The Popularity of Plant-Based Diets: A Comparative Analysis of the Attitudes and Perceptions of the Irish Population Towards their Dietary Choice

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By

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Declaration

I hereby certify that the material, which I now submit for assessment on the program of study leading to the award of M.Sc is entirely my own work and has not been taken from the work of others safe to the extent that such work has been cited and acknowledged within the text of my own work. No portion of work contained in this thesis has been submitted in support of an application for another degree or qualification to this or any other institution.

Signed:_____ Date:_____

Student Name (Aoife Mitchell)

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This thesis is dedicated to my parents and my late brother Eoin, all of whom showed and continue to show me what strength and determination truly are when faced with life's challenges

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Abstract

As a country with a historically high rate of meat consumption, Ireland has a significant dependency on our agriculture and meat exports. Given the rise in vegetarian and vegan diets globally due to the perceived health and environmental benefits, it is relatively unknown as to whether Ireland is following similar trends. In this dissertation, the Irish populations' attitude and perception towards plant-based diets are fully explored and assessed.

A survey was used to collect qualitative and quantitative insights from the Irish population during February and March 2022. The survey collected the responses of a total of 139 adults (69% female, 31% male) above the age of 18 years old living in Ireland to understand the attitudes and perceptions the population have towards plant-based diets, their meat consumption preferences, and the motivations behind their respective diets.

Irish respondents generally identified themselves to be omnivores, consumed meat daily, and considered it highly unlikely to eliminate meat from their diet. Nonetheless, a willingness to reduce meat consumption existed - likely influenced by the Irish population's perception of plant-based diets as healthy, ethical, and sustainable and the rise in popularity of less restrictive plant-based diets i.e. flexitarianism. Irish people demonstrated a good awareness of plant-based diets and there is a generally positive attitude towards them.

Health, the environment, and animal welfare were key concerns and core motivators for moving to a plant-based diet, much in line with other Western countries understanding the effects of high meat consumption. There is a continued positive relationship with meat observed in Ireland due to taste, tradition, and availability, but also an emerging curiosity and acceptance of plant-based diets and meat alternatives which can potentially be nurtured through knowledge.

In conclusion, to help further improve the perception of plant-based diets in Ireland, campaigns and education on the diet would be recommended as well as an improvement in taste, quality, and cost of meat alternatives to further encourage a reduction in meat consumption. Plant-based diets are perceived positively in Ireland and therefore have a role in the future of Irish and global diets as a means of combating food scarcity, unsustainable food production, and damaged public health. In this case, knowledge is both power and the key to unlocking new traditions in the Irish diet.

List of Abbreviations

CAGR	Compound Annual Growth Rate
CHD	Coronary Heart Disease
EPA	Environmental Protection Agency
EU	European Union
FAO	Food and Agricultural Organization of the United Nations
GDPR	General Data Protection Regulation (EU)
GDP	Gross Domestic Product
GNR	Global Nutrition Report
HSE	Health Service Executive
PBMA	Plant-Based Meat Alternatives
NHS	National Health Service
UK	United Kingdom
USA	United States of America
WHO	World Health Organization

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Chapter 1: Introduction

Let food be thy medicine and medicine be thy food

- Hippocrates

1.1 Diets in Ireland

The Irish diet can be defined as one that is rich in dairy, red meat, cereals, and convenience or processed foods (Williams *et al*., 2020). According to the Food and Agricultural Organization of the United Nations (FAO) the Irish diet can be broken down as follows: meat and dairy account for 39%, fruit and vegetables at 29%, and cereals at 12.8% with the remainder divided between processed and snack foods (FAO, 2022). The high consumption of meat and dairy can be linked to the Ireland's strong agricultural position and the importance of farming in rural areas (FAO, 2022). Bord Bia reported that Irish Meat Exports amounted to €3.2 billion in 2020, which represented 26% of all Irish exports. The Bord Bia Dairy report from 2020 reported that 8 million litres of cow's milk was sold the same year, the highest on record (Bord Bia, 2021).

Irish people have had a long-standing complex relationship with food, suggesting a link back to the Great Famine and food shortages during economic downturns. There is a fear of not having sufficient food, having optimum nutrition to avoid sickness, and ensuring food is not wasted (Kelly and O' Grada, 2015). Joel Mokyr's "Why Ireland Starved" discusses the factors that contributed to the Famine, the primary reason being elevated population levels and the theory of Malthusianism (Mokyr, 2015) which relates to population levels increasing faster than its method of sustenance which can lead to famine (Merriam-Webster, 2022). According to Mokyr, Ireland suffered higher rates of poverty in the late 19th and early 20th century due to the lack of economic development in the country in the decades prior to the famine (Mokyr, 2015).

In the decades that followed, focus was primarily on sustenance, cost efficiency, simplicity, and reducing food waste in the home (Keating and Mac Con Iomaire, 2018). A Teagasc report from 2009 listed a variety of foods considered traditional by the Irish public and included bacon, soda bread, mutton, potatoes, and spiced beef (Murphy, 2021). With more frequent travel and the introduction of fast-food chains in the 1970's, the Irish diet has become less traditional and more influenced by alternative ethnic cuisines and other dietary trends. However, the traditional inclusion of meat in most meals has remained (Murphy, 2021).

The cultural stereotype of the Irish population has frequently suggested that Irish people have a strong affiliation with potatoes, reminiscent of the population's troubled history with the crop. However, even though meat remains a highly consumed food in Ireland, recent studies have shown that Ireland consumes more fruit and vegetables daily than any other European Union (EU) country. According to a report published by Eurostat in January 2022, 33% of Irish people consume the recommended five portions of fruit and vegetables each day suggesting a concern and awareness for health and nutrition through diet (O'Donnell, 2022).

1.1.1 Irish Government's Position on Public Nutrition

The Irish government, in conjunction with the Health Service Executive (HSE), have presented their recommendations on a healthy, balanced diet for optimal health and well-being. The Health Food for Life programme focuses on evidence-based approaches towards a balanced diet as presented in *Figure 1.1*. The programme suggests consumption of lean meats such as turkey and chicken, as opposed to highly processed meats such as sausages and bacon. The HSE recommends two palm sized servings of meat per day (including fish) (HSE, 2016).

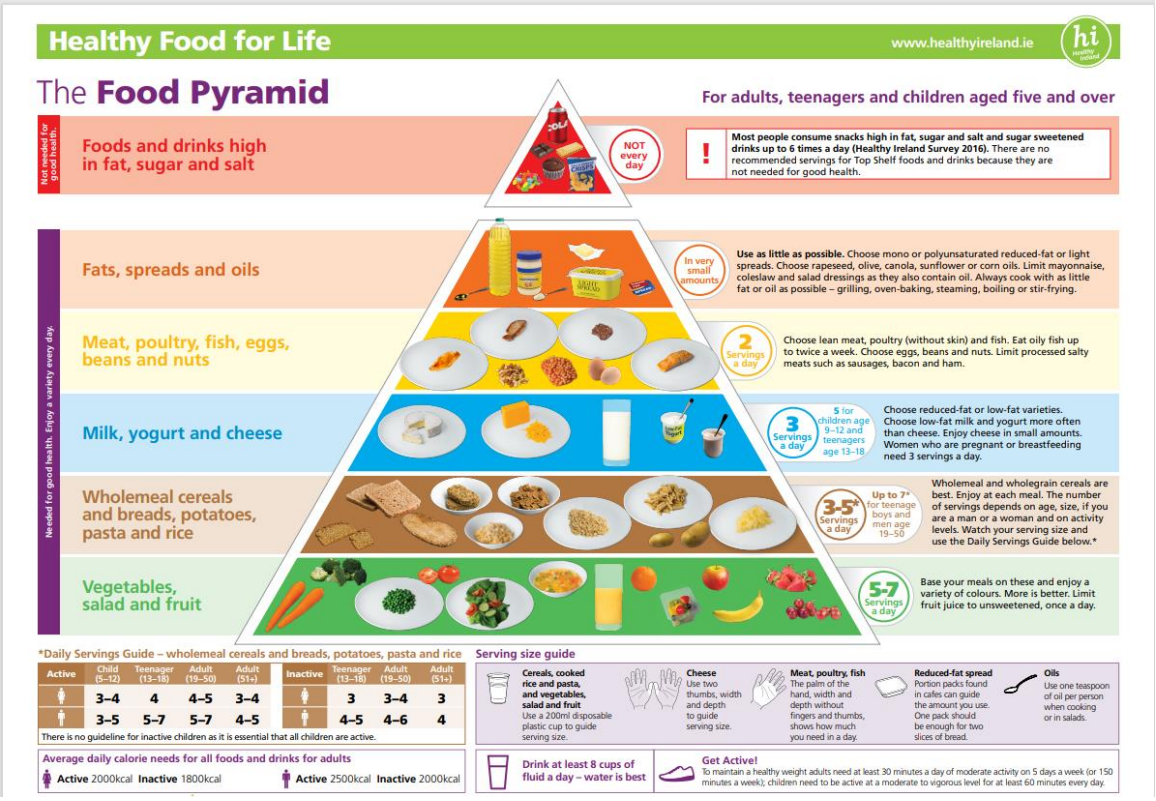

Figure 1.1: *Consumer version of the Food Pyramid as per the HSE and Healthy Food for Life programme (Taken from HSE.ie, 2016).*

1.1.2 Nutrition and Health Status of the Irish Population

With such dietary guidelines in place particularly in relation to the consumption of meat, there is clear evidence that meat plays a vital role in the dietary habits of the Irish population. It is recommended that the food group which should be consumed at the highest level is fruits and vegetables, however the FAO have determined that meat and dairy is the highest consumed category of food among the Irish population at 39% (FAO, 2022). The intake of meat among the Irish population is greater than the government recommendations and potential poses a threat to public health.

It is well established that a healthy diet, high in fibre and protein and low in saturated fat and salt, contributes to good health and can reduce the risk of a variety of health issues including obesity, type 2 diabetes, hypertension, cardiovascular disease, and certain cancers (Health Executive Service, 2022). The Global Nutrition Report (GNR) 2020, tracks and sets nutrition targets for countries including childhood obesity rates, child stunting and wasting rates, diabetes, anaemia, and obesity. The report was initiated to combat malnutrition globally which can be seen in *Figure 1.2* which gives an indication of the worst effect countries in terms of malnutrition burdens, particularly among children (Global Nutrition Report, 2020). Ireland is highlighted as only carrying a single burden among the host of malnutrition issues globally. The World Health Organization (WHO) defines malnutrition as “deficiencies, excesses or imbalances in a person’s intake of energy and/or nutrients” (World Health Organization, 2020).

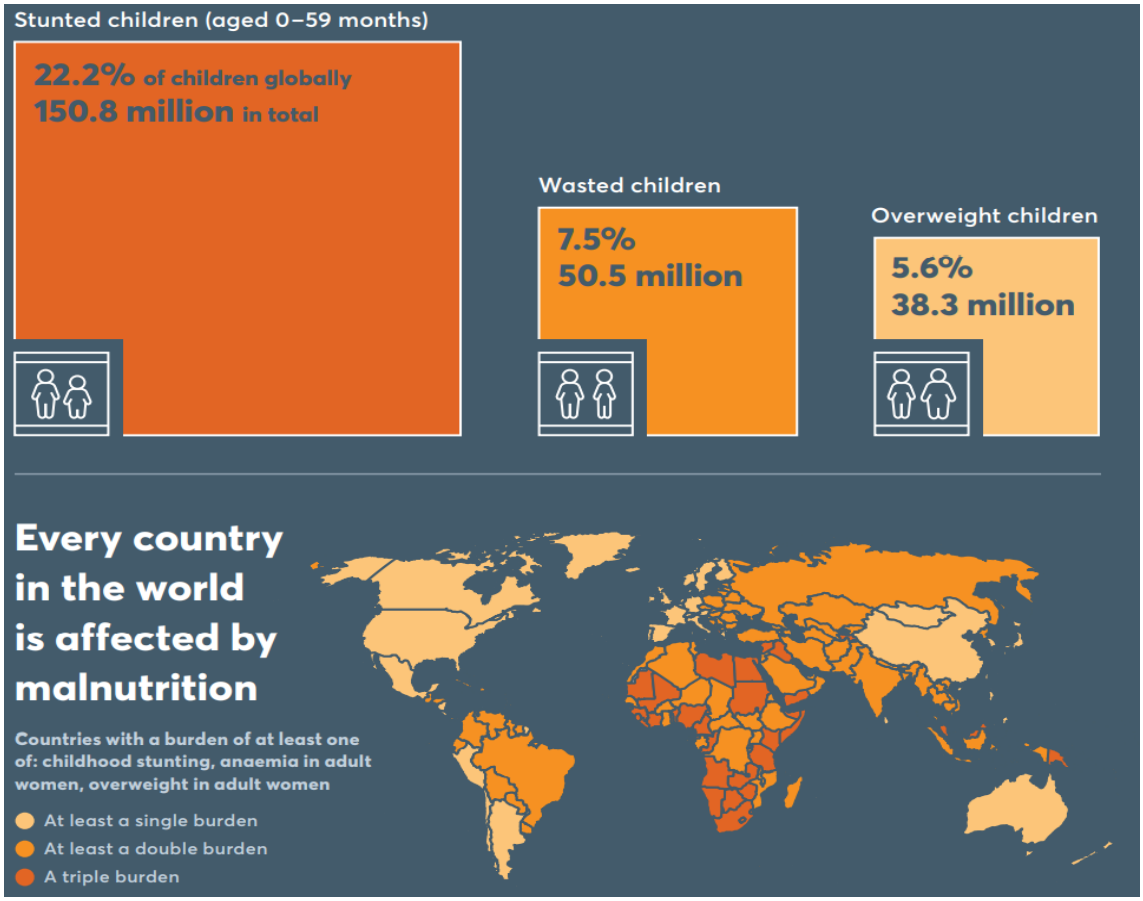

Figure 1.2: *Global malnutrition according to the Global Nutrition Report 2020 (Taken from GNR, 2020).*

As per the 2020 GNR, Ireland is not on track to meet the 2025 nutritional targets as outlined in *Table 1.1*.

INDICATOR	ON TRACK	OFF TRACK – SOME PROGRESS	OFF TRACK – NO PROGRESS OR WORSENING
Stunting	AARR ≥ required AARR* or level <5%	AARR < required AARR* but ≥0.5	AARR < required AARR* and <0.5
Anaemia	AARR ≥5.2** or level <5%	AARR <5.2 but ≥0.5	AARR <0.5
Low birth weight	AARR ≥2.74* or level <5%	AARR <2.74 but ≥0.5	AARR <0.5
Not exclusively breastfed	AARR ≥2.74** or level <30%	AARR <2.74 but ≥0.8	AARR <0.8
Wasting	Level <5%	Level ≥5% but AARR ≥2.0	Level ≥5% and AARR <2.0
	ON TRACK	OFF TRACK – SOME PROGRESS	
Overweight	AARR ≥-1.5	AARR <-1.5	

Table 1.1: *Method used to track progress of countries towards nutritional targets. *AARR = average annual rate of reduction* (Taken from Global Nutrition Report, 2020).*

Ireland's current status in relation to these nutritional targets can be seen in *Table 1.2* and highlights the main areas that require additional attention in order to meet the 2025 targets. It is vital that Ireland maintains a level of public health through improved nutrition which can be achieved by meeting these nutritional targets. By doing so, the country will have a population that will live longer and evoke a lesser economic burden through illness. This can be achieved through healthier and more nutritious dietary choices (GNR, 2020).

Target	Status	Comment
Childhood Stunting	No data	No information
Childhood Wasting	No data	No information
Obestiy (Male)	Off course	28.4% men are obese
Obesity (Female)	Off course	28.7% women are obese
Aneamia	No progress or worsening	12.5% 15 – 49 year old women affected
Sodium Intake (Male and Female)	Off course	No information
Diabetes (Male and Female)	Off course	5.6% women affected, 8.1% men affected.
Low Birth Weight	No progress of worsening	5.9% of infants born underweight
Raised Blood Pressure (Male and Female)	On course	No information
Childhood Overweight	No data	No information

Table 1.2: *Ireland's current status in relation to progress towards 2025 nutritional targets set by the GNR 2020 (GNR, 2020).*

Unfortunately, the increasing levels of obesity (including individuals deemed as overweight) are largely contributing to the lack of progress made by the country in relation to these targets mainly caused by the high intake of fat, sugar and processed foods including processed meat and dairy products (As shown in *Figure 1.3* and *1.4*).

Overweight is defined by a body mass index (BMI) of 25.0 to 30.0 and obesity is defined by a BMI of 30.0 or higher (Center for Disease Control and Prevention, 2022).

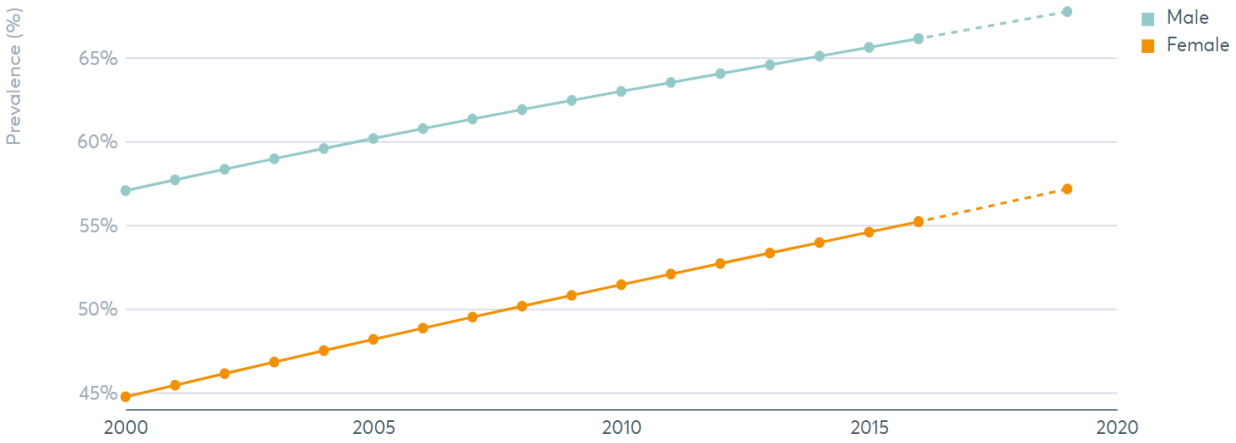

Figure 1.3: *Prevalence (%) of overweight status of both males and females in Ireland between 2000 and 2020. Prevalence (%) estimates in this report are based on modelled age standarised estimates for adults as determined by WHO (GNR, 2020).*

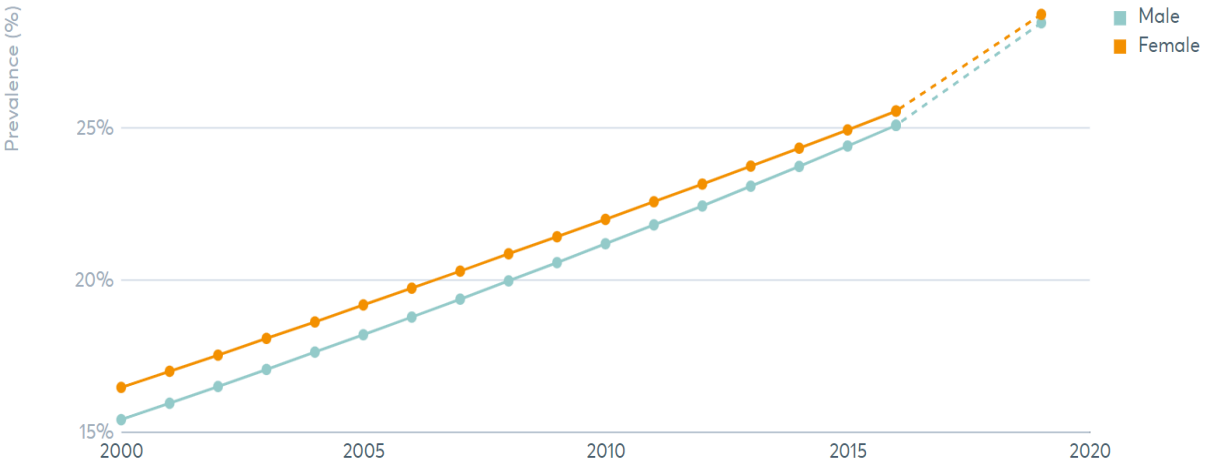

Figure 1.4: *Prevalence (%) of obesity of both males and females in Ireland between 2000 and 2020. Prevalence (%) estimates in this report are based on modelled age standarised estimates for adults as determined by WHO (GNR, 2020).*

The GNR is in place in order to prevent malnutrition and ultimately reduce the mortality rates associated with poor diet and nutrition. *Figure 1.5* shows the average number of dietary composition and weight associated deaths in Ireland, highlighting the importance of diet in relation to health and reduced mortality (GNR, 2020).

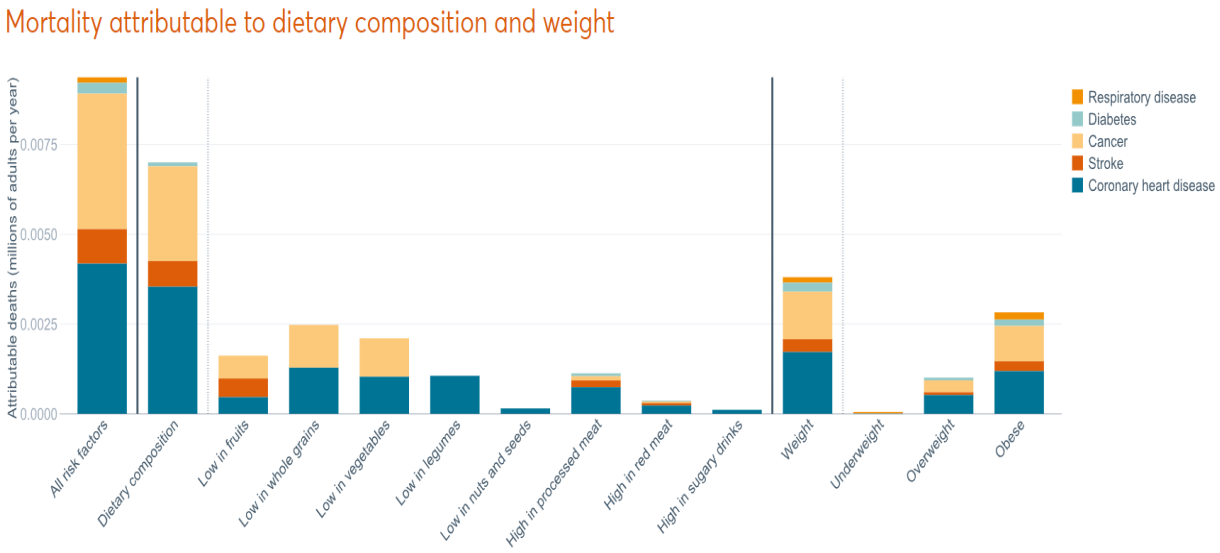

Figure 1.5: *Average rates of mortality attributed to diets and weight and the associated diseases causing the deaths in Ireland (Taken from GNR, 2020).*

It is known that high levels of meat intake is a contributor to some of these mortality causing diseases. By encouraging and educating a nation around the benefits of reducing meat intake, the number of diet relation diseases and deaths can be decreased (GNR, 2020).

1.1.3 Meat Consumption in Ireland

On a global scale, 350 million tonnes of meat are consumed each year (The World Counts, 2022). Meat consumption in Ireland has steadily increased between 2010 – 2020 (see *Figure 1.6*). On average, a person living in Ireland will consume 19kg of meat annually from a variety of sources, most commonly being chicken, beef and pork as shown in *Table 1.3* (McCarthy *et al.*, 2017). The Irish consumption of meat is considered high compared to the world average of 6.4 kg per person annually but is in line with many other Western European countries (Donnelly, 2017).

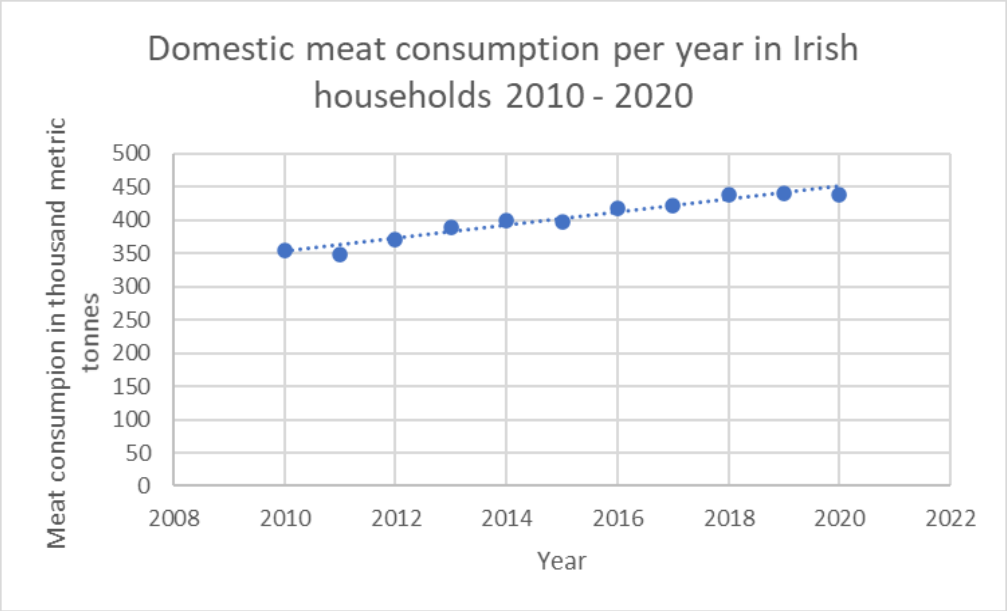

Figure 1.6: *Domestic meat consumption in Ireland has steadily increased between 2010 – 2020 (Adapted from Shahbandeh, 2021).*

	Processed pork indulgers	All things meat	Chicken eaters	Fish eaters	Beef focused	Diverse moderates
Cluster size (%)	13	4	20	21	21	21
Age (years)	45	56	38	50	43	45
Body mass index	28	28	27	27	27	26
Energy from meat (%)	28	26	22	19	19	14
Energy from fat (%)	37	36	34	35	34	34
Fat from meat (%)	37	38	28	26	25	19
Beef (g/day)	88	41	43	33	124	30
Chicken (g/day)	49	38	138	35	39	46
Fish (g/day)	8	36	15	79	20	11
Pork (g/day)	108	24	28	37	30	39
Lamb (g/day)	6	66	2	4	1	17
Turkey (g/day)	3	9	1	2	1	4
Game, offal (g/day)	1	22	0	1	0	2

Table 1.3: *Meat consumption patterns of people living in Ireland showing chicken, beef and pork as the most consumed meats (Taken from McCarthy et al., 2017).*

The increase in meat consumption between 2010 and 2020 in Ireland is in line with the global rise in meat consumption as shown in *Figure 1.7*. The breakdown of meat consumed in Ireland follows a similar trend to that of the rest of the world with poultry consumed at the highest rate even with Irish beef exports greater than the export of any other meat from Ireland (McCarthy *et al.*, 2017).

