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Empirical Study on Consumer Acceptance of Cultured Meat in Europe

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Masters in International Management

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BUSINESS
SCHOOL

Department of Marketing,
Strategy and Operations

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Resumo

A comida é parte integrante da vida cotidiana, das opções disponíveis vamos sondar o consumo de carne. A carne tem muitos problemas, vários desses problemas estão ligados à tecnologia, à industrialização da produção de carne que tem levado ao aumento do estresse em animais, ambientes e pessoas (Galusky, 2014). Devido à atual crise global de saúde causada pelo COVID - 19, muitas pessoas estão introspectando suas causas e efeitos e mudando hábitos, percepções e comportamentos em relação às suas escolhas alimentares diárias. Entender um desses substitutos é a carne cultivada e sua aceitação nos países europeus, uma vez que a comercialização dessa tecnologia é cada vez mais interessante e com maior viabilidade. Ainda assim, enfrenta um nojo imprevisível de comida que poderia ser enfrentado positivamente por meio do conhecimento do produto e destacando a técnica de produção de carne convencional dos dias modernos. De forma geral, esta tese tem como objetivo explorar e buscar a relação entre diversas variáveis como sócio-demografia, neofobia alimentar, disponibilidade do produto, vontade de experimentar e vontade de recomendar daqui em diante concluindo as objeções e expectativas mais importantes dos consumidores.

Palavras-chave: Pesquisa e desenvolvimento, Mudança Tecnológica, Marketing

JEL: O3 – Pesquisa e desenvolvimento, Mudança Tecnológica & M3 – Marketing and Advertising

Abstract

Food is an integral part of everyday life, of the available choices we are going to probe meat consumption. Meat has many problems, several of those problems are tied to technology, the industrialization of meat production which has led to increased stresses in animals, environments and people (Galusky, 2014). Due to the current global health crisis caused by COVID – 19, many people are introspecting the cause and effects of the same and changing habits, perceptions, behaviours regarding their daily food choices. Understanding one such substitute is cultured meat and its acceptance in the European countries, since commercialization of this technology is growing interest and increasing greater feasibility. Yet it faces unforeseeable food disgust which could be positively tackled through awareness of the product and highlighting the modern-day conventional meat production technique. Overall this thesis aims to explore and seek relationship between various variables such as socio-demography, food neophobia, product availability, willingness to try and willingness to recommend henceforth concluding the most important objections and expectations of the consumers.

Keywords: Research and Development, Technological change, Marketing

JEL: O3 – Research and Development, Technological Change & M3 – Marketing and Advertising

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Researcher's Background

A brief overview of my background would enable to understand a consumer point of view towards the topic. I was born in India and quite immediately migrated to the Middle east grew up extensively eating Arabic cuisine as well as Indian cuisine. The Indian region and community I belong majorly consume meat therefore all my favourite dishes are meat based. The food reminds me of the traditional cooking styles of the region and generation passed down recipes. I am of the belief that food is not merely something that we eat regularly but infact it is something greater associated to an emotion, nostalgia, culture, history. You do not have to eat Michelin star food or 5 star grade food to feel these behavioural aspects towards food. I migrated back to India and had the privilege to try different cuisines from different households as well as different regions and states it brought me closer to my cultural background but also taught me much more about my own country through food.

I have studied and worked in 3 different countries and 2 different continents. The experience of learning culture, history, origins as enabled me to discover my passion for cooking and trying different cuisines. I have undertaken this research with the intention to educate myself since I deeply adore and care for animals, I believe if we carefully observe every animal we get to see a distinct personality in them. Since I grew up spending time around cows,dogs, elephants, chickens I can attest these animals have emotions. Yet, I find it extremely hard to give up eating meat and cannot see myself turning vegan or vegetarian therefore I am in the lookout for future advanced technologies to develop similar taste and looks of meat so that I can continue to enjoy my food without guilt and allow other creatures on this planet to live without the fear of being someone's next meal.

Chapter 1: Introduction

1.1 Contextualization of the research and relevancy of the study

My motivation to undertake this research project was by noticing an alleged root cause of COVID-19 as well as being a food enthusiast. There appeared a dimension between what is already offered to the consumers and what can be offered to the consumers to reduce the grave consequences of current conventional meat production methods. Since the product is not yet available in the retail market currently undergoing research and development as well as mass production assessment, I considered highlighting the reasons for our mundane food choices and provide a possible perspective for future food choices and expectations.

The world population is expected to rise to 2 billion people by 2050, resulting from 7.7 billion to 9.7 billion (United Nations, 2019b). This is expected to increase meat consumption especially in emerging and developing countries (Alexandratos & Bruinsma, 2012). Today, the world population approximately uses 50% of total habitable land for agriculture (Ritchie & Roser, 2013) (Annex K). There is a systematic failure primarily on part of human beings to take responsibility throughout the system of meat consumption. Today birds and animals anatomy are expected to develop at a perfect size, perfect weight so on and so forth. There is also a huge ethical debate on how we should treat animals since it is widely acknowledged that animals feel the same pain as humans (Shapiro, 2018). The most well-known diseases caused by livestock production is bovine spongiform encephalopathy (BSE) better known as mad cow disease and forms of influenza such as swine and avian (Understanding the BSE threat, 2002). In addition, high intake of meat has also many adverse effects on human health such as cancer, cardiovascular disease (Wolk, 2016). These viruses continue to adapt and evolve to multiple reservoir hosts including humans therefore posing major threats globally to the poultry industry as well as people (Song & Qin, 2020). As stated by the World Health Organization, one of the most prominent ways to prevent disease transmission through animals is through the increased use of antibiotics, this has led to the rise of multi-resistant bacteria hence humans indirectly through meat consumption become resistant to antibiotics. The organization views this problem as one of the greatest threats to human health. Another problem is maintained by the Animal Institute Welfare, Pennsylvania

regarding mass-produced animals, they have been held captive in cages, barns and feedlots curtailing their movement which creates stressful, crowded and unsanitary conditions along with painful mutilation or cutting of horns of cattle, beaks of chicken and docking the tails of sheep, pigs and dairy cattle (Inhumane Practices on Factory Farms, 2019). The animals are also held under conditions in which they do not get enough water to drink or healthy food to consume. Therefore these animals are injected with a fair share of antibiotics (Landers, Cohen, Wittum, & Larson, 2012). Research suggests, by producing 1000 kg of cultured meat compared to conventional meat, land use can be reduced by 99%, greenhouse gas emission by 96%, water use by 96% and energy use by 45% (Tuomisto & Teixeira de Mattos, 2011). Cultured meat could overcome the limits of conventional meat production and address the estimated increase in meat demand in the near future (Tuomisto & Roy, 2012).

1.2 Research Objectives

On the European side, the literature lacks studies on consumer perception regarding the packaging, safety certification and branding for the future sale of cultured meat. A more recent cross-national study involving Belgium, Portugal and the United Kingdom (Verbeke, Marcu, et al., 2015) revealed disgust and considerations of unnaturalness among the participants, they established only 5% to 11% of the respondents in their study mentioned they would eat cultured meat.

The overall objective of the project is to analyse various factors that can contribute to building acceptance of the product. This will be conducted in a concise, clear, accurate and interesting manner from the perspective of a future consumer, it will emphasize understanding of factors that enable to understand tastes, perception and value chain for the novel product in the European market and increase the acceptance that would eventually enable entities to consider important variables for the value proposition of their novel product. There is a wide agreement that food quality is a multifactorial and complex concept that evolves with time and societal priorities (Font-i-Furnols & Guerrero, 2014) therefore considering the rapidly changing time, this research is a matter to provide space for cultured meat.

1.3 Research Questions

To quote (Grunert, 2005) “More fragmented, heterogeneous and dynamic consumer demand creates opportunities for those producers and value chains that are willing to take the risk to differentiate their products, aim at serving specific target markets and adapt to local conditions even under the wings of a global marketing approach”.

1. Are Internal or External factors more important to try cultured meat.
2. What welfare consequences are more important ?
3. Could product awareness invoke demand?
4. Willingness to try and recommend cultured meat.

1.4 Expectations

Firstly the research will address the reasons and causes of conventional meat production, personally I believe if we do not look into the cause and effect we cannot understand the magnitude of damage we are inflicting on the environment. We can understand why the European Union is extensively pushing for change and supporting one meat substitute called *Cultured meat* that is likely to prove great success in the near future, Secondly I intend to highlight customer acceptance through various intrinsic and extrinsic attributes that could build awareness and enable willingness to try and recommend the product. Last but not the least, I would like to call to attention the major implications of meat consumption on human health, sustainability and animal welfare resulting in featuring the interrelationship between these aspects and the future of the world.

1.5 Structure

The following dissertation is divided into the following chapters

Introduction: It provides an overview of the topic and describes why this topic is important for future sustainence.

Literature Review: The literature review provides an elementary unit to understand cultured meat and its gradual progression towards acceptance by incorporating various elements into the product like extrinsic attributes such as packaging, safety certification, branding and

intrinsic attributes such as food neophobia. Also taking into account the pleasant terminology, source of product availability. These crucial aspects will be further utilized to discuss their influence on Sustainability, Human Health and Animal Health.

Research Design and Methodology: It examines the type of research conducted, how data was collected, selected and thereafter analysed. Moreover, the target sample was composed of 58 participants for the survey conducted originating from 11 different countries across the European Union, EEA and UK.

Results and Discussion: This chapter presents the main findings with plenty graphical representation in the form of graphs as well as explorative descriptive data to provide an objective approach.

Conclusions: The final chapters sums up all key findings, interrelations thereby elaborating on the limitations and future research prospects. Finally it culminates the main contribution.

Table 1.1 Structure of the Thesis

Chapter 1: Introduction = Brief overview of the thesis
Chapter 2: Literature Review = Foundation of the knowledge base
Chapter 3: Research Design and Methodology = Methods and approaches adopted
Chapter 4: Results and Discussion = Findings and Interpretations
Chapter 5: Conclusion = Culmination of main findings, limitations and contribution

Chapter 2. Literature Review

2.1 Conventional production of livestock and its consequence

According to Godfray, et al. (2010), the world nowadays encounters threefold challenges; First to meet the demand for food in the world with a rapidly growing population. Second, we have to meet the demand in the most sustainable way possible. Thirdly, ensure in the long term the poorest countries profit from food and do not starve. Production of livestock has an enormous environmental impact. The total land utilized for caring animals and growing crops for their consumption amounts to around 30% of the world's ice-free land surface and the supply chain is responsible for about 14.5% of global human-made greenhouse gas emissions (European Union, 2018). The United Nations Environment Programme (UNEP) and the European Commission have called for reducing meat consumption, they jointly published a report calling for radical change in the way the economy uses natural resources, stating there is an important opportunity to guide the transition in consumption in OECD and developing countries towards sustainability through policy settings and frameworks that privilege environmental friendly and socially just products and services (*1951 Sustainable Consumption*, 2015). According to Willet et al., 2019, In order to achieve a sustainable diet and enough food for people all over the world the recommended consumption per person per year should only be 10.22 kgs. The demand for protein is expected to grow 70% over the next 30 years as the global population increases significantly, Cargill has announced it would invest in Aleph Farms, a cultured meat company focused on growing complex meat varieties like steak with the outlook of keeping all options for protein on the table to feed people and deliver great-tasting protein ("Protein innovation: Cargill invests in cultured protein | Cargill," 2020). Current protein production is very expensive, the first public unveiling of cultured meat burgers was in August 2012 adding a great amount of marketability and awareness towards the product. In 2013 London, a cultured meat burger was tasted - tested in an effort to demonstrate proof of concept and edibility. Funded by Google Sergey Brin, was purported to cost €250,000. The same burger was described to have the taste of cake (Fountain, 2013). The fundamental issue that most companies are trying to solve is to imitate a typical muscle, replacing blood vessels, connecting tissues. While consumers may likely place lesser importance to the issue due to lack of existence

and uncertainty of availability of the product (Goodwin and Shoulders, 2013) consumer insight will be indispensable for future marketplace acceptance. Either meat consumption must be cut by more than 80% which is highly unlikely or more sustainable protein-based options must be available (Ramona et al. 2019).

