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Building 'sustainability' into national healthy eating guidelines

Review of international practice and practical implications for policy.

safefood

Review of international practice on building 'sustainability' into national healthy eating guidelines and practical implications for policy

Date: April 2023

Foreword

The scale and urgency of current health, environment and climate change challenges demand action at global, national and local levels.

Dietary risks are a leading contributor to the global burden of disease. In 2017, 11 million deaths and 255 million daily adjusted life years (DALYs) were attributable to dietary risk factors. The recent Lancet Global Syndemic Report recommends comprehensive actions to address obesity in the context of the co-occurring epidemics of obesity, undernutrition and climate change (termed the Global Syndemic). Concurrently, the EAT-Lancet Commission calls for a food system transformation to address the global syndemic. It calls for a shift from current and environmentally unsustainable food practices to a more sustainable food system with an increased reliance on plant-based foods which "ensures food security and nutrition for all in such a way that economic, social and environmental bases to generate food security and nutrition for future generations are not compromised."

International commitments, legally binding obligations to reduce greenhouse gas emissions (GHG) and increasing environmental and health concerns, along with social inequities evident in dietary practices within Ireland, place the issue of working towards a sustainable diet for all as a central policy concern.

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- Those who participated in the Expert Panel policy review and workshop
- Ms Dominyka Jevista, research intern from April 2021-July 2021.

*is not an author of the scoping review (Task 2)

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1 Executive summary

Aims and objectives

This 18-month project commenced in April 2021. A mixed methods approach was utilised to identify best practice and practical approaches to building sustainability in healthy eating guidelines, along with the potential policy implication, based on the literature and the lived experience, knowledge and expertise of a broad range of actors on the island of Ireland. To achieve this, the project was carried out in five distinct but interconnected tasks:

1) A case study exploring the context, content and process evidenced in seven countries who have integrated sustainability within their food-based dietary guidelines ;
2) A review of peer-reviewed literature (n= 54) to identify consumer behaviours and attitudes towards sustainable diets;
3) An online survey of 2525 persons living on the island of Ireland to identify dietary patterns, attitudes, knowledge and behaviours towards more sustainable diets;
4) An online survey (island of Ireland), policy action review and a workshop with a multidisciplinary team of experts in Ireland (IE) to identify both common and contested ground regarding which sustainable dietary guidelines could be included along with the wider challenges and opportunities associated with promoting more sustainable diets in Ireland and Northern Ireland (NI); and
5) Seven consumer focus groups to investigate potential issues with sustainable dietary recommendations across the island of Ireland.

Key findings and recommendations

Case study

The case study enhances our current understanding of best practice to integrating sustainability into national healthy eating food-based dietary guidelines (Task 1), which can inform the development process of sustainable dietary guidance on the island of Ireland.

Case study results

Based on the case studies exploring the integration of sustainability into healthy eating guidelines in seven countries, several similarities were noted:

- All countries based their guidelines on current eating patterns and health challenges, have complementary policies in place, and assume a whole food rather than a nutrient approach. The majority also facilitated public consultations and workshops during and after the development of the initial draft and pre-tested for understanding.
- Most of the guidelines speak to food waste reduction. All recommend choosing local, seasonal or regionally produced foods, and all outline the relationship between food and the environment, albeit to varying degrees.
- Several offer guidance specific to the environmental benefits of limiting overconsumption; in most instances, this is specific to highly processed foods.
- Further certainty in dietary guidance, particularly pertaining to animal-based foods, will be required for future food-based dietary guidance.

Several considerations pertaining to the various stages of development were also highlighted for consideration:

- The process should be guided by experts representing the multiple dimensions of sustainability, led by strong guiding principles and delivering a clear statement of intent.
- Capturing citizens' expectations and the challenges associated with past guidance pre-development will be beneficial.
- Protective measures to limit potential conflicts of interest in the development process will be essential.

In relation to the guidance itself, considerations were also noted in the context of the guidelines explored and emerging literature:

- Highlighting a clear link between each guideline and its relationship with the various dimensions of sustainability;
- Recognition of the influence of food environments (e.g., marketing) and advice on how to navigate same;
- Specific guidance on seafood in terms of species to favour over others, and portion size;
- Specific guidance for vegetarian and vegan diets;
- The promotion of breastfeeding as a cornerstone of sustainable diets.

To support sustainable dietary guidelines, further 'multi-level, multi-actor and multi-sector' complimentary actions will also be required. These include:

- Incorporating joint human and environmental health remits and objectives within the working of key state bodies;
- Aligning national (agricultural production) efforts with proposed consumer efforts - recognising the interdependence of production and consumption;
- Complimenting, by further actions and collaborations, dietary diversity, healthy eating practices and sustainability;
- Developing guidelines along with introducing or updating national food policy.

Review paper

The review of international literature identifies the factors influencing consumer behaviour towards more sustainable diets and contributes to our understanding of how support can be generated for the necessary structural and system level changes that are required to support behaviour change (Task 2).

Review paper results

A rapid review of 54 journal articles provided an overview of how sustainable diets are conceptualised by consumers, the factors influencing consumers' attitudes and behaviours, and the strategies that can be employed to assist people in moving towards more sustainable diets.

- The review reaffirmed that several factors influence people's capacity to access more sustainable diets. In addition to numerous structural barriers, a low awareness of the environmental impact stemming from diets, scepticism of the scientific evidence, and the belief that individual habits play a minimal role in the global context of climate change, all contribute to a resistance in shifting towards more sustainable diets.
- The concept of sustainable diets encompasses multiple meanings at the level of the individual, with human health representing the strongest. People find the terminology used to capture and measure the ecological impacts of diets confusing. They also have difficulty in discerning which dietary behaviours carry the heaviest environmental burden, tend to underestimate the ecological impacts stemming from dairy, fish, and ruminant meat production, and overestimate the impact of food miles, origin and the healthiness of cheese and cured meat.
- The review also highlighted several strategies that can be used to facilitate access to more sustainable diets. For instance, targeting people before strong values are formed – e.g., at primary school level - with widespread promotion of the co-benefits of more sustainable food choices or targeting the perception that individual diets do not matter in the global picture.

Consumer survey

The review informed the development of a quantitative online study to provide insight into the current dietary patterns and beliefs, attitudes, knowledge and behaviours of a representative sample of adults on the island of Ireland towards sustainable healthy diets (Task 3), and further identifies opportunities and challenges for supporting and encouraging a more sustainable dietary pattern.

Consumer survey results

A survey of consumer beliefs, attitudes, knowledge and behaviours of a representative sample (n=2525) across the island of Ireland towards sustainable healthy diets indicates that:

- Much work needs to be done in reconnecting human and ecological health, building awareness and knowledge of sustainable diets, and in making the more sustainable choice the easier choice.
- Affordability, accessibility and nutrition and health are the most important characteristics of sustainable diets that influence food purchases, whereas organically produced food, low environmental impact and a short or local supply chain are the least important.
- Almost half of all respondents were not interested in eating less animal-based food and more plant-based food. However, roughly one in five said they have started reducing their consumption of red and processed meat 'some of the time'.
- The most popular sustainable dietary behaviours that people are already engaged with are: eating more home-cooked meals and wholegrain foods, reducing food waste through prevention, and eating less discretionary foods.
- There is an apparent knowledge gap in relation to environmental impact (e.g., carbon and land footprint) of foods and food products (e.g., animal-based foods versus plant-based alternatives).

Expert group panel

Incorporating the evidence from task one and two, the expert survey, policy action review process and workshop identified which sustainable dietary guidelines could be considered in the island of Ireland context, and prioritised actions with the most practical relevance to inform the development of sustainable FBDGs and supportive policies (Task 4). This facilitated the translation of actionable knowledge, from a multidisciplinary perspective, to allow the development of food-based dietary guidelines of practical relevance for optimal health and environmental sustainability in both Ireland and Northern Ireland.

Expert group panel results

This mixed methods approach brought together a diverse range of academic and professional expertise that spans the health, environmental, social, political and economic disciplines and sectors.

- The report identifies a set of broad measures that can be used as a starting point to build sustainable dietary guidelines for the population in Ireland, along with practical approaches that can be used to strengthen existing policies that influence how we produce and consume food.
- Based on the challenges raised by the expert panel, five goals and 26 actions are proposed to assist in moving both people and policy towards more sustainable diets. These goals include:
    - Ensuring policy coherence and shared responsibility across multiple sectors,
    - Promoting plant-based diets as the norm rather than the exception,
    - Redefining people's relationship with food, encouraging sustainable food literacy, and further collaboration between research and practice,
    - Addressing vested interests and counteracting industry narratives, and
    - Addressing inaccuracies presented within policy and media frameworks.
- There is a high level of agreement amongst various experts in terms of what guidance is important and what challenges need to be overcome to move towards a more sustainable diet. However, some divergence is also evident concerning some of the most important and widely used guidance. This includes reducing reliance on animal-based foods and promoting plant-based whole foods along with seasonal, local and organic diets and sustainable seafood consumption.
- Further qualitative research with a multidisciplinary group of experts would be beneficial to understand the low levels of agreements associated with these guidelines prior to the development of sustainable dietary guidelines. Such research may limit future conflicts and facilitate unified and well supported public messaging, reducing consumer confusion and encouraging more sustainable diets.

Consumer focus group

Finally, seven consumer focus groups convened across the island of Ireland (Task 5) to investigate the potential issues arising from the recommendations supported by the multi-disciplinary expert panel and assist in outlining the scope and content of dietary guidelines with sustainability considerations. Participants (n=40) were aged between 18 and 65 and mixed in gender and socio-economic backgrounds. The focus group discussion focussed on exploring familiarity with and adherence to current healthy eating, perceptions of the term 'sustainable diets', and four sustainable dietary recommendations:

i. eating more plant-based whole foods,

ii. reducing processed meat,
iii. reducing red meat consumption, and
iv. limiting ultra-processed foods.

Participants also completed a short exit survey upon completion of the focus groups to explore the degree to which participants consider their current diets to be sustainable, and to capture the level of agreement with the 15 sustainable dietary guidelines presented to the experts. Quantitative data was analysed descriptively using SPSS and qualitative data was analysed thematically, guided by the research objectives, and supported by NVivo version 12 Pro Software.

Consumer focus group results

Knowledge and awareness of sustainable diets was low. While some people do consider additional sustainable dietary components, such as packaging and food waste, when making decisions about what foods to purchase and consume, the general consensus is that a sustainable diet is "*hard work*", a lifestyle choice, more expensive, time-consuming and less accessible, particularly for families. Outside of the high concern for food waste and packaging, the environmental impacts of food production and consumption do not appear to influence dietary choices. This is complicated further by a general confusion concerning terminology, distrust of information, the positioning of certain foods as 'bad', perceived vested interests, conflicting narratives, and a legacy of changing dietary advice.

Eating more plant-based whole foods

There is a clear need for guidance on the term 'plant-based' in particular. For most consumers, particularly those not familiar with more plant-based wholefoods, perceptions that plant-based diets are another fad diet, associated with vegan and vegetarian diets, and with a commercialised industry containing many highly processed foods, appear to be prevalent. The distinction made between traditional vegetarian diets containing plant-based wholefoods such as legumes, versus new vegetarian diets which were considered by some to be highly processed, is an important one that can be used to raise more awareness of plant-based wholefoods.

Eating less red meat

It is important to note that consumption of red meat was not high in any group, with most participants suggesting they eat red meat about three times per week. However, there also appeared to be some confusion around what red meat is. There is a need for further awareness of what meats are classified as red meat, with that awareness accompanied by a

clear "eat less" not "exclude" message based on actual consumption patterns. Given the dissonance evident in some of the discussions on reducing red meat, many of which were concerned with the potential economic and nutritional impacts, consumers require and desire clear and transparent reasoning as to why they are being encouraged to consume less red meat, so that those with the resources to do so can make an informed decision. In the context of sustainable diets and making the relationship between people, food and the environment clear, expanding the conversation beyond carbon footprints and nutrients, and highlighting potential economic gains, will be essential in encouraging a reduction in red meat consumption.

Eating less processed meats

Much of the food we eat today is processed in some form. However, the degree of processing is an important distinction that is not entirely, or at all, understood by most people. There is a negative connotation associated with the term 'processed' which may be causing further confusion amongst consumers and creating a stigma around some processed foods. Further awareness of what processed meat is, which food products are included in this category, along with clear explanations as to why these foods should be consumed and easier swaps for parents substituting processed meat in lunches, would be useful to consumers.

Moreover, and as suggested by some participants, food products commonly associated with the term 'processed meats', such as burgers or chicken goujons, can be made using raw and minimally processed ingredients such as fresh mincemeat or chicken breast, which may not pose the same health risk as some of their highly processed counterparts. Thus, less of a focus on end product and more of a focus on the ingredients, form and process may prove a useful distinction that avoids demonising particular foods and promotes consumer education.

Eating less or avoiding ultra-processed foods

While consumers appear very open to recommendations on limiting ultra-processed foods (UPFs), they require more knowledge of how to identify UPFs, which must be accompanied by making more minimally or unprocessed foods more accessible. Most people are not familiar with the term 'ultra-processed' and there are overlaps between some 'processed meats' and 'ultra-processed meats'. For instance, industrially produced chicken nuggets are considered as processed meat by some, but as ultra-processed by others. While the language of ultra-processed foods is not mainstream yet, growing evidence concerning these foods in the context of the multiple dimensions of sustainable diets, and the increasing use of the terms within media and academic circles, means that equipping consumers with the knowledge of how to distinguish such foods may be beneficial to avoid further confusion. This would also help clarify some of confusion between processed foods and ultra-processed foods and bring

the issue of concern back to the degree of processing, the purpose of the processing and the ingredients added, rather than the food itself.

2 Introduction and background

Governments worldwide recognise the importance of a good diet for health and well-being and the prevention of chronic disease. Many countries, including Ireland, have implemented policy actions to address this priority. Improving environmental sustainability and building economic and social prosperity in an equitable manner are, likewise, key policy goals. One policy tool to help address the multiple sustainability challenges associated with food systems are dietary recommendations that better support environmental and human well-being. Many countries have developed Food Based Dietary Guidelines (FBDGs) which aim to provide population guidance about recommended food consumption patterns to provide required nutrients and to promote health. However, the growing body of evidence concerning the multi-layered environmental, socio-cultural and economic impacts of current diets has highlighted the need for countries to develop FBDG with sustainability as central component. In high income countries, where the overconsumption of meat, meat alternatives and discretionary foods are commonplace (1), a transition towards more whole plant-based diets is especially critical.

Despite weak adherence to FBDG across most countries, likely compounded by socio-economic factors (1), dietary guidelines represent an important tool that can be leveraged to build a more sustainable food environment and a more resilient food system (2,3). FBDG set the standard for foods available in institutional settings and are utilized as a benchmark for food reformulation. FBDG also act as an educational tool and '... reflect societal context, historical changes in the ways in which societies conceptualise food and health'(4). Equally, they provide a foundation for which further supportive food policies can be used as a benchmark to assess the adequacy of food supply and consumption patterns within countries (5). FBDG play a pertinent role in shaping current and future food cultures. The scale and urgency of current health, social and environmental challenges require a reassessment of dietary guidelines to ensure advice is aligned with the necessary transition diets that protect human and planetary health.

Defining, measuring and assessing sustainable diets

The term 'sustainable diets' first appeared in academic literature in 1986 in a short paper by Joan Gussow and Katherine Clancy, which proposed the alignment of dietary guidelines with environmental concerns to improve health and ensure the long term viability of the food system (6). As a working concept, the term remained dormant for several years. The growing body of literature concerning the detrimental impacts of human behaviours on the planet led

to a re-emergence of the concept of sustainability and a broadening of its definition beyond environmental and health concerns (7).

In 2010 the Sustainable Diets conference, hosted by the United Nations Food and Agricultural Organisation (FAO), led to the first broad, multi-criteria definition of a sustainable diet: 'those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources' (8).

The development of this definition was informed by the growing body of evidence concerning the detrimental effects of dietary patterns on climate, biodiversity, water use, soil health, human health and land use. The definition acknowledges that these issues are compounded by demographic pressures and economic factors embedded within the agri-food chain which impact power relations and consumer access to food. The social determinants of diets in addition to ethical considerations are also incorporated (7).

At its core, sustainable diets acknowledge the interdependence between diets and the environment and reaffirm human health as inseparable from planetary health. Figure 1 presents a diagrammatic representation of the components of a sustainable diet as defined by the UNFAO in 2010. The six bolded headings in each petal represent the key components of a sustainable diet. The text within each petal highlights the multiple determinants, factors and processes that influence each of the interconnected components (6).

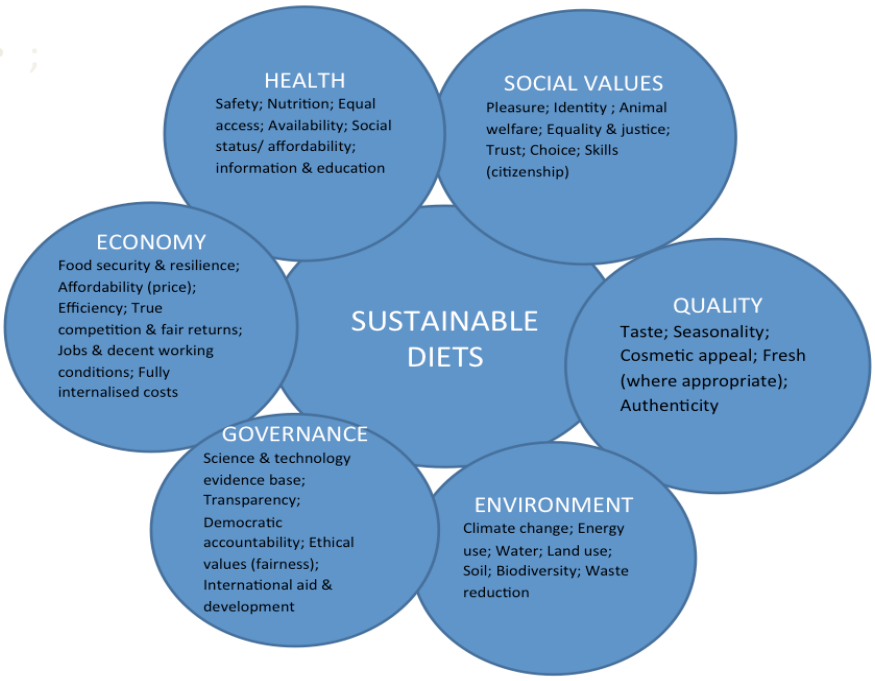
Figure 1: Components, determinants, factors and processes of a sustainable diet

Source: Johnston et al, 2014: 421

There is now broad consensus that high income countries will need to shift towards more plant-based diets, with less reliance on animal-sourced foods, to protect human and planetary health (9–14). In recent years, a number of scientific papers focussing on exploring the co-benefits and the composition of such diets have been published (13–16). Yet, understanding and capturing the complexity represented in the definition of sustainable diets has been understandably difficult (7) because, as evidenced in Figure 1, carbon and nutritional concerns, while critical, only capture one element within two of the larger interconnected components. However, as a starting position, more sustainable diets in high income countries that have a lower carbon footprint and higher health gains will require less animal-based and more plant-based, whole foods, although the specific details of such diets will vary according to the particular national, social, cultural and economic contexts (17). To this end, Mason and Lang (2017) propose the use of a multi-criteria framework (Figure 2). This framework offers a way to explore current food systems concerns, encouraging a transgression beyond both single frame and binary thinking. It draws attention to the multidimensional nature of sustainable diets and the discreet but overlapping issues of health, the environment, social values, economy, governance and quality. Moving beyond the nutrition versus carbon debate, and incorporating multiple dimensions of sustainability

within national dietary guidelines, can assist the transition towards more sustainable diets (2, 3, 10, 17, 18).

Figure 2: Multi-criteria framework for assessment and consideration



Source: Mason and Lang, 2017

Integrating sustainability into National Dietary Guidelines

Since 2014 several countries have integrated elements of sustainability into their official FBDG (19). For the most part, this integration is centred on one or more of the following broad guidance: recommending more plant-based diets, preferring local and/or seasonal fruits and vegetables, avoiding overconsumption, limiting food waste and limiting or reducing meat consumption. Several other countries have attempted to integrate sustainability concerns and either failed to achieve government endorsement at the national level (in the case of Australia in 2013 and the US in 2015, due to intense lobbying by the meat and dairy industry) or at the European level in the case of Sweden in 2008. Notably, progress in Sweden – the first country to attempt integration – was blocked by the European Food Safety Authority, which cited anti-competitiveness concerns regarding advice to choose local and seasonal food and to reduce meat consumption. These failed attempts highlight the political nature of dietary guidelines and the power of food industry lobbying and vested interest groups (2,7,10), along with the general primacy afforded to economic interests. While progress has since ensued, further ambition, political will and safeguards against food industry influence is required to transition towards more sustainable diets (13,20).

In 2017, the UNFAO 'Plates, Pyramids and Planets' report explored the composition of FBDG across the globe and documented the development process of FBDG that have incorporated sustainability into these guidelines. Out of the then 83 countries with official FBDG, only four (Germany, Brazil, Sweden and Qatar) specifically reference or consider environmental factors within their main messaging. This report highlights that the term 'sustainability' is often used as a synonym for specific environmental concerns such as GHG emissions, water or land use concerns, with much less attention paid to the social and cultural aspects of sustainability and presents several considerations for countries developing sustainable FBDG. In relation to the development process specifically, the recommendations are to incorporate guidance from a broad range of expertise reflecting the concept of sustainability, multi-agency championing, and inclusive but distinct consultation processes. Box 1 provides an overview of all key recommendations (10).

Box 1: Overview of all key recommendations

To have an effect on consumption patterns the following should be considered:

- Government ownership but cross-sectoral support spanning multiple government departments.
- Targeting the general public, health professionals, consumer organisations and the food industry, and with different versions depending on target audience;
- Clear links to established food policies such as public food provision and procurement, food promotion policies, industry standards, advertising regulations;
- Be widely promoted.

The development process requires:

- Clear championing by multiple government agencies;
- Incorporating a broad range of expertise that reflects broader sustainability concerns;
- Two distinct and independent components: (i) advice from health and environmental experts; (ii) a consultation process with civil society and industry.

To effect environmental change, the guidelines must be:

- Accompanied by and built upon information that highlights the link between health and sustainability, so people are informed about the relationship between food and sustainability and understand the need for such dietary patterns.

Be accessible but ambitious:

- Current consumption patterns and the cultural context must be considered so that the recommendations do not 'stretch' people unrealistically, while at the same time communicating a clear change in consumption patterns. This can be achieved by adopting a series of achievable steps.

Have clear guidance on:

- Reducing meat consumption and suggestions on how these changes can be appealing and accessible;
- The environmental benefits stemming from limiting the overconsumption of food;
- Food waste reduction;
- Safe and efficient food preparation;
- Shopping;
- The place and value of food in our lives;
- Specific guidance for vegetarians and vegans.

More recently, a framework for quantitatively assessing the integration of key sustainability concerns within dietary guidelines was developed and applied to two groups of countries(2). Group one countries included those who are recognised as having already incorporated sustainability into their official dietary guidelines, and group two are those who have not. Despite failed attempts to explicitly include sustainability concerns within Australia's FBDG, these guidelines still received the second highest total sustainability score behind Brazil when other elements of sustainability are accounted for (2). In line with Gonzales-Fischer et al (2016), the findings also indicate that the ecological and human health dimensions were the most represented in all twelve guidelines explored, while the socio-political and cultural aspects were underrepresented (See Table 1 for overview). Acknowledging the significant influence of the food environment on consumer purchases, and corresponding dietary patterns, the authors suggest that 'future guidelines should incorporate an understanding of how key aspects of the food environment influence food security, food access, and diets.' (2)

Table 1: Sustainability concepts represented in dietary guidelines (Ahmed et al, 2019)

Key Dimensions	Most represented sub-dimensions	Least represented	Countries with the highest score
Ecological	Local and seasonal foods followed by sustainable agriculture practices and production quality	Clean energy and sustainable technologies	Brazil (100%), Nordic countries (88%) and Sweden (50%)
Human health	Dietary diversity, ultra-processed food limitation and plant-based diets were present in all of the dietary	Economic aspects of food security and food	Brazil (100%), Australia (100%), America (100%)

Key Dimensions	Most represented sub-dimensions	Least represented	Countries with the highest score
	guidelines examined. Regular exercise and physical activity, energy limitation and holistic diets were also prevalent	environment impacts	
Economic	Food advertising, cost of diets, food loss and food waste, and food packaging and recycling.	Distribution, supply chains and transport	Australia (100%), Brazil (88%), Qatar (50%)
Socio-cultural and political	Food consciousness, food knowledge and skills, and food system and cultural values	Labour	Brazil (100%) Qatar (88%), and Australia (88%)

Source: Compiled using Tables 1 – 5 in Ahmed et al, 2019.

A food policy framework has also been developed and applied to qualitatively analyse the degree of sustainability integration in 12 countries who have explicitly integrated sustainability into their official dietary guidelines(21). This framework is based on 60 concepts housed within five key domains: (1) nutrition and health, (2) food security and agriculture, (3) environment and ecosystems, (4) markets and value chains, and (5) sociocultural and political domain. The findings highlight eight concepts present in all documents (Table 2) and identify health and nutrition as the most dominant framing, with environmental recommendations centered on eating less meat and processed foods.

Table 2: Sustainability concepts present in all documents reviewed

Concept	Criteria	Domains & noted overlaps
Malnutrition	Stunting (related cognitive and physical development), undernutrition, underweight, overweight, obesity, wasting double-	Health and nutrition/ sociocultural and political/markets and value chains

Concept	Criteria	Domains & noted overlaps
	burden, micronutrient deficiency, chronic malnutrition	
Physical activity	Sedentary lifestyles, physical fitness, exercise, activity	Health and nutrition
Energy and caloric intake	Limit sugar/added sugars/salt/added salt, sugar-sweetened, sugar additives, junk food, fast food, macronutrients, processed, ultra-processed, commercially made, industrial products, energy-dense foods	Health and nutrition
Cultural acceptability	Convenience, preferences, religion, tradition, culturally appropriate, breastfeeding, share meals, eat together, food culture, eat slow, context of eating, eating environment	Sociocultural and political
Dietary diversity	Diet quality, nutrients, nutritional adequacy of diet, plant-based diets, vegetarian, vegan, balance calories, energy balance, variety, whole foods	Health and nutrition
Non-communicable disease	Diabetes, cardiovascular disease, stroke, asthma, allergies, chronic disease, diet-related disease, cancer, carcinogenic, osteoporosis, nutrition transition	Health and nutrition
Water consumption	Drink water, conserve water when cooking	Health and nutrition

Concept	Criteria	Domains & noted overlaps
Food literacy	Cooking, food preparation, training, recipes, nutrition literacy, quality of food choices, health literacy, food education, food skills, food storage, role model, home-made foods, dining-in, freshly prepared, food/nutrition labels, limit pre-prepared, meal planning, shopping, organization of kitchen stores, preparing ingredients	Sociocultural and political

Source: Compiled using Mazac et al (2021).

3 Aims and objectives

The aim of this research is to expand the scientific knowledge on incorporating sustainability into the development of healthy eating guidelines and national food and nutrition policies using a multi-method approach. The objectives of the research were to:

- Conduct a review of existing literature/case studies to identify current evidence of action and 'best practice' approaches to integrate sustainability into food-based dietary guidelines (FBDG).
- Conduct a rapid review to explore consumers' attitudes and behaviours towards sustainable diets and to identify influencing factors.
- Measure, by means of an online survey, current beliefs, attitudes, knowledge and behaviours of a representative sample of adults on the island of Ireland (IOI) to sustainable healthy diets, and to profile the sample based on a-prior and posthoc segmentation analysis (including demographic and knowledge characteristics).
- Convene a panel of experts in the field of food, health and sustainability across the island of Ireland to capture the views of a diverse range of actors towards more sustainable dietary recommendations and policies, and actions whereby sustainability could be strengthened, incorporated and prioritised.
- Invite groups of consumers to take part in focus group discussions across the island of Ireland to investigate potential issues pertaining to potential dietary recommendations. The findings will help outline the scope and content of dietary guidelines with sustainability considerations.
- Identify and prioritise actions with the most practical relevance to incorporating sustainability in developing FBDGs in consultation with food policy experts on the island of Ireland and make recommendations on practical approaches.

Task 1: Case Study

A review of existing literature to identify current evidence of action and 'best practice' approaches to integrate sustainability into food-based dietary guidelines (FBDG).