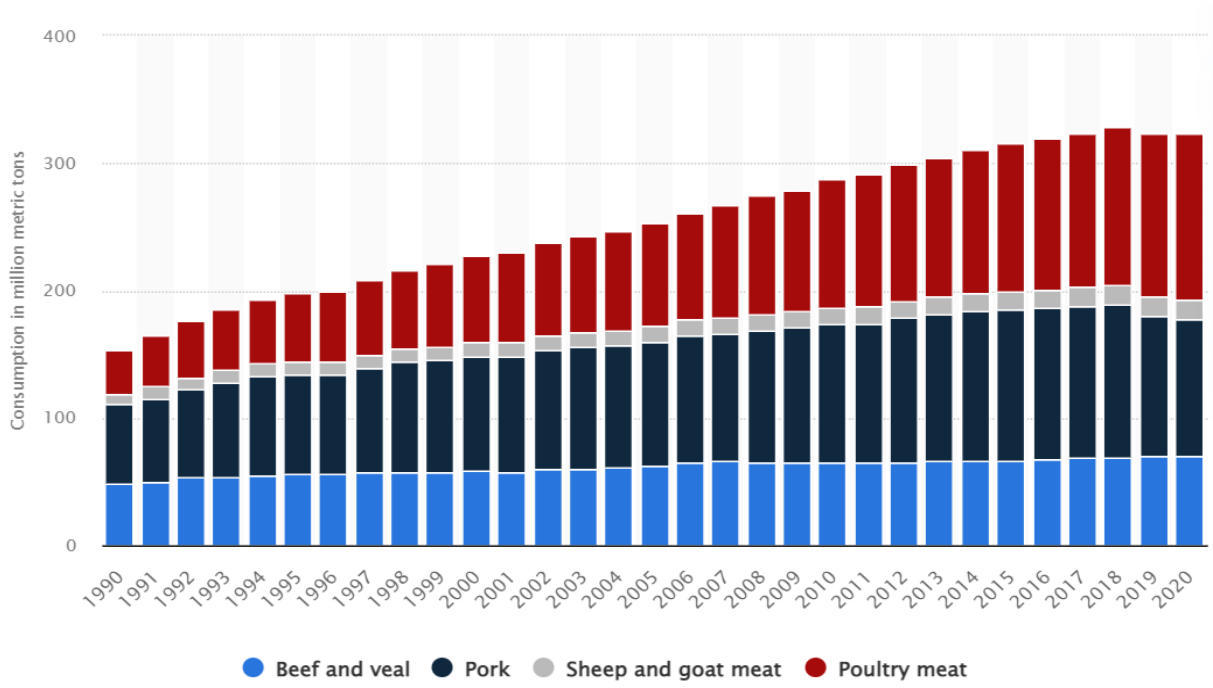

Figure 1.7: *Global meat consumption in metric tonnes between 1991 – 2020 which is in line with the increase seen in Ireland between 2010 – 2019 and the slight decline between 2019 – 2020. The graph also indicates the breakdown of meat consumption between beef and veal, pork, sheep and goat meat, and poultry (Taken from Shahbandeh, 2021).*

While meat consumption globally is increasing, the levels of meat consumption differ depending on the country. India is a low consumer of meat, the drivers of this will be discussed in later sections, while China has experience exponential growth between the 1960s and 2010 as shown in *Figure 1.8*.

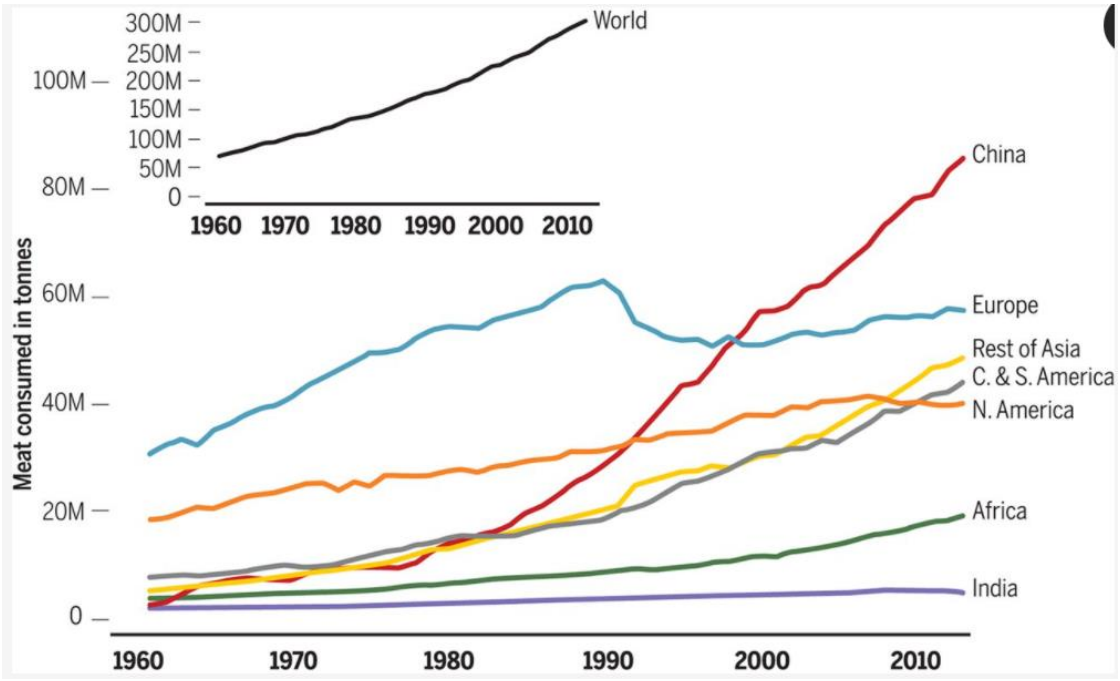

Figure 1.8: *Total consumption of meat (in million metric tonnes) by region globally showing the shared increase in consumption between countries and the varying rates of consumption between regions (Taken from FAOSTAT, 2021).*

Research completed by Cosgrove *et al*. (2005) examined the variations in consumption between red meat, white meat and processed meat among Irish adults in relation to the overall quality of their diet. The meat consumption of the 1379 participants of the study can be seen in *Table 1.4* which shows that over 70% of the participants, both male and female, consumed the three different meat types.

Meat Type	Male	Female
Red Meat	92%	84%
White Meat	77%	81%
Processed Meat	82%	75%

Table 1.4: *Breakdown of meat consumption by type among Irish adults in Cosgrove et al's., study in 2005 (Adapted from Cosgrove et al., 2005).*

The study showed that men consumed significantly more meat, of all types, than women ($P<0.001$). Results show men aged 18 – 35 years consumed less red meat but more processed meat than men aged 51 – 64 years. The research also yielded an interesting

correlation between the type of meat consumed and the dietary quality of the participants (Cosgrove *et al.,* 2005). For example, those who consumed high levels of processed meat, had lower intakes of wholegrains, fruits and vegetables and those who consumed high volumes of white meat, ate significantly less high carbohydrate foods (Cosgrove *et al.,* 2005). This correlates to the percentage breakdown of the Irish diet, whereby meat and dairy were consumed regularly and often overshadowed other food groups which can contribute to an unbalanced and unhealthy diet (FAO, 2022).

Historically, meat consumption in Ireland differed depending on the position held in society. Cattle farming has been considered an important part of the Irish economy since the 1600s and with the understanding of the high cost of producing beef, meat was considered a symbol of high societal status and wealth with high quality cuts reserved for the wealthiest in society (Campbell, 2016). In the 1830s and 1840s, the average Irish person consumed 25kg of meat per year, while the United Kingdom's (UK) averge consumption at the same time was 39kgs per year (Clarkson and Crawford, 2002). The middle and upper class in Irish society enjoyed meat consumption levels similar to the UK. Expenditure on meat consistently grew in Irish between 1700 – 1841 as seen in *Table 1.5* in line with the significant growth of the population (Clarkson and Crawford, 2002).

Date	Total population (000)	Meat-eating population (000)	Cattle numbers[a] (000)	Sheep numbers[b] (000)	Pig numbers[c] (000)
1700	2,000	800	57	376	30
1753	2,300	920	65	432	34
1800	5,000	2,000	141	940	74
1841	8,200	3,280	232	1,542	122

[a] Assuming beef and veal accounted for 50 per cent of meat consumption.
[b] Assuming sheep and mutton accounted for 33.5 per cent of meat consumption—the mean of the weighted and unweighted averages.
[c] Assuming pork and bacon accounted for 6 per cent of meat consumption.

Table 1.5: *Approximate number of animals slaughtered in Ireland between 1700 – 1851in conjunction with population growth (Taken from Clarkson and Crawford, 2002).*

Meat consumption in Ireland has considerably changed since the beginning of the 20th Century. Only 7% of the Irish diet was meat in 1936 with the remainder consisting of dairy, potatoes, and other vegetables. This level of meat consumption declined during the period of World War II due to food shortages (Donnelly, 2017). This type of event, much like the Great Famine, has fostered a significant and heightened value of meat among the Irish population, ensuring it has reamined a staple food in the Irish diet.

In the 1990s there were fluctuating levels of meat consumption which began with a decline at the beginning of the decade, a further decline in 1996 and an increase at the end of decade (McCarthy *et al*., 2003). This fluctuation was very much influenced by Bovine spongiform encephalopathy (BSE) or mad cow disease (The Guardian, 2000), which saw beef sales plummet. Between 1989 and 1993 the Irish consumption of meat dropped from 25.1kg/capita to 19.8kg/capita (McCarthy *et al.,* 2003). The increase consumption noted at the end of the 1990s can be partially attributed to a national campaign launched by Bord Bia to reinstate confidence in the beef industry following the BSE crisis (McCarthy *et al.,* 2003).

Retail costs of red meat also fluctuated throughout the 1990s in line with the varying levels of meat consumption as can be seen in *Figure 1.9.* This did not cause a move to plant-based products but instead to leaner meats such as poultry or pork as it was deemed healthier and cheaper by customers at the time. This could potentially be due to a lack of knowledge and availability of plant-based products and their ability to replace meat and provide similar nutritional benefits deemed essential by consumers.

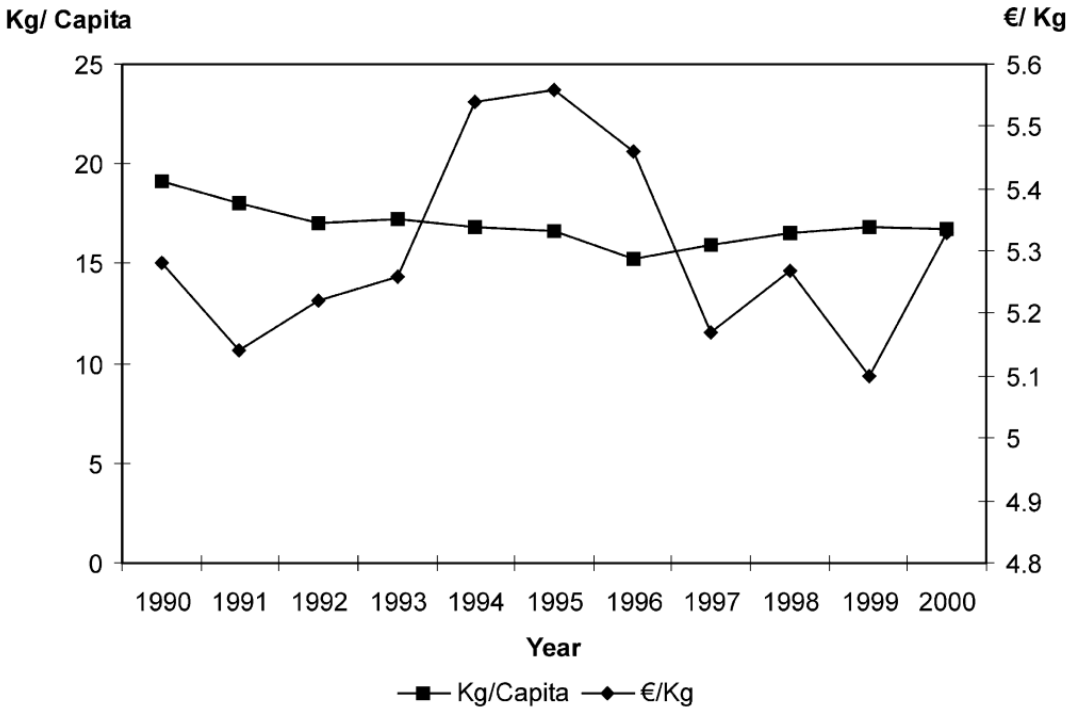

Figure 1.9: *Correlation between Irish meat consumption per capita and the retail price of red meat from 1990 to 2000 (McCarthy et al., 2003).*

While meat consumption is shown to remain a popular dietary choice in Ireland, the trend of fluctuating consumption levels remains in the country. A 2017 Bord Bia PERIscope study reviewed the largest quantitative research of Irish attitudes towards different areas of the food industry and consumer market (Bord Bia, 2017). While there is an understanding that meat consumption in Ireland remains high, this study showed that 48% of participants were trying to eat less meat (Bord Bia, 2017), a trend that has not been further examined.

1.1.4 Drivers of Meat Consumption in Ireland

Based on information provided by Bord Bia, Teagasc and reviewed literature, the biggest drivers for the consumption of meat in Ireland is the significance of the Irish agriculture sector, the perceived quality and the safety of Irish meat (Bord Bia, 2020).

The Irish agricultural sector is of huge importance and a key contributor to Irish economic growth. This growth is particularly evident in the exports market with the

agri-sector exports being valued at €13.6 billion in 2018, a 64% increase since 2010 (Sustainable Food Systems Ireland, 2018).

Ireland is synonymous with family farming and best practice agriculture which aids in the perception that Irish meat is safe and of high quality. This has become increasingly important since the horse meat scandal in 2013 whereby traces of horse and pig were found in Irish beef (Hunt, 2013). Food quality is an important factor for consumers when choosing meat and consumers typically base their meat buying decisions on both intrinsic (colour, fat) and extrinsic (brand, label, price) characteristics (McCarthy *et al.*, 2017), purchasing from well -known brands and retailers they trust.

A recent Bord Bia study focused on the key trends in the meat retail category and was able to highlight what is currently driving meat sales in seven European countries and what could be done to further improve sales (Bowles, 2022). The meat retail category has an understanding that meat production has a negative impact on the environment and therefore there has been a move to focus on sustainability. Customers believe that local meat is more sustainability and retail have been seen to highlight this in store (Bowles, 2022). This saw a huge boost with campaign to "Shop/Buy Local" during the COVID – 19 pandemic (Ewing -Chow, 2020). This has reinvigorated the category that has been viewed negatively in recent years. In addition, the report emphasised the need for the meat category to be renovated due to price increases to help continue to drive sales. Consumers are looking for something new and innovative and this should be addressed in this category (Marcarelli, 2018).

1.1.5 Consequences of Long-Term Meat Consumption in Ireland

The high level of meat consumption in Ireland has had both positive and negative impacts of different areas of society. The success, growth and quality of the Irish meat industry has proven to be a key factor in the continual consumption of meat and has positively impacted the Irish economy for decades in terms of export growth and perceived high-quality farming in Ireland (Bord Bia, 2021). On the other hand, high levels of meat consumption have been linked to adverse health outcomes such as increased cardiovascular disease, hypertension, and obesity, as well as questions being

raised on the sustainability of the industry and its contribution to greenhouse emissions (Bord Bia, 2021).

1.1.5.1 Environmental Impact of Meat Consumption in Ireland

In 2018, Ireland was ranked the lowest performing country in the European Union in terms of reducing greenhouse gas emissions. The biggest contributor to greenhouse emissions in Ireland is the agricultural sector with the 7.5 million cows on the island contributing a carbon footprint of two tonnes annually (Environmental Protection Agency, 2021). In 2020, the Environmental Protection Agency reported that the agricultural sector accounted for 37.1% of the emissions generated that year (see *Figure 1.10).*

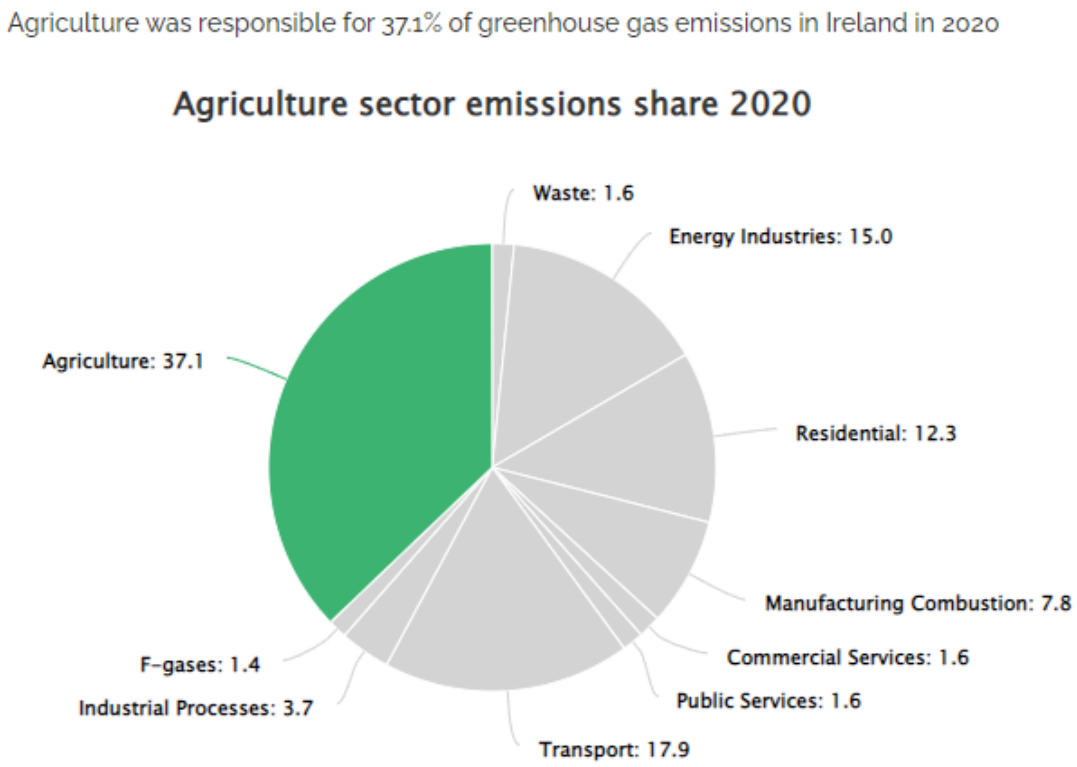

Figure 1.10: *Breakdown of the total greenhouse gas emissions generated in Ireland in 2020, highlighting the agriculture sector as the largest contributor at 37.1%, an increase of 1.4% from 2019 (Taken from: Environmental Protection Agency, 2021).*

Within the agricultural sector, several areas are promoting greenhouse gas emissions including fuel combustion, urea application and liming (see *Figure 1.11*). However, the biggest impact is via enteric fermentation (Environmental Protection Agency, 2021). Enteric fermentation is the process within the digestive system of ruminant animals i.e. cattle, sheep and goats. The microbes in the digestive tract breakdown and ferment the food the animal has consumed. This produces methane as a by-product which greatly impacts the environment and air quality (Climate and Clean Air Coalition, 2022).

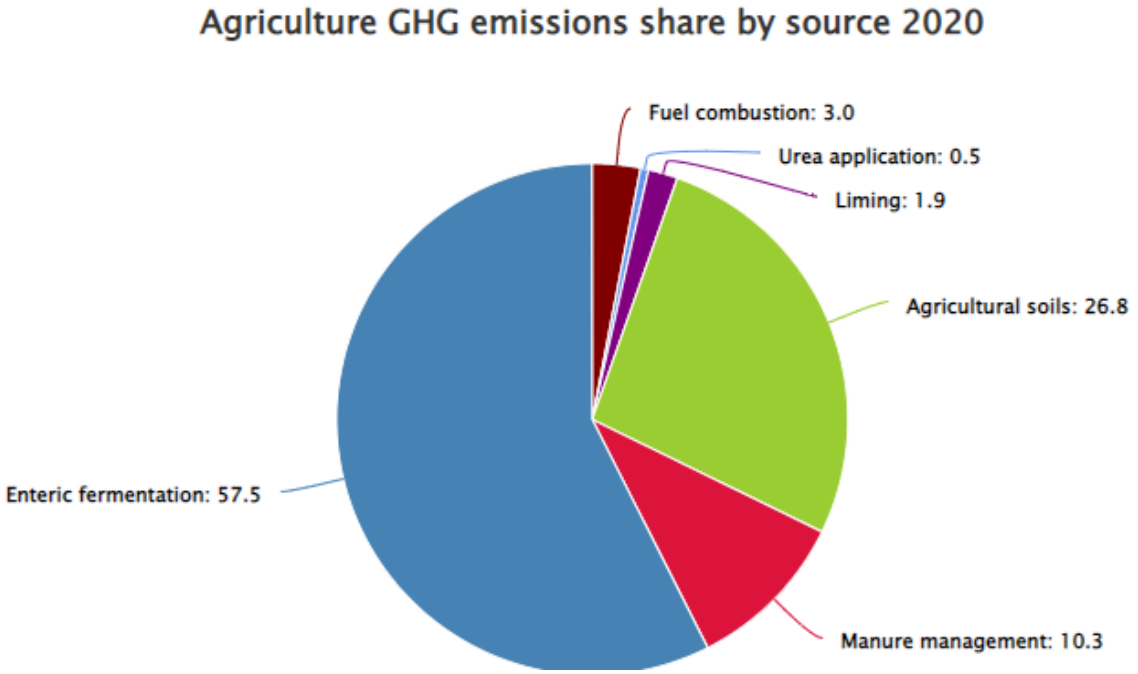

Figure 1.11: *Breakdown of agriculture specific activities and their greenhouse gas emissions, highlighting that enteric fermentation is the highest contributor (Taken from: Environmental Protection Agency, 2021).*

Cattle numbers in Ireland are continuing to increase which is likely to cause an emissions increase of 3% between 2021 – 2030 if changes are not implemented Environmental Protection Agency, 2021). Meat retail sales in 2021 were 15% higher than 2019 and are forecasted to continue to increase (Bord Bia, 2021). This continued increase will account for the steady rise in greenhouse gas emissions in Ireland. Such startingly numbers could create a foundation to incentivise the Irish population to reevaluate their meat consumption and perhaps look towards finding other, more sustainable protein and meat alternatives.

1.1.5.2 Health Impacts of Meat Consumption in Ireland

According to a recent article on the Irish Heart Foundation website, the Irish diet is causing damage to the health of the population, and this is largely contributed to the high levels of red and processed meat consumed in Ireland daily. Poor public health among a population can lead to a variety of issues including increased public health expenditure and can be partially attributed to poor dietary choices. With cardiovascular disease being one of the leading causes of death in Ireland, there are concerns around the link between the disease and meat consumption (Shannon, 2020).

There have been extensive studies on the potential negative impact of high levels of meat consumption on health, particular processed meat which is a large proportion of the Irish diet (Godfray *et al.,* 2018). There is strong evidence that links consumption of processed meat to colorectal cancer resulting in groups such as the International Agency for Research on Cancer, an agency belonging to the World Health Organisation, describing some meats as "carcinogenic to humans" (De Smet and Vossen, 2016).

Recent studies in both Ireland and the UK have suggested that by adopting a diet with a 50% reduction in meat consumption may not only reduce greenhouse gas emissions by 19% but also help to prevent 37,000 premature deaths from heart disease every year (Institute of Public Health, 2021).

1.1.5.3 Economic Impacts of Meat Consumption in Ireland

While it can be concluded that the high meat consumption in Ireland may have a negative environmental and health impact, the high consumption in Ireland and globally has heavily contributed to a successful economic impact the sector has had on the country (Bord Bia, 2021). 26% of all exports out of Ireland can be attributed to meat exports to the UK, Europe, and Asia which amounts to approximately €3.2 billion (Bord Bia, 2021). In comparison, 17% of UK exports (Gov.UK, 2022) and less than 2% of the United States exports are meat and meat products (U.S Meat Export Federation, 2022). 1.03 million tonnes of meat left Irish shores in 2020, the breakdown of which can be seen in *Table 1.6* (Department of Agriculture, Food and Marine, 2021).

Meat Type	Worth (€)	Volume (tonnes)	No. of countries exported to
Beef	€2.3 billion	518,000	70 (EU 38%, UK 46%, Non-EU 16%).
Pig Meat	€893 million	276,000	60 (EU 18%, UK 32%, Non-EU 50%).
Sheep Meat	€354 million	64,000	40 (EU 69%, UK 20%, Non-EU 11%).
Poultry	€255 million	140,000	40 (EU 17%, UK 55%, Non-EU 28%).

Table 1.6: *Breakdown of worth, volume and countries Irish meat was exported to in 2020 (Adapted from Department of Agriculture, Food and Marine, 2021).*

Considering Ireland's size, the meat exports from the country are significantly larger than other countries with larger capacity to export meat. For example, the United Kingdom exports on average 582,490 tonnes of livestock meat a year amounting to €1.6 billion in comparison to Ireland's €3.2 billion in 2020 (Agriculture and Horticulture Development Board, 2022). Meat exports have steadily grown for the last 60 years as seen in *Figure 1.12* and with this the meat industries contribution to the economy has also grown (FAO 2021).