2.2 Cultured Meat

Many people have become sensitive to the suffering and slaughtering of farm animals (Ruby, 2012). Cultured meat is one out of a number of alternative proteins which help reduce the demand for meat from animals in the future (Bryant & Barnett, 2018). Cultured meat is produced within in vitro cell culture of animal cells without slaughtering the animal, it is a form of cellular agriculture (Stephens et al., 2018) and has the potential to address ethical, environmental and public health issues associated with conventional meat production (Bryant & Barnett, 2020). The function of the stem cells within an animal is to create new muscle tissue when the muscle is injured, this innate function enables the growth of new stem cells which can be generated into cultured meat. The cells are placed in a bioreactor containing nutrients and necessary growth factors allowing them to multiply just like fermented beer and sauce. The cells are conducting the same function as inside an animal but will be administered in a controlled environment. Many argue the standard reference of the product should be changed into something that does not confuse, scare consumers and enable acceptance. A study conducted by (Shapiro, 2018) resulted in the name “clean meat” as the most appealing. However in many scientific papers the most common reference is still cultured meat. Four surveys have investigated the rate of personal willingness to consume cultured meat (Dupont and Fiebelkorn et al, 2020; Weinrich et al., 2019; Verbeke et al., 2017; Mancini and Antonioli, 2018).

2.3 Regulation instated by European Union

Scientific progress has opened and continues to do so, in opening doors to unprecedented food scenarios by providing new technologies which often require a new framework to assist both consumers as well as producers. Within the European Union, the legislator has approved Regulation (EU) 2015/2283 on novel food, defined as food that was not used for human consumption to a significant degree within the EU before 15 May

1997, which is when the first regulation on the novel food came into existence (Regulation CE 258/1997). The present study shows that cultured meat could have the potential as new production methods are required, if consumers see ethical advantages, transcend disgust and tap into a sense of optimism on a global scale. (Weinrich, Strack, & Neugebauer, 2019) has concluded the challenges researchers and marketers face is to find the best communication methods, the best product design and placement to make consumers purchase and enjoy cultured meat on a regular basis . At this point in time, it is still open to debate when all related to institutional, governmental, social, political issues will be resolved so that cultured meat can be a marketable product. Two recent reviews identified about 15 different issues impacting on consumer acceptance of novel agro-food technologies in general (L.J. Frewer et al., 2011) while (Hopkins and Dacey, 2008) proposed about a dozen possible objections that might be provoked if a product like cultured meat would be available in the market. The perceived naturalness of food production technology and naturalness of food has been shown to strongly influence the acceptance of innovative food technologies (Siegrist, 2008). Furthermore in another study respondents with higher meat consumption were more willing to try cultured meat (Mancini & Antonioli, 2019).

2.4 Studies on Customer Acceptance

The analysis of consumer perception towards meat attributes is important to understand and predict their behaviour (Grunert, Bredahl & Brunso, 2004). Food production and technology generates ethical discomfort while providing material comfort, the technology that serves as the source of disaster and the promise of progress. For European consumers, the indication of meat origin is mandatory taking significant importance and is associated with product safety (Ehmke, 2006; Schupp & Gillespie, 2001). The debate on cultured meat currently relies on consumer acceptance as a necessary but not sufficient factor. The results of consumer studies indicate that consumers intend to support cultured meat because of the positive benefits derived for animal welfare and the environment (Bryant & Barnett, 2018) however consumers are also skeptical towards consuming cultured meat due to the feeling of disgust, unnaturalness and negative sensory expectations (Bryant & Barnett, 2018). Consumer insight has always been a

crucial factor to ensure that the new developments were in line with consumer perception and preferences to enhance the likelihood of commercial success (Gruhert et al., 2011).

2.5 Factors influencing Purchase Decision

Purchase intention is a plan or intention regarding the purchase of a certain product or service in the future (Paul & Fred, 1985), it can be used to measure a specific product buying possibility of the consumers (Schiffman & Kanuk, 2004).

2.5.1 Packaging, Safety Certification and Branding

Much of the information that consumers receive is through advertisements, labels, brands and information specific campaigns (Font-i-Furnols & Guerrero, 2014). Packing is a relevant marketing tool and it is especially important in creating competitive advantages (Rundh, 2009). It is not merely an element that contains and protects a product rather it also defines product quality (Venter, van der Merwe, de Beer, Kempen, & Bosman, 2010). Various authors have emphasized the importance of packaging from a marketing perspective (Peters-Teixeira & Badrie, 2005). It acts as a vehicle for communication due to its colour, message, design and for (Silayoi & Speece, 2004) increasing relevance especially due to the rise of self-service establishments. In this sense, packaging favours product identification and differentiation as well as brand identity and value (Ampuero & Vila, 2006). In any event, brand presence on meat is synonymous with a guarantee of wholesomeness, traceability and authenticity of the product (Grunert, Bredahl, & Brunsø, 2004). This finding calls into question the idea of global packaging design that can be applied across different cultures considering the growing tendency to import products from various countries. Convenience entities are at an ever-growing demand and rise since they enable the ease of product availability for consumers. In particular, consumers have a positive willingness to pay for their own country of origin meat (Ehmke,2006).

2.5.2 Food Neophobia and Food Disgust

Previous research on human food neophobia has led to the development of two psychometric instruments that can be used to measure individual differences in willingness to try novel foods. Food neophobia is defined as a person's aversion to novel foods (Pliner & Hobden, 1992), specifically designed to measure individual differences in food neophobia. It is common during childhood and can extend into adulthood (Kaar, Shapiro, Fell, & Johnson, 2016). It has received considerable attention as an explanatory construct in recent decades, it reflects primarily the degree of reluctance to consume foods that are novel, and particularly those from other food cultures (Pliner & Pelchat, 1991). The negative influence of food neophobia on the willingness to consume the meat alternatives which had previously been reported in other studies will be studied. Consumer attention towards animal welfare was confirmed by several studies conducted at European Level (Troy & Kerry, 2010), the concept is being closely linked to increased meat quality and influenced the Willingness to Pay (WTP) of consumers for animal friendly certified products (Toma et al., 2012). (Egolf, Hartmann, & Siegrist, 2019) found that disgust sensitivity predicts low acceptance of new food technology applications therefore they proposed stressing similarities of the new and the conventional alternatives in communication strategies for the introduction of novel foods. According to (Bryant & Barnett, 2018) the less information potential customers have the better however I differ from the ideology primarily highlighting in today's day and age with an abundance of information consumers are looking for relatability and items close to their ethics, culture and understanding. According to (Lazzaroni, Iacurto, Vincenti & Biagini, 2008) consumer preferences are tightly rooted in traditional foods whereas place-based and food quality are mainly equated to the naturalness of the product. According to Nielsen (2016), 55% of Italian consumers look for 100% natural products, 49% and 43% look for those free of artificial colours and flavours respectively. 41% desire GMO - free foods and 21 % prefer vegetable-based protein foods. Italian consumers are far from the solid acceptance of novel food due to unfamiliarity like GMO (Frewer et al., 2011). (Verbeke sans et al, 2015) showed that unfamiliarity leads to lack of trust uncertainty. Food neophobia is a continuous personality trait usually manifested in the unwillingness to try or even fear of trying unfamiliar food (Shepherd, 1990). Advancing globalization and increasing cultural

diversity, food neophobia may also negatively impact on some food production industries and markets especially with regards to increasing consumption of novel food throughout the world (Henriques, King, & Meiselman, 2009).

2.5.3 Animal Welfare & Sustainability

In developed countries, a product's extrinsic attributes are becoming a pivotal factor for consumer choices often involving externalities of the production process concerning the environment, animal welfare and the potential impact on food security in less developed countries (Grunert, 2006). Notably (Gijmez-Luciano, Vriesekoop, & Urbano, 2019) found that respondents from Spain showed a higher willingness to consume the insects compared to respondents in the Dominican Republic who highlighted a higher willingness to try cultured meat. Germany was included in the (Special Eurobarometer, 2005) where "Growing meat from cell cultures so that we do not have to slaughter farm animals". Two studies (Grace Calheiros & Oliveira, 2015a; de Boer et al., 2014) showed that higher meat consumption frequency and positive attitudes towards meat (Graca et al, 2015) were associated with lower willingness to reduce meat consumption. In contrast, knowledge about the topic and sustainable food choices were associated with higher willingness to change meat consumption behaviour (Verain et al., 2015; de Boer et al., 2014). The results of consumer studies indicate that consumers intend to support CM because of the positive benefits derived from an environmental standpoint and animal welfare (Bryant & Barnett, 2018) but consumers are also very skeptical when it comes to the decision to consume cultured meat due to feelings of disgust, unnaturalness and negative sensory expectations (Verbeke, Sans, & Van Loo, 2015). To the best of my knowledge, no extensive research has been carried out considering a sample throughout Europe trying to identify food neophobia along with extrinsic and intrinsic attributes influencing the acceptance of novel food.

Based on extensive research on this novel product it is revealed that people utilise various sensemaking strategies to discuss cultured meat. Therefore it is very evident, that various extrinsic attributes and intrinsic attributes enable customer to associate a certain brand identity towards the product that enable the willingness to try as well as accept the novel product introducing change in perception and improvement in consideration.

Chapter 3: Research Design & Methodology

3.1 Research Design

The purpose of this research design is to explore factors that can influence consumer's acceptance of cultured meat in Europe. In order to conduct this, (Saunders et al. ,2007) Research Onion framework is used to exhibit the most relevant research design methods which will form a base to further analysis. The research project is guided by the pragmatist research philosophy which helped me get a holistic view and a better understanding of the cultured meat market. This approach helped me indicate and understand the current perception towards food safety, food innovation, animal welfare, market trends and sustainability thereby understanding how society and people can benefit from the future novel product.

3.2 Research Methodology

The following chapter examines the methodological approach adopted to collect, collate and analyze data which is the foundation of the thesis. It describes the data collection methods and the way the data was conceptualized and further processed. It also highlights the reasoning behind the research questions for the survey.

