



Widespread market applications of plant-based foods in the EU

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07.06.2022, SCHWELM, GERMANY

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Widespread market applications of plant-based foods in the EU

How are markets changing in the EU towards widespread applications of plant-based foods?

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Preface

As part of the graduation phase of the program International Food Business at Aeres University of Applied Sciences and Dalhousie University, I was tasked with writing my Bachelor thesis. This research will suggest improvements in the market conditions for the widespread adoption of plant-based foods which could be beneficial for governmental bodies and retailers looking to transition towards more sustainable food. This research could also be beneficial for anyone looking to understand why the market is changing towards more plant-based food products.

I would like to thank my thesis coach Taco Medema for providing crucial guidance, valuable feedback and for his patience and support during the writing of this bachelor thesis. His support has been an important part of the final stage of my studies as an International Food business student.

During the research limitations occurred with the original timeframe criteria of new plant-based companies of the second sub-question. The second sub-question was therefore slightly adjusted to include companies which have been established within the last 3 years in the EU instead of within the last year.

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Summary

To feed the expected population of nearly 10 billion people by the year 2050, radical changes must be made in the ways that food is produced and in the types of foods that are consumed. Supplying the ever-growing demand for animal-based meat has caused the current global food system to produce negative effects on the environment and also on human health. Studies have shown that a global shift towards sustainable plant-based diets can positively impact both the environment and human health. Food-related policies should therefore encourage the reduction of animal-based food consumption and promote plant-based diets in order to truly transition towards a more sustainable food system.

The EU has emphasized its goal of transforming the EU food system into the global standard of a sustainable food system. This is supported by the European Green Deal along with the Farm to Fork strategy which lays the framework of what must be done to drive the EU towards sustainable food production and consumption habits. Further strengthening this vision of sustainable food practices is the EU Promotion Policy's 2022 work program which has a budget allocated towards funding the promotion of plant-based diets. Businesses can benefit from this funding as long as they align with the EU's sustainability goals, promote the consumption of plant-based products, and do not infringe on the protected dairy terms laid out in the Common Market Organization Regulation. The plant-based food industry in the EU has seen significant growth throughout the last few years (+49%) with a variety of new plant-based businesses being established within the last 3 years. This research has presented 16 of these newly established businesses with products across the categories of plant-based fish, meat, eggs, dairy, snacks and drinks. The results of the survey conducted during this research prove that local retailers across the EU are increasing the promotion of plant-based products in their stores, aligning with recommendations put forth by the EU. Furthermore, the survey has shown that consumers throughout the EU are independently increasing their consumption of plant-based products as they become more aware of the sustainability and health benefits that are associated therewith.

1. Introduction

As the world's population continues to grow, it is expected to reach 8.5 billion people by the year 2030, 9.7 billion people by 2050, and about 10.9 billion by 2100 (United Nations, 2019). Along with an increasing global population comes an increase in human activities. These activities have been responsible for the vast majority of increasing greenhouse gas emissions, loss of natural ecosystems and declining biodiversity (Shukla, et al., 2019). One such activity is the need for large-scale food production to feed the ever-growing population. Currently, about 50% of the world's vegetated land is being used for agriculture. The amount of food produced will have to increase by 56% to feed the expected population by 2050, which would require clearing forest areas twice the size of India to free up more land for agricultural use (Ranganathan, Waite, Searchinger, & Hanson, 2018). With meat consumption expected to rise together with its resource-intensive needs, this will further increase the negative impact on the environment along with substantial effects on people's health (Godfray, et al., 2018). Improving global food production is needed to meet future nutritional demands. Moreover, this is also fundamental towards reducing malnutrition, poverty and improving access to healthy diets (Schneider, et al., 2011). It is estimated that 26.4% of the current world population (about 2 billion people) still live in moderate to severe levels of food insecurity (FAO, 2019). It is therefore important to not only maximize but to optimize food productivity to have enough supply to match the growing demand and to do so in ways that are environmentally and socially sustainable. This challenge requires changes in the way food is produced and in the types of foods consumed (Godfray, et al., 2010). Technological innovations, agricultural efficiency, policy reinforcements and a shift in global diet trends are required to increase production and promote sustainability in the food system without depriving future generations of the natural resources provided by planet Earth (Gill, et al., 2020).

Climate change and the need to reduce greenhouse gas emissions

Climate change, in which global warming is a key aspect thereof, provides a serious threat to existing ecosystems and is associated with a wide range of consequences. This includes extreme weather events (hurricanes, droughts, floods, etc.), rising sea levels, resource depletion, decrease in ground water levels, soil depletion and decreasing biodiversity (Verplanken, Marks, & Dobromir, 2020). Climate change has been taking place throughout the planet's 4.5-billion-year history with temperatures fluctuating between warm and cold periods for thousands of years. However, the current global warming differs from previous ones in its rate and causes. The current increase in global average temperature is occurring much faster than any of the other warm periods over the last million years. This is overwhelmingly due to the increase in heat-trapping gases caused by human activities that are being added to the atmosphere by burning fossil fuels and transforming the Earth's landscape from carbon-storing forests to farmland (Kennedy & Lindsey, 2015). When it comes to managing climate change, switching to renewable and sustainable sources of energy is the fastest way to have the largest reduction on global warming, as burning fossil fuels for energy (industrial, transport, heat, electricity, etc.) accounts for the majority of greenhouse gas emissions. (Pachauri, et al., 2014). Greenhouse gases trap heat in the Earth's atmosphere thus making the planet warmer, with the largest contributing greenhouse gas being carbon dioxide (EPA, 2020).

In 2016, The Paris Agreement, which is a legally binding international treaty on climate change, entered into force and was adopted by 196 countries. Its goal is to limit the increase in the global average temperature below 2°C and to limit it preferably in this century as close as possible to a target of 1.5°C above pre-industrial levels (UNFCCC, 2021). The countries involved are committing to reduce their greenhouse gas emissions with the goal of achieving net zero global emissions within the second half of this century (Wei, et al., 2016). However, carbon dioxide and other greenhouse gas emissions continue to grow despite emerging climate policies. Failing to recognize the factors behind continued emission growth could limit the desired global temperature target (Peters, et al., 2019).

The global food system and its role in greenhouse gas emissions

The global food system, which comprises everything from farm to fork, is one of the key contributors of greenhouse gas emissions, as the food industry is directly responsible for at least 26% of total greenhouse gas emissions worldwide (Ritchie, 2019). Even though it is not the largest source of emissions, it is a key area in which finding sustainable alternatives is crucial to reducing the accompanying environmental footprint. A breakdown of the global emissions of food production can be seen in Figure 1.

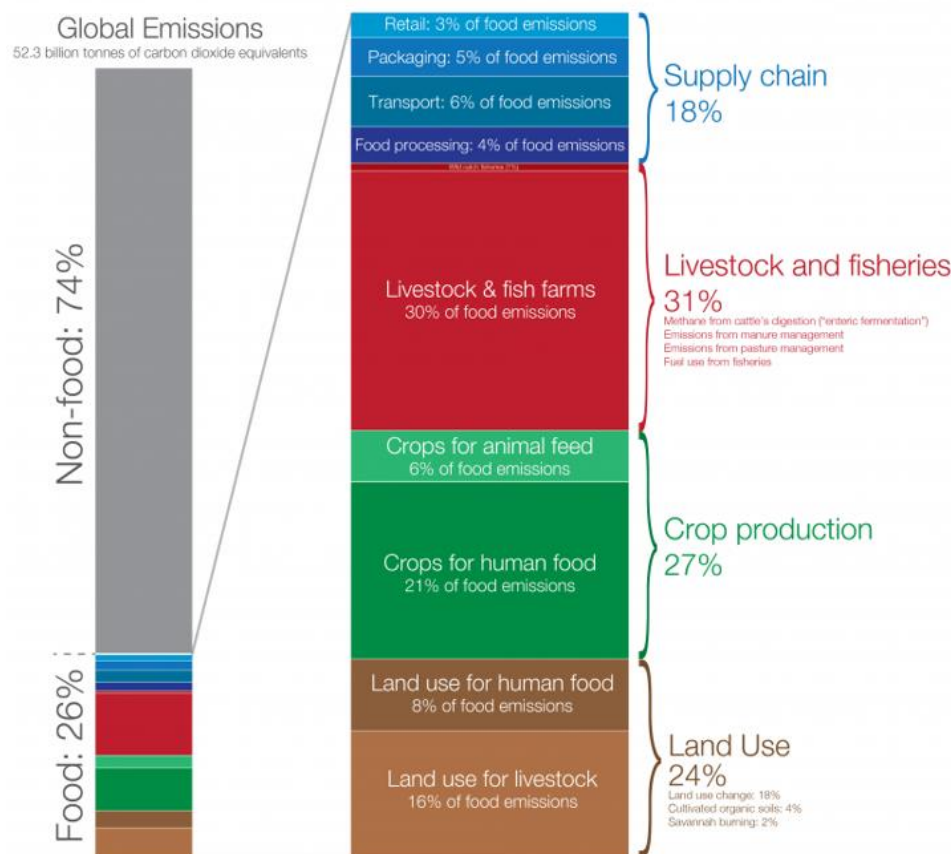


Figure 1. Global greenhouse gas emissions from food production (Ritchie, 2019)

The global food industry has been able to supply enough food to handle the demand of the ever-growing population thanks to advancements in technology, intensive production models, and government-backed subsidies (Winders & Ransom, 2019). Since the 1960's the world population has grown over 150% and the global production of meat has increased more than 500%. Today, most of the meat consumed globally comes from large-scale industrial operations which rely on housing and raising large numbers of animals in concentrated spaces to maximize efficiency, often at the expense of the health and general well-being of the animals, surrounding communities, and the environment (Winders & Ransom, 2019).

Raising livestock requires land for the animals and for growing crops used to feed these animals. Half of all the habitable land on Earth is used for agriculture with 77% thereof being used to raise livestock and for growing the crops needed to feed them (Ritchie & Roser, 2019). The conversion of land for meat production and animal feed is a leading cause of deforestation in numerous tropical regions (Dunne, 2020). "Tropical deforestation causes loss of biodiversity and other ecosystem services, soil degradation and the disruption of hydrological cycles" (Henders, Persson, & Kastner, 2015). Soil erosion is accelerated by extensive livestock grazing without sufficient recovery periods which leads to the loss of fertile land, increased pollution, sedimentation in streams and rivers, ultimately causing further loss of biodiversity (Woldeab, 2019). Agriculture utilizes about 70% of all global freshwater resources (The World Bank, 2020) with 29% of the agricultural water footprint directly related to the production of animal products (Mekonnen & Hoekstra, 2021). Each live animal being raised for human consumption also produces methane as a by-product, another type of greenhouse gas which is 84 times more potent than carbon dioxide (UNEC, n.d.) Methane is the second most abundant greenhouse gas in the atmosphere and traps 30 times more heat than carbon dioxide which intensifies the global warming effects (Okshevsky, 2020). Throughout the animal's lifetime methane is released by belching, farting, and through their manure. Livestock manure also keeps releasing methane long after it has left the animal due to an anaerobic decomposition process (Tauseef, Premalatha, Abbasi, & Abbasi, 2013). Moreover, toxins from manure, fertilizers, and wastewater that pour into waterways stimulate an overgrowth of algae (Milman, 2017). This overgrowth, known as algae bloom, can in some situations lead to oxygen-deprived stretches of water causing marine life to flee or die (dead zones), affecting an entire ecosystem. (Freshwater-Aquaculture, 2019).

Aquaculture, also known as fish farming, is the controlled process of cultivating aquatic species (mainly) for human consumption. This takes place around the world in coastal waters, freshwater ponds, rivers, and in tanks on land (Global Aquaculture Alliance, 2019). Aquaculture now produces more than 50% of all seafood consumed globally (Ritchie, 2019). Fish farming does not have the same land requirements for space and feed compared to livestock production, however with fish being the most produced, consumed, and traded meat, its impact on greenhouse gas emissions and water pollution is still extensive (da Silva, et al., 2018). Fish farms are typically overcrowded and produce large amounts of waste which can include feces, dead fish, and diseases, that are then discharged into the environment resulting in a dangerous contamination of the surrounding water and wildlife (Amirkolaie, 2011). It is estimated that 52% of global mangrove loss has resulted from different forms of aquaculture and another 15% could be lost by the year 2100 due to climate change. At this rate, all mangroves could be destroyed within the next 100 years. (Ahmed & Glaser, 2016). Mangroves protect millions of people living on coasts against coastal erosion and storms, provide habitat for a variety of marine species, and can store up to four times as much carbon as land-based forests (Polidoro, et al., 2018) (Mcsweeney, 2018).

As with meat from land-based animals, the demand for seafood is expected to rise every year within the next decade (Rowland, 2017). Overfishing has led to fish populations rapidly declining with many species facing possible extinction (Worm, 2016). "Overfishing occurs when more fish are caught than the population can replace through natural reproduction" (Conserve Energy Future, n.d.). There are currently over 4.6 million legally registered fishing vessels around the world (FAO, 2018). Every year there are up to 2.7 trillion wild fish caught, which is comparable to 5 million fish every minute. This does not include fish that are caught illegally, as bycatch, those caught for feed use, and all other unreported captures (Mood, 2010). It is estimated that up to 40% of all marine life that are caught each year, considered as bycatch, gets thrown back into the sea (Keledjian, et al., 2014). "Bycatch, or the catch of non-target fish and ocean wildlife, is one of the largest threats to maintaining healthy fish populations and marine ecosystems around the world" (Keledjian, et al., 2014). Large scale commercial fishing specifically focuses on catching massive amounts of fish using methods that have been wreaking havoc on the marine environment. One such method is that of bottom trawling which drags a large net or multiple nets along the seabed to catch a large quantity of fish all at once (British Sea Fishing, n.d.). Dragging these large and heavy nets along the sea floor can damage or destroy natural seabed structures, including deep-water coral reefs and important fish habitats which is catastrophic for deep-sea biodiversity and marine ecosystems (Mood, 2010). To put that into perspective, on land 25 million acres of forest are lost every year, while bottom trawling damages approximately 3.9 billion acres per year (Seaspiracy, 2021).

With the expected population growth by 2050 and the need for increased food production to meet future demands, the current food system cannot continue in a sustainable manner. Food production will need to focus on increasing yields instead of expanding production areas as has been done intensely for the past century (Wik, Pingali, & Broca, 2008). If food production areas continue to be expanded the environmental damage and greenhouse gas emissions that will occur will be substantial (Hofstrand, 2014). *"For adaptation and mitigation throughout the food system, enabling conditions need to be created through policies, markets, institutions, and governance. (...) Public health policies to improve nutrition – such as (...) awareness raising campaigns – can potentially change demand, reduce healthcare costs, and contribute to lower GHG emissions. Without inclusion of comprehensive food system responses in broader climate change policies, the mitigation and adaptation potentials will not be realized, and food security will be jeopardized"* (IPCC, 2019). Undoubtedly, consumers changing their food consumption habits is an essential part of transitioning towards a more sustainable global food system (Mason & Lang, 2017).