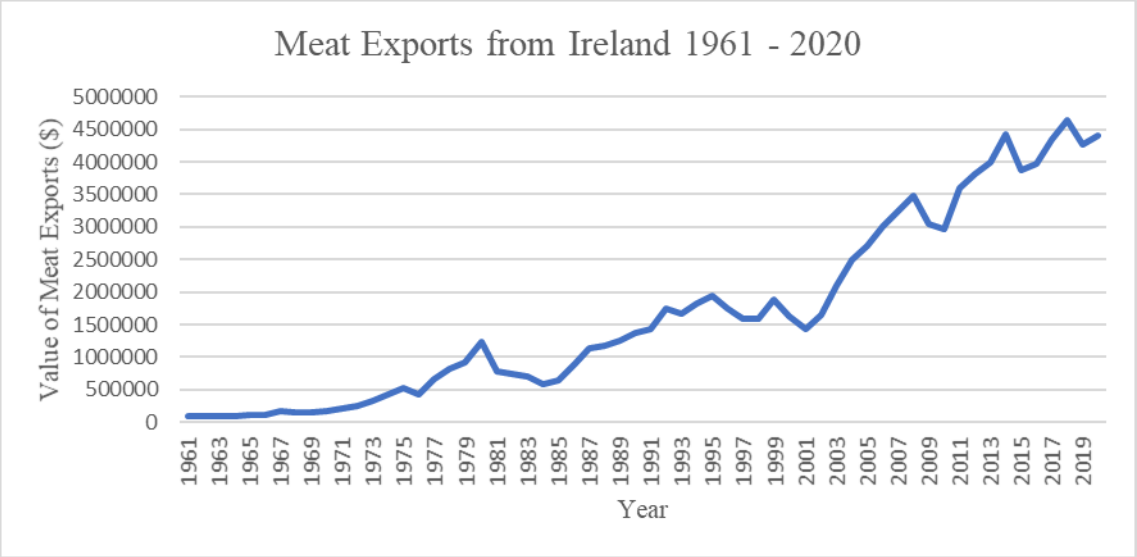

Figure 1.12: *The value of total exports of meat from Ireland globally between 1961 – 2022 (FAOSTAT, 2021).*

Rural activity and the regional economy in Ireland heavily rely on the export demand of meat which accounts for 90% of all meat sales in Ireland (Meat Industry Ireland, 2019). Not only do the 137,000 beef farmers in Ireland thrive due to the global demand for Irish beef, but there are 10,000 additional jobs generated from the production and distribution of meat products (Kieran, 2019).

The meat industry is an essential component of both the agriculture sector, the exports sector and the overall Irish economy and therefore maintaining meat consumption levels both in Ireland and abroad is vital to those industries and the economy (Kieran, 2019).

1.1.6 Dairy Consumption in Ireland

According to a 2021 report by Bord Bia, the dairy industry in Ireland is worth €5 billion and forecast to continue to increase (Bord Bia, 2022). With such a high value industry producing large volumes of dairy products for domestic and international use, it is not surprising that the Irish population consume large quantities of dairy products. According to the National Dairy Council (2022), the domestic consumption of milk in Ireland in 2021 was approximately 8,745 million litres annually or 291kgs/capita, compared to just 66kgs/capita among U.S citizens (Agricultural Economic Insights,

2020). This accounts for a 5.5% increase since 2020. This places Ireland 8th in the world with Finland consuming the most milk worldwide at 430kgs/capita (World Population Review, 2022).

Ireland is considered one of the best dairy producing countries due to the grass-based family farming focus of the industry. A recent study conducted by the National Dairy Council showed that 78% of consumers rate the Irish grass-fed system highly and see it as a system that produces high quality products (National Dairy Council, 2021). 75% of respondents said they trust dairy farmers and the product they produce. Interestingly, 20 – 29-year-old respondents of the survey were not as trusting of dairy farmers and questioned the health benefits of dairy thus not consuming as much as other age categories (Kavanagh, 2018).

While dairy consumption is high in Ireland and seen as an important part of both the Irish diet and Irish agricultural exports, there are concerns around the health benefits of consuming diary. 1 in 10 people in Ireland consume a dairy free diet. 13% of those who consume a dairy free diet are aged between 25 – 34 years old and 13% live in Dublin, suggesting younger, urban located people are more likely to avoid dairy (National Dairy Council, 2021).

1.1.7 History of Diets in Ireland: Why we eat the way we do.

The Irish diet has changed drastically over the last 180 years since pre-famine time. Ireland's relationship with food has played heavily into the reliance the country has on rural agriculture and farming (Hickey, 2018). In addition, the history of the Irish diet has been shaped by class and position in society. Pre-famine, the poor consumed a staple diet of potatoes and milk, while the rich regularly consumed meat. Post- famine, the Irish demographic changed significantly with mass movements from rural to urban settings and mass emigration (Clarkson and Crawford, 2002). The 20th Century saw an increase in availability of food in Ireland. Bread, potatoes, and milk were still part of the staple diet, but dairy and meat were more regularly consumed (DoChara, 2017). As mentioned, with meat being a symbol of social status in Ireland, that attitude has remained and could potentially make it difficult to change the populations' perception of meat, making a move to a plant-based diet more challenging.

1.1.8 Emergence of Dietary Habits in Ireland

As discussed, while the Irish diet has remained traditional, it has gradually been influenced by the dietary habits of other countries. In addition to this, the emergence of different dietary trends in Ireland has been significantly driven by the development of a more stable economic situation in the country (Santeramo *et al*., 2018) Over the past 50 years, Ireland went from one of poorest to one of richest countries in Europe (Sheehy and Sharma, 2011). In parallel with this economic growth was an increase in the incidence of obesity, cardiovascular heart disease, and diabetes in Ireland, in line with other European countries. The Food and Agriculture Organization has estimated that the estimated calorie intake of an average European citizen in 1961 was 2196kcal/day. This has increased to 2870kcal/day in 2011 (Santeramo *et al*., 2018).

A modern Irish diet has emerged from a time of simple pleasures to an endless variety of foods and ingredients culminating in a more globalized diet (Gormley, 2019). The major cities are flooded with cuisines from all over the world making them a more mainstream option for the Irish population (Williams, 2020). Chef's Pencil, a food trends analysis group, used Google trends to analyze the most popular international cuisines in Ireland and concluded that the top five were Chinese, Italian, Thai, Indian and Mexican (Williams, 2020). The full breakdown and popularity score for each cuisine can be seen in *Figure 1.13*.

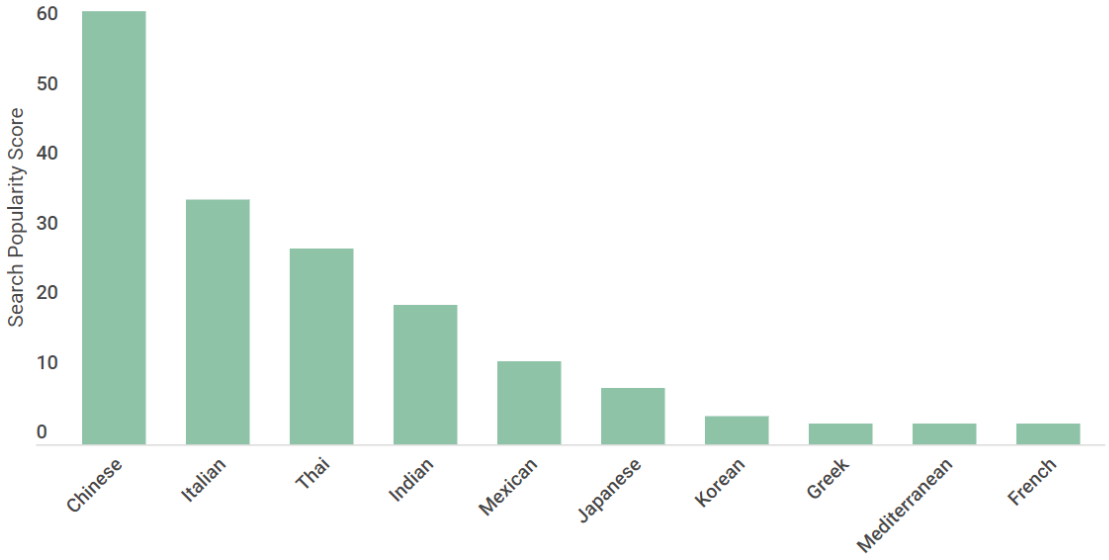

Figure 1.13: *Most popular international cuisines in Ireland based on a Google Trends analysis by Chef's Pencil showing that with only 20,000 Chinese nationals living in Ireland, Chinese cuisine is rated most popular (Williams, 2020).*

As well as the Irish diet becoming more globalised, the influence of social media and increased travel has created more awareness and uptake of plant-based diets from flexitarianism to veganism developing an entire dietary habit that has had limited examination in Ireland (McCarthy *et al*., 2003).

1.2 Plant-Based Diets

Plant-based diets can be referred to as an umbrella term over a diverse family of dietary choices. They are defined diets that eliminate or have a low frequency consumption of animal products (Satija and Hu, 2018). Plant-based diets range from extremely strict vegan diets which completely exclude all animal products from the diet i.e meat, dairy, eggs, honey to flexitarian or semi-vegetarian who may have reduced or low consumption of meat or avoid certain meats. Plant-based diets as an isolated definition focuses primarily on foods directly from plants (vegetables, nuts, fruit, legumes, and wholegrains) (Satija and Hu, 2018).

Many studies suggest that plant-based diets are followed due to their proposed health benefits, positive impact on the environment and concern for animal welfare which has caused an increase in these diets in Western societies and is predicted to continue to grow in the next decade (Alcorta *et al*., 2021). Those who claim to follow a vegan diet in the United States of America increased 500% from 4 million people to approximately 19 million people between 2014 and 2017 according to the American Vegan Society (2020). Other sources claim much more conservative numbers. For example, according to Ipsos, a Global Marketing Research firm, there are 9.7 million vegans in the United States in 2019, an increase of just over a quarter of a million over 15 years (Ipsos, 2020). In contrast, another source in favor of plant-based diets stated that 6% of Americans were vegan in 2021 (Bourassa, 2021). Based on the most recent population figures in the Unites States of American currently standing at 331.4 million people, that would suggest that 19 million Americans are vegan (Bourassa, 2021).

While there is variation in reported figures, most research has suggested that frequency and prevalence of plant-based diets are increasing globally. Therefore, it is important to understand the origins, variations, perceived benefits, and potential negative impacts of these diets to prepare for a future society that could see plant-based diets become more mainstream.

1.2.1 History of Plant-Based Diets

There is an understanding that the first humans would have consumed a majority plant-based diet, due to the scarcity of meat and the prominence of the hunter-gatherers. This style of living and eating was based on hunting for animals and foraging for plants to consume. Vegetation was more abundant than meat and therefore the diet comprised of mostly plant-based foods (National Geographic, 2022).

The first prominent figure in history understood to follow a plant-based diet was Greek philosopher and mathematician Pythagoras who lived at the same time of the Indian leader Siddhartha Gautama, also known as Buddha who would create the foundation for vegetarianism and non-violence against animals as a religious teaching. By the 19th Century, vegetarianism was a popular dietary choice among high society who deemed it a healthier dietary choice (Miller, 2022).

It would be a common misconception that the movement of vegetarianism and other plant-based diets was a modern phenomenon, with research and history has shown that the concept has been part of society since human existence. Plant-based diets, over the course of history, have been both voluntary; a choice based on a variety of motivations and involuntary; caused by poverty and scarcity of meat considered a high value commodity (Spencer, 1996).

Plant-based diets in the modern day continue to be driven by the same motivations as seen throughout history such as health, animal welfare and religion. Moreover, the dietary choice has become an element of social identity and a method of conveying an opinion. It has also evolved to include varying levels of restriction in terms of consumption of meat and animal products (Nezlek and Forestell, 2020).

1.2.2 Vegetarianism

The Vegetarian Society of Ireland (2016) defines a vegetarian as a person who consumes nuts, grains, fruits, and a variety of other materials provided by nature or made by humans none of which are meat or fish. The Vegetarian Society in the United Kingdom (2022) simply defines the diet as one that excludes meat, chicken, and fish. The term vegetarianism can be ambiguous and in recent years has seen the term being used to describe diets that are not in line with the commonly understood meaning as defined above. This includes a vegetarian deeming their dietary lifestyle healthy due to the consumption of fruits and vegetables but also lean white meats such as chicken and turkey. This ideal aligns with the concept of semi-vegetarian or flexitarian which was previously discussed, however the line between the two diets has blurred in recent years (Antony, 2019).

1.2.3 Veganism

Veganism as a pattern of eating includes the total abstention of meat and animal products e.g dairy, eggs, and honey (Katz and McPherson, 2020). Vegan diets are considered more restrictive than vegetarian and are often associated with extreme commitment to the complete avoidance of product derived from animals from both a consumption and lifestyle point of view i.e wearing of leather clothing, use of cosmetics

or chemicals tested on animals (Vegan.org, 2022). Many organizations that promote veganism consider the diet as a natural extension of vegetarianism (Vegan Society, 2022).

Government health agencies such as the National Health Service (NHS) in the UK, have expressed concerns about maintaining health while partaking in a restrictive vegan diet as often the diet can be so restrictive that participants lack in certain macro- and micronutrients (NHS, 2022). It is vital that individuals have an appropriate level of understanding as to what is considered a nutritionally adequate diet. This knowledge will prevent nutritional shortfalls that are typically associated with the vegan diet, for example, deficiencies in vitamin B12, iron, zinc and vitamin D (Craig, 2009).

Comparatively, there are many associated health benefits of the diet including higher intakes of dietary fibre and vitamin C and reduced intakes of saturated fat and high cholesterol foods. These factors contribute to a lowered risk of cardiovascular disease, diabetes, and certain cancers (Craig, 2010).

1.2.4 Flexitarianism

Literature has referred to flexitarianism as semi-vegetarianism (Derbyshire, 2017) or meat reduction and involves a diet with reduced meat intake or infrequent meat consumption (Kemper *et al*., 2021). For example, a flexitarian may only consume meat on one or two days of the week or only on a special occasion. Flexitarianism has become a popular plant-based dietary choice due to the lessened restrictions compared to veganism or vegetarianism. It is a diet that is viewed as achievable and therefore often taken up by those aged 18 – 35 years old (Bayer *et al*., 2019).

Trends such as Meatless Mondays have largely contributed to the popularity of this diet and have encouraged people to eliminate meat from their diet for one day a week. (Meatless Monday, 2022). Campaigns driven by various organizations towards meat reduction highlight the benefits of meat reduction to both personal health and the health of the planet. A study completed by Derbyshire (2017) reviewed the possible health benefits of a semi-vegetarian or flexitarian diet. The literature review-based study uncovered research on flexitarian diets and body weight (Tonstad *et al*., 2009),

flexitarianism and reduced rates of cancer and flexitarianism and metabolic syndromes management (Agrawal *et al*., 2014). The strongest correlation between this diet and improved health was in relation to weight management and reduced rates of diabetes, evaluated blood pressure, and other side effects of obesity (McEvoy *et al.*, 2012).

In relation to sustainability, flexitarian diets are deemed the most achievable to take up and maintain and therefore could have the greatest impact on environmental sustainability (Capper, 2021). Vegan and vegetarian diets require a greater commitment that can be intimidating and perceived as unmaintainable by the public. The nature of this diet, its flexibility, is an attractive proposition to those who want to reduce their meat intake (Kadey, 2011).

1.2.5 Pescatarian

A pescatarian diet is very similar to a vegetarian diet, however it includes the occasional consumption of fish and seafood (Carey *et al*., 2018). One of the biggest motivations for moving to this diet is an individual's belief around the impact meat production has on the environment. Pescatarians often believe that fishing is less harmful to the environment (Noe Pagan, 2021). This has recently been debated in the media due to documentaries such as *Seaspiracy* which has condemned the fishing industry accusing it of contributing to 46% of the plastic in the ocean (Berry, 2021).

1.2.6 A Review of Plant-Based Diets

With the increased popularity and uptake of plant-based diets, it is not surprising that the concept of removing meat and animal products from the diet has been challenged. There are pros and cons to the diet, and it is important to acknowledge both and critically review both sides of the argument. This is particularly relevant to the main areas of differing opinion on the matter including health, the environment, agriculture, and the economy (Feher *et al*., 2020).

1.2.6.1 Health and its role in plant-based diets

There is growing recognition of the health benefits and the role of a plant-based diet in the prevention and treatment of certain diseases (Ha, 2019). With this growing acknowledgement also comes an increase in health issues such as obesity, dangerous cholesterol levels, diabetes, and certain cancers (Grant, 2017). According to WHO, global obesity levels have tripled since 1975 (WHO, 2021). A 2016 report by WHO showed that 1.9 billion adults were overweight with 650 million of these obese (WHO, 2021). The main reported causes for this are the increased intake of high fat, sugar and processed foods and the stark volume of red and processed meat consumed which is also contributing to other health issues such as colorectal cancer and diabetes (WHO, 2015).

Recent studies in relation to plant-based diets and their impact on either the prevention of or role in the treatment of certain diseases has been extensive. A 2017 study by Satija *et al*. reviewed plant-based diets in relation to reduced risk of coronary heart disease (CHD) among US adults. The results showed a significant link between the uptake of a healthy plant-based diet and substantially lower risk of CHD (Satija *et al.*, 2017). Another study in this area by Hemler and Hu (2019) reviewed which elements of a plant-based diet were more effective in reducing the risk of CHD and emphasized the importance of a varied diet with high quality macronutrients and balanced sugar and carbohydrate intake (Hemler and Hu, 2019). The study highlighted that there are healthy and unhealthy plant-based diets, and a plant-based diet is not always synonymous with better health. A plant-based diet could still include highly sweetened beverages, low-quality plant protein sources and too many refined grains which should be avoided (Satija *et al*., 2017).

While studies would suggest that one's health can benefit from a plant-based diet and a reduction in the consumption of meat; in particular, red, and processed meat, there are some concerns around potential negative impacts on nutritional health should individuals move to a plant-based diet. There are two established nutritional risks associated with a plant-based diet which are ensuring adequate protein intake and minimizing the risk of certain vitamin and mineral deficiencies e.g iron and zinc (Craig, 2010). Results from the EPIC – Oxford study showed varying level protein intake

among individuals who consumed meat, were pescatarian, vegetarian and vegan (see *Table 1.7*). As the results show, the highest level of protein was derived from the individuals who consumed meat and the lowest from the individuals who followed a vegan diet (Mariotti and Gardner, 2019). Protein is a vital macronutrient required for numerous activities in the body such as transport of hemoglobin and muscle, bone, skin, and hair maintenance (Harvard T.H Chan, 2022).

	Meat-eaters	Fish-eaters	Lacto-ovo-vegetarians	Vegans
n (%)	18,244 (60)	4531 (15)	6673 (22)	803 (3)
Energy (kcal)	2091	2030	2002	1944
% Energy from protein	17.2	15.5	14.0	13.1
Protein (g/kg of body weight) [1]	1.28	1.17	1.04	0.99
Protein (g) [2]	90	79	70	64
Body weight (kg) [2]	70	67	67	64

[1] Based on a subsample of 29,028 individuals with information on body weight; [2] As calculated by ourselves.

Table 1.7*: Protein intake of different types of vegetarians compared to omnivores based on the EPIC-Oxford study (Taken from Mariotti and Gardner, 2019).*

In general, protein intake in western and economically viable countries is adequate and has increased significantly in the last 50 years. For example, the intake of protein in Spain in 1961 was 79g per person daily and this increased in 109g per person daily in 2009 (FAO, 2017). Vegetarian protein intake according to the EPIC-Oxford study is approximately 14% of total energy intake or 1.04g/kg of body weight/ 70g/day of protein (Mariotti and Gardner, 2019), which is higher than the recommended daily intake of 0.8g/kg of body weight (Pendick, 2022). Therefore, while protein intake of those following a plant-based diet is lower than a meat-eater, the intake is deemed adequate but varies on a case-by-case basis. This is encouraging information for those who would consider a plant-based diet but are concerned about the nutritional adequacy of a diet that does not include meat.

Another concern is around ensuring the adequate intake of micronutrients such as iron. Iron is abundant in meat products such as red meat. The recommended daily allowance of iron is 16 – 18mg for men and 12mg for woman on average (Institute of Medicine, 2001). In foods iron is presented as haem or non-haem, haem being the form that is most efficiently absorbed in the body (He *et al*., 2016). In animal products, 40% of the iron is haem, while in plant foods all the iron is non-haem and therefore not as easily

absorbed. A deficiency in iron can lead to anaemia which presents itself with tiredness, shortness of breath, weakness, pale skin, and for women, loss of menstrual cycles (Mayo Clinic, 2022).

1.2.6.2 Environmental factors in plant-based diets

It has been well established that the current global diet is not sustainable, and it is becoming reflective in the increased cost and delivery of goods due to over consumption and the production of unsustainable food products (Springmann, 2020). As well has having an overall positive impact on health, plant-based dietary patterns have less of an environment impact then meat-based diets (Hemler and Hu, 2019). It has been established in previous sections that the meat production industry in Ireland is the largest contributor to greenhouse gas emissions and there is a global trend aligned to this with food product in general responsible for 70% water usage and 80% deforestation (Nelson *et al*., 2016). The resources required to produce meat product are much higher than what is required to produce plant-based products, this is shown in *Table 1.8 (*predicted figures for 2030) and *Figure 1.14.*

Food commodity	Global	High-income countries	Upper-middle-income countries	Lower-middle-income countries	Low-income countries
Wheat	0.37	0.37	0.39	0.37	0.37
Rice	1.55	1.49	1.44	1.63	1.51
Maize	0.36	0.36	0.38	0.36	0.36
Other grains	0.36	0.34	0.37	0.36	0.37
Roots	0.11	0.11	0.11	0.11	0.11
Legumes	0.29	0.29	0.28	0.31	0.29
Soybeans	0.27	0.27	0.28	0.27	0.27
Nuts and seeds	0.54	0.57	0.53	0.53	0.51
Vegetables	0.30	0.30	0.30	0.30	0.30
Fruits (temperate)	0.24	0.24	0.24	0.24	0.24
Fruits (tropical)	0.25	0.25	0.25	0.25	0.25
Fruits (starch)	0.55	0.55	0.55	0.55	0.55
Sugar	0.57	0.57	0.57	0.57	0.57
Palm oil	4.92	4.92	4.93	4.92	4.92
Vegetable oil	2.06	1.65	1.74	2.16	2.75
Beef	36.82	16.18	43.61	38.69	41.85
Lamb	20.12	15.95	21.39	20.42	22.06
Pork	3.16	2.77	3.68	3.11	2.97
Poultry	2.16	1.89	2.26	2.24	2.01
Eggs	1.82	1.54	1.89	1.75	2.32
Milk	3.07	1.31	3.21	3.01	5.28
Shellfish	1.55	0.39	2.36	1.61	1.28
Fish (freshwater)	1.95	1.34	1.88	2.42	0.72
Fish (pelagic)	0.01	0.01	0.00	0.01	0.00
Fish (demersal)	0.53	0.78	0.43	0.75	0.06

Table 1.8: *Breakdown of the forecasted greenhouse gas emissions emitted to produce both meat and plant-based products by 2030 in different regions (Taken from Springmann, 2020).*

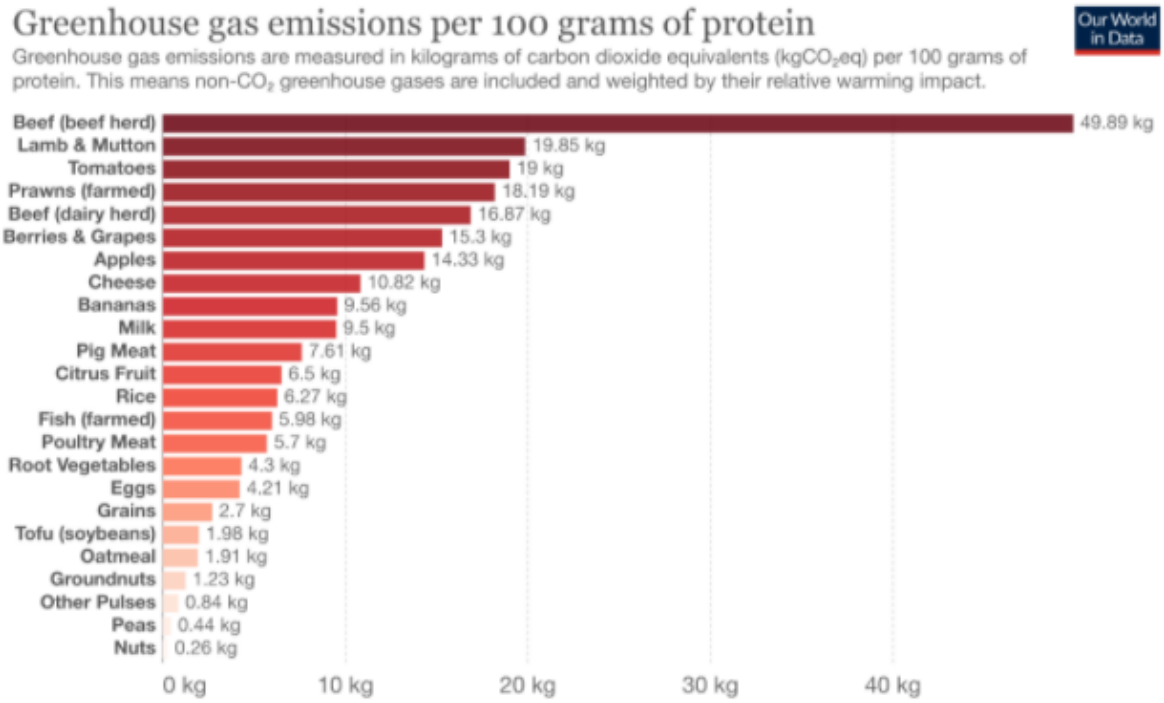

Figure 1.14: *Greenhouse gas emissions per 100g of protein provided by a range of both meat and plant-based products including beef, lamb, tofu, fruits, and vegetables (Taken from Poore and Nemcek, 2018).*

The research has shown that the foods that have the lowest carbon footprint and environmental impact are those that are plant-based, meaning a reduction in meat consumption which reduce the demand for meat production and potentially have a significantly impact on the environment. Poore, the lead researcher in the 2019 analysis *Reducing food's environmental impacts through producers and consumers,* said that a vegan diet has the potential to have the most positive impact on the environment via reduced global acidification, land and water use (Webber, 2021).

It is believed that not only increased costs and taxes on certain products i.e sugar, palm oil, meat, are required to encourage more sustainable diets, but other incentives too. The World Health Organization believe additional education and media campaigns are required, as well as diet restrictions and mandates to see a tangible environmental impact (Springmann, 2020).