3.2.1 Research Approach

My research approach for this project is an abductive approach as I did not want to consider moving from theory to data or data to theory. The abductive approach involves sorting out the facts in order to attain an idea of what we find before us (Åsvoll, 2013). The application of this approach enabled me to use different research methodologies in order to collect detailed and rich literature as well as streamline and formulate precise survey questions. This approach further allowed me to not only examine various variables on willingness to try but also to analyze how various novel food entities would be able to inculcate these basic practices in their existing value proposition. Subsequently, these findings were tested using new data in order to find the right methodological extrinsic and intrinsic choices and strategies that can be further pursued. The outlook is to receive external validity to achieve marketing objectives, food scientists must incorporate certain elements of consumer purchase behaviour, demand and acceptance and the marketing context in which food products would be consumed.

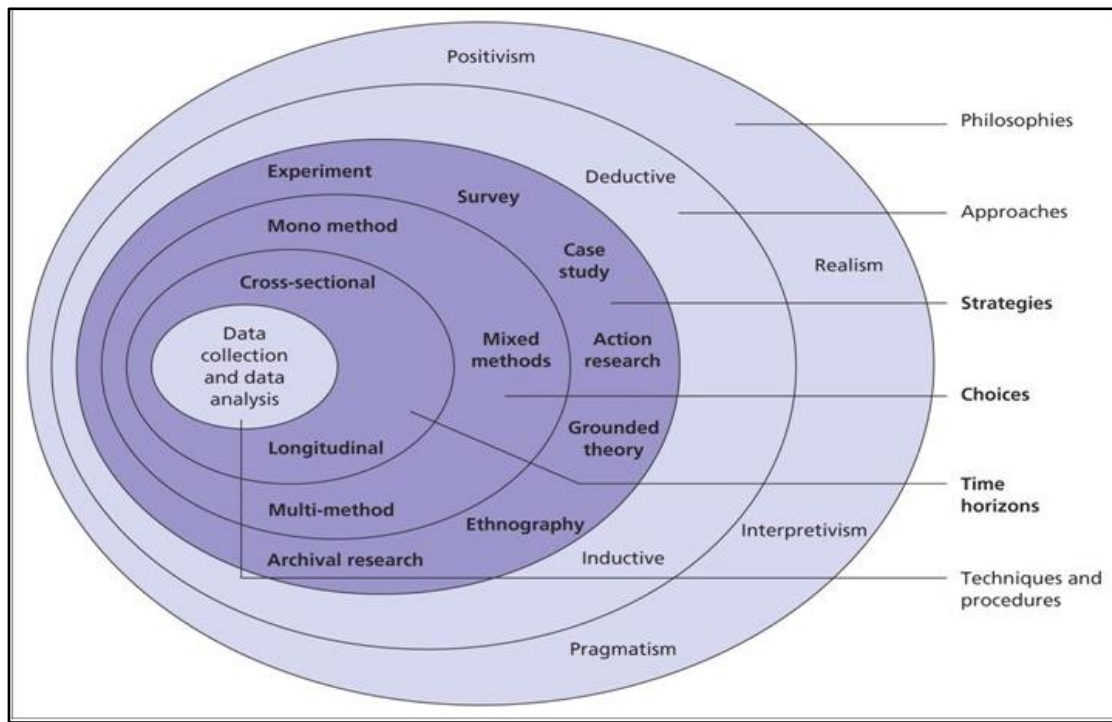


Figure 3.1 - Onion Research Methodology - Source : Saunders et. al, 2007

3.2.2 Research Strategy

In order to conduct this research, my primary research analysis included a survey. A series of both predefined questions, and open-ended questions, were used as an instrument to collect information from participants in the sub divided age group, through my network (Phillips, 2017) therefore *snowball sampling* was adopted. The survey was constructed in English and the questionnaire was circulated throughout my professional and personal network of people residing in Europe or who have lived in any of the European countries in the last 5 years this also included respondents from the United Kingdom and EEA since they majorly follow the European food law.

Further, the time horizon chosen for this section is cross-sectional. A cross-sectional study describes a group of subjects at one particular point in time (Campbell, Machin, and Walters, 2007). The cross-sectional study will help me in looking at the data from a defined set of the target customer segment at one specific point of time collected over a short study time duration. The approach that I used revolves around exploratory

and evaluative studies. This allowed me to gather information about food neophobia that are used by various researchers in order to understand the likes and dislikes associated with food. It has enabled me to understand how various food brands in the health and nutrition sector have benefitted out of this scale and finally on how one can receive a brief understanding and learn from the data collected in their novel product awareness efforts. Evaluative research is conducted to analyse the future acceptance through various factors such as taste, product availability, safety, packaging and animal welfare which various cultured food entities would offer in comparison to what consumers are expecting as well what is already existing in the market through competitor brands.

3.2.3 Sampling techniques

As mentioned earlier, a survey was conducted using the snowball sampling method as it allowed me to generalize data collected from my networks. While larger samples give a better estimate of the population, it can also be difficult to obtain an adequate number of responses as not everyone who is sent out a survey shall end up filling the questionnaire as well the time constraints resulted in accumulation a sample size of 58. Techniques to increase the response rate were also implied by making the questionnaire easy to understand, sending reminders to fill up the questionnaire while at the same time sending it among those individuals who were most likely to respond (Clark et. al. 2003). The ethical practices were conducted by taking the considerations of the participant in account therefore the survey was anonymous. The survey was done with total honesty, confidentiality and transparency. The primary research method in this thesis consists of a quantitative survey, leveraging the time provided by the current pandemic of COVID - 19 to allow participants to introspect thereafter observing changing food habits and requirements.

3.2.4 Questionnaire Design

In a study conducted by Loureiro and Umberger (2007) experiments were performed to analyse the consumer's willingness to pay (WTP) a premium for a product guaranteed with various important meat attributes such as origin, labels, traceability, tenderness and certification. The results underline how consumers would prefer to pay a premium in

chronological order first for safe and certified meat, second for traceable meat, third guaranteed origin meat, fourth tender meat therefore extrinsic attributes such as packaging, safety certification and branding were considered. The attributes based on taste, smell and colour of the product also placed very high importance we try to understand this through the food neophobia scale and food disgust. The addition of other attributes that influence purchase decision and acceptance towards a novel product were also incorporated such as terminology, source of product availability.

The survey in this study consisted of 12 broad questions but had subcategories resulting in a total of 28 questions, which included a mixture of open-ended questions, closed-ended questions, Likert questions, rating scale questions and ranking scale questions. According to (Foddy, 1993: 127). In a study conducted by (Verbeke, Sans and Van Loo, 2015) additional information provided prior to the survey can influence the answers received particularly while highlighting environmental benefits regarding cultured meat, this eventually resulted in the positive perception of Belgians. I wanted to understand the need of positive perception based on awareness henceforth prior awareness about the product was questioned and thereafter in section 2 of the survey the beneficial aspect of producing cultured meat without harming the animal. This survey was conducted using Google forms and thereafter the analyse was conducted using JAMOVI. To those that are skeptical regarding the subject matter all the Likert scales questions had a midpoint - Neither agree nor disagree. These surveys consist of differences likely underpinned by differences in sample size, country, the description provided, question design and socio-demographic outline.

The idea behind including survey participants from different locations around Europe was to understand the general consumer acceptance of cultured meat. The survey consisted of open ended and close ended questions to identify concise answers yet also allow the participants to put forward their opinion. I started analyzing the data by using the software *Jamovi*, below in the detailed descriptive exploratory analysis of each question.

Chapter 4: Results and Discussion

4.1 Results

Meat experience consumption characteristics and quality attributes determine the purchasing decisions of an individual (Becker, 2000). This chapter provides an objective report of the results and findings of customer acceptance towards cultured meat. More specifically, it will exhibit different factors observed from the survey answers. The first section will primarily explore the socio demography of the sample ($n=58$)(Figure 4.1) as well as the prior awareness about the product (Figure 4.1). The second section will explore the importance of extrinsic attributes such as packaging, safety certification, branding (Figure 4.3), the food aversion of individuals based on the food neophobia scale (Figure 4.4), future product availability setting (Figure 4.5) and suitable adoption of terminology (Figure 4.6). The third section entails food disgust(Figure 4.7), important extrinsic attributes like sustainability, human welfare and animal welfare(Figure 4.8). In the literature review, it was mentioned that much of the information that consumers receive is through advertisements, labels, brands and information specific campaigns (Font-i-Furnols & Guerrero, 2014) therefore the end result is to determine if awareness could invoke prospective demand for the product.

In a study conducted on German participants (Weinrich, Strack, & Neugebauer, 2019) broadly evaluating 57% intending on trying it and only half of those interested also anticipate consuming cultured meat on a regular basis or prompting it to friends. Another study conducted in Belgium by (Verbeke, Sans, & Van Loo, 2015) suggested 23.9% and 42.5% of Belgian participants indicated their willingness to try cultured meat on a 3 point scale. A more similar share of 54% resulted in a recent Italian survey (Mancini & Antonioli, 2019).

4.2 Socio – demography

According to (Mancini & Antonioli, 2019) age significantly impacted the preferences. Participants under the age of 25 years express a more positive perception of cultured meat as opposed to others. Out of the 58 respondents the majority answering the survey were of the age group 26 – 35 years at 55%, the second highest were in the age group 18 - 25 years (Figure 4.1).

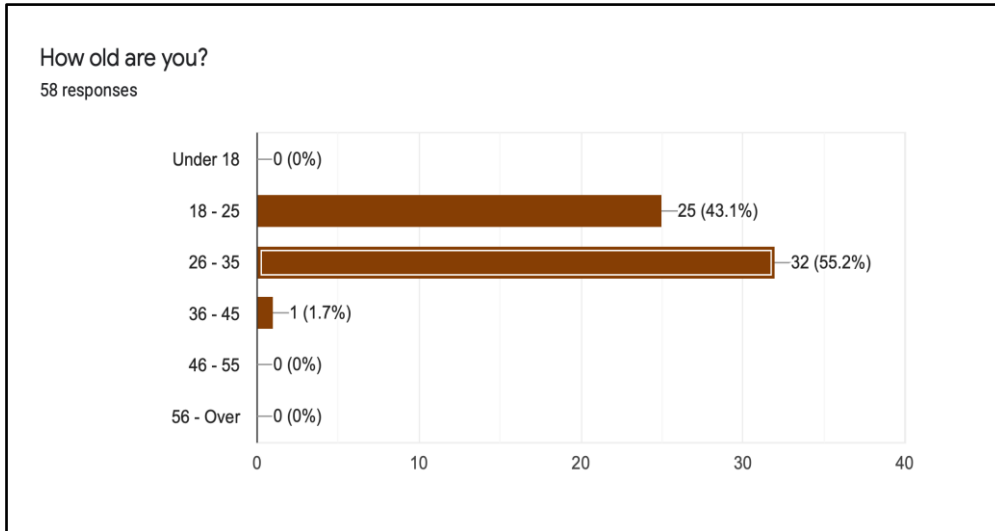


Figure 4.1: Age Demographics

The studies were conducted in different European countries therefore cultural backgrounds might affect the study (Annex A). The (Figure 4.2) suggests more number of females filled the survey rather than males by 14%.