A case study was conducted to explore the extent to which sustainability has been integrated in the development of FBDGs, the differences in approaches between countries, and the degree to which consumer behaviours and attitudes towards sustainable healthy diets have been considered in the integration of sustainability measures in the development of FBDGs.

The findings identify best practices along with important considerations specific to the various stages of sustainable FBDGs that be used to guide the development of sustainable FBDGs on the island of Ireland.

Task 2: Scoping Review

A scoping review of consumer behaviour and attitudes towards sustainable diets was carried out.

A review of peer-reviewed literature was carried out to explore what is currently known about consumers' attitudes and behaviours towards sustainable diet. The purpose of this review is to provide an overview of the literature concerning consumers' attitudes and behaviours towards sustainable diets to identify:

i. how consumers engage with the concept of sustainable diets;
ii. the range of factors influencing the uptake of more sustainable dietary practices; and
iii. proposed strategies that can be utilised to support the transition towards more sustainable diets.

This will assist in the development of strategies to encourage behaviour change and contribute to understanding how support for structural and system-level changes can be generated at the societal level.

Task 3: Consumer Survey

Online survey to explore current beliefs, attitudes, knowledge and behaviours of a representative sample of adults on the island of Ireland (IOI) to sustainable healthy diets.

An online quantitative survey was developed to identify current beliefs, attitudes, knowledge and behaviour of consumers on the island of Ireland. Current dietary behaviours were assessed by means of a short food frequency questionnaire, which included key food groups within sustainability debates with the ability to impact (positively and negatively) on sustainability measures. Nutrition knowledge was assessed in addition to environmental knowledge concerning the impacts of diets and food production. The findings provide an important national baseline to begin encouraging a transition towards diets that impact minimally on human and environmental health.

Task 4: Expert Panel

Convene a panel of experts in the field of food, health and sustainability across the island of Ireland to capture the views of a diverse range of actors towards more sustainable dietary recommendations and policy actions whereby sustainability could be strengthened, incorporated and prioritised.

This task was carried out in three phases:

i. A review of existing policies and actions where sustainability could be included or strengthened;, actions to be prioritised; and identifying barriers to incorporating sustainability into existing policies in Ireland;
ii. an online survey to identify the views of a diverse range of experts to incorporating sustainability into national dietary guidelines across the IoI; and
iii. an online expert panel workshop to explore the opportunities and challenges in encouraging a shift towards more sustainable diets in Ireland.

The findings indicate widespread support for the inclusion of sustainability within dietary guidelines across disciplines and interests, and identifies which recommendations are widely supported, along with the barriers to integration. The findings provide a useful starting point for developing more sustainable food based dietary guidelines and developing additional policies to support more sustainable diets.

Task 5: Consumer Focus Groups

Encouraging the successful adoption and implementation of dietary guidelines with sustainability considerations will require taking into account the perceptions and recommendations of different actors and stakeholders. The goal of this task was to investigate potential issues pertaining to the sustainable dietary guidance identified by the experts to provide insight into the scope and content of dietary guidelines with sustainability considerations. The objectives were focussed on: (i) exploring the appropriate language to use when communicating information about sustainability, food and nutrition; (ii) providing feedback on particular guidelines to ensure they will resonate with target segments of the population; and (iii) determining what resources would be valued by consumers and how to support them in implementing guidelines.

4 Methods

This research took a mixed methods approach to identifying consumer behaviours, attitudes and beliefs towards sustainable dietary practices. The research employed a cross-sectional survey design with a randomly selected quota sample of adults across the island of Ireland, and seven consumer focus groups across both jurisdictions . The design of the survey questionnaire and the consumer focus groups' topic guide were informed by:

i. a case study approach to identify countries where sustainability has already been incorporated into national food-based dietary guidelines;
ii. a scoping review of existing literature of consumers' attitudes and behaviours towards more sustainable diets; and
iii. an expert panel discussion workshop and policy review to identify practical actions to incorporate sustainability into the development of food policy, specifically in relation to FBDGs on the island of Ireland, and to make recommendations on practical approaches.

Task 1: Case Study

A case study approach was chosen to explore the processes, framing and commonalities evident within countries that have already incorporated sustainability within their FBDG. An initial literature search identified 14 countries[1] who have integrated various sustainability concerns, beyond the advice to choose local and seasonal foods[2] into their official FBDG. Owing to the lack of background documents available in English and supporting academic literature, in addition to the current updating of the Nordic Nutrition Dietary Guidelines, Brazil, Qatar, Sweden, the Netherlands, Denmark, France and Canada were chosen to explore the following research questions:

- To what extent has sustainability been integrated in the development of FBDGs?
- What are the differences in approaches between countries?

[1] Brazil, Germany, Qatar, Sweden, Canada, France, Switzerland, Denmark, Australia (sustainability concerns referenced in the appendix), the Netherland, Estonia, Finland, Iceland and Norway

[2] Tetens et al (2020) identifies 23 out of 32 countries within the European Union plus Iceland, Norway, Switzerland and the UK, as having guidance on sustainability within their FBDG. However, for 11 of these countries the only link was in the advice to choose local and/or seasonal produce.

- Have consumer behaviours and attitudes towards sustainable healthy diets been considered in the integration of sustainability measures in the development of FBDGs?

Task 2: Scoping Review

The purpose of the review is to synthesize the empirical evidence surrounding consumers' attitudes and behaviours towards more sustainable diets to assist the development of strategies encouraging behaviour change and to contribute to understanding how support for structural and system-level changes can be generated at the societal level. Using the key search term 'Sustainable diets AND attitudes AND behaviour', a search for English-language articles published in peer-reviewed journals was conducted from January 1st 2012 to April 30th 2021 across four databases: Web of Science, Science Direct, Pub Med, and Scopus. The initial search resulted in 1006 articles of which 322 contained relevant titles and key terms. After removing duplicates, an initial eligibility screening of 256 articles was carried out by two independent researchers using Rayyan software, yielding 154 articles. Conflicts concerning the inclusion of studies in the next phase of screening was resolved through discussion. A final round of full text screening resulted in 54 empirical studies (Figure 4) that met the inclusion criteria (Table 4). Metadata was extracted from each of the 54 articles on: title, publication year, journal, country of study, methods employed, focus of study, relevance to research question, definition of sustainable diets used, and limitations.

The included articles were uploaded to NVivo (version 12) and coded inductively, based on the findings related to consumers' behaviours and attitudes towards sustainable diets. Factors encouraging or prohibiting more sustainable diets were documented and reorganised to illustrate the level at which these influences operate. Suggested actions and strategies to encourage more sustainable diets were also tabled and reorganised by the research team into three target areas: policy, food environment and research, education, skills and awareness raising and messaging considerations. Details of the scoping review methods can be accessed in the full scoping review report.[3]

Task 3: Consumer Survey

The overarching aim of this task was to present a snapshot of current consumer behaviours, beliefs, attitudes and knowledge toward healthy sustainable diets by means of a cross-sectional survey, and to profile the sample based on demographic and knowledge characteristics. The cross-sectional survey was informed by the case studies (task 1) and the

[3] Kenny T, Woodside, JV, Perry IJ, Harrington JM. (2022). Consumer attitudes and behaviours towards more sustainable diets: a scoping review

scoping review (task 2). The purpose of the survey was to capture a snapshot of current dietary practices, attitudes and behaviours towards more sustainable diets, and to assess diet and food-related environmental and health knowledge of adults on the island of Ireland. Accordingly, the survey was organised into three sections: (i) current food consumption and dietary practices measured through a brief food frequency questionnaire; (ii) attitudes towards, and important purchase attributes and beliefs about, sustainable diets; and (iii) perceived diet-related environmental and health knowledge. Socioeconomic and demographic data was captured at the beginning and end of the survey.

An all-island sample, representative of national age and gender distribution was recruited by Qualtrics XM market research company. The survey was hosted on the Qualtrics platform from 06/01/2022 and remained open for a four-week period, closing on 03/02/2022. No reference or indication was made in the advertisement or cover page of the survey to the specific objectives of the study in order to minimize self-selection bias. Ethical approval for the study was granted by the Social Research Ethics Committee of UCC (Log 2021-192) and reaffirmed by Queens University Belfast (MHLS 20_148) prior to the pilot test.

Data were analysed using STATA SE Version 17.0. Descriptive statistics were computed, and results are presented by gender (male and female) and in some instances by education and income group, where appropriate. Chi square and one-way AVOVA tests were performed as appropriate and P values are presented.

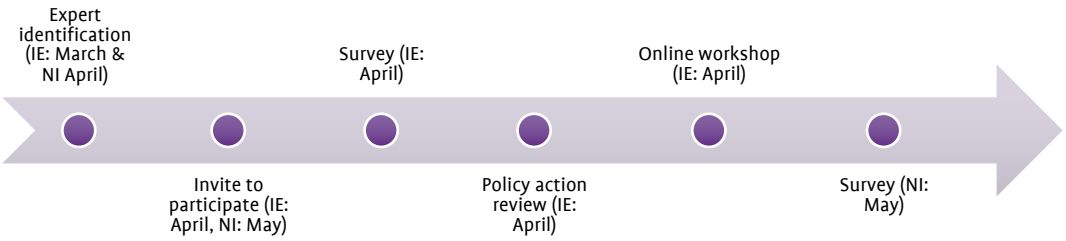
Full details of the methods and questionnaire outline can be reviewed in the full quantitative survey report.[4]

Task 4: Expert Panel

The goal of this task was to identify practical actions to incorporate sustainability into the development of food policy, specifically in relation to FBDGs on the island of Ireland, and to make recommendations on practical approaches (Figure 3). To achieve this goal, and recognising the time pressures of potential experts, a multi-method phased approach was taken to ensure the voices of various interests (health, environment, socio-cultural, political and economic) were captured. Ethical approval was granted by the Social Research Ethics Committee, UCC (Log 2022-114) and affirmed by Queens University Belfast (Log MHLS 22_53) prior to establishing contact with any experts.

[4] O'Mahony L, Kenny T, McCarthy M, Woodside JV, Harrington JM. (2022). A cross sectional survey of current dietary behaviours, beliefs, attitudes and knowledge towards sustainable healthy diets from a representative sample of adults on the island of Ireland. School of Public Health, UCC.

Figure 3: Research process and timeline



Beginning in March, a list of experts from various Ireland[5] and Northern Ireland[6] organisations and institutions, along with independent experts, were identified by the research team to represent health, environment, socio-cultural and political, and economic dimensions of sustainable diets. These experts were chosen based on their expertise, experience and knowledge of the multidimensions of food, people, and the Irish/NI/UK food system in the context of sustainable diets. To reduce potential bias, and following the Food Environment Policy Index (Food-EPI) methods, food industry actors were not included in this list.

Phase one of this work package focussed on the Ireland context. On April 3rd and 4th 2022, 47 experts[7] were invited via email to participate in this research, which was comprised of three parts:

i. a guided review of four key policies within IE,
ii. a short online survey (Appendix 2), and
iii. a half-day online workshop.

All invitees received a link via email to a short survey hosted on the Qualtrics platform within four days after receiving the initial invite. Only those who expressed interest in

[5] Irish Environmental Network, Friends of the Environment, Talamh Beo, The Irish Health Foundations, Food Safety Authority Ireland, An Taisce, Irish Wildlife Trust, Diabetes Federation Ireland, ***safefood***, Social Justice Ireland and the Consumer Association Ireland, along with a range of expertise from University College Dublin, University College Cork, Trinity, Maynooth University, Atlantic Technological University, University Limerick, Munster Technological University and Dublin Institute of Technology.

[6] Belfast Food Network, Institute for Public Health, Food Standards Agency, The Woodland Trust, Community Dieticians, Local Councils with Northern Ireland, The Consumer Council, Academics within Queens University, Ulster University, Sheffield University, Coventry University, City University London and the University of Gloucestershire, Sustainable Food places, Soil Association, Sustainable Food trust, Social Farm and garden organisation, Nature Friendly Farming, Food Ethics Councils, Sustain, Northern Ireland Environmental Link, SECAD, Northern Ireland Chest, Heart and Stroke.

[7] Sixteen invites were extended to those representing health and 15 representing the environment. Identifying experts to represent the economic and socio-cultural aspects of sustainable was more difficult and consequently only eight invites were extended to those representing these considerations.

attending the online workshop (n=25) were invited to participate in the Ireland policy review exercise.

Phase two was specific to Northern Ireland . A Food Strategy Framework (FSF) has already been developed to work towards building a more sustainable food environment. Given that the FSF was in the final stages of approval, and that key policies[8] in this jurisdiction were in the process of being updated, along with the wealth of information received from the short survey conducted in Ireland, the decision was made by the research team to explore the Northern Irish context through an adapted survey targeting a larger sample of potential experts. In May 2022, 70 experts representing the multi-dimensions of sustainable diets (health, environment, socio-cultural and political and economic) and spanning several agencies and organisations were invited to participate in short online survey via email.

In total, 14 participated in the Ireland policy review exercise, with 26 completing the survey, and 14 attended the attended the two-hour IE workshop hosted online on April 29th. A total of 31 experts from Northern Ireland participated in the survey. In all, 57 experts across the island of Ireland contributed to this research task.

Ireland policy review exercise

The primary purpose of the policy review exercise was to identify actions within existing policies due for renewal in the immediate future where sustainability could be strengthened and prioritized. This exercise was based on the methods and evidence document from the previously published Food Environment Policy Index for Ireland (Food EPI) (Harrington et al., 2020). In advance of the workshops, key policies were collated and sent to the expert panel. Sustainability was not considered in the Food EPI framework; thus, two additional key policies addressing sustainability in the context of national food systems and climate change were added to the evidence document sent to the panel of experts. Although Ireland does not have a standalone food and nutrition policy, there are several associated policies that influence dietary patterns, practices and food production more generally. Three weeks before the workshop, the experts who expressed interest in participating in an online workshop (n=25) received a background document containing a brief overview of four key Irish policies along with the actions described in each of these policies. The policies chosen were: (1) A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016-2025; (2) Healthy Ireland Framework 2019-2025; (3) Food Vision 2030; and (4) Ireland's Climate Action Plan – Securing our Future. For further context, Ireland's current dietary guidelines for the general population and for children aged one to four years were also included.

[8] Obesity policy

After reviewing the policy action review document, the experts were asked to identify: (i) specific actions in each policy where sustainability could be easily incorporated or strengthened; (ii) specific actions in each policy which should be prioritised; (iii) primary barriers to incorporating or strengthening sustainability within these policies; and (iv) policies within the experts' area of work and expertise, relating to food, where sustainability concerns could or should be incorporated. The responses were submitted via a link to a Microsoft office form embedded within the background document and responses were collated for analysis. The document contained a total of 205 actions; only the actions identified by at least four experts are reported. A total of 14 experts representing human health (n=7), the environment (n=3), and sociocultural and political (n=4) aspects of sustainability participated in this task. However, one respondent chose to focus solely on Ireland's Obesity Policy and Healthy Ireland Framework, another chose to provide general commentary on the policies, while two others chose to review the Food Vision 2030 and Ireland Climate Action Plan only.

Expert survey

The purpose of the survey was to elicit the views of a multi-disciplinary group on food systems sustainability and sustainable dietary guidance. The broad guidelines were selected from the literature (Jones et al, 2020; Gonzalez-Fisher et al, 2016) and dietary guidelines elsewhere that have already incorporated sustainability within their FBDG (Task 1: Case Studies). The survey consisted of questions centred on capturing the views of the experts on the sustainability of current food systems, recommendations included in food-based dietary guidelines elsewhere, and gaps and considerations not addressed in the broad guidance presented. A further question, relating to existing policies where sustainability pertaining to food could also be incorporated, was included in the Northern survey.

In Ireland, the survey was active from April 8th to April 28th 2022. In Northern Ireland, the survey was active from May 12th to June 6th2022. The results were analysed using IBM SPSS. The open questions were coded inductively using thematic analysis.

Ireland Expert Panel Workshop

The goal of this workshop was to explore the barriers to incorporating sustainability concerns within the FBDG and to identify practical steps to addressing these challenges. The workshop was hosted on MSTeams on April 29th and was attended by 14 experts[9]. Dr Janas Harrington chaired the workshop and additional project team members were also present on the day; a representative from *safe*food also attended the workshop as an observer. The structure of the

[9] Originally, 20 participants had returned consent forms and agreed to participate. However, in the days preceding the workshop, six experts sent apologies and could not attend.

workshop included a presentation of the preliminary findings of the scoping review (Task 2) and the online consumer survey (Task 3). Following the presentation, the panel were asked a series of questions based on the approach guidance and avoidance guidance (Table 3). Specifically, experts were asked to reflect on the following questions:

1) Considering the approach guidance, what are the key challenges to incorporating such guidance into FBDG?
    a) What are the practical steps to be taken to address these challenges?
2) Considering avoidance guidance, what are the key challenges to incorporating such guidance into FBDG?
    b) What are the practical steps to be taken to address the challenges?

Table 3: Approach and avoidance guidance

Approach guidance	Promotion of diet diversity/variety of whole foods
	Promotion of breastfeeding as a cornerstone of sustainable diets
	Purchase and support of seasonal food produced in Ireland
	Promotion of lifestyle behaviours (for example, physical activity)
	Promotion of plant-based, whole food diets
	Purchase and support of local food produced in Ireland
Avoidance guidance	To limit/reduce processed meat consumption
	To limit/reduce foods high in fat, salt and sugar
	To limit the consumption of ultra-processed foods
	Reduce food waste by planning meals and purchasing less
	To limit/reduce red meat consumption
	To limit the consumption of dairy products
Other	Standards for ethical treatment of livestock

To ensure accurate reporting and transcription, the workshop was recorded with the consent of the experts. The suggested policy implications (practical steps) were devised by the research team based on the challenges and opportunities raised by the experts.

Task 5: Consumer Focus Groups

The aim of task five was to investigate potential issues pertaining to the sustainable dietary guidance identified by the experts (Task 4) to provide insight into the scope and content of dietary guidelines with sustainability considerations.

Participant recruitment

As per the research protocol, an initial sample size was established at 30 participants (minimum), which would include six to eight focus groups. To account for potential attrition and drop-out, a sample frame of six participants was agreed by research team and seven groups were organised via two channels: a recruitment agency and the *safe*food community network. Specific eligibility criteria were applied for all focus groups, as shown in Table 4. Characteristics taken into consideration to establish participant eligibility included: being a competent adult between the age of 18 and 65 years; diversity of socioeconomic status (four focus groups with participants of middle-higher socioeconomic status; three with participants of lower socioeconomic status); a mixture of urban or rural residency (three focus groups intended to include participants living in a rural location and four included those primarily in an urban location).

A consumer recruitment agency was employed to recruit participants for four focus groups (Cork City, Clonmel, Drogheda and Belfast). The recruitment agency liaised between the research team and participants in terms of recruitment and scheduling, and the researchers had no interaction with participants until the day of the focus group. Specifications included two participants from each target age group: 18-29 years, 30-49 years, 50-65 years, rural/ urban mix, gender balance and mixed socioeconomic status gauged by employment status and job description.[10]

The network of community food initiatives funded by ***safe*food** were utilised to recruit participants for the three focus groups comprised of individuals from lower socio-economic backgrounds. ***safe*food** contacted community group leaders to brief them on the research and to introduce members of the research team to projects that might be interested in participating in the research. A formal introductory email was then sent to the group leader of four community projects in Cork, Dublin and Belfast informing them of the details of the study, with a request to share information about participation with their members as

[10] (a) Higher managerial, administrative, professional occupations; (b) Intermediate managerial, administrative, professional occupations; (c) Supervisory, junior managerial, administrative, professional occupations; (d) Skilled manual occupations; and (e) Semi-skilled or unskilled manual occupations.

appropriate (e.g., via word of mouth, or email). The contact within the organisation liaised between the research team and participants in terms of recruitment and scheduling. The researchers had no interaction with participants until the day of the focus group.

All participants received a Participant Information Sheet, via the recruitment agency or the community group leader, which outlined the purpose and conduct of the research and their participation prior to consenting to participate. Each participant received a €50/£40 voucher (Me2You/One4All), distributed by the researcher at the end of the focus groups, as a thank you for their time and participation.

Ethical approval was granted by Social Research Ethics Committee, UCC (Log 2022-114) and reaffirmed by Queens University Belfast (Log MHLS 22_106). Written informed consent was obtained from all participants prior to participating in the research.

Table 4: Focus group sample characteristics

	Location	Gender	Socioeconomic status	Took place on	Number of participants	Quotation denoted as*
Ireland						
Group 1	Cork City	Mixed	Middle/higher SES	21/09/2022	6	CC
Group 2	Cork suburb	Mixed	Lower SES	15/09/2022	4	CS
Group 3	Clonmel	Mixed	Middle/higher SES	20/09/2022	6	CL
Group 4	Dublin City	All female[a]	Lower SES	13/09/2022	6	D
Group 5	Drogheda	Mixed	Middle/higher SES	12/09/2022	6	DR
Northern Ireland						
Group 6	Belfast	Mixed	Middle/higher SES	20/09/2022	6	B
Group 7	Belfast (West)	Mixed	Lower SES	20/09/2022	6	BW

SES = Socio-Economic Status

*For example: Cork City Female: CCF#1; Drogheda Male: DRM#3

[a] All-female group selected due to scheduling and availability of the group to participate, despite efforts made to recruit from a mixed-gender group.

Topic Guide Development

A topic guide was developed based on research objectives, the scoping review (Task 2), and findings from the Ireland expert workshop and the all-island expert survey (Task 4). Accordingly, the topic guide focussed on exploring familiarity with, and adherence to, current healthy eating, perceptions of the term 'sustainable diets', and four sustainable dietary recommendations: (i) eating more plant-based whole foods, (ii) reducing processed meat, (iii) reducing red meat consumption, and (iv) limiting ultra-processed foods (Figure 1). The semi-structured topic guide was piloted by the research team in early September. Based on the feedback received, some adjustments were made to the wording of questions, such as simplifying 'concerns' to 'worries'.

Figure 4: Topic guide overview

Data collection and analysis

Data collection began with participants completing a short online survey, hosted on Qualtrics online data management software, to capture socio-demographic information. The link to complete this survey was shared directly with the participant via the recruitment agency or the community group one week in advance of the workshop. Quantitative data from the exit survey was entered into SPSS, without any identifying data, and descriptive statistics were calculated.

All focus groups took place in-person between September 13th and September 23rd 2022 and were facilitated by TK and LoM. Each focus group lasted roughly 90 minutes and were audio-recorded with consent using a Dictaphone to ensure accurate transcription. Recordings were immediately uploaded to the secure University server (OneDrive) and erased from the recording device. Once uploaded to the server, all recordings were transcribed by the facilitators, and participants were assigned anonymised IDs to preserve anonymity. All other identifying information was erased from the transcripts. Once all transcripts were transcribed and checked for accuracy, recordings were erased. Qualitative analysis was performed by TK and LoM using Braun and Clarke's (2012) six step approach to thematic analysis. All transcripts were read through thoroughly and transcribed to ensure understanding of, and immersion in, the data (Step 1). Thematic analysis was performed, guided by the research objectives, and supported by NVivo version 12 Pro Software. Initial codes were applied using a deductive approach which allowed for grouping and separation of themes and sub-themes based on topic guide and

sentiments within and between the data. Final codes were revised and discussed by the research team to ensure accuracy and consistency in their reflection of the findings (Steps 2-5) and final report write-up (Step 6).

Participants also completed a short exit survey (Appendix 2) to explore the degree to which participants consider their current diets to be sustainable, and to capture the level of agreement with the 15 sustainable dietary guidelines presented to the experts (Task 4). Quantitative data from the exit survey was entered into SPSS, without any identifying data, and descriptive statistics were calculated. Written informed consent forms were scanned and uploaded to a secure University server and hard copies of both consent forms and the exit survey were shredded.

5 Results

Task 1: Case Study Approach

Integrating sustainability into FBDG, an overview of the policy environment, development process and degree of sustainability integration.

This section summarises the development and integration of sustainability concerns within the FBDG of Brazil, Sweden, Qatar, Netherlands, Denmark, France and Canada. Full details for the development process in each country, the timeline (where evident), along with the degree of stakeholder involvement and the extent to which sustainability is integrated within the guidelines, can be found in the detailed Case Study Report[11].

Sustainable dietary guidance and development process.

Sustainable dietary guidance is mostly centred on reducing red and processed meat, eating local, seasonal and regional foods, and choosing agroecologically or organically produced food where possible, along with encouraging diet diversity, food literacy and reducing food waste. Limiting overconsumption is also encouraged and mostly in relation to ultra-processed food. Apart from Brazil, Qatar and Canada, reducing greenhouse gas emissions is the primary ecological concern communicated in all guidelines. Denmark, the most recent addition to countries who have integrated sustainability concerns within their dietary guidelines, overtly states that its guidelines are 'climate friendly'. While dairy is considered a 'foundational food group of dietary guidelines', and would have been traditionally represented as a single food group (22) in Canada and the Netherlands, dairy no longer maintains a separate space and is now represented along with other 'protein' foods.

To varying degrees, all FBDGs noted the link between diet and the environment, acknowledged obstacles and barriers preventing access to better diets, and provided tips and recommendations to overcome these challenges. However, in line with Mazac et al findings (2021), the most dominant sustainable diets framing is that of health and nutrition, with recommendations pertaining to the environment centered on eating less meat and processed foods.

Each country based their guidelines on current health challenges, dietary patterns, habits and/or meals rather than nutrients alone. This approach is aligned with a shift away from the reductivist approach to diets and is more reflective of the reality in which people eat (11, 23, 24). In the case of Sweden, Canada, the Netherlands and Denmark, food availability within country was also considered.

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[11] Kenny T and Harrington JM (2022).

It is not clear whether food availability was assessed in France and Qatar, whereas Brazil's guidelines considered the wider and rapid nutrition transition that occurred over the previous decades.

The timeframe from initiation to completion of the guidelines varies. For instance, the entire process in Sweden took roughly one year, while the remaining countries took between two and three years. Consumer engagement also varied. Brazil, Sweden and Canada consulted with consumers, or via consumer councils in the case of Brazil in terms of expectations prior to the development of the initial draft, and throughout the process via surveys, focus groups and workshops. In the Netherlands, public consultation occurred in relation to the evidence review, while in Qatar, workshops and public hearings did not take place throughout the initial development process. It is unclear whether Denmark and France held any open public consultations prior to the development of the initial guidelines. However, all countries pre-tested the guidelines for tone, clarity and understandability prior to publishing (Table 5).

Table 5: considerations and public/private engagement

	Based on current consumption patterns	Based on current health challenges	Food availability accounted for	Complimentary policies and political will evident	Whole food approach	Workshops with various stakeholders during development process	Public consultation/hearing after initial drafting	Pre-tested for understanding
BRZ	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes
SWD	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
QTR	Yes	Yes	Unclear	Yes	Yes	No, only food supply sector	Yes	Yes
NDS	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
DNK	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes
FRC	Yes	Yes	Unclear	Yes	Yes	Unclear	Unclear	Yes
CND	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Several countries took protective measures to limit any potential conflicts of interests and industry influence. Canada, with a history of industry influence in the development of previous FBDG and in the recent 2016 healthy eating strategy (25, 26), excluded all industry-funded research from its evidence review process. In the Netherlands, industry-funded research used in the evidence review was flagged in the public consultation, and industry was excluded from the development of the Wheel of Five. In Brazil, representation from the wider agri-food sector was also excluded from the workshops in the development stages. However, after development of the initial draft, the food industry did participate in the consultation process. In countries where opposition to the guidelines was documented (Brazil, Sweden, Canada), much of this resistance was in relation to key food and drink groups within sustainability discussions: dairy, meat, fruit juice and processed food sectors.

Supportive policy environments

The integration of sustainability concerns into the FBDG explored here took place in the context of multiple supportive policies and strategies. Each country has a national food and nutrition policy, or, in the case of Canada, has developed a 'people's food policy' in conjunction with revising their guidelines. In both Qatar and Canada, the guidelines were developed as part of a wider health and healthy eating strategy, and in the case of Qatar, integrating environmental concerns with national FBDG aligned with its National Development Strategy to create a more environmentally aware society. Additional supportive factors evident in the case of Canada and Sweden were the joint human and environmental health remits and objects of key state bodies, which acknowledge the relationship between food and the environment. In the Netherlands, Denmark and France, further commitments to align the agri-food sector with more sustainable production signifies attempts to address 'the production and consumption mismatch' (27) evident in many high income countries.