1.2.6.4 Agriculture and the Global Economy

As mentioned in previous sections, the meat and dairy industry are of vital importance to the Irish economy. The importance of these industries stretches beyond Ireland and is evident on a global scale. According to the World Health Organization, the production of meat between 1997 – 1999 was 218 million metric tons and this is set to increase to 376 million metric tons by 2030 (Morder Intelligence, 2022). The demand for meat is evident and therefore there is an economic benefit to the industry that could be affected should plant-based diets become more mainstream.

The processed meat market alone in the United States was valued at $26.4 billion in 2020 (total meat market value $838 billion in 2020) suggesting that convenience and longer life meat products are a desirable choice in that region and an important economic factor (Grand View Research, 2021). In comparison, the plant-based product market in the United States is valued at $4.5 billion but set to increase to $74.2 billion by 2017, with a compound annual growth rate (CAGR) of 11.9% from 2020 (Meticulous Research, 2021).

Even with the growth of the plant-based market, there is still more economic value in the meat market which is deemed to be of higher monetary value and capable of better contributing to the global economy.

1.2.7 Global Prevalence of Plant-Based Diets

Vegetarianism and veganism are two plant-based diets that have been examined in terms of global prevalence with less attention given to other plant-based diets. The prevalence of vegetarianism varies greatly from country to country with approximately 5% of Americans, 8% of Canadians, 4% of Germans and over 30% of Indians comprising of vegetarians (Paslakis *et al.,* 2020).

Recent research shows that veganism is a less popular choice with as little as 1% of the German population partaking in this diet perhaps due to the restrictive nature of the diet (Paslakis *et al.*, 2020). Many of the regions with low frequency of plant-based diets have an inversely associated relationship with meat consumption (Pfeiler and Eglof, B,

2018). This would suggest that a country with a high level of meat consumption will naturally have a lower uptake in plant-based diets. In theory, this suggests that Ireland should have a low prevalence of plant- based diets.

1.3 Meat Alternatives

Meat alternatives can be defined as non-animal-based proteins that are developed to mimic the characteristics and quality of animal proteins. Meat alternatives are also known as faux meat, meat substitutes and imitation meat (Thavamani *et al*., 2020). The main purpose of meat alternatives is to provide a food source that was replace meat both from an organoleptic point of view i.e taste and texture and a nutritional point of view. Meat alternatives such as tofu and tempeh are not a new phenomenon and have been key components of Asian cuisine for thousands of years. The introduction of meat alternatives to Western cuisine occurred in the 1960s and has continued to grow and become more prevalent since then (Wild *et al.,* 2014).

With the knowledge of the impact meat production has on the environment and perceived health benefits of meat reduction, the demand for plant-based meat alternatives is rising with over 4,400 products launching from 2015 – 2021 in the category (Estell *et al*., 2021).

1.3.1 Types of Meat Alternatives

There are both traditional and modern types of plant-based meat alternatives (PBMA). Traditional types of PBMA include tofu and tempeh, both derived from soya (Shurtleff and Aoyagi, 2013). These products are generated via the process of soaking, dehulling, partially cooking, breaking down and compressing together, typically into a block (Babu *et al*., 2009). Another traditional type of PBMA is seitan, which differs from tofu and tempeh as it is derived from wheat gluten, a strong plant protein source (Mal'a *et al*., 2010). Modern PBMAs are more complex and often aim to mimic meat and provide the same nutritional composition.

These first generation or traditional PBMA do not mimic the conventional texture, taste, or appearance of meat and while this may not be desirable for some consumers, there is

a drive towards making PBMA as reflective of standard meat as possible (He *et al*., 2020). Products such as Beyond Meat ™ and Impossible Burger ™ have revolutionized the area of PBMA in the last decade. The main component of these product is soy protein but the addition of other ingredients such as beet juice to mimic blood and iron derived heme for flavour, these products are comparable to real meat (Impossible Burger, 2022).

While consumers enjoy meat for its taste, the nutritional composition of the food, especially the protein content is of high importance to consumers (Bohrer, 2017). Food businesses and manufacturers strive not only to develop a PBMA that has the sensory characteristics of meat but is also nutritionally comparable (He *et al*., 2020)

1.3.2 Nutritional Analysis of Meat Alternatives

The introduction of meat alternatives into an individual's diet begs the question – can meat alternatives be part of healthy diet and why?. According to Dr Frank Hu of the Harvard Department of Nutrition, long-term epidemiologic studies have shown the positive impacts of the consumption of legumes, nuts and PBMA as a replacement for red meat (Harvard T.H. Chan, 2022).

Recent literature suggests that PBMAs pose a healthier nutritional composition than meat, however for flavour enhancement, sodium content can be high in these products (Harvard T.H. Chan, 2022). *Table 1.9* gives a nutritional overview of both PBMAs and conventional beef products. The average protein content of the PBMAs reviewed was 13.3g/100g, while the conventional beef burger average protein content was 15.84%. Fat and saturated fat levels were significantly lower in the PBMA products with carbohydrate and dietary fibre levels lower in the conventional beef burger products (He *et al*., 2020)

Product	Energy (kcal/100 g)	Protein (g/100g)	Fat (g/100g)	Saturated Fat (g/100g)	Cholesterol (mg/100g)	Carbohydrate (g/100g)	Dietary Fibre (g/100g)	Sodium (g/100g)	Iron (g/100g)
Great Value Meatless Burger	176	16.8	8.85	0.44	0	10.62	5.31	300	10.09
Yves Veggie Burger	147	17.05	5.11	0.45	0	9.09	3.41	420	4.2
Wholly Veggie Burger	146	9.33	4.67	0.4	0	18.67	4	226	1.68
Beyond Burger	221	17.7	15.93	5.31	0	2.65	1.77	345	3.72
Impossible Burger	212	16.8	12.39	7.08	0	7.96	2.65	327	3.72
Great Value Beef Burger	221	15.04	16.81	7.96	70.8	3.54	0.88	451	4.2
Pre Grass Fed Beef Burger	198	19.21	13.9	6.62	62.91	0	0	76.16	0.84
M&M Classic Beef Burger	274	13.27	22.12	6.19	57.52	5.31	0	442	0.84

Table 1.9: *Nutritional breakdown of both PBMA and traditional beef burger products, highlighting the key nutritional differences and similarities between the products. This data is based on back of pack nutritional information (Adapted from He et al., 2020).*

Research suggests that the health benefits of consuming PBMAs come more from its replacement in diet of red meat, as opposed to its nutritional profile. The nature of the products require a high volume of ingredients and lacks a "clean label" or natural status (Nagra, 2021). PBMAs can be perceived as highly processed and therefore unhealthy. This has been challenged as the length of an ingredient declaration should not always dictate the health status of the product but rather the healthfulness of each individual ingredient (Nagra, 2021). Regardless of some PBMAs falling into the processed food category, they remain a convenient and accessible method of reducing meat in the diet (Simon, 2022).

1.3.3 Availability Meat Alternatives in Ireland

The monetary value of the Irish plant-based meat industry is projected to grow from €23 million in 2020 to €39 million by 2024 (Glennon, 2021). With such strong growth forecasted, many Irish businesses are noticing the importance of entering this flourishing market. Popular traditional meat producing businesses in Ireland have branched out to the meat-free market in recent years. Rudd's launched their 100% plant-

based range in 2021 which includes sausages and mock black pudding with low fat and high protein claims (The Taste, 2022). Similar, Denny's have released both a meat free sausage and burger onto the Irish market which boast high fibre claims and have been highly successful (Denny's, 2022). Bird's Eye have also expanded into the plant-based category with their *Green Cuisine* frozen meat alternatives such as nuggets, burgers, and meatballs (Birds Eye, 2022).

Figure 1.15: *Examples of Irish owned traditionally meat manufacturers who have expanded into the meat alternative market in recent years (Denny's, Bird's Eye, Rudd's, 2022).*

With the rise of plant-based alternatives on Irish supermarket shelves, there have been some setbacks including a review completed by Safe Food Ireland in 2021 which showed that 25% of meat alternatives on the Irish market did not meet a "source of" protein claim (Safe Food, 2021). With 1 in 3 Irish people consuming the products because of their perceived health benefits, the uncertainly around the nutritional composition is concerning (Safe Food, 2021). This raises the issue around health claims made on food products, the legitimacy, and the consistency of them. These concerns can often hinder a move to new or different products (Food Safety Authority of Ireland, 2022).

1.3.4 General Consumer Attitude Towards Meat Alternatives

A study of an Australian sample set in 2021 by Estell *et al*., reviewed the Australian consumer's perception and attitude towards meat alternatives in terms of both sensorial acceptance and perceived nutritional value (Estell *et al.,* 2021). Participants of the study strongly agreed that a plant-based diet is nutritious and promotes good health, however 42% of participants felt as though it would be difficult to achieve desired protein intake while following a plant-based diet. Of the participants who had tried PBMA, almost 50% said they tried them because they were influenced by the trend. The remaining reasons were spilt between ethics, the environment and heath (Estell *et al.,* 2021). There was a common consensus among the participants that taste was the most important element when it came to whether they would choose a PBMA with none of the PBMAs rated highly for taste.

A similar trend was observed in an Italian study carried out in 2018, whereby the sample set were asked their opinion on and willingness to consume cultured meat. 44% (n = 552) of the participants were open to cultured meat, with the main requirement being that it needed to have similar taste and texture to conventional meat (Mancini and Antonioli, 2018). One of the overall conclusions of the study was that while customers would pay a premium for a delicious PMBA, there was concerns around the novelty and safety of the product. It suggests consumers need to be convinced that the product is safe and nutritionally accurate as with novel and unfamiliar products, consumers tend to be less trusting (Siegrist, Sutterlin and Hartmann, 2018).

A 2021 Chinese study of 4666 participants found that 1614 of the participants had a neutral response to the following statement "how healthy, safe, and nutritional do you think artificial meat would be compared to conventional meat?" (Liu *et al*., 2021). Even though participants did not have a positive or negative perception towards the health, safety, or nutritional composition of artificial meat, over 70% had tried it before and 52% would accept it as a replacement for conventional meat (Liu *et al.,* 2021). This may suggest consumers are seeking a meat replacement and not necessarily a product with added nutritional benefits.

The attitudes and perceptions towards meat alternatives have been reviewed in many regions, however this type of study has not been conducted among an Irish population which this research will address.

1.4 Motivations Driving Plant-Based Diets in India and Australia: a comparative case study

Australia and India were chosen as the focus for this case study due to the stark differentiation between the two regions meat consumption. Australia has one of the highest levels of meat consumption globally with an average of 96kg/person being consumed annually (Cheah *et al*., 2020). India, at the other end of spectrum, has one of lower levels of meat consumption at approximately 4kg/person annually (Stanley, 2021).

Having reviewed the available literature on the motivations driving a plant-based diet in both India and Australia, there are five main factors that motivate people in both regions to partake in a plant-based diet. The drivers were identified as ethical concerns for animal welfare, perceived health benefits, sustainability, religious influence, and social norms (Cheah *et al*., 2020).

1.4.1 Ethical Motivations

Concerns around animal welfare in relation to meat consumption was the only commonly ranked driver for moving towards a plant-based diet in both Australia and India.

Malek and Umberger (2018) carried out a study on anti-consumption of meat among a sample set of 328 Australians, positioned concern for animal welfare as a main driver for their reduction in meat consumption (Malek and Umberger, 2018). More than half of the participants viewed animal welfare as the primary motivation for choosing a vegetarian diet. Meat avoidance due to concern for animal wellbeing was more strongly driven by lifelong, committed vegetarians as opposed to flexitarians. In addition to this, Australians had more exposure to ethically concerns such as unregulated farming through media which may have influenced some outputs of this study. This has greatly affected the dietary and purchasing choices of Australians (Khara *et al.*, 2021).

An additional study by Khara *et al,* examined the meat paradox, and focused how participants felt about animal well-being and its part in farming and food production. Haslam and Bastian in 2014 and observes physiological struggle people have between animal welfare and the enjoyment of meat. The study focused on points including participants views on animals in general, the contrast between farm animals and pets and farming of animals to produce food (Khara *et al.,* 2021). The research showed that participants were highly concerned with the impact meat production has on animal suffering.

1.4.2 Health Motivations

Meat is a high value food in nutrition as well as for other sensory factors such as taste, smell and, texture. As mentioned in *section 1.1.2.3* on the health impacts of meat consumption in Ireland, there are concerns around the potential negative implications of consuming meat and this has driven the increase uptake of plant-based diets globally (Orlich *et al*., 2019).

Recent research formally known as the Indian Migration Study (IMS) involved 7067 adults from 4 different regions in India and examined the health status of both vegetarians and non-vegetarians. It showed that vegetarians across all the 4 regions had an increased standard of living and were less likely to include alcohol in their diet or smoke, promoting better health (Shridhar *et al*., 2014). In the IMS, vegetarians' participants consumed larger quantities of vegetables, legumes, diary, and sugar while those who consumed meat ate higher volumes of cereals, fruit, fatty and salty foods (Cheah *et al*. 2020). The outcomes of this study can be seen in *Table 1.10*.

Diet	Results
Non-vegetarian	Increased levels of animal products consumed e.g. red meat, milk, and poultry linked to a pattern of obesity particularly central obesity in males. Positively linked with higher levels of diet related diseases such as CVD and hypertension.
Vegetarian	Inversely linked with heart disease and other diet related diseases including an overall lower concentration of cholesterol, lower systolic and diastolic blood pressure and incidences of diabetes.

Table 1.10: *Diet and health related outcomes of the IMS, validating the benefits to health of vegetarianism compared to diets that include meat and dairy (adapted from Cheah et al. 2020)*

Another study which examined the perceived benefits of meat reduction among an Australia cohort collected data from 350 people with two thirds of participants eating meat three times weekly and 11.3% consuming it four to five times per week (Cheah *et al*., 2020). The results showed that perceived benefits were closely linked with a positive attitude and intention to meat reduction. The sample set felt that by reducing the amount of meat they consume they would benefit from better health and reduce the risk of contracting diseases such as cardiovascular disease (Cheah *et al.*, 2020).

1.4.3 Environmental Motivations

As previously discussed, it is a well-established fact that rearing livestock to meet the demands of meat consumption has a negative effect on the environment. (Gonzalez *et al*., 2020). There were no studies specific to sustainability as a motivator for vegetarianism in India, however the Australian population have expressed concerns for the environment in relation to meat consumption, studies have shown (Bogueva *et al*., 2021).

A five-year long study in Australia reviewed the meat-eating behaviours and patterns of 30 participants with frequent interventions such as information on the environmental impact of consuming meat and cookery classes showed mixed views in relation to the environmental influence on dietary choices. The older individuals in the study aged between 60 years and above believed consuming meat had very little impact on the environment, while more than 50% of younger participants were passionate about the

impact beef rearing and high meat consumption has on the sustainability levels. An attitude similar to the meat-paradox meant the enjoyment and taste of meat overruled the concern about the environmental impact the consumption of meat has (Bogueva *et al*., 2021).

1.4.4 Religious Motivations

None of the literature reviewed that highlighted religion or religious obligation as a rationale for plant-based diets in Australia.

Predictably, religion is a key motivator for vegetarianism in India due to teachings of the primary religions in the country focusing on anti-violence towards animals (Singh, 2018). Vegetarianism is strongly linked to Hinduism and Buddhism, as both religions promote meat avoidance through the principles of *Ahimsa* or non-violence towards animals (Orlich *et al.*, 2019). In contrast, Islam, which is also an important religion in India, does not prohibit eating meat and in fact observes ritual related slaughtering of animals.

The interesting subject of meat-paradox is an important topic in relation to religions motivations for vegetarianism because it describes the internal conflict meat eaters have towards animals and animal welfare. It is closely linked empathy and sympathy for animals; however, people tend to enjoy meat too much and are unable to avoid meat as a result of this internal moral conflict (Khara *et al.*, 2021).

In the meat-paradox study by Khara *et al*. (2021) both followers of Hinduism and Islam were included in the participants in the Indian study. It was highlighted how religion influences the eating and dietary habits of the country and how social standards determine so much of what the general population will accept. The Indian caste system: a societal hierarchy in India, has considerably influenced dietary habits (Deshpande, 2010). Hindu participants were conflicted in their opinions due to the high level of importance Hindus place great importance on karma and reincarnation of living things and therefore were particularly conflicted when it came to eating meat, highlighting the potential disapproval from their parents (Nagaraj *et al*., 2013).

1.4.5 Social Motivations

Social identify relates to how an individual places themselves among their peers or within a group of people. Plant-based diets can express a stance on dietary choice and also an expression of social identity. Followers of plant-based diet have shared beliefs such as animal wellbeing, ethics, and environmental awareness which can be a contributor to their whole social identity (Nezlek and Forestell, 2020).

In today's world of social media dominance, influencers, diets and political and social agendas, addition pressure is placed on individuals, in particular young people, to shape their social identity around evoking principles and topical subjects e.g sustainability, animal wellbeing and civil rights movements. This subject is considered in the work conducted by Theriault *et al* (2021) on the "sense of should" whereby young people feel pressured and obliged to be and act a certain way and conform. For example, one may feel compelled to wear a dress or skirt if they are female or be a vegetarian or because they are concerned about and love animals (Theriault *et al.,* 2021).

In Australia, there appears to be a lack of social pressure in favour of plant-based diets. Instead, Australians feel the pressure of social norms towards meat consumption. The high level of meat consumption in Australia has caused it to become an inherent part of Australian society. Nguyen and Platow (2021) describe this as national social identity and by not following this one can lose their affiliation or association with their country's identity and culture. A link is confirmed between this and tradition and the mindset of "that's just what we do". This attitude would suggest a stubborn and unwavering favouring of meat regardless of any social pressures in relation to plant-based diets (Judge, 2012).

A significant difference is observed in Indian society where the caste system strongly promotes the dedication to vegetarianism. In some cases, plant-based diets can be linked to social status and wealth and therefore is highly important in India society and culture. (Khara *et al*., 2021).

1.5 Global Attitudes and Perceptions Towards Plant-Based Diets

There has been minimal research into the psychological foundations that form the attitudes and perceptions towards plant-based diets and those who partake in them. Studies that have been conducted on this topic have had varying results dependant on the geographical location of the study. For example, a New Zealand study of 1,326 participants (66% female and 34% male) was carried out to determine the cohort attitude towards both vegetarians and vegans. It was hypothesized that the attitude towards vegetarians would be most positive than vegans due to the perceived negative group dominance of vegans that is seen to challenge the theory of human supremacy over animals. The study comprised of 94.6% non-vegetarians which could cause an imbalance in results. While the attitudes of non-vegetarians towards vegetarians was generally positive, as predicted, the attitudes towards vegan were less so. Due to the economic significance of meat and the meat industry in New Zealand, this group was deemed potentially threatening to cultural and societal norms (Judge and Wilson, 2018).

A similar study conducted in the United Kingdom by Bryant (2019), based the research on the attitudes and perceptions towards plant-based diets of meat-eaters only. In the 1,000 participants, 49.8% were male and 49.8% female (the remaining percentage did not disclose gender). The participants were asked to rate 11 aspects of a vegetarian and vegan diet on a 1- 7-point scale. The aspects participants were asked to rate, as well as the number of participants with positive, negative, or neutral opinions on the aspects in relation to vegetarianism are detailed in *Figure 1.16* (Bryant, 2019).

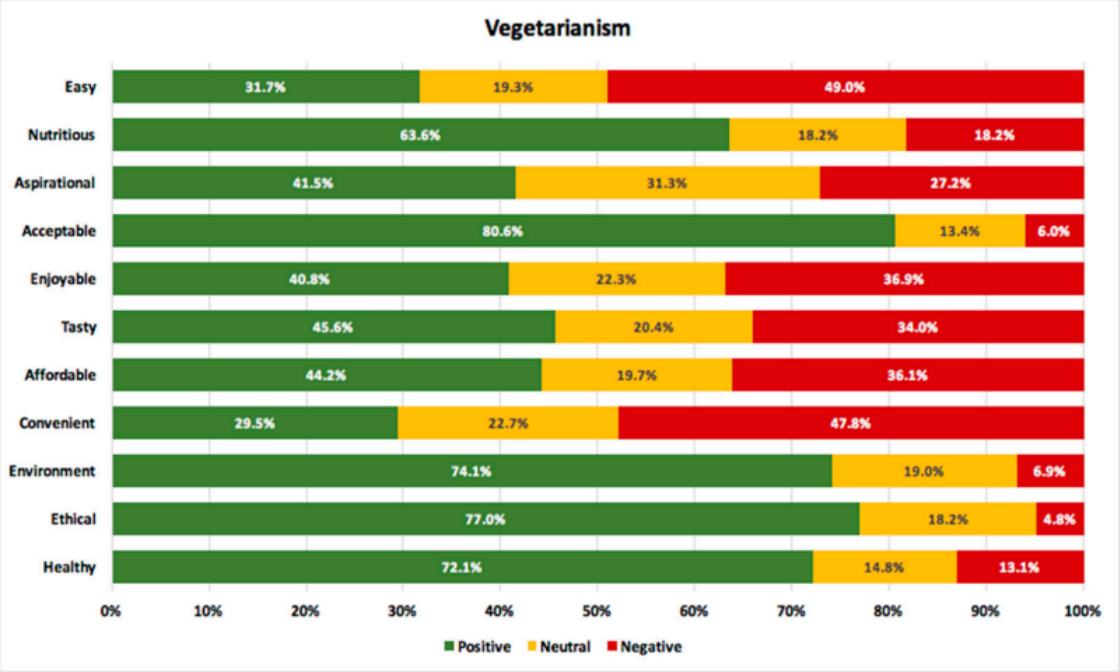

Figure 1.16: *Proportion of participants with a positive, negative, or neutral opinion towards different aspects of a vegetarian diet. (Taken from Bryant, 2019).*

As seen in *Figure 1.16*, most of the meat-eating participants had positive views on the different aspects of a vegetarian diet, notably that the diet is healthy, ethical and has a positive impact on the environment.

Participants were then asked to rate the same aspects towards a vegan diet. The results of this are presented in *Figure 1.17*. Respondents here had more negative views of the aspects with a vegan diet, particularly in relation to easiness and convenience.

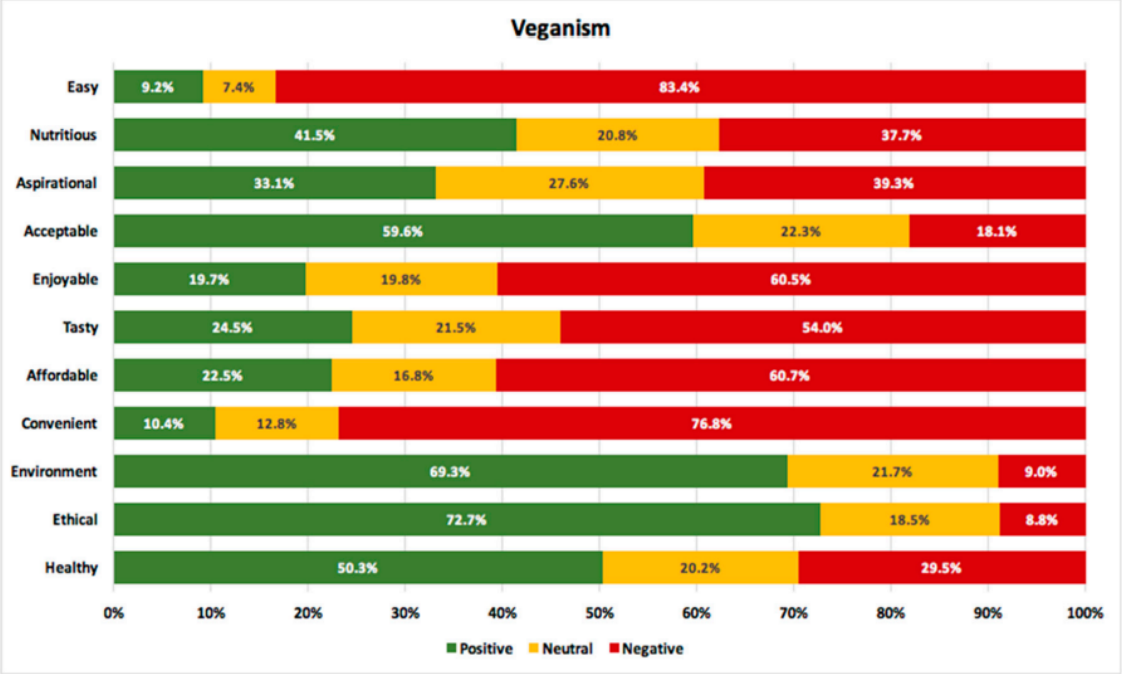

Figure 1.17: *The proportion of participants with positive, negative, or neutral opinions towards different aspects of veganism (Taken from Bryant, 2019).*

A key finding in this part of Bryant's research was in relation to the acceptability of the two diets which is telling of the overall opinion towards the diets. 80.6% of the sample set believed vegetarianism was acceptable and 59.6% believed the same for veganism. This would suggest that the sample set did not view those dietary choices as threatening to social norms as per the New Zealand study.

While many view plant-based diets as a healthy, ethical, and sustainable diet, several studies have reviewed the diets relative to the diets presenting a threat to cultural, social, and economic status quo. This opinion is more evident in Western societies with a high consumption of meat like Australia and the United States. The main concern in these regions with regards to a potential rise in plant-based diets is the impact on agriculture due to the country's reliance of exports of meat and dairy products (Stanley, 2021). For example, Australia exported just short of 900,000 tonnes of meat products to 57 global markets in 2021 (Australian Government: Department of Agriculture, Water, and the Environment, 2022). While this was the lowest export level in 36-years, meat production and exports are still of great economic importance to the country. MacInnis and Hodson (2015), expressed similar views that veganism, in particular, presents

significant threats to the dietary norms of Western societies with prevailing cultural standards around meat-eating.

In comparison, as discussed in section 1.3, the Indian attitude towards plant-based diets is largely more positive due to the high prevalence of the diet and religious and cultural pressure. This is largely due to the cultural stigma and caste system which greatly influences the attitudes of the Indian population towards meat-eating and violence towards animals. The social and religious influence in India has even resulted in Indian's under reporting their consumption of meat (Khara *et al*., 2021).

The positive perception that a plant-based diet is beneficial to health appears to be a common attitude in many studied regions. Extensive research supports a diet richer in fruit and vegetables and fewer animal product is better for your health. In early 2022, the EU Commission released their promotional policy supporting EU agri-food products, which includes a shift towards plant-based diets having deemed meat and meat products a cancer risk. The policy is also encouraging the push towards more plant-based innovation to help promote the diet (Foote, 2021).