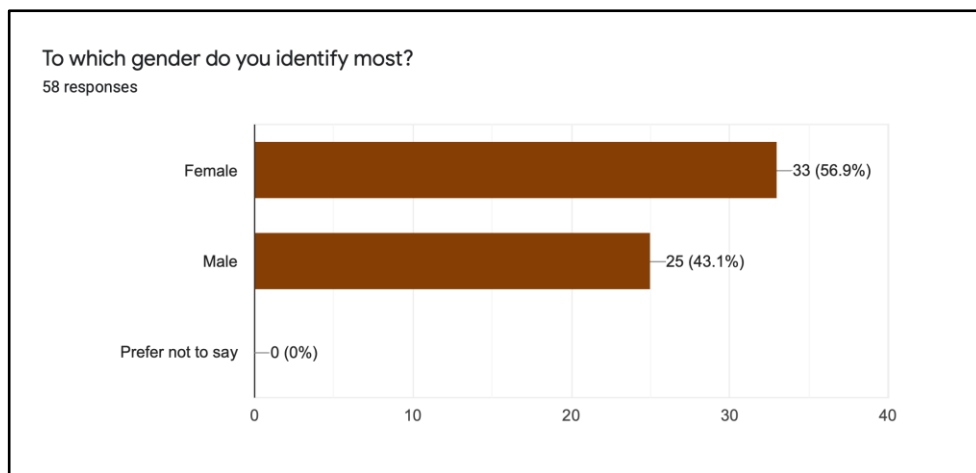


Figure 4.2 Gender classification

4.3 Awareness about cultured meat

Consumers in the West are unwilling to reduce their meat consumption (Tobler, Visschers, & Siegrist, 2011), yet are increasingly concerned about the implications of meat for sustainability and animal welfare (Vinnari & Tapio, 2009). This is reflected in the outcome. (Figure 4.3) states **27.6%** of the respondents *have never heard* of the product

and are *not willing to try* the product. **31%** do not know about the product but were *willing to try* the product. A majority of the respondents constituting 41.4% have the knowledge or pre-existing information about the product and are *willing to try* the product. There are different factors which affect the consumer’s decision to try the product primarily their age and level of education also the media is an important source of information to the public and likely plays a crucial role in shaping public perception of food technologies (Lynn J. Frewer, Howard, & Shepherd, 1995). The sample is only representative of individuals who have in the past 5 years lived in any of the countries belonging to the European Union. Therefore the sample is limited to generalizability and not representative to a specific country within the European Union. Furthermore, there was no prior information regarding the product provided to the participants, this indicated their level of knowledge and understanding of the product indicating their awareness about a novel product in true honesty.

Frequencies

Frequencies of How likely are you to try a cultured meat product?

Levels	Counts	% of Total	Cumulative %
No, I have never heard of cultured meat.	16	27.6%	27.6%
Yes, Also I know what cultured meat means.	24	41.4%	69.0%
Yes, however I don't know what cultured meat means.	18	31.0%	100.0%

Figure 4.3: Descriptive Analysis of awareness regarding Cultured Meat

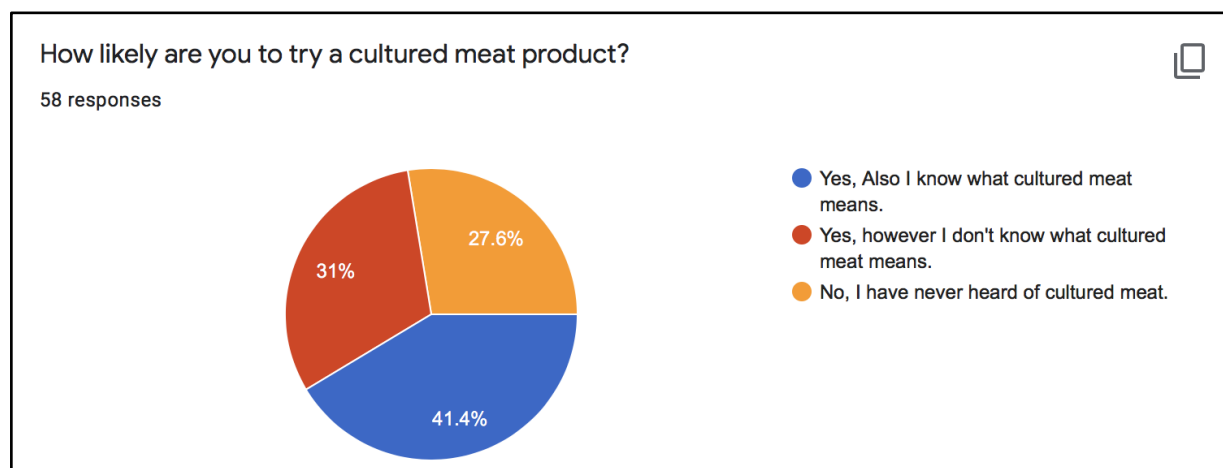


Figure 4.4: Awareness regarding Cultured Meat

Based on the above visible (Figure 4.4) we can observe there isn't a huge disparity between the 3 categories and most people are willing to try cultured meat as well as know about the product. In order to further bring all participants to the same level of understanding about the product, information about cultured meat and its brief function and method of production was shared. The process was explained since positive or negative information about cultivated meat would influence the answers of the participants (Bekker, Tobi, & Fischer, 2017), an effort was made to provide the information in a manner as neutral as possible yet attempting to destigmatize the concept.

The information constructed and provided on the survey regarding cultured meat is as mentioned below: (Own Elaboration)

“Cultured meat is produced within vitro cell culture of animal cells without slaughtering the animal, it is a form of cellular agriculture. The function of the stem cells within an animal is to create new muscle tissue when the muscle is injured, this innate function enables the growth of new stem cells which can be generated into cultured meat. The cells are placed in a bioreactor containing nutrients and necessary growth factors allowing them to multiply just like fermented beer and sauce. The cells are conducting the same function as inside an animal but under a controlled environment.”

4.4 Extrinsic Attributes

After informing about cultured meat and the brief function of stem cell involving the complete natural process of replenishment, the perceptions and expectations of the participants regarding cultured meat were evaluated by asking them to assess extrinsic qualities of the product and its importance on their purchasing decision such as packaging, safety certification of the product and branding identity.

4.4.1 Packaging

Below is the table highlighting 48.3% agreeing and 8.6% strongly agreeing packaging is considerably important for them to purchase cultured meat, attesting to (Rundh, 2009) that packaging is a relevant marketing tool and it is especially important in creating competitive advantages (Figure 4.5).

4.4.2 Safety Certification

The most important factor is the safety certification of the product 63.8% strongly agree and 31% agree this also correlates to the research conducted by (Ehmke, 2006; Schupp & Gillespie, 2001) stating, the indication of meat origin is mandatory taking significant importance and is associated with product safety for European consumers.

4.4.3 Branding

The amusing factor during the analysis is to realize the purchasing decision to buy a novel product based on a branding is of relatively very low importance - 17.2% Strongly agree, 20.7% Agree and 37.9% Neither agree nor disagree (Figure 4.5). To conclude, in this survey more than half of the total respondents indicated that packaging of the product was an important factor to purchase the novel product. In any event, brand presence on meat is synonymous with a guarantee of wholesomeness, traceability and authenticity of the product (Grunert, Bredahl, & Brunsø, 2004) therefore inferring safety certification and branding go hand in hand which should eventually articulated in a distinctive manner to the customers through packaging. This could eventually benefit the brand identity of the product and prove to be synonyms to meat substitute.

Frequencies

Frequencies of [You would buy the product based on packaging]

Levels	Counts	% of Total	Cumulative %
Agree	28	48.3%	48.3%
Disagree	7	12.1%	60.3%
Neither Agree nor Disagree	14	24.1%	84.5%
Strongly Agree	5	8.6%	93.1%
Strongly Disagree	4	6.9%	100.0%

Frequencies of [The safety certification of the product is necessary]

Levels	Counts	% of Total	Cumulative %
Agree	18	31.0%	31.0%
Neither Agree nor Disagree	3	5.2%	36.2%
Strongly Agree	37	63.8%	100.0%

Frequencies of [I would purchase if it belongs to a specific brand]

Levels	Counts	% of Total	Cumulative %
Agree	12	20.7%	20.7%
Disagree	7	12.1%	32.8%
Neither Agree nor Disagree	22	37.9%	70.7%
Strongly Agree	10	17.2%	87.9%
Strongly Disagree	7	12.1%	100.0%

Figure 4.5: Descriptive analysis on the extrinsic attributes of the product

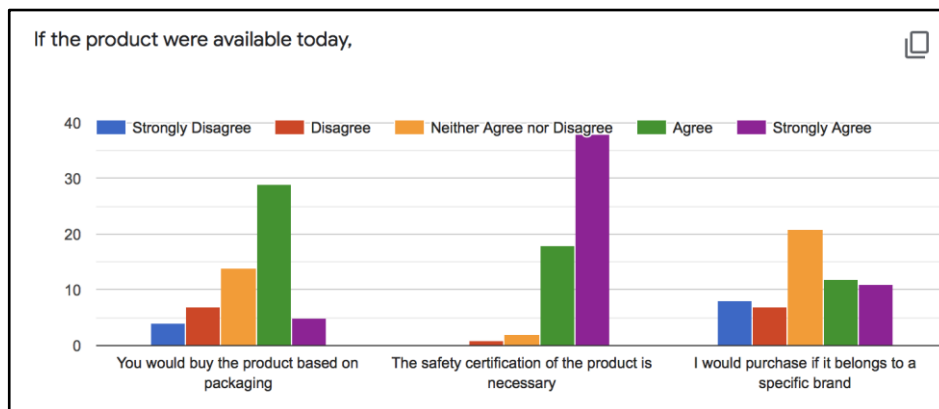


Figure 4.6: Extrinsic attributes of the product

4.5 Intrinsic Attributes - Food Neophobia Scale

Across the responses received, it is observed some people are more neophobic than the others. Food disgust showed as a negative influence in the willingness to consume (Dupont & Fiebelkorn, 2020; Hartmann & Siegrist, 2018; Verbeke, 2015) however this negative influence was not detected after destigmatizing the concept. Food neophobia which was previously reported in other studies was confirmed in this study. Consumers resist changes in their diet due to taste preferences and traditions (Mazzocchi et al., 2014), however this survey has highlighted a strong inclination to try new food, ethnic food or traditional restaurants. Pearson's correlation was utilized to measure and describe the relationship between multiple questions. Below are the questions asked and the questions present with R indicate they are reversed while scoring therefore they determine neophilia rather than neophobia. Each scale item has a seven-point Likert response set: (1 = strongly disagree; 4 = neither agree, nor disagree; 7 = strongly agree).