Future considerations: UPFs, breastfeeding and seafoods

Only Qatar and Canada offer specific guidance on vegetarian diets and alternatives to meat and dairy products. In the Canadian context, concerns have been raised regarding the ability of consumers to move away from animal-based proteins without relying on ultra-processed plant-based sources of protein or compromising nutritional adequacy (28). Acknowledging the conflicts of interests pertaining to the authors of the Fernandez et al's (2020) paper, this is an area that requires some consideration and broadening to include all UPFs.

For instance, Brazil's FBDG, considered to be one of the most sustainable dietary guidelines produced to date in terms of addressing the multiple dimensions of sustainability (2), are based on a general recommendation to avoid UPFs (19). UPFs already account for 50 per cent or more of total dietary intake in high income countries (29), making UFPs a central consideration in the shift towards more sustainable diets. Brazil's FBDG are centred on

choosing minimally processed food as much as possible and avoiding ultra-processed food. They also provide guidance on how to distinguish ultra-processed foods and explain why these foods should be avoided for social, cultural, health, economic and environmental reasons. Considering the mounting evidence that has emerged in recent years supporting these links (29–33), and the growth of ultra-processed plant-based foods benefiting from a health halo (34), Brazil's approach to focussing on the message of avoiding UPFs as a category of food has significant merit in capturing multiple dimensions of sustainability in one simple message. As Cotter et al (2021) suggest, 'Much as marketers build a brand, the public health community needs to build meaning around the term 'ultra-processed'.' There is a growing call for both the inclusion of the explicit inclusion of messages to avoid UPF within dietary guidelines and for warning labels, such as those used to indicate high level of salt or saturated fat, to be introduced to help consumers to identify UPF (35–37) as has been done in the regulation of UPFs in Chile (38).

Breastfeeding is the 'cornerstone' of promoting sustainable diets (39) and is a central climate justice issue (40) that embodies multiple dimensions of sustainability. While the Brazilian guidelines do reference supporting and protecting breastfeeding, and signpost to further information and guidance on breastfeeding, the Qatari FBDG are the only guidelines to explicitly highlight the significant co-benefits of breastfeeding within their guidelines. There is a growing body of evidence highlighting the environmental, political, social, health and cultural implications stemming from the highly lucrative infant formula sector (40–43). Thus, a strong case can be made for the inclusion of breastfeeding in FBDG (44, 45), particularly in countries with low breastfeeding rates, as a means to normalize breastfeeding.

Clearer guidance on seafood is also a consideration for future FBDG. All guidelines explored here promote seafood consumption, except for Brazil, which abstains from any specific seafood recommendations, and most recommend oily fish and provide examples of species within this category. Canada and Qatar offer some additional guidance on other species of seafoods to consume and recommend/and or highlight local species. Only Denmark offers guidance on portion size and, along with Qatar and Sweden, recommends using labels, or directing consumers towards online sources of information to assist them in choosing the most environmentally friendly option. These countries also draw attention to the environmental impacts and/or benefits of fish and shellfish. Fish and shellfish are meat with various social, environmental, health and economic impacts, and thus will require the same level of clarity and nuance as other animal-based products in future guidelines.

Labelling

In all cases except for Brazil, various labelling systems and symbols are promoted to assist consumers in identifying the healthier, more ecologically friendly option, signalling the important role that labelling can play in guiding some consumers towards better diets.

However, an issue arises when many of these labels capture only one element within one dimension of sustainability. In the EU, there are several Front of Package (FoP) labelling systems in operation [23], and one objective to the Farm to Fork Strategy is to harmonize and include sustainability. Calls for an omni-label, that captures the multi-dimensional nature of sustainability in one label, can be traced back to the UK in the early 2000s (46) and while such a label does not yet exist, metrics have been proposed and debates and proposals have been reinvigorated on the back of the UN Food Summit. To develop such a label requires sustainable food profile modelling (SFPM). While there are several SFPM currently in operation, very few account for more than two environmental indicators and even less take nutritional values or other sustainability dimensions into account. Issues concerning the inconsistency within the methods applied have also been raised (47).

Foundation Earth[24], an industry led non-profit organisation, is currently trialling an EU-wide Front of Package eco label and certification system derived from assigning scores based on carbon footprint, water use, pollution, and biodiversity loss. Still, social, economic, cultural or health impacts are not accounted for in this SFPM. The same issue is present within commonly used nutritional labelling systems, both reductive and interpretive, which do not consider the social, economic and cultural dimensions of diverse foods and foodways (48). FoP labelling systems are an important element in assisting some consumers in choosing healthier foods, and their use is encouraged in most FBDG. However, their role and scope in the context of shifting mainstream consumers towards more sustainable food choices is limited. This is due to the lack of a food label that captures the multidimensional nature of sustainability, the diversity of foods and foodways within various countries, and, critically, the inability of food labelling more generally to tackle dietary inequities[25] (48) There is also evidence to suggest that people concerned about environmental, social and ethical issues associated with food production are the people more likely to use labelling systems (49). In the European context, taste, food safety and cost are prioritised over sustainability concerns when purchasing food (50) This suggests that while sustainability labelling is welcomed, extensive work is required in creating awareness and concern around these issues and in ensuring more sustainable choices are accessible and desirable.

Finding a balance between holistic and prescriptive messaging

Common criticisms of dietary guidelines include their reductive nature (51), quantitative discourse (52), and misinterpretation due to overly detailed messages (53). Additional criticisms have been directed towards the individualistic behavioural model approach in some dietary guidelines (54) in the absence of considering socio-economic factors such as tradition, history and culture (55) economic disparities, and food industry influence (56). Brazil's and Canada's dietary guidelines seem to have overcome much of these criticisms; however, they fall short on the specificity and clarity of messaging highlighted as central to

achieving an effect on the environment (10), especially concerning meat and dairy guidance (Table 6 and 7). For instance, Brazil's FBDG do not offer any guidance on upper limits of meat consumption and Canada's guidelines offer no specific guidance on meat other than giving preference to non-animal-based proteins and choosing lean cuts.

While most other countries explored here provide clear guidance concerning meat and dairy products, wholegrains, processed meats, and sugar are highlighted as uncertain in most countries (Table 6 and 7). Denmark's most recent guidelines were not published prior to Springmann et al's (2020) analysis. Applying the same scoring method, it is estimated that these guidelines provide the lowest uncertainty score and thus the clearest guidance.

Table 6: Degree of certainty within FBDG (1 = low uncertainty, 5 = high uncertainty)

	fruit & veg	red meat	fish	milk	eggs	legumes	nuts & seeds	whole grains	Processed meat	sugar
Brazil	5	4	5	5	4	5	5	4	4	4
Canada	5	5	5	5	5	4	4	4	5	1
Netherlands	1	1	1	1	1	1	1	4	4	4
France	2	1	2	1	5	2	2	4	4	5
Qatar	1	5	2	1	5	3	5	4	1	4
Denmark	1	2	1	1	2	1	1	1	4	1
Sweden	1	1	1	1	5	5	2	4	4	4

Source: Springmann et al, 2020; Supplementary material and researchers' application of the same scoring method to the Danish FBDG

None of guidelines explored here meets both health and environmental international agreements (13), albeit Denmark and Qatar were not included in Springmann's analysis (Table 14). Canada's guidelines exceed the GHGe Paris Agreement target by a factor of 4.49. The Netherlands FBDG are the closest but still exceed by a factor of 2.61. Recent evidence from the Netherlands suggests that further policies, encouraging reduced consumption of meat, butter, cheese and snacks in particular, are required to steer consumption patterns towards lower impact diets (57).

Brazil is 50 per cent short of achieving the Aichi Biodiversity Targets, 25 per cent short of the nitrogen target, 17 per cent short on mortality reduction related to non-communicable disease (NCD). It does meet phosphorus targets and is within two per cent of the freshwater target (Table 7).

Table 7: FBDG alignment with international agreements

National Dietary Guidelines	GHGe	Cropland	Bluewater	Nitrogen	Phosphorus	NCDs
Global Targets	Paris Climate Agreement	Aichi Biodiversity Target	SDGs & Planetary boundaries	SDGs & Planetary boundaries	SDGs & Planetary boundaries	NCD agenda mortality reduction
Brazil	3.92	1.5	1.02	1.25	0.75	1.17
Canada	4.49	1.52	1.08	1.37	0.83	1.01
Netherlands	2.61	1.28	1.03	1.4	0.82	0.78
France	3.17	1.3	1.06	1.43	0.83	1.27
Qatar	n/a	n/a	n/a	n/a	n/a	n/a
Denmark	n/a	n/a	n/a	n/a	n/a	n/a
Sweden	2.8	1.29	1.12	1.48	0.84	0.76

Source: Springmann et al, 2020; Supplementary material

Aligning production and consumption towards less reliance on animal-based foods

National efforts must also align with proposed consumer efforts. Attempts to reduce meat consumption at the level of the consumer, without addressing intensive animal production at the national level, has been met with backlash, as was the case in Denmark's attempt to remove meat-based meals in canteens in 2020 (58). This highlights the importance of more sustainable dietary guidelines being supported by similar efforts at the level of national production. While all countries explored here have multiple policies supporting a shift towards more sustainable diets, there are still some significant digressions between consumer guidelines and national trajectories given that each of these countries, except for Qatar, are major meat and dairy producers.

Brazil is among the largest producers and consumers of meat per capita in the world and while there are regional variances, red and processed meats comprise, on average, 70 per cent of total meat intakes (59). Brazil is also the largest exporter of beef in the world (60) and livestock accounts for 70 per cent of Brazil's total agricultural emissions (61). While consumption in line with Brazil's guidelines would result in a 'considerable GHG reduction' (61), these would not be enough to meet the goal of the Paris Climate Agreement or to reduce premature deaths from NCD (13).

Denmark and the Netherlands are amongst the top GHG emitters within Europe. However, both countries are taking, or considering, substantial steps in addressing national emissions, and ammonia pollution in the case of the Netherlands. The Netherlands is the EU's largest exporter of meat and comprises one of the largest livestock industries in Europe. In December of 2021, a E25bn 13 year plan was launched, devised by the Ministry of Agriculture and Finance, to reduce livestock (cow, pig and chicken) by 30 per cent by compensating farmers to relocate or exit the industry, and encouraging extensive opposed to intensive farming (62). Denmark is one of the largest pig meat producers in the world and recently allocated E168 million in funding to incentivise farmers to grow plant protein crops for human consumption and plant-based food research as part of their new climate agreement for food and agriculture (63). Similarly, France, Europe's second largest dairy producer, launched a National Plant Protein Strategy in December of 2020 to increase the area of land dedicated to protein-rich plants by 40 per cent by 2022 and 50 per cent by 2030. The rationale behind this strategy was one of agricultural sovereignty – to reduce reliance on plant protein imports for human and animal consumption, and sustainability (64). It is also worth noting that these countries' food policies also feature regularly as an example of 'international best practice' in the Healthy Food Environment Policy Index evidence document (65). So while there are gaps between production, recommended consumption and actual consumption, positive steps have been taken towards encouraging less animal-based production and consumption.

Task 2. Scoping Review

Most studies were published between January 2016 and April 2021 (n=48), used quantitative methods (n=37), and were carried out in European counties (n=35). Twenty-four papers (44%) focussed primarily on the topic of meat consumption, reduction and avoidance (beliefs, attitudes, motivations and willingness to reduce consumption). Within these 24 studies, two included vegetarians and vegan consumers in their study design, and seven also explored consumers' awareness and knowledge of the environmental impacts of meat consumption. The remaining papers (n=30) focussed on attitudes and behaviours towards sustainable diets more generally and included papers that explored consumer perceptions and knowledge (n=11), values, motivations and related eating patterns (n=11), and sustainable diet determinants and consumer concerns (n=8).

The rationale for all papers were centred mostly on human and environmental health, and only 30 per cent (n=16) of papers provided a definition of a sustainable diet that extended beyond a human and environmental health framing (see supplementary materials, data 1). Furthermore, the overrepresentation of women, well-educated and urban populations was observed in 22% of the included studies, but particularly in the papers exploring sustainable diets more generally (30%).

Summary

In this scoping review we synthesize the evidence surrounding consumers' attitudes and behaviours towards more sustainable diets and present a range of factors, considerations and proposed strategies that can contribute to building the societal level support for urgent and systems-level changes. The findings suggest that consumers, insofar as they are interested in sustainability and have the capacity to engage with the concept, approach the concept of sustainable diet primarily from a human health perspective. However, the interconnectedness of human health and well-being with planetary health is poorly understood. This highlights the need for: (i) sustained efforts to create awareness of the relationship between food and the wider physical and social environment when promoting more sustainable consumption; (ii) a broader research lens focussed on the multidimensional concept of sustainability within the literature exploring consumer attitudes and behaviours; and (iii) public health to work with other sectors and disciplines to develop clear, simple and coherent messages and narratives based on established and emerging evidence.

Dietary determinants: structural and intermediary influences

As illustrated in Figure 5, the factors influencing the uptake of more sustainable diets operate at both the structural and intermediary level. The structural determinants refer to

socioeconomic and political circumstances that shape diets, whereas intermediary determinants relate to the material circumstances, behaviours and psychosocial factors influencing diets (66). The following results present an overview of how these determinants interact and influence the adoption of more sustainable diets, including how consumers understand the concept of sustainable diets, before outlining four broad strategies that can be pursued to facilitate and support consumer behaviour change.

Figure 5: Overview of factors influencing more or less sustainable diets

Structural determinants

- Macro-economic polices
- Cultural and societal values/norms
- Marketing
- Broader infrastructure
- Social class
- Education
- Local food environment
- Gender.

Intermediary determinants

- Psychsocial
- Social networks
- Importance of social image
- Family stage
- Cognitive dissonance
- Neophobia
- Habits and routines
- Involvement/interest in food/cooking

Resources

- Time
- Income/budget
- Cooking skills

Values and motivations

- Convenience/sustainability/environment/ethical/financial/health motives
- Political values
- Value orientation (for example ethical)

Awareness and knowledge

- Dietary impact on health environment
- Health benefits of a diverse/plant-based diet.

Normative and personal beliefs/attitudes

- Moral/ethical/environmental/sustainability aspects of food and diet
- Diet and health
- Plant based diet and meat replacements (costs/enjoyment)
- Role of meat
- Scepticism/environment.

The knowledge, attitudes and behaviour of consumers are influenced by several socio-demographic variables (67). Gender, level of education (49, 68–73) and income (49, 70, 74)

impact the likelihood of consumers engaging with more sustainable dietary behaviours. Women are reportedly more engaged with sustainability dietary concerns and are more likely than their male counterparts to act accordingly (49, 72, 75–77). Women are also more likely to associate meat with ecological and animal welfare concerns (77–80) and are more open to information concerning both the impacts and benefits of reducing meat consumption (81). However, while women are more open to adopting meatless meals (82), and thus a suggested target group for interventions and campaigns (76), qualitative research highlights that this interest can be hampered by less willing male partners and children (83–85). On the other hand, there is also evidence of men reducing their meat consumption due to the influence of a vegetarian partner (83).

The relationship between higher educational attainment and more sustainable dietary practices has also been observed in several studies (68–70, 73, 75, 86), while additional studies suggest that the more educated a person is, the more likely they are to believe that current levels of meat production and consumption are unsustainable (78, 87), and to purchase meat replacements (86). Links between place of residence and sustainable dietary practices, awareness and openness to alternative consumption patterns, have also been observed. For example, in Portugal, those living in urban areas are more knowledgeable about the environmental implications associated with meat production, more familiar with meat alternatives, and more open to reducing meat consumption, compared to those living in rural areas (88). Research carried out in Scotland suggests that personal links to the agricultural economy are associated with a lower familiarity of the concept of sustainable diets and a lower willingness to reduce meat consumption (82). In contrast, a UK-based study reported no location or gender-based differences in resistance to reducing meat consumption (83).

The social, cultural, economic and informational environments in which people live can also work to support existing consumption patterns. Meat consumption is tied with various social values such as pleasure, identity, heritage and cultural norms (82, 83, 89–92), and in many high-income countries, meat is perceived as central and necessary to ensure a 'proper dinner' (69, 89, 91). Although this idea is deeply rooted in tradition, and rationalised as 'this is how I was raised' (93), it is also evident in national discourses and supported by economic interests. For instance, in Norway (89), New Zealand (85), and the UK (94), the influence of the agricultural sector and institutional discourses on national narratives concerning sustainability were noted as being at odds with a shift towards less meat consumption. In the

case of Norway, this was offered as a partial explanation as to why consumers underestimate the environmental impacts of meat consumption and was noted as a barrier to reducing current consumption levels (89). Kemper (2020) reports a lack of trust in both New Zealand government advice and the food supply chain more generally. In Scotland, qualitative findings highlight confusion and scepticism around the amounts of red and processed meat (RPM) that can be consumed as part of healthy diet and scientific evidence concerning the health and environmental impacts of RPM, which is due to perceived conflicts of interests and contradictory messages (91). This contributes to making an already complex food environment, with multiple and often conflicting messaging, difficult for consumers to navigate. For example, one large-scale study (n=22,934) identifies how French consumers are 'torn between purchasing animal-based products to follow dietary guidelines or limit purchase for environmental issues' and that these dilemmas were more prominent when purchasing meat rather than dairy foods (80).

Addressing structural barriers: Income, food environments, and information provision

Drawing on the philosophies of 'gourmets', Scholser and de Boer (2018) suggest several practices evident within this community that can encourage a more sustainable diet. These include: the attention given to pleasure, taste and social relatedness which can be encouraged by promoting quality rather than quantity; urging people to explore additional eating styles; building food competences; and an acceptance of the natural limitations of seasons (95). Nonetheless, for some 'mainstream consumers', sustainability is not considered as important as more immediate financial concerns (96). Additional research suggests that people living in a less wealthy neighbourhood do not associate plant-based diets with any well-being domains (physical, social, human, financial, eudaimonia or overall well-being) (97).

Income also plays a role in determining what is chosen as a substitute when navigating health versus environment dilemmas. In the US, research indicates that low-income populations tend to reduce the purchase of poultry and seafood rather than red meat (69) , while research in France suggests that lower income groups report more health versus environment dilemmas in comparison to higher income groups (80). In the UK, social class differences were not found in the willingness to reduce meat consumption; however, income is a critical factor in terms of capability to enact change (83) and thus a central consideration in encouraging more sustainable dietary patterns (96, 98, 99).

While consumers may want to support local food production and purchase food that is fresh, nutritious and lower impact, and understand the benefits of doing so, highly processed foods are more accessible, cheaper and allow for food budgets to support other non-flexible costs such as housing (96). In the Australian context, food practices are described as 'household budget and nourishment practices' first and foremost, which makes a sustainable diet difficult if not impossible for low-income families and individuals when economic inequalities are not addressed. Thus the discrepancies between desired behaviours, more healthy and sustainable dietary practices, and actual behaviours can be attributed to multiple structural factors, such as low mobility (access to shops, markets, and transport), time pressures, social dynamics, economic restrictions (77, 96, 99–101) and market forces reinforcing existing consumption patterns (90, 102).

Increasing accessibility to more sustainable food choices in price, availability and marketing would encourage and enable consumers to practise more sustainable eating behaviours (99). However, reducing the cost of such foods would require government subsidization rather than price reductions (68, 99), along with a range of additional policy actions targeting various levels of the food environment, such as those identified in Tables 8-9.

Table 8. Action proposed in the literature to address structural challenges

	Food Environment, Policy and Research	
Focus	Action	Sources
Policy instruments	Moving policy and efforts beyond awareness raising: making the more sustainable choice the easier choice, supporting government policies, regulation, true cost accounting	(90, 99, 100, 103–107)
	Economic incentives / disincentives (i.e., reducing the price of organic food, healthier foods, subsidizing local agriculture and healthier foods, taxing less sustainable foods)	(68, 79, 99, 103, 108–110)
	Addressing socio-cultural, economic and physical barriers	(77, 83, 96, 97, 99, 111, 112)
	Incorporating sustainability within dietary guidelines	(68, 78, 80, 113, 114)
	Policies clarifying and outlining how our food consumption affects the future of the planet	(76)
Food Environment	Social opportunities/exposure: Repeated exposures to meat alternatives, greater support for 'meatless day' campaigns in public institutions, exposing children to meatless meals from an early age in institutional settings	(79, 84, 90, 93, 102, 104, 115)
	Strategies targeting various segments of the population	(102, 109, 116–118)
	Sustainability labelling and environmental impact labelling	(75, 91, 99, 101)
	Formulating appealing, convenient, affordable meat alternatives	(79, 82, 91)
	Creating opportunities to eat sustainably – demonstration sites – schools, institutions, restaurants	(95, 100)
	More research 'upstream' focused on food provisioning and production systems, food environments, social and cultural context	(85, 100, 108, 119, 120)
	Choice editing (limiting the choice available to consumers)	(96)
Research and monitoring	Research that captures the additional dimensions of sustainable diets (social, cultural, economic)	(75, 98, 108)
	More research on what information on a sustainable eating pattern should be presented, and how and by whom, to gain consumer trust, should be carried out before the information is disseminated	(111)
	Regular monitoring of consumption practices and attitudes	(101)
	Exploring how, who and what is shaping media discourse	(85)
	Campaigns informed by studies based on randomized and national representative samples	(109)

Considering the abundance of low cost meat products within western food environments (90) along with a multitude of socio-cultural and economic barriers, information alone is unlikely to change behaviour (91, 99, 111, 115, 121, 122). The limited efficacy of the Attitude, Behaviour and Change (ABC) paradigm, favoured by public policy in contending with complexities in which food choices are made, suggests that the notion of consumer sovereignty should be challenged in favour of 'large-scale dietary change' (91). Evidence from Canada suggests that an increase in the cost of meat results in less consumption (87), and while such measures are likely necessary for large-scale dietary change in high-income countries (90), fiscal measures are the least supported structural change aimed at reducing consumption (106). With the limitations of informational campaigns, the absence of awareness concerning the ecological impacts of diets, these structural changes are unlikely to be accepted by the public (91, 106, 121). However, for some populations, increased awareness of the relationship between food and sustainability concerns can also lessen the gap between intention and behaviour (75, 99).

Several authors advocate increasing the awareness of the ecological impacts stemming from meat production and consumption (69, 111, 117), along with building consumers' knowledge and understanding of the various components encompassed by the term sustainable diets (77, 99, 123, 124) (see Table 2 for additional education, skills and awareness strategies identified in the literature). At the same time, addressing the cultural, social, economic and physical barriers within society are also a prerequisite for moving towards more sustainable diets (77, 96, 97, 99, 111, 112). In short, multiple strategies targeting various segments of the population (92, 116–118, 125) and multiple levels of the food environment (90, 99) are required to support more sustainable diets.

Table 9: Building consumer knowledge and awareness

Developing education, skills and awareness		
Focus	Action	Sources
Increase awareness of:	Social and environmental representation of sustainability – connections and relationships imbued within the concept	(49, 76, 77, 99, 124)
	Ecological and health impacts related to diets, most especially animal-based foods	(68, 69, 76, 84, 104, 106, 109, 111, 114, 117, 126, 127)
	Long-term consequences of high levels of meat consumption	(113)
	Co-benefits: addressing the environmental sustainability of food choices as part of public health messaging to promote healthier and more sustainable diets	(69, 70, 84 ,86, 90, 93, 111, 116, 122)
	Food waste and how to use leftovers	(68, 95)
Education and information provision	Educating consumers before strong values are formed (i.e., at primary level). Creating opportunities for younger populations to visit farms and learn about sustainable production, education in schools at a young age	(99, 108, 116, 122)
	Employing education and activities targeting increased moral engagement as an avenue for increasing the consumption of sustainable foods	(91, 128)
	Innovative advertising strategies, especially for fruit and vegetables	(99)
Knowledge and skills	Increasing knowledge on plant-based alternatives, more sustainable food choices, healthier and more sustainable food habits	(75, 91, 108)
	Improving consumers' nutritional knowledge	(68, 108)
	Developing food skills: purchasing, preparing, cooking and eating	(68, 95, 99, 101, 104)
Perceptions	Enhancing perceived consumer effectiveness	(49, 77, 111, 117)
	Improving consumer perceptions of meat alternatives	(79, 82, 84, 88)
Multipronged	Public health nutrition programmes based on the key considerations within the concept of sustainable diets	(77)

Accounting for socio-cultural and political barriers in research, appealing to emotions, attitudes and social norms, and increasing exposure to plant-based meals

Within the current consumer behaviour literature on sustainable diets, health remains the dominant focus (108, 125) and several studies call for more attention to be paid to the socio-political and cultural constraints influencing diets (83, 85). For many consumers, social and cultural norms maintain rather than disrupt ideas supporting current meat consumption levels, and some research suggests changing norms using opinion leaders, role models and community social marketing to assist in establishing new social and cultural norms (85, 90, 115).

While still in the minority, an increasing number of people have adopted flexitarian, vegetarian and vegan diets in recent years, and the rejection of relationism[12] seems to be a factor in this regard. For instance, in Germany a quarter of the population do not differentiate between farm and companion animals and this group of consumers have the highest number of flexitarians and vegetarians (129). Specific interventions targeting ethical and moral attitudes and social norms, along with raising awareness of the link between people, planet and food, is a key recommendation in the literature to move towards more sustainable and healthy diets (71, 98, 99, 116, 128). One such strategy to shift social norms and attitudes is through increased exposure to more plant-based meals beginning at an early age (91). Indeed, several papers recommend increasing the availability of, and exposure to, plant-based meals (69, 85, 86, 90, 92, 115, 130).

Encouraging meat alternatives, flexitarianism and substitution

Introducing and familiarising consumers with meat alternatives is considered an important element of the transition towards diets containing less meat. Despite a growing market, the consumption of alternative meat products is generally low (79, 86, 94) even within populations that have actively reduced their consumption of meat (69, 115). Low familiarity, usage and the sensory appeal of meat substitutes are some of factors attributed to lower acceptance of these products within the general public (79, 104, 119), in addition to the perception of meat alternatives as unnatural, unhealthy (79, 88) and ultra-processed (85). The literature suggests addressing these concerns by promoting more whole food options

[12] Relationism is described as an animal ethical position that distinguishes farm animal from other (i.e., companion or wild) animals (129)

(69) and creating appealing and affordable meat alternatives that may encourage further consumption (91). Further proposals to encourage a reduced meat diet include: (1) challenging cultural norms and existing meal formats, (2) incremental change through substitutes to de-routinize meat as a staple of every meal, (3) introducing less familiar food in combination with routinized foods, and (4) focussing on promoting portion size awareness as a supplement to substitution practices (119).

While reduction rather than the exclusion of meat is more acceptable to consumers (103, 115), an "eat less" message is counterintuitive to the operations of the food industry and will therefore require concerted societal and government backing (86). At the household level, reduction rather than exclusion is the approach currently taken by families actively reducing meat consumption, and the methods employed vary by lifecycle stage (85), interest in cooking (93) and type of meal being prepared (94), all of which are important considerations when designing campaigns to encourage reduction. For instance, young adults and families exhibit more creativity and exploration when creating meals. The emphasis is placed on cooking meals from other cultures and trying new recipes (85, 95, 131). By contrast, retirees tend to reduce by portion size and substitute with fish and other meats (85). Other strategies employed by households included swapping meats for fish and other animal-based products, planning meals in advance, and reducing the quantity of meat in meals such as curries and stews (94).

Labelling, clear context specific messages, addressing counter narratives and targeted approaches

Godin and Sahakian (2018) point out that there is no hierarchy attached to the idea of sustainable diets: ideas are not fixed, they are emotionally charged, often overlap, and can conflict with other elements. For instance, issues such as local food versus organic food, or less meat and better meat versus no meat, and navigating these tensions, is unfairly left to the consumer, who is perceived as the responsible agent in these matters (100). Thus clear information and advice to assist the consumer in assessing and navigating these dilemmas will be necessary (111). Although labelling is a valuable tool to assist the transition towards more sustainable diets (75, 99, 101), some caveats and considerations apply, one being that labelling is more likely to be used by consumers with a higher level of perceived consumer effectiveness and who are already concerned about both environmental and ethical/societal dimensions (49). This suggests that building awareness, knowledge and regard for the

impacts of diets is also a precursor to sustainability labelling, in addition to campaigns that maintain a balance between communicating key messages clearly without oversimplifying.

For instance, one potential weakness highlighted in the 'meatless day' strategy relates to its inability to communicate that overall animal-based protein ought to be reduced and plant-based alternatives pursued. Promoting 'veggie days' was proposed as means to communicate this message more clearly (86). Several additional studies suggest that specific guidance on preferred foods to consume when reducing meat consumption, along with recipes for plant-based meals (82, 85, 93, 118), would assist consumers in choosing and preparing more sustainable meals. A more complex example is that of seafoods, because while the associated GHG emissions are lower, additional impacts such as biodiversity loss have yet to be considered in sustainability messaging (76).