The attitudes and perceptions towards plant-based diets is both positive and negative depending on the geographical location, cultural and religious influences and the economic importance of meat and meat production. While the reasons for the attitudes towards these diets has been recognised and established in countries such as Australia and India, it has not been thoroughly examined in an Irish context.

1.6. Plant- Based Diets in Ireland

There has been limited research of the attitudes and perceptions of plant-based diets among the Irish population. However, there have been some studies examining the prevalence of plant-based diets in Ireland to understand whether the country is aligned to any other region and to identify emerging consumer trends. A 2018 Bord Bia Consumer Lifestyle Trends report focused on the rise of plant-based diets in Ireland and presented figures around the prevalence of the diets in the country (Bord Bia, 2018).

The report identified trends including well-being, engaging experiences, and responsible living, all of which give way to evolving lifestyles and therefore evolving dietary choices among a population steeped in dietary tradition. In 2018, 3.5% of the Irish population were vegan and 5.1% were vegetarian (Bord Bia, 2018). 18–24-year-old was the age category most likely to partake in these diets with a mostly urban demographic. The main reasons for this dietary choice were focused on well-being, health, environmental impact, and identity, much like the dietary motivations noted in the Australian and India case study.

While understanding the current plant-based diet status in Ireland is important and will be further researched in this study, having insight into the general public's attitude towards the diets could unlock whether there are bigger market opportunities for the plant-based diet food industry (Bord Bia, 2021).

1.7 Rationale for this Research

This literature review has identified that there is a paucity of information on the adoption of plant-based diets among the Irish population. With strong agricultural and meat consumption habits, the question of the opinion of the Irish population of this dietary choice and their potential likelihood of moving towards plant-based diets becomes important. Having reviewed the literature on the health and environmental impacts of high meat consumption, it is vital to understand what would be required to encourage a more plant-based diet among the Irish population. There is a likely hood that meat and animal product prices could increase due to taxation on increased carbon emissions and finding acceptable replacements for them is key. This research is important to understand if there is a strong market for plant-based products in future in Ireland and whether there would be demand for it. This study will examine the attitudes and perceptions of plant-based diets among adults in Ireland in 2022, the motivations for consuming meat or transitioning to a plant-based diet and the likelihood of them doing so.

A summary of the main aims and objectives of this research is as follows:

- Examine the current dietary choice of the Irish population
- Review the level of meat consumption among the population
- Explore the attitudes and perceptions towards plant-based diets in the population
- Understand the likelihood of participants moving to a plant-based diets and their motivations for doing so
- Review the attitudes towards and consumption of meat alternatives.
- Examine what is required to encourage an increase in plant-based diets

Chapter 2: Methods

2.1 Introduction to Research

Following the review of the literature in this area, it was evident that research around the attitudes and perceptions of plant-based diets among adults living in Ireland in 2022 has not been explored prior to this research.

To answer these questions, it was deemed that a survey including both qualitative and quantitative research questions would be generated and circulated among both males and females aged 18 and older living in Ireland in 2022.

2.2 Research Process

To formulate a methodology in research, several steps must be taken (see *Figure 2.1*) These steps were applied using the research onion concept, coined by Saunder *et al.* (2007).

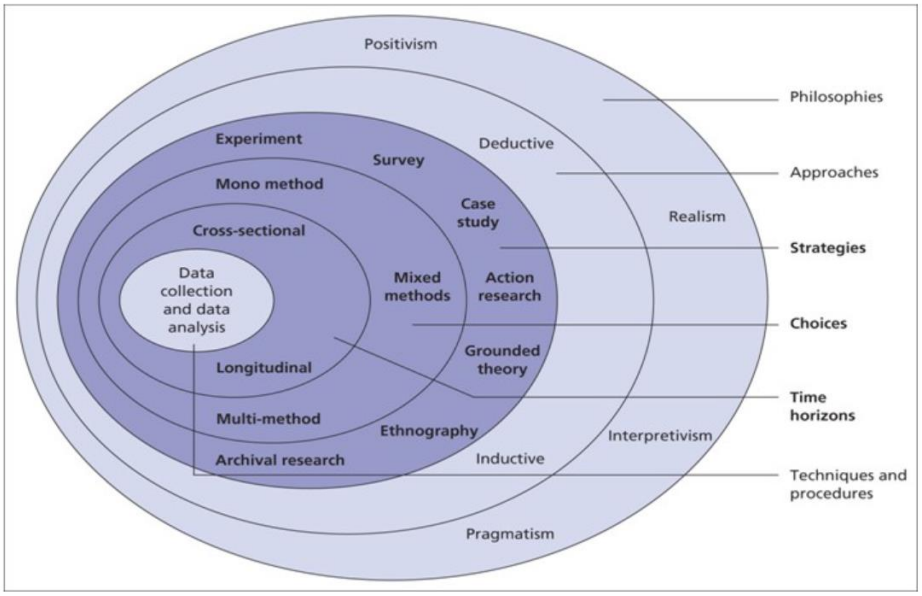

Figure 2.1: *The research onion model used to develop thesis methodology (Taken from 15 Writers, 2022)*

Research Philosophy – Interpretivism, as the study was of a qualitative nature with the collection of data in relation to behaviors, attitudes, and perceptions of individuals.

Research Approach – Inductive, as this study began with an observation that Ireland has a high meat consumption and theorized that the attitudes and perceptions of plant-based diets may be negative.

Research Strategy – A survey was used to collect the data and is further explained in the study and questionnaire design section below.

Methods – Qualitative and quantitative questions were included in the survey.

Time Horizons – Cross – sectional, as the study was conducted at one point in time capturing the attitudes and perceptions of the Irish population in early 2022.

2.3 Study Design

An online survey using Microsoft Forms (MS Forms) was used to collect qualitative and quantitative data on the attitudes and perceptions of the Irish population on their diets and on plant-based diets in Ireland. The survey was circulated to participants between 19th of February 2022 and 4th of March 2022.

2.4 Participant Recruitment and Consent

Voluntary participants aged 18 or older living in Ireland were the target profile population of the survey (n = 141). As this was a study of the general Irish population, the only participant requirements were that they were 18 or older, Irish, or living in Ireland. Using the survey monkey sample size calculator (Sample Size Calculator: Understanding Sample Sizes | SurveyMonkey), the appropriate sample size was derived. Based on the 3.7 million people living in Ireland in 2021 aged 18 or older (World Population Review, 2022), and with a 95% confidence interval and 10% margin error, it was concluded that a minimum of 97 people were required for the study to give an accurate and adequate number power in the sample size and data collected. Survey Monkey sample size calculator was used for this study (see *Figure 2.2).*

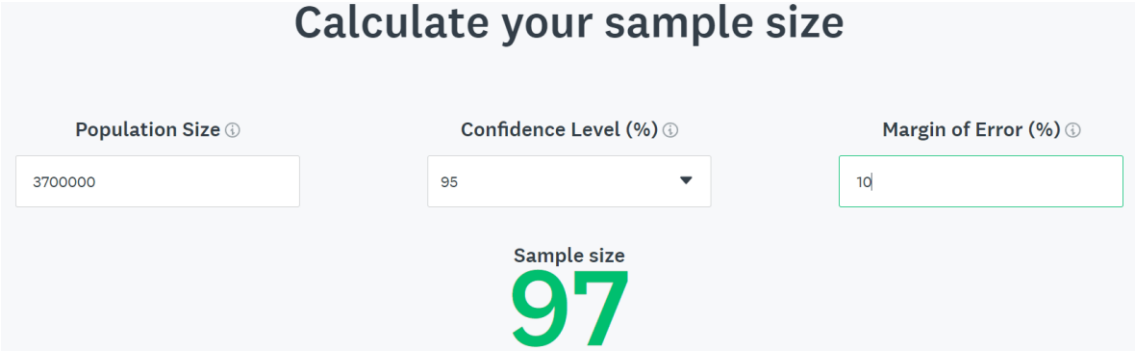

Figure 2.2: *Survey Monkey sample set size calculation based on the 3.7 million people over the age of 18 living in Ireland, as per most recent figures, with a 95% confidence level and 10% margin error (Taken from Survey Monkey: Sample size calculator, 2022).*

With the knowledge of a typical 30% response rate from participants in online surveys, the survey was sent to 300 people to ensure the quota of 97 respondents would be met. The survey was sent to both professional and personal networks such as colleagues, friends, classmates and family, and opt-in was ensured by each individual before the link was shared (to the MS Forms survey).

Consent and an opt-in were achieved via a tick box within the first question of the survey which detailed the purpose, voluntary status, and option to leave at any time to the participants. A participant information leaflet with further detail of the study, including the research contact details was provided to all participants as requested. The final sample set was n = 139 (male = 44 and female = 95).

2.5 Questionnaire Design

The survey was designed using mixed qualitative and quantitative questions. Each section had a specific theme aimed at answering the research question. The themes included current dietary preferences, likelihood of reduction of meat consumption, attitudes towards different diets, motivations for diets, and attitudes towards meat alternatives. The overall objective of the research was to understand participants attitudes and perceptions of plant-based diets, as well as gaining an understanding of meat consumption in Ireland.

Participants were given some brief information about the study and then asked to give their consent in the first question. The questionnaire was divided into three sections.

1. Section one asked initial demographic questions (age, gender) to stratify the sample population and analyze if there are differential attitudes and perceptions towards plant-based diets based on age or gender. Next, the participants were asked to choose all diets they were familiar with to evaluate current knowledge of diets. Finally in section one, participants were asked about their current dietary choice i.e., vegetarian, omnivore, vegan with short definitions given of each, their existing level of meat consumption and likelihood of reducing this. The likelihood of reducing meat consumption was asked via a 5 - point Likert scale.

2. In section two, participants were asked questions in relation to their opinion on certain aspects of a plant-based and a meat inclusive diet. The response options were based on a 5-point Likert scale ranging from "strongly disagree" to "strong agree" around 9 aspects of the diet. Statements in the first question included "A diet that includes meat is…" and subsequently

    (a) "healthy"
    (b) "ethical"
    (c) "convenient"

    Statements in the second question included "A plant-based diet is..." and subsequently

    (a) "healthy"
    (b) "ethical"
    (c) "convenient"

    Finally, participants were asked to indicate their top-ranking reason for (1) choosing or remaining with a meat-based diet and (2) moving to a plant-based diet with 6 options including an open text "other" option.

3. Section three was designed to look specifically at attitudes and perceptions of plant-based diets. The first two questions asked what words come to mind when

the participant thinks about (1) plant-based diets and (2) a person who partakes in a plant-based diet. The results of these questions were used to develop a word cloud graphic to visually represent attitudes towards plant-based diets in Ireland. Question 16 and 17 dealt with the participants opinion on the prevalence of plant-based diets and the age category it is most relevant to in their opinion. In question 18, participants were given 7 statements and asked to give their opinion via a 5-point Likert scale (ranging from "strongly disagree" to "strongly agree"). Furthermore, participants were asked what they think is required to make plant-based diets more appealing in Ireland. Finally, participants were asked questions around their familiarity with and likelihood of consuming meat alternatives. A definition of meat alternatives was provided in the survey.

Access to the full questionnaire is available via the link below and A copy of the questionnaire is also available in the appendices (See *Appendix A*)

https://forms.office.com/r/YNmee5mAVs

2.6 Data Analysis

Microsoft Forms analyses data as responses are submitted by participants. The data was reviewed firstly to ensure all participants were over 18 years old and gave consent. Age, gender, and dietary choice data was collated into a table format and broken into number and percentage. The remainder of the data was collated into bar charts, stacked bar charts, pie charts, and word clouds to represent the results.

Data was analyzed using the chi-square test function in Microsoft Excel. Chi-square test was used to determine whether there was any statistically significant differences in attitudes and perceptions between genders.

5-point Likert scales were used for several questions within the survey which included two extreme poles, one neutral option, and two intermediate options. The Likert scales rated likelihood of reducing meat consumption and level of agreeance with different aspects of meat-based and plant-based diets.

All Likert scale type responses were combined into the positive, neutral, and negative responses i.e. “very unlikely” and “unlikely” and “very likely” and “likely” were combined. Chi-square test was used on the Likert scale questions to determine if there was significantly statistical difference between the observed and expected results. The significance level of $p = 0.05$ was used for all tests in this research and is highlighted with an * in the results section.

There were four open- ended questions in the survey, two of which are “other” options for motivations for consuming a certain diet. The two remaining open-ended questions allowed the participants to express their opinion in an open text format on plant-based diets and those who consumed a plant-based diet in three words. This data was analyzed using Word Cloud which created a visual, highlighting the most frequently occurring response within those open-ended questions.

2.7 Ethical Considerations

This research required retrieving data from participants online via a survey and therefore ethical approval was required. Approval was achieved via the TU Dublin Research ethics committee. The ethics approval reference number for this research is 057 and approval was officially received on the 18th of February 2022. Human participation requires assurance that all legal requirements are adhered to, as a way of review of the resources being used and any possible risks to participants. By way of requesting ethical approval, the category of risk had to be determined. This research was deemed as requiring Category 2 Ethical Approval. Category 2 Ethical Approval is defined as research which involves direct/indirect human participation with results not intended to be shared in the public domain.

To achieve ethical approval, detailed information regarding the purpose of the research, how the research will be conducted, how consent will be obtained and the level of risk to the participants is needed. It was important to consider the requirement of human participants, which was deemed essential for this research. In addition, ethical consideration was given to each question asked of the participant in the survey. Questions that could potentially disclose the identity of the participant were excluded from the survey i.e location of residency, job title, employer. This was not only

important as an ethical consideration but also from a General Data Protection Regulation (EU) 2016/679 (GDPR) perspective. The questions asked of participants were deemed to be low risk as they revolved around eating and dietary habits.

This research was submitted for ethical approval to the TU Dublin Ethics Committee on the 28th of January 2022 under the guidance of the supervisor of this research. Ethical approval was granted on the 18th of February 2022. The TU Dublin ethics approval document can be found in the appendices (see *Appendix B*).

Chapter 3: Results

3.1 Participant Profile

141 individuals participated in the study. The survey had an approximate response rate of 56% (250 people were asked to participate). The final number and demographic of participants can be seen in *Table 3.1*. It was vital to gather this data to be reflective of the Irish population in 2022 with both genders and all age groups above 18 years old represented in the data. Two participants left the consent question blank and therefore their answers were removed from the results, leaving a total of 139 participant responses. The breakdown of the participants in relation to gender, age category and self-proclaimed diet e.g omnivore, vegetarian, vegan, is summarised in *Table 3.1*.

	Survey Participants (%)	Survey Participants (n = 139)
Gender		
Female	69%	95
Male	31%	44
Age		
18 - 24 years old	2.8%	4
25 - 34 years old	29.4%	41
35 - 44 years old	14.3%	20
45 - 54 years old	35.2%	49
55 - 64 years old	12.9%	18
65 years old +	5.0%	7
Dietary Choice		
Omnivore	83.4%	116
Vegetarian	6.4%	9
Vegan	1.4%	2
Flexitarian	7.9%	11
Pescatarian	0.7%	1

Table 3.1: *Breakdown of the participants according to gender, age category and dietary choice.*

The participants were female dominated with the highest percentage ages 45 – 54 years old and the lowest percentage in the 65 years old + category. Most of the participants consumed meat which confirms that the Irish population are avid meat-eaters, this corroborates the evidence to date around the historically high-level consumption of meat in Ireland and the status of meat presence within the Irish diet.

3.2 Awareness by Irish Population of Plant-Based Diets

Participants were asked if they were familiar with the following terms: omnivore, vegan, vegetarian, pescatarian and flexitarian (*Figure 3.1*). 95% of participants were

familiar with the term vegetarian and, of those, 98% were also familiar with one other dietary term listed in the question i.e. omnivore, vegan, flexitarian, pescatarian. 38 participants (27.3%) were familiar with all 5 terms listed. 50 participants (35.9%). were familiar with 4 out of the 5 listed terms. 22 participants (15.8%) were familiar with 3 of the 5 terms listed. 17 participants (12.2%) were familiar with 2 of the 5 terms listed. 11 participants (7.9%) were familiar with only one of the 5 terms listed in the question.

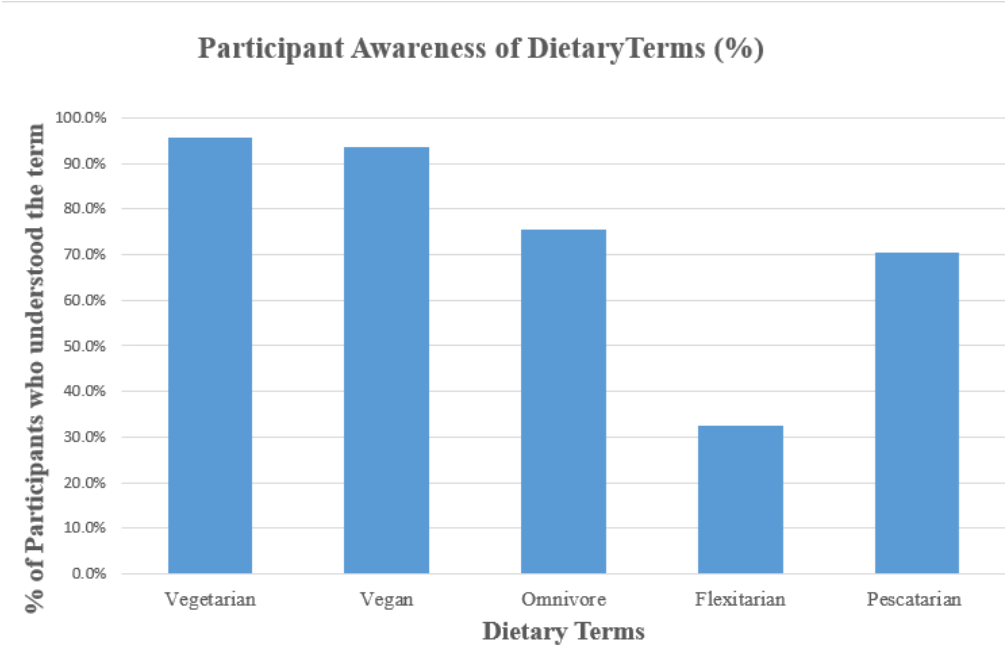

Figure 3.1: *Percentage of participants who were familiar with plant-based dietary terms. Participants were able to choose multiple terms.*

The general understanding of the range of plant-based diets is very strong among the Irish population. This demonstrates that participants are aware of or have heard of the terms but do not necessarily know the details of them. The results do suggest that plant-based terms are commonly used in Irish society, social media and other public forums.

3.3 Meat Consumption Among the Irish Population

Participants were asked to disclose their average meat consumption per week. As seen in *Figure 3.2,* 28% (n =39) of participants consumed meat daily which further highlights the persistent prevalence of meat consumption in Ireland in 2022 . The other extreme is the 10% of participants who do not consume meat at all.

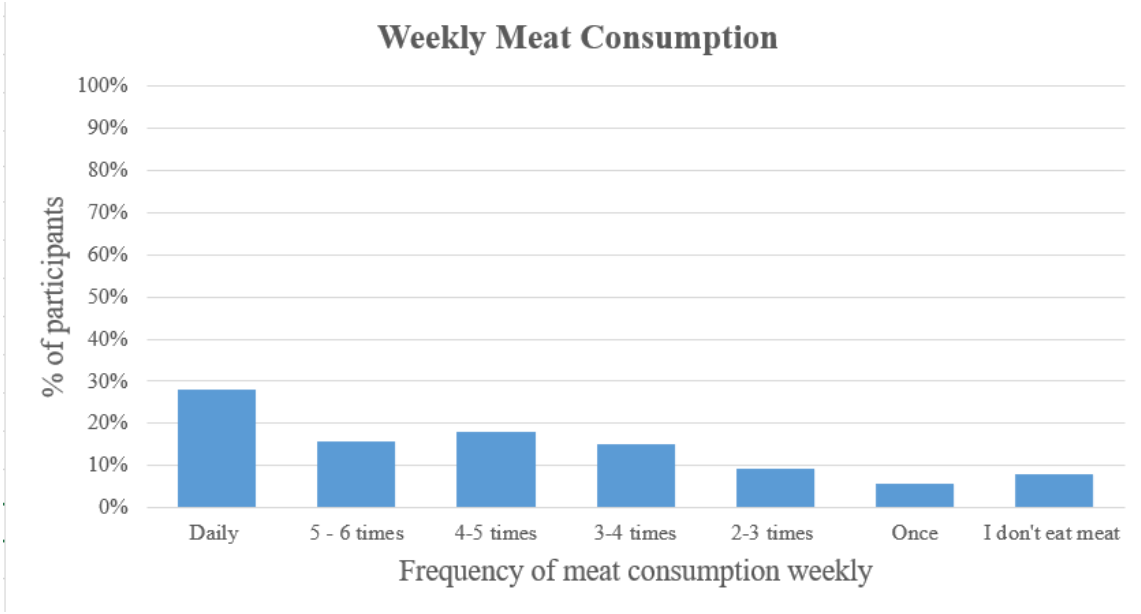

Figure 3.2: *Participant's (%) average meat consumption frequency across a one week period.*

With increased numbers consuming meat daily, the potential to eliminate meat consumption completely becomes more difficult. Therefore, a reduced consumption approach may be more likely and more maintainable. These results also demonstrate that nearly 10% of the Irish population in 2022 do not consume meat which closely aligns with the Bord Bia Lifestyle Trends report in 2018 which found that 5.1% of the Irish population is vegetarian and 3.5% are vegan (Bord Bia, 2018).

3.4 Willingness of the Irish Population to Reduce Meat Consumption

The likelihood of participants moving to a plant-based diet (type not specified) was examined, the results of which can be seen in *Figure 3.3*.

To statistically analyse the Likert scales used, the "likely" and "very likely" results in total and the "very unlikely" and "unlikely" were combined. Data collected was combined into three categories – likely, neutral, and unlikely – for statistical purposes (see *Figure 3.3*).

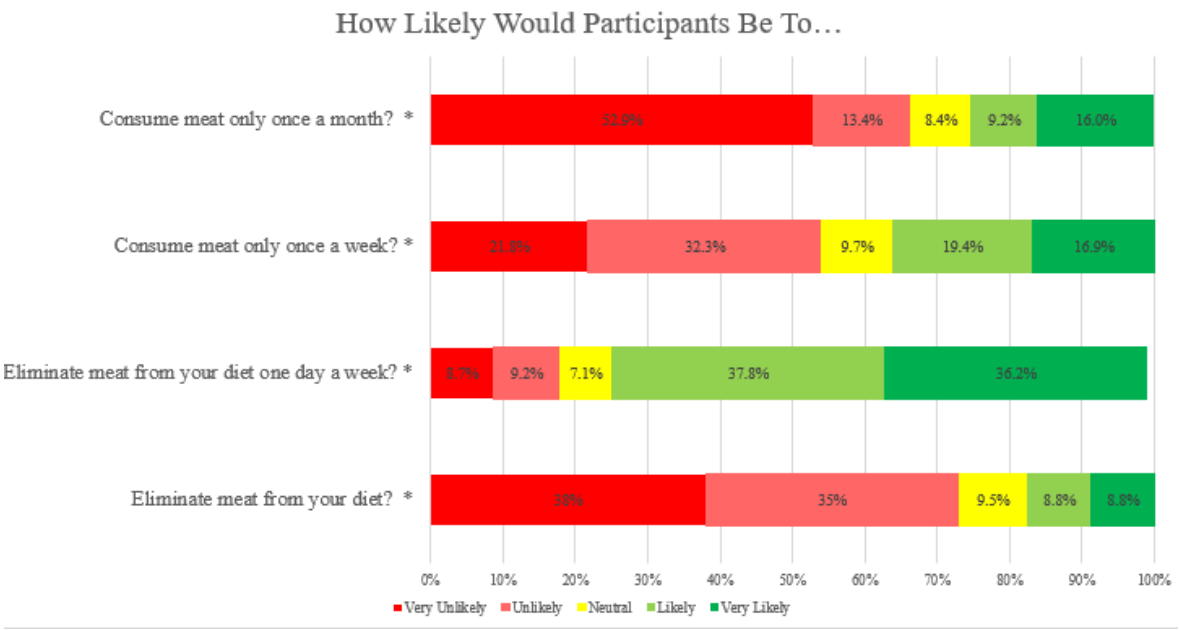

Figure 3.3: *Breakdown of the participant's likelihood of reducing their meat consumption ranging from complete elimination from the diet to excluding from the diet one day a month. Those labelled with an asterisk * demote the statistically significant findings with $p < 0.05$.*

3.5 Comparison of Atttiudes Towards Plant-Based and Meat-Based Diets

Figure 3.4 and *Figure 3.5* show participants attitude towards 9 aspects of plant and meat based diets. Participants were asked their level of agreeability to the 9 aspects based on a 5 point scale. For the purpose of statistical analysis the total "agree", "neutral" and "disagree" responses were combined into three categories. The "strongly disagree" and "disagree" responses were combined and the "strongly agree" and "agree" responses were combined.