Achieving climate goals by promoting sustainable foods

Countries and their governments have an important role to play in achieving international climate targets and influencing changes in dietary patterns through methods such as subsidies, taxes, policies, and dietary guidelines (Carbon Brief, 2020). “Managing the demand for animal products by promoting a dietary shift away from a meat-rich diet will be an inevitable component in the environmental policy of governments” (Mekonnen & Hoekstra, 2021). The United Nations, currently made up of 193 member states, has adopted the “2030 Agenda for Sustainable Development” in 2015 (United Nations, n.d.). This agenda encompasses 17 sustainable development goals aimed at tackling climate change, ocean and forest preservation, achieving food security, and promoting sustainable consumption and nutrition patterns among other goals (United Nations, n.d.). The European Union (EU) has an important responsibility and leadership role in improving the global food and nutrition agenda as it is one of the largest global importers and exporters of food (Benton, Hartel, & Settele, 2011). The population of the EU with its 27 Member States was estimated at 447.7 million as of January 1st 2020 (European Commission, 2020). Europe is aiming to become the first climate-neutral continent by 2050 and has planned to make a 55% reduction of net greenhouse gas emissions by 2030 (European Commission, n.d.). This 2030 agenda is also reinforced by the Sustainable Development Goals put forth by the United Nations which the EU forms part of (Lafortune, Fuller, Schmidt-Traub, & Kroll, 2020). The food sector plays an important role in tackling climate change with approximately 17% of EU household carbon footprints associated with food consumption (Sandström, et al., 2018). Through less emission-intensive consumption and production methods can the associated carbon footprint see a significant decrease (Ivanova, et al., 2017). The European Green Deal is another ambitious plan to help fortify the net zero greenhouse gas emissions goal by 2050. The Green Deal also aims to promote healthy and sustainable diets, improving the overall health of its citizens and reducing the environmental footprint (Haines & Scheelbeek, 2020). The Farm to Fork strategy is at the center of the European Green Deal, further emphasizing the commitment to a healthier and more sustainable EU food system (European Commission, n.d.). This includes promoting the EU transition towards healthy and sustainable diets and adding sustainable food labels that covers the nutritional, climate, environmental, and social aspects of food products to help facilitate consumer choices (European Commission, n.d.).

The role of consumption patterns in climate change and human health

With current diet trends and production practices, feeding today’s population of 7.8 billion people is placing new demands on agriculture and natural resources. To meet future food security and sustainability needs, food production must grow significantly while simultaneously reducing agriculture's environmental footprint (Foley, et al., 2011). A shift from current dietary patterns towards a diet that excludes animal products can deliver environmental benefits on a scale beyond what can be achieved by producers only (Springmann, et al., 2017). A reduction in the demand for animal products will reduce greenhouse gas emissions, food’s land and freshwater use, and improve soil health. Additionally, the land which would no longer be needed for food production and raising livestock could remove an extra 8 billion metric tons of greenhouse gases from the atmosphere as natural vegetation regenerates (Poore & Nemecek, 2018). A US-based consumer research survey found that over 70% of people are concerned about climate change, and 52% said that this sometimes impacts their food and beverage purchases. About one in five claimed these concerns always impact their purchases (Sims, 2021). Another survey found that two-thirds of EU consumers are open to changing their eating habits for sustainability and

environmental reasons (Foote, 2020). When compared to animal products such as meat and dairy, the carbon footprint of plant-based foods is between 10 to 50 times smaller (Dunne, 2020). To reduce contributions to climate change while feeding a growing world population, strategies should include measures encouraging a more plant-based diet with the focus on consuming more plant-based products with a high nutritional content (González, Frostell, & Carlsson-Kanyama, 2011).

Shifting towards healthier and sustainable diets does not only have positive impacts on the environment but also on human health (Vermeulen, Campbell, & Ingram, 2012). A 2016 study found that a global shift towards dietary guidelines that are more in line with plant-based diets could reduce global mortality up to 10%, reduce greenhouse gas emissions up to 70%, and save trillions of dollars in health- and environment-related costs by 2050 (Springmann, Godfray, Rayner, & Scarborough, 2016). In the EU, the intake of meat, fish, and dairy products (commonly considered as primary sources of protein), are higher than dietary recommendations with red meat consumption being twice as high as recommended by the World Cancer Research Fund (World Cancer Research Fund, 2007). This contributes to a substantial rise in obesity and chronic diseases, including coronary heart disease, diabetes, and cancer (Mertens, et al., 2021). Estimates show that 70-80% of all EU healthcare costs (roughly 700 billion euros) are spent treating chronic diseases of which most could be prevented through healthier lifestyle choices (Seychell, 2016). Plant foods and plant-based diets have been associated with health promotion and disease prevention among children and adults (Newby, 2009). People who start following a more plant-based diet can experience many health benefits such as lower body weight, reduction in medications, lowered risk of chronic diseases, and increased life expectancy (Hever, 2016). Those dealing with lactose intolerance, which in the EU is about 30%, also benefit from plant-based dairy alternatives as these do not contain lactose (Catanzaro, Sciuto, & Marotta, 2021). Plant-based diets focus on maximizing the consumption of nutrient-dense foods derived from plants such as fruits, vegetables, whole grains, nuts & seeds, while minimizing processed foods, oils and animal products. Doing so requires right combinations of plant foods to ensure an adequate intake of a variety of nutrients to avoid any deficiencies (Tuso, Ismail, Ha, & Bartolotto, 2013). There is strong evidence that food systems and human diets have a significant impact on both the environment and public health. Food policies should encourage the reduction of animal-based food consumption and promote plant-based diets and a transition towards a more sustainable food system (European Public Health Association, 2017).

Knowledge gap

It is known that shifting towards consumption of more plant-based foods will have a positive impact on the environment and on efforts to achieve a more sustainable food system (Springmann, Godfray, Rayner, & Scarborough, 2016). Furthermore, research revealed that the European Union has formulated strategies aiming towards a more sustainable food system and promoting healthy diets (European Public Health Association, 2017). However, it is unclear if this includes the introduction of more plant-based products. The role of policy makers is of great importance in building the framework to help support sustainability in the food system. Yet there has been no investigation done in the EU into how governmental policies have influenced upcoming businesses in the plant-based food industry. It is known that consumers have become more conscious about the environment and sustainability of their food choices (Schiano, Harwood, Gerard, & Drake, 2020), but it is not clear if a change in food offers is playing a role in consumption habits.

This research is focusing on how market conditions are moving towards the increased adoption of plant-based foods. This gives governmental bodies a better understanding of how current policies are influencing the plant-based food industry. Moreover, this research can benefit retailers that are shifting their current assortment towards more sustainable solutions as it looks into upcoming plant-based companies and customer experiences with plant-based options in their local markets. The topic is relevant as it investigates if the EU market is accommodating for the rapidly growing plant-based industry as claimed is needed for shifting towards a sustainable food system. If it is found that there is room for improvement this research can be a starting point for further research.

Therefore, the main question and sub questions formulated for this research are:

How are markets changing in the EU towards widespread applications of plant-based foods?

To examine this question the following sub-questions were formulated:

1. How are governmental policies in the EU influencing businesses in the plant-based food industry?
2. What are upcoming companies that entered the market within the last 3 years, that could help boost the growth of the plant-based food industry within the EU?
3. Have consumers been experiencing a shift towards more plant-based products in their local supermarkets?

2. Materials & Methods

The materials and methods describe how the research on the thesis questions will be conducted. The types of research methods that will be used to answer these questions are both qualitative and quantitative.

1. How are governmental policies in the EU influencing businesses in the plant-based food industry?

The first sub-question will be answered using qualitative research that will look into current policies in the EU relevant to sustainable food systems, and startups. The sources should be provided by the European Union, European Commission, other governmental webpages, and research institutes. Data will be collected from policies, legislations, journals, research articles, peer-reviewed sources. If the data found using these methods appear to be insufficient, then non peer-reviewed but relevant sources will also be used to help formulate an answer to this sub-question. The specific words and terms that will be searched are “EU sustainable policies”, “EU sustainable business”, “EU plant-based”, “EU plant-based policies”, “EU startup funding”, “EU plant-based industry”.

2. What are upcoming companies that entered the market within the last 3 years, that could help boost the growth of the plant-based food industry within the EU?

To answer the second sub-question, qualitative research will be conducted to look into plant-based food companies/products that are still in the development phase. The requirements will be that these products/companies are not yet available on the market but can be in the development or pre-launch phase. A minimum of 15 different types of plant-based businesses will be chosen to show a variety of growth possibilities for the plant-based food industry. The specific words and terms that will be searched are “EU plant-based startups”, “EU plant-based businesses in development”, “EU plant-based alternatives”, “EU alternative protein”, “EU new food technologies”. The website “newprotein.org” will also be used to identify new companies in the EU.

3. Have consumers been experiencing a shift towards more plant-based products in their local supermarkets?

The third sub-question will be answered using a quantitative research method. This will be done by means of a questionnaire that will be sent out to citizens living within the EU. After using a survey calculator on “surveysystem.com”, a sample size of 384 was identified as sufficient to represent a 95% confidence level to project the opinions of the total population of the EU. It is therefore expected to have at least 384 respondents living withing different countries in the EU. The questionnaire will be distributed through Facebook groups and other social media channels. The questionnaire can be found in the appendix and the responses will be analyzed to answer this sub-question.

3. Results

In this chapter, the results of the three sub-questions are collected and presented. The first sub-question focuses on relevant governmental policies of the EU which could impact businesses in the plant-based food industry. The second sub-question presents a variety of plant-based companies operating within the EU which have recently entered the market. During the research of the second sub-question, problems with the collection of data were encountered. Consequently, the research method was broadened to include companies which entered the EU market within the last 3 years. For the third sub-question, the results collected through the questionnaire are presented and clarified.

1. How are governmental policies in the EU influencing businesses in the plant-based food industry?

The European Green Deal and its Farm to Fork Strategy

The European Green Deal works as a roadmap to make Europe the first climate-neutral continent by the year 2050, through methods such as the implementation of a sustainable growth strategy intended to boost the economy and improve the health and quality of life of its citizens (European Commission, 2020). At the heart of the European Green Deal lies The Farm to Fork Strategy, which provides a foundation for new and future EU food related policies, and aims at accelerating the transition towards more sustainable and resilient food systems, which will be beneficial for the people and the planet (The European Alliance for Plant-Based Foods, 2020). This strategy aims to make the EU food system a global standard for sustainability (European Commission, 2020).

The Farm to fork strategy, as seen in figure 1, is therefore meant to accelerate the EU towards a sustainable food system that should ultimately “have a neutral or positive environmental impact, help to mitigate climate change and adapt to its impacts, reverse the loss of biodiversity, and ensure that everyone has access to safe, nutritious and sustainable food” (European Commission, n.d.). This will help to further strengthen the resilience of the EU food system and allow the EU to lead the global transition towards sustainability throughout all the stages from farm to fork (European Commission, n.d.). The farm to fork strategy includes regulatory and non-regulatory initiatives, such as the common agricultural and fisheries policies to support the transition towards a more sustainable food system (European Commission, n.d.). A legislative framework for sustainable food systems has been proposed to support the enforcement of the farm to fork strategy and the development of a sustainable food policy, but this has not yet been put into place (European Commission, n.d.). Recently, a coalition of 63 organizations led by the European Alliance of Plant-based Foods and Bridge2Food called on the European Commission to guarantee funding for plant-based food research as they claim that “directly supporting the sector can help the EU meet its target of climate neutrality by 2050” (O'Brien, 2022).



Figure 2. The Farm to Fork Strategy

Stimulating sustainable food practices through the Farm to Fork Strategy.

Companies within the food sector have a major influence over the food market which can impact the dietary choices of consumers. This is caused by the way that food products are produced, packaged, transported, marketed, and by the types of nutritional composition of these food products (European Commission, 2020). The EU food industry has an important role in global trade and strengthening its sustainability will not only reduce its environmental and social footprint, but will also help to invigorate the reputation of sustainable businesses and products. The food industry should therefore work to facilitate the availability and affordability of healthy and sustainable food options to not only reduce the associated environmental footprint, but to also meet the growing demand for sustainable food products by consumers (European Commission, 2020). The consumer demand and growth of the plant-based food sector also supports the transition towards a sustainable food system. This creates new opportunities for EU farmers who can diversify their agricultural crops and for EU food businesses who can expand their product portfolios with an ever-growing selection of plant-based product alternatives (Plant Based Food Alliance, 2021). To further promote the transition towards a more sustainable food system, the EU Code of Conduct on Responsible Food Business and Marketing Practices has been developed by the European Commission under the EU Farm to Fork Strategy (European Commission, n.d.).

EU Code of Conduct on Responsible Food Business and Marketing Practices

The EU Code of Conduct on Responsible Food Business and Marketing Practices, which went into force on July 5th 2021, is an essential part of the efforts to reinforce the availability and affordability of healthy, sustainable food options to help the EU achieve its climate goals. It shows the actions, principles, and objectives that can be implemented throughout the food chain which all actors involved can voluntarily commit to and work to improve their sustainability efforts (European Commission, 2021). “This Code has been developed with EU associations and companies, as well as international organizations, NGOs, trade unions and trade associations. Associations and companies in the food sector that sign the Code voluntarily commit to accelerate their contribution to a sustainable transition” (European Commission, n.d.).

The Code includes 7 aspirational objectives, accompanied by specific targets and a list of SMART actions, which contributes to a food environment that facilitates healthy and sustainable food choices (European Commission, n.d.). These objectives are listed below:

1. Healthy, balanced and sustainable diets for all European consumers
2. Prevention and reduction of food loss and waste
3. A climate neutral food chain in Europe by 2050
4. An optimized circular and resource-efficient food chain in Europe
5. Sustained, inclusive and sustainable economic growth, employment and decent work for all
6. Sustainable value creation in the European food supply chain through partnership
7. Sustainable sourcing in food supply chains

EU Promotion Policy for Agricultural Products (Regulation (EU) No 1144/2014)

The general objective of the EU Promotion Policy is to enhance the competitiveness of the agricultural sector of the EU. Regulation (EU) No 1144/2014 establishes the conditions for agricultural and food products to receive financing from the budget of the European Union (The European Parliament and The Council Of The European Union, 2014). The EU Promotion Policy is meant to reinforce the objectives of the Farm to Fork Strategy in terms of sustainable food production and sustainable food consumption. Pertaining to promoting sustainable consumption, promotional activities aimed at consumers within the EU market should be in accordance with Food Based Dietary Guidelines of each of the targeted Member States of the EU. (European Commission, n.d.). The Promotion Policy has budgeted €185.9 million for the work program for 2022 which will be allocated to campaigns in line with the sustainability ambitions of the Farm to Fork Strategy both inside and outside of the EU (Foote, 2022). The 2022 work program also states that when assessing the award criteria for campaign funding, promotion programs must support the environmental and sustainability objectives of the Common Agricultural Policy (CAP), the European Green Deal and the Farm to Fork Strategy, specifically focusing on sustainable food production and consumption. Most importantly, proposals targeting the internal market of the EU should encourage the shift to a more plant-based diet as this further aligns with the objectives of Europe's Beating Cancer Plan, the Communication on the Future of Food and Farming, and the HealthyLifestyle4All initiative (European Commission, n.d.).

EU law on food information to consumers

Regulation (EU) No 1169/2011 clarifies the responsibilities of food business operators at all stages of the food chain with respect to food information that needs to be provided towards consumers (European Commission, n.d.). Regulation (EU) No 1169/2011 establishes the general principles, requirements and responsibilities governing food information, and in particular food labelling (European Commission, n.d.). "This Regulation provides in particular clearer and harmonized presentation of allergens (e.g. soy, nuts, gluten, and lactose) for prepacked foods (emphasis by font, style or background color) in the list of

ingredients and mandatory allergen information for non-prepacked foods, including in restaurants and cafes” (European Commission, n.d.). In addition, Member States may adopt national measures requiring additional mandatory aspects for specific types of foods, if clear and specific justifications can be made (European Commission, n.d.). The European Commission has announced to revise the current EU law on food information to consumers to ensure that consumers are able to make healthier and more sustainable food choices, which is at the forefront of the Farm-to-Fork Strategy (European Commission, n.d.). This would be done through a proposed sustainability labelling framework which would provide consumers with additional nutritional, climate, environmental and social aspects of food products within the EU (European Commission, n.d.).