Some consumers are already engaging in multiple actions related to more sustainable diets, such as reducing food waste (68, 132) and avoiding excess packaging (68). However, due to the ambiguous phrasing of 'excess packaging', it has been suggested that recommendations pertaining to more specific behaviours, such as avoiding highly processed foods and buying in smaller quantities (68), may be more beneficial. Hoek and colleagues (2017) echo this call for more precise messaging, along with educating consumers to distinguish between processed and highly processed foods (104). Table 3 provides an overview of some additional and specific messaging considerations identified within the literature.

Table 10. Considerations outlines in the literature for developing clear and targeted consumer messaging

	Messaging consideration and strategies	
Focus	Action	Sources
Message content: general abstract	Highlight relationship between traditionality, sustainability and health	(113, 132)
	Communicating social, economic, cultural and environmental representation of sustainability – connections and relationships imbued within the concept	(49, 76, 77, 99, 101, 124)
Message: general: impact	Using environmental implications that people know about – air pollution, water pollution ('this burger equates to x car journeys')	(91)
	Highlight key food behaviours which incur the highest environmental impact and ensure that messaging is simple to help consumers navigate some of the potential trade-offs	(111)
	Avoiding oversimplification	(68, 104)
	Targeted health and environmental awareness programmes/campaigns	(110, 118, 130)
Message source	Community-based social marketing, role modelling	(79, 90, 115)
Message target	Targeting women (more open to change, and as duty bearers of shopping and cooking in a household) while being mindful of the role of additional household and family members in influencing decision making	(85, 91, 133)
	Tailoring messages to different values	(102, 109, 116–118)
Informational messages	Highlight limitations on food choices – i.e., seasonal unavailability of food	(95)
	Messages aimed at promoting more sustainable eating patterns need to ensure that participants are aware that their individual food behaviours are important in helping to preserve the environment (improving consumer effectiveness)	(111, 117)
	Reducing meat content by adding more wholefood plant-based foods in meals. For instance, adding lentils to mincemeat dishes	(85, 86, 94, 115)
	Promoting flexitarian diets	(103, 113, 119)
	Provide recipes for plant-based meals, information on simpler ways of preparing plant-based meals	(69, 82, 85, 118, 134)
	Distinguishing between processed and highly/ultra-processed food	(104)
	Smaller portions, reduction rather than exclusion, 'eat less', 'eat less but better'. 'Quality (organic, ethically produced) rather than quantity'	(69, 85, 86, 95, 104, 115)
	Addressing common inaccurate beliefs (meat is essential for adults to ensure a healthy diet, plant-based meals are inadequate to maintain a heathy diet)	(69, 82, 90, 106)

Belief modification	Clear and relatable messaging based on common beliefs within the population/ counter narratives.	(69, 91, 106)
	Encouraging open-mindedness towards other eating styles (vegetables as a main rather than a side)	(95)
	Specific advice about preferred foods to eat when reducing meat	(69, 86)
	Addressing values in sustainable diet practices as part of dietary counselling and health and nutrition promotion programming	(77, 116)
	Improved transparency and clarity: health and/or sustainability labelling programs supported by detailed information about what exactly the label covers	(75, 85, 99)
Message: Appeal rational, emotional and moral	Addressing moral defence (4 n's)/positive attitudes towards meat	(69, 82, 90, 91, 106, 113)
	Emphasising health benefits of sustainable diets	(86, 103, 111, 116, 121, 135)
	Addressing the underestimation of the high environmental impact of ruminant meats, dairy, cured meats	(106, 126)
	Messages that activate social norms and emotional involvement	(135)
	Promoting animal welfare ethical values	(73, 129)

A call to return to more traditional diets, which in some instances do not align with sustainability concerns, may also require some consideration (71, 105). The influence of industrialised food systems favouring uniformity and standardization, and the commercialisation of 'traditional' recipes by hypermarkets, renders some traditional dietary patterns a problematic reference point for sustainable diets (113). On the other hand, drawing on certain aspects of traditional diets can align with more sustainable diets and dietary practices. However, this may depend on the farming systems operating within countries and traditional food cultures. For example, in the Transylvanian region of Romania, most people are interested in consuming quality, locally produced fruits and vegetables which are central to the traditional food culture in this region in both production and consumption (132). Likewise, in the Brazilian context, some traditional diets are based on foods such as fruits, vegetables, beans and rice, which are both widely produced and consumed throughout Brazil (124). Thus the call to return to traditional diets to encourage more sustainable dietary practices may require country-specific consideration and a wider appreciation of national food systems and their influence on food cultures and dietary patterns.

Offering counter-narratives to the positive attributes associated with the elevated status of meat from health and cultural perspectives have also been noted as potential strategies worth pursuing (69, 106). For countries with strong agricultural industries, exploring cultural and media discourses surrounding meat and dairy consumption may help in both identifying what these narratives are and in developing positive counter-messages, particularly in the context of dietary guidelines based on sustainable food (85). For example, outlining that sufficiently planned, vegetarian and vegan diets can be nutritionally adequate providing due consideration is given to the micronutrients of concern, and acknowledging that, while plant-based diets may contain less protein, the average person currently consumes 20 to 60 per cent more protein than is required for a healthy diet (69). However, as outlined earlier, for consumers with a high attachment to meat, information alone will likely be insufficient to change behaviour or intentions, and may even be counterproductive by furthering entrenchment of the behaviours and attitudes within this population cohort. Thus indirect and structural approaches that facilitate the mainstreaming of plant-based diets may be a better approach (81, 90, 122) .

Task 3. Consumer Survey

Sample characteristics

Overall, 2,524 respondents responded to the survey. Table 11 presents the key sociodemographic and economic characteristics of the respondents. Seventy six per cent and 24% of respondents were current residents in IE and NI, respectively. Slightly more females (53% n=1303) than males (47% n=1163) completed the survey. Almost half of respondents (48% n=1181) had a degree/postgraduate education, while the majority of respondents (68% n=1533) had an income below €43,000. The majority of respondents (52% n=1292) lived in a suburb/outskirts of town.

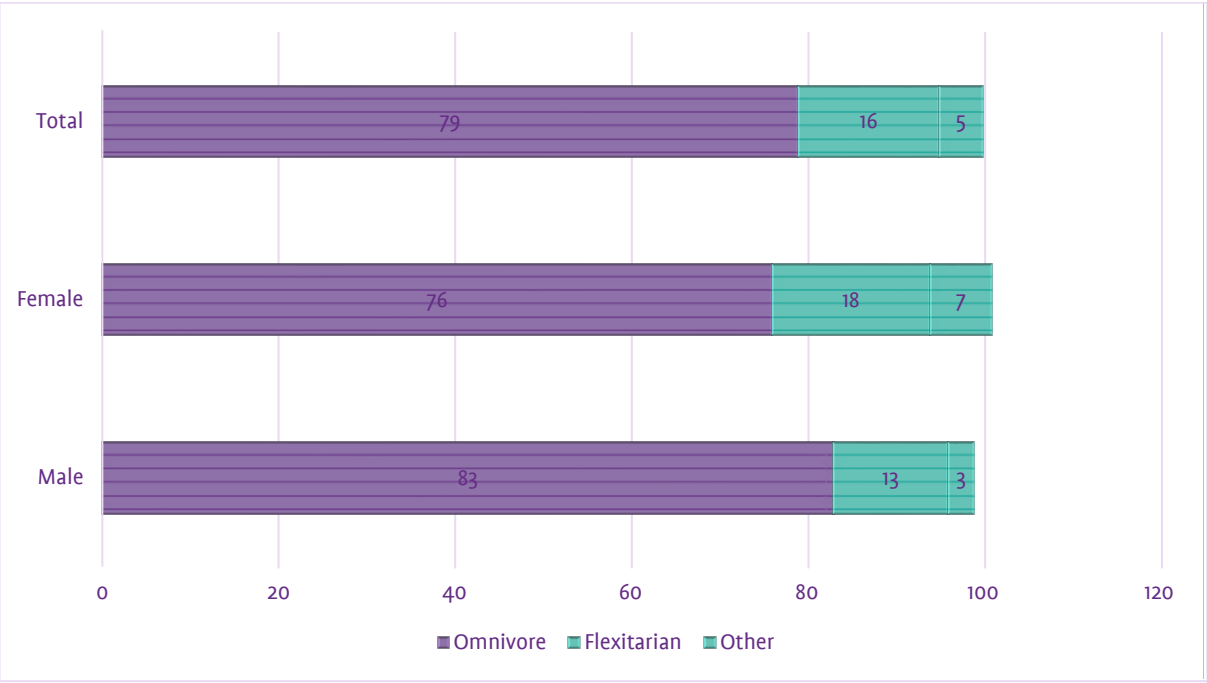
Table 11: Sociodemographic description of the survey population

		Male % (N)	Female % (N)	Total % (N)
Age Group	**18-24**	15 (175)	10 (136)	13 (311)
	25-34	20 (232)	28 (364)	24 (596)
	35-44	20 (235)	28 (370)	24 (605)
	45-54	18 (210)	20 (262)	19 (472)
	55+	27 (311)	13 (171)	20 (482)
Jurisdiction	**IE**	75 (874)	76 (992)	76 (1866)
	NI	25 (289)	24 (311)	24 (600)
Education	**Primary or Secondary**	20(224)	13 (167)	16 (391)
	Further/Higher Education	34 (387)	37 (482)	36 (869)
	Degree/Postgraduate	47 (539)	50 (642)	48 (1181)
Marital Status	**Single**	33 (380)	29 (370)	31 (750)
	Married/civil partnership/co-habiting	61 (690)	62 (794)	62 (1484)
	Divorced/separated/widowed	6 (67)	9 (109)	7 (176)
Income category	**<22,999**	30 (324)	34 (399)	32 (723)
	23,000-42,999	35 (369)	38 (441)	36 (810)
	43,000-60,999	16 (176)	15 (177)	16 (353)
	61,000+	18 (195)	12 (145)	15 (340)
Children	**0**	63 (731)	48 (622)	55 (1353)
	1 or 2	31 (356)	40 (523)	36 (879)
	3+	6 (76)	12 (157)	9 (233)
Living situation	**Living alone**	16 (185)	13 (171)	15 (356)
	Living with others	84 (950)	87 (1107)	85 (2057)
Residence	**City**	22 (254)	16 (212)	19 (466)
	Suburbs	54 (630)	51 (662)	52 (1292)
	Village/farm	24 (278)	33 (425)	29 (703)

Current Dietary Behaviours

The majority of respondents (79% n=1959) self-identified as following an omnivore dietary pattern (figure 6). Significantly more males than females identified as omnivore, while a higher proportion of females (18% n=228) identified as following a flexitarian diet or other, including pescatarian, vegetarian and vegan (7% n=87) compared to males (3% n=36)

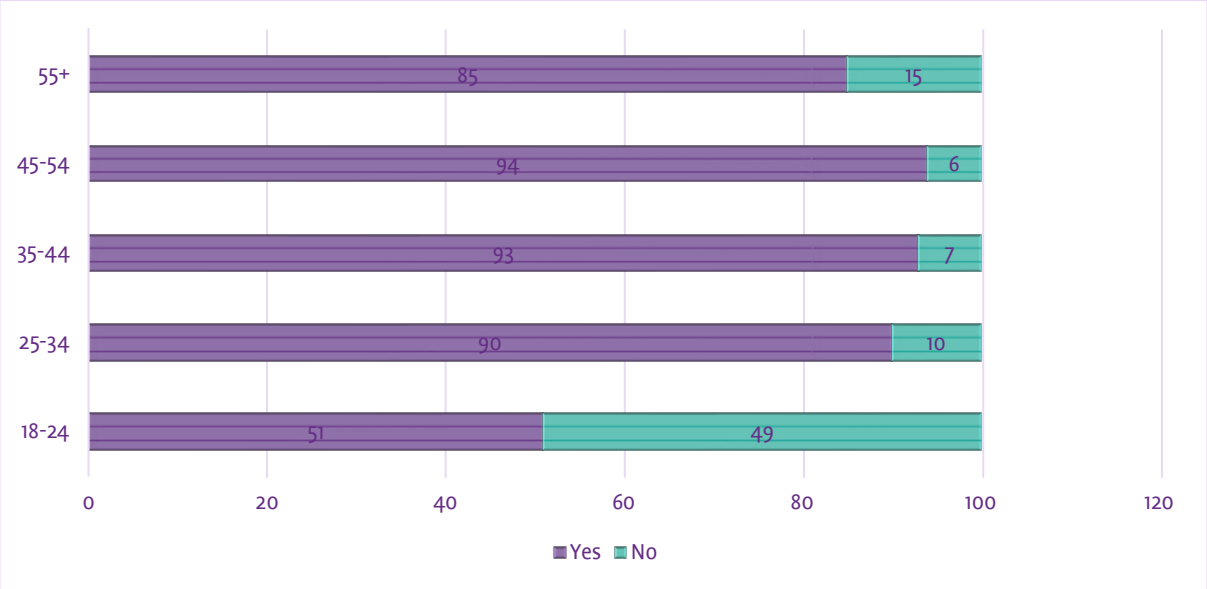
Figure 6: Self-reported dietary pattern by gender



Comparing age groups, a higher proportion of 18-24 year olds (9% n=28) and 25-34 year olds (6% n=37) identified as following an 'other' dietary pattern compared to the older age groups (35-44 yr: 4%; 45-54 yr 4%; and 55yr+ 4%). There was no difference across education groups in relation to type of dietary pattern followed; however, a higher proportion of those in the lower income bracket reported following a flexitarian, or 'other' diet pattern. It is worth noting that compared to the older age brackets, the lower income group had a higher proportion of younger respondents.

Most respondents reported that they were the person responsible for grocery shopping and cooking in their household, although more females (92% n=1200) than males (78% n=913) reported this role. Significantly fewer respondents aged 18-24 years reported that they were responsible for shopping and cooking (Figure 7).

Figure 7: Proportion of respondents mainly responsible for grocery purchases and cooking by age group.



Respondents mainly completed their weekly grocery shopping at two or more supermarkets (male 57% n=670; female 56% n=741), while approximately one third of respondents did their grocery shopping in just one supermarket (males 34% n=401; females 35% n=460). Very few people purchased most of their weekly groceries from independent stores, butchers or grocers, farmers' markets, directly from a farmer, or from community-supported agriculture (males 4% n=44; females 6% n=82).

Current Dietary Practices

Current dietary practices for some specific food groups were assessed by means of an adapted self-reported food frequency questionnaire. Table 12 outlines the frequency of consumption of different food groupings. Aligned with those reporting as following an omnivore dietary pattern, there was a high frequency of daily (or more) consumption of meat and dairy products.

Table 12: Reported frequency of consumption of composite food groups from the food frequency questionnaire.

	Rarely/never		1-2 servings/day		3-4 servings/day		>5 servings per day	
Food Group	**Male % (N)**	**Female % (N)**	**Male % (N)**	**Female % (N)**	**Male % (N)**	**Female % (N)**	**Male % (N)**	**Female % (N)**
Overall meat (all meat products)**	10 (122)	15 (191)	69 (803)	67 (876)	15 (176)	15 (198)	5 (57)	3 (37)
Red and processed meat	15 (172)	21 (272)	76 (879)	72 (927)	6 (67)	7 (86)	3 (32)	<1 (10)
Meat alternatives (inc. fish)*	20 (236)	21 (271)	67 (783)	70 (914)	9 (100)	6 (80)	4 (43)	3 (33)
Meat alternatives	29 (330)	28 (361)	65 (754)	67 (867)	5 (60)	4 (56)	1 (13)	<1 (12)
Fruit and vegetables*	-	-	31 (356)	28 (351)	54 (621)	54 (686)	15 (166)	18 (229)
Confectionery, savoury snacks**	23 (265)	17 (213)	65 (747)	72 (921)	9 (102)	9 (120)	3 (32)	2 (25)
Dairy products*	19 (211)	14 (182)	68 (780)	73 (947)	11 (121)	11 (137)	3 (30)	2 (24)

*P<0.05; **P<0.01

Exploring differences by education (results not shown), higher proportions of respondents with only primary/secondary education reported higher frequency of consumption of overall meat products (P<0.001), red and processed meat products (P<0.001), snacks and confectionary (P<0.001), while reporting lower frequency of consumption of fruits and vegetables (P<0.001). No difference was seen across education status for dairy consumption.

In addition to the composite food groups above, respondents reported the frequency of consumption of wholegrains and plant- based dairy products. Only 23% (n=571) reported consuming wholegrains daily (19% n=468) or several times a day (4% n=103), while 9% (n=233) reported consuming plant-based dairy products either daily (7% n=7%) or several times a day (2% n=57).

Consumer attitudes, purchase attributes and beliefs about healthy and sustainable diets.

Beliefs about sustainable diets

Respondents' beliefs and attitudes towards healthy and sustainable diets were assessed (Table 13). The majority of respondents (60% n=1480) considered that a sustainable and healthy diet were 'similar, but not the same', one fifth (20% n=520) reported that they were different, while 12% (n=309) reported that they were the same. Six per cent of respondents didn't know whether they were similar, the same or different.

Respondents who reported that sustainable and healthy diets were not the same (different) were more likely to be male compared to female (24% v 19%), aged 18-24 compared to older age groups, have higher levels of education and be in the higher income bracket (Table 3)

Table 13: Belief that healthy and sustainable are the same thing by socioeconomic indicators

		The same	Similar but not the same	Not the same (different)	Don't know
Gender	Male	13 (152)	57 (658)	24 (274)	7 (79)
	Female	12 (157)	63 (822)	19 (246)	6 (77)
Age group	18-24 yr	10 (32)	66 (215)	18 (58)	6 (21)
	25-34 yr	15 (92)	61 (367)	20 (119)	4 (24)
	35-44 yr	11 (67)	62 (376)	22 (135)	5 (28)
	45-54 yr	13 (61)	58 (273)	23 (108)	7 (31)
	55yr +	12 (58)	55 (266)	21 (102)	12 (57)
Education	Primary/Secondary	12 (49)	57 (226)	17 (68)	13 (51)
	Further/Higher Education	12 (107)	62 (543)	19 (167)	7 (64)
	Degree/ Postgraduate	13 (151)	60 (713)	24 (281)	4 (42)
Income group*	<€22,999	12(85)	60 (439)	19 (140)	9 (68)
	€23,000-42,999	13(104)	62 (501)	20 (165)	5 (40)
	€43,000-60,999	13 (46)	60 (213)	23 (81)	4 (14)
	€61,000+	15 (51)	56 (191)	27 (92)	3 (10)

*for comparison, all sterling income was converted to Euro

Assessing the perceived attributes of what a sustainable diet is, as indicated in Table 14, the majority of respondents perceived a sustainable diet to be 'nutritious' (males 71% n=832, females 79% n=1045), 'healthy' (males 70% n=825, females 76% n=1011) and 'natural' (males 66% n=772, females 69% n=910). However, the majority of respondents reported that it was 'not/somewhat less cheap' (males 59% n=698, females 65% n=854), and 'not/somewhat less traditional' (males 39% n=464, females 36% n=470). While a high proportion of respondents also agreed (yes/somewhat) that a sustainable diet is 'beneficial for the planet' (males 72% n=851; females 78% n=1036), slightly less agreed that it was beneficial for them (males 62% n=729; females 67% n=880).

Table 14: Respondents' perceived attributes of a sustainable diet

	No/Somewhat less	Neither	Yes/Somewhat

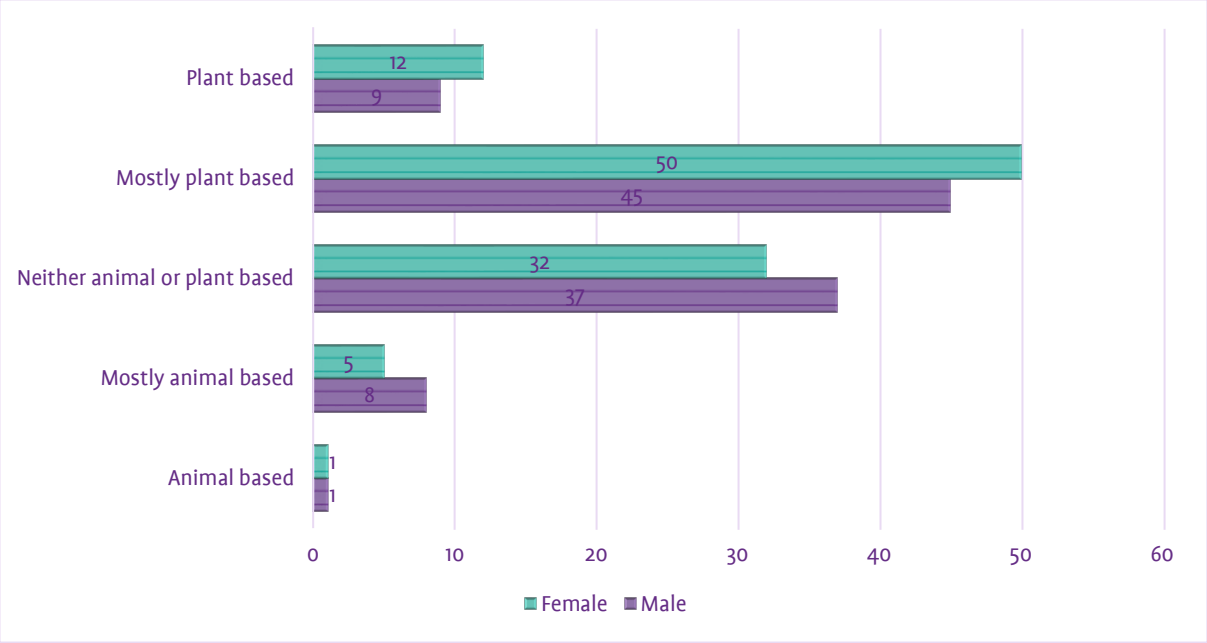
	Male % (N)	Female % (N)	Male % (N)	Female % (N)	Male % (N)	Female % (N)
Beneficial for the planet* **	8 (89)	5 (63)	20 (236)	17 (217)	72 (838)	79 (1023)
Beneficial for me*	14 (162)	12 (157)	24 (283)	21 (279)	62 (718)	66 (867)
**Healthy ** **	6 (67)	5 (60)	24 (281)	19 (247)	70 (815)	76 (996)
Accepted by my family/household	23 (272)	26 (344)	34 (396)	31 (402)	43 (495)	43 (557)
Filling* **	19 (226)	14 (186)	26 (299)	20 (264)	55 (638)	65 (853)
Nutritious* **	10 (126)	7 (93)	18 (215)	14 (180)	71 (822)	79 (1030)
Traditional	40 (460)	36 (469)	36 (423)	39 (506)	24 (280)	25 (328)
'For me'*	29 (341)	26 (343)	39 (455)	37 (485)	32 (367)	36 (475)
Natural	12 (140)	9 (121)	22 (261)	22 (284)	66 (762)	69 (898)
Easily available	40 (460)	45 (588)	18 (207)	13 (170)	43 (496)	42 (545)
Cheap* **	60(693)	65 (843)	34 (400)	29 (372)	6 (70)	7 (88)
Tasty* **	24(281)	18 (239)	35 (409)	30 (386)	41 (473)	52 (678)

***P<0.001 **P<0.01 * P<0.05

Comparing education groups, significantly higher proportions of respondents with lower levels of education compared to higher levels of education perceived a sustainable diet as 'less tasty' (P<0.001), 'not cheap' (P<0.05), 'less available' (P<0.05), 'not/less natural' (P<0.001), 'not suitable' (P<0.001), 'not/less nutritious' (P<0.001), 'not/less filling' (P<0.001), 'not/less healthy' (P<0.00), 'not/less beneficial for me' (P<0.001), 'not/less beneficial for the planet' (P<0.001). These patterns are not echoed across income category (results not shown), with the exception of those in the higher income category group, who were more likely to report a sustainable diet as 'more beneficial for me' (P<0.01), 'more beneficial for the planet' (P<0.01), 'more suitable for me' (P<0.05).

When asked what they perceive as the basis of a sustainable diet, almost half (48%) believed it is 'mostly plant-based' (males 45% n=529; females 50% n=656), a third (34%) believed it is 'neither animal- nor plant-based' (males 37% n=439; females 32% n=421), while 10% believed it is 'plant-based' (males 9% n=107; females 12% n=154). Only few considered the diet to be animal-based: 7% believed it is 'mostly animal-based' (males 8% n=93; females 5% n=72), while 1% of respondents believed it is 'animal-based' (Figure 8).

Figure 8: Proportion of respondents reporting their perception of what a sustainable diet is



Important purchase attributes

Respondents were asked to identify which characteristics of sustainable foods were important to them when purchasing foods. Using a five-point scale ranging from 'not important' to 'very important', 14 characteristics of sustainable diets were listed. Responses were collapsed into four groups: important (important/very important), neutral (neither/nor), less important (somewhat important) and not important. An overview of important purchase attributes can be seen in **Figures 9a and 9b.**

'Affordability' was most important to both males (82% n=969) and females (89% n=1171), followed by being 'easily accessible/widely available' (males 70% n=824); females (77% n=1014). It was also important for people that the food be 'nutritious and healthy' (males 70% n=826; females 75% n=989), have 'high animal welfare standards' (male 69% n=816; females 75% n=996), 'respect for worker's rights' (males 67% n=782; females 73% n=959) and be 'minimally processed' (males 67% n=789; females 70% n=926).

While most attributes were considered neutral, somewhat important or important, those attributes with the highest proportion of respondents for 'not important' included: 'produced in Northern Ireland or the UK' (males 24% n=278; females 19% n=250), 'organic' (males 15% n=180; females 14% n=18) and 'low environmental and climate impact (carbon footprint)' (males 12% n=138; females 9% n=118).