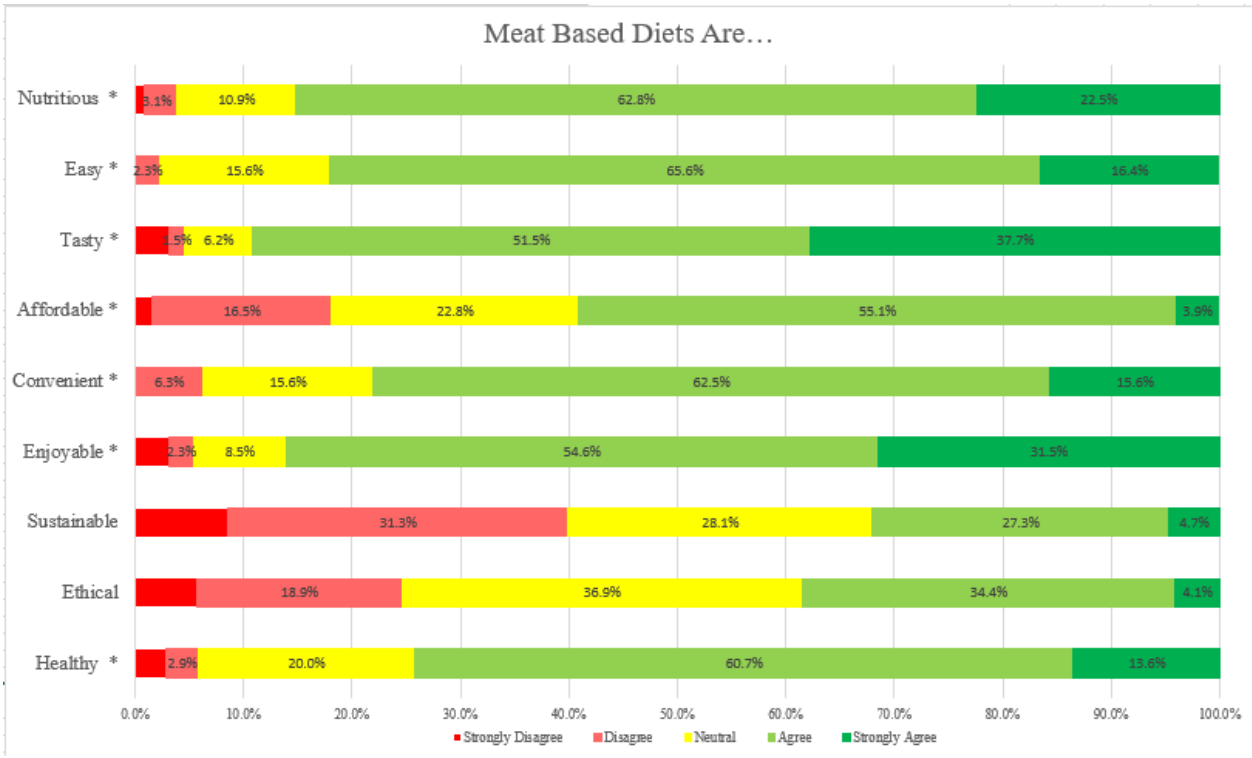

***Figure 3.4**: Proportion of participants who gave disagreeable, neutral and agreeable responses to 9 aspects in relation to meat-based diets. Those labelled with an asterisk * demote the statistically significant findings with $p < 0.05$.*

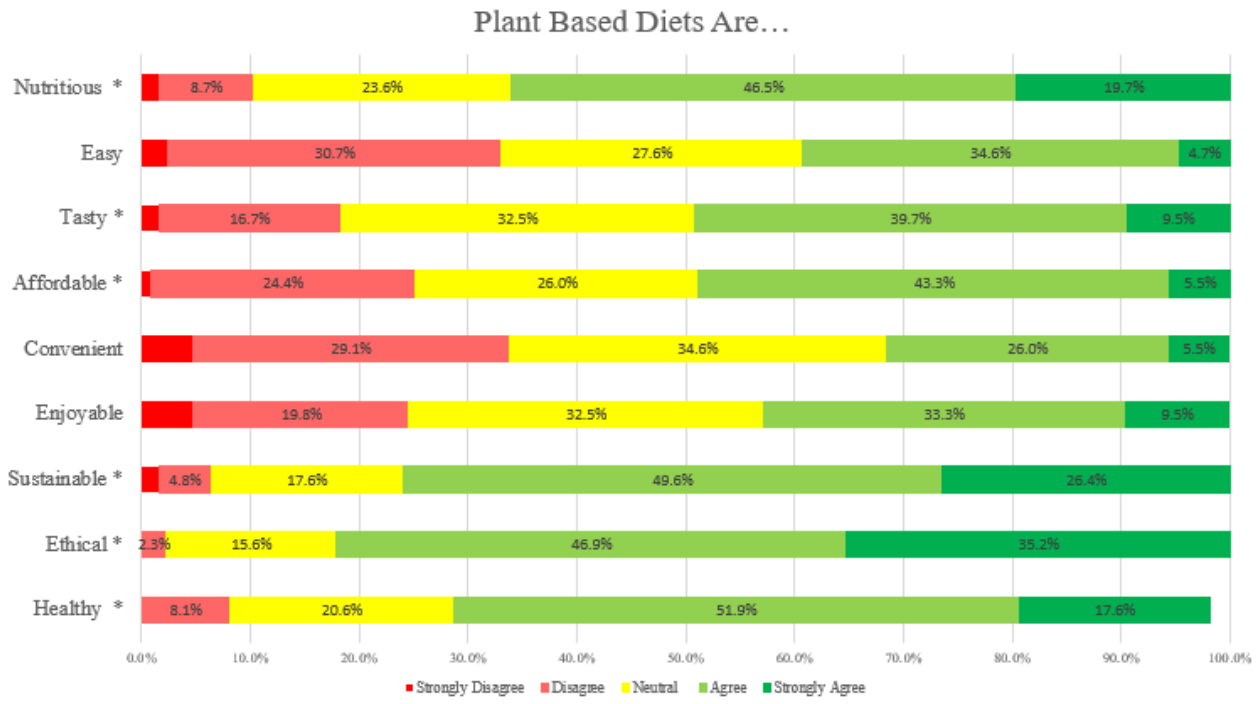

***Figure 3.5**: Proportion of participant who gave disagreeable, neutral and agreeable responses to 9 aspects in relation to plant-based diets. Those labelled with an asterisk * demote the statistically significant findings with $p < 0.05$.*

In order to show whether the attitudes towards certain aspects of meat-based and plant-based diets were statistically signficant, the chi-square test was used with a signficance level of $p = 0.05$. Any values > 0.05 were deemed as insignificant and any values <0.05 were deemed as statistically significant.

As these results show, both diets were viewed as healthy, affordable, tasty and nutritious. In terms of meat-based diets, the results were not significant with expressive aggreance as to whether the diet is sustainable or ethical. In other words, participants were conflicted as to whether meat-based diets have a positive or negative impact on the environment perhaps due to a lack of awareness or concern on the topic. Similarly, participants viewed meat-based diets are neither ethical nor non-ethical which raises the question around the theory of meat paradox and the internal conflict of meat eating among the Irish population.

Participants viewed meat-based diets as convienent, easy, and enjoyable, none of which were significantly positively viewed in relation to plant-based diets. This may be

because the majority of participants are omnivores and therefore view their own diet (which consists of meat) as convienent to purchase, easy to prepare, and enjoyable to consume as well as being a diet familiar to them.

3.6 Motiviations for Dietary Choice Among the Irish Population

In section one participants were asked if they would be likely to reduce their meat intake, to follow in section two it was important to understand what the participants' highest rated reason for moving towards a plant-based diet would be. This can be seen in *Table 3.2.* Also shown in *Table 3.2* are the participants' motivations for continuing to consume a diet that includes meat.

	Survey Participants (%)
(1) Motivations for Plant-Based Diet	
Health	34.09%
Environment/Sustainability	25.1%
Ethics/Animal Welfare	23.7%
Taste	6.4%
Cost	2.8%
Other	7.1%
(2) Motivations for Meat Diet	
Health	32.1%
Environment/Sustainability	2.1%
Societal Pressures	2.1%
Cost	6.4%
Lack of Choice	18.7%
Other	38.6%

Table 3.2: *Percentage breakdown of participants highest ranked motivation for (1) moving to a plant-based diet should they chose to and (2) continuing to consume meat.*

Both questions had an “other” option and gave the participant an opportunity in an open text box to explain their motivation if it did not fall into one of the other options. The main response in the “other” question for motivations for a plant-based diet centred around the diet contribution to a dietary plan for weight loss. 35.9% of participants selected the “other” option for motivations to continue to consume meat and the main response here was in relation to taste and enjoyment of meat. It was noted that this should have been an option in the main body of the question as it accounted for the motivation for many of the participants.

3.7 The Irish Attitude and Perception of Plant-Based Diets

Section three focused on the attitudes and perceptions the participants had in relation to plant-based diets and the individuals who followed those diets. *Figure 3.6* is a word cloud generated from the responses to the question “what three words come to mind when you think of plant-based diets?”. *Figure 3.7* represents the responses to the following question “what three words come to mind when you think of a person who participates in a plant-based diet?”.

Figure 3.6: *A word cloud representing the answers to the question “**What 3 words come to mind when you about plant-based diets?”**. Healthy was the most common response.*

Figure 3.7: *A word cloud representing the responses to the question* ***"What 3 words come to mind when you think of those who participant in a plant-based diet?".***

Both questions further emphasied that plant-based diets are perceived as healthy among the Irish population with "healthy" being the most frequently occuring word in the open-ended questions. In addition, there were also some negative perceptions of the diet noted including bland, boring, and expensive and those who followed the diet were viewed as judgemental and pretencious, all of these factors could create a barrier to transitioning to a plant-based diet.

Next, participants were asked their level of agreeability to 7 statements on a 5 point scale. For the purpose of collating total "agree", "neutral" and "disagree" responses, and for statistical analysis the "strongly disagree" and "disagree" responses were combined and the "strongly agree" and "agree" responses were combined (see *Figure 3.8).*

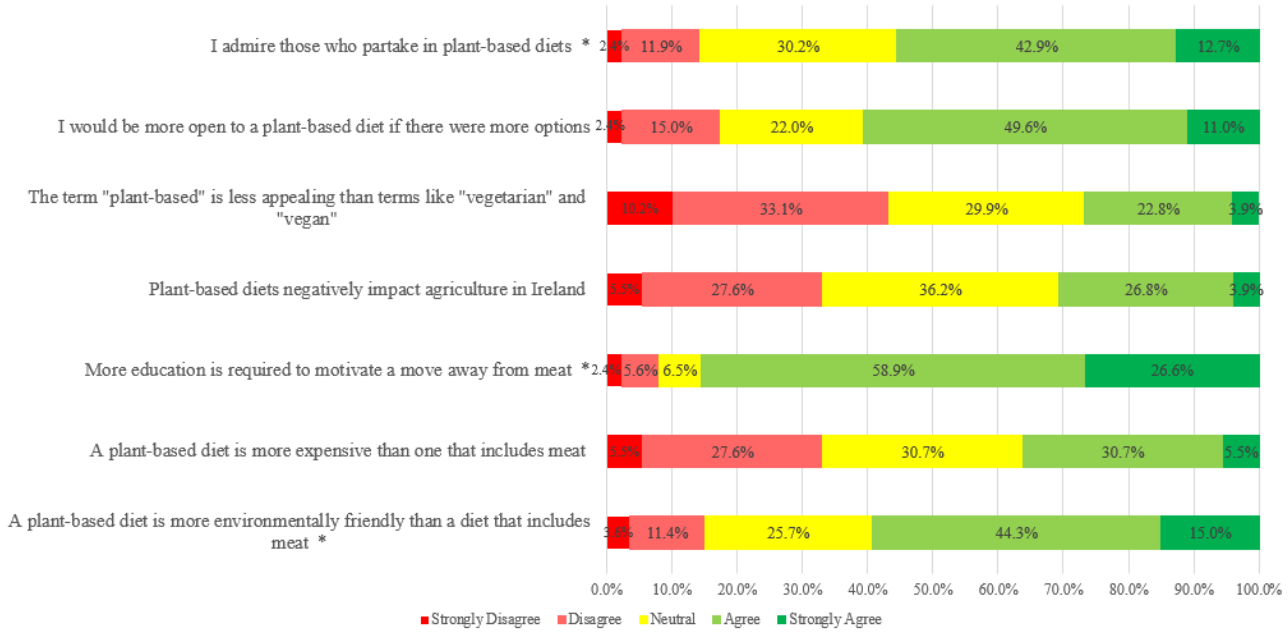

Figure 3.8: *Proportion of participants who gave disagreeable, neutral and agreeable responses to the statements provided to them around plant-based diets, designed to gain a better understanding of the attitudes towards the diet. Those labelled with an asterisk * demote the statistically significant findings with $p < 0.05$.*

While some of the responses to the open-ended questions in relation to those who partake in a plant-based diet were negative, the Irish population admire them, perhaps due to the percieved healthy lifestyle associated with the diet. The participants agreed that education and knowledge is vital to reduced meat consumption. As per *Figure 3.5* the Irish population believe that a plant-based diet is more sustainable and contributes to less environmental damage than a meat-based one. Such emphasis on this point suggests that the Irish population care about their personal contribution to climate change and therefore this could be a key motivator for reducing meat consumption.

An understanding of the percieved prevalence of plant-based diets in Ireland is important as if there is a belief that prevalence is low, the likelihood of others transitioning to the diet becomes decreased. The Irish population do not believe that plant-based diets are prevalent in Irish society (see *Figure 3.9*).

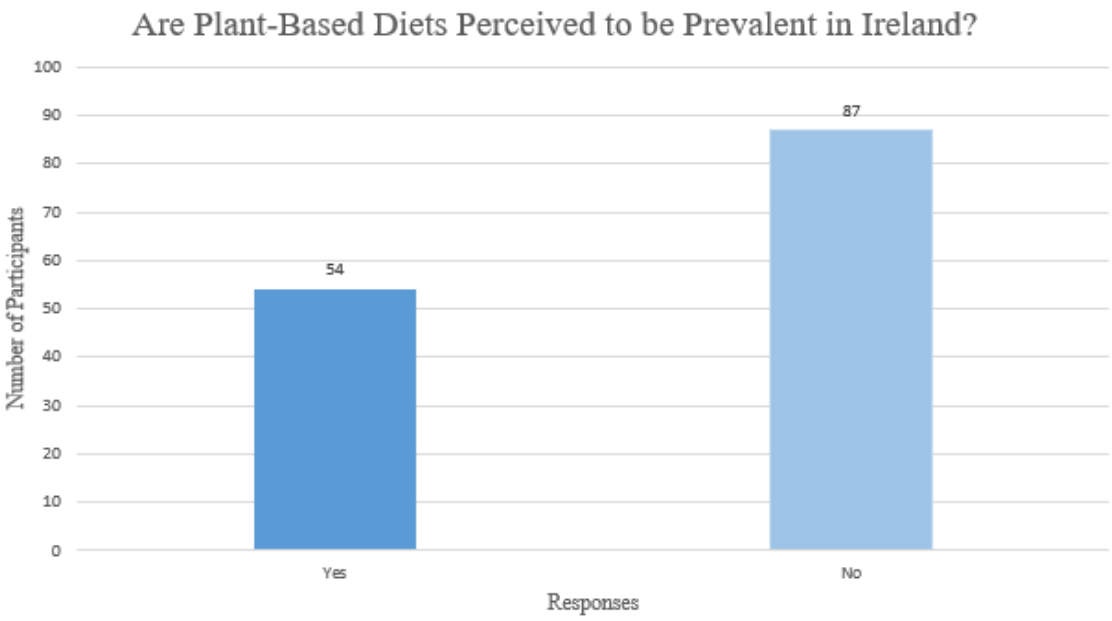

Figure 3.9: *Breakdown of the responses in relation to whether participants preceived that many of the Irish population followed a plant-based diet..*

3.8 Requirements to Promote Plant-Based Diets in Ireland

In order to understand what is required to help promote plant-based diets in Ireland, participants were asked what they believed was needed to achieve this. The word cloud presented in *Figure 3.10* represents participant responses to this question. Education was the most common response to this question and highlights the desire among the Irish population to gain a greater understanding of what plant-based diets are. Campaigns and intiatives around plant-based diets could potential lead to a greater uptake of the diet in Ireland.

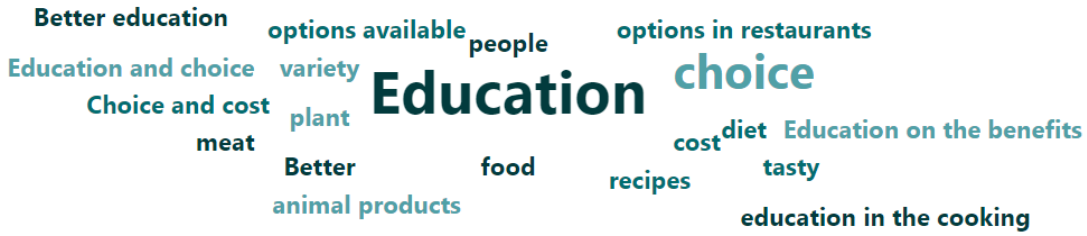

Figure 3.10: *A word cloud representing what the participants felt was needed to increase the rate of Irish individuals partaking in a plant based diet. Education around the diet and its benefits was the most common response.*

In addition, participants were asked to chose which age category they perceived plant-based diets were most relavant to (see *Figure 3.11*)

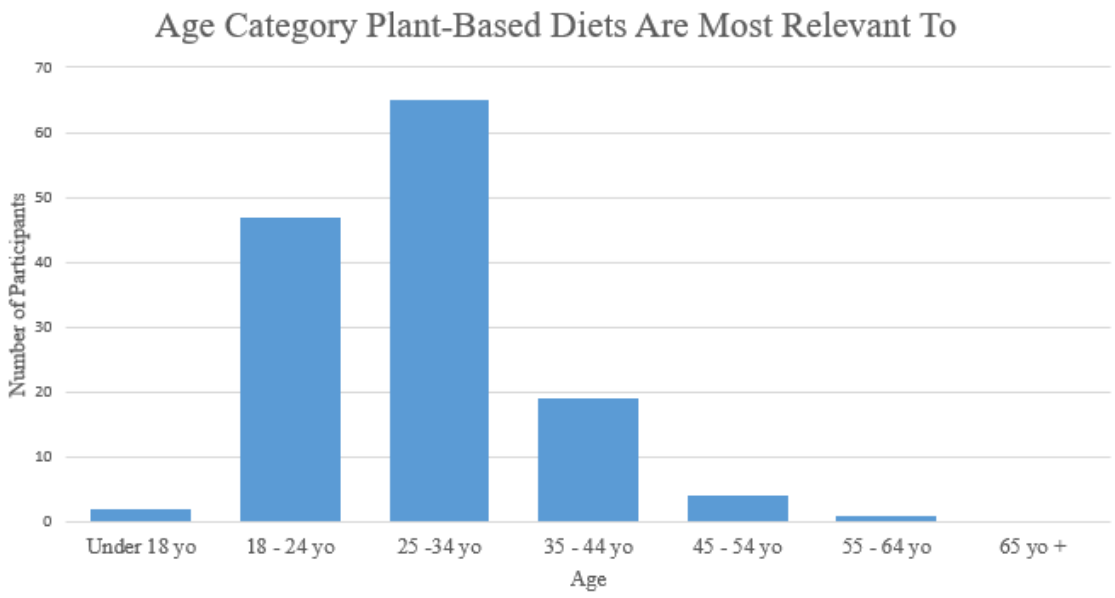

Figure 3.11: *Breakdown of age categories participants believed plant-based diets were most relevant to.*

The Irish population believe plant-based diets are most relevant to those ages 25 – 34 years old, indicating a perception that plant-based diets are aimed at young generations, but not so young that the diet would be deemed a phase but more a maintanable commitment. This result also suggests that older age groups maybe are less likely to partake in these diets perhaps due to lifelong dietary habits or tradition.

3.9 Frequency of Meat Alternative Consumption in Ireland

Next, questions were asked of the participants in relation to meat alternatives in an attempt to capture the usage of them and attitudes towards them among the Irish population. *Table 3.3* shows the percentage of participants who have tried meat alternatives and the type of meat alternatives they have tried.

	Survey Participants (%)
% of participants who have tried meat alternatives	68.7%
% of participants who have not tried meat alternatives	21.3%
Type of meat alternative tried	
Tofu	17.2%
Legumes	25.2%
Vegetable Based e.g veggie sausages	43.1%
Other	14.4%

Table 3.3: *Breakdown of participants who have tried meat alternatives and the types of meat alternatives they have tried.*

A high majority of participants have tried meat alternatives, with the highest percentage having tried vegetable based meat alternatives such as sausages and burgers made with vegetables. Fewer participants have tried legumes or tofu regardless of their flexibility, inexpense and source of protein.

3.10 Attitude Towards Meat Alternatives in Ireland

Finally, in the same format as the other 5 point scale results, *Figure 3.12* shows the responses to 5 statements in relation to meat alternatives with responses combined into total “disagree”, “neutral” and total “agree”.

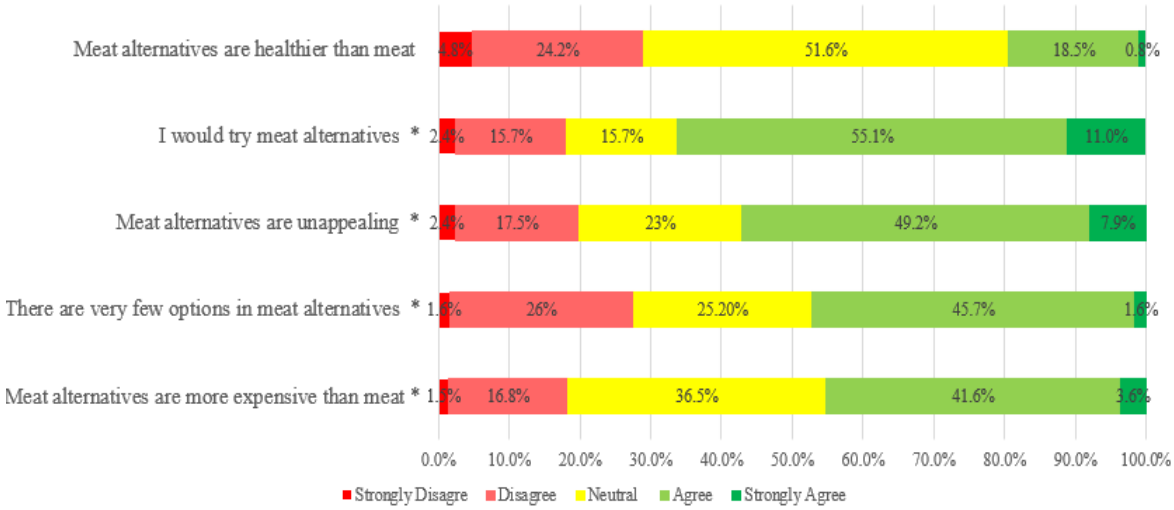

Figure 3.12: *Proportion of participants that agreed, neither agreed nor disagreed and disagreed with the statements presented to them in relation to meat alternatives. Those labelled with an asterisk * demote the statistically significant findings with $p < 0.05$.*

While participants were opened to trying meat alternatives, no particular type was specified. There were some significant negative results in relation to certain aspects of meat alternatives. Participants felt meat alternatives were unappealing, expensive and, lacking in option in the market. This would suggest an overall negative attitude towards the products, however, there is still a sense of curiosity around trying meat alternatives which opens the possibility of creating meat alternatives that will address some of the issues highlighted by the participants and encouraging an increase in consumption of them.

3.11 Stratification of Differences in Attitudes and Perceptions Based on Gender

Participants were asked to state their gender to stratify the attitudes and perceptions of plant-based and meat-based diets based on gender. *Figure 3.13* demonstrates the breakdown of male and female agreeance with the aspects of a meat-based diet.

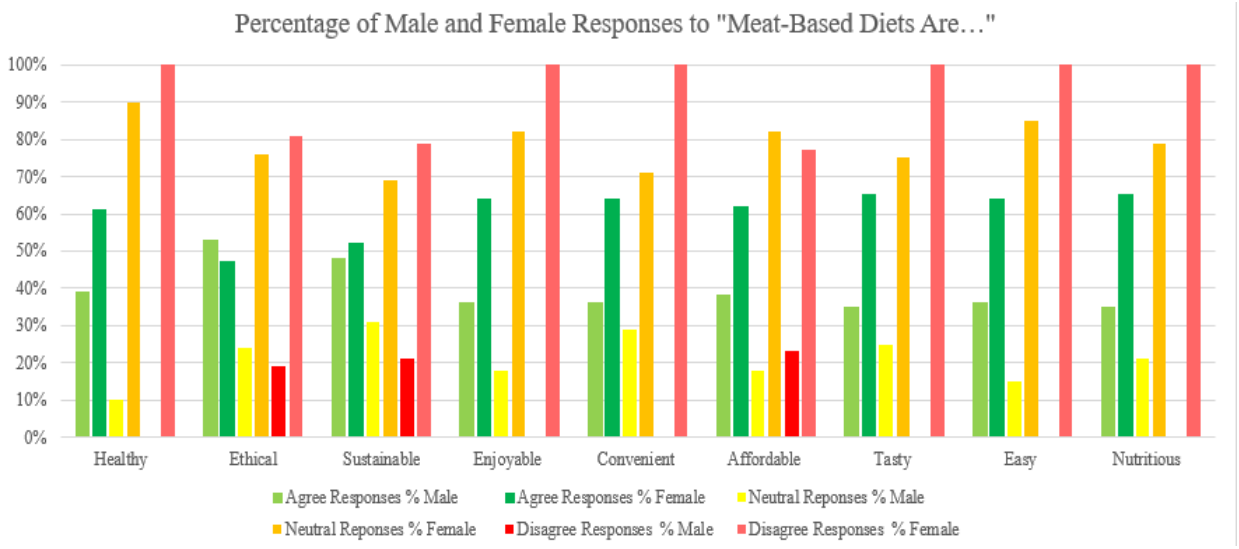

Figure 3.13: *Graph representing the breakdown of male and female responses to each aspect of a meat-based diet listed.*

In general, males in Ireland more positively perceived meat-based diets compared to women. The difference between male and female responses were signficant for all aspects except in the case of agreeance that meat-based diets are ethical and sustainable. This result was also evident in the overall response. 100% of those who disagreed that meat-based diets are tasty, easy, convient and nutritious were female. These females all declared themselves as followers of a plant-based diet. Significantly more men than women perceived the diet to be healthy, enjoyable, convenient, tasty, easy, and nutritious.