Regulation (EU) No 1308/2013 (Common Market Organization Regulation).

The organization of the European single market for agricultural products is defined by Regulation (EU) 1308/2013 establishing a common organization of the markets in agricultural products, also known as the CMO. The CMO officially defines milk products as products derived exclusively from milk, with the word “milk” being defined as “exclusively the normal mammary secretion obtained from one or more milkings without either addition thereto or extraction therefrom” (European Parliament & European Council, 2013). Annex VII of the CMO also states terms that are to be used exclusively for milk products such as milk, butter, cream, cheese, whey and yoghurt (European Parliament & European Council, 2013). Therefore, food business operators are not allowed to designate plant-based products (such as plant-based dairy alternatives) with protected dairy terms, which are laid down in Annex VII of Regulation (EU) 1308/2013 (Leialohilani & de Boer, 2020).

Names for plant-based products such as ‘soy milk’ or ‘vegetarian cheese’ are not legally allowed in the current regulatory framework of the EU (Plant Based Food Alliance, 2021). These rules were confirmed by the European Court of Justice ruling on the “TofuTown Case” (case C-422/16) (Plant Based Food Alliance, 2021). It was alleged that TofuTown confused consumers by marketing its purely plant-based products using “Soyatoo tofu butter”, “veggie cheese”, and other similar names, thereby infringing the German Act Against Unfair Competition in conjunction with Regulation No. 1308/2013 (Library of Congress, 2017). “The European Court of Justice ruling allows the use of dairy terms in descriptive commercial communication, provided that these are not misleading” (Plant Based Food Alliance, 2021). There are, however, many exceptions to these rules depending on the country and language being used. For example, in France the terms almond milk (*lait d’amande*) and oat cream (*crème d’avoine*) are allowed, and in Spain referring to almond milk as *leche de Almendras* is also allowed. Another example of such an exception can be found in the Netherlands with butter beans (*boterbonen*) and cacao butter (*cacaoboter*) (Verzijden, 2017). Furthermore, terms such as “plant-based alternatives to yoghurt” and “cheese alternative” have since been validated by several Member States within the EU (Plant Based Food Alliance, 2021).

2. What are upcoming companies that entered the market within the last 3 years, that could help boost the growth of the plant-based food industry within the EU?

According to a report published by the EU-funded Smart Protein Project, Europe's plant-based food sector grew by 49 % overall in the period between 2018-2020, which amounts to a total sales value of €3.6 billion (Smart Protein Project, 2021). The pandemic has further accelerated this growth as consumers have become increasingly conscious of the impact their food choices have on their health and the environment (V-Label, 2021). It is projected that Europe's plant-based food and beverage market will grow at a CAGR (Compound annual growth rate) of 8.87% during the period from 2022 to 2027, however with the rapid rate of growth in the sector, this assessment may be in short supply to the ever-growing consumer demand for plant-based products (Business Wire, 2022).

The following section comprises of plant-based food companies operating in the EU which have entered the market within the last 3 years. The total number of companies in this section is 16 and includes a diverse selection of plant-based alternatives for fish, meat, eggs, dairy, snacks, and drinks (listed in that order).

BettaF!sh

A food tech start-up based in Berlin, Germany, BettaF!sh is a producer of plant-based seafood alternatives and was founded in 2020 (Pitchbook, 2022). BettaF!sh provides consumers with an alternative way to help preserve healthy oceans as they consume some of their favorite foods. This is done using a high-tech solution that utilizes sustainable seaweed cultivation in Europe to make seaweed-based fish alternatives. Therefore, BettaF!sh seeks to positively impact the supply chain as a whole by creating an alternative income opportunity for local fishing communities, help to restore balance in the oceans, and by providing delicious food products that are high in protein (Pale Blue Dot, n.d.). Their first product launch is the BettaF!sh TU-NAH, which has been launched across more than 4000 locations of Aldi, one of Germany's top Retailers, in their collection of ready-to-eat 100% plant-based tuna sandwiches (Ho, 2022). The company states on their website that there are more products in development and that their products will be available to the rest of Europe by October 2022, however it is unclear whether this will be in retail stores, available online, or a combination of both (BettaF!sh, 2022).



Figure 3. BettaF!sh Logo

Novish B.V.

Novish is a manufacturer of plant-based Seafood alternatives and is the first vegan fish company in Europe. The company, located in the Netherlands, was started in 2019 and their first products were launched on the market in January 2020 (Novish, n.d.). Their assortment currently consists of plant-based burgers, bites, chunks, sticks and filets. The products are available for purchase through online retailers in the Netherlands such as Picnic and Crisp, and have recently entered the UK and German markets (Bobekdijk Food Group B.V., n.d.). Their focus is on creating 100% plant-based seafood alternatives with a good taste & texture that helps in restoring the balance in the



Figure 4. Novish Logo

oceans and aid in the reduction of overfishing and bycatch (Bobekdijk Food Group B.V., n.d.). Novish has also made their products 100% soy-free to help combat the sustainability issues that are associated with deforestation to clear land for soy crops. The company aims to have fully sustainable packaging for their products by 2030 (Novish, n.d.).

Revo Foods

Revo Foods is a plant-based food start-up based in Austria, which uses 3D-printing technology to develop and produce their seafood alternatives (EIT Manufacturing, 2021). Their mission is to offer the best plant-based seafood alternatives and to help reduce overfishing to protect the health of our oceans. The company was founded in 2020 and the first Revo product was released onto the market in November 2021. Their product range currently consists of (plant-based and 3D-printed) smoked-salmon and salmon spreads, which are now available in over 1400 locations across 14 countries throughout Europe (Revo Foods, n.d.). Revo Foods is also funded by the European Union and supported by the European Institute of Innovation & Technology (EIT) Food, EIT Manufacturing, and The Austrian Research Promotion Agency (FFG) among others (Revo Foods, n.d.).



Figure 5. Revo Foods Logo

Planted Foods AG

Planted Foods is a plant-based alternative meat company founded in 2019 in Zürich, Switzerland (Catalyze Group, n.d.). The company recognizes the rising meat consumption habits that are happening in conjunction with the rising global population and wants to revolutionize the way meat is perceived and consumed globally. To ensure that Planted Foods aid in the transition towards a sustainable food system, the company puts taste, environment, animal welfare and health at the forefront of their mission, vision and decision-making process (Planted Foods, n.d.). Their products do not contain any additives, chemicals, soy, gluten, GMOs, hormones or antibiotics and only use 100% natural ingredients. Their current assortment of meat alternatives contains their plant-based chicken, schnitzel, pulled pork, and kebab that are made out of pea protein, pea fibers, water, and rapeseed oil (Pun, 2022). The company continues to expand and improve their research and development efforts which is further being supported by additional funding of almost €38 million received over the past year (Vegconomist, 2021). Their first product entered the market in late 2020 and their products can now be found in restaurants and retails across Switzerland, Germany, Austria, France, Italy, and the UK, with plans of further expansions in the future (Planted Foods, n.d.).



Figure 6. Planted Foods Logo

PLANTY-OF-MEAT GmbH

Planty-of-Meat, founded in 2019, is a Germany-based manufacturer of plant-based meat alternatives. Their products are organically grown and produced locally and developed regionally to deliver sustainable products to help consumers shift into a more balanced and sustainable eating culture (PLANTY-OF-MEAT, n.d.) Their current portfolio of meat alternatives includes plant-based nuggets, schnitzels, fillets, burgers, minced meat, and sausages (PLANTY-OF-MEAT, n.d.) Their products are now being sold in Germany, Austria, the Netherlands by restaurants, local retailers and supermarkets (PLANTY-OF-MEAT, n.d.).



Figure 7. Planty-of-Meat Logo

Rival Foods

Rival Foods is a food technology company founded in the Netherlands in 2019 that creates whole-cut plant-based products for branded food companies that are active in the plant-based protein markets around the world (Rival Foods, n.d.). The company uses a unique technology that allows them to create whole-cut products using only plant-based ingredients that produces a product with “a remarkable texture, juiciness and clean or clear label” that can then be customized to the needs of branded food companies to expand their plant-based product offerings (Rival Foods, n.d.) Rival Foods co-founder, Birgit Dekkers, explains that there is currently still a gap between the supply of meat and the supply of meat alternatives. According to her observations, there are a lot of processed plant-based products such as burgers, sausages, and minced meat available, but not enough “whole-muscle” meats such as a steak or pork alternative. “In order to allow more people to eat plant-based, the range of meat substitutes must be expanded” (Kloosterman, 2021). Rival Foods hope that its products can help further expand and fortify the plant-based protein market, positively influence the protein consumption pattern of consumers, and accelerate the transition towards a more sustainable food system (WUR, n.d.).



Figure 8. Rival Foods Logo

The Protein Brewery

Founded in the Netherlands in 2020, The Protein Brewery is a developer of protein-rich food ingredients that are based on fermentation technologies (de Zeeuw, 2022). “The Protein Brewery contributes to a more sustainable world by developing novel ways of producing food proteins, deploying fermentation technologies using locally produced, non-allergic and water efficient crops” (The Protein Brewery, n.d.). The company’s first product, Fermotein, is a vegetable ingredient with a high nutritional value which can be derived from carbohydrate-rich food crops such as sugar beets, cassava, potatoes and corn which is done using the help of a fungus (Thole, 2020). The company has already received €22 million in funding that it has used to begin building a larger demo-scale plant in Breda, which should have a production capacity of at least 1500 tons per year once the factory is operational by the end of 2022 (Watson, 2021). The Protein Brewery aims to become a major player in not only the European market, but also in the US and Asia with its first Fermotein products expected to enter the market by the end of 2022 or early 2023 (Duurzaam-ondernemen, 2021).



Figure 9. The Protein Brewery Logo

Upside Plantbased

Founded in the Netherlands in 2020, Upside Plantbased is a manufacturer of plant-based meat alternatives, with their focus being plant-based sausages. Their products are completely organic with most of the ingredients coming from Germany, and the rest grown at their facility in the Netherlands (Upside Plantbased, n.d.). Their assortment includes 5 types of plant-based sausages and their products are available for purchase in the Netherlands and Belgium in local organic shops, supermarkets (ex. “Plus” in the Netherlands) (van Loon, 2020) and in organic wholesalers such as Udea, Odin, and Vegan Food Service (Upside Plantbased, n.d.). Besides producing plant-based products, the company is also working on reaching their goal of having fully recycled packaging and is further reducing their environmental impact by planting 40 trees every month in the Netherlands and Madagascar to help combat deforestation and natural habitat loss (Upside Plantbased, n.d.).



Figure 10. Upside Plantbased Logo

Bettr Egg

Bettr Egg is a start-up company that is based in Berlin, Germany and has been founded since 2021 (Crunchbase, n.d.). The company plans on introducing the first plant-based egg alternative that looks, feels, tastes and that can be used like a traditional chicken egg. The ingredients are obtained solely from vegetable protein sources and are gluten-free, contain no cholesterol, allergens, GMOs, or preservatives. The company hopes to play a crucial role in the plant-based revolution as they continue to develop products that are planet and health friendly (Bettr Egg, n.d.). Bettr Egg successfully completed their initial seed funding in 2021 and have recently culminated further rounds of funding in 2022 (Pitchbook, 2022).



Figure 11. Bettr Egg Logo

Stockeld Dreamery

Founded in 2019 in Sweden, Stockeld Dreamery is a producer of plant-based cheese alternatives (Stockeld Dreamery, n.d.). The company's mission is to “reduce the environmental footprint, animal suffering and improve health through a plant-based cheese product that delivers on taste, price, convenience and transparency” (Astanor, n.d.). The company secured €16.5 million in its Series A funding round, the largest of all time for a European plant-based start-up, bringing the total amount of funding raised to date to about €20 million (Ho, 2022). Stockeld Dreamery's first product, Stockeld Chunk, launched in May 2021 and is based on peas and fava beans that is manufactured using a fermentation process (Ellis, 2021). Their product is currently available at select partners in Sweden, but will soon have a nationwide rollout with plans to enter the Alternative dairy markets in other EU countries (Stockeld Dreamery, n.d.).



Figure 12. Stockeld Dreamery Logo

Natulatte B.V.

Natulatte claims to be the first company in the world to have a fully plant-based oat milk powder and cacao milk powder that can be used with professional coffee machines (Natulatte, n.d.). Based in the Netherlands, the company launched their first products in early 2021 and is now a new player in the market for dairy substitutes in the Netherlands which has seen a growth of 10% per year (Duurzaam-ondernemen, 2021). Natulatte provides a sustainable alternative for



Figure 13. Natulatte Logo

coffee lovers. With each cup of Natulatte consumers save about 66 liters of water, 0.24 kg of CO₂, and 1 square meter of land, when compared to a cup of cappuccino (van Santen, n.d.). The company currently has two products on the market: Natu Latte Topping and Choco Latte Cacao Mix, which are available at retailers and partners throughout the Netherlands (Natulatte, n.d.). With the company aiming to sell 4 million plant-based lattes per year by the end of 2025, it can be assumed that the company will try to take advantage of the market opportunities in other EU countries (TrendWatching, 2020).

The Hempany GmbH

The Hempany is a food and beverage company founded in 2020 in Stuttgart, Germany, that produces products made from organic hemp (The Hempany, n.d.). "There are currently two brands behind The Hempany - hemi, the first hemp milk produced in Germany, and ChillChoc, the anti-stress cocoa with hemp" (Apollo, n.d.). The company uses hemp due to



Figure 14. The Hempany Logo

its nutritional values, taste, ability to be grown regionally, improves soil quality, and can capture up to twice the amount of CO₂ compared to trees (Yumda, n.d.). The company's mission is to strengthen regional hemp cultivation thus contributing towards sustainability and an improved climate (The Hempany, n.d.). The Hempany currently sells their products across several major retailers and health food stores in Germany (Kaufland, Rewe Süd, Naturgut, Denns, Alnatura, Basic) and are busy developing other sustainable food products made with Hemp (The Hempany, n.d.).

BanaBar (FoodSpace B.V.)

BanaBar was founded in 2019 by food technologist Marco Mega at Wageningen University in the Netherlands, who was looking for an alternative to the traditional granola and date-based snack bars (BanaBar, n.d.). This led to the creation of Europe's first organic fruit & nut bar based on dried bananas. The company creates 100% plant-based and organic fruit



Figure 15. BanaBar Logo

bars composed of dried bananas that come from Ecuador in South America (Vegconomist, 2022). Bananas are one of the most produced fruits in the world, which also require an extensive amount of pesticide to keep crops healthy. Although research has shown low risk of exposure for end consumers, the risk for plantation workers and those living nearby these areas are considerable (Stewart, 2020). It is therefore BanaBar's mission to use their products to create a positive social and environmental impact through their use of organic ingredients, but to also promote a healthy and sustainable snacking experience to consumers (BanaBar, n.d.). "We use only rejected bananas not suitable for the export market and commit

1% of our total revenue to support the organic farmers we work with in Ecuador” (Vegconomist, 2022). BanaBar is currently available in stores across the Netherlands, but orders made through their website can be delivered throughout the EU. The company currently has 4 flavors in their assortment and plans on launching new flavors and products in the coming months and years (BanaBar, n.d.).