Figure 9a Important purchase attributes for sustainable foods as perceived by males

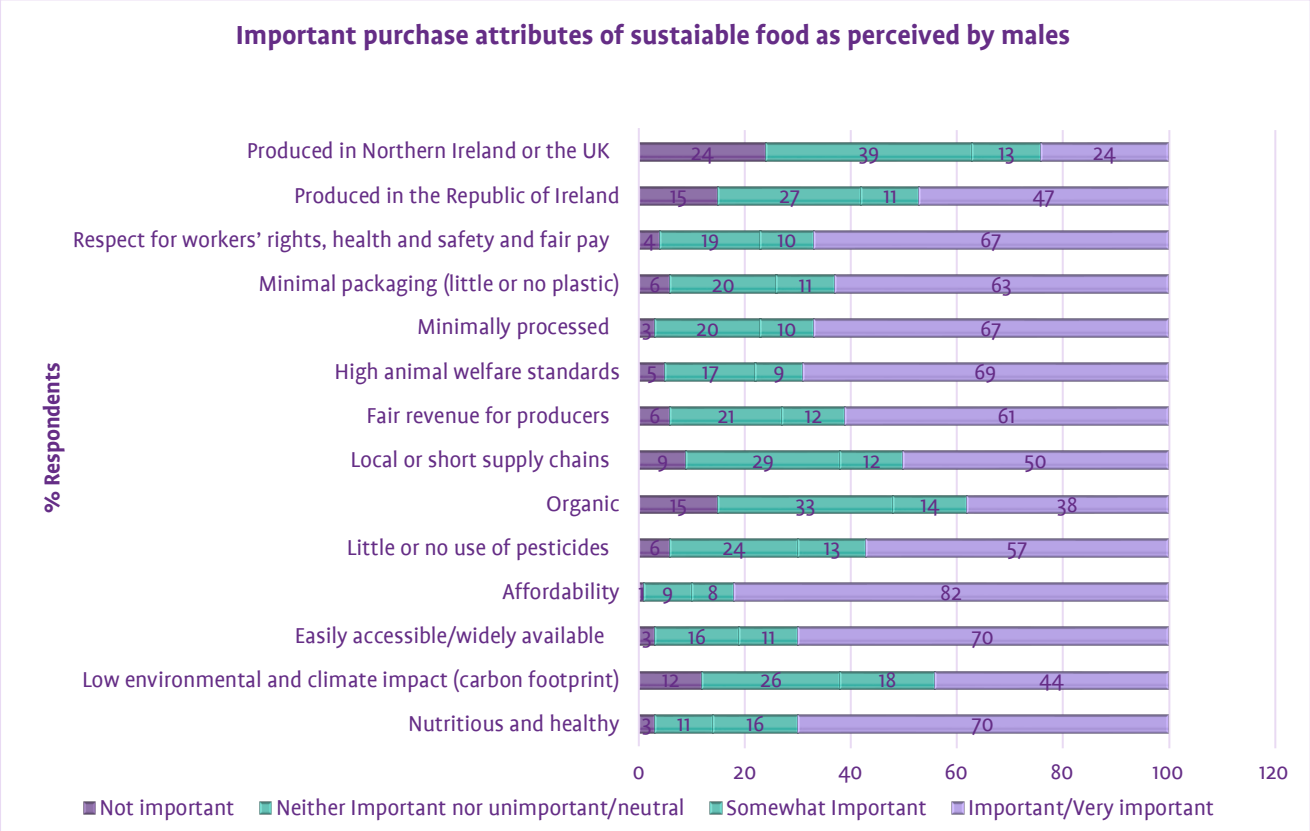
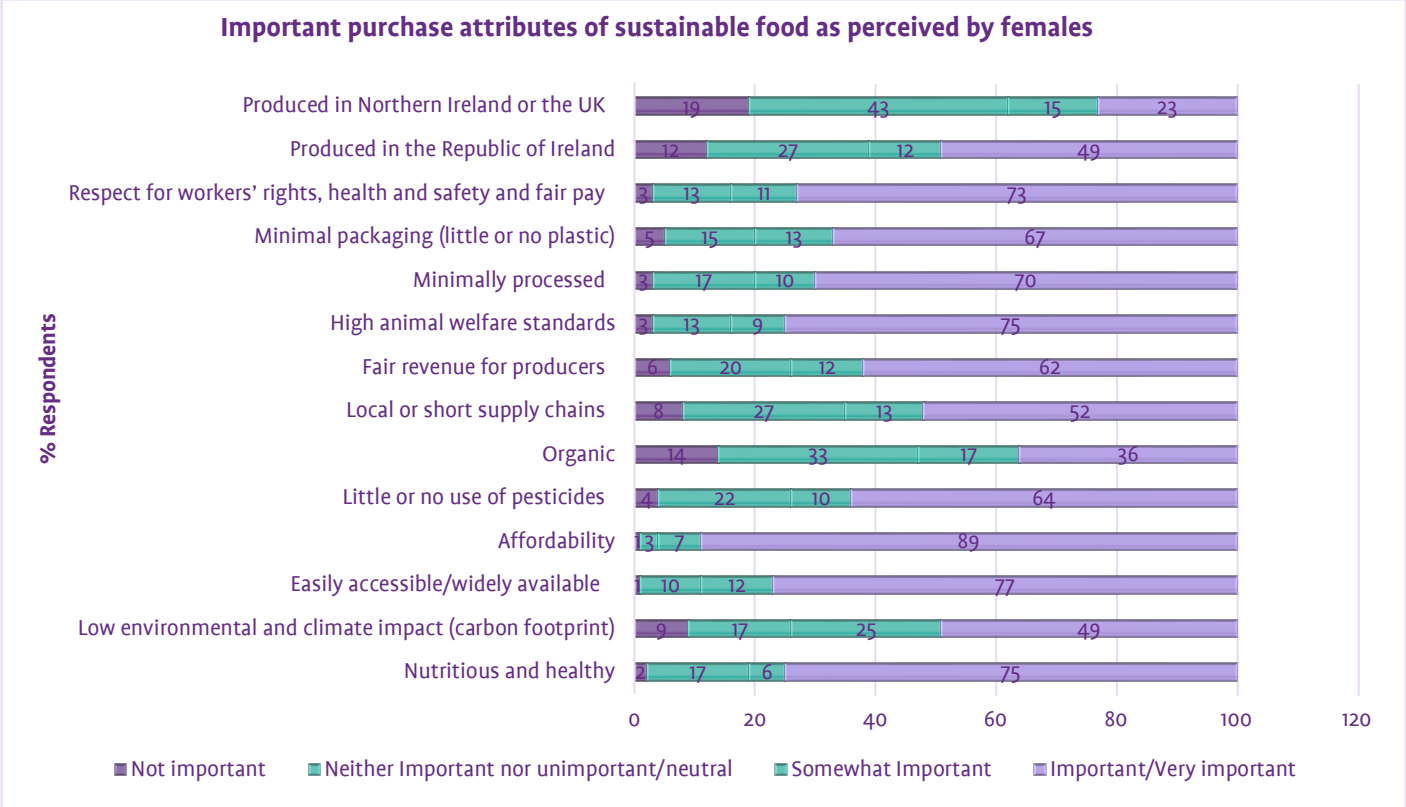


Figure 9b Important purchase attributes for sustainable foods as perceived by females



Exploring the attributes rated important/very important by education and income (Table 15), it is interesting to note that education more so than income appears to be significantly associated with rating attributes as important. Those with higher levels of education compared to those with lower levels of education were more likely to rate nutritious/healthy, environmental impact, affordability, organic, local supply chains, minimally processed and minimal packaging as important/very important sustainability attributes when purchasing food.

Table 15: Attributes perceived as important/very important by education and income group

	Education % (N)			Income Group % (N)			
	Primary/ Secondary	Further Education	Degree/ Postgraduate	<22,999	23-42,999	43-60,999	61,000+
Nutritious and healthy	62 (242)	71 (616)	78 (918)**	69 (500)	71 (577)	78 (275)	78 (266)**
Low environmental impact	40 (158)	45 (388)	50 (584)*	47 (337)	46 (369)	47 (166)	47 (160)
Easily accessible	67 (261)	74 (641)	76 (896)**	70 (510)	76 (619)	73 (257)	73 (247)
Affordable	81 (317)	85 (741)	88 (1033)*	85 (617)	87 (703)	84 (297)	85 (290)
Little or no use of pesticides	58 (225)	61 (527)	62 (735)	59 (426)	61 (497)	60 (212)	63 (215)
Organic	36 (139)	34 (295)	39 (456)**	34 (244)	37 (302)	39 (137)	40 (135)
Local or short supply chains	46 (180)	51 (443)	53 (625)*	48 (348)	54 (434)	52 (183)	54 (183)*
Fair revenue for producers	59 (229)	61 (533)	63 (742)	59 (423)	63 (509)	62 (220)	62 (211)
High animal welfare standards	70 (275)	71 (618)	74 (878)	72 (518)	73 (590)	73 (258)	72 (245)
Minimally processed	63 (246)	66 (572)	73 (863)**	65 (469)	70 (569)	74 (260)	72 (245)*
Minimal packaging	60 (236)	64 (558)	68 (807)**	62 (446)	66 (539)	70 (248)	67 (227)*
Respect for workers' rights	68 (268)	70 (610)	70 (821)	69 (500)	70 (565)	73 (256)	62 (212)
Produced in IE	38 (145)	51 (437)	50 (581)**	41 (290)	49 (393)	53 (188)	55 (185)**
Produced in NI/UK	25 (95)	24 (207)	23 (272)	27 (189)	25 (198)	25 (88)	19 (63)*

**P<0.001 *P<0.05

Behaviours and attitudes towards transitioning to more sustainable food behaviours

Respondents were asked about their attitudes towards making changes in their diet (**Figures 10a and 10b**). Behaviours in which the majority of respondents reported to be 'doing confidently most of the time' included 'eating more home-cooked meals' (males 59% n=684; females 70% n=913), and 'reducing food waste by purchasing less food and planning meals' (males 41% n=472; females 45% n=594). Lower proportions of respondents reported to be confidently 'eating more wholegrain food such as wholemeal or rye bread, brown rice, bulgur wheat, wholegrain pasta' (males 25% n=293; females 28% n=371), 'purchasing seasonal and locally produced fruits and vegetables' (males 28% n=331; females 26% n=340) and eating less discretionary food most of the time (males 30% n=348; females 37% n=485)

There were several sustainable dietary behaviours which respondents were *not interested in doing at the moment*, including 'Eating mostly plant-based proteins (lentils, beans, tofu, chickpeas)' (males 51% n=603; females 44% n=581), 'Eating less animal-based foods overall (meat and dairy)' (males 45% n=526; females 34% n=445), and 'Eating sustainably sourced seafood' (males 32% n=377; females 34% n=447). 'Reducing red and processed meat consumption' followed closely behind, with 37% of males (n=435) and 25% of females (n=335) reporting they were 'not interested in doing this at the moment'.

Figure 10a. Behaviours and attitudes towards dietary changes (males).

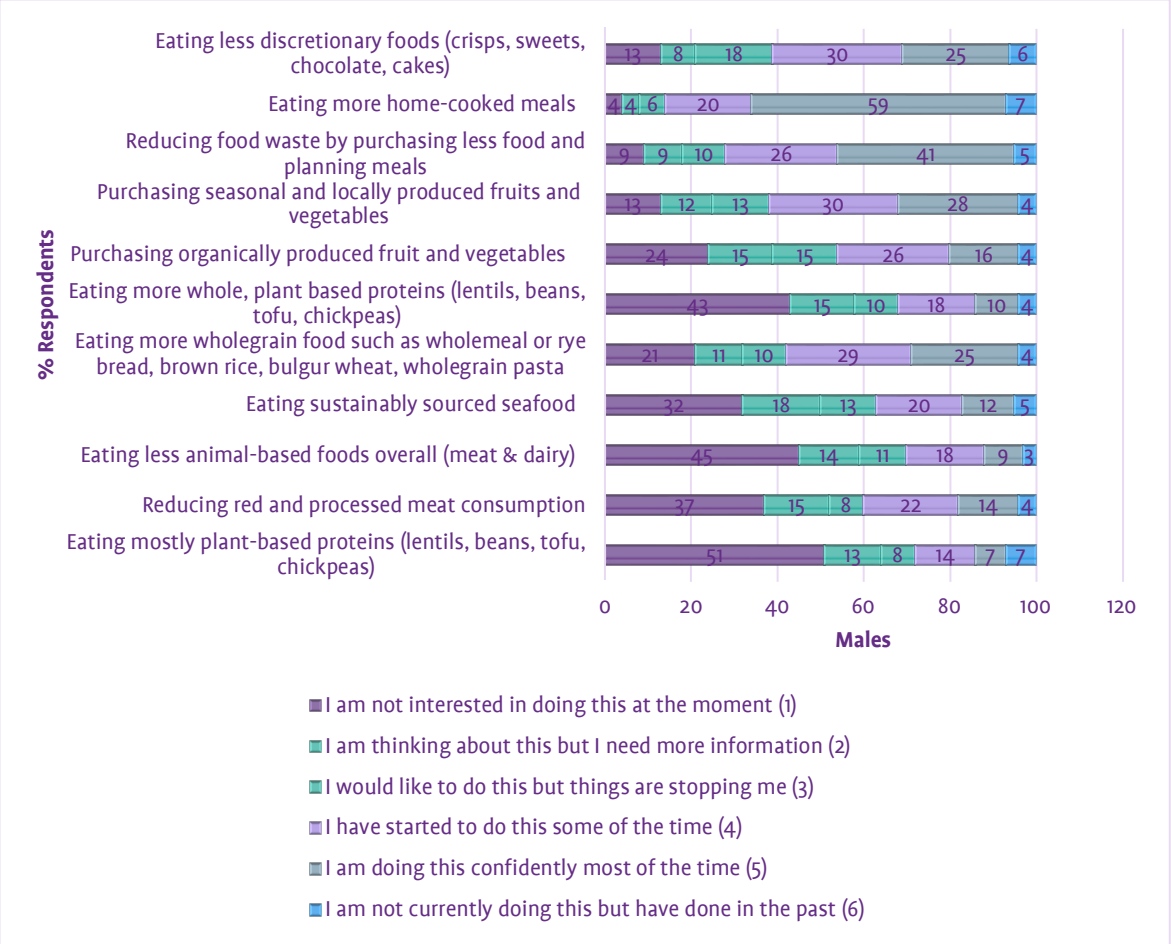
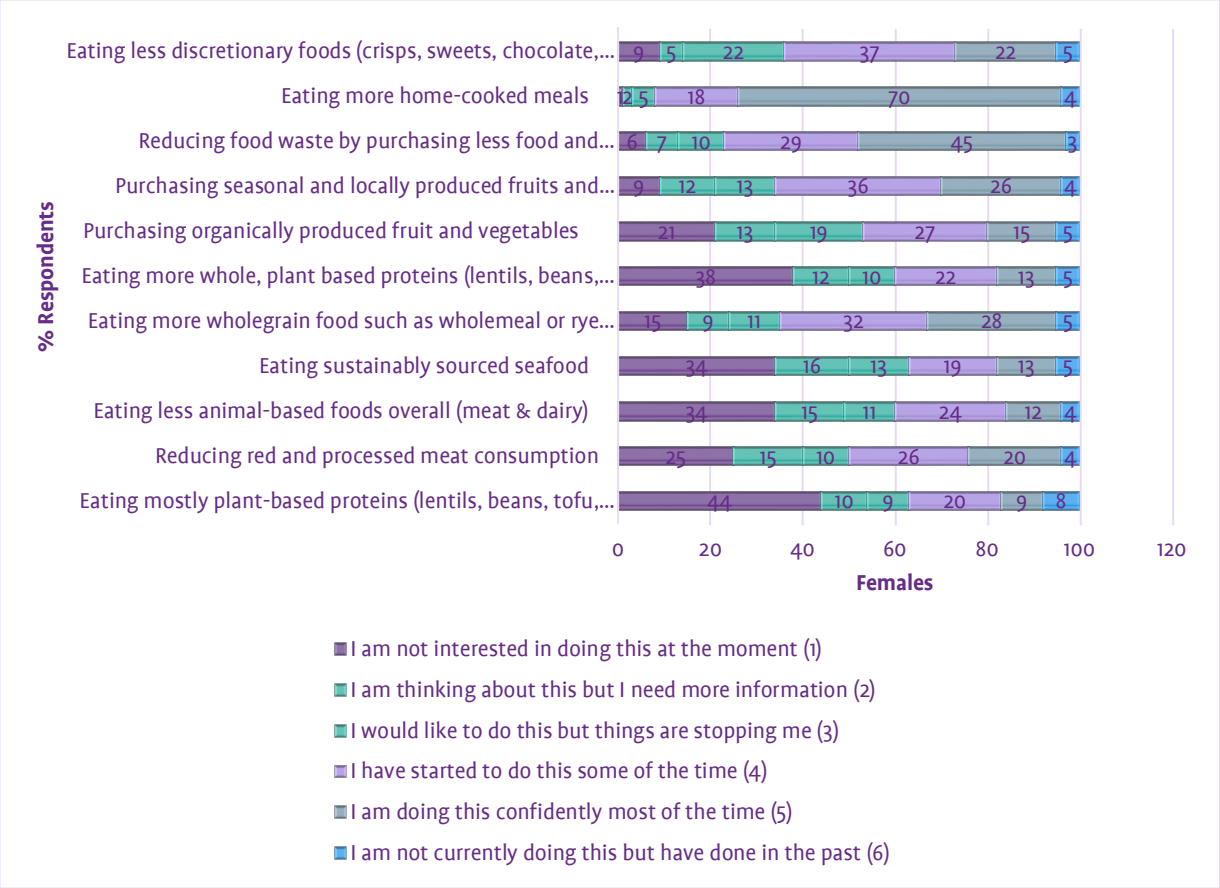


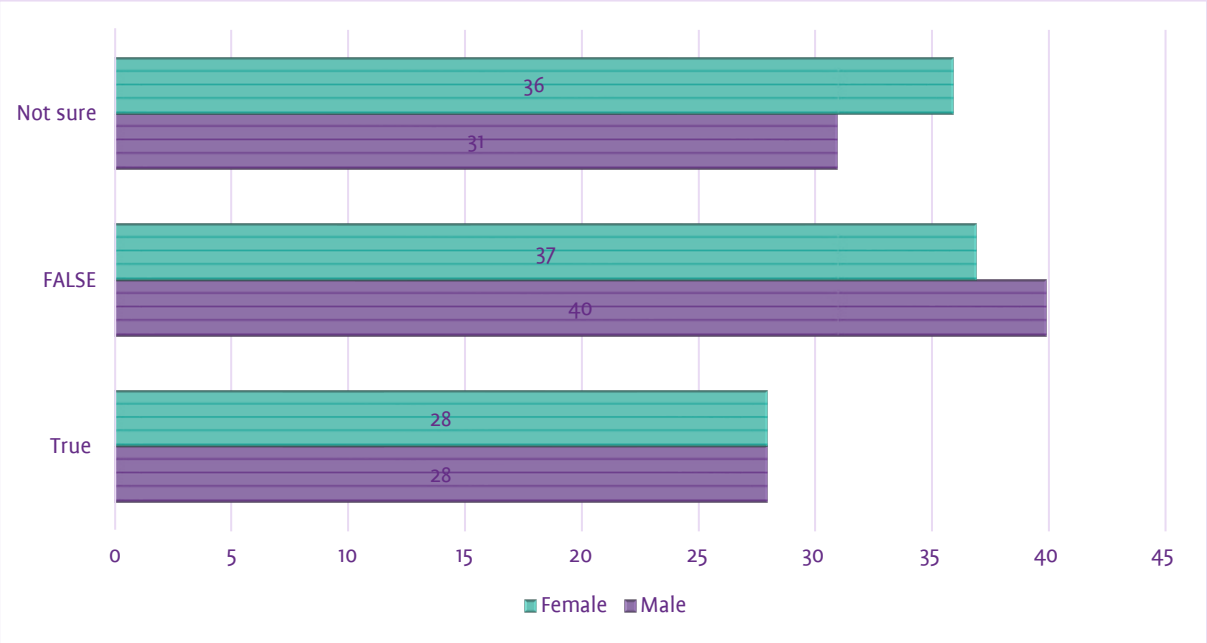
Figure 10b. Behaviours and attitudes towards dietary changes (females)


Eating less discretionary foods (crisps, sweets, chocolate,...
Eating more home-cooked meals
Reducing food waste by purchasing less food and...
Purchasing seasonal and locally produced fruits and...
Purchasing organically produced fruit and vegetables
Eating more whole, plant based proteins (lentils, beans,...
Eating more wholegrain food such as wholemeal or rye...
Eating sustainably sourced seafood
Eating less animal-based foods overall (meat & dairy)
Reducing red and processed meat consumption
Eating mostly plant-based proteins (lentils, beans, tofu,...
% Respondents
0
20
40
60
80
100
120
Females
I am not interested in doing this at the moment (1)
I am thinking about this but I need more information (2)
I would like to do this but things are stopping me (3)
I have started to do this some of the time (4)
I am doing this confidently most of the time (5)
I am not currently doing this but have done in the past (6)

Consumer knowledge of sustainable and healthy diets

As can be seen from **Figure 11,** only approximately one third of respondents (males and females, 28%) believed they had a good knowledge of sustainable diets; this aligns with a low environmental knowledge score (presented in the next section). A higher number of respondents responded that they did not have a good knowledge of sustainable diets (males 41% n=477; females 36% n=483), or that they were not sure (males 31% n=366; females 36% n=471).

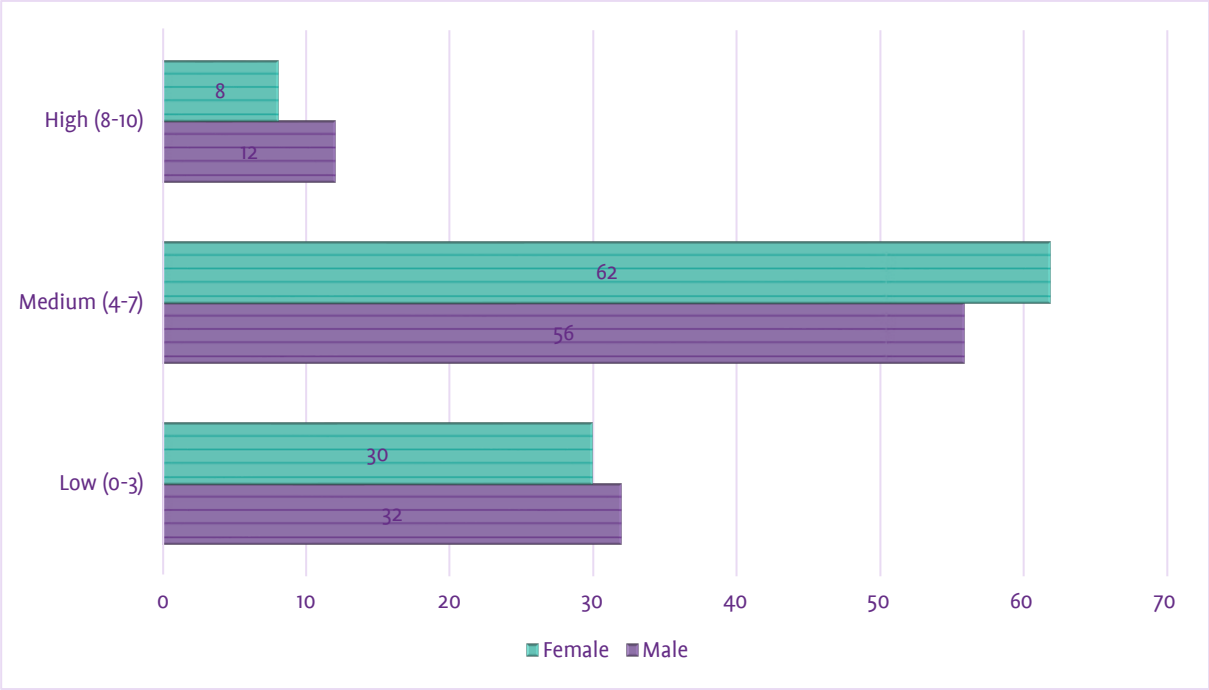
Figure 11: Respondents' response to the statement 'My knowledge of sustainable diet is good'



Environmental knowledge

Environmental knowledge was rated based on responses to 10 questions. This was subsequently categorised into low (0-3), medium (4-7) and high (8-10). Overall, one third of respondents (male 33% n=373; female 30% n=382) had a low environmental knowledge score, 60 per cent (male 56% n=641; female 62% n=800) had a medium score, and only one in ten respondents (male 12% n=133; female 8%, n=109) had a high environmental knowledge score (**Figure 12**).

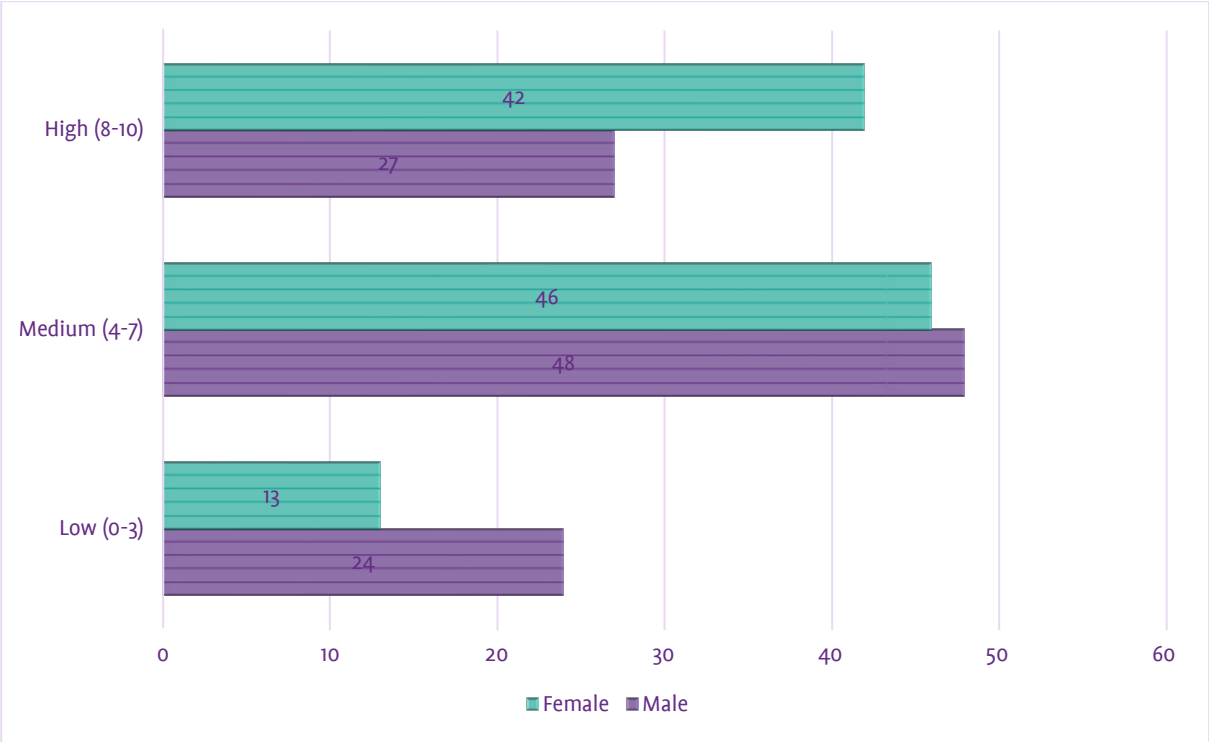
Figure 12: Respondents' environmental knowledge score



Health knowledge

Health knowledge was rated based on responses to nine questions. This was subsequently categorised into low 0-3), medium (4-6) and high (7-9). Just over one in three respondents were categorised in the 'high' health knowledge score category. More females (42% n=538) than males (24% n=281) had a high health knowledge score. Almost half of respondents scored in the 'medium' category (male 48% n=551, female 46% n=588), while less than one in five respondents (18% n=445) scored in the 'low' health knowledge category (male 24% n=281, female 13% n=164).

Figure 13: Respondents' health knowledge score



Overall knowledge of sustainable and healthy diets

Environmental knowledge scores and health knowledge scores were cross referenced (Table 15). A Spearman's correlation was run to assess the relationship between a health knowledge score and an environmental knowledge score. There was a moderate positive correlation between health and environmental knowledge which is statistically significant, $r_s=0.49$, $p=0.000$. As health knowledge score increases, environmental knowledge score is also likely to increase.

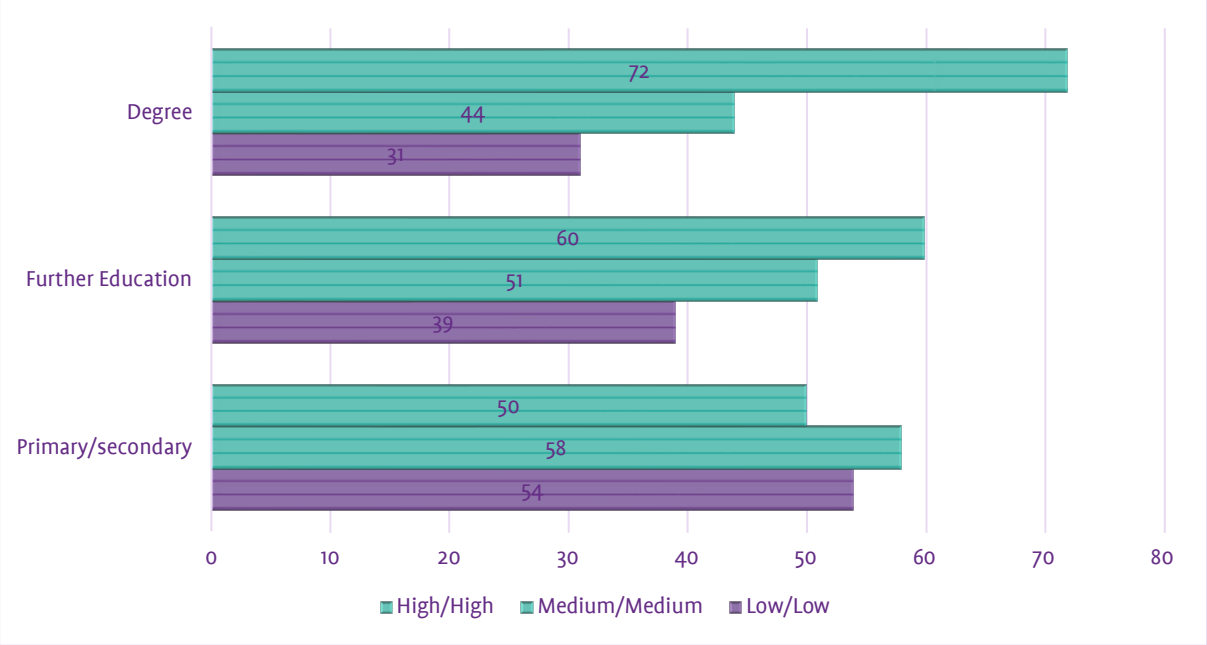
Overall, 6% of respondents (n=159) had both high environmental knowledge and high health knowledge scores, almost one third (29% n=702) had medium environment and medium health scores, while 12% (n=298) had both low environment and low health scores. A significantly higher proportion of females had 'high/high' scoring, while a higher proportion of males had a 'low/low' scoring.