How well do you agree or disagree with this statement

1. *I am constantly sampling new and different foods (R)*
2. I don't trust new foods
3. *If I don't know what is in a food, I won't try it*
4. I like foods from different countries (R)
5. Ethnic foods look too weird to eat
6. At dinner parties, I will try a new food (R)
7. I am afraid to try things I know I have never had before (I am afraid to eat things I have never had before)
8. *I am particular about the foods I will eat (I am very particular about the foods I will eat)*
9. *I will eat almost anything (R)*
10. I will new ethnic restaurants (R) (I like to try new ethnic restaurants)

Figure 4.7 Food Neophobia Scale ; Source – Pliner & Hobden, 1992)

4.5.1 Cronbach's Alpha

The item score reliability was utilized to be useful to assess the repeatability of an individual item score in a group. The item score reliability was conducted considering item rest correlation and further with Cronbach's alpha to have little bias (Figure 4.8). On the basis of summed FNS scores, the food neophobia scale displayed an average score of 3.32 (SD=0.97) (Figure 4.8). The survey was found reliable with a Cronbach's alpha of .79 which implies the estimated data is 79% of the variance in the scores is reliable variance. Therefore the internal consistency is considered good.

Item Reliability Statistics				
	mean	sd	item-rest correlation	if item dropped Cronbach's α
Q1 ^a	3.14	1.515	0.351	0.780
Q2	3.31	1.603	0.570	0.754
Q3	4.47	1.921	0.405	0.776
Q4 ^a	3.59	0.956	0.453	0.774
Q5	2.55	1.453	0.376	0.777
Q6 ^a	2.26	1.540	0.327	0.783
Q7	2.76	1.699	0.486	0.764
Q8	4.07	2.101	0.587	0.750
Q9 ^a	3.79	2.084	0.490	0.765
Q10 ^a	3.26	1.264	0.625	0.754

^a reverse scaled item

Figure 4.8 Cronbach's alpha of the 10 attributes

Scale Reliability Statistics			
	mean	sd	Cronbach's α
scale	3.32	0.965	0.787

[3]

Figure 4.9: Scale Reliability Statistics

4.5.2 Correlation Matrix of Food Neophobia

Based on the correlation matrix on food neophobia, the observable pattern is that all the variables do not correlate with each other. Therefore we can summarise all the variables are mostly independent of the other.

Correlation Matrix		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Q1	Pearson's r	—									
	p-value	—									
Q2	Pearson's r	-0.213	—								
	p-value	0.108	—								
Q3	Pearson's r	-0.032	0.647 ^{***}	—							
	p-value	0.813	<.001	—							
Q4	Pearson's r	0.561 ^{***}	-0.143	-0.011	—						
	p-value	<.001	0.286	0.933	—						
Q5	Pearson's r	-0.092	0.332 [*]	0.158	-0.294 [*]	—					
	p-value	0.491	0.011	0.237	0.025	—					
Q6	Pearson's r	0.398 ^{**}	0.026	0.101	0.420 ^{**}	-0.131	—				
	p-value	0.002	0.846	0.452	0.001	0.326	—				
Q7	Pearson's r	-0.163	0.395 ^{**}	0.164	-0.240	0.453 ^{***}	-0.246	—			
	p-value	0.221	0.002	0.219	0.070	<.001	0.063	—			
Q8	Pearson's r	-0.267 [*]	0.384 ^{**}	0.318 [*]	-0.198	0.315 [*]	-0.228	0.457 ^{***}	—		
	p-value	0.043	0.003	0.015	0.136	0.016	0.086	<.001	—		
Q9	Pearson's r	0.104	-0.440 ^{***}	-0.533 ^{***}	0.229	-0.021	0.219	-0.124	-0.480 ^{***}	—	
	p-value	0.439	<.001	<.001	0.083	0.876	0.098	0.352	<.001	—	
Q10	Pearson's r	0.338 ^{**}	-0.306 [*]	-0.238	0.540 ^{***}	-0.360 ^{**}	0.506 ^{***}	-0.438 ^{***}	-0.356 ^{**}	0.354 ^{**}	—
	p-value	0.009	0.019	0.071	<.001	0.005	<.001	<.001	0.006	0.006	—

Note. * p < .05, ** p < .01, *** p < .001

Figure 4.10: Correlation Matrix

4.6 Source of Product Availability

The main advantage of a new product is to save time, which is considered extremely important in fast-growing and busy societies. The place of purchase of meat emerges as a factor in relation to consumer expectations. These latter develop and change in the function of the information available at a shopping mall for example product shelf life, packaging, appearance, label, context, advertising or price generate new expectations (Font-i-Furnols & Guerrero, 2014) therefore the frequency levels present for online purchase and delivery are scattered across all levels of importance. It does not imply the product must be available 100% of the time rather it means availability when the customer needs it by facilitating the nearest place the customer seeks it. According to (Grunert, Bredahl, & Brunsø, 2004) a high degree of importance is attached to buying from a butcher, it shows that consumers prefer to entrust the purchase decision to an expert, who is more capable of predicting the outcome of the meal than themselves. Concluding based on the results of this survey question (Figure 4.11) many respondents are expecting the source of product availability for cultured meat in a Supermarket, Hypermarket, Meat shop or Food market in order to see, smell, seek information before purchasing the product.

Frequencies

Frequencies of [Online Purchase and Delivery]

Levels	Counts	% of Total	Cumulative %
Fairly important	11	19.0%	19.0%
Important	12	20.7%	39.7%
Not at all important	15	25.9%	65.5%
Slightly important	9	15.5%	81.0%
Very important	11	19.0%	100.0%

Frequencies of [Supermarkets/Hypermarkets]

Levels	Counts	% of Total	Cumulative %
Fairly important	15	25.9%	25.9%
Important	4	6.9%	32.8%
Not at all important	2	3.4%	36.2%
Slightly important	1	1.7%	37.9%
Very important	36	62.1%	100.0%

Frequencies of [Meat Shops/Food Markets]

Levels	Counts	% of Total	Cumulative %
Fairly important	9	15.5%	15.5%
Important	6	10.3%	25.9%
Not at all important	7	12.1%	37.9%
Slightly important	6	10.3%	48.3%
Very important	30	51.7%	100.0%

Figure 4.11 Source of Product availability

4.7 Enticing terminology

Recently (Bryant & Barnett, 2018) studied messages relating to cultured meat on its naturalness but the results were mixed, it seemed as if every piece of information regarding the production of the food declines the acceptance via eliciting disgust. Beginning with the wording of a variety of terms for example - Cultured Meat, Synthetic Meat, In vitro meat, Artificial meat and many more resulting in a negative connotation. Therefore in this survey the accepted terminology by the participants to entice them to try cultured meat is mentioned in (Figure 4.12). This question allowed the participants to choose from more than one option and also suggest any other terms. Analysing the results we can conclude the terms like clean meat and slaughter free meat aim to provoke positive

emotions and acceptance also the constant usage of cultured meat across media and research could have created a general acceptance towards the terminology resulting in the highest acceptance amongst other terminologies. Additional terms like Meat 2.0 and Gourmet meat were also suggested by a participant.

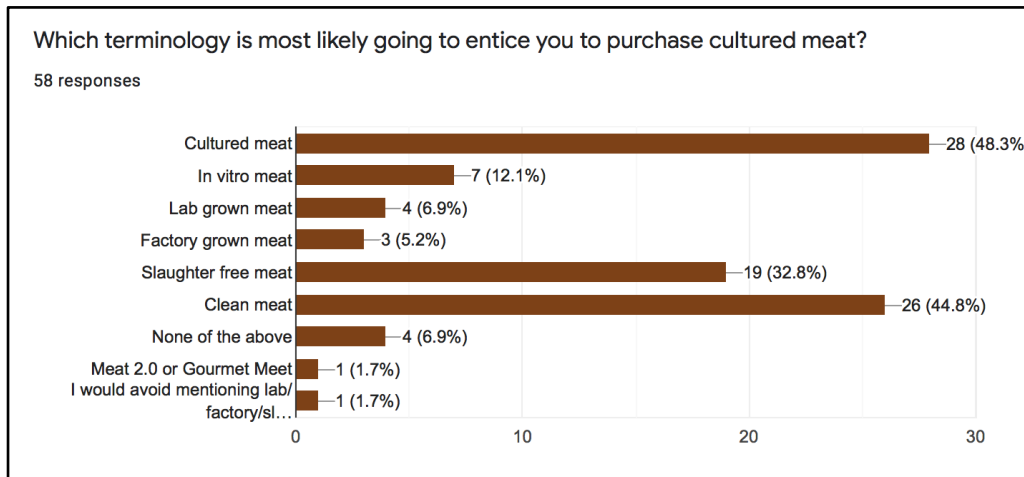


Figure 4.12: Accepted Terminology

4.8 Food Disgust

The linear scale indicated the level of disgust amongst the respondents with 1 being “Strongly Disagree”, 3 “Neither Agree nor Disagree”, 5 “ Strongly Agree. The majority disagree the product is disgusting. A considerable number of respondents aren’t yet sure about their disgust due to the absence of availability of the product with 25.9% neither agreeing nor disagreeing. This can be a result of a non-judgemental attitude towards a product which I believe is a positive influence and implies that most respondents would be able to reach to a conclusion once they try the product. Only a small proportion of the respondents agree the product is disgusting with 10.3% to Agree and 5.2% Strongly Agree (Figure 4.13). (Egolf, Hartmann, & Siegrist, 2019) proposed using repeated exposure via visibility in the media to decline the provocation of disgust for cultured meat. Due to current day access to information and major media influence, there is vast disagreement about food disgust towards cultured meat amongst the respondents of the survey. This looks very optimistic to the future of the product.

Frequencies of The thought of the product is disgusting			
Levels	Counts	% of Total	Cumulative %
1	20	34.5%	34.5%
2	14	24.1%	58.6%
3	15	25.9%	84.5%
4	6	10.3%	94.8%
5	3	5.2%	100.0%

Figure 4.13: Descriptive Analysis of Food disgust

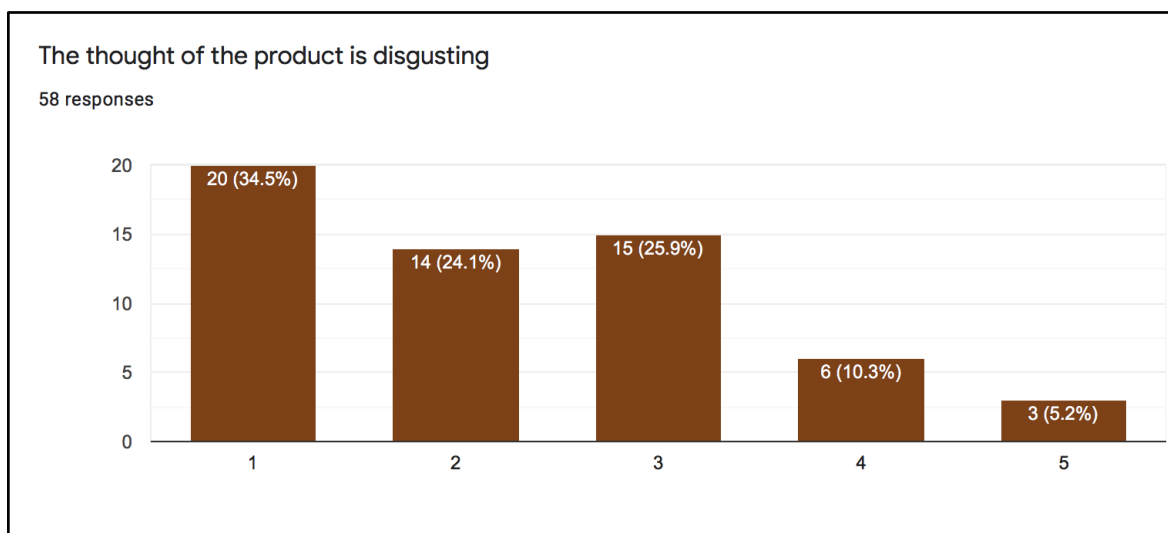


Figure 4.14: Food Disgust

4.9 Implications – Sustainability, Human Health and Animal Welfare

“There is no power for change greater than a community discovering what it cares about.” – Margaret.J.Wheatley