ZBS Food UG

Zero Bullshit Food is a company based in Germany which was founded in 2020. Their mission is to produce sustainable products that are good for the people and the environment. The company produces 100% plant-based crackers that are made using 30% upcycled organic raw materials which aids in helping them to achieve their vision achieving the sustainable development goals of the UN (ZBS Food, n.d.). The company currently has 2 flavors for their crackers, and they are available for online purchase through their website with deliveries being made to Germany and Austria (ZBG Food, n.d.).

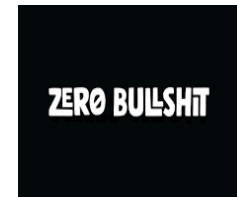


Figure 16. ZBS Food UG Logo

OSSA (INDI B.V.)

OSSA is a Belgium beverage start-up which was founded in 2019 that produces a plant-based alternative energy drink that uses the Guayusa leaf as its base (Verima, n.d.). Guayusa is a leaf native to the Amazon rainforest in Ecuador that contains high levels of caffeine and antioxidants which helps energize the body while simultaneously relaxing the nervous system. The OSSA drink is therefore made using only natural ingredients, is additive-free, completely organic, sugar free, and comes in fully recyclable packaging (Good & Food, n.d.). Their products come in three flavors and are available in specialized stores in Belgium and online via their website with shipping to Belgium, France, Switzerland, and Germany. OSSA also donates 1% of their revenues to support environmental solutions (OSSA, n.d.).



Figure 17. OSSA Logo

Pacha de Cacao B.V.

Pacha de Cacao B.V. is a beverage company which was founded in 2020 and is based in The Netherlands. The company's main product, Pacha de Cacao, is a 100% natural juice made from fresh cacao pulp and water out of Ecuador (Pacha de Cacao, n.d.). For the production of chocolate, cacao pods are opened and the cacao bean is taken out, and the white pulp that remains inside is the cacao pulp. Only about 25% of this pulp is used during fermentation with the other 75% being discarded (Cocoa Box, 2021). Pacha de Cacao takes this cacao pulp that would otherwise be discarded and creates a natural refreshing beverage that is not only full of vitamins and nutrients, but also provides extra income for the farmers who grow and harvest the cacao fruit and reduces food waste in the cacao supply chain (van Essen, 2020). Pacha de Cacao can be ordered online through their website and deliveries are made throughout Europe (Pacha de Cacao, n.d.).



Figure 18. Pacha de Cacao Logo

3. Have consumers been experiencing a shift towards more plant-based products in their local supermarkets?

The questionnaire was successful in receiving the required sample size to project the opinions of the EU population with a confidence level of 95%. In total, the number of respondents amounted to 400 individuals, with 2 of those being inapplicable for the target market of individuals living within the EU. This brings the total number of respondents of people living within the EU to 398. The questionnaire consisted of 14 questions (listed in the appendix) which will be discussed in this chapter as well as the responses received.

The questionnaire also collected respondents from each of the 27 member states of the EU. Questions 1-3 captured the demographics of the respondents. The largest group of respondents were from the Netherlands with 12.31% (49), Romania with 11.81% (47), Poland with 7.04% (28), and Slovakia with 6.03% (24). The respondents consist of 49% male, 49% female, and 2% Other (non-binary, genderfluid, genderqueer, prefer not to say). The age groups of the respondents consisted of 92% between 18-29, 6% between 30-44, and 2% between 45-59.

The following two questions (Question 4 & 5) were about the respondent's experience visiting supermarkets and were intended to get a general picture of both the frequency that the respondents visit their local grocery store or supermarket, and what, according to them, has been the most noticeable change in these local stores within the last 2 years. These questions were asked before the specific plant-based questions were presented, to get an uninfluenced response solely from their own perspectives and experiences.



Figure 19. Question 4 - How often do you go to your local supermarket/grocery store?

The results for question 4 reveal that of the 398 respondents, the largest percentage (43%, or 171 individuals) go to their local supermarket/grocery store three times a week, followed by the second largest percentage (38%, or 151 individuals) that visits their local supermarket/grocery store at least once a week. The third largest group (35 individuals, or 8.8%) visit their local store once a day, making this the group of most frequent visitors. The smaller groups include those who visit their local stores three times a month

(26 individuals, or 6.5%), those who only visit once a month (12 individuals, or 3%), and the smallest group of respondents who say they never visit their local supermarket/grocery store (3 individuals, or 0.7%).

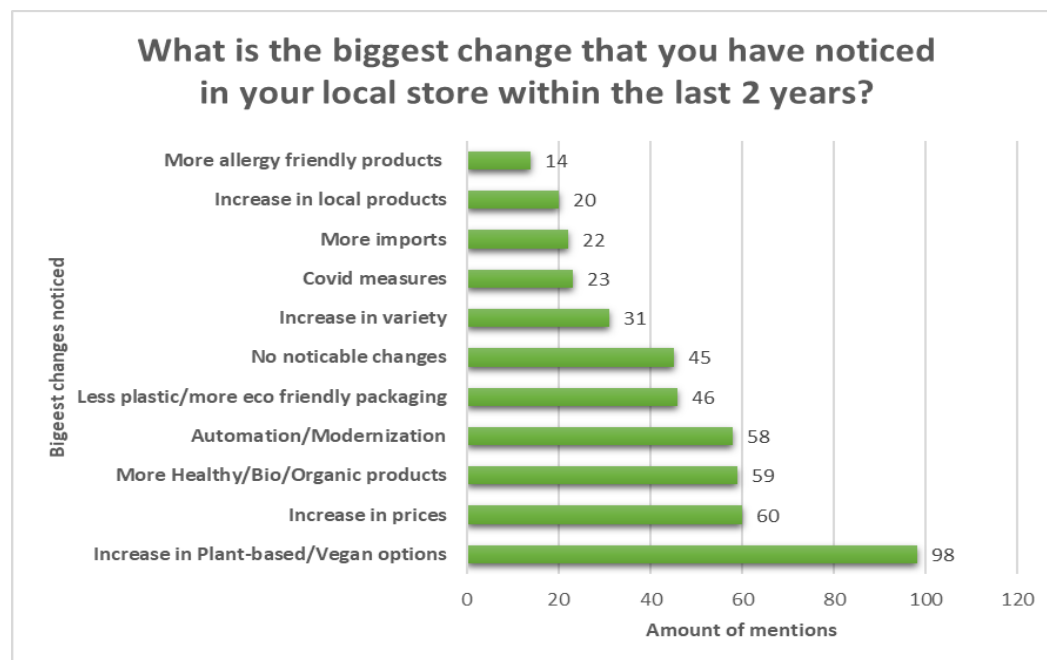


Figure 20. Question 5 - What is the biggest change that you have noticed in your local store within the last 2 years?

Question 5 allowed the respondents to fill in their custom answer to describe the biggest change/changes that they have noticed in their local supermarket/grocery store within the last two years. The answers consisted of both short and long answers which have been categorized into the main categories seen in figure 3. Some respondents also mentioned multiple changes which are then each showcased in their own category. Hence why there are 476 answers for this question compared to the 398 respondents. The category with the most noticeable change was the increase in plant-based/vegan options. This includes respondents who mentioned the increase in both plant-based and vegan products or alternatives, and those who used terms such as “meat alternatives” and “fake meat”. The second biggest noticeable change has been the increase in prices. Respondents pointed out the continuous price increase in most products with many blaming it on inflation. The third most noticeable change has been the increase in healthy/bio/organic products. This also includes respondents who mentioned the increase in fresh fruits and vegetables, products that have a bio, organic, or eco-friendly label, and products that promote a healthy lifestyle. The fourth biggest group of noticeable changes falls under automation/modernization. This group includes respondents who have noticed layout changes, building expansions and improvements (exterior and interior), and the use of new technologies. These technological improvements include the introduction of self/auto checkout, card payment options, online shopping experience, introduction of a store application, and home delivery options.

Figure 3 also shows the other groups of noticeable changes that were mentioned. This includes the use of less plastic packaging and the increase of more eco-friendly/biodegradable packaging, an increase in the availability of local products, noticing more imports and international products, more allergy friendly products (lactose-free, gluten-free, etc.), the introduction of covid related measures, a general increase in the variety of products available, and those who claim to have noticed little to no changes at all within

the last 2 years. Honorable mentions that did not make this list but should be highlighted include an increase in items available in bulk, a decrease in fresh foods, an increase in ready-to-eat/takeaway meals, price decreases and green washing.

The following questions are specifically focused on the respondents' experience with plant-based products in their local supermarket/grocery store. These questions will seek to clarify the experience that the respondents have had with the promotion and placement of plant-based products in their local supermarket/grocery store and how this has influenced their purchasing behavior in relation to these products.

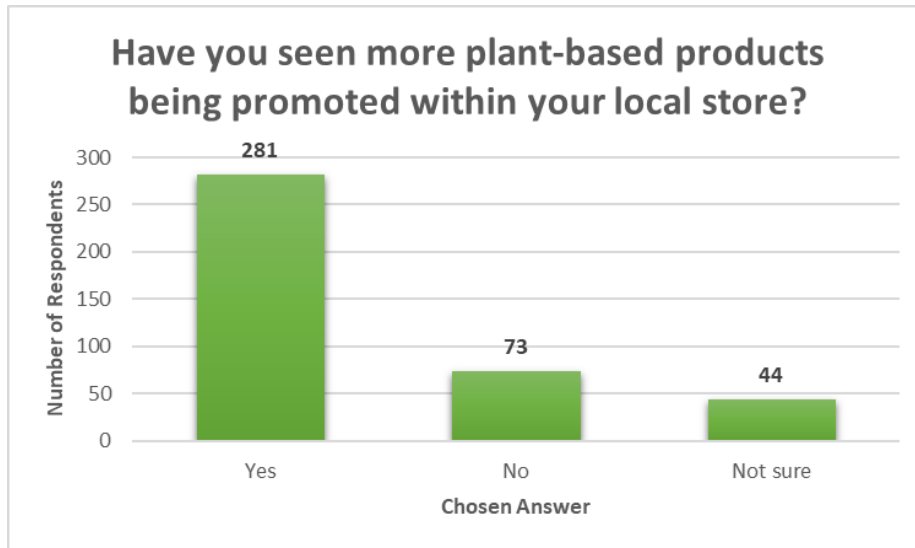


Figure 21. Question 6 - Have you seen more plant-based products being promoted within your local store?

Question 6 was asked to determine if the respondents had seen any promotion being done for plant-based products within their local supermarket or grocery store. This question had a simple yes/no/not sure answer option, and the results can be seen in figure 4. Of the 398 respondents, 281 (70.6%) chose Yes, 73 (18.4%) chose No, and 44 (11%) chose the Not sure option. The answers reveal that the majority of respondents (70.6%) have seen more promotions for plant-based products and only a small group (11%) were not sure. This could mean that they either had not noticed any or are part of those who are not interested in this topic and therefore do not pay attention to such promotions.



Figure 22. Question 7 - Have you seen a specific area within your local store dedicated only for plant-based products?

Question 7 was made to see if the respondents had seen a specific area dedicated only for plant-based products within their local supermarket or grocery store. This question had a simple yes/no/not sure answer option, and the results can be seen in figure 5. Of the 398 respondents, 256 (64.3%) chose Yes, 106 (26.6%) chose No, and 36 (9.1%) chose the Not sure option. The result of this question makes it clear that the majority of respondents have seen a specific area dedicated only to plant-based products.

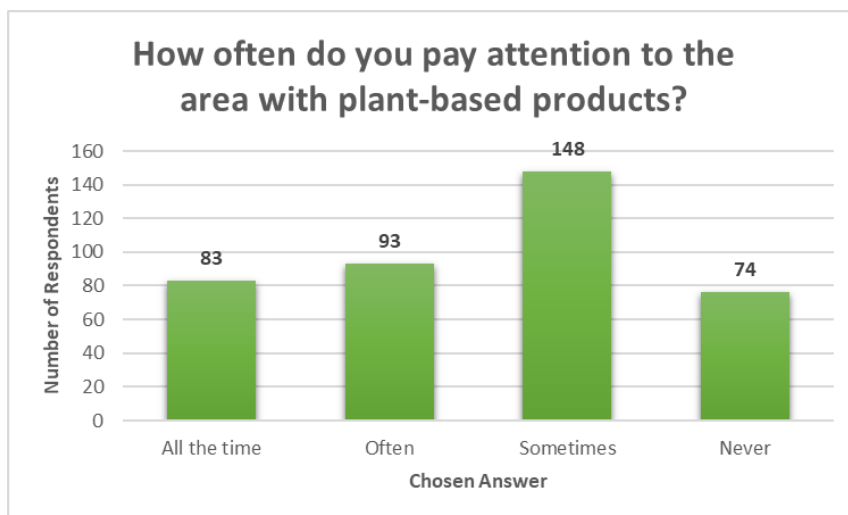


Figure 23. Question 8 - How often do you pay attention to this area with plant-based products?

Question 8 follows after the previous question and aims to show the effectiveness of such a plant-based only section, if applicable, and how often this gets paid attention to by the respondents. This question had the answer options of: all the time, often, sometimes, and never. The results can be seen in figure 6. Of the 398 respondents, 83 (20.8%) chose All the time, 93 (23.4%) chose Often, 148 (37.2%) chose Sometimes, and 74 (18.6%) chose Never.



Figure 24. Question 9 - Is there a large variety of different types of plant-based products available in your local store?

Question 9 was created to see if the respondents had seen a large variety of different types of plant-based products within their local supermarket or grocery store. This question allowed respondents to enter a short answer text so that they can give some extra information. Based on the responses, the following categories were made: Yes, No, Not sure, and Not interested. The results can be seen in figure 7. Of the 398 respondents, 298 (74.9%) chose Yes, signifying that this group feels there is a large variety of different types of plant-based products available at their local store. This group also consists of respondents who claimed that there is either a satisfactory or small amount of plant-based options available within their local store. In contrast, 65 respondents (16.3%) chose No, that they do not feel like this is the case. 26 (6.5%) said that they were not sure, and only 9 (2.3%) said that they were not interested.

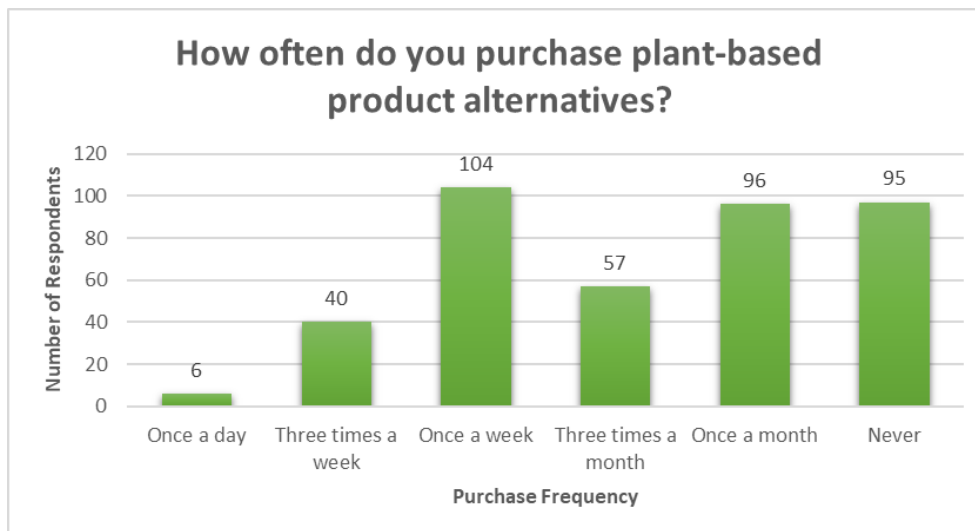


Figure 25. Question 10 - How often do you purchase plant-based product alternatives?