Table 16 Cross reference of respondents' environmental knowledge and health knowledge scores

		Environmental Knowledge Score		
		0-3 Low % (N)	4-7 Medium % (N)	8-10 High % (N)
		MALES		
Health Knowledge Score	0-3 Low	50 (187)	13 (86)	6 (8)
	4-6 Medium	41 (153)	55 (350)	36 (48)
	7-9 High	9 (33)	32 (205)	58 (77)
		FEMALES		
	0-3 Low	29 (111)	6 (52)	<1(1)
	4-6 Medium	55 (210)	44 (352)	24 (26)
	7-9 High	16(60)	50 (396)	75 (82)
		TOTAL		
	0-3 Low	40 (298)	10 (138)	4 (9)
	4-6 Medium	48 (363)	49 (702)	31 (74)
	7-9 High	12 (93)	42 (601)	66 (159)

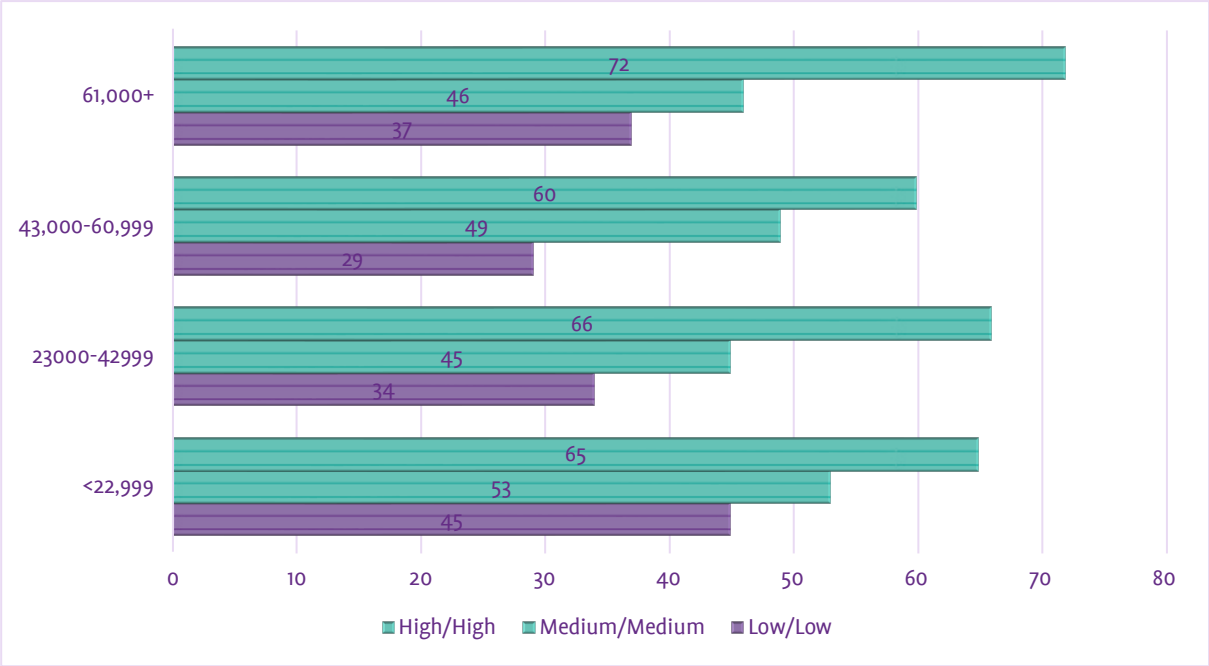
Comparing by education group (**Figure 14**), a higher proportion of those with primary/secondary education were in the 'low/low' category (54% n=87), while a higher proportion of those with a degree/higher degree were categorised into the 'high/high' category (72% n=97).

Figure 14: Classification of environmental and health knowledge score by education



Similarly, comparing across income groups (**Figure 15**), a significantly higher proportion of those in the higher income group were classified in the 'high/high' category compared to those in lower income groups.

Figure 15: Classification of environmental and health knowledge score by income group



Task 4. Expert Panel

Part 1. Policy review exercise: Incorporating sustainability into existing policies, prioritising actions and identifying policy gaps on the island of Ireland.

The purpose of the policy action review process was to identify actions within existing policies that could be strengthened and prioritised in the context of promoting and facilitating more sustainable diets on the island of Ireland. Many of the actions highlighted for strengthening and incorporating sustainability were actions focused on encouraging policy alignment, ensuring financial and physical access to more sustainable diets, further research that addresses knowledge gaps and existing inequalities, monitoring progress, diversifying food systems, and building agency and fairer food value chains, along with educating and creating greater awareness within the population across multiple levels of the food system.

The top priority actions, identified by the experts, that could facilitate more sustainable diets within each policy reviewed were:

- **Facilitating behavioural change through awareness and education:** 'Developing consecutive evidence-based communication strategies aimed at creating behaviour change, including the development of print, online and social media resources. The strategies should place a special emphasis on reducing inequalities. The strategy will bring a consistent approach with regards to information and messages across a number of sectors, including schools.' (Obesity Policy Action Plan, identified by six experts)
- **Building agency of young people**: 'Supporting and linking existing partnerships, strategies and initiatives that aim to improve the decision-making capacity of children and young people through strengthening self-esteem, resilience, responses to social and interpersonal pressure, health and media literacy, including social media literacy.' (Healthy Ireland Framework, identified by five experts)
- **Diversification and improving soil health**: 'Promoting increased use of leguminous crops to fix nitrogen in production systems.' (Climate Action Plan, identified by four experts)
- **Creating and implementing transparent action plans**: 'Producing detailed plans to manage the sustainable environmental footprint of the dairy and the beef sectors' (Climate Action Plan, identified by four experts)
- **Supporting farmer education, knowledge and awareness**: 'Upskilling farmers and advisors to ensure they have the knowledge and tools to implement climate

mitigation, biodiversity enhancement and adaptation practices.' (Climate Action Plan, identified by four experts)

- **Ensuring policy coherence**: 'Prioritising coherent food and health policies to deliver improved health outcomes'. (Food Vision 2030, identified by six experts)
- **Improving the social viability of food producers**: 'Improving the social sustainability of primary producers.' (Food Vision 2030, identified by six experts)

Primary barriers and opportunities to incorporating or strengthening sustainability within existing policies.

The experts identified several key barriers to incorporating or strengthening sustainability within the policies presented. These included the difficulty in retrofitting sustainability concerns after these policies have been devised (Expert 3), monitoring implementation and the lack of specificity within current policies (Experts 3 and 5), policy misalignment, a siloed approach to food, health and environment and in encouraging cross-departmental and government support and responsibility (Experts 3 and 8). The experts noted a general tendency within current policies to focus on 'industry-led … inputs and solutions', the lack of investment in supporting a resilient local food system (Expert 6), and low citizen engagement in policy processes (Experts 1 and 2).

The use of terms such as 'regenerative agriculture', and 'environmental sustainability', and statements concerning Ireland being 'world leaders in sustainable agriculture', were also highlighted as problematic in the context of Ireland's growing GHGe attributed to agriculture (Expert 4). Several experts drew attention to the lack of political will, ambition, and a general reluctance to address the need for a more sustainable Irish food system or to accept (Experts 4, 8, 9, 10 and 11) that 'significant changes are required in the farming landscape to achieve long-term sustainability objectives' (Expert 9). Heavy lobbying by the meat and dairy industry was also raised as a central challenge to be overcome if sustainability is to be incorporated or strengthened within these policies (Experts 10, 13 and 12), along with the need for cultural change to support the necessary dietary changes (Experts 10 and 12) and ensuring that more sustainable diets are financially accessible to all (Experts 1, 2 and 10).

The importance of having a clear definition of what sustainability means in the context of sustainable food-based dietary guidelines, while ensuring nutritional adequacy, was also raised in relation to the recommendation to limit dairy consumption in the context of Ireland being a dairy-producing country: 'We live in a country where dairy production is easy, [it's] understandable to limit dairy where … [it is] transported over thousands of miles' (Expert 1).

Practical actions to address some of the broad challenges were raised in terms of encouraging policy alignment and promoting a more diverse farming and food landscape. For instance,

one expert suggested the development of an overarching sustainable food policy framework (Expert 8), while another proposed that a percentage of all investments in agriculture could be ring-fenced for developing and supporting local food systems (Expert 6). Supporting alternatives to the mainstream farming systems by ensuring that access to finance is available to non-beef and dairy farmers, and updating the Green Cert training to include training on nature-based and organic farming methods, were also suggested (Expert 6). Developing 'widespread health promotion campaigns' focused on practical advice to enable people to eat less meat and more plant-based diets without compromising nutrition was also proposed as a first step in altering current food cultures (Expert 10). Including and appropriately weighing the views of young people on building sustainability and animal welfare into current food systems was raised as an important consideration, along with potential legal and constitutional opportunities to prioritise protecting the environment and the rights of future generations (Expert 14).

Additional policies where sustainability concerns could or should be incorporated, and final comments and observations

Several existing policies, not included in the policy review exercise, where sustainability could be incorporated, were also identified by the experts. These included school meals programs, Healthy Eating Guidelines, Community Health Initiatives, policies and actions related to food poverty, Public Procurement policies, Local Economic and Community Development Plans and the National Development Plan, along with the Cardiovascular Health Strategy, should it be updated and renewed. Additional areas highlighted for essential consideration were policies related to employment conditions, wages (e.g., a living wage), poverty, food and sustainability education (both students and educators) and the Social Personal and Health Education school programme more generally, along with policies influencing food provided in institutional settings (i.e., encouraging the procurement of local and organic foods).

The experts were also invited to submit any comments and observations. Two highlighted the limited / no mention of packaging within the policies explored (Experts 5 and 10). Carbon pricing (i.e., incorporating the carbon cost of production, packaging and transportation) was also noted as an absent but potentially important aspect of any strategy encouraging sustainable food systems and diets (Expert 8). One expert warned of the highly political nature of some guidelines: 'Be conscious that meat and dairy groups will describe the importance of these food for avoiding nutritional deficiencies … we need to keep the focus on the fact that chronic diseases like CVD/T2DM are highly prevalent in Ireland – we need to shape nutritional guidelines to prevent these, while diversifying food sources of key micronutrients' (Expert 10). On a similar note, another expert suggested that 'a major problem from the onset here is the assumption that meat and dairy are the best foods for nutrient density/provision – hence the intransigence in reducing meat and dairy

consumption ...' (Expert 13). Lastly, a final comment was in relation to the perceived acceptability of sustainability as a consumer concern: 'It is very hard to find someone who is not concerned about sustainability in the context of averting a climate crisis. The challenge is in how to channel this into effective action' (Expert 1).

Part 2: Expert survey: sustainable food systems and dietary guidance (island of Ireland)

The purpose of the survey was to elicit the views of a multi-disciplinary group on food-systems sustainability and sustainable dietary guidance. A total of 57 experts and professionals across Ireland participated in the survey. As illustrated in Table 17, the Northern Ireland sample had lower male participation, and representation from the 'other' disciplines/areas of expertise formed the largest cohort. However, this 'other' category in both samples represented a range of diverse experience and knowledge, including those with expertise in food policy, culinary practises, law, food journalism, sustainability, farming, biodiversity and food systems. In both samples, the majority of experts were familiar with the current national FBDG, and those with expertise in nutrition and public health were overrepresented in comparison to other areas of representation.

Table 2: Area of expertise, gender and familiarity with national FBDG (n=57)

		NI % (n)	IE % (n)	All-island (n)
Discipline/Representation	Nutritional Sciences	16 (5)	19 (5)	18 (10)
	Environmental Sciences	3 (1)	15 (4)	9 (5)
	Social Sciences	6.5 (2)	27 (7)	16 (9)
	Political Sciences	3 (1)	0	2 (1)
	Public Health Sciences[13]	10 (3)	8 (2)	9 (5)
	Economist	0	4 (1)	2 (1)
	Other NI[14] Other IE[15]	61 (26)	27 (7)	46 (26)
Gender	Male	19 (6)	46 (12)	32 (18)
	Female	81 (25)	54 (14)	68 (39)
Familiarity with national food-based dietary guidelines	Yes	58 (18)	65 (17)	61 (35)
	No	16 (5)	4 (1)	11 (6)
	Somewhat	26 (8)	31 (8)	28 (16)

Providing the experts with a definition of a sustainable food system as one that 'ensures food security and nutrition for all in such a way that economic, social and environmental bases to generate food security and nutrition of future generations are not compromised' (HLPE, 2020), a series of statements were presented, and level of agreement sought. As illustrated in Table 4, there is widespread agreement across the island of Ireland (IoI) that food systems, global and national, are not entirely sustainable. However, national food systems fared slightly better in comparison to global food systems. More than 85% of the total sample agree (strongly or somewhat) that more/better environmentally friendly farming practices are required; however, 13% of the Northern Ireland sample neither agreed nor disagreed with this statement compared to 0% in Ireland, and two experts (8%) in IE strongly disagreed with this statement.

Roughly a quarter of experts 'strongly agreed' that the national farming systems need to align more/better with the health and nutritional needs of its population and over 60% of

[13] Public health dietician, public health policy, public health medicine, public health specialist recoded to public health scientist.

[14] Other disciplines/representation included: 'culinary officer', 'food policy specialist', and 'food policy', 'sustainability scientist', 'research associate', 'engagement officer, academic, ENGO employee with special interest in food systems and biodiversity', 'food NGO worker', 'farmer'.

[15] Other disciplines included: 'Law', 'journalist', and 'food policy researcher on agri-food'.

participants strongly agreed that sustainability recommendations should be included in national FBDG (Table 18). However, it is worth noting that the inclusion of sustainability within FBDG received slightly more support in the Northern Ireland context, with all participants somewhat or strongly agreeing with the inclusion of sustainability within dietary guidelines.

Table 3: View on global and national food systems and including sustainability within dietary guidelines

island of Ireland (n=57)	Strongly agree % (n)	Somewhat agree % (n)	Neither agree nor disagree % (n)	Somewhat disagree % (n)	Strongly disagree % (n)
The world's food system(s) is sustainable	4 (2)	4 (2)	2 (1)	26 (15)	65 (37)
Current national food systems are sustainable	0	9 (5)	7 (4)	39 (22)	46 (26)
The IoI needs to adopt more/better environmentally friendly farming practices	53 (30)	37 (21)	7 (4)	0	4 (2)
The IoI farming systems need to align more/better with the health and nutritional needs of its population	26 (14)	60 (34)	11 (6)	4 (2)	2 (1)
Sustainability recommendations should be included in food-based dietary guidelines on the IoI	63 (36)	32 (18)	4 (2)	0	2 (1)

Table 19 below offers an overview of opinions as to which guidelines should be included in national food-based dietary recommendations, along with the degree of importance and

difficulty in including such guidance. For illustrative purposes, the various colours indicate levels of agreement importance and challenge[16] associated with each proposed recommendation.

Across the island of Ireland, the guidelines concerning limiting foods high in salt, sugar and fat (91%), reducing processed meat consumption (84%), limiting the consumption of ultra-processed foods (UPF) (82%), promoting dietary diversity (81%) and reducing food waste by planning meals and purchasing less (79%), received high levels of agreement. However, the levels of support did vary by jurisdiction. For instance, in Ireland there were slightly higher levels of support for reducing processed meat consumption (92% in IE versus 77% in NI), whereas in Northern Ireland limiting the consumption of ultra-processed food received slightly more support (90% in NI versus 73% in IE). The inclusion of breastfeeding promotion as the cornerstone of sustainable diets also received a higher level of agreement in Ireland (77% versus 61%), as did the recommendation to limit/reduce red meat consumption (65% versus 52%). It is also worth noting that while the promotion of plant-based, whole food diets received a lower level of strong agreement across both jurisdictions (51%), this guideline was identified as very/extremely important to include in FBDG by 70 per cent of the total sample. Similarly, the inclusion of standards for the ethical treatment of animals also received a lower level of strong agreement (56%) but was identified as very/extremely important to include within sustainable FBDG by 73 per cent of the sample.

All guidelines with high levels of agreement were also identified as very or extremely important to include. Additional guidelines considered very important to include by the majority were the recommendation to support local (75%) and seasonal foods (80%) and reducing red meat consumption (75%). Therefore, while experts expressed lower levels of agreement for including these latter guidelines, their importance is still recognised by the majority. It is also worth noting that in both categories (agreement and importance), support for the recommendation to limit/reduce both red and processed meat consumption was higher in Ireland compared to Northern Ireland, and both jurisdictions indicated very low levels of support for recommendations promoting organic food and limiting dairy consumption (Table 19).

In Ireland, the only guidelines highlighted as particularly challenging by the majority were the recommendation to limit dairy production (76%) and, although to a lesser extent, the

16

High: 75%+	Medium: 60-74%	Low: 40-59%	Very low: 0-39%

promotion of plant-based whole food diets (60%). However, the restriction/reduction of processed meat consumption and UPF consumption was also highlighted as very/extremely challenging by more than 50 per cent of the experts. Although no single recommendation had high levels of agreement (>75% agreement) in Northern Ireland, certain aspects were considered very/extremely challenging to include in future FBDG: 45% agreed that limiting dairy product consumption, and 42% agreed that limiting/reducing processed meat consumption, were very/extremely challenging.

Table 4: Expert opinions on what should be included in dietary recommendations, what they consider to be important to include, and what would be challenging to include

iIsland of Ireland (n=57)	Strong agreement to include % (n)			Importance (very/extremely) to include % (n)			Challenging (very/extremely) to include % (n)		
	NI	IE	AI	NI	IE	AI	NI	IE	AI
Promotion of diet diversity/variety of whole foods	81 (25)	81 (21)	81 (46)	84 (26)	92 (24)	88 (50)	19 (6)	20 (5)	20 (11)
Promotion of breastfeeding as a cornerstone of sustainable diets	61 (19)	77 (20)	68 (39)	61 (19)	96 (24)	77 (43)	13 (4)	16 (4)	14 (8)
To purchase and support seasonal food	71 (39)	65 (17)	68 (39)	84 (26)	76 (19)	80 (45)	23 (7)	24 (6)	23 (13)
Promotion of lifestyle behaviours (for example, physical activity)	77 (24)	58 (15)	68 (39)	77 (24)	76 (19)	77 (43)	10 (3)	8 (2)	9 (5)
Promotion of plant-based, whole food diets	51 (16)	50 (13)	51 (29)	64.5 (20)	77 (20)	70 (40)	23 (7)	60 (15)	39 (22)
To purchase and support local food	68 (21)	42 (11)	56 (32)	77 (24)	72 (18)	75 (42)	12.9 (4)	24 (6)	18 (11)
Promotion of sustainable seafood consumption	64.5 (20)	42 (11)	54 (31)	61 (19)	73 (19)	67 (38)	25.8 (8)	36 (9)	30 (17)
To purchase and support organic food	38 (12)	15 (4)	28 (16)	55 (17)	46 (12)	51 (29)	39 (12)	44 (11)	41 (23)
To limit/reduce processed meat consumption	77 (24)	92 (24)	84 (48)	81 (25)	100 (26)	89 (51)	42 (13)	52 (13)	46.5 (26)
To limit/reduce foods high in fat, salt and sugar	97 (30)	85 (22)	91 (52)	90 (28)	92.3 (24)	91 (52)	23 (7)	28 (7)	25 (14)
To limit the consumption of ultra-processed foods	90 (28)	73 (19)	82 (47)	90 (28)	88.5 (23)	89 (51)	26 (8)	52 (13)	37.5 (21)
To reduce food waste by planning meals and purchasing less	87 (27)	69 (18)	79 (45)	77 (24)	84 (21)	80 (45)	10 (3)	24 (6)	16 (9)
To limit/reduce red meat consumption	52 (16)	65 (17)	58 (33)	71 (22)	81 (21)	75 (43)	39 (12)	48 (12)	43 (24)
To limit the consumption of dairy products	26 (8)	23 (6)	25 (14)	45 (14)	42 (11)	44 (25)	45 (14)	76 (19)	59 (33)
Standards for ethical treatment of livestock	64.5 (20)	46 (12)	56 (32)	77 (41)	68 (17)	73 (41)	32 (10)	32 (8)	32 (18)

Colour Key:

High: 75%+	Medium: 60-74%	Low: 40-59%	Very low: 0-39%

Barriers to integrating sustainability within FBDGs in Ireland

In the IE, several barriers to incorporating the more challenging recommendations within the set of guidelines provided were highlighted. This was an open question within the survey and for the purpose of reporting, these barriers were organised into five overarching barriers: (1) commercial interests, (2) lack of political will, the 'business as usual' approach and policy incoherence, (3) concentration of power within the retail and processing sectors, (4) people and the food environment, and (5) communication (Figure 3).

Commercial interests within the meat and dairy sector, including vested interests and political opposition from these sectors specifically, were highlighted by the majority of experts (n=11) as a primary barrier to integrating the more challenging recommendations. Lack

of political will, policy incoherence, concentrations of power within the retail sector, physical food environments, lack of knowledge and awareness, the costs associated dietary change, and the cultural aspects of current diets were also noted as primary barriers within in the Ireland context (Figure 3).

With regards to the integration of sustainability concerns within FBDG more generally, three similar themes were identified: (1) commercial interests, power imbalances and policy incoherence; (2) communication and data; and (3) people (factors affecting people's agency). However, the communication and data barriers were specific to building and translating the evidence into actionable, specific and clear guidelines, along with perceived disagreements on both the definition of UPF and the literature supporting a reduction in UPF consumption. A further general barrier identified, better described as a prerequisite for ensuring more sustainable diets, was ensuring equitable access. Figures 16 and 17 below present an overview of the aforementioned challenges noted by the experts in Ireland. The larger circles represent the broader challenges (by theme/overarching barrier) and the smaller circles depict specific barriers.

Figure 16: Barriers to integrating the more challenging recommendations into IE FBDG

Figure 17: General barriers to incorporating sustainability concerns within FBDG in IE

Barriers to integrating sustainability within FBDGs in Northern Ireland

In Northern Ireland, some experts did not perceive any challenge with the inclusion of these general recommendations (n=3), with one expert asserting that 'these recommendations are not challenging, reflect the FAO guidelines, and should be implemented as soon as possible.' However, the majority pointed to various barriers within the food system. In contrast to Ireland, the majority of barriers raised, regarding the more challenging recommendations (Figure 18) and general integration of sustainability concerns with Northern Ireland's FBDGs (Figure 19), were at the citizen level. For example, affordability issues, current food practices and perceptions, education, and cooking skills were noted by several experts. Others pointed to the difficulties in reaching certain population cohorts and questioned the applicability of some of the recommendations in the context of food-based dietary guidelines. Within the realm of policy and economic systems, barriers were noted regarding implementation, infrastructure supporting alternative production methods, access to local and seasonal food, and food being treated as a commodity rather than a human right. The physical food environment was identified as problematic, along with the strong influence of, and 'resistance' to change in, the meat and dairy industry. The idea that reducing or limiting animal-based food in diets would harm farmers was also highlighted as a barrier.

It should also be noted that the value of promoting breastfeeding as the cornerstone of sustainable diets, the promotion of local and seasonal foods, and the treatment of animals within general FBDG, was questioned, and was suggested as possibly confusing and distracting from the 'key nutritional messages'.

Similar concerns were raised by the experts when asked about the largest barrier to integrating sustainability into Northern Ireland's FBDG in more general terms (Figure 6). The issues of affordability, existing dietary inequalities, attitudes, 'prevalence, promotion, and price of unhealthy processed food', vested interests, greenwashing and policy misalignment were noted as problematic.

Figures 18 and 19 below present an overview of the aforementioned challenges noted by the experts in Northern Ireland. The larger circles represent the broader challenges (by theme/overarching barrier) and the smaller circles depict specific barriers.

Figure 18: Barriers to integrating the more challenging recommendations into the NI FBDG

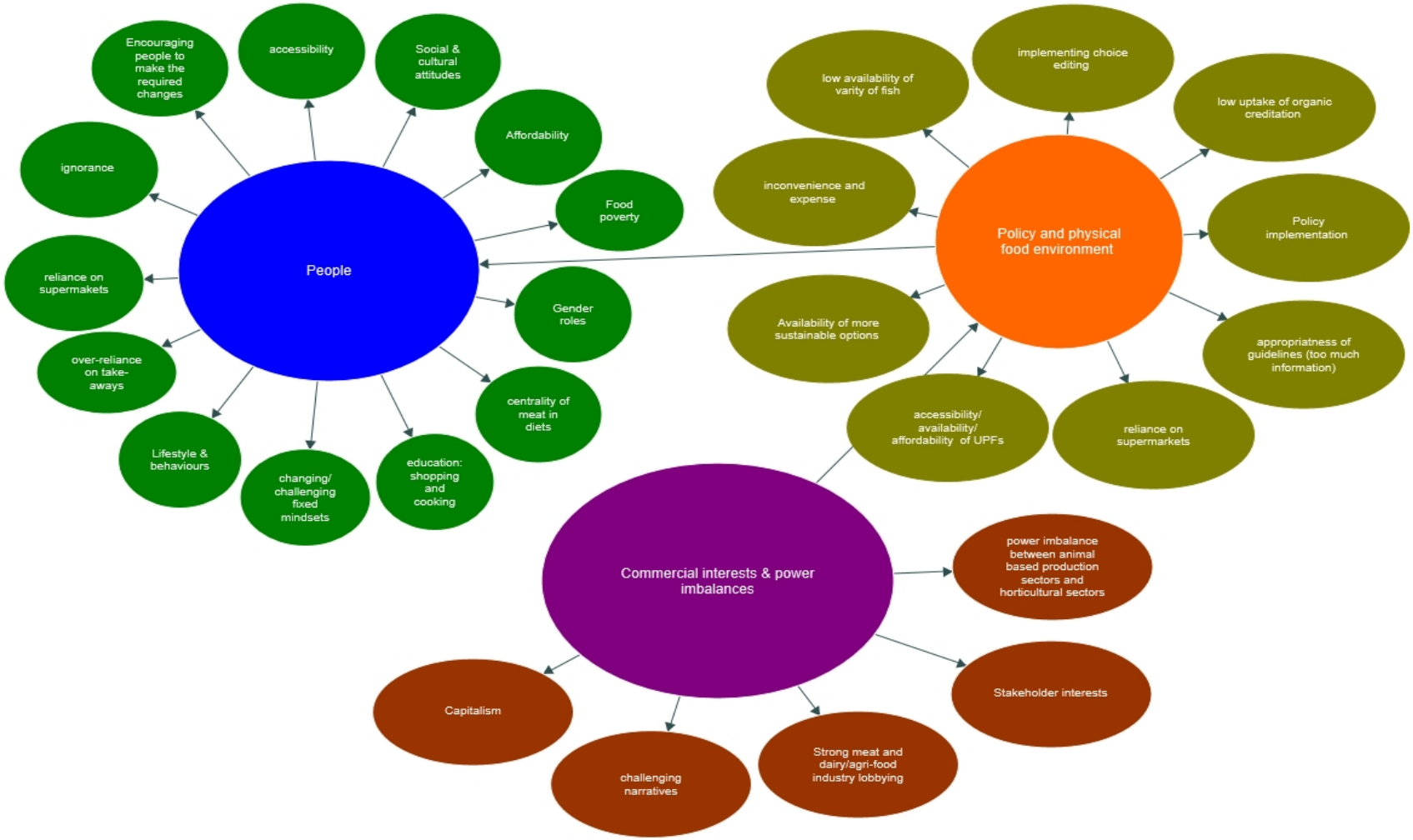
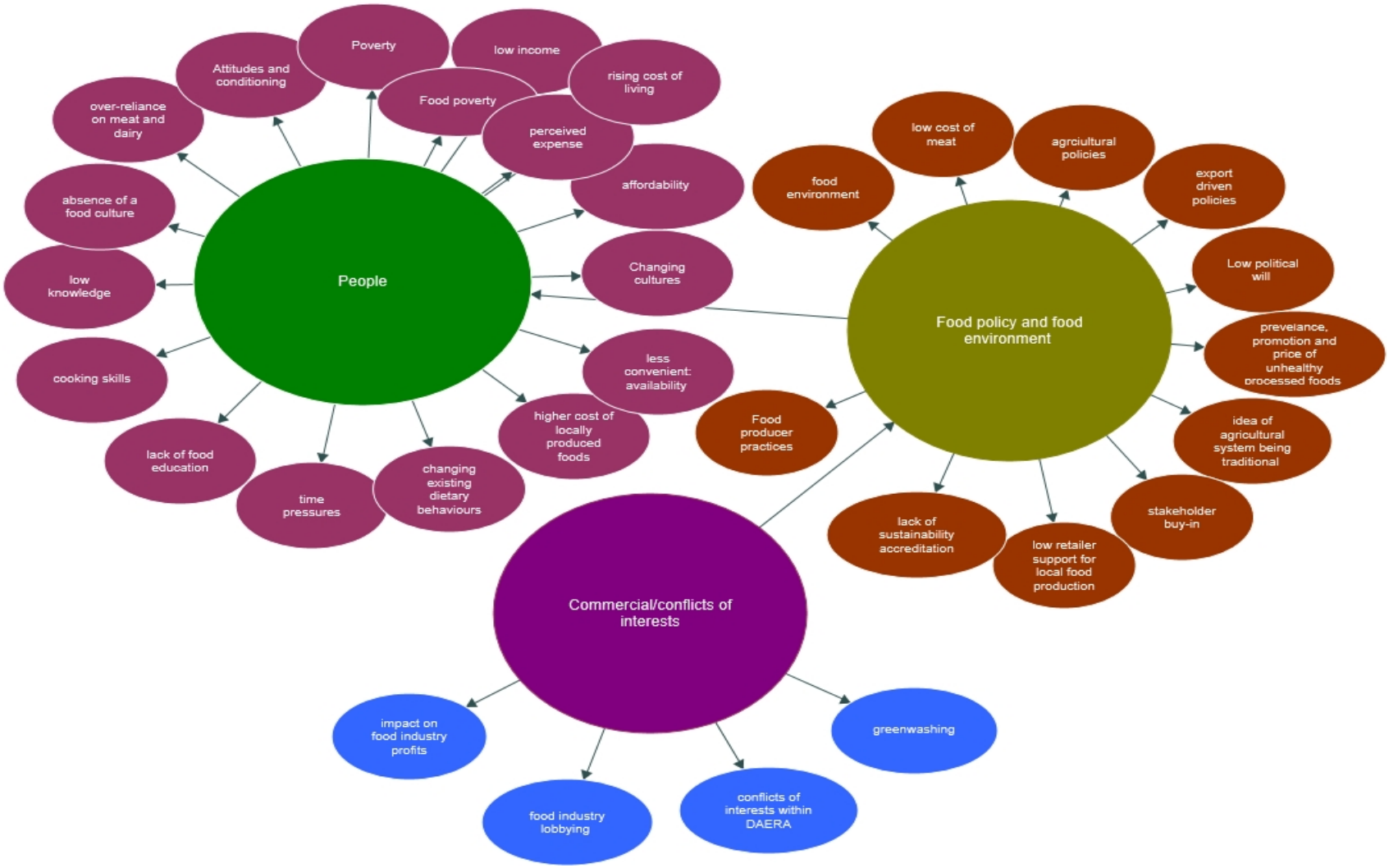


Figure 19: General barriers to incorporating sustainability concerns within FBDG in the NI



All-island: Additional considerations missing from the proposed recommendations

The survey also asked the experts if anything was missing from the guidance presented that they considered to be important. In Ireland, experts put forward several considerations, such as the need to consider employment conditions within the food sector, along with broader ethical considerations for food workers across the food system. The incorporation of the impacts of food production and diets on biodiversity, along with consideration of inputs, were also considered important. In the Northern Irish context, broader concerns affecting the wider economy, such as the impact of Brexit, the illegal invasion of Ukraine and the ongoing food, fuel and feed crisis, were raised, as was closing the gap for lower income consumers through subsidised purchasing, promotion of food skills, and ensuring food availability and affordability. The promotion of nature-friendly farming practices that enhance biodiversity was also noted as a missing and important consideration to capture within the FBDG.