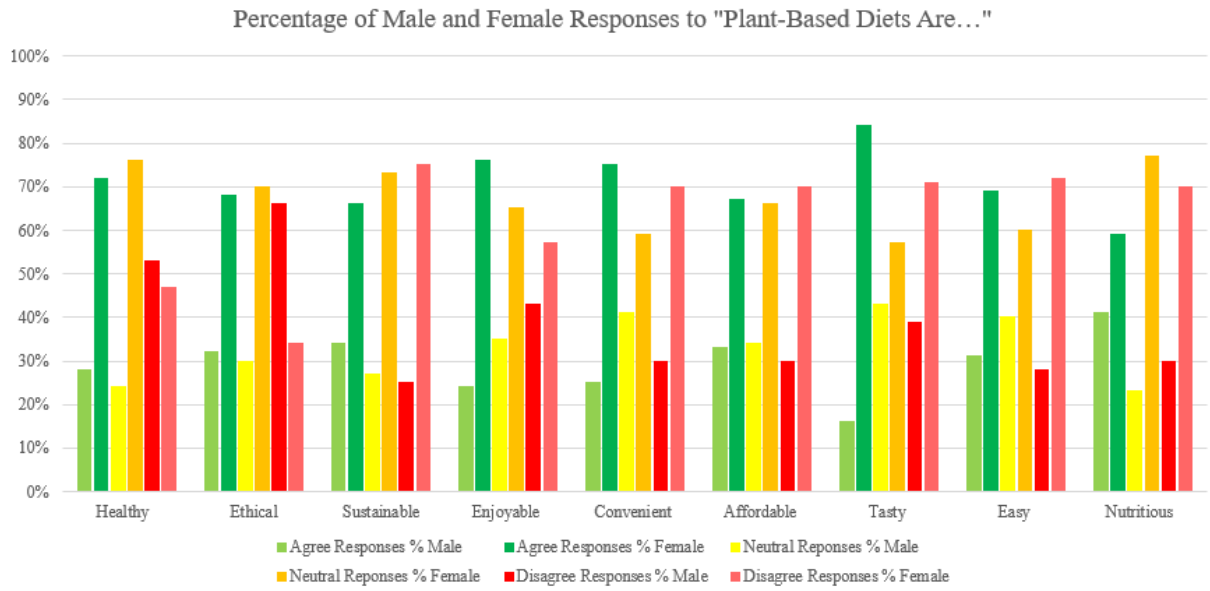

Figure 3.14: *Graph representing the breakdown of responses to the aspects of a plant-based diet into male and female.*

As shown in *figure 3.5* plant-based diets are generally viewed positively. *Figure 3.14* shows the percentage breakdown between male and female responses for each aspect of a plant-based diet. As shown in the graph, the difference between the number of male and number of female responses is significant for the majority of the aspects. For example, significantly more females than males percevied plant-based diets to be healthy, ethical, sustainable, enjoyable, convient, affordable, tasty, easy, and nutritious. In general, females in Ireland had a more positive perception of plant based diets than males. It would appear that the main concerns Irish males have in relation to plant-based diets are the taste and enjoyment of the diet. This highlights a stark difference between male and female perception of plant and meat-based diets in Ireland with females having a more positive perception of plant-based diets and males of meat-based diets.

Chapter 4: Discussion

4.1 Aim of Research and Overview of Key Findings

The aim of this study was to review the attitudes and perceptions of plant-based diets among the Irish population in 2022. Other objectives included gaining an understanding of how familiar the Irish population are with plant-based diets and their motivations for continuing to eat meat or move to a plant-based diet. Finally, the Irish population's familiarity, perception of and willingness to consume meat alternatives was analysed. It was important to obtain an awareness of this topic for several reasons including identifying any similarities in attitudes and perceptions with other global regions, highlighting whether there could be a potential shift towards plant-based diets in Ireland, and providing trends for both the meat and dairy industry and the plant-based industry in Ireland. The findings of this study could contribute to future plant-based product design and proofing the Irish meat and dairy industry for a potential shift in demand for animal products.

4.1.1 Current and Potential Future Irish Dietary Trends

There were some key findings from this research which highlighted important consumption and dietary trends among the Irish population which supported previous research conducted by various agencies such as Bord Bia and Teagasc. A high level of meat consumption among the Irish population was confirmed; this directly feeds into the ongoing importance of meat to the Irish economy and diet preferences to the meat industry and meat exports industry in Ireland (Bord Bia, 2021). While there appears to be a general understanding of plant-based diets, including the perceived benefits it has on health, animal welfare and the environment, the Irish population generally are not willing to eliminate meat from their diet in its entirety.

Nonetheless, a willingness does exist and a willingness to reduce meat consumption to gain health benefits and reduce the deleterious impact meat farming has on the environment. This was further supported as health and the environment were rated highly as motivations for moving to a plant-based diet. The research showed that while participants chose a diet that includes meat because it is easy, tasty, healthy, and nutritious, there was a conflict demonstrated as to whether it was ethical or sustainable. Participants attitudes relayed showed that more education is required to increase

prevalence of plant-based diets which in turn could change the currently negative attitude towards meat alternatives among the Irish population.

4.2 A Significant Prevalence of Meat Consumption in Ireland Prevails

Of those who participated in the study, 83% consumed meat suggesting that much of the Irish population continues to consume meat in their diet. With such importance placed on the meat industry in Ireland and the history of meat consumption in the country, this result was not surprising (Bord Bia, 2021). A significant majority of both male and female participants consumed meat in general across the survey with the highest consumption rate in the 45 – 54-year-old age category.

While the continued high consumption of meat in Ireland will be of benefit to the agriculture and farming industry and their respective economies, it does flag the ever-persistent concerns around the impact the high consumption is having on the environment and public health. The significant prevalence of meat consumption in Ireland is in line with the history of meat consumption in the country whereby it has played a central role in Irish diets for centuries.

Meat consumption has risen both in Ireland and globally in the past 50 years and it is believed that this is due to the rise in incomes and ability to afford more expensive food products (Richie, 2011). Ireland has the 2nd highest gross domestic product (GDP) in Europe which would suggest an economically viable country with a population capable of consuming a diet consisting of high value foods such as meat (Central Bank of Ireland, 2021). With this seemingly comfortable economic situation, the Irish population should be able to afford meat alternatives which tend to be aligned in price with meat (Root, 2019). Continued high meat consumption in Ireland suggested economic prosperity.

A prevalence of meat consumption in a country may make it more difficult to encourage a transition to meat alternatives or plant-based diets, however the Irish population is showing promising signs of a willingness to transition or reduce consumption. Similar outcomes were observed in a study of a UK cohort; a country that also has a high level of meat consumption (Culliford and Bradbury, 2020).

4.2 Increased Prevalence of Plant-Based Diets in Ireland

15% of the participants identified themselves as partaking in a plant-based diet. With the number of participants being sufficient to reflect the Irish population aged 18 and over, it can be assumed that approximately 15% of the Irish population follows a plant-based diet. This percentage is high compared to other reported percentages of plant-based diets in Western societies with similar demographics to Ireland (World Atlas, 2022). For example, 5% of Americans, 8% of Canadians, and 4% of Germans consider themselves to follow plant-based diets (Paslakis *et al.*, 2020).

Ireland having such a high level of plant-based diet prevalence is surprising given the strong incidence of meat consumption that emerged from the data and results. However, in comparison with countries such as India where almost 30% of the population are vegetarian (Stanley, 2021), Ireland remains a long way from plant-based diet dominance among the population. As discussed, the prevalence of vegetarianism in India is highly influenced by social and religion which was not a motivating factor in dietary choice in Ireland. A currently high level of plant-based diet consumption in Ireland provides a good foundation for future plant-based diet trajectories whereby this kind of diet can begin to shape business and consumer trends.

5.7% of the participants were vegetarian which is aligned with previous research on the topic conducted by Bord Bia in 2018 and 1.4% were vegan which was slightly lower than the reported 3.5% reported in the same study (Bord Bia, 2018). The findings here align with the data showing there is a steady maintenance of vegetarianism in Ireland since 2018 and a decrease in vegan lifestyles; this is possibly due to the restrictive nature of the diet or increased concern around the nutritional status of diets in light of COVID – 19 (Bord Bia, 2021). During the pandemic, individuals opted for a more balanced, rounded diet which included varying levels of meat, and were limited in their food choice due to availability and periods of isolation (Aman and Masood, 2020).

Reports such as the Bord Bia Lifestyle Trends Reports, are not including flexitarianism which, if in line with this research, is the most commonly occurring plant-based diet in Ireland. Instead, the focus of the lifestyle trend reports has been on vegetarianism and veganism or plant-based diets overall, so it may represent mismatch in findings of types

of plant-based diet preferences. The most popular choice among the plant-based diets was flexitarianism (7% of participants). This is a positive result and encouraging data regarding the potential and future uptake of plant-based diets by the Irish population over time which mirrors the study completed by Bayer *et al*. (2019). This research indicated that flexitarianism is the most achievable and maintainable of the plant-based diets for future Irish population trends and therefore a more attractive route to encouraging a reduced meat-consumption with fewer restrictions (Bayer *et al*., 2019). By encouraging the increasing prevalence of flexitarianism in Ireland, the country may see an improved environmental status in terms of levels of greenhouse gas emissions because of the decrease in demand for meat and therefore less need for animal farming which is the main cause of greenhouse gas emissions in Ireland (Wolfson, 2019).

4.3 Evidence of a Willingness to Eliminate or Reduce Irish Meat Consumption

In relation to a transition from meat consumption to reduced consumption or elimination of meat from the diet, there were mixed responses from participants. A significant number of participants demonstrated that they would not be likely to eliminate meat from their diet. However, the results were more positive in relation to participants willingness to eliminate meat from their diet instead to once a week, whereby 74% of participants were willing to do this. This is an increase compared to the Bord Bia 2017 study which saw 48% of Irish people willing to reduce meat in their diet (Bord Bia, 2017). This attitude and openness to begin to reduce meat consumption is encouraging and is testament to campaigns such as “Meatless Mondays” (Meatless Mondays, 2022) which appear to be a gentle form of fostering a different attitude towards plant-based diets. Not consuming meat just one day a week can reduce meat consumption by 15% contributing greatly to less water wastage, fewer fossil fuels and decrease in the likelihood of developing diabetes or heart disease, all of which are positive factors contributing to better Irish public and environmental health in the future (Nangia, 2017).

The likelihood of participants only consuming meat once a week/once a month was less positively viewed and most participants were not likely to want to do this. Interestingly, more women were willing to reduce their meat consumption than men with 22% of female participants likely to eliminate meat completely and only 2% of men willing to

do the same. This finding parallels findings by Cosgrove *et al* (2005), who observed that most men in their study consumed meat with little willingness to reduce or eradicate from their diet (Cosgrove *et al.,* 2005). A 2015 US survey by researchers at John Hopkins Center for a Livable Future mirrored these results whereby women of all ages were more likely to reduce their meat consumption compared to men (Coffman and Milburn, 2018).

Overall, considering the strong and significant prevalence towards meat consumption in Ireland, it is reassuring to observe that there is a willingness to reduce meat consumption which would aid in the transition towards a flexitarian diet uptake. It is important to note that while a statement of willingness to reduce meat consumption is positive for plant-based diet uptake, it is not certain that this move will be taken by the Irish population and is deemed an intention rather than an action.

4.4 Awareness Levels of Plant-Based Diets in the Irish Population

It is important to gain an insight into the understanding among the Irish population of plant-based terms used to describe diets as, without a general understanding, participants would not be able to give true responses on their attitudes towards or perception of the diets. Overall, the Irish population surveyed demonstrated significant familiarity with plant-based dietary terms and it can be assumed that the responses in relation to attitudes and perceptions are true and valid. It can be stipulated that there is good awareness of plant-based dietary terms in general, but the Irish population require further information and education on the diets in order to encourage a greater following.

The question around familiarity with the terms; vegetarian, vegan, flexitarian and pescatarian, may have been perceived as only needing to have heard the term and not necessarily understanding them and therefore more information and education is in fact required. Lea *et al.* (2005) had similar findings, whereby participants felt a lack of education was a potential barrier to the diet and a factor in the reduced levels of plant-based individuals (Lea *et al*., 2005). Being familiar with the terms is not the same as understanding the terms. There was no significant difference between men and women in relation to their familiarity with the plant-based terms. 75% of men and 79% of women were familiar with 3 or more of the terms presented to participants. There was

an observed difference in familiarity between age categories, in particular between the 55 – 64-year-old age group and the remaining age groups with 33% of 55 – 64-year-olds being familiar with 3 or more terms while 75% - 100% of the remaining age groups were familiar with 3 or more terms.

With females having a higher level of willingness to reduce meat consumption and perceived understanding of plant-based diets it would not have been surprising if this age group (55 – 64 years old) was male dominated, however the group was 83% female. There was no skew in the age groups for familiarity with the terms. Despite while you may expect older age groups to be less familiar with these diets, this was not the case with the Irish population. This aligns with research carried out by the British Nutrition Foundation (BNF) in 2020 on 2,000 adults in UK which revealed that 22% of the younger age group (24 – 35 years old) and the older age group (55 years old +) were familiar with and likely to follow a plant-based diet (Morrison, 2021). This would suggest that Irish plant-based product producers can focus the marketing of their products on a range of age groups and not solely younger generations.

Participants agreed that plant-based diets were most relevant to those aged 25 – 34 years old. This is in line with research conducted by National Dairy Council who found that individuals ages in their late 20's and early 30's are most likely to avoid animal products and live a plant-based lifestyle. However, this age group did not have significant awareness of the plant-based terms compared to other age groups and therefore may not know enough about the diets to begin experimenting with them.

The two plant-based dietary terms that participants were most familiar with were vegetarianism and veganism. This is unsurprising as these terms are far more frequently used in media as opposed to plant-based diets or flexitarian diets. The prevalence in vegetarianism and veganism is also a factor in the familiarity status of the terms which was seen in the study conducted by Faber *et al.* (2020) amongst residents of Belgium, Spain, the Netherlands, and Denmark whereby participants were far more familiar with these terms than newer terms such as "plant-based diets". This was attributed to the prevalence of these diets in those countries. The study also saw that the awareness of these terms was due to the rise and significance of vegetarian and vegan social media

influencers who positively associate health and sustainability with these diets (Faber *et al*., 2020).

Awareness and knowledge of plant-based diets is a key driver in promoting the diets and provides a foundation for transitioning to those diets and reducing meat consumption. While there is good understanding by the Irish population of plant-based dietary terms, the attitudes expressed towards them were contradictory, suggesting the understanding should be interpreted with caution.

4.5 A Comparison of Attitudes Towards Plant VS Meat-Based Diets

One of the most interesting (and often conflicting) set of results from this study was around the comparison in attitudes towards meat-based and plant-based diets which were each rated against the same 9 aspects. The aspects of each diet included whether they were considered healthy, tasty, affordable, convenient, nutritious, ethical, easy, enjoyable and, sustainable.

4.5.1 The Maintenance of a Positive Attitude Towards Meat-Based Diets

With both a continued high level of meat consumption and the ratings of the aspects of meat-based diets by the Irish population, it is confirmed that there is a positive attitude towards meat among the Irish population. Taking into consideration that most of the participants consumed meat daily, the continued positive attitude towards meat in Ireland is unsurprising. Participants positively rated seven aspects of a meat diet. The attitudes towards the aspects that were significantly different to the expected results (presuming the responses would be equally spilt between positive, neutral, and negative) were healthy, enjoyable, affordable, tasty, easy, and nutritious. This suggests that participants view meat-based diets as a diet that is essential for health and nutrition, enjoyable, tasty to consume, easy, and convenient to buy and prepare.

The historical significance of meat consumption in Ireland and the status of which it has held in society as a symbol of wealth has solidified meat as an important element of Irish diet (Campbell, 2016). In relation to the significant evidence in support of meat-based diet being easy and convenient, the vast availability and supermarket formation might contribute to this easy purchasing of meat (Teagasc, 2018). If meat products are

highlighted and given significant shelf space in an Irish supermarket supported by advertising and promotions, the Irish consumer will naturally be drawn to these products.

Irish people highly value the enjoyment and taste satisfaction derived from meat products. One of the significant motivations for continuing to consume meat in this study was taste. Meat's unique combination of fat and umami flavours provides a sensorial sensation that Irish people are likely to deem essential to dietary choice, making the mimicking of meat in meat alternative product development even more difficult (Zaraska, 2013). Unless a meat alternative can be developed and introduced to the Irish market with optimum taste matching that of conventional meat, it can be assumed that taste will always be a primary driver in meat consumption in Ireland with no meat-free comparable product available worthy of a change to plant-based diets.

There was no significant difference in the responses for the aspects of ethical and sustainable in relation to a meat-based diet. This shows some indifferent attitudes towards consuming meat from an ethical and environmental point of view. This strongly conflicts with Australian studies conducted by Malek and Umberger (2018) and Bogueva *et al.* 2021, which saw and awareness that animal welfare and the environment are greatly impacted by meat – based diets.

In relation to the environment, the results suggests that some participants are unaware of the environmental impact meat production and consumption has in Ireland, even with regular news and agency reports such as those presented by Bord Bia and Teagasc in recent years identifying the main culprit of greenhouse gas emissions in Ireland as meat production (Environmental Health Agency, 2021). The Irish population's response to the sustainability of meat-based diets was indifferent suggesting a lack of understanding of the impact meat consumption has on the environment. While the warnings and reports on the issue have been continuous in recent years, the real consequences have yet to be realized by the public (Environmental Health Agency. 2021).

4.5.2 The "Meat Paradox" Prevalence in the Irish Population

The "Meat-Paradox" as described by Khara *et al.,* explores the internal conflict experienced by individuals who enjoy and continue to eat meat while also having a love and concern for animals and the suffering they can endure to supply meat to the market (Khara *et al.,* 2021). The taste and enjoyment of meat were significantly positively rated aspects of meat-based diets among the Irish population. In parallel with this, participants strongly felt that plant-based diets were ethical and chose animal welfare among the top three reasons for potentially moving to a plant-based diet. This highlights a morally complex relationship between the Irish population and animal wellbeing.

The response as to whether meat-based diets are ethical was not significant which may suggest polarizing opinions (1) some meat-eaters do not sympathize with animals and feel superior or dominant to animals and therefore feel no guilt consuming animals or (2) there is a dissonance, disassociation, avoidance, and denial amongst meat eaters of animal suffering for meat production (Dowsett *et al*., 2018). While the meat-paradox is evident among the Irish population, this has not stopped meat consumption, implying that the Irish population have either overcome the meat-paradox or continue to disassociate the link between food and animals.

As mentioned previously the meat-paradox is more evident among societies that have greater exposure to the realities of meat production and animal suffering (Khara *et al.,* 2021). This was clear among the Australian population and similar exposure is seen in Irish society through the significance of agriculture and farming in Ireland with 167,5000 people employed in the sector (Teagasc, 2022).

Literature has shown differences in meat consumption and willingness to reduce meat consumption between men and women, and this difference is also observed in relation to the meat-paradox. It has been deemed by society and societal constructs that gender influences individuals' emotions and perceptions around meat consumption (Dowsett *et al.,* 2018). This has often been linked to meat being associated with strength, masculinity, and superiority, and therefore more strongly linked to males (Shaw, 2019). Women, historically, are perceived as more gentle, neutering, and empathic. Therefore, it was not surprising to see in the results of this study that more women than men were

willing to reduce their meat consumption and fewer women than men viewed meat-based diets as ethical.

While the meat-paradox is evident among meat-eaters in the Irish population, it does not appear to be impactful on meat consumption in the country. The meat-paradox may have been a factor in the rise of plant-based diets and a change in the perception of plant-based diets in Ireland, however, this change in attitude towards the diets will likely only come to fruition by addressing the ambivalence towards meat in Ireland (Buttlar and Walther, 2018).

4.5.3 The Emerging Positive Irish Perceptions on Plant-Based Diets

Participants were asked to provide their attitude and opinion towards plant-based diets and those who followed a plant-based diet. There appears to be a generally positive perception towards plant-based diets among the Irish population in 2022, based on the perception that the diet is healthy, ethical, sustainable, and affordable.

There are several potential reasons as to why the Irish population, a country traditionally and historically linked to high meat consumption, are beginning to view plant-based diets in a more positive light. Plant-based diets are a major rising trend in the food and lifestyle industry both in Ireland and globally. Other food trends such as sustainability, convenience, health, and animal welfare are pushing consumers towards plant-based diets and shaping food habits globally (Surman, 2021). Many Irish consumers are also now more knowledgeable and concerned around the environmental footprint their food creates and where their food originated from, all supported by the Bord Bia Consumer Lifestyle Trends Report in 2021 (Bord Bia, 2021). In addition, KPMG's post COVID-19 consumer trends analysis reports that 88% of Irish consumers are concerned about personal well-being as well as the environment (Savage, 2021), both of which can potentially be benefitted by following a plant-based diet.

The Irish population believe that plant-based diets are healthy, nutritious, ethical, tasty, affordable, and sustainable. As the perception of both plant-based diets and meat-based diets are perceived as healthy among participants this was deemed a key factor in dietary decision and will be discussed in detail in a further section.

Sustainability was the second highest rated motivation for a potential move to a plant-based diet and was also an aspect strongly associated with the diets in this research. There appears to be a level of understanding that plant-based diets are more sustainable than diets that include meat in Ireland. According to the Environmental Protection Agency (EPA) in Ireland, 76% of the population have some level of awareness of climate change and the factors driving it, including meat consumption with one in three consumers choosing to limit meat intake for environmental reasons (EPA, 2021). Similarly, 25% of this study's participants would move to a plant-based diet in order to help protect the environment. In addition, participants believe that a plant-based diet has overall less of a negative impact on the environment, highlighting the positive attitude towards this diet regarding sustainability.

The Irish population believe that plant-based diets can be both tasty and affordable. First and foremost, ensuring that people perceive plant-based diets to be tasty is vital. Research has shown that palatable food, covering all five flavours – sweet, sour, salty, bitter, and umami – will contribute to increased consumption of that food and greatly affects dietary choice and behaviors (Kourouniotis *et al*., 2016). With the Irish population perceiving plant-based diets to be tasty emphasizes a potential to transition to that diet and also highlights knowledge and awareness of the composition and food groups included in those diets.

There are many factors that influence our food choices with cost and affordability being major drivers in dietary decisions, particularly in certain socio-economic situations. Those with a lower socio-economic status are likely to consume an unbalanced and highly processed diet, strongly linked with a lack of knowledge and education around diet and health (The European Food Information Council, 2006). With the Irish population viewing plant-based diets as affordable, there is a greater chance of more people moving to this diet. However, participants felt as though meat alternatives were expensive but overall thought plant-based diets were not more expensive than meat-based diets. This would suggest that the Irish population view plant-based diets as being comprised of cheaper foods such as fruit, vegetables, cereals, and legumes as opposed to more expensive meat alternatives.

While maintaining a strong link to meat consumption, like Australia and the United States, Ireland, in general, does have a positive perception towards plant-based diets. It also suggests that Ireland is much in line with New Zealand as per the study conducted by Bryant in 2019 which highlighted similar positive associations with plant-based diets in relation to health, ethics, and the environment (Bryant, 2019).

4.6 The Difference in Perception of Diets Between Genders in Ireland

The findings of this research confirmed that in general, the women of the Irish population have a more positive perception of plant-based diets compared to men, while Irish men have a more positive perception of meat-based diets. In addition to this, there is also more of an openness to plant-based diets and meat reduction among Irish women than men. This is aligned to the study conducted by Rosenfeld and Tomiyama (2021) which found that men tend to consume more meat and are less accepting of plant-based diets. Rosenfeld and Tomiyama found that eating habits and behaviors often mirrors identify and can be linked to gender, quoting "real men eat meat" as a reflection of masculinity and male stereotype (Rosenfeld and Tomiyama, 2021). The difference in plant-based diet perception between genders is not isolated to Ireland but seen globally.

Significantly more Irish women perceive plant-based diets to be healthy compared to men. It is known that plant-based diets can often be lacking in iron rich foods and with one third of the reproductive aged women globally suffering from anemia, it is questionable how healthy the plant-based diets being consumed are and highlights the need for education on appropriate variety in plant-based diets (Klassen, 2019). With women both statistically living longer and more invested in their personal health, it is not surprising that dietary choice among women appears to be health driven in Ireland as well as globally (Barebring *et al.*, 2020).

The positive perception females within the Irish population have towards plant-based diets is something that is seen globally with significantly more females than males opting for a plant-based diet (REF). Research has shown that it is not solely to do with the perceived health benefits but plays heavily into the heightened compassion more traditionally evident in females than males (Gorvett, 2020). With meat so strongly linked to masculinity, the adoption of a diet without meat is not seen as a threat to

societal norms or gender identity for women, as it could be for men (Rosenfeld and Tomiyama, 2021).

More men than women in Ireland perceive diets that include meat to be ethical. In comparison to this, significantly more women than men perceived plant-based diets to be ethical. As mentioned, convention has labelled women as more compassionate and sympathetic, therefore it is not surprising that women in Ireland appear to be more concerned with animal welfare than men. Furthermore, more Irish women than men chose animal welfare as their main motivation for choosing a plant-based diet. An Australian study had similar findings whereby 40% of women agreed that a plant-based diet was more ethical than one including meat (Ruby, 2012). Another study conducted in 2021 across universities in 22 countries found that women had a higher concern for animal welfare than men due to their sensitivity to animals and support of animal wellbeing legislation (Randler *et al.,* 2021). Furthermore, only 13% of Irish beef farms are owned and run by women, suggesting that Irish men are more exposed and perhaps numbed to the realities of meat production (Moran, 2015).

In terms of sustainability, men and women in Ireland have similar attitudes in relation to meat-based diets and the environment. Of those who felt meat-based diets were sustainable, 53% were male and 47% were female. However, significantly more women perceived plant-based diets to be sustainable compared to men (66% vs 34%). Studies have shown that gender disparities do exist in relation to attitudes and behaviors towards climate change and sustainability (Khan and Trivedi, 2015). A recent US study uncovered that women seemed to be more active and interested in sustainability and that there may be a psychological reason for this. The participants of the study believed that eco-friendly purchasing and environmentally responsible behaviors are linked to femininity (Bragantini, 2019). Moreover, there have been many studies confirming that young females in western societies are more likely to choose a plant-based diet based on concerns for the environment, which appears to be reflected in the data for Ireland (Sanchez-Sabate and Sabate, 2019).

While the overall attitudes towards plant-based diets in Ireland positive, there appears to be a gender gap in this attitude with more women open and accepting of a less traditional Irish diet excluding meat. A more rounded understanding of why men and

women tend to have different dietary patterns and levels of meat consumption may be helpful in reducing the meat consumption in Ireland. In addition, these findings may aid in shaping marketing campaigns for plant-based products with a focus on women as a target market currently and preparing for a shift in dietary patterns and uptake of plant-based diets across both genders in the future.

4.7 Health as a Key Driver for Dietary Choice in Ireland

Throughout this study health has been a reoccurring theme, whether it be a confirmed positive aspect of both plant and meat-based diets in Ireland or the top motivation for considering a plant-based diet, health is a key factor in dietary choice among the Irish population.

Optimal health of an individual is personal, and diets should be tailored to the characteristics of individuals. The emergence of personalised nutrition and the way in which it can actively intervene in the health of an individual compared to a "one size fits all" dietary standard has revolutionised the way people think about diet and health (Ordovas *et al.*, 2018). With personalised nutrition likely to be a key assessment method for dietary health in the future, it is likely that the definition of "healthy" will differ from person to person. The position of meat and meat alternatives within this is still unknown (Forster *et al.*, 2016).