Question 10 was intended to reveal the purchasing behavior of the respondents for plant-based products within their local supermarket or grocery store. The response options for this question were as follows: Once a day, three times a week, once a week, three times a month, once a month, or never. The results

for this question can be seen in figure 8. When it come to the frequency of purchase, of the 398 respondents, 6 (1.5%) chose once a day, 40 (10.1%) chose three times a week, 104 (26.1%) chose once a week, 57 (14.3%) chose three times a month, 96 (24.1%) chose once a month, and 95 (23.9%) claimed to never purchase plant-based products or alternatives.



Figure 26. Question 11 - Has your local store influenced you to purchase more plant-based product alternatives?

Question 11 aimed to clarify if the respondents felt influenced by their local supermarket or grocery store to purchase more or any plant-based products or alternatives. This question had a simple yes/no/not sure answer option, and the results can be seen in figure 9. Of the 398 respondents, 257 (64.6%) chose No, 64 (16.1%) chose Not sure, and 77 (19.3%) chose the Yes option.



Figure 27. Question 12 - Do you think that your local store has enough plant-based product alternatives?

Question 12 allowed the respondents to state whether they think that their local store has enough plant-based product alternatives available for purchase. This question had a simple yes/no/not sure answer option, and the results can be seen in figure 10. Of the 398 respondents, 99 (24.9%) chose Yes, 217 (54.5%) chose No, and 82 (20.6%) chose the Not sure option.



Figure 28. Question 13 - Would you like to see more types of plant-based product alternatives in your local stores?

Question 13 gave the respondents the opportunity to state whether they would like to see more types of plant-based products and alternatives within their local stores. This question had a simple yes/no/not sure answer option, with the results being presented in figure 11. Of the 398 respondents, 301 (75.6%) chose Yes, 39 (9.6%) chose No, and 59 (14.8%) chose the Not sure option.



Figure 29. Question 14 - What are some of the reasons that you purchase plant-based products?

The final question of the questionnaire, Question 14, asked the respondents to state their reasons for purchasing plant-based products, if they do. This question allowed respondents to choose from multiple answer options and gave them the ability to write their own reasoning in case it was not in the answer options. Therefore, this question has a total of 952 entries compared to the 398 respondents. Based on the responses, 10 different groups of reasons were formed which are represented in figure 12. The biggest reason for the purchase of plant-based products comes from sustainability (239 or 25.11%), followed by health reasons (236 or 24.79%), animal welfare (187 or 19.64%), taste (129 or 13.55%), allergies/intolerances (72 or 7.56%), and to make a statement (39 or 4.10%). For this question 2.63% of respondents (25) said that they do not purchase any plant-based products, 0.74% (7) said that they do it because of they are vegan, another 0.74% (7) said they do it out of curiosity, and 1.16% (11) for other reasons (religion, lifestyle, sale, and for clients).

4. Discussion of results

The discussion of results presents the reflection of the research methods, and the discussion of the research results for each of the sub-questions as well as provides an interpretation in relation to the information given in the introduction. The objective of this research was to figure out how the EU market is accommodating for businesses that innovate plant-based products that support the transition towards a sustainable food system.

4.1 Reflection of research method

For the first sub-question, the overall information was satisfactory for describing the current regulations in place that could affect food businesses in the EU, especially since a policy was found that specifically mentioned the term “plant-based” as this research was aiming to discover. Furthermore, the research found strong support for sustainable business practices with clear indications that policies aiming to support such businesses are becoming a focal point for policies within the EU.

Limitations of the research methods were revealed in the second sub-question. This is because it was first stated that companies or products which had not yet entered the market would be researched. However, during the research it became clear that this was not the correct method needed to answer the question itself. To correctly answer the question, the research method was changed to find companies or products that had recently entered the EU market. Further limitations were found in the question itself, as the timeframe of companies or products which entered the market within the last year provided insufficient results than what were the minimum requirements described in the research method, with that being 15 companies or products launched within this 1-year time frame. To successfully achieve the minimum requirements of the research method, the timeframe was increased to companies or products which entered the market within the last 3 years.

The research methods for the third sub-question were successfully executed and provided satisfactory results for confidently answering this sub-question. To achieve the desired number of respondents required, paid marketing was used on the social media platform of Instagram to target individuals living within each of the countries within the EU. This provided a rapid response which led to the minimum required number of respondents to be reached within 1 week. Moreover, this targeting ensured that the respondents included residents of each member country of the EU, providing an extensive view on the consumer experience regarding plant-based products. As for what could have been done differently, a reduction in questions placed in the questionnaire would have also been sufficient for answering this sub-question. The respondents could be considered slightly biased as they were informed that the topic of the questionnaire was covering plant-based products. Therefore, it could be concluded that respondents would rather complete a questionnaire if it fits their interests rather than not. However, in this case almost 24% of the respondents stated that they never purchase plant-based products yet still decided to partake in the survey.

Overall, the research generated interesting insights in the current legislative framework of the EU in relation to sustainable food practices and exposed a broad range of products and businesses which will

be at the forefront of strengthening the sustainability of the EU food system. Furthermore, the responses generated to answer the third sub-question provided a comprehensive insight into the perception of consumers in relation to the topic of plant-based foods.

4.2 Discussion of results

1. How are governmental policies in the EU influencing businesses in the plant-based food industry?

In the introduction emphasis was placed on the role of countries and governments in relation to achieving international climate goals and influencing dietary patterns. The United Nations and its 193 member states have highlighted the importance of tackling climate change and promoting sustainable consumption and nutrition patterns in its 2030 agenda for sustainable development. Furthermore, Europe's goal of becoming the first climate-neutral continent by the year 2050 has the European Green Deal playing a key role towards the achievement of this goal, with the European Green Deal aiming to promote healthy and sustainable diets among its other points of focus. At the center of the European Green Deal lies the Farm to Fork Strategy which further emphasizes the commitment to a healthier and more sustainable EU food system. The results of this research show that the Farm to Fork Strategy aims to make the EU food system a global standard for sustainability and provides a foundation for new and future EU food related policies. Currently, although a legislative framework for sustainable food systems has been proposed to support the enforcement of the farm to fork strategy and the development of a sustainable food policy, this has not yet been put into place. The only part of the Farm to Fork Strategy that has been put into force is the "EU Code of Conduct on Responsible Food Business and Marketing Practices" which shows the actions, principles, and objectives that can be implemented throughout the food chain for all actors involved who can voluntarily commit to and work on improving their sustainability efforts using this as their guideline. The EU Promotion Policy for Agricultural Products (Regulation (EU) No 1144/2014) was the only policy found which directly encourages the shift towards a more plant-based diet. However, the policy more so emphasizes the need to increase consumption of fruits and vegetables as this has declined in the EU in recent years and now stands below the recommendations of the World Health Organization (European Commission, n.d.). Furthermore, the EU law on food information to consumers (regulation (EU) No 1169/2011) and the Common Market Organization Regulation (regulation (EU) No 1308/2013) are relevant to all businesses in the food industry, including those focusing on the plant-based sector.

2. What are upcoming companies that entered the market within the last 3 years, that could help boost the growth of the plant-based food industry within the EU?

The results of this research have found strong evidence that the plant-based food industry within the EU is growing rapidly. As the report published by the EU-funded Smart Protein Project stated, the plant-based food sector grew by 49% in the period between 2018-2020, with the Covid-19 pandemic further accelerating this growth as consumers became increasingly aware of the impact their food choices have on both their health and the environment. The research conducted for this sub-question has been able to discover a diverse collection of plant-based food companies operating in the EU across different

categories which have all entered the market within the last 3 years. Of the 16 companies collected in the results, 15 are established within a member country of the EU (Germany, the Netherlands, Belgium, Austria, Sweden) leaving only 1 which is established in another European country (Switzerland). However, all 16 are distributing their products to member states of the EU thus contributing to the growth of the plant-based sector. The results further support the growth of the plant-based food (and beverage) industry within the EU with the projected compound annual growth rate of at least 8.8% during the period from 2022 to 2027.

The results can benefit retailers that are shifting or plan to shift their current assortment of products towards more sustainable solutions as these results have presented a wide-ranging list of upcoming plant-based companies and products available within the EU. The results presented in the first sub-question have already highlighted the EU's encouragement towards sustainable promotion and consumption practices with emphasis on shifting towards more plant-based diets. The list of companies presented in the second sub-question has covered at least one product example for plant-based product alternatives in the categories of (plant-based) fish, meat, eggs, dairy, snacks, and drinks. Retailers can therefore expand their current assortment using any of these products or can also choose to use other popular and well-established plant-based brands and products which were not included in these results as they were outside the scope of this research. Nonetheless, there is a large variety of plant-based categories and products available that retailers could include in their assortment to further promote and support the sustainability goals of the EU.

3. Have consumers been experiencing a shift towards more plant-based products in their local supermarkets?

The final section of the results analyzed the responses received through the conducted questionnaire aimed towards individuals living within the EU. The results gathered responses from individuals living within each of the 27 member states allowing for a comprehensive insight into the viewpoints of consumers in the EU in relation to their experience with plant-based products in their local grocery store or supermarket. The key takeaways from the results reveal that 70.6% of respondents claim to have seen promotions being done for plant-based products within their local stores, and 64.3% of respondents claim to have seen an area dedicated specifically for plant-based products. Although 74.9% of respondents state that there is a large variety of plant-based products currently available, a notable 75.6% declared that they would like to see even more plant-based product alternatives become available within their local stores. In the knowledge gap, it was stated that it was not clear whether a change in food offers is playing a role in the consumption habits of consumers. The results gathered for this question has now revealed that 64.6% of respondents declare to have not been influenced by their local store or supermarket to purchase more plant-based product alternatives, despite the clear indications of the increased promotions and availability of such products. According to the results gathered, the top reasons that consumers purchase plant-based products are for sustainability reasons, health awareness, supporting animal welfare, taste preferences, or due to some form of allergy or intolerance (in that order). Both governmental bodies and retailers can use these results to obtain a better understanding of what drives consumers to change their dietary patterns and purchasing behaviors.

4. Main question: How are markets changing in the EU towards widespread applications of plant-based foods?

The three previously discussed sub-questions can provide support in the formulation of an answer to the main question of this research. The EU has proven its determination to transform its legislative framework by establishing a strong foundation for its goals of net-zero emissions by 2050 and the transformation of its food system into a global standard for sustainability. The European Green Deal along with the Farm to Fork Strategy emphasizes the EU's commitment towards a healthier and more sustainable food system by highlighting sustainable food production and sustainable food consumption as fundamental elements necessary for all new and future EU food related policies. In the knowledge gap, it was alleged that it was unclear whether these commitments and strategies included the introduction of more plant-based products. The results of this research have now revealed that the EU Promotion Policy's work program for 2022 has become the first instance where shifting towards a plant-based diet has been officially encouraged and where funding to support the industry has been pledged. In the knowledge gap it was also stated that there had been no investigation done in the EU as to how governmental policies have influenced upcoming businesses in the plant-based food industry. The results of this research have now revealed that plant-based businesses can apply for funding through the EU Promotion Policy, but since the policy's 2022 work program is the first instance mentioning plant-based, it is still too early to report what effect this policy has had on these businesses. The results do show that businesses in the plant-based industry have been successfully entering the market in different member states throughout the EU across many categories of plant-based alternative products such as plant-based fish, meat, eggs, dairy, snacks, and drinks. Finally, it was further stated in the knowledge gap that although it is known that consumers have become more conscious about the environment and sustainability of their food choices, it is not clear if a change in food offers is playing a role in consumption habits. The results of this research have now revealed that consumers in the EU are not basing their choices solely on the types of food being offered, but that their consumption habits are being primarily influenced by sustainability, health, animal welfare and taste. Recent developments in the EU have shown further support for this as the citizen-led EU initiative COFE (Conference on the Future of Europe) has advocated for shifting towards sustainable diets, plant-based eating, and increased animal welfare further proving that a sustainable food system is high among the concerns of EU citizens (Vegconomist, 2022).

5. Conclusions and Recommendations

5.1 Conclusions

As the world's population continues to increase, the global food system finds itself at a tipping point where future nutritional demands of the population need to be met while simultaneously reducing its environmental footprint. The challenge of improving global food production will require technological innovations, agricultural efficiency, policy reinforcements, and a global shift in dietary trends that together promote sustainability throughout the entire food system without depriving the planet of its natural resources. Previous studies have shown that shifting towards consumption of more plant-based foods will have a positive impact on public health, the environment and on efforts to achieve a more sustainable food system. This research therefore focused on the market conditions in the EU in terms of widespread applications of plant-based foods.

In terms of policies, there is significant evidence found related to the EU's dedication towards the promotion of sustainable food production and consumption habits. The European Green Deal's Farm to Fork strategy emphasizes the need for a transition towards more sustainable and resilient food systems that are beneficial not just for its citizens, but for the entire planet and all those living on it. When it comes to plant-based foods specifically, this stands out in the EU Promotion Policy's work program for 2022, where as a criterion to receive funding through this policy, promotion campaigns within the EU should encourage the shift to a more plant-based diet. This is in line with the recommendations referred to in the introduction made by the European Public Health Association. Businesses in the plant-based industry could apply for this funding as they would be promoting the shift towards plant-based diets. Additionally, businesses in the plant-based food industry must be aware of the limitations related to naming their products to ensure that they are not infringing on protected terms such as the protected dairy terms laid out in the Common Market Organization Regulation (Regulation (EU) No 1308/2013), unless these are allowed by the member states in which they are operating. As per the point raised in the knowledge gap, the limitations that a policy such as the CMO regulation presents to upcoming businesses in the plant-based food industry is that of product naming. This presents an obstacle for food business operators as they are not allowed to designate plant-based products (such as plant-based dairy alternatives) with protected dairy terms (milk, butter, cream, cheese, whey and yoghurt) since these are to be used exclusively for milk-containing products. Nonetheless, granted that businesses in the plant-based food industry comply with the requirements of the CMO regulation and EU law on food information to consumers, there are no policies in the EU hindering the success of businesses in the plant-based food industry.

The plant-based food industry within the EU has seen significant growth over the last few years. The Smart Protein Project which is funded by the EU has reported a growth of 49% for the plant-based food industry in the period between 2018-2020 alone. The Covid-19 pandemic has further accelerated this growth in the period thereafter as consumers became increasingly aware of the impact their food choices have on their health and the environment. Within the last 3 years a variety of plant-based businesses have entered the EU market across different categories, further supporting the growth of this industry. In the category of plant-based fish there is Bettafish from Germany, Novish from the Netherlands, and Revo Foods from

Austria. For the plant-based meat category there is Planted Foods from Switzerland, Planty-Of-Meat from Germany, and Rival Foods, The Protein Brewery and Upside Plantbased all located in the Netherlands. Under the plant-based eggs category lies Bettr Egg, which is based in Germany. In the category of plant-based snacks there is BanaBar from the Netherlands and also ZBS Food UG from Germany. Furthermore, for the category of plant-based dairy alternatives there is Natulatte from the Netherlands, Stockeld Dreamery from Sweden, and The Hempany from Germany. Finally, there is Ossa from Belgium and Pacha de Cacao from the Netherlands which both fall under the category of plant-based beverages. This list of companies supports the notion of the plant-based industry's flourishing development within the EU. With a compound annual growth rate of at least 8.8% projected for the plant-based food industry within the EU, the upcoming companies listed previously can certainly help boost the growth of this sector alongside those businesses that have already been established for a much longer period in the same industry.