Additional Ireland-specific considerations focussed on particular communication points and the language used within guidance. For example, 'sustainable lifestyles' was found to be too amorphous; thus communicating the climate emergency as an explicit driving force of dietary change was suggested. Others highlighted how alternative sources of protein should be promoted in addition to specific recommendations to reduce snacking between meals, along with the promotion of growing vegetables and fruits at home. Experts in Northern Ireland also proposed several specific considerations, such as the promotion of smaller portions, the financial and health co-benefits of cooking from scratch, and reducing alcohol consumption. The recommendation to promote breastfeeding as the cornerstone of a sustainable diet was highlighted as problematic by one expert, who believed that 'there is enough of a push through health and adding it … will add more pressure on new mums' (NI expert), whereas another expert suggested broadening the focus of this particular recommendation to include a focus on maternal health in the context of the first 1000 days. Although not in response to this question, the phrasing around breastfeeding guidance was also raised in the Ireland context in relation to barriers to integrating the more challenging recommendations (Figure 2). This expert highlighted that 'While … breastfeeding goes hand-in-hand with the reduction of ultra-processed foods, I am not sure the phrasing here is correct. Not all mothers can breastfeed, I think the phrasing should take this into account' (IE expert).

Northern Ireland policies where sustainability should be incorporated

As a brief reminder, the question concerning additional policies where sustainability could be considered was only included in the survey because this question was asked in the IE context in the policy review exercise (Part 1).

The NI experts noted a range of policies, within their area of work and expertise, where sustainability could or should be incorporated (Table 20). However, as one expert highlighted: 'if affordability is not addressed, lower income populations will be left behind'. Several experts noted and welcomed the draft Northern Ireland Food Strategy Framework (FSF) as a positive development but raised concerns about executing the ideas and plans within the draft. In relation to the FSF, it was suggested that the recommendation to develop an industry-led sustainability body needs to be broadened to also include environmental NGOs within the design of this proposed body. The importance of visible commitments from multiple stakeholders beyond citizens was also noted:

> "consumers will need to see industry, producers, farmers and retailers do more to secure a more sustainable food system" – Expert

Table 5: Northern Irish policies where sustainability could be incorporated, according to the experts

NI policies where sustainability could or should be incorporated, according to the experts
Future Agricultural Policy Framework
NI Food Strategy Framework
Labour policies (fair wages for workers in agri-food system)
School Food Policy
Public Procurement policies
Obesity Strategy (A Fitter Future for All)
Food education within schools
Local authority and company reporting
Land use policy
Agricultural policy
Nutritional standards for public sector
Inclusion of food, farming and land use in local authority climate emergency plans
Climate change legislation
Green Growth Strategy

Part 3: Online Expert Workshop Panel Discussion

As explained earlier, Northern Ireland has already developed a Food Strategy Framework to work towards building a more sustainable food environment. Given that this was in the final stages of approval, in addition to key policies being currently updated, the decision was made by the research team to host an online workshop in Ireland only.

Subsequent to the Ireland policy action review process and the short survey, 14 experts attended a two-hour workshop on April 29th to focus on exploring the barriers to incorporating sustainability concerns within Ireland's FBDG, with the goal of identifying practical steps to address these challenges. For the most part, the discussion mirrored the points raised in the work completed by the experts (survey and policy action review) prior to attending the workshop (Parts 1 and 2 of this report).

In summary, the various challenges raised by the experts during this workshop can be summed up by five key actions/goals.

1) Ensuring policy coherence and shared responsibility across multiple sectors.
2) Promoting plant-based diets as the norm rather than the exception.
3) Redefining people's relationship with food, encouraging sustainable food literacy and developing further collaboration between research and practice.
4) Addressing vested interests and counteracting industry narratives.
5) Addressing inaccuracies presented within policy and media frameworks.

Based on the challenges identified by the experts, we (the research team) suggest several policy actions to address these challenges. These are outlined in Table 21 below:

A detailed summary of the workshop discussion can be found in the Expert Panel Report[17].

Table 21 provides an **overview of the considerations** raised by the experts, along with practical approaches to assist the transition for a population wide shift towards more sustainable diets.

Table 6: Policy priorities and practical approaches to address the shortcomings as identified by the expert panel

Ensuring policy coherence and shared responsibility across multiple sectors
Coherence across all policies and shared responsibility.
Promotion of a reduction in animal-based foods and the alignment of state bodies with more plant-based diets.
Communication centred on substitution and replacement to ensure consumers understand that the increase in plant-based foods needs to be coupled with a decrease in animal-based food consumption.
Benchmarking Ireland's progress with countries, such as Denmark, that have a similar agri-food system structure.
Expanding access to markets by strengthening alternative access to short value chains for food producers such as farmers markets.
Fiscal policy is essential for ensuring equitable access to sustainable and healthy foods by ensuring lower income families can access more sustainable diets.
Ensuring the retail food environment is considered and targeted in all policies aimed at promoting a more sustainable diet.
Making plant-based diets the norm rather than the exception: increasing exposure to more sustainable plant-based choices
Promoting plant-based diets as diets for everyone and ensuring these diets are accessible to everyone.
Simple and consistent messaging supported by all government departments.
Recognising public procurement as central to dietary shift.

[17] Kenny T, O'Mahony L, Harrington JM. 2022. Building Sustainability into National Healthy Eating Guidelines and Practical Implications for Policy: a multidisciplinary approach to identifying barriers and opportunities. Expert Panel Discussion Workshop

Restructuring the School Meals Scheme to enable schools to purchase ingredients and to prepare meals and snacks onsite.
Funding available for facilities (working kitchens) within schools to enable schools to prepare meals onsite.
Using the School Meals Scheme to educate school children about the relationship between people, food and the environment.
Redefining people's relationship with food, encouraging sustainable food literacy and further collaboration between research and practice
Sustainable dietary education across multiple levels – government, media, academics and general public.
Stronger collaboration between academic research and practice, and further emphasis on how food reinforces poverty rather than using poverty as a reason for inaction.
Moving away from 'consumer' and 'consumption' language.
Sustainable dietary education across multiple levels – government, media and people.
Employing both emotive and rational messaging to appeal to various populations.
Addressing vested interests and counteracting industry narratives
Devising a symbol to distinguish between independent sources of health and environmental information from industry-funded sources.
Protective measures to limit conflicts of interests within academic research and to ensure greater transparency.
Stronger academic advocacy and leadership to counteract to industry narratives.
Research exploring the degree to which animal-based dietary patterns are promoted via the school setting and in the education of health professionals.
Addressing inaccuracies presented within media frameworks
Addressing the inaccuracies presented in the narrative of rural Ireland being a community of farmers all benefiting from the current system.
Delivering an accurate representation of Ireland's reliance on global inputs (i.e., imported animal feed and fertilizers) to maintain current levels meat and dairy production.
Delivering an accurate representation of the social, ecological and health costs of food from seed to soil. Monetising the internal and external costs borne by taxpayers for the purpose of creating awareness of the true cost of food.
Emphasising the urgency of climate change and the role of agriculture within the required transition.

Task 5. Consumer Focus Groups

Sample description

A final sample of 40 adults aged between 18-65 years took part in the focus group discussions. More participants were resident in Ireland (n=28; 70%) than in Northern Ireland (n=12; 30%), as expected and reflective of the distribution of focus groups held e.g., five in Ireland and two in Northern Ireland. (Table 22). Despite best efforts to obtain equal gender representation and age distribution, difficulties in recruiting for the lower social economic focus groups resulted in slightly more females (n=23; 57.5%) than males, (n=17; 42.5%), and a lower representation of those living in rural communities and aged between 18-29 years. Most participants were aged 30 to 49 years old (n=18; 45%), or 50-65 (n=15; 37.5%), and resided in urban areas (n=26; 65%) rather than rural (n=14; 35%). Most had upper secondary level education (n=16; 41%), or a bachelor's degree (n=13; 33.3%) and reported their occupation in the last 12 months as government or non-government employees (n=20; 51.3%). Five participants were unemployed (12.8%), others were homemakers (n=4; 10.3%), carers or retired (each n=3; 7.7%), self-employed or students (each n=2; 5.1%). Nearly all participants were living with other people (n=32; 82%). Twenty-two participants did not live with any children under the age of 18 (56.4%), while others lived with one or two children (n=11; 28.2%), three or four children (n=4; 10.3%), or more than five (n=2; 5.1%).

Of those who participated in the lower SES groups (Cork Suburb, Dublin City; West Belfast) (n=16), there were mixed levels of education, with most having completed upper secondary level. Three had no formal education or training, and two had completed bachelor's degrees. There were more females (n=11) than males (n=5), and middle-aged (30-49 years, n=9; 50-65, n=7). There were a variety of occupation statuses, with three stating they were employed. The remainder were a homemaker (n=4), unemployed (n=4) a carer (n=2) or retired (n=2). Several participants in the lower SES groups had participated previously in food-related education programmes such as cooking skills, meal planning and budgeting, or community gardens (n=11).

During focus group discussions, four female participants described themselves as being vegetarian. (Clonmel n=1; Drogheda n=1; Cork n=2).

Table 22. Socio-demographic characteristics (n=40)

Variable	Category	Number of participants	Percentage of sample (%)
Age	18-29	7	17.5

	30-49	18	45.0
	50-65	15	37.5
Gender	Male	17	42.5
	Female	23	57.5
General area of residence*	Urban	26	65
	Rural	14	35
Education*	No formal education/training	3	7.7
	Primary or lower secondary	2	5.1
	Upper secondary, or technical or vocational cert	16	41.0
	Bachelor's degree	13	33.3
	Postgraduate/Doctorate	5	12.9
Primary occupation in the last 12 months*	Government employee or non-government employee	20	51.3
	Self-employed	2	5.1
	Student	2	5.1
	Homemaker	4	10.3
	Carer	3	7.7
	Retired	3	7.7
	Unemployed	5	12.8
Living situation*	Living alone	7	17.9
	Living with others	32	82.1
Number of children aged under 18 in the household	None	22	56.4
	1 or 2	11	28.2
	3 or 4	4	10.3
	5+	2	5.1
Participation in food-related interventions in the past two years	Yes	17	42.5
	No	23	57.5
*Prefer not to say n=1			

Healthy eating guidelines and sustainable diets: Familiarities and associations

When asked, participants had a limited familiarity with dietary guidelines such as the Eatwell Guide or Food Pyramid, and had only a vague understanding of the recommendations given in each. It was clear that there are many different 'healthy eating' messages in the public domain, and that certain recommendations have been picked up (Figure 20). It is not clear to what extent those recommendations are followed, with those who responded to this question reporting "trying to" follow them, "sometimes" following them, or not following them at all due to low familiarity and exposure.

Only some participants in Northern Ireland recognised the 'Eatwell Plate' as a healthy eating guide, saying that they were not very familiar with it other than its division into five "*different portions of food*" or "percentage of things on a circle", and that it might give a sense of calorie content. Instead, participants spoke of being aware of food package labelling, specifically the 'traffic light' nutrient labelling system, and this tended to be how some participants assessed the healthiness of particular foods.

> *"The colours … you don't have to do much reading into it, you can just tell red is bad, green is good, simple as that." (DRM#1)*

Others felt that assessing the list of ingredients on a particular food product can point to whether a product is likely to be healthy or otherwise.

> *"If it's a shorter list, it's probably less processed, which leads me to believe it's healthy." (DRF#5)*
>
> "*They put things like added magnesium, added vitamin D … they add in the extra bits." (CLF#1)*

Several participants noted the food pyramid, "*the triangle thing*", as a healthy eating guideline, though most suggested that it was something they remembered from school or, less often, a work canteen.

> *"The pyramid would have been very prominent when I was younger, you don't see it as much now." (DRM#2)*
>
> "*In the canteen in work we have the food pyramid there, but it's there for years, like. I'd say it's probably yellow now …" (CCM#3)*

One group suggested that the food pyramid is "*overly basic*", given the variety of food and diets available today, particularly for parents who might "*want more detail.*"

> *"It's a bit overly basic … There are so many more different choices around foods and diets, that it just overly simplifies … doesn't really answer any questions you might have." (CSF#2)*

Another felt the food pyramid does not always apply for vegetarians or those who do not eat dairy. One person felt the food pyramid was "*boring*", and that they did not pay any attention to it anymore.

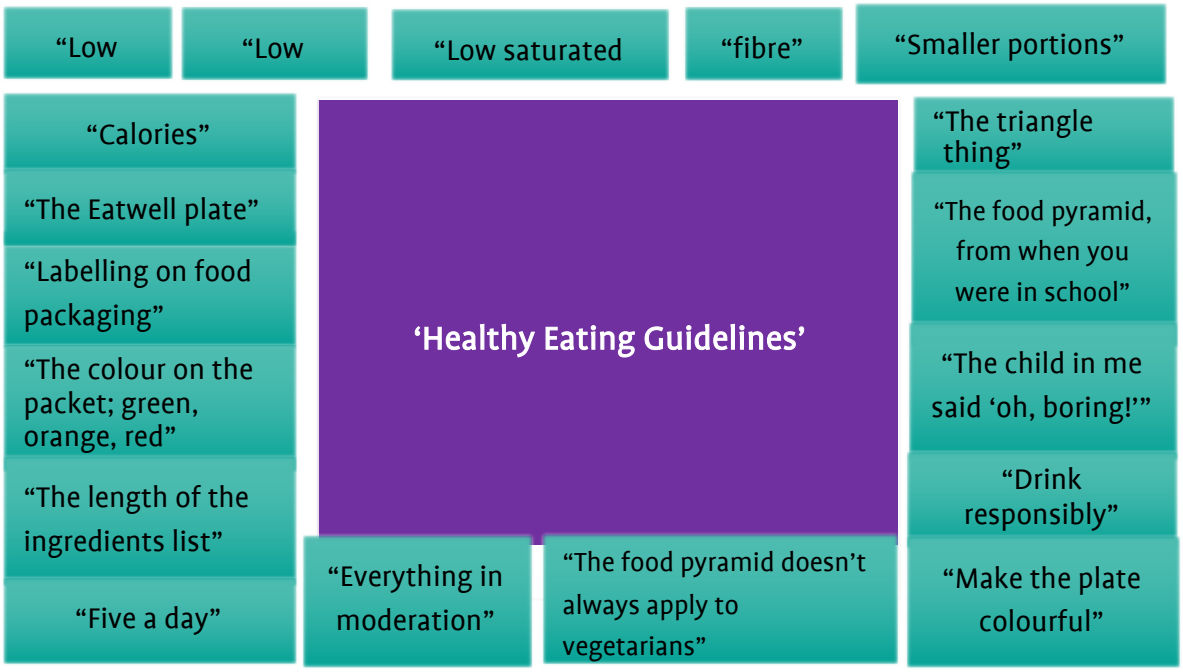
> *"The first word that comes into my head when you said (healthy eating guidelines), the child in me says 'Oh, boring!'..." (CCF#5)*

Several had heard of healthy eating guidelines from their children being in school and noted programmes like 'Food Dudes' or 'Good Food Friends', speaking of restrictions on sweets, chocolates and crisps. Some parents suggested they would like more specific information reflecting the variety of foods on offer today, and further guidance on what a healthy lunch might look like rather than be told what foods are not allowed.

> *"Cheese Strings are still part of the healthy eating break here in schools ... Schools just say no fizzy drinks, no chocolate and no crisps and that's it." (BM#1)*

Many were familiar with different public-facing messages; for instance, speaking about guidance for specific nutrients such as low salt, sugar, saturated fats or fat content, and high fibre. They also noted different messages they associated with hearing 'healthy eating guidelines': *"five a day"; "everything in moderation"; "drink responsibly"; "make the plate colourful"; "your plate one third protein and 2/3 veg"*.

Figure 20. Different associations made by participants when asked about 'healthy eating guidelines'



Sustainable diets: Perceptions and associations

Each focus group were asked if they had heard of the term 'sustainable diet' and what it might mean to them. Most participants were not familiar with the term specifically, with several people in various focus groups initially perceiving such a diet as something they can maintain and "*stick to*" (CCM#6; CSF#1, DRF#5), or the same "*kind of meals*" (DCF#1). Some suggested it may be a vegan diet (DCF#1) or vegetarian diet.

One male responded with "*... we don't do diets*" (BWM#4) while others responded with a question: "*... this is where I am confused now ... does it apply to if it's made in Ireland?*" (CSF#2) and "*Is the sustainable bit about how the food was produced?*" (DRM#3) or *"Has it anything to do with the environment?"* (BM#5)

While understandings of the term were mostly vague and uncertain, some participants were familiar with the various components of a 'sustainable diet' and suggested that the term referred to the environmental impact of food (CLM#2), eating smaller portions of meat (CLM#3), the carbon footprints associated with food (CLM#3; CLF#1), reducing food waste (CCF#2), purchasing more local food (CCF#1), seasonal eating (CCF#1; CCF#2, CLF#1), reduced packaging and recycling (CCF#5; CSM#4), knowing the origin of your food (CSF#2), "*What impact is it having on the world around me?*" (CLF#1), and how the food was produced (DRM#3; CSM#4; CSF#2). However, one participant qualified this last perceived attribute of a

sustainable diet with, *"I'd go for local if there was a choice … local produce rather than something flown in" (DRM#3).*

When facilitators either suggested that a sustainable diet generally refers to a diet that is good for both people and the planet, the importance of reduced packaging, particularly plastic packaging, limiting food waste and supporting and sourcing local food was apparent across all focus groups in both jurisdictions. Local food was perceived as fresher and longer lasting, and several participants spoke about buying from a farmers' market or a local grocer or butchers. Nevertheless, for several participants buying local food was a practice influenced by upbringing, tradition and trust, and the idea that local food lasts longer and is of better quality rather than specific sustainability motivations.

> *"When I'm doing the shopping, I'm just trying to get as much fresh produce as I can. That's the way I was brought up. We always shopped local … there's a shop that has all the fruit and veg, the butchers for my meat, the fish shop." (DRF#6)*
>
> *"I would buy in the butchers, that's just going off who I trust." (BM#1)*
>
> *"… not as mass produced as what Tesco and all them get. It's probably checked more. I think there are probably more safety standards in a butchers …" (BM#3)*
>
> *"I won't get my fruit and veg from Aldi or Lidl because they won't last and they are not local." (CSF#3)*

Despite a general low awareness of the term initially, participants did make reference to several attributes of a more sustainable diet as the discussion progressed. However, awareness and concerns were mostly centred on reducing plastic packaging and food waste from an environmental perspective, and nutrition from a human health perspective (Table 23)

Table 73: Components of a sustainable diet and associated attributes and impacts suggested by participants

Sustainable diet components, associated attributes and impacts	
Components	Attributes
The environment	Less packaging/plastics/recycling
	Less food waste
	Lower carbon footprint
	Organic (less pesticides, better soil health)
	'Natural'
	Low air miles
Animal welfare	Free range eggs
	Transport of livestock 'inhumane travel'
Accessibility	Affordability and availability
	A diet that can be maintained
Specific foods/diets	Lots of fruit and vegetables
	Smaller portions of meat
	Vegan and vegetarian diets
Origin of the food/source of purchase**	Made in Ireland
	Locally sourced
	Farmers' markets
	Butchers (local and less plastic)
	Local grocers
	Seasonal food
	Home grown
Human health	'Healthy for me'
	Nutritious
	Balanced diet '80% good and 20% bad'

Sustainable diet components, associated attributes and impacts	
	Obesity as a health impact
	Heart disease as a health impact
Production methods	How the food was produced or harvested
**Local food was associated more with quality, trust and traditions rather than the environmental motivations	

Cost, convenience (availability/accessibility) and human health remained central in perceptions that sustainable diets are 'something to do with the environment'. The general consensus is that a sustainable diet is 'hard work', a lifestyle choice, more expensive, time-consuming and less accessible.

> *"It's not just that simple as going in the shop and find that, find that ... you have to think about everything you're buying, all the packaging into it and all the calories into it and all the money into it. It's just overwhelming almost." (DRM#1)*

Diet as a temporary concept

Similar to the word 'sustainable', the word 'diet' was often perceived as confusing by several participants. Some suggested 'sustainable lifestyles' as a more appropriate term. This was discussed in particular by the Cork City and suburb focus group.

> *"But diet ... I don't agree with that word because that's like something you're going to do for a while to get yourself to a certain place and then you're going to stop doing it, whereas really it should be just 'this is how you live a sustainable lifestyle.'' (CCM#4)*

In one focus group, participants spoke about how interpretations of the word 'diet' might be different between younger and older generations, and that some people may think of 'the staple diet' while others think of 'a diet you go on to lose kgs' *(CCM#3)*. The following quote comes from a discussion between a younger and older participant:

> *"I wouldn't think of diet as a short-term thing. (CCM#4: Would you not?) ... I would think of it more like ... I would think the definition of diet is the food you eat." (CCF#1)*

Nevertheless, disparities exist, such as in another focus group where the two younger participants (aged 18-29) also considered a 'sustainable diet' to be about achieving a balance in the diet:

> *"Eating like 80% of the time good, 20% of the time bad, as opposed to if you were to diet for a couple of weeks, you'd eventually just start binging again." (DRF#5)*

Figure 22. Different associations made by focus group participants with regard to the term 'sustainable diet'

Perceptions of a 'sustainable diet'

'A diet that I could stick to'

A sustainable diet is about maintaining **consistency** in eating habits, having '**balance**' and '**routine**' in shopping and meals.

The word **'diet'** suggests something temporary:

"something you're going to do for a while to get yourself to a certain place, then you're going to stop."

'Something to do with the environment'

A sustainable diet is mostly considered in the context of **reducing food waste** and **packaging**, purchasing **locally**, easing **seasonally**, and considering the **origin** and how the food was produced.

People suggested it might include a **vegetarian** and **vegan** diet, buying **organic** food, shopping at local markets, grocers and butchers and avoiding high 'air-miles'.

, a lifestyle choice, is more **expensive** and **time-consuming,** and **less accessible**.

Feedback on potential sustainable dietary guidance

1. **Eating more plant-based whole foods**
2. **Eating less processed meat**
3. **Eating less red meat**
4. **Eating less or limiting ultra-processed foods**

Eating more plant-based whole foods

When asked, the vast majority of people knew what wholefoods were, listing foods like fruit and vegetables, nuts, beans, legumes, cereals, wholegrains, eggs and milk. They generally considered wholefoods as minimally processed: "*not genetically modified*" (*CLCI6*) or as near to its natural form as possible. However, some divergence arose stemming from the term 'plant-based' in particular, with participants across several focus groups expressing scepticism and dislike for the term.

> *"... it draws a blank ..." (CLM#3)*

"You don't eat ferns or daffodils." (BM#4)

"*I love meat so I would kind of veer away from it." (CCM#6)*

"My father, he is 83, he said that (plant-based milk) is the work of the Devil. All the milk. Cause he does pick it up by mistake in the supermarket. He thinks it's the right milk." (DRM#6)

Others were not familiar with the term at all: "*I don't even know what it is.*" (DRM#2). Associations were made between plant-based and unhealthy, unappealing, 'very processed' food (DRF#4), which was considered by some participants to be for 'vegans and vegetarians', or as being a fad diet or something trendy (Figure 2).

"... (the) girls are in school, and come home and say ... 'I think she is vegan' ... This could be a cool thing to say now ..." (CCM#4)

"Tofu is nice actually ... it is a bit of a thing. It's popular at the moment, it used to be low carbs and low fat." (CSF#2)

The perceived commercialised nature of 'plant-based' foods also appeared to contribute to negative sentiments towards to the term.

"*... talk about plant-based stuff is relatively recent." (DRM#3)*

"I feel plant-based is always put in front of you know, the alternative ... Dairygold have a range now as well. And it's all plant-based, but even, like, it doesn't seem to say in the advertising what grain or anything where it's from? But it just says plant-based spread." (CCF#1)

"They [plan- based food products] look to me like they're marketed as healthy, they don't look appealing and they're overly processed ..." (DCF#2; DCF#1)

Some participants, including one person who described their diet as vegetarian, conceptualised the term in a broader sense and considered the animals that ate a plant-based diet to also be plant-based foods because they are foods 'from the land'. The perception appeared to be that natural and less processed foods are the defining characteristic of 'plant-based wholefoods'.

"... take meat production or milk, like that's based on the plant-based diets ... I suppose it's someone's perspective. It's not something that's produced in the lab. It's natural." (CLM#2)

"As a vegetarian, plant-based to me, just means it's more from the land. So even animals are grazing out on the land ... my chickens are out on the land ... I'm eating maybe more organically. I'm taking stuff from, like I said, less processed." (CLF#1)

> *"Yeah I think fruit and veg, just something that is minimally processed as possible, that you could grow." (DRF#5)*

Other participants, with either partners or family members who eat 'plant-based' food, identified the influence of family members and social media in altering their dietary habits by introducing them to more plant-based food. It also appeared that people who have vegetarian partners or children, or eat meatless meals themselves, were most familiar with legumes, grains and pulses as being part of a plant-based diet.