With the objective to assess what the majority of participants deeply care about, a ranking scale for importance was present - 1 being “Most important”, 2 being “Important” and 3 being “Least Important”. Unfortunately, over the years there has been a huge disconnect between the clever mind and the human heart on how our decisions to consume food would affect the future generations the major cause of this problem is we have been caught up in materialism and the

ease of acquiring items also due to the shift to urban cities we have completely distanced ourselves from the process of where our meat originates. The majority of prior research suggests the consumers aren't aware of the huge impact caused by the production and consumption of meat however in this analysis we can see that participants care more about the environment than animal welfare. As mentioned earlier in the literature review, animals feel pain however here we can see the respondents have stated animal welfare is least important. It looks like the approach the ends justify the means is quite prominent. The ultimate importance is given to human health, we can infer from this that humans place the highest importance to themselves however when going through the pattern for individuals who have the least importance for human welfare regarded animal welfare the top most importance in the ranking scale (Figure 4.15). We can observe there is a strong contrast of behaviour.

Frequencies

Levels	Counts	% of Total	Cumulative %
M . Important	20	34.5%	34.5%
Important	28	48.3%	82.8%
L. Important	10	17.2%	100.0%

Levels	Counts	% of Total	Cumulative %
L. Important	16	27.6%	27.6%
Important	7	12.1%	39.7%
M . Important	35	60.3%	100.0%

Levels	Counts	% of Total	Cumulative %
Important	21	36.2%	36.2%
L. Important	27	46.6%	82.8%
M . Important	10	17.2%	100.0%

Figure 4.15 Descriptive analysis of Implications

4.10 Willingness to try or recommend

After being informed about the product there is a considerably shift in behaviour and the participants seem to definitely be willing to try the product, 36.2 % are still not sure about their stance towards the product (Annex I) therefore doubtful of trying the product. There is almost no difference between the genders to try the product (Figure 4.16). That cannot be proven in this survey.

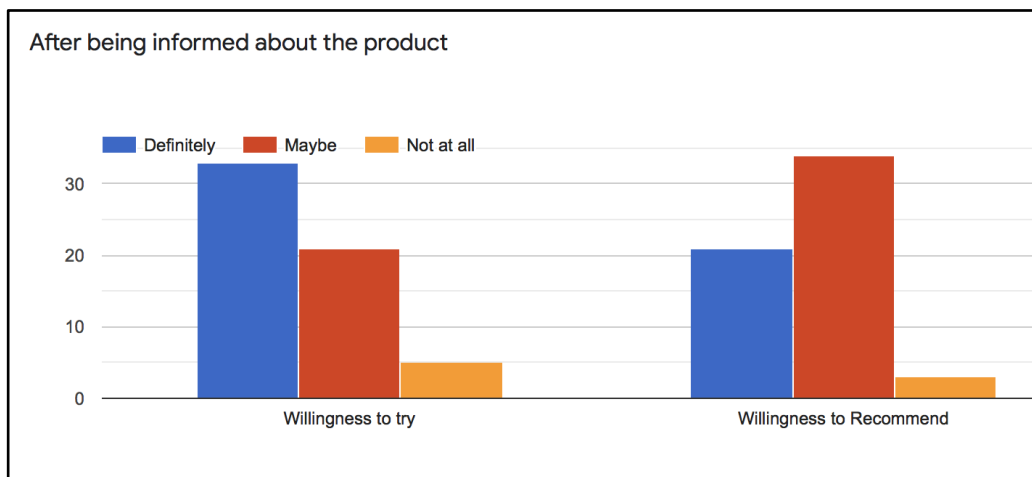


Figure 4.16 : Willingness to Try & Recommend

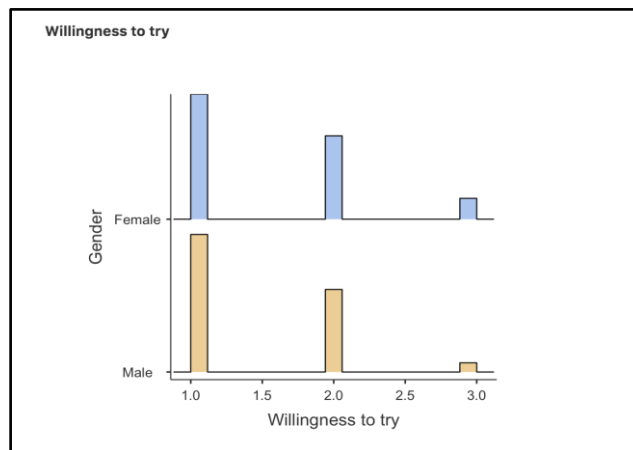


Figure 4.17 - Willingness to try based on gender

The independent variable is Customer Awareness and the Dependent variable is Customer Acceptance therefore the more the customer is aware of the product the more likely they are willing to try cultured meat. In (Figure 4.18) we can see the customers who were willing to try the product from the beginning of the survey maintain the same willingness to try the product. After they were informed the participants who were willing to try but weren't aware about the product, changed their decision to definitely or maybe and the positive outcome of respondents who earlier mentioned they wouldn't try changed their decision to definitely and maybe as well. For the willingness to recommend (Figure 4.19) most participants maintained they would maybe recommend the product, this could be due to the non-existence of the product.

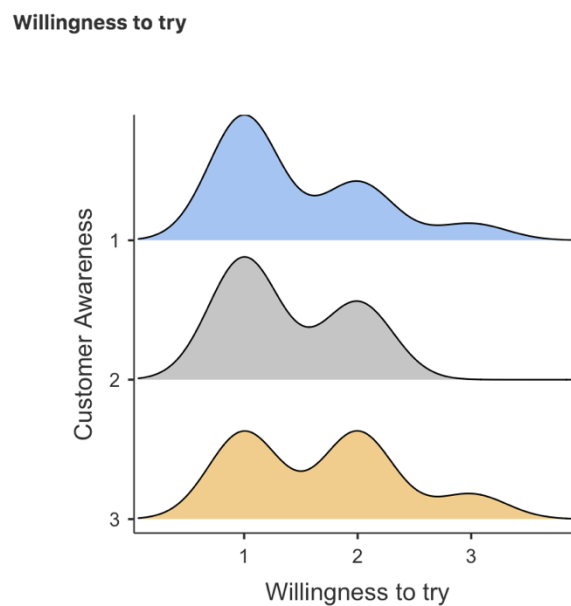


Figure 4.18 - Relationship between Customer Awareness and Willingness to Try

Willingness to Recommend

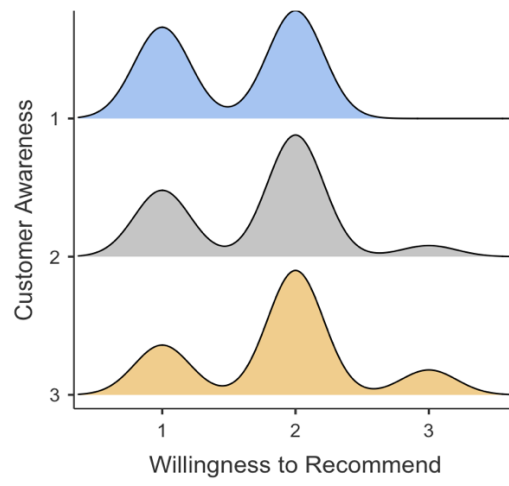


Figure 4.19 - Relationship between Customer Awareness and Willingness to Recommend

Chapter 5. Conclusion

Consumers are unlikely to break their food habits unless they are aware of the problem and are motivated by the solutions, with the positive feedback from various participants about the knowledge provided and time for introspection provided through the questionnaire, it may have pushed respondents towards a higher acceptance due to the sentiment towards human health, sustainability and animal welfare. I would like to strongly believe as the human species have the most amount of intellect and reasoning capacity they will in time change their outlook for the better therefore we can see many companies, institutions, individuals, governments actively taking part and bringing in reforms to save our planet as well put the required legislation and regulation in place. In terms of regulations, German ministry banned serving meat, fish or meat derived products at official functions (Mosbergen, 2017). Additionally, Portugal has passed a law which requires public cafeterias to offer atleast one vegan option applicable to prisons, schools, universities, hospitals and other public buildings (Shareit, 2017).

The main contribution to this thesis is that we can see the external factors such as Brand identity allows the customer to perceive a certain product a certain way therefore incorporating packaging and safety certification which is highly regarded through the responses, could prove beneficial for the future brand identity of the novel product. Due to its novelty there are many uncertainties pertaining to regulation, religious classification and economic impacts yet unknown and will only be understood gradually once the product is available in the market. Careful navigation of these challenges can ensure cultured meat to fulfil its potential to alleviate animal suffering and environmental degradation (Bryant & Barnett, 2020). It is demonstrated that a classification scheme for tenderness as well as meat quality would be appreciated by European consumers. (Verbeke, Perez Cueto, 2010) and this can be incorporated in the packaging of the product.

Concerning the role of information, the results point to the fact that information can positively influence consumer perception (Hopkins, 2015). While reading various research papers and company websites, I have understood that many companies are focusing on the constituents of the product and are rarely looking into the value chain as well as the idea of nudging the potential consumers through distinctive attributes like home

delivery, through specific events like World health day, World Animal day so on and so forth . I have observed that in case the cultured meat is provided in varieties of ethnic or traditional specific food it is more likely to receive customer's willingness to try a novel product, this aspect hasn't been proved prior however the high correlation suggests high relationship between the 2 variables. Overall these studies indicate that most consumers are willing to try cultured meat and a very small proportion are disgusted by the product or idea, there also can be a slight bias based on the education and awareness level. The current millennial generation have a reputation of caring more than their predecessors since they are conditioned through education. According to Dimitriadis and Papista (2010), building brand awareness in competitive markets can play an active role in the modern marketing environment. Through a small simple survey I can attest the outlook is very positive and open for debate as opposed to the prior apprehension through various other research studies highlighting participants inclined to a negative attitude after being questioned about the product. A strong brand awareness will create a competitive advantage in the marketplace that will enhance their overall reputation and credibility. I believe we must discuss about the past and plan the future. In areas with high rates of poverty we cannot expect people to change their eating habits or behaviour towards the environment since they are in the look out to put food on the table in one way or the other and they are unable to pay a higher price for the namesake of ethics and welfare. Since we have an exponential amount of human intellect and technology at disposal I hope the majority population would change enabling the sale of cultured meat at a much lower rate due to economies of scale. I believe educating children at a very young age can enable change, if they perceive the earth in terms of conservation they will bound to think that the planet needs, it has also been scientifically proven that children need to be exposed to outdoor world to improve their mental capacity therefore in this day and age when everyone is glued to their phones and children hooked onto a gadget rather than experiencing with the outdoor world would make them disconnected to the animal welfare, human health and sustainability.