The survey conducted provided insights into the experiences EU consumers have in relation to plant-based products in their local supermarkets. Over 70% of respondents stated to have seen promotions being done for plant-based products, and more than 64% claim that there is now a specific area dedicated to plant-based products in their local supermarkets. Additionally, even though 74.9% of respondents stated that there is a large variety of plant-based product options currently available, 75.6% declared that they would like to see even more of these types of products become available within their local supermarkets. Since the respondents who took part in the survey come from each of the 27 member states of the EU, the insights provided by the collected data give a comprehensive look into the consumer experience in relation to the shift towards plant-based products throughout the EU. The results also provide clarity into the question raised in the knowledge gap as to whether a change in food offers is playing a role in consumption habits. Despite the results showing an increased availability and promotion of plant-based products, this has not played a significant role in consumption habits. The results have revealed that the top 3 reasons consumers in the EU have been changing their consumption habits are due to sustainability reasons, health awareness, and to support animal welfare.

Through the combination of results gathered during this research, an answer to the main question can now be composed. There is strong evidence that the markets in the EU are changing in favor towards widespread applications of plant-based foods. Governmental policies in the EU are benefiting businesses that promote and partake in sustainable food production and sustainable consumption practices, and funding opportunities have been put in place to support efforts towards the promotion of plant-based diets. Additionally, Businesses in the plant-based industry have continued to emerge, with many examples presented across a range of food and beverage categories throughout the EU. Finally, the insights into the local grocery shopping experience provided by the survey has further supported the increase in availability and promotion of plant-based products across the EU. Both governmental bodies and retailers can use these results to obtain a better understanding of what drives consumers to change their dietary patterns and purchasing behaviors.

Governmental bodies and politicians can use the results to compare current policies and regulations to better understand how these should be adapted to increase the speed of which the transition towards more sustainable business practices should be brought into law. Furthermore, retailers that are shifting or plan to shift their current assortment of products towards more sustainable solutions can use these results to choose from the wide-ranging list of upcoming plant-based companies and products presented to further promote and support the sustainability goals of the EU and cater to the desires of consumers represented in the survey.

5.2 Recommendations

In this section, recommendations are given to the target groups of governmental bodies and retailers associated with food. If these recommendations are taken into consideration, it could facilitate and accelerate the adoption of plant-based foods throughout the EU. This could lead to more sustainable consumption habits that are in line with the current goals and strategies set forth by the EU. These recommendations could help clarify how institutional support of governments and support of food retailers and food service providers can cooperatively make the EU food system a global standard for sustainability.

In the short term, governments should create or support educational campaigns (for schools, companies, institutions, health clubs such as gyms) highlighting the benefits that sustainable consumption habits can have on personal health, society, and the environment that can incentivize people to consume more plant-based products. Retailers can focus on offering more plant-based products and conduct local surveys to figure out the preferences and desires related to these products within their local community. Furthermore, food retailers could collaborate with upcoming plant-based food businesses and create projects where their products could be trial-tested in these retailers' shops to see how such products are being received by consumers. This could help upcoming businesses receive a better understanding of how their products are performing in terms of packaging, marketing, taste, and consumer interest before they move to fully launch on open markets.

In the long term, governmental bodies should work on improving and shortening decision making times (months instead of years) on important topics related to the sustainability of the food industry in order to achieve their sustainability goals within the desired timeframe. Further emphasis must be placed on creating more policies that support and accelerate the sustainability goals and targets as current measures in place (such as goals, guidelines, strategies) are not legally binding and can therefore significantly slow down the achievements of long term sustainability targets. Moreover, comparative measures should be carefully formulated that uniformly display the sustainability, social, and economic impact of each food product within the EU. Additionally, the EU should make a comprehensive analysis of which countries are most behind in terms of sustainably food production and consumption practices and specifically help those countries with funding or the necessary infrastructure needed to support such practices.

List of references

- Ahmed, N., & Glaser, M. (2016, April). Coastal aquaculture, mangrove deforestation and blue carbon emissions: Is REDD+ a solution? *Marine Policy*, 66, 58-66. Retrieved April 24, 2021, from doi: 10.1016/j.marpol.2016.01.011
- Amirkolaie, A. K. (2011, February 23). Reduction in the environmental impact of waste discharged by fish farms through feed and feeding. *Reviews in Aquaculture*, 3(1), 19-26. Retrieved April 20, 2021, from doi: 10.1111/j.1753-5131.2010.01040.x
- Apollo. (n.d.). *The Hempany GmbH*. Retrieved April 24, 2022, from Apollo: <https://www.apollo.io/companies/The-Hempany-GmbH/605c5278b7998b00a46b2424?chart=count>
- Astanor. (n.d.). *Stockeld Dreamery*. Retrieved April 25, 2022, from Astanor: <https://astanor.com/cases/stockelddreamery/>
- BanaBar. (n.d.). *Home*. Retrieved April 21, 2022, from BanaBar: <https://www.banabar.com/>
- BanaBar. (n.d.). *Products*. Retrieved April 21, 2022, from BanaBar: <https://www.banabar.com/collections/all>
- BanaBar. (n.d.). *The Story*. Retrieved April 21, 2022, from BanaBar: <https://www.banabar.com/pages/our-story>
- Benton, T., Hartel, T., & Settele, J. (2011, November 30). Food security: A role for Europe. *Nature*, 480, 39. Retrieved March 23, 2021, from doi: 10.1038/480039d
- BettaFish. (2022). *BettaFish*. Retrieved April 24, 2022, from BettaFish: <https://betterfish.de/>
- Bettr Egg. (n.d.). *Better for you. Better for the planter. Bettr Egg*. Retrieved April 24, 2022, from Bettr Egg: <https://bettr-egg.co/>
- Bobeldijk Food Group B.V. (n.d.). *Novish*. Retrieved April 20, 2022, from Bobeldijk: <https://www.bobeldijk.nl/en/customer-cases/novish/>
- British Sea Fishing. (n.d.). *Commercial Fishing Methods*. Retrieved March 15, 2021, from British Sea Fishing: <https://britishseafishing.co.uk/commercial-fishing-methods/>
- Business Wire. (2022, February 23). *Europe Plant-Based Food and Beverage Market is Projected to Grow at a CAGR of over 8.87% During 2022-2027 - ResearchAndMarkets.com*. Retrieved April 25, 2022, from Business Wire: <https://www.businesswire.com/news/home/20220223005850/en/Europe-Plant-Based-Food-and-Beverage-Market-is-Projected-to-Grow-at-a-CAGR-of-over-8.87-During-2022-2027---ResearchAndMarkets.com>
- Carbon Brief. (2020, September 15). *In-depth Q&A: What does the global shift in diets mean for climate change?* Retrieved March 15, 2021, from Carbon Brief: <https://www-carbonbrief-org.cdn.ampproject.org/v/s/www.carbonbrief.org/in-depth-qa-what-does-the-global-shift-in->

diets-mean-for-climate-change/amp?amp_js_v=a6&_gsa=1#referrer=https%3A%2F%2Fwww.google.com&_tf=From%20%251%24s&share=https%3A%2F%2Fwww

- Catalyze Group. (n.d.). *Planted: creating new plant-based meat alternatives*. Retrieved April 22, 2022, from Catalyze: <https://www.catalyze-group.com/case/planted-creating-new-plant-based-meat-alternatives/>
- Catanzaro, R., Sciuto, M., & Marotta, F. (2021, May). Lactose intolerance: An update on its pathogenesis, diagnosis, and treatment. *Nutrition Research*, 89, 23-34. Retrieved April 4, 2021, from doi: 10.1016/j.nutres.2021.02.003
- Cocoa Box. (2021). *Cacao Pulp: All You Need to Know About That Mysterious Substance Inside the Cacao Pod*. Retrieved April 21, 2022, from Cocoa Box: https://www.cocoabox.com.au/cacao-pulp-all-you-need-to-know/?utm_source=rss&utm_medium=rss&utm_campaign=cacao-pulp-all-you-need-to-know#:~:text=They%20open%20the%20pods%2C%20discard,25%25%20is%20used%20during%20fermentation.
- Conserve Energy Future. (n.d.). *What is Overfishing?* Retrieved March 4, 2021, from Conserve Energy Future: <https://www.conserve-energy-future.com/causes-effects-solutions-of-overfishing.php>
- Crunchbase. (n.d.). *About*. Retrieved April 24, 2022, from Crunchbase: <https://www.crunchbase.com/organization/bettr-egg>
- da Silva, M. G., Packer, A. P., Sampaio, F. G., Marani, L., Mariano, E. V., Pazianotto, R. A., . . . Alvalá, P. C. (2018, August 27). Impact of intensive fish farming on methane emission in a tropical hydropower reservoir. *Climate Change*, 150, 195-210. Retrieved March 5, 2021, from doi: 10.1007/s10584-018-2281-4
- de Zeeuw, M. (2022, January 18). *This is what Wim de Laat, CEO of The Protein Brewery, learned about the future of our food*. Retrieved April 24, 2022, from Mtsprout: This is what Wim de Laat, CEO of The Protein Brewery, learned about the future of our food
- Dunne, D. (2020, 09 14). *Interactive: What is the climate impact of meat and dairy?* Retrieved March 7, 2021, from Carbon Brief: <https://interactive.carbonbrief.org/what-is-the-climate-impact-of-eating-meat-and-dairy/>
- Duurzaam-ondernemen. (2021, September 13). *Natulatte launches plant-based milk substitute for coffee machines*. Retrieved April 25, 2022, from Duurzaam-ondernemen: <https://www.duurzaam-ondernemen.nl/natulatte-lanceert-plantaardige-melkvervanger-voor-koffieautomaten/>
- Duurzaam-ondernemen. (2021, October 20). *The Protein Brewery builds large-scale demonstration factory*. Retrieved April 24, 2022, from Duurzaam-ondernemen.nl: <https://www.duurzaam-ondernemen.nl/the-protein-brewery-bouwt-grootschalige-demonstratiefabriek/>
- EIT Manufacturing. (2021, September 13). *Revo Foods: From the idea of plant-based, 3D-printed seafood to an investment of almost 2 Mio. Euro*. Retrieved April 20, 2022, from EIT Manufacturing:

- <https://www.eitmanufacturing.eu/news-media/news/revo-foods-from-the-idea-of-plant-based-3d-printed-seafood-to-an-investment-of-almost-2-mio-euro/>
- Ellis, J. (2021, May 13). *Future Food* 🗣️: *How Stockeld Dreamery is making 'the world's most ambitious cheese'*. Retrieved April 25, 2022, from AgFunderNews: <https://agfundernews.com/stockeld-dreamery-is-making-the-worlds-most-ambitious-cheese>
- EPA. (2020). *Greenhouse Gas Emissions: Global Greenhouse Gas Emissions Data*. Retrieved March 2, 2021, from United States Environmental Protection Agency.
- European Commission. (n.d.). *Agriculture and the Green Deal*. Retrieved March 22, 2022, from European Commission: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/agriculture-and-green-deal_en
- European Commission. (n.d.). *ANNEX I Work Programme for 2022*. Retrieved May 27, 2022, from European Commission: https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/key_policies/documents/commission-decision-c2022-9236-annex_en.pdf
- European Commission. (n.d.). *ANNEX II Work Programme for 2022*. Retrieved May 28, 2022, from European Commission: https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/key_policies/documents/commission-decision-c2022-9236-annex_en.pdf
- European Commission. (2020, May 20). *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS*. Retrieved March 23, 2022, from EUR-Lex: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52020DC0381>
- European Commission. (2020). *EU population in 2020: almost 448 million*. Retrieved March 10, 2021, from European Commission: <https://ec.europa.eu/eurostat/documents/2995521/11081093/3-10072020-AP-EN.pdf/d2f799bf-4412-05cc-a357-7b49b93615f1#:~:text=On%201%20January%202020%2C%20the,States%20on%201%20January%202019.>
- European Commission. (n.d.). *EU climate action and the European Green Deal*. Retrieved March 1, 2021, from European Commission: https://ec.europa.eu/clima/policies/eu-climate-action_en
- European Commission. (n.d.). *EU Code of Conduct on Responsible Food Business and Marketing Practices*. Retrieved March 23, 2022, from European Commission: https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy/sustainable-food-processing/code-conduct_en
- European Commission. (n.d.). *Farm to Fork strategy*. Retrieved March 22, 2022, from European Commission: https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy_en
- European Commission. (n.d.). *From Farm to Fork*. Retrieved April 2, 2021, from European Commission: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/farm-fork_en

- European Commission. (n.d.). *Food information to consumers - legislation*. Retrieved January 28, 2022, from European Commission: https://ec.europa.eu/food/safety/labelling-and-nutrition/food-information-consumers-legislation_en
- European Commission. (n.d.). *Mandatory Food Information*. Retrieved January 28, 2022, from European Commission: https://ec.europa.eu/food/safety/labelling-and-nutrition/food-information-consumers-legislation/mandatory-food-information_en
- European Commission. (2021, June). Retrieved March 23, 2022, from European Commission: https://ec.europa.eu/food/system/files/2021-06/f2f_sfpd_coc_final_en.pdf
- European Commission. (n.d.). *What is the EU Code of Conduct on Responsible Food Business and Marketing Practices?* Retrieved March 23, 2022, from European Commission: https://ec.europa.eu/food/system/files/2022-03/f2f_sfpd_coc_factsheet.pdf
- European Parliament & European Council. (2013, December 17). *EUR-Lex*. Retrieved December 22, 2021, from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013R1308>
- European Public Health Association. (2017). *Healthy and Sustainable Diets for European Countries*. Retrieved March 24, 2021, from European Public Health Association: https://eupha.org/repository/advocacy/EUPHA_report_on_healthy_and_sustainable_diets_20-05-2017.pdf
- FAO. (2018). *The State of World Fisheries and Aquaculture*. Retrieved April 4, 2021, from FAO: <http://www.fao.org/3/ca0191en/ca0191en.pdf>
- FAO. (2019). *FAO*. Retrieved April 8, 2021, from FAO: <http://www.fao.org/state-of-food-security-nutrition>
- Foley, J. A., Ramankutty, N., Brauman, K. A., Cassidy, E. S., Gerber, J. S., Johnston, M., . . . O'Connell, C. (2011, October). Solutions for a cultivated planet. *Nature*, 478, 337-342. Retrieved March 30, 2021, from doi: 10.1038/nature10452
- Foote, N. (2020, June 4). *EU consumers open to exploring more sustainable diets, but lack information to do so*. Retrieved April 10, 2021, from EURACTIVE: <https://www.euractiv.com/section/agriculture-food/news/eu-consumers-open-to-exploring-more-sustainable-diets-but-lack-information-to-do-so/>
- Foote, N. (2022, January 6). *EU's 2022 promotional policy brands meat cancer risk, encourages shift to plant-based diets*. Retrieved May 28, 2022, from Euractiv: <https://www.euractiv.com/section/agriculture-food/news/eus-2022-promotional-policy-brands-meat-cancer-risk-encourages-shift-to-plant-based-diets/>
- Freshwater-Aquaculture. (2019, August 26). *If algae produce oxygen in a pond, how can having too much algae cause an oxygen depletion?* Retrieved March 20, 2021, from Freshwater Aquaculture: <https://freshwater-aquaculture.extension.org/if-algae-produce-oxygen-in-a-pond-how-can-having-too-much-algae-cause-an-oxygen-depletion/#:~:text=Trace%20minerals%20or%20nutrients%20needed,oxygen%20depletions%20and%20fish%20kills.>

