensory, and health-related aspects of insect consumption, with responses limited to "Yes" or "No." The questions explore whether participants believe insects have a bitter flavour, contain low-quality proteins, or negatively affect digestion. Additionally, they assess knowledge about the nutritional benefits of ants and bees (such as being sources of Omega-3, iron, and calcium), whether insects should be listed as allergens, and the protein content of specific insects like crickets and dragonflies. Other questions address whether beetles are low in fat, the taste of crickets and ants, and whether insects provide important nutrients like fiber, antioxidants, and micronutrients. The questionnaire also covers how cooking methods affect insect texture, the crunchiness of termites when roasted, the number of edible insect species, and whether different insect species share similar textures. The overall responses from the sample reveal an even split between positive and negative answers. A significant portion of participants responded negatively to questions regarding whether insects have a bitter flavour, contain low-quality protein, and whether crickets taste similar to chicken or ants have a buttery and sweet flavour.

The Scale D questions evaluate participants' confidence and skills in using insect-based ingredients, with answers limited to "Yes" or "No." They explore whether participants feel competent in preparing insect-based bread, cooking with fried insects, and pairing insects with first courses (such as pasta or rice) or second courses (like meat, fish, or vegetables). Additionally, the questions assess participants' understanding of food safety practices

when handling insects, their confidence in creating a signature dish that emphasises insect flavours, and their ability to plan a complete meal using insect-based ingredients. The responses indicate that a significant number of participants answered negatively when asked about their knowledge of food safety regulations and best practices for handling and preparing insects. For the remaining questions, participants were evenly divided on whether they felt capable of preparing or cooking insect-based dishes and pairing insects with first or second courses. Similarly, responses were split regarding their confidence in creating a signature dish that highlights the unique flavour of insects and their ability to design a full- course meal centred on insect-based ingredients.

Scale E focuses on assessing participants' awareness and attitudes regarding the environmental sustainability of insect consumption. The questions explore beliefs about the potential of insects to contribute to global food security, support for initiatives promoting insect consumption for environmental protection, and recognition of insects as a more sustainable protein source than traditional livestock. Additionally, the scale addresses the need for stronger educational campaigns across Europe about the environmental benefits of insect consumption and evaluates respondents' familiarity with the advantages of insect farming over conventional livestock agriculture. The majority of respondents expressed positive views regarding the role of insects in global food security, recognising them as a sustainable protein source and affirming the need for educational campaigns on the environmental benefits of insect consumption. They also indicated familiarity with the environmental advantages of insect farming compared to traditional livestock agriculture. Interestingly, responses were evenly split when it came to supporting initiatives aimed at promoting the acceptance of insect consumption for environmental protection. Finally in response to the question of whether participants had ever eaten insects, the vast majority answered negatively. However, when asked if they had ever cooked insects, all respondents indicated that they had not. Taking into consideration all the above research results highlight a distinct aspect of Cypriot culture regarding insect consumption.



Exploring contemporary attitudes toward insect consumption in Cyprus reveals a complex interplay of historical roots, cultural significance, economic considerations, and existing stereotypes. While some Cypriots may hold traditional views shaped by historical practices, others approach the idea of consuming insects with curiosity or skepticism, influenced by modern Western dietary norms. Despite the UNESCO recognition of the Mediterranean diet, which emphasizes sustainability and local produce, insect consumption remains largely uncharted territory in Cyprus. Bridging the historical gap and reshaping perceptions to highlight the benefits of incorporating insects into the diet is essential. Consumer education and awareness campaigns will play a crucial role in dispelling myths and fostering a more positive outlook on insect-based products.

As an EU member, Cyprus must comply with Regulation EU 2015/2283, which governs novel foods, including insects. This regulation classifies whole insects and their preparations as novel foods that require authorization for lawful marketing within the EU. The uncertainty surrounding the qualification of insects under previous regulations has led to varied approaches among member states. To address the challenges of insect consumption, Cyprus can explore innovations in insect farming that promote sustainable practices. These may include efficient waste recycling systems, advanced farming techniques, and partnerships between government and private sectors. A multidisciplinary approach involving agriculture, environmental science, and cultural studies is necessary to implement these innovations. Engaging local communities and integrating traditional knowledge will also contribute to the success of insect farming initiatives.

2.10.3. Italy

The 14 chef respondents and 70 consumer respondents were a mix of males and females across different age groups, with a slight skew towards male respondents in both surveys. Interestingly, the willingness to try insect-based products did not show significant differences across gender lines, although younger respondents (below 50 years) generally expressed more openness towards trying insect-based foods in various forms. Many of the respondents, particularly among chefs, had higher educational backgrounds (university degrees). This factor seemed to correlate with greater openness to experimenting with insect-based foods, especially when considering processed or disguised insect ingredients. This may suggest that more educated individuals are more open to innovation in food choices, especially when presented with information about the environmental and nutritional benefits of insects.