It seems impossible to change human behaviours and habits towards meat consumption by highlighting implications towards environment however I have observed that human beings care more about themselves or the environment therefore tackling food disgust and projecting the consequences of conventional meat production through the lens of human health, sustainability can result to a much more productivity outcome yet they must not forget to stress

on the pain and distress animals face due to human meat consumption. The controlled environment of the production process and the limited human and animal interaction would allow for improvements in both safety and health, thereby reducing the risks in the spread and formation of any disease (Datar & Betti, 2010). We can also see that through information and awareness respondents are also changing their approach towards the novel product and this could positively result in changing attitudes.

5.1 Limitation

As with any research, this study has limitations. First, cultured meat is not yet available in the market. Secondly, the papers did not explicitly suggest that disgust can be one of the major motivating factors therefore it should be considered in any further research regarding cultured meat and its preferences. The discrepancy or gap between behavioural intention and actual behaviour can be caused by product availability, perceived behaviour controls, financial aspects of social norms (Ashemann - Witzel et al., 2015). There were many people from different age groups, educational levels, financial backgrounds the responses could have been limited to a certain group. The sample has highly educated individuals and individuals who can comprehend English as compared to the European Union average. Also based on the size of European Union, the sample size is very small and is a result due to time constraints and change in research topic due to the pandemic. Currently, the economic and health crisis induces consumers to focus their attention on product prices and on quality-price correlation therefore if this product is introduced within the market highlighting various positive benefits, the consumer will still be less likely to try an expensive novel product therefore taking that aspect into consideration I did not question the participants based on the price of the product. Finally, although survey answers have limited predictive validity yet this survey is highlighting key aspects that humans look forth in a novel product. The survey did not include a question specific to their existing meat-eating preference eg: vegetarian, non-vegetarian or vegan primarily understanding it would not greatly impact the survey due to a previous study indicating (Wilks & Phillips, 2017) positive perceptions towards the product but lower willingness to try the product. Yet, there were a few feedbacks highlighting the same. The survey asked about a hypothetical future product that is not currently available. (Van Wezemael, Verbeke, Kügler, de Barcellos, & Grunert, 2010) found that availability is a signal of

meat quality and safety to consumers and therefore asking about a product before its availability may not be a representative frame of consumers in comparison to when the product is available in the market. As mentioned in the literature review, the organoleptic attribute hasn't been studied and considered an important attribute for meat choice by consumers (Troy & Kerry, 2010)

5.2 Future Research

During the course of the research, a wide variety of studies suggested acceptance towards insects. Insect consumption is also known as entomophagy and is part of the traditional culinary culture in over 130 countries (Fiebelkorn, 2017). It was shown in (Lammers, Ullmann, & Fiebelkorn, 2019) 41.9% of German consumers would be willing to consume an insect burger furthermore (Hartmann, Shi, Giusto, & Siegrist, 2015) showed that German consumers who were of the age group were more willing to consume products containing processed insects than unprocessed insects. Many insect species have high protein content and a large number of essential amino acids required by humans, numerous minerals, high fat and fibre content. (Rumpold & Schuler, 2013). This approach aims to marry a consumer's desire to eat meat with the drive to ensure global food security, a nutritious diet, and reduce the environmental burden of food production. (Stephens et al., 2018). There is only one experimental study that examined how meat consumption could be reduced through a nudging intervention (Kurz, 2017)

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Annexes

Annex A: Demographics Table

Frequencies				
Frequencies of In which country from the European Union, have you resided the longest (in the last 1-5 years)?				
Levels	Counts	% of Total	Cumulative %	
Andorra	1	1.7%	1.7%	
Austria	1	1.7%	3.4%	
France	1	1.7%	5.2%	
Germany	9	15.5%	20.7%	
Ireland	10	17.2%	37.9%	
Italy	3	5.2%	43.1%	
Netherlands	3	5.2%	48.3%	
Portugal	16	27.6%	75.9%	
Spain	5	8.6%	84.5%	
The Czech Republic	2	3.4%	87.9%	
UK	7	12.1%	100.0%	

Annex B: Survey Questions

Questions	Survey Design
<p>A. Socio demographics -</p> <ul style="list-style-type: none"> a. Age, b. Gender c. Residing country 	<p>Check boxes and open ended question on residing country</p>

<p>B. Awareness about the product</p> <ol style="list-style-type: none"> 1. Yes, Also I know what cultured meat means. 2. Yes, however I don't know what cultured meat means. 3. No, I have never heard of cultured meat. 	<p>Dropdown Question</p>
<p>C. Extrinsic Attributes- Purchase decisions influenced by</p> <ol style="list-style-type: none"> a. Packaging b. Safety Certification c. Specific Brand 	<p>Likert Scale - 1 to 5</p> <p><i>1- Strongly disagree, 2 - Disagree, 3- Neither Agree nor Disagree, 4- Agree and 5-Strongly agree</i></p>
<p>D. Extrinsic Attributes - Food Neophobia Scale</p> <ol style="list-style-type: none"> 1. I am constantly sampling new and different food. 2. I don't trust new foods. 3. If I don't know what is in a food, I won't try it. 4. I like foods from different countries. 5. Ethnic food looks too weird to eat. 6. At dinner parties, I will try new food. 7. I am afraid to eat things I have never had before. 8. I am very particular about the foods I will eat. 9. I will eat almost anything. 10. I like to try new ethnic restaurants. 	<p>Likert scale 1 - 7</p> <p><i>1 - Strongly disagree, 2- Disagree, 3 - Somewhat disagree, 4 - Neither agree nor disagree, 5 - Somewhat Agree, 6 - Agree, 7 - Strongly Agree</i></p>

<p>E. Product Availability</p> <ul style="list-style-type: none"> a. Online Purchase/ Delivery b. Supermarket/ Hypermarkets c. Meat Shops/ Food Markets 	<p>Likert scale - 1 to 5</p> <p><i>1 - Not at all important, 2 - Slightly important, 3 - Important, 4 - Fairly important, 5 - Very important</i></p>
<p>F. Terminology alluring purchase</p>	<p>Checkbox and open ended question</p>
<p>G. Food Disgust</p>	<p>Linear scale 1 - 5</p> <p><i>1 - Strongly Disagree</i> <i>5 - Strongly Agree</i></p>
<p>H. Important Implications</p> <ul style="list-style-type: none"> a. Sustainability b. Human health c. Animal Welfare 	<p>Ranking scale - <i>Most Important, Important and Least important</i></p>
<p>I. Willingness to try and recommend</p>	<p>Checkbox grid - <i>Definitely, Maybe, Not at all</i></p>

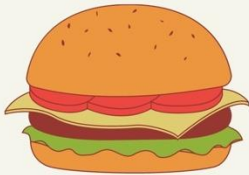
Annex C: Creative for cellular agriculture



Cells are removed from the animal in a biopsy



The cell is cultured in the lab and grown into edible tissue in a bioreactor



The tissue is processed into food products like burger patties

Annex D: Descriptive Analysis of Food Neophobia

Frequencies of Q1			
Levels	Counts	% of Total	Cumulative %
1	1	1.7%	1.7%
2	4	6.9%	8.6%
3	5	8.6%	17.2%
4	12	20.7%	37.9%
5	15	25.9%	63.8%
6	12	20.7%	84.5%
7	9	15.5%	100.0%

Frequencies of Q2			
Levels	Counts	% of Total	Cumulative %
1	6	10.3%	10.3%
2	16	27.6%	37.9%
3	13	22.4%	60.3%
4	7	12.1%	72.4%
5	12	20.7%	93.1%
6	1	1.7%	94.8%
7	3	5.2%	100.0%

Frequencies of Q3			
Levels	Counts	% of Total	Cumulative %
1	4	6.9%	6.9%
2	7	12.1%	19.0%
3	10	17.2%	36.2%
4	7	12.1%	48.3%
5	7	12.1%	60.3%
6	13	22.4%	82.8%
7	10	17.2%	100.0%

Frequencies of Q4			
Levels	Counts	% of Total	Cumulative %
3	1	1.7%	1.7%
4	3	5.2%	6.9%
5	4	6.9%	13.8%
6	13	22.4%	36.2%
7	37	63.8%	100.0%

Frequencies of Q5			
Levels	Counts	% of Total	Cumulative %
1	18	31.0%	31.0%
2	13	22.4%	53.4%
3	13	22.4%	75.9%
4	7	12.1%	87.9%
5	6	10.3%	98.3%
7	1	1.7%	100.0%

Frequencies of Q6			
Levels	Counts	% of Total	Cumulative %
1	3	5.2%	5.2%
3	2	3.4%	8.6%
4	3	5.2%	13.8%
5	11	19.0%	32.8%
6	16	27.6%	60.3%
7	23	39.7%	100.0%

Frequencies of Q7			
Levels	Counts	% of Total	Cumulative %
1	17	29.3%	29.3%
2	15	25.9%	55.2%
3	8	13.8%	69.0%
4	7	12.1%	81.0%
5	7	12.1%	93.1%
6	2	3.4%	96.6%
7	2	3.4%	100.0%

Frequencies of Q8			
Levels	Counts	% of Total	Cumulative %
1	5	8.6%	8.6%
2	14	24.1%	32.8%
3	7	12.1%	44.8%
4	10	17.2%	62.1%
5	3	5.2%	67.2%
6	6	10.3%	77.6%
7	13	22.4%	100.0%

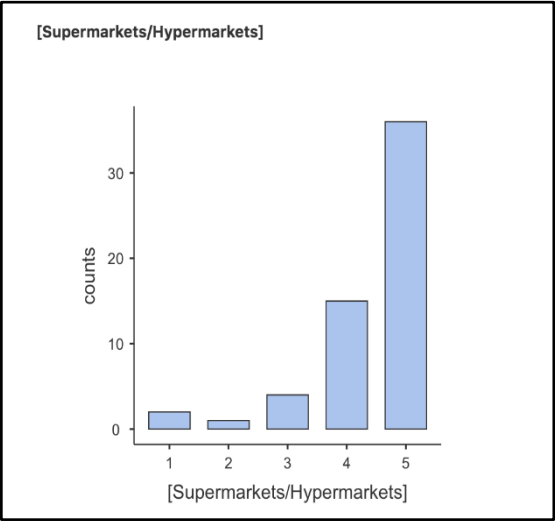
Frequencies of Q9

Levels	Counts	% of Total	Cumulative %
1	9	15.5%	15.5%
2	6	10.3%	25.9%
3	8	13.8%	39.7%
4	6	10.3%	50.0%
5	8	13.8%	63.8%
6	12	20.7%	84.5%
7	9	15.5%	100.0%