- Gill, M., Wellesley, L., Stark, C., Reay, D., Kim, B., Roberts, S., . . . Percival, R. (2020, September 16). *Experts: How do diets need to change to meet climate targets?* Retrieved March 27, 2021, from Carbon Brief: <https://www.carbonbrief.org/experts-how-do-diets-need-to-change-to-meet-climate-targets>
- Global Aquaculture Alliance. (2019, March 27). *What Is Aquaculture and Why Do We Need It?* Retrieved April 9, 2021, from Global Aquaculture Alliance: <https://www.aquaculturealliance.org/blog/what-is-aquaculture-why-do-we-need-it/>
- Godfray, H. C., Beddington, J. R., Crute, I. R., Haddad, L., Lawrence, D., Muir, J. F., . . . Toulmin, C. (2010, February 12). Food Security: The Challenge of Feeding 9 Billion People. *Science*, 327(5967), 812-818. Retrieved April 14, 2021, from doi:10.1126/science.1185383
- Godfray, H. J., Aveyard, P., Garnett, T., Hall, J. W., Key, T. J., Lorimer, J., . . . Jebb, S. A. (2018, July 20). Meat consumption, health, and the environment. *Science*, 361(6399). Retrieved April 18, 2021, from doi: 10.1126/science.aam5324
- González, A. D., Frostell, B., & Carlsson-Kanyama, A. (2011, October). Protein efficiency per unit energy and per unit greenhouse gas emissions: Potential contribution of diet choices to climate change mitigation. *Food Policy*, 36(5), 562-570. Retrieved May 2, 2021, from doi: 10.1016/j.foodpol.2011.07.003
- Good & Food. (n.d.). OSSA. Retrieved April 25, 2022, from Good & Food: <https://goodandfood.be/en/portfolio-item/ossa-en/>
- Haines, A., & Scheelbeek, P. (2020). European Green Deal: a major opportunity for health improvement. *The Lancet*, 395(10233), 1327-1329. Retrieved April 26, 2021, from https://researchonline.lshtm.ac.uk/id/eprint/4655684/1/Haines_Scheelbeek_2020_European-Green-New-Deal.pdf
- Henders, S., Persson, U. M., & Kastner, T. (2015, December 22). Trading forests: land-use change and carbon emissions embodied in production and exports of forest-risk commodities. *Environmental Research Letters*, 10, 2. Retrieved April 29, 2021, from doi: 10.1088/1748-9326/10/12/125012
- Hever, J. (2016). Plant-Based Diets: A Physician's Guide. *The Permanente Journal*, 20(3), 15-082. Retrieved April 22, 2021, from doi:10.7812/TPP/15-082
- Hofstrand, D. (2014, February). *Can We Meet the World's Growing Demand for Food?* Retrieved April 6, 2021, from AgMRC: <https://www.agmrc.org/renewable-energy/renewable-energy-climate-change-report/renewable-energy-climate-change-report/january--february-2014-newsletter/can-we-meet-the-worlds-growing-demand-for-food>
- Ho, S. (2022, January 4). *Vegan Cheese Makers Stockeld Dreamery Announce \$20M Series A*. Retrieved April 25, 2022, from Green Queen: <https://www.greenqueen.com.hk/stockeld-dreamery-series-a-funding/>

- Ho, S. (2022, January 4). *Vegan Tuna Sandwiches Are Landing In 4,000 Aldi Stores Across Germany*. Retrieved April 24, 2022, from Green Queen: <https://www.greenqueen.com.hk/vegan-tuna-bettafish-aldi/>
- IPCC. (2019). *Climate Change and Land: An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*. Retrieved April 25, 2021, from Intergovernmental Panel on Climate Change.
- Ivanova, D., Vita, G., Steen-Olsen, K., Stadler, K., Melo, P. C., Wood, R., & Hertwich, E. G. (2017, May 12). Mapping the carbon footprint of EU regions. *Environmental Research Letters*, 12(5). Retrieved March 4, 2021, from doi: 10.1088/1748-9326/aa6da9
- Keledjian, A., Brogan, G., Lowell, B., Warrenchuk, J., Enticknap, B., Shester, G., . . . Cano-Stocco, D. (2014). *Wasted Catch*. Retrieved March 20, 2021, from Oceana: https://oceana.org/sites/default/files/Bycatch_Report_FINAL.pdf
- Kennedy, C., & Lindsey, R. (2015, June 15). *What's the difference between global warming and climate change*. Retrieved March 15, 2021, from Climate: <https://www.climate.gov/news-features/climate-qa/whats-difference-between-global-warming-and-climate-change>
- Kloosterman, C. (2021, March 02). *Rival Foods: Everything has to be right to convince a meat eater*. Retrieved April 24, 2022, from Food Agribusiness: <https://www.foodagribusiness.nl/rival-foods-alles-moet-kloppen-om-vleeseter-te-overtuigen/>
- Lafortune, G., Fuller, G., Schmidt-Traub, G., & Kroll, C. (2020). How Is Progress towards the Sustainable Development Goals Measured? Comparing Four Approaches for the EU. *Sustainability*, 12(18). Retrieved March 21, 2021, from doi: 10.3390/su12187675
- Leialohilani, A., & de Boer, A. (2020, October). EU food legislation impacts innovation in the area of plant-based dairy alternatives. *Trends in Food Science & Technology*, 104, 262-267. Retrieved April 2, 2022, from doi:10.1016/j.tifs.2020.07.021
- Library of Congress. (2017, June 27). Retrieved December 22, 2021, from <https://www.loc.gov/item/global-legal-monitor/2017-06-27/european-union-milk-cannot-be-used-to-market-purely-plant-based-products/>
- Mason, P., & Lang, T. (2017). *Sustainable Diets: How ecological nutrition can transform consumption and the food system*. New York: Routledge. Retrieved April 14, 2021, from https://books.google.de/books?hl=en&lr=&id=kUIDwAAQBAJ&oi=fnd&pg=PP1&dq=consumer+habits+sustainable+food+system&ots=D5NyJ2ps0K&sig=XfEQk4qAJka0T4f1IVTH19PjMoE&redir_esc=y#v=onepage&q=consumer%20habits%20sustainable%20food%20system&f=false
- Mcsweeney, R. (2018, February 26). *Mangrove deforestation emits as much CO2 as Myanmar each year*. Retrieved April 26, 2021, from Carbon Brief: <https://www.carbonbrief.org/mangrove-deforestation-emits-as-much-co2-as-myanmar-each-year>

- Mekonnen, M. M., & Hoekstra, A. Y. (2021, January 24). A Global Assessment of the Water Footprint of Farm Animal Products. *Ecosystems*, 15, 401-415. Retrieved March 24, 2021, from doi: 10.1007/s10021-011-9517-8
- Mertens, E., Kuijsten, A., Kanellopoulos, A., Dofková, M., Mistura, L., D'Addezio, L., . . . van 't Veer, P. (2021, February). Improving health and carbon footprints of European diets using a benchmarking approach. *Public Health Nutrition*, 24(3), 565 - 575. Retrieved April 2, 2021, from doi: 10.1017/S1368980020003341
- Milman, O. (2017, August 1). *Meat industry blamed for largest-ever 'dead zone' in Gulf of Mexico*. Retrieved March 18, 2021, from The Guardian: <https://www.theguardian.com/environment/2017/aug/01/meat-industry-dead-zone-gulf-of-mexico-environment-pollution>
- Mood, A. (2010). *Worse things happen at sea: the welfare of wild-caught fish*. Retrieved March 20, 2021, from Fishcount: <http://www.fishcount.org.uk/published/standard/fishcountfullrptSR.pdf>
- Natulatte. (n.d.). *Homepage*. Retrieved April 25, 2022, from Natulatte: <https://www.natulatte.nl/en/>
- Natulatte. (n.d.). *Sample Pack*. Retrieved April 24, 2022, from Natulatte: <https://www.natulatte.nl/en/sample-pack/>
- Newby, P. (2009, May). Plant foods and plant-based diets: protective against childhood obesity? *The American Journal of Clinical Nutrition*, 89(5), 1572S-1587S. Retrieved April 1, 2021, from doi: 10.3945/ajcn.2009.26736G
- Novish. (n.d.). *About us*. Retrieved April 16, 2022, from Novish: <https://www.novish.eu/en/about-us/>
- O'Brien, A. (2022, April 15). *Call for dedicated EU funding for plant-based food sector*. Retrieved April 25, 2022, from Agriland: <https://www.agriland.ie/farming-news/call-for-dedicated-eu-funding-for-plant-based-food-sector/>
- Okshevsky, M. (2020, March 15). *Cows, Methane, and Climate Change*. Retrieved April 7, 2021, from Let's Talk Science: <https://letstalkscience.ca/educational-resources/stem-in-context/cows-methane-and-climate-change>
- OSSA. (n.d.). *Home*. Retrieved April 25, 2022, from Drink Ossa: <https://www.drinkossa.com/>
- Pacha de Cacao. (n.d.). *Frequently Asked Questions*. Retrieved April 21, 2022, from Pacha de Cacao: <https://pachadecacao.com/frequently-asked/>
- Pacha de Cacao. (n.d.). *Home*. Retrieved April 21, 2022, from Pacha de Cacao: <https://pachadecacao.com/>
- Pachauri, R. K., Allen, M. R., Barros, V. R., Broome, J., Cramer, W., & Christ, R. (2014). *Climate Change 2014: Synthesis Report*. Retrieved April 12, 2021, from IPCC: https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf
- Pale Blue Dot. (n.d.). *BettaFish*. Retrieved April 24, 2022, from Pale Blue Dot: <https://paleblue.vc/portfolio/bettafish>

- Peters, G. P., Andrew, R. M., Canadell, J. G., Friedlingstein, P., Jackson, R. B., Korsbakken, J. I., . . . Peregon, A. (2019, January). Carbon dioxide emissions continue to grow amidst slowly emerging climate policies. *Nature Climate Change*(10), 2. Retrieved May 4, 2021, from doi: 10.1038/s41558-019-0659-6
- Pitchbook. (2022). *BettaF!sh*. Retrieved April 24, 2022, from Pitchbook: <https://pitchbook.com/profiles/company/469466-38#overview>
- Pitchbook. (2022). *Bettr Egg Overview*. Retrieved April 24 2022, from Pitchbook: <https://pitchbook.com/profiles/company/492928-84#signals>
- Plant Based Food Alliance. (2021, February 9). *Plant Based Food Alliance*. Retrieved March 23, 2022, from Plant Based Food Alliance: https://plantbasedfoodalliance.eu/wp-content/uploads/2021/03/Multi-stakeholder-Letter-on-CMO-Amendment-171_9-February-2021-1.pdf
- Planted Foods. (n.d.). *Map*. Retrieved April 23, 2022, from EatPlanted: <https://en.eatplanted.com/map>
- Planted Foods. (n.d.). *Mission*. Retrieved April 22, 2022, from EatPlanted: <https://en.eatplanted.com/mission>
- PLANTY-OF-MEAT. (n.d.). *About us*. Retrieved April 20, 2022, from Planty-of-meat: <https://planty-of-meat.de/#about>
- PLANTY-OF-MEAT. (n.d.). *Our Products*. Retrieved April 20, 2022, from Planty-of-meat: <https://planty-of-meat.de/produkte/>
- PLANTY-OF-MEAT. (n.d.). *Stores*. Retrieved April 20, 2022, from Planty-of-meat: <https://planty-of-meat.de/stores/>
- Polidoro, B. A., Carpenter, K. E., Collins, L., Duke, N. C., Ellison, A. M., Ellison, J. C., . . . Yong, J. W. (2018, April 8). The Loss of Species: Mangrove Extinction Risk and Geographic Areas of Global Concern. *PLOS ONE*. Retrieved May 1, 2021, from doi: 10.1371/journal.pone.0010095
- Poore, J., & Nemecek, T. (2018, June 1). Reducing food's environmental impacts through producers and consumers. *Science*, 360(6392), 987-992. Retrieved April 28, 2021, from doi: 10.1126/science.aag0216
- Pun, A. (2022, December 29). *The plant-based revolution: 10 European vegan meat alternative brands to check out*. Retrieved April 22, 2022, from EU-Startups: <https://www.eu-startups.com/2021/12/the-plant-based-revolution-10-european-vegan-meat-alternative-brands-to-check-out/>
- Ranganathan, J., Waite, R., Searchinger, T., & Hanson, C. (2018, December 5). *How to Sustainably Feed 10 Billion People by 2050, in 21 Charts*. Retrieved March 3, 2021, from World Resources Institute: https://www.wri.org/insights/how-sustainably-feed-10-billion-people-2050-21-charts?_ga=2.18565113.1721513116.1618791983-1237854025.1612209930
- Revo Foods. (n.d.). *About Us*. Retrieved April 19, 2022, from Revo Foods: <https://revo-foods.com/revo-foods/>

- Ritchie, H. (2019, November 06). *Food production is responsible for one-quarter of the world's greenhouse gas emissions*. Retrieved February 28, 2021, from Our World in Data: <https://ourworldindata.org/food-ghg-emissions>
- Ritchie, H. (2019, September 13). *The world now produces more seafood from fish farms than wild catch*. Retrieved February 24, 2021, from Our World in Data: <https://ourworldindata.org/rise-of-aquaculture>
- Ritchie, H., & Roser, M. (2019, September). *Land Use*. Retrieved March 4, 2021, from Our World in Data: <https://ourworldindata.org/land-use>
- Rival Foods. (n.d.). *About Us*. Retrieved April 24, 2022, from Rival Foods: <https://rival-foods.com/about-us/>
- Rival Foods. (n.d.). *Our Solution*. Retrieved April 24, 2022, from Rical Foods: <https://rival-foods.com/our-solution-2/>
- Rowland, M. P. (2017, July 24). *Two-Thirds Of The World's Seafood Is Over-Fished -- Here's How You Can Help*. Retrieved March 12, 2021, from Forbes: <https://www.forbes.com/sites/michaelpellmanrowland/2017/07/24/seafood-sustainability-facts/>
- Sandström, V., Valin, H., Krisztin, T., Havlík, P., Herrero, M., & Kastner, T. (2018, December). The role of trade in the greenhouse gas footprints of EU diets. *Global Food Security*, 19, 48-55. Retrieved April 2, 2021, from doi: 10.1016/j.gfs.2018.08.007
- Schiano, A. N., Harwood, W. S., Gerard, P. D., & Drake, M. A. (2020, December). Consumer perception of the sustainability of dairy products and plant-based dairy alternatives. *Journal of Dairy Science*, 103(12), 11228-11243. Retrieved March 17, 2021, from doi:10.3168/jds.2020-18406
- Schneider, U. A., Havlík, P., Schmid, E., Valin, H., Mosnier, A., Obersteiner, M., . . . Fritz, S. (2011, February). Impacts of population growth, economic development, and technical change on global food production and consumption. *Agricultural Systems*, 104(2), 204-215. Retrieved April 13, 2021, from doi: 10.1016/j.agsy.2010.11.003
- Seaspiracy. (2021). *Facts*. Retrieved April 9, 2021, from Seaspiracy: <https://www.seaspiracy.org/facts>
- Seychell, M. (2016, 12 9). *Towards better prevention and management of chronic diseases*. Retrieved May 5, 2021, from European Commission: https://ec.europa.eu/health/newsletter/169/focus_newsletter_en.htm#:~:text=70%25%20to%2080%25%20of%20all,suffer%20from%20a%20chronic%20condition.
- Shukla, P. R., Skea, J., Calvo Buendia, E., Masson-Delmotte, V., Pörtner, H. O., Roberts, D. C., . . . Malley, J. (2019). *Summary for Policymakers*. Retrieved May 6, 2021, from IPCC: <https://www.ipcc.ch/srccl/chapter/summary-for-policymakers/>
- Sims, T. (2021, January 15). *Agriculture and Greenhouse Gas Emissions*. Retrieved May 8, 2021, from Food Insight: <https://foodinsight.org/agriculture-and-greenhouse-gas-emissions/>