The **consumer** survey reveals some notable trends regarding the acceptance of insect consumption. First of all, a significant portion of the consumer respondents were reluctant to eat insects in their original form, with **most respondents (about 86%) indicating a refusal** to consume whole insects. This result highlights a clear cultural or psychological barrier to consuming insects in their natural state, often due to the "yuck factor" or unfamiliarity with this type of food. Slightly more openness was observed when insects were offered in a fried form. However, **a majority (64%) still expressed disinterest in eating fried insects**, indicating that even with a more familiar cooking method, the reluctance remains strong among consumers. One of the more promising findings is the increased acceptance of insect-based products when presented as flour incorporated into familiar foods. About **half of the respondents (50%) were open to consuming insects in this form**, such as in burgers, pasta, or snacks. This suggests that disguising the insects' original appearance and texture could significantly improve their acceptance among the general public. When asked about their prior experience, the majority of consumers had never eaten or cooked with insects. This lack of exposure further contributes to the reluctance to try insect-based products. **Only a minority had ever eaten (43%) or**

prepared insects (none had cooked insects themselves), underlining the novelty of this food category in Italian consumer habits.

The responses from **chefs** largely mirrored those of consumers, with a few key differences. Indeed, similar to consumers, **most chefs (86%) were unwilling to work with insects in their original form**, indicating that even culinary professionals share the same hesitations when it comes to presenting insects in a recognizable form to their customers. Chefs, however, demonstrated greater openness to working with processed insect products. Many chefs **were willing to incorporate insect-based flours** into their dishes, signaling a potential pathway for introducing these products into the restaurant industry. They acknowledged that using insects in processed forms, where their texture and appearance are masked, could be more palatable to their clientele. The majority of chefs had little to no direct experience with cooking insects. **None of the respondents had ever prepared insects**, and only a few had tasted insect-based dishes. This lack of exposure among chefs highlights a gap in both culinary education and consumer familiarity, which will need to be addressed if insect-based foods are to become more common in restaurants.

Both consumers and chefs showed clear hesitation towards eating or preparing insects in their original form. The visual and textural characteristics of whole insects likely play a significant role in this reluctance. These barriers are deeply rooted in cultural perceptions and will require targeted educational campaigns to overcome. There is a notable shift in acceptance when insects are processed into forms such as flour, where their original appearance is masked. Both chefs and consumers are more willing to experiment with insect-based products when integrated into familiar foods. This suggests that innovation in product presentation and marketing could be key to introducing insects into mainstream consumption.

The overwhelming lack of experience with eating or cooking insects among both chefs and consumers points to a significant gap in knowledge and exposure. Providing opportunities for tasting and experimenting with insect-based foods, especially in controlled and familiar

culinary settings, could help reduce the unfamiliarity and discomfort associated with entomophagy.

Finally, there is a clear need for increased education about the nutritional and environmental benefits of insect consumption. For both consumers and chefs to embrace insect-based products, information campaigns that emphasize sustainability and health benefits will be crucial. In particular, chefs could be key advocates in normalizing these products through creative and appealing dishes.

The findings from both the consumer and chef surveys indicate that while there is significant potential for insect-based foods in Italy, particularly in processed forms, overcoming cultural and psychological barriers will require focused efforts in education and product innovation. Chefs, as influential food professionals, could play a role in introducing these products to a wider audience, especially if they can creatively incorporate insect-based ingredients into familiar dishes.

2.10.4. Romania

During the administration of the questionnaire to professionals in the HoReCa sector in Romania, several significant concerns were raised by the participants. A notable level of reticence was observed, primarily due to the non-anonymous nature of the form. Respondents indicated apprehension that their answers could be misinterpreted, particularly regarding questions about their potential involvement with cooking or consuming insects. This led to a discernible hesitation in providing candid responses, as many feared that their participation might be perceived as tacit admission to having engaged with insect-based food practices.

Furthermore, the feedback we received from a substantial number of participants indicated that the tone of some questions was perceived as uncomfortable, with descriptions ranging from "displeasing" to "disgusting." This reaction underscores the sensitivity around the topic of insect consumption within the industry, suggesting a need for careful framing and question design in future iterations.

Additionally, several respondents recommended the inclusion of binary, yes/no options for key questions related to insect consumption and preparation, such as: "Have you ever eaten insects?", "Would you eat insects?", "Have you ever cooked insects?", and "Would you ever cook insects?". Such a format would likely reduce discomfort and offer a more straightforward way for participants to express their opinions or experiences without the potential for ambiguity.

In light of this feedback, it is evident that future surveys on this subject would benefit from a more tactful approach, with enhanced sensitivity to the personal and professional reservations of the participants. Moreover, adjusting the structure and anonymity of the form could lead to more accurate and comprehensive data collection.