As mentioned in the introduction to this study, there is a vast amount of research concerning the positive and negative health implications of both plant and meat- based diets. The public are constantly bombarded with mixed messages from different sources outlining dietary guidelines for optimum health and depending on the source it can be biased. For example, the Vegetarian and Vegan societies of Ireland promote plant-based diets as the only diet for optimum health (Vegetarian Society of Ireland, 2022) while the HSE include meat as a key source of protein for a balanced diet to maintain health (HSE 2016).

This conflictual, and often confusing, information was reflected in the participants opinion in this research. Participants believed both diets were healthy, but without open questions, it is not possible to elaborate on this. However, it can be hypothesised that

participants saw healthy elements of both diets, but the response also suggests that participants see potential deficiencies or over consumption in both diets. For example, Craig (2010) saw concern from participants around adequate protein intake in plant-based diets, while other studies highlighted the danger of the saturated fat content of meat (Satija *et al*., 2017).

Health is a significant motivator for transitioning or trying a plant-based diet among the Irish population which highlights that this group see the perceived health benefits of the diet and feel it could contribute to better or improved health. This was also previously noted among Indian and Australian studies, where participants believed there was a positive association between health and reduced meat consumption (Cheah *et al.,* 2020). Contradictory to this, studies in American and Switzerland which focused on consumer knowledge of healthy diets, showed that there are misconceptions in relation to what food is healthy and how it contributes to good health (Dickson – Spillman and Siegrist, 2010).

The overriding attitude among the Irish population towards plant-based diets and those who follow those diets was health related. Participants believe these diets are healthy and those who partake in them are "healthy", "fit", "active", and "health-conscious". Both vegan and vegetarian diets were viewed as healthy and nutritious in a similar New Zealand study examining the perceptions and attitudes towards the diet there (Bryant *et al*., 2019), highlighting health as a key driver in dietary choice in other western societies aligning with the status in Ireland on the topic.

4.8 Barriers to Plant-Based Diets in Ireland

Even with a willingness and clear motivations to try plant-based diets, challenges have been identified by this research. Irish people showed concern around the enjoyment, convenience, and ease of following such a diet with a clear indication that further education is required to help address these concerns. Similar and additional challenges were identified in relation to plant-based diets in a Bord Bia report in 2021. 29% of participants in this study said convenience was an important factor in their dietary choice, with 36% of US participants being of the same opinion (Bord Bia, 2021).

The use of certain language and plant-based terms was recognized as a deterrent with 61% of British people discouraged from trying plant-based diets because of a lack of understanding of the terminology (Bord Bia, 2021). While Irish people identified that more education was required, they did not deem certain terminology to be more and less appealing in relation to plant-based diets. In addition, they expressed a familiarity with the plant-based dietary terms presented to them.

The Thinking House study, in association with Bord Bia, identified that 18% of participants stopped a vegan or vegetarian diet due to affordability. This was not mirrored in this study as Irish people felt plant-based diets were affordable and therefore did not consider this a barrier to the diet. This may depend on what an individual classes as a plant-based diet and whether it includes expensive mimic meat products. It will also depend on an individuals' disposable income and socioeconomic status as dietary choice is heavily based on what economic factors and what an individual can afford (Lo *et al.*, 2009). Affordability is likely to be an even more significant factor in dietary choice with recent price increases due to high oil prices, climate change, and political instability (Amado, 2022). In March 2022, the index of food prices increased by 12.6% since February 2022, the biggest increase in 30 years, further emphasizing the importance of food security and affordability (Hughes, 2022).

18.7% of the Irish population considered a lack of choice as a barrier to plant-based diet and a motivator for continuing to eat meat. This is perhaps also links to a lack of knowledge on the variety and availability of plant-based ingredients and meals in Irish supermarkets and requires alternative marketing and advertising techniques to enhance the position of plant-based dietary choices to consumers. Irish companies such as Rudd's and Denny's are known as reputable Irish brands and have launched plant-based ranges that have been very successful. These companies attribute their success to strong brand positioning and attempting to replicate the taste and texture of meat products (Maguire, 2021). With this success and the rise of plant-based diets in Ireland, it is likely that more household brand names will look to expanding into plant-based products, creating variety and availability in the market.

It is essential that measures are put in place to address these barriers to plant-based diets in Ireland to foster the positive perception of the diets that is evident in Ireland and encourage an increased following of the diets.

4.9 Factors to Influence Transition to Plant-Based Diets in Ireland

Research in recent years has been clear on the impact meat consumption has on health and the environment, both of which have been in the media spotlight for several years. Studies conducted by Godfray *et al*. (2018), Bogueva *et al*. (2021) and Foote (2021) have all expressed concerns around the lasting impact high levels of meat consumption can have on public health; leading to increased occurrences of diabetes, obesity, cardiovascular diseases, and high blood pressure, and the environment; with increasing levels of carbon emissions from agriculture and meat production (McCarthy *et al*., 2017). This was reflected in this research with participants' clear understanding that a plant-based diet or reduced meat consumption can be beneficial for health and more sustainable with both being main motivators for transitioning to a reduced meat diet. The key factor now is understanding how this mindset for change can be encouraged and facilitated in Ireland.

According to Vinnari (2008), there are social, environmental, technological, and economic influences that will impact meat consumption globally in the future. All of which are relevant to Ireland's future meat consumption and a potential future increase in consumption in plant-based diets. Most of the influences are centred around meat alternatives, the acceptance of them, increased positive associated with plant-based diets, improved technology for better mimicking of meat, decreased cost of meat alternatives and decreased energy costs of producing meat alternatives (Vinnari, 2008). Even with the potential positive changes and the general knowledge that plant-based diets are beneficial for personal health and the environment, the greatest challenge is influencing a behavioural change which appears to be the biggest barrier but may be achieved through education (Graca *et al*., 2019). The main consideration to help motivate this change sits with education, which was highlighted in this research as necessary to encourage participants to eat a plant- based diet and move away from meat.

The benefits of making this change must outweigh the barrier participants feel are currently present, for example, a lack of knowledge of the diet and choice/variety within the diet. Government agencies and influential groups must focus on providing information such as, diet design for effective iron and protein intake (to combat health concerns around a plant-based diet), tips for gradual transitioning, and methods by which plant-based diets can be introduced to children (Lea *et al*., 2005). There is currently a vivid lack of government policies or campaigns aimed at meat reduction, regardless of the known facts around the negative impacts of increased consumption. In fact, the HSE as seen in *Figure 1.1* actively encourages daily meat consumption (HSE, 2022). There does appear to be some conflict between the need to combat certain health and environment implications of a high level of meat consumption and the importance of the meat industry and agriculture to the Irish economy. This has the potential to hinder the encouragement of meat reduction.

One potentially successful campaign has been outlined by Harveston (2019) and includes a nutritional programme for plant-based diets based around whole foods and limited processed foods, as well as reduced meat consumption (Harveston, 2019). The programme is designed to slowly introduce the diet to populations with small dietary changes. The campaign mimics the teachings of flexitarianism and provides a pathway to plant-based diets that is gradual and non-restrictive with a focus on health benefits, fresh and whole foods. This type of programme would be suitable for the Irish population.

4.9.1 Do meat alternatives have a place in Irish supermarkets?

By gaining an insight into the attitudes the Irish population have towards plant-based diets and those who follow those diets, the better one can understand whether plant-based diets will become a more commonly occurring dietary choice in the country. This is important information for both retailers and food product developers as it identifies opportunities for meat alternatives.

Almost 70% of the Irish population have tried meat alternatives, with 66% willing to try including them in their diet. Similar figures were seen in the Australian study by Estell *et al.* (2021) and the Chinese study conducted by Liu *et al*. (2021), whereby more than

50% of participants in both studies either tried or were willing to try meat alternatives. These studies showed that there were concerns around protein intake, taste, and the cost of meat alternatives. Taste was deemed the main motivation for continuing to consume meat in the Irish study and suggests taste would be a key factor when developing meat alternatives for the Irish market.

With the positive attitude towards plant-based diets identified in Ireland, meat alternatives do have a place on Irish supermarket shelves, both now and in the future. However, there are concerns around the cost, appeal, and array of options in the sector which would need to be addressed to ensure they appeal to Irish consumers. With meat playing an important role in the Irish diet, it would be important to closely mimic meats in appearance, flavour, and texture much like Denny's and Rudd's have achieved. Being reflective of conventional meat products to a standard whereby the difference between the meat alternative and real meat could not be deciphered would enhance the position of meat alternatives greatly in Ireland.

The Irish population feel plant-based diets are most relevant to those aged between 25 – 34 years old, however research has shown those mostly likely to consume this diet are aged between 18 – 34 years old. Marketing to this generation will be key to the success of meat alternatives in Irish supermarkets. A report by Clarkson Consulting (2022), focused on the need to highlight what is most appealing and emotive about the diet to the target audience (Clarkson Consulting, 2022). In the case of Ireland, health, nutrition, and the environment were important to them in plant-based diets. Highlighting the nutritional benefits of the product such as "high protein" or "high fibre" and sharing the minimal impact the production of the product had on the environment compared to meat could be marketing methods used to encourage consumption (Fona, 2021).

The meat alternative market in Ireland is continuing to grow with forecasts of more than €39 million by 2024 (Glennon, 2021). This, in conjunction with the growing positive attitude towards plant-based diets and the Irish population's willingness to reduce meat consumption, meat alternatives are set to increase market share in Ireland in the next 5 to 10 years.

4.10 The Future of Plant-Based Diets in Ireland

Based on the confirmation that there is strong prevalence of plant-based diets in Ireland and a positive perception of the diets, it is likely that plant-based diets will shape the diets of the Irish population in the future. This paired with a growing population in Ireland and globally and concerns on food security will drive the increase in uptake of plant-based diets (Center for Nutrition Studies, 2020).

This begs the question – what will the Irish diet look like in the future? Evolving technology in food and agricultural innovation are all focused on sustainability and managing water and land usage. Indoor and vertical farming, robots to monitor crop growth and health and technologies to improve crop yield are all likely to increase the availability and minimise the cost of plant-based alternative proteins such as lupini beans, duckweed, and algae (Center for Nutrition Studies, 2020). Transitioning to this kind of food production in Ireland could lessen the requirement for intense meat farming.

If the Irish population continued to reduce their meat consumption, there would be ample land available to grow other, more sustainable food crops, food- relation greenhouse emissions could drop by up to 70% within the next 30 years and diet related mortality could be greatly reduced, also reducing medical expenses (Webber, 2022).

One of the greatest barriers to plant-based diets prevailing in Ireland is the reliance and significance of meat exports to the Irish economy which would be greatly implicated should there be a dramatic increase in plant-based diets in Ireland. The thousands of farms who rely on this market as their livelihood would cease to exist, as would the €3.2 billion annually generated by meat exports in Ireland (Bord Bia 2021). With such a vital exports market based around national and global meat consumption, it is unlikely plant-based diets would have the ability to overthrow this industry in Ireland.

4.11 Limitations of this Research

This research included a sample set representative of the Irish population in 2022. The sample set captured the attitudes and perceptions of males and females, individuals aged from 18 – 65 + years old and a range of dietary lifestyle. Therefore, the research is balanced and unbiased. However, there were some limitations in the research which if addressed could further balance the overall response and outcome of the research. While there was representation in all age categories, the number of participants in each category was not equal. This may have affected the results as the perception and attitudes towards plant-based diets may vary depending on age. Biased may be evident as the participants were majority female. This and previous research have shown that females are more likely to eliminate meat from their diet with some research suggesting woman are 1.6 times more likely to avoid meat (Takeuchi, 2018). Also, if a 10% margin of error was using when calculating the appropriate sample size, the data collected would have been more accurate. Data was collected at 5% margin of error; however the sample size was higher than required and the study had time constraints which did not allow for increased data collection. Finally, the survey lacked more appropriate open-ended questions which could have aided in gaining a deeper insight on topics should as ethics and the meat-paradox.

Chapter 5: Conclusion and Future Work

6.1 Conclusion

To conclude, this research aimed to gain an understanding of the current dietary choice of the Irish population, the level of meat consumption in Ireland, the attitudes and perceptions towards plant-based diets, the likelihood of moving to these diets, and the attitudes towards meat alternatives. Through this research, greater insight was gained into the current and future status of the Irish diet. Assumptions made in the introduction to this research in relation to the significance and dominance of meat consumption in Ireland matched the results, however the confirmed positive attitude towards the dietary choice was a surprising outcome.

Meat consumption in Ireland remains high as per history and tradition in the country. Nonetheless the prevalence of plant-based diets in Ireland in 2022 is significantly growing albeit as a parallel component rather than an outright replacement to the Irish meat tradition in the diet. With this growth comes a broadening of attitude and perception towards the traditional dietary choice of meat. This is an encouraging outcome for plant-based diets as typically countries with high meat consumption have a low prevalence of such diets, a strong negative attitude towards them and an unwillingness to try plant-based diets (Prokop – Dorner *et al.*, 2022).

A strong awareness of plant-based diets is demonstrated within the Irish population, including an understanding of the perceived benefits of the plant-based diets, mainly the positive health and environmental impact the diet could have on the public and the planet. This awareness is accompanied by a willingness among the Irish population to reduce their meat consumption and try meat alternatives, despite the desire to keep meat in the diet – a positive finding for Irish agriculture and exports. This emphasises the openness among the Irish population to dietary changes and trends. The research findings here showed that Ireland is aligned to other western societies (Faber *et al.*, 2020).

The research has confirmed differences in attitudes and perceptions based on gender, with women within the Irish population viewing plant-based diets more positively than men and being more open to plant-based diets. In conjunction with this, men in Ireland perceived meat-based diets more positively than women verifying the general global

status that men favour meat and are less open to plant-based diets than women. This information can help shape target and demographic appropriate campaigns for plant-based products and diets in Ireland.

The outcomes of this research have highlighted a potential for plant-based diets to hold a strong position in the future Irish diet. Nevertheless, the research also identified the need and desire for education on plant-based diets to enhance the understanding of what the diets are comprised of and the benefits they can contribute to both personal and planetary health. Without enhanced knowledge of the diets, the likelihood of Irish people transitioning to the diet is limited.

With the possibility of plant-based diets featuring in the Irish diet in the future, it was important to highlight the positive and negative implications of such a change. It is likely that public health, the environment, and animal welfare would see a vast improvement with reduced meat consumption, including the ability to further enhance sustainable food production systems and prevent food scarcity. The change would have great knock-on effects to the Irish agriculture and exports industry which so heavily rely on the Irish and global population continuing to consume meat. It is vital that the Irish population balance the pros and cons of adopting such dietary changes.

6.2 Future Work

The findings of this study could be used as consumer research during the discovery phase of innovation and new product development work by food producers. Plant-based diet information providers such as Vegetarian and Vegan societies could benefit from digesting these findings knowing there is a future for plant-based based diets in Ireland. Campaigns with such organisations can use this research to target certain demographics and encourage a move to plant-based diets. The findings have the potential to shape the approach taken by food businesses while designing and developing plant-based products and meat alternatives for the Irish market.

A key outcome of this research focused on the need for further education around plant-based diets, their benefits, and impact on health and the environment. Future work in this area should include a focus on campaigns and marketing schemes centred around

educating the consumer and empowering them with knowledge to make better dietary choices. This research has highlighted a gap in knowledge that could be addressed in existing programmes at school level such as Food Dudes – a programme based around educating the youth on healthy eating (Food Dudes, 2022).

The findings have identified the limitations of meat alternatives, particularly in relation to the taste and sensorial acceptability of the products. These limitations should be addressed concurrently with the negative perception and often misleading campaigns on protein and nutritional content of meat alternatives (Rodl, 2018).

While the research representative the general population in Ireland in 2022, future work could include more in-depth exploration into whether there is a correlation between males, females or certain genders and their dietary choice and attitude towards plant-based diets. This could further aid food businesses in identifying opportunities in certain demographics.

Appendices

Appendix A – Copy of Research Questionnaire

Attitudes and Perceptions of Plant-Based Diets in Ireland - Questionnaire

* Required

Section 1

The purpose of this study is to examine the attitudes and perceptions of plant-based diets within the Irish population. There has been no research to date focused on the Irish population in relation to this topic. Plant-based diets can be defined as a diet composed of mostly plant- based foods e.g fruit, vegetables, seeds and does not include meat, however can include animal products (milk, eggs). Plant-based diets include vegetarianism and veganism.

The responses you give in this survey are completely confidential. Information will be stored securely and destroyed 12 months post graduation from this programme (October 2023). You are not obliged to complete the survey and can withdraw your responses at any time prior to the research project submission date (18th April 2022). The survey should take no longer than 10 minutes to complete. If you require any additional information regarding this survey or the study please contact me (X00181157@mytudublin.ie (mailto:X00181157@mytudublin.ie)). By clicking "yes" to the consent question below (Q1) you are consenting to your responses being part of this research project.

1. I consent to partake in this survey *

- ◯ Yes
- ◯ No

2. What age category do you belong to? *

- ◯ 18-24 years old
- ◯ 25-34 years old
- ◯ 35-44 years old
- ◯ 45-54 years old
- ◯ 55 - 64 years old
- ◯ 65 years old +

3. What gender do you identify as?

- ◯ Female
- ◯ Male
- ◯ Prefer not to say
- ◯ Other

4. Which of the below terms have you heard of? Select all that apply.

- ☐ Vegetarian
- ☐ Vegan
- ☐ Flexitarian
- ☐ Omnivore
- ☐ Pescatarian

5. Which of the below best represents your diet?

- ◯ Omnivore (consumes meat and plants)
- ◯ Vegan (does not consume any product derived from animals i.e eggs, milk
- ◯ Vegetarian (does not consume meat but does consume eggs, milk)
- ◯ Flexitarian (primarily consumes a vegetarian diet but occasionally consumes fish and meat)
- ◯ Pescatarian (does not consume meat but will consume plants and fish)

6. If you consume meat, how often do you consume it?

- ◯ Daily
- ◯ 5 - 6 times a week
- ◯ 4 - 5 times a week
- ◯ 3 -4 times a week
- ◯ 2 - 3 times a week
- ◯ Once a week
- ◯ I don't eat meat

7. Please chose the option that is most relevant to you

	Very unlikely	Unlikely	Neither likely nor unlikely	Likely	Very likely
How likely would you be to eliminate meat from your diet?	◯	◯	◯	◯	◯
How likely would you be to eliminate meat from your diet one day a week?	◯	◯	◯	◯	◯
How likely would you be to consume meat once a week?	◯	◯	◯	◯	◯
How likely would you be to consume meat once a month?	◯	◯	◯	◯	◯

Section 2

Please answer the below questions in relation to motivations for choosing your diet.

8. Please chose the option that best represents your opinion on the below statements. A diet that includes meat is...

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Healthy	○	○	○	○	○
Ethical	○	○	○	○	○
Environmentally sustainable	○	○	○	○	○
Enjoyable	○	○	○	○	○
Convenient	○	○	○	○	○
Affordable	○	○	○	○	○
Tasty	○	○	○	○	○
Easy	○	○	○	○	○
Nutritious	○	○	○	○	○

9. Please chose the option that best represents your opinion on the below statements. A plant-based diet (vegetarian, vegan or flexitarian) is...

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Healthy	○	○	○	○	○
Ethical	○	○	○	○	○
Environmentally sustainable	○	○	○	○	○
Enjoyable	○	○	○	○	○
Convenient	○	○	○	○	○
Affordable	○	○	○	○	○
Tasty	○	○	○	○	○
Easy	○	○	○	○	○
Nutritious	○	○	○	○	○

10. If you were to move to a plant-based diet (vegetarian, vegan or flexitarian), what would be your biggest motivation for doing so?

- ◯ Health
- ◯ Environment/Sustainability
- ◯ Ethics/Animal Welfare
- ◯ Taste
- ◯ Cost
- ◯ Other

11. If you selected "other" in question 10, please detail here.

12. What would be your main motivation for continuing to eat meat?

- ◯ Health
- ◯ Environment
- ◯ Societal pressures
- ◯ Cost
- ◯ Lack of choice
- ◯ Other

13. If you selected "other" in Question 12, please detail here.

Section 3

Please answer all questions. Questions are in relation to your attitude and perception of plant-based diets.

14. What 3 words come to mind when you think about plant-based diets?

15. What 3 words come to mind when you think of those who participate in a plant-based diet?

16. Do you think that many people follow a plant-based diet (vegetarian/vegan) in Ireland?

- ◯ Yes
- ◯ No

17. What age category do you think is most relevant for plant-based diets?

- ◯ Under 18 years old
- ◯ 18 - 24 years old
- ◯ 25 - 34 years old
- ◯ 35 - 44 years old
- ◯ 45 - 54 years old
- ◯ 55 - 64 years old
- ◯ 65 years old +

18. Please chose the option most relevant to your opinion in relation to the below statements

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
A plant-based diet is more environmentally friendly than a diet that includes meat	○	○	○	○	○
A plant-based diet is more expensive than a diet that includes meat	○	○	○	○	○
More education on plant-based diets is required to motivate a move away from meat	○	○	○	○	○
Plant-based diets negatively impact agriculture in Ireland	○	○	○	○	○
The term "plant-based" diet is less appealing than the terms "vegetarianism" or "veganism"	○	○	○	○	○
I would be more open to a plant-based diet if there were more options	○	○	○	○	○
I admire those who partake in a plant-based diet	○	○	○	○	○

19. What is required to make plant-based diets more appealing or acceptable in Ireland?

20. Have you ever used meat alternatives? Meat alternatives are defined as products made from plant sources to mimic meat i.e tofu, vegetarian sausages, meat-less bacon.

- ◯ Yes
- ◯ No

21. What meat alternatives do you like? (Please select all that are relevant)

- ◯ Tofu based e.g meatless nuggets, meatless bacon
- ◯ Legumes (beans, peas)
- ◯ Vegetable based e.g veggie sausages/burgers
- ◯ Other

22. If you selected "other" in question 21, please detail your answer here.

23. What is the reason for your choice in question 21?

24. Please chose the option most relevant to your opinion in relation to the below statements.

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
Meat alternatives are more expensive than meat	◯	◯	◯	◯	◯
There are very few options in meat alternatives	◯	◯	◯	◯	◯
Meat alternatives are unappealing	◯	◯	◯	◯	◯
I would try meat alternatives	◯	◯	◯	◯	◯
Meat alternatives are healthier than meat	◯	◯	◯	◯	◯

Appendix B – TU Dublin Ethics Approval Document

TU Dublin,
Tallaght,
D24 FKT9,
Ireland.

Date: 18/02/2022
To: Áine Behan
cc: Aoife Mitchell

Ethics Reference No: *Please quote this ref on all correspondence*	057 – Áine Behan
Project Title:	The popularity of plant-based diets: an examination of the attitudes and perceptions of the Irish population towards the dietary choice.

Dear Áine,

Thank you for submitting your amended application.

DSEC grants ethical approval for this project

If you have any questions, please don't hesitate to contact me.

The committee wishes you the best of luck with your research project.

Yours Sincerely

Gordon Cooke

Gordon Cooke B.Sc. PhD PGDipUTL,
SSCEC Secretary,
TU Dublin, Tallaght.
Email: gordon.cooke@tudublin.ie

Appendix C – Chi – Square Analysis Table (Results from Survey)

How Likely Would Participants Be To:			Chi-Square Test		
	Mean	Standard Deviation	Observed	Expected	P Value
Eliminate meat from their diet?					
Unlikely	1.44	1.11	100	45.3	<0.05*
Neutral			13	45.3	
Likely			24	45.3	
Eliminate meat from their diet once a week?					
Unlikely	2.54	2.13	24	42	<0.05*
Neutral			9	42	
Likely			93	42	
Consume meat only once a week?					
Unlikely	1.82	1.54	66	41	<0.05*
Neutral			12	41	
Likely			45	41	
Consume meat only once a month?					
Unlikely	1.59	1.3	78	39.3	<0.05*
Neutral			10	39.3	
Likely			30	39.3	

Table 6.1: *Chi-square, mean and standard deviation results in relation to participant willingness to reduce meat consumption highlighting with an * the statistically significant results with P = 0.05.*

			Chi Square Test	
	Meat Based Diets Mean (SD)	Plant Based Diets Mean (SD)	Meat Based Diets P Value	Plant Based Diets P Value
Healthy	2.7 (2.21)	2.6 (2.03)	*<0.05**	*p <0.05**
Ethical	2.13 (1.73)	2.7 (2.21)	*p= 0.15*	*p <0.05**
Sustainable	1.91 (1.57)	2.69 (2.12)	*p= 0.20*	*p <0.05**
Enjoyable	2.8 (2.31)	2.17 (1.59)	*<0.05**	*p = 0.05*
Convenient	2.72 (2.24)	1.98 (1.38)	*<0.05**	*p = 0.93*
Affordable	2.41 (2.00)	2.25 (1.73)	*<0.05**	*p <0.05**
Tasty	2.84 (2.34)	2.30 (1.70)	*<0.05**	*p <0.05**
Easy	2.80 (2.29)	2.04 (1.51)	*<0.05**	*p = 0.41*
Nutritious	2.81 (2.31)	2.55 (1.98)	*<0.05**	*p <0.05**

Table 6.2: *Chi-square analysis of the aspects of both meat-based and plant-based diets with the statistically significant results marked with an * with P = 005.*

Statement	Chi-Square Test
I admire those who partake in plant-based diets	$P < 0.05$*
I would be more open to plant-based diets if there were more options	$P = 0.47$
The term "plant-based" is less appealing than terms like "vegetarian" and "vegan"	$P = 0.09$
Plant-based diets negatively impact the agricultural industry	*P = 0.73*
More education is required to motivate a move away from meat-based diets	$P < 0.05$*
A plant-based diet is more expensive than one that includes meat	$P = 0.47$
A plant-based diet is more environmentally friendly than a diet that includes meat	$P < 0.05$*
***P* = 0.05**	

Statement	Chi-Square Test
Meat alternatives are healthier than meat	$P < 0.05$*
I would try meat alternatives	$P < 0.05$*
Meat alternatives are unappealing	$P < 0.05$*
There are very few opinions in meat alternatives	$P < 0.05$*
Meat alternatives are more expensive than meat	$P < 0.05$*
$p = 0.05$	

Table 6.3: *Chi-square analysis for questions in relation to plant-based diets and meat alternatives with significant results marked with an * with P= 0.05*.

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