- Smart Protein Project. (2021). *Plant-based foods in Europe: How big is the market?* Retail Scanning Data Nielsen. Retrieved April 25, 2022, from <https://smartproteinproject.eu/wp-content/uploads/Smart-Protein-Plant-based-Food-Sector-Report.pdf>
- Springmann, M., Godfray, H. J., Rayner, M., & Scarborough, P. (2016, April 12). Analysis and valuation of the health and climate change cobenefits of dietary change. *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, 113(15), 4146-4151. Retrieved April May 7, 2021, from doi: 10.1073/pnas.1523119113
- Springmann, M., Mason-D'Croz, D., Robinson, S., Wiebe, K., Godfray, H. J., Rayner, M., & Scarborough, P. (2017, January). Mitigation potential and global health impacts from emissions pricing of food commodities. *Nature Climate Change*, 69-74. Retrieved April 18, 2021, from doi: 10.1038/nclimate3155
- Stewart, M. (2020, March 30). *The Deadly Side of America's Banana Obsession*. Retrieved April 21, 2022, from Pulitzer Center: <https://pulitzercenter.org/stories/deadly-side-americas-banana-obsession>
- Stockeld Dreamery. (n.d.). *About Us*. Retrieved April 25, 2022, from Stockeld Dreamery: <https://www.stockeld.com/about>
- Stockeld Dreamery. (n.d.). *Our Product*. Retrieved April 24, 2022, from Stockeld Dreamery: <https://www.stockeld.com/stockeld-chunk>
- Tauseef, S. M., Premalatha, M., Abbasi, T., & Abbasi, S. A. (2013, March 15). Methane capture from livestock manure. *Journal of Environmental Management*, 117, 187-207. Retrieved May 9, 2021, from doi: 10.1016/j.jenvman.2012.12.022
- The EAT-Lancet Commision. (2019, July). *EAT-Lancet_Commission_Summary_Report.pdf*. Retrieved May 29, 2022, from EAT Forum: https://eatforum.org/content/uploads/2019/07/EAT-Lancet_Commission_Summary_Report.pdf
- The European Alliance for Plant-Based Foods. (2020, December). *EAPF's POSITION ON THE EU FARM TO FORK STRATEGY*. Retrieved January 28, 2022, from Plant-based Food Alliance: https://plantbasedfoodalliance.eu/wp-content/uploads/2021/02/EAPF-Position-Farm2Fork_Final.pdf
- The European Parliament and The Council Of The European Union. (2014, October 22). REGULATION (EU) No 1144/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL. *Official Journal of the European Union*, 59. Retrieved May 26, 2022, from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R1144#:~:text=This%20Regulation%20lays%20down%20the,may%20be%20fully%20or%20partially>
- The Hemphany. (n.d.). *Hemi stores*. Retrieved April 24, 2022, from Drink hemi: <https://drink-hemi.com/pages/stores>
- The Hemphany. (n.d.). *Mission*. Retrieved April 24, 2022, from Drink Hemi: <https://drink-hemi.com/pages/mission>
- The Protein Brewery. (n.d.). *Our Mission*. Retrieved April 24, 2022, from The Protein Brewery: <https://www.theproteinbrewery.nl/our-mission>

- The World Bank. (2020, May 8). *Water in Agriculture*. Retrieved May 12, 2021, from The World Bank: [https://www.worldbank.org/en/topic/water-in-agriculture#:~:text=Currently%2C%20agriculture%20accounts%20\(on%20average,be%20both%20physical%20and%20virtual.](https://www.worldbank.org/en/topic/water-in-agriculture#:~:text=Currently%2C%20agriculture%20accounts%20(on%20average,be%20both%20physical%20and%20virtual.)
- Thole, R. (2020, November 4). *Breda protein grower The Protein Brewery raises €22 million for the construction of a demo factory*. Retrieved April 24, 2022, from Business Insider Nederland: <https://www.businessinsider.nl/the-protein-brewery-wim-de-laet/>
- TrendWatching. (2020, November 23). *Innovation of the Day*. Retrieved April 25, 2022, from TrendWatching: <https://www.trendwatching.com/innovation-of-the-day-dutch-start-up-natulatte-creates-vegan-creamers-and-hot-chocolate-mix-for-vending-machines>
- Tuso, P. J., Ismail, M. H., Ha, B. P., & Bartolotto, C. (2013). Nutritional Update for Physicians: Plant-Based Diets. *The Permanente Journal*, 17(2), 61-66. Retrieved May 14, 2021, from doi:10.7812/TPP/12-085
- UNEC. (n.d.). *Methane Management: The Challenge*. Retrieved April 11, 2021, from United Nations Economic Commission for Europe: <https://unece.org/challenge#:~:text=Methane%20is%20a%20powerful%20greenhouses,are%20due%20to%20human%20activities.&text=Coal%20is%20another%20important%20source%20of%20methane%20emissions.>
- UNFCCC. (2021). *The Paris Agreement*. Retrieved March 14, 2021, from United Nations Framework Convention on Climate Change: <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>
- United Nations. (2019). *World Population Prospects 2019*. Retrieved May 7, 2021, from United Nations: https://population.un.org/wpp/Publications/Files/WPP2019_Highlights.pdf
- United Nations. (n.d.). *The 17 Goals*. Retrieved May 7, 2021, from United Nations: <https://sdgs.un.org/goals>
- United Nations. (n.d.). *Transforming our world: the 2030 Agenda for Sustainable Development*. Retrieved May 7, 2021, from United Nations: <https://sdgs.un.org/2030agenda>
- Upside Plantbased. (n.d.). *Voor de wildernis*. Retrieved April 20, 2022, from Upside Plantbased: <https://www.upside-plantbased.com/voor-de-wildernis>
- Upside Plantbased. (n.d.). *Where to buy*. Retrieved April 20, 2022, from Upside Plantbased: <https://www.upside-plantbased.com/waar-te-koop>
- van Essen, D. (2020, December 7). *New: Cacao Juice from Pacha de Cacao!* Retrieved April 21, 2022, from The High Five Company: <https://www.thehighfivecompany.com/new-cacao-juice-from-pacha-de-cacao/>
- van Loon, D. (2020, May 7). *Upside: 100% plantaardige worsten*. Retrieved April 20, 2022, from Food Personality: <https://www.foodpersonality.nl/upside-100-plantaardige-worsten/>

- van Santen, A. (n.d.). *Natulatte*. Retrieved April 25, 2022, from Voor de wereld van morgen: <https://www.voordewereldvanmorgen.nl/leden/natulatte>
- Vegconomist. (2021, August 3). *Planted Foods Raises 19M Swiss Francs, Will Launch Whole Cuts of Plant-Based Meat*. Retrieved April 23, 2022, from Vegconomist: <https://vegconomist.com/investments-finance/planted-foods-raises-19m-swiss-francs-will-launch-whole-cuts-of-plant-based-meat/>
- Vegconomist. (2022, March 9). *Banabar: "We Are the Only Organic Bar Brand in Europe Using Dried Banana as a Base"*. Retrieved April 21, 2022, from Vegan News: Banabar: "We Are the Only Organic Bar Brand in Europe Using Dried Banana as a Base"
- Vegconomist. (2022, May 9). *EU Citizens Tell Their Leaders to Shift to a More Sustainable Food System*. Retrieved May 30, 2022, from Vegconomist: <https://vegconomist.com/politics-law/eu-citizens-tell-their-leaders-to-shift-to-a-more-sustainable-food-system/>
- Verima. (n.d.). *OSSA - Tea Energizer*. Retrieved April 25, 2022, from Verima: <https://www.mangajo.be/c-5902074/ossa-tea-energizer/>
- Vermeulen, S. J., Campbell, B. M., & Ingram, J. S. (2012). Climate Change and Food Systems. *Annual Review of Environment and Resources*, 37, 195-222. Retrieved March 6, 2021, from doi: 10.1146/annurev-enviro-020411-130608
- Verplanken, B., Marks, E., & Dobromir, A. I. (2020, December). *Journal of Environmental Psychology*, 72. Retrieved March 17, 2021, from doi: 10.1016/j.jenvp.2020.101528
- Verzijden, K. (2017, July 31). *The EU Tofutown case – don't mess around with dairy product names*. Retrieved January 28, 2022, from Food Health Legal: <http://foodhealthlegal.eu/?p=889>
- V-Label. (2021, June 16). *Europe goes plant-based: Insights and how-to's for small medium brands*. Retrieved April 25, 2021, from V-Label: <https://www.v-label.eu/news/europe-goes-plant-based>
- Watson, E. (2021, November 14). <https://www.foodnavigator-usa.com/Article/2021/11/14/Sustainable-boring-protein-made-to-order-The-Protein-Brewery-looks-to-US-market-with-fermented-fungi-protein>. Retrieved April 24, 2022, from Food Navigator: <https://www.foodnavigator-usa.com/Article/2021/11/14/Sustainable-boring-protein-made-to-order-The-Protein-Brewery-looks-to-US-market-with-fermented-fungi-protein>
- Wei, D., Cameron, E., Harris, S., Prattico, E., Scheerder, G., & Zhou, J. (2016). *The Paris Agreement: What is Means for Business*. New York: We Mean Business. Retrieved February 27, 2021, from https://www.bsr.org/reports/BSR_WeMeanBusiness_Business_Climate_Paris_Agreement_Implications.pdf
- Wik, M., Pingali, P., & Broca, S. (2008). *Global Agricultural Performance*. Retrieved May 15, 2021, from The World Bank: <https://openknowledge.worldbank.org/handle/10986/9122>
- Winders, B., & Ransom, E. (2019). *Global Meat: Social and Environmental Consequences of the Expanding Meat Industry*. Cambridge, Massachusetts: MIT Press. Retrieved April 10, 2021, from <https://books.google.de/books?hl=en&lr=&id=g7i0DwAAQBAJ&oi=fnd&pg=PR7&dq=rising+mea>

t+consumption&ots=Yu6lHZMzLt&sig=MnKWG2EMdfXLGr9q93HDhTF7eyY#v=onepage&q=risin
g%20meat%20consumption&f=false

Woldeab, R. (2019, December 19). *Industrialized Meat Production and Land Degradation: 3 Reasons to Shift to a Plant-Based Diet*. Retrieved May 14, 2021, from Population Education:
<https://populationeducation.org/industrialized-meat-production-and-land-degradation-3-reasons-to-shift-to-a-plant-based-diet/>

World Cancer Research Fund. (2007). *Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective*. American Institute for Cancer Research. Retrieved May 20, 2021, from
<https://discovery.ucl.ac.uk/id/eprint/4841/1/4841.pdf>

Worm, B. (2016, May). Averting a global fisheries disaster. *Proceedings of the National Academy of Sciences*, 113(18), 4895-4897. Retrieved May 16, 2021, from doi: 10.1073/pnas.1604008113

WUR. (n.d.). *Rival Foods*. Retrieved April 24, 2022, from Wageningen University & Research:
<https://www.wur.nl/en/article/rival-foods.htm>


Yumda. (n.d.). *The Hempany GmbH*. Retrieved April 24, 2022, from Yumda:
<https://www.yumda.com/en/companies/1037846/the-hempany-gmbh.html>

ZBG Food. (n.d.). *Shop*. Retrieved April 20, 2022, from Zero Bullshit: <https://zbs-food.com/shop/>

ZBS Food. (n.d.). *Mission*. Retrieved April 20, 2022, from Zero Bullshit: <https://zbs-food.com/mission/>

Appendix 1

Questionnaire



Section 1 of 6

Plant-based products in local supermarkets

As a bachelor student of Aeres University of Applied Sciences, I am conducting research on consumers within the European Union and their experience with plant-based products in their local supermarkets.

I would like to ask for your kind cooperation for the fulfillment of this research.
This questionnaire consists of 14 short questions, and the estimated completion time is 5 minutes. Sometimes with some extra space for an explanation/elaboration of the answer.
Please keep these answers short.

*This questionnaire is only intended for people living within the European Union (EU).
If you do not meet this criteria please share this with someone who does*

Thank you in advance for your time!

~Marcus Kock~

After section 1 Continue to next section

Section 2 of 6

Demographics

Description (optional)

1. What Gender do you identify with? *

- ☐ Female
- ☐ Male
- ☐ Prefer not to say
- ☐ Other...

2. What age group are you in? *

- ☐ 18-29
- ☐ 30-44
- ☐ 45-59
- ☐ 60-74
- ☐ 75+

3. Which country do you live in? *

Short answer text

After section 2 Continue to next section

Section 3 of 6

Visiting supermarkets

Description (optional)

4. How often do you go to your local supermarket/grocery store? *

- ☐ Once a day
- ☐ Three times a week
- ☐ Once a week
- ☐ Three times a month
- ☐ Once a month
- ☐ Never

5. What is the biggest change that you have noticed in your local store within the last 2 years? *

Long answer text

After section 3 Continue to next section

Plant-based products

Plant-based products are products that consists mainly of ingredients derived from plants and do not contain animal ingredients of any kind. These include meat, seafood and dairy alternatives that would usually contain ingredients of animal origin. Examples are: plant-based (vegan) burgers, plant-based milk (made from: soy, coconut, almond, oat, etc.), Plant-based Cheese, Tofu, Tempeh, and any other product being labeled as plant-based or Vegan.

Single ingredient plant-based foods such as fruits & vegetables are not included in this research.

Example of Plant-based (Vegan) Products



6. Have you seen more plant-based products being promoted within your local store? *

- ☐ Yes
- ☐ No
- ☐ Not sure

7. Have you seen a specific area within your local store dedicated only for plant-based products? *

- ☐ Yes
- ☐ No
- ☐ Not sure

8. How often do you pay attention to this area with plant-based products? *

- ☐ All the time
- ☐ Often
- ☐ Sometimes
- ☐ Never

9. Is there a large variety of different types of plant-based products available in your local store? *

Short answer text

After section 4 Continue to next section

Section 5 of 6

Purchasing behaviour



Description (optional)

10. How often do you purchase plant-based product alternatives? *

- ☐ Once a day
- ☐ Three times a week
- ☐ Once a week
- ☐ Three times a month
- ☐ Once a month
- ☐ Never

11. Has your local store influenced you to purchase more plant-based product alternatives? *

- ☐ Yes
- ☐ No
- ☐ Not sure

12. Do you think that your local store has enough plant-based product alternatives? *

- ☐ Yes
- ☐ No
- ☐ Not sure

13. Would you like to see more types of plant-based product alternatives in your local stores? *

- ☐ Yes
- ☐ No
- ☐ Not sure

...

14. What are some of the reasons that you purchase plant-based products? *

- ☐ Sustainability
- ☐ Health
- ☐ Allergies/Intolerances
- ☐ Animal welfare
- ☐ Taste
- ☐ Statement
- ☐ Other...

After section 5 Continue to next section

Section 6 of 6

That's it! You did it!



Please share this questionnaire with another EU consumer to further help support this research

Appendix 2

Ads used to promote the questionnaire