2.10.5. Spain

In Spain, the intentions and propensity to consume insects reflect a moderate level of openness. With a score of **20.41%**, the country's willingness to embrace insect-based foods suggests that while there is some interest, the general readiness to adopt this dietary shift remains relatively low compared to other countries.

However, Spain stands out in terms of technical knowledge about the properties of insects. Scoring **98.36%**, this indicates that Spanish consumers and professionals possess a high level of awareness regarding the nutritional and environmental benefits of insect consumption. This puts Spain on par with Italy in terms of understanding the potential advantages of insects, even if this knowledge has not yet resulted in widespread consumer adoption.

Regarding prejudices and cognitive biases against insects, Spain fares relatively well. With a score of **26.30%**, the resistance to the idea of insect consumption is lower than in countries like Italy and Greece, although it is still slightly higher than in Cyprus. This indicates that while cultural and psychological barriers exist, they are not as pronounced in Spain as in some other countries.

Finally, Spain ranks highly in recognizing the environmental benefits of insect consumption. With a score of **40.14%**, Spain shows significant awareness of the positive impact that insects can have on sustainability and resource efficiency. This suggests that environmental concerns could play a key role in encouraging greater acceptance of insect-based foods in the country, potentially making them more appealing to eco-conscious consumers in the future.

The conclusions about Spain from our " Social Psychology Research for the Measurement of Attitudes, Beliefs and Perceptions about Insects Consumption" document is consistent with findings from various additional sources. Spain shows moderate but growing interest in eating insects, technical knowledge about their properties, moderate/high levels of prejudice which are decreasing, and high recognition of their environmental benefits. These trends are supported by reports and studies from the FAO, EFSA, European Commission, and other academic and policy sources.

It is important to notice also, that there is a great reluctance even to just answer the survey among professionals of the HoReCa sector, who informally told us during the dissemination of the questionnaires, that they are not interested in the topic and have a great fear in terms of bad reputation for their restaurants and enterprises giving the idea that they are using insects in their meals. Likewise, among final consumers we found a great reluctance to answer the survey, mentioning that they are absolutely not interested in these ingredients when we have a Mediterranean Diet with high quality and delicious ingredients produced in the country, not understanding the need to use insects in cooking.

By comparing these conclusions with multiple sources, it is evident that the analysis in the document is well-aligned with broader research and trends observed in Spain.

2.10.6. Greece

The 27 responses from **chefs** in this study revealed a complex relationship with the idea of incorporating insects into their culinary repertoire. While most chefs expressed a general

openness to trying insect-based products, they exhibited notable hesitation when it came to consuming insects in their original form. Specifically, a significant number of chefs were not comfortable with the idea of eating insects that retained their natural appearance, such as whole crickets or mealworms. This reluctance was evident in their responses, with **80% stating they would not eat insects** in their natural, unprocessed form. However, attitudes shifted when it came to more familiar or processed forms of insects. A large portion of chefs were more willing to experiment with fried insects, with **80% indicating they would try them**. Moreover, their openness increased further when insects were presented in powdered or flour form, integrated into products like pasta, burgers, or snacks. In fact, **60% of chefs stated they would be willing to consume insects as part of a dish if they were processed into flour**. This highlights a key insight: chefs are more likely to embrace insects when they resemble familiar ingredients and can be seamlessly incorporated into recipes.

Interestingly, when it came to the idea of using insects as a protein supplement—particularly for athletic or dietary purposes—chefs showed a mixed response. Roughly half were open to the idea, while the other half remained skeptical. This division suggests that while chefs are intrigued by the nutritional potential of insects, the concept of incorporating them into everyday diets still requires more exploration and perhaps greater evidence of their benefits.

It is important to note that many chefs had already encountered insects as part of their professional experience. About **50% reported having eaten insects before**, and a similar percentage had also cooked with them. This prior exposure likely contributes to their somewhat more adventurous approach compared to consumers. However, despite this experience, chefs' acceptance still hinges largely on the way insects are presented—processed and disguised within more familiar foods are far more acceptable than whole insects on a plate.

On the **consumer** side (63 answers), the story is one of greater reluctance. While some consumers expressed curiosity, a significant portion remained hesitant about the idea of eating insects, particularly when presented in their natural state. Only a small fraction of consumers, approximately **30%**, were open to the idea of eating whole insects, a figure that reflects a clear discomfort with the concept.

However, like the chefs, consumer willingness increased slightly when insects were presented in a more familiar context. For example, when asked about fried insects, the response was more favorable, with **50% of consumers expressing willingness to try them**. This shift suggests that preparation methods that alter the appearance or texture of insects can help mitigate some of the initial aversion.