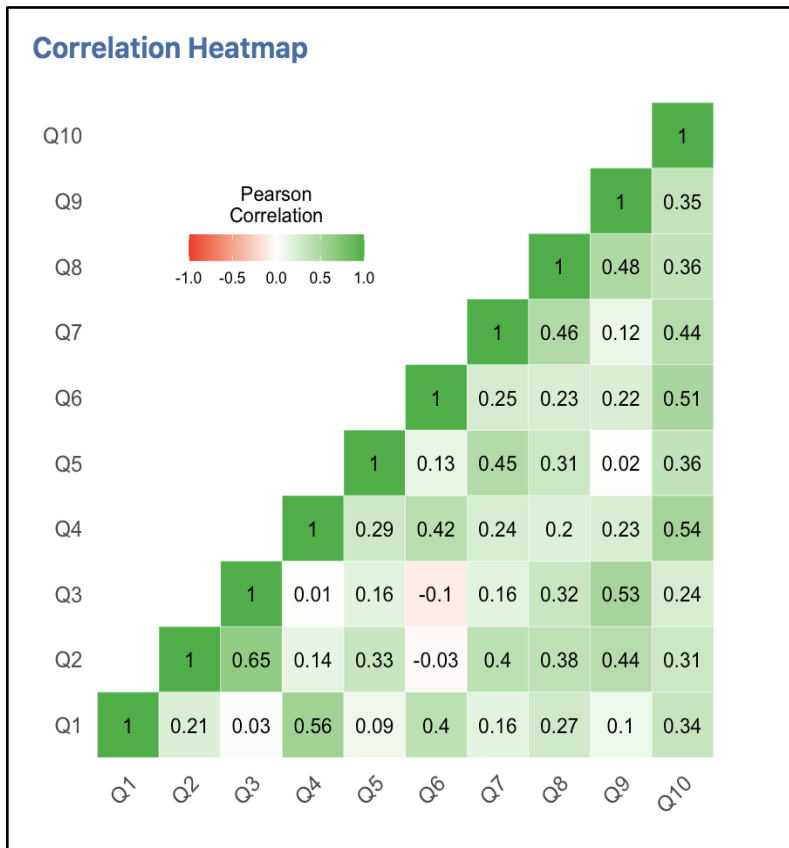
Frequencies of Q10

Levels	Counts	% of Total	Cumulative %
2	2	3.4%	3.4%
3	3	5.2%	8.6%
4	3	5.2%	13.8%
5	8	13.8%	27.6%
6	26	44.8%	72.4%
7	16	27.6%	100.0%

Annex E: Source of Product availability



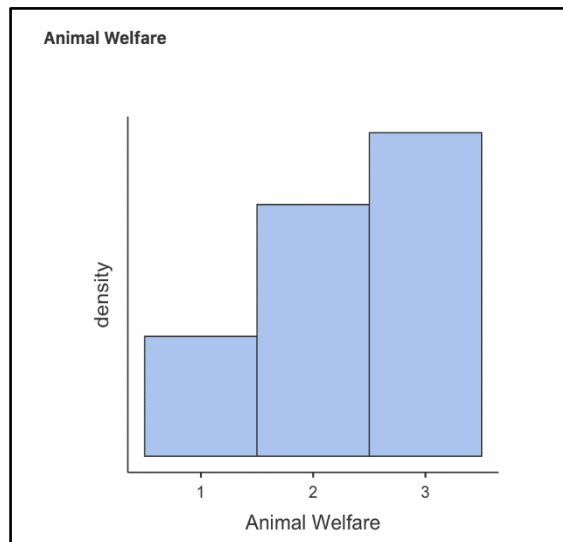
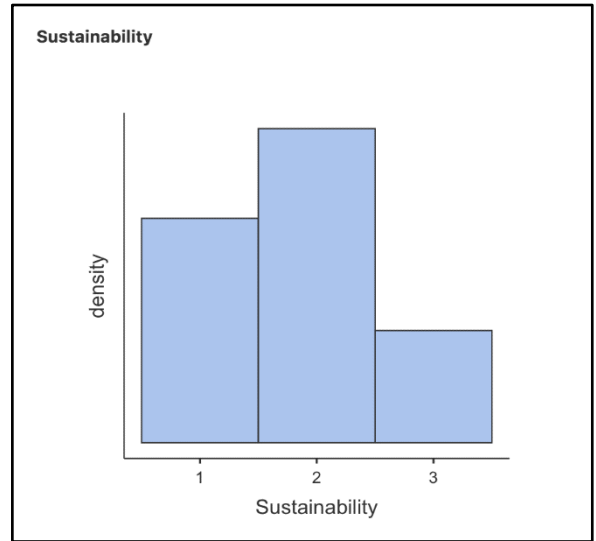
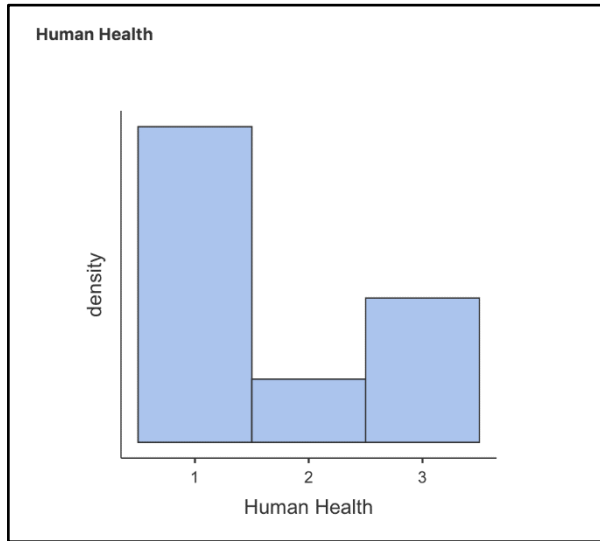
Annex F: Correlation Heatmap



Annex G: Strength of the Linear Relationship

Correlation	Strength of the linear relationship
1	Perfect
0.8 to 1.0	Very strong
0.60 – 0.80	Strong
0.40 – 0.60	Moderate
0.20 – 0.40	Weak
0.00 – 0.20	None to extremely weak

Annex H: Implications



Annex I : Descriptive analysis of Willingness to Try & Recommend

Frequencies

Frequencies of After being informed about the product [Willingness to try]

Levels	Counts	% of Total	Cumulative %
Definitely	33	56.9%	56.9%
Maybe	21	36.2%	93.1%
Not at all	4	6.9%	100.0%

Frequencies of After being informed about the product [Willingness to Recommend]

Levels	Counts	% of Total	Cumulative %
Definitely	21	36.2%	36.2%
Maybe	34	58.6%	94.8%
Not at all	3	5.2%	100.0%

Annex J: Willingness to Try & Recommend

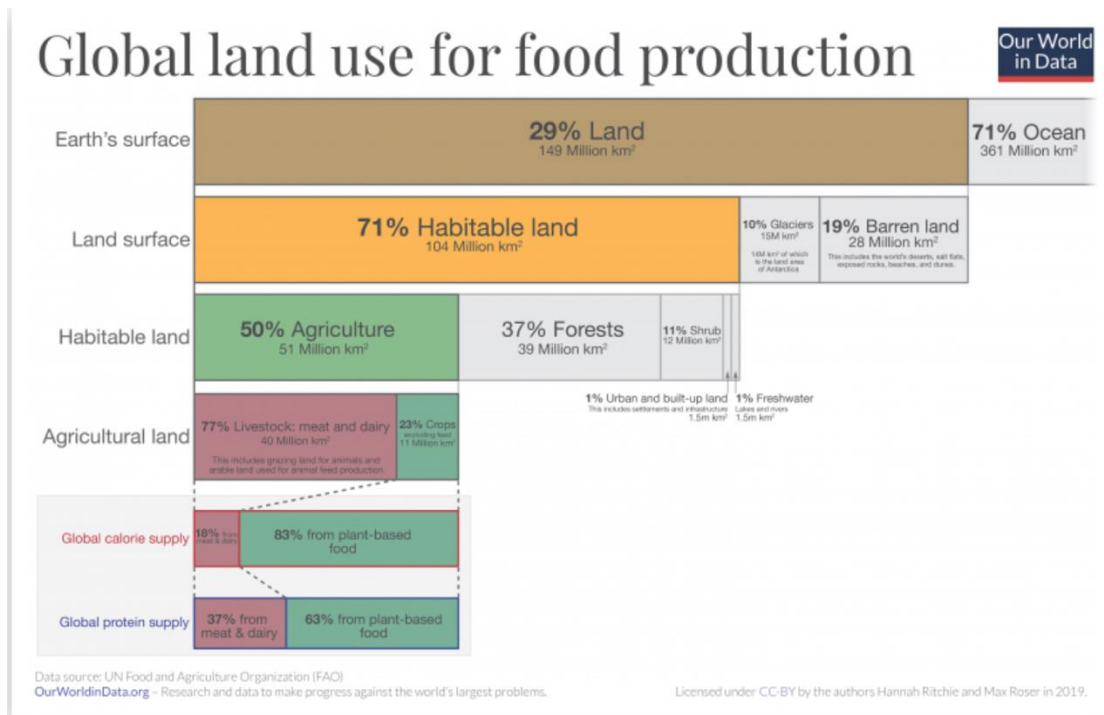
Frequencies of Willingness to try

Willingness to try	Gender	
	Female	Male
1	18	15
2	12	9
3	3	1

Frequencies of Willingness to Recommend

Willingness to Recommend	Gender	
	Female	Male
1	12	9
2	19	15
3	2	1

Annex K: Global land use for food production



Annex L: Feedback and Comments

Any comments or feedback. Thank you for your participation!

4 responses

Great survey!

Difficult to answer as a vegan

It sounds really interesting, but unfortunately still unknown for the public. I would love to find any place to try it in Lisbon

Interesting. Will there be space for people to tamper with these meats in the future? If there isn't adequate regulation people may bypass certain things under the guise of cultured meats being sustainable, ethical and 'healthy'?

Annex M: List of Figures

Figure No.	Title of the Figure
Figure 3.1	Onion Research Methodology
Figure 4.1	Age demographics
Figure 4.2	Gender Classification
Figure 4.3	Descriptive Analysis of awareness regarding Cultured Meat
Figure 4.4	Awareness regarding Cultured Meat
Figure 4.5	Descriptive analysis on the extrinsic attributes of the product
Figure 4.6	Extrinsic attributes of the product
Figure 4.7	Food Neophobia Scale
Figure 4.8	Cronbach's alpha of the 10 attributes
Figure 4.9	Scale Reliability Statistics
Figure 4.10	Correlation Matrix
Figure 4.11	Source of Product Availability
Figure 4.12	Accepted Terminology
Figure 4.13	Descriptive analysis of food disgust
Figure 4.14	Food Disgust
Figure 4.15	Descriptive analysis of implications
Figure 4.16	Willingness to Try & Recommend
Figure 4.17	Willingness to try based on gender
Figure 4.18	Relationship between Customer Awareness and Willingness to Try
Figure 4.19	Relationship between Customer awareness and Willingness to recommend