Interestingly, when it came to insect-based flour products, consumers were more divided. Whereas some consumers (around **40%**) showed interest in trying insect-based flour products, a slightly higher percentage remained skeptical. This ambivalence highlights the fact that, while processing insects into flour may make them more palatable for some, the general idea of eating insects—whether visibly present or not—remains a challenge for many consumers.

The idea of incorporating insects into their diet for fitness or nutritional purposes was also met with resistance. More than **60% of consumers stated they would not be interested** in using insect-based protein supplements as part of their fitness regime. This indicates that, despite the growing trend of alternative protein sources in health-conscious circles, insects have not yet gained significant traction in this domain.

Moreover, consumers reported far less direct experience with insects compared to chefs. Only a small number had eaten insects in the past, and even fewer had ever cooked with them. This lack of familiarity may contribute to their more cautious stance, as novelty often breeds skepticism.

From the data, it is clear that both chefs and consumers share a fundamental hesitation when it comes to eating insects in their natural, unprocessed form. Whole insects are seen as unappetizing by the majority of both groups, though chefs, with their professional experience and exposure to food trends, show a greater openness to experimenting with them in processed forms.

What stands out is the shift in perception once insects are transformed into more familiar products. Both chefs and consumers demonstrated a higher willingness to try insects when presented as flour-based products or fried snacks, indicating that the key to increasing insect consumption may lie in how these foods are introduced. The challenge lies in presenting insects in a way that minimizes the “novelty factor” while emphasizing their nutritional and environmental benefits.

While consumers remain cautious, chefs, with their adventurous spirit and professional responsibility, could serve as important advocates for normalizing insect-based foods. Their role in introducing new culinary trends and making insects more approachable through creative recipes and familiar presentations will likely be pivotal in shifting consumer attitudes over time.

Ultimately, the findings suggest that for insects to gain broader acceptance in Western diets, especially in Greece, they will need to be integrated subtly and creatively into foods that people already enjoy. A focus on processing insects into more recognizable formats, such as protein powders, flours, and snack foods, alongside public education campaigns about the environmental and health benefits of insects, will be key strategies for overcoming the initial hesitation displayed by both chefs and consumers alike.

Conclusions

The conclusions of this research on insect consumption in Turkey and various EU countries, such as Spain, Italy, Cyprus, Greece, and Romania, highlight both the opportunities and challenges associated with the promotion of insect-based foods. The findings suggest that, while there is significant potential for insect consumption to contribute to sustainability, food security, and economic development, several barriers must be addressed for its broader acceptance.

One of the strengths identified is the environmental and nutritional benefits that insect consumption offers. Insects require fewer resources than traditional livestock farming, producing less greenhouse gas emissions and using significantly less water and land. This makes them a highly sustainable alternative protein source. Moreover, insects are nutrient-rich, providing essential vitamins, minerals, and proteins that can address nutritional deficits, particularly in regions where food security is an issue.

However, the research also highlights significant cultural and psychological barriers to the acceptance of insects as food. Many consumers, particularly in Europe, hold deep-seated prejudices against entomophagy, viewing insects as unsanitary or unsuitable for human

consumption. Overcoming this "yuck factor" requires concerted efforts in public education and awareness campaigns that focus on the environmental and health benefits of insects, as well as introducing insect-based foods in familiar and appealing forms. Products like insect flour, protein bars, or snacks, which disguise the insects' original appearance, may be more acceptable to consumers.

The regulatory framework for insect consumption is another critical area that requires attention. Although the EU has made strides in approving certain insect species as food under the Novel Food Regulation, the implementation of these regulations is uneven across member states. Countries like Turkey, Greece, and Cyprus face additional challenges due to a lack of clear, comprehensive guidelines governing the production, processing, and marketing of insect-based products. Strengthening these regulations and aligning them with EU standards is essential to ensure food safety, consumer protection, and the successful commercialization of insect-based foods.

Additionally, the research underscores the importance of fostering entrepreneurship and innovation in the insect farming sector. Government incentives, support for startups, and investment in research and development can drive innovation in insect farming techniques and product development. Collaborations between academia, industry, and government agencies can also generate valuable insights into overcoming technical and logistical challenges in the supply chain, ensuring that insect-based foods are accessible to a wider audience.

Finally, the role of chefs, restaurateurs, and food professionals is highlighted as a factor in promoting insect-based cuisine. These professionals can act as ambassadors for entomophagy by introducing innovative dishes that incorporate insects into traditional culinary practices. Government initiatives that support culinary innovation, chef training programs, and partnerships between restaurants and insect producers can help mainstream insect-based foods in the dining industry.

In conclusion, the research shows that while insect consumption offers significant opportunities for sustainability, economic growth, and public health, achieving widespread acceptance requires a multifaceted approach. This includes developing supportive

policies, enhancing consumer education, fostering innovation, and addressing cultural perceptions.

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