> *"If I hadn't my son … I wouldn't have a notion what plant-based foods were. Now I'm so used to them and eating them and really enjoying them. They're a natural part of our diet …" (CCM#3)*
>
> *"I suppose my wife being a vegetarian as well, like, it's a bit easier from that point of view." (CSM#4)*

Two focus groups discussed potential differences appearing between 'new vegetarian' foods and 'traditional vegetarian foods'. For instance, one woman pointed to 'The Happy Pear' recipes for using 'traditional' plant-based food such as lentils and beans. Another woman, who identified her diet in the past as being vegetarian, suggested that she would not have eaten highly processed 'stuff like that' (BM#1). For those following vegetarian diets, or experimenting with plant-based wholefoods, health appeared to be the key motivation in their decision to eat these foods.

> *"I went like old-style [vegetarian]. I didn't get the fake … meats or cheeses and stuff … I went literally with The Happy Pear's one-week food planning video. And it was so good for me. Like, I felt different. My stomach was different, my energy levels were different." (CSF#1)*
>
> *"I've been vegetarian for such a long time. But I've always got like the anaemia thing in the back of my brain going on … even though the diet suits me and my medical needs. I've got to look at the plate. I've got to have this much protein. I've got to make sure we're getting the greens in …" (CLF#1)*

Several people spoke favourably about various plant-based foods, both highly processed and minimally processed, that they have tried. While one participant described how her children consume these foods regularly, others were reluctant to try these 'meat alternatives' and took issue with the 'fake meats' variety in particular.

> *"I was in Lidl and I [saw] plant-based burgers … curry flavoured ones and I got a packet to try … and they were absolutely gorgeous." (WBF#3)*
>
> *"I like the Denny [plant-based] sausages and the sausage rolls, the Quorn sausage rolls … my kids eat the Quorn chicken nuggets … My kids think they are McDonald's chicken nuggets … And there's extra protein in them and because the older fella is a fussy eater,*

> *I'd make them more than the normal chicken nuggets and they're nearly as cheap when they're on sale, you can buy the big bags of them." (DCF#5)*
>
> *"No, I'll stick to meat, pork and beef. I'll stick to that. Plant-based meat? No." (DCF#6)*
>
> *"Plant-based fair enough but when they try to make it look like meat … like a vegetarian burger, ok, you know it's vegetables – I would eat them but when they are plant-based but trying to look like burgers – it's not right." (BWM#1)*

Overall, the lack of familiarity with the term 'plant-based', and perceptions of these foods being highly processed, more expensive and less tasteful, could be considered as the main barriers to the consumption of more plant-based wholefoods and alternatives, along with a perceived poorer selection of plant-based alternatives in some of the more 'affordable' supermarkets and restaurants.

> *"All the vegetarian options, all those ones are so much more expensive. If somebody wanted a veggie burger, it was 10 euro." (CCF#5)*
>
> *"… we need more in supermarkets that are affordable to us because it's not often we'd go shopping in Dunnes because it is that little bit more expensive … So if we could get it [plant-based options] everywhere it would be a lot handier." (DCF#2; DCF#1)*

Actions suggested by participants to increase the consumption of plant-based whole food diets included greater exposure in restaurants (DCF#2) and schools (DRM#2), encouraging people to taste these foods (CCM#3), campaigns explaining what plant-based foods and meals are, along with their benefits (CLF#1; DCF#2), in addition to providing people with 'one template' (CLM#3) for easy swaps and substitutes that meet their protein needs (BF#4). Some suggestions made by participants included:

> *"Like an Eatwell plate based on being a vegetarian, that's split up in the five sections of how are we getting protein and from what foods …" (BM#1)*
>
> *"You know, kind of promotional in-store samples." (CCF#5)*
>
> *"Just spread greater awareness … even looking at the food pyramid … I'd have a very old image of just veg is plant-based and that is it …" (CCM#6)*

It was also recognised that mainstreaming plant-based diets may require significant marketing and long-term thinking.

> *"… trying to introduce more plant-based and less red meat … for the first 10 or so years … give people that information because like the vegan thing took off, I'm sure that could take off as well with marketing." (CLF#1)*
>
> *"You want to start it in infants or junior infants or something in school. Like something that was completely alien to me when I was a kid is not fully fledged. So I'm talking*

> *about maybe eight, nine, ten year olds. Get them thinking in the right direction and when their having children. It's become the norm."* (DRM#2).

In addition to the term 'plant-based' being too vague or 'not specific enough' (CLM#6) and associated with very processed and heavily marketed foods, other concerns raised in relation to guidance encouraging people to eat more plant-based wholefood foods were specific to potential nutrient deficits and the potential impact on Ireland's farming community.

> *"People just see it as being healthy and they don't think of other implications … getting their proper protein … proper iron." (BM#5)*
>
> *"I think [plant-based foods] might potentially damage our own food production industry. Like, we're a world-renowned food producer and like, plant-based, automatically people associate with veg and fruit and moving away from, say, traditional meat, meat and milk which is our main produce … I'd be kind of conscious of that from a farmer's perspective." (CLM#2).*

Figure 23: Associations made by participants when asked about plant-based foods

Eating less processed meat

Participants were generally accepting of the suggested guidance to reduce processed meat consumption, mostly because they considered processed meat to be less healthy. However, there were some concerns about removing processed meats from children's meals, particularly luncheon meats, where processed meats can be more convenient, less expensive and easier for 'fussy eaters'.

As indicated in Figure 24, processed meats were mostly viewed as pork products, meats purchased at particular supermarkets, produced in large factories, and containing several nutrients of concerns and other ingredients to ensure a longer shelf-life. However, others perceived processed meats as meat not produced in Ireland, and there was some confusion as to whether frozen mince or mince are considered processed meats. It was apparent from all focus groups that a vague understanding persists of what 'processed' means.

> *"I wouldn't even say I know what food processing myself is, but it just doesn't sound good." (DRM#1)*

> *"... define processed again? I don't think we are sure ... what is processed? Cause I just think anything in the freezers ..." (CCM#6)*

When asked about what they could replace processed meat with, the majority referred to 'better quality' meats such as meats cooked at home and sliced for sandwiches, 'proper cuts of meat' (CSM#4) or organic meats. However, as one person highlighted in relation to organic meat, and which is reflective of a primacy afforded to local food in the context of more sustainable diets: "*... we lack butchers or abattoirs that process it, so that is probably not a viable option.*" (CLM#2)

While most people are already on board with the existing guidance to eat less processed meats in their own diets, "*I can't see how you would lose, health-wise, by not eating processed meat,*" (BM#5) and would "*love for (their) children to eat less processed meat,*" (DCF#5), parents with children may find replacing processed meat sandwiches in children's lunch 'difficult' (CCM#4). Processed meats are cheaper, widely available, easy to prepare and palatable.

> *"Convenience ... they're quick and easy when you're in a hurry." (DCF#5)*
>
> *"... And you know that they're going to eat it if you make it for them and it's easier if you're home late." (DCF#4)*
>
> *"You can buy a big bag of say frozen chicken nuggets or chicken goujons for the freezer ... it's a whole lot easier and cheaper." (DCF#2)*
>
> *"But then with a child, you worry if they don't eat, so whatever they ... like, I will give them ham." (CSF#2).*

Protein as a nutrient of concern, in addition to worries about 'feeling full', were suggested as challenges in the context of reducing processed meat consumption, as evidenced in the following excerpt from one focus group:

" ... if I took ham out of the girls' three rolls in the morning, put hummus in. My wife would be like, 'Oh, but they're going to be starving now!'" (CCM#2)

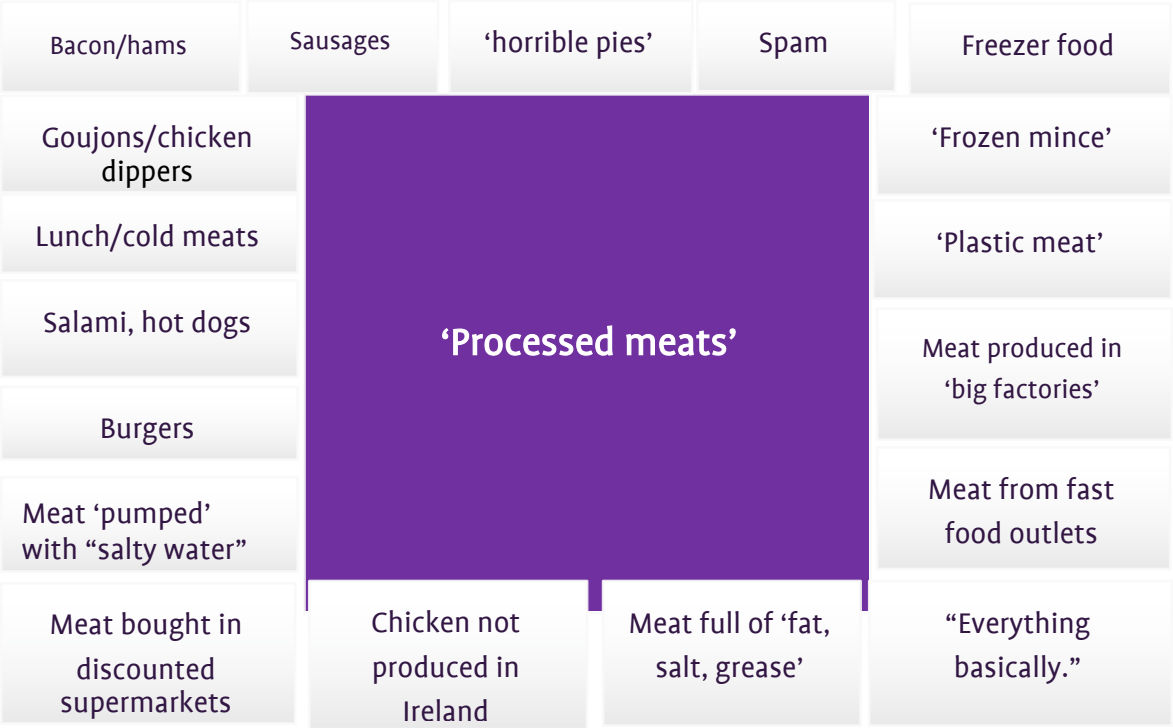
> *"But has that got protein in it?" (CCF#5)*
>
> *"Oh it has, but this is the perception." (CCM#2)*
>
> *"That's true, yeah. No meat - you're hungry." (CCM#6) "*

One younger participant rationalised consuming specific processed meats, such as turkey sausages, as a healthier and less processed sausage option 'with more protein' *(BM#1)* in comparison to pork sausages.

Overall, participants suggested that reducing processed meat would be beneficial to health, but that making these changes within the diet would require more information on what to substitute the meat products with.

> *"I'd be on board, as long as I know more about it, then yeah, definitely." (DRF#5)*

Figure 24. Associations made by participants when asked about processed meats



Eating less red meat

There were varying perceptions of this recommendation, with many participants in agreement with reducing red meat consumption to a few times a week. However, many considered red meat as a long-standing dietary staple and felt that reducing red meat in the diet may have health implications, particularly for nutrients like iron and protein.

> *"... I mean it's very hard to get enough protein, particularly if you're a woman. You need enough protein." (BF#2)*

From the examples spoken about by participants, there appeared to be confusion as to what red meat is. Two participants in two different focus groups suggested pork as an alternative to red meat and another person asked, "Is bacon a red meat?" (BM#6). One female reported not having 'issues with red meat' but having 'issues with pork' due to how it is produced (BF#2). One male queried as to whether mince was classified as a red meat (BM#1). A similar question was posed within a different focus group.

> *"When you say red meat, do you mean things like mince steak? Like, we would have mince twice a week. We might have steak maybe once every two weeks ... we are trying to be more conscious about having maybe one or two vegetarian meals and then maybe having a fish or cheese as the main part of it." (CSF#1)*

> *"The kids love pork ... like pork meatballs and stuff like that, so we don't really eat much red meat." (CSF#3).*

Most participants reported eating red meat only two or three time a week, with one lower income group suggesting about four times per week. One person, notably with a vegetarian partner, saw red meat as a 'treat' while others perceived red meat consumption to have already been reduced significantly in recent years.

> *"I see it as a treat, if you are out somewhere or for a Sunday dinner or a steak on a night out. I don't usually cook red meat at home." (BM#3)*

> *"... I'd say the red meat consumption has gone down completely. Like, we buy a bit of bacon or sausages ..." (CLF#1)*

Poultry, mostly chicken, was the most reported preferred choice to red meat or as an alternative to red meat. Similar to sentiments expressed about processed meat, replacements often appeared centred on another meats (Table 2).

> *"I'm replacing red meat with another meat, like, you have to have your meat. Yeah, you have to have your meat and two veg."* (DCF#5)

Most participants appeared to accept the 'eat less' guidance as long the advice was not to exclude it entirely, was science-based, that clear reasoning was provided to explain why people are being asked to reduce their consumption, and clear guidance was provided to ensure people knew what to replace it with in order to avoid any potential negative nutritional outcomes.

> *"I think it would have to be science-based, like I would be open minded enough ... I think there's too much debate around it [red meat] at the moment, that there's two sides of the argument [and] they're both producing studies that are saying the opposite." (CLM#2)*

> *"I do like [red meat] but I don't mind reducing it. I wouldn't give it up completely ..." (DCF#1)*

> *"... I think nowadays people would be curious as to why you are saying that ..." (CCM#4)*

> *"I sort of thought it [reducing red meat consumption] was already one." (BF#6)*

> *"I think I'd be happy enough. Like obviously, I'd like red meat. I like my burgers and my steak, but if I have to replace with a complete chicken and turkey, it wouldn't be the end of the world." (DRM#1).*

Similar to the concerns raised about encouraging more plant-based diets, and in addition to nutritional concerns, some hesitance was noted in relation to the wider potential effects of

reducing red meat. These included the potential economic impacts, nutritional impact, entitlement, and feeling hungry without red meat.

> *"The only kind of issue there would be if everyone did that … then there's the economic impact because there is the butchers, there's the farming industry. If the bottom drops out of the market for red meat, then there is going to be consequences." (BM#5)*
>
> *"… but the fact is it [cattle production] is turning the world economy …" (CCM#2)*
>
> *"Iron …" (BM#5; COF#1)*
>
> *"Probably vitamins too, B12 and B6." (BM#3)*
>
> *"Red meat is crucial to our brains." (DCF#2)*
>
> *'But like what are cows for … like that's what they are there for … nobody has a pet cow." (BWM#4)*
>
> *"I just have the old mentality that …[if] you're taking the ham out and putting in hummus you'd be hungry …"(CCM#6)*

Table 84 Meat (processed meat and red meat) replacements suggested by participants

Red meat replacements	Processed meat replacements
Chicken	Organic meats
Pork	"Quorn and vegetarian alternatives"
Fish	Better quality meat
"… some sort of carb …"	Fish
Turkey	"Egg dishes, eggs, cheese, dairy"
Chickpeas	"Proper cuts of meat"
"Beans or lentils – not fake meat …"	"Chicken breast or ham"
Eggs	Quinoa
Vegetables	Hummus
Quorn	"Meat substitutes"
Tofu	"Pasta and noodles and handy things"

Red meat replacements	Processed meat replacements
Cheese	"Buy sausage meat from the butchers and make your own"
Pasta	More vegetables

Eating less or avoiding ultra-processed foods

The majority of participants were not familiar with the term ultra-processed food and those who were, were not entirely sure how to explain it. However, as the discussion continued it was apparent that most people were able to list the types of food most likely to be classified as ultra-processed, along with the potential characteristics of such foods. As is the case with processed foods, however, uncertainty was evident (Figure 4).

Generally, foods with a high sugar or fat content were considered ultra-processed or highly processed, such as *"granola … and natural yogurt … laced with sugar …"* (CLM#2). Associations were also made between ultra-processed foods and any food with a red traffic-light nutrient label, and tinned food.

> *"I've heard of it, but I can't really define it. But when I hear it, it sounds like reprocessed on numerous occasions that are like enhanced to make it look like something that it is not …" (CLM#6)*
>
> *"… I'm thinking ultra-processed, if I look at the label it will be all red." (CCF#2)*
>
> *"Is tuna and sardines and those little cans that ultra-processed?" (CCM#4)*

Some participants found the term confusing and explained that they are only familiar with processed food and unprocessed food *(BM#3)* and several looked for clarity regarding the difference between processed and ultra-processed and/or the definition of ultra-processed foods.

> *"I would have a problem between what's processed [and] what's ultra-processed." (BWM#1)*
>
> *" … but if it's processed, then how do you ultra-process?" (BM#1)*

No focus groups, or individual participants, were strongly opposed to guidance suggesting that ultra-processed food should be limited or avoided. However, clear definitions and simple guidance to help people to identify these foods, as well as clear explanations as to why they should be avoided where possible, and what they can replace them with, were identified as essential information to encourage limiting ultra-processed foods.

> *"… like, if you say to someone ultra-processed foods and they don't know what that is, but if you say to them, 'Well if you look at the ingredient package – the more ingredients there are in it the more you want to avoid it.' If you put things simply and give people examples, like using tinned of tomatoes, passata and herbs instead of pasta sauce – give people an example of how they can*

do it on a budget instead of us going out looking for something that's going to cost double." (DCF#2).

Additional barriers included the low incomes and squeezed food budgets, and confusion caused by health claims such as 'one of your five a day'.

"It's [UPF] basically the food that we can afford." (DCF#5)

"But I suppose if you didn't have those frozen dinners, those kids have nothing for their tea."(CLF#4)

"Yeah, [tinned] spaghetti and sausages, but they say 'one of your five a day' on it." (BF#6)

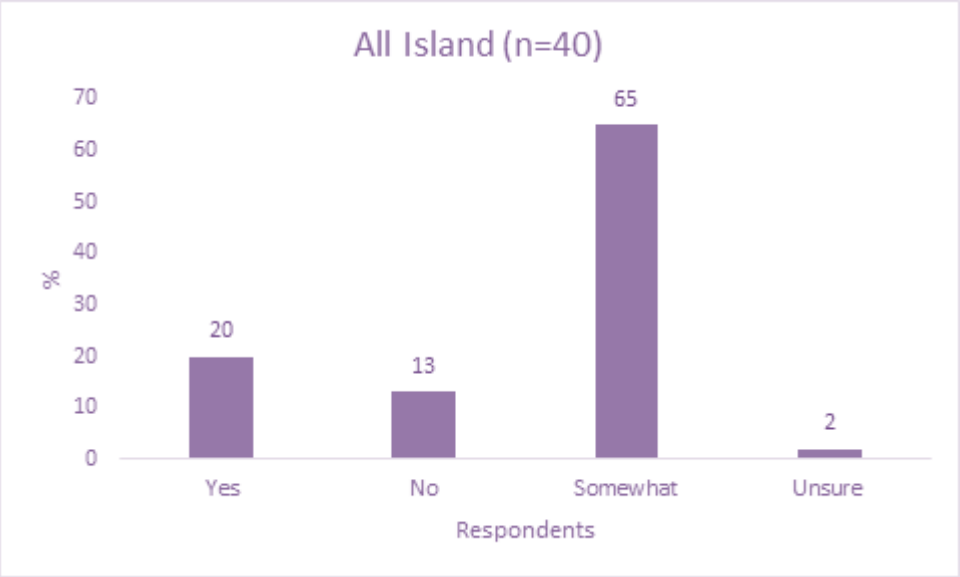
"... you have large corporations that are processing food and, like, they want to get a stake in the game, like, so then effectively they just replace what they're processing as unhealthy food and they would say we're now going to process healthy food. But you're still buying processed food, just the labelling is different." (CLM#2)

Figure 25. Associations made by participants when asked about UPFs

Exit survey findings

Upon completion of the focus group, participants were asked to complete a short questionnaire to identify whether they perceived their current diets to be sustainable and their level of agreement concerning specific dietary guidelines. Most of the participants (65%) considered their current diets to be somewhat sustainable (Figure 26) but, as evidenced in the focus group discussions, further practical guidance on what a sustainable diet means is required. (20% considered their diet to be sustainable, 13 said their diet was not sustainable and 2% were unsure)

Figure 36: Do you consider your current diet to be sustainable?



Guidance on purchasing and supporting seasonal and local food, promoting lifestyle behaviours, reducing food waste and limiting ultra-processed foods received high levels of strong agreement. The promotion of plant-based wholefoods, breastfeeding, sustainable seafood, organic foods and limiting /reducing processed meat received low levels of strong agreement, and the majority of participants were not in strong agreement with guidance to reduce red meat and dairy foods. However, these findings need to be interpreted within the context of the conceptual and practical barriers raised by the focus group participants in relation to red and processed meat and plant-based wholefood in particular. It's also worth noting that most participants considered their red meat consumption to be already low (about three times per week). Moreover, when looking at the survey results by the numbers and percentage of people disagreeing with the recommendations, only 14% (n=6) strongly or somewhat disagree with limiting/reducing red meat, 7% (n=3) strongly or somewhat disagree with limiting/reducing processed meat consumption, and 10% (n=4) strongly or somewhat disagree with the promotion of plant-based wholefoods. Indeed, across all guidelines, while there were various levels of agreement exhibited, very few, and zero in most instances, were opposed to their inclusion in dietary guidelines. This potentially suggests that in terms of promoting further knowledge and awareness of the potential gains, explaining what the terms used actually mean, clear reasoning, and advice on what to substitute the foods that people may be asked to reduce, people are open to moving towards eating more in line with human and planetary health.

> *"We should be helping the environment because that is where our children are growing up and where are grandchildren are going to grow up in so we need to help that for them." DSF#2)*

Table 24: Level of 'strong agreement' concerning various recommendations

Level of strong agreement to include in dietary guidance	Recommendation	All-island agreement (%)
High levels of strong agreement (75%+)	To purchase and support seasonal food	85%
	Promotion of lifestyle behaviours (for example, physical activity)	85%
	To purchase and support local food	88%
	To limit the consumption of ultra-processed foods	83%
	To reduce food waste by planning meals and purchasing less	88%
Medium levels of strong agreement (60-74%)	Promotion of diet diversity/variety of whole foods	68%
	To limit/reduce foods high in fat, salt and sugar	73%
	Standards for ethical treatment of livestock	68%
Low levels of strong agreement (40-59%)	Promotion of plant-based, whole food diets	40%
	Promotion of breastfeeding as a cornerstone of sustainable diets	50%
	Promotion of sustainable seafood consumption	53%
	To purchase and support organic food	55%
	To limit/reduce processed meat consumption	53%
Very low levels of strong agreement (0-39%)	To limit/reduce red meat consumption	20%
	To limit the consumption of dairy products	7%

Challenges and opportunities for sustainable dietary guidelines

Cost, convenience and food environments

While several factors influence what and how people eat, many of which were beyond the scope of this research, recurring sentiments throughout all focus groups suggested that a sustainable diet is less accessible by being more expensive and less convenient, something for people with more time and money, and not as suitable for those with busy lifestyles or families.

> *"You would go to a market – a farmer's market. There's no packaging and it's all locally sourced and homegrown … but it's going to be more expensive … organic is more expensive … you can get the 49c stuff in Dunnes and Aldi whereas at the market you are paying for proper stuff." (DCF#4).*
>
> *"I'd like to think sustainability of making it [food] plays a part, but I think it's just whatever is handy at the end of the day …" (DRM#1).*
>
> *"It's cheaper to be unhealthy than it is to be healthy." (DCF#2).*

Labelling, language and clear guidance

Labelling is considered an important tool for people looking to eat healthier food, and many people tended to pay attention to calories, sugar, salt, fat, best before dates, the origin of the food and, to a lesser extent, animal welfare. While the traffic-light system was considered very useful, obtaining information in relation to where the food came from and the conditions in which the animal was raised was highlighted as difficult, misleading and time consuming.

> *"When you walk into (shop), you're powerless to know where it came from at that stage. You have committed, you're going in for your shopping." (CCM#4)*
>
> "*… there's a bit of mislabelling going on as well, just because it's packaged in Ireland doesn't mean it's an Irish product.*" (CLM#6)
>
> *"Like, you see 'Buy British' on Spanish oranges so [they're] claiming to be British but no oranges grow in Britain." (BWM#1)*
>
> *"… there is this 'farm fresh' and there's all these different terms. You know and then you sort of wonder has that hen really been out." (BF#2)*
>
> *"I do love animals and I do try and get the cornfed chicken if it says it on the packet, that they were out and had a happy life – they win me over even if it's not true." (CSF#2)*
>
> *"… I'm a single person and its fine for me to be looking at packaging and all that, but there are so many mums and people who just don't have time …" (CCF#5)*

Several focus groups noted the importance of positive language in framing sustainable dietary advice and suggested that if restrictive language was used, such as telling people not to eat or to limit something, it would have the opposite effect.

> *"I think it's just how you get it across to people because you know you can't shove it down somebody's throat." (CCF#2)*

This sentiment was particularly pertinent to the discussion on reducing red meat, which often veered towards the idea that people would be told to exclude red meat entirely. In conjunction with the apparent confusion as to what red meat is, it is essential that dietary guidance around reducing red meat intake is very clear in its approach to 'eat less' red meat, identifies what meats are classified as red meats, and qualifies what 'eating less' means in terms of daily/weekly intake.

> *"What is less? Is it three, or five days? Like, I wouldn't have it seven days week, I'd say three nights a week ..." (CLM#6)*

> *"... if I had to go a week without a rib eye steak I might as well throw myself out the window." (CCM#3)*

> *"And that's why you have to meet people where they are." (COF#2)*

Addressing nutrition adequacy fears will also be essential. Participants appeared to be mostly motivated by health and concerned about potential nutritional deficits stemming from diets with less meat and more plant-based foods. Thus, providing clear guidance on foods with a similar nutritional profile, if there is a risk of a nutrient deficiency, is essential to encouraging more sustainable dietary patterns.

Regardless of the particular guideline being discussed, using simple and clear language, ensuring the foods are accessible and convenient, providing people with affordable and easy swaps and recipes, and explaining why there is advice to eat less of certain foods, were suggestions repeated across various focus groups.

> *"It's all very well saying what you have to do but if you don't know how to do it or why you're doing it, you aren't going to take it in ..." (DCF#1)*

> *"... a particular aisle in the supermarket that you go for that stuff. You just pick it off that aisle rather than the other aisle. Without too much knowledge ... I'd know where to go." (DRM#2)*

> *"Why is it bad for you? What is it doing to your body? What are the effects of it?" (DCF#2)*

> *"Information on a proper diet. Simplify things. If someone would give a sheet – now there is a good diet." (BW#5) [participant wanted meal plans]*

At a broader level, all participants suggested that sustainable foods and dietary choices need to be made more accessible (cost, knowledge, convenience) to garner both interest and adoption from the general public.

Developing relatable messages and building trust and confidence

Keeping the rationale for the suggested dietary changes focussed on local impacts and developing messages that people can relate to was suggested as a means of connecting

people to the potential wider social, economic and environmental impacts of dietary choices and practices.

> *"When you see those signs at Christmas. If you buy from a local bookshop as opposed to Amazon, your helping put their kid through football lessons or something." (CLF#5).*
>
> *" ... humanize it ... like the banana thing. Fair Trade ... it puts a bit of a kind of actual connection, like, oh wait, some other human hands have had, or minds have had, thought and input on this thing which I'm now gonna bring home and give to my family or myself ..." (CLF#1)*

Others suggested using social media to promote dietary guidance, as well as celebrities such as local sport figures, to endorse sustainable dietary guidance as a means to attract younger people *(CCF#2; CCM#4)*.

However, a large degree of distrust was evident with regards to dietary advice and scientific reports more generally, with much of it appearing to be traced back to conflicting advice.

> *"Radio, television you listen to when they have stuff on different. But the problem I see with all of it is that they conflict what they say. Like different studies come up with different results ... there was a study that red meat causes cancer. And then you have an all the farm groups coming out and saying that was totally not true and there's actually a whole load of health benefits ..." (CLM#2)*

Many appeared concerned that dietary advice keeps changing and that whatever guidance is suggested will change again within a short period of time. This sentiment suggested a disinterest or distrust in any new recommendations, and that people instead felt more comfortable to stick to their traditions and habits.

> *"Like, sugar was OK for a long time. And it's obviously not. Tobacco was OK for a long time, it's obviously not ..." (BM#3)*
>
> *"Oh, eggs are terrible, don't be eating too many eggs; now eggs are good for you. For years it was butter is really bad, everyone eat margarine and now they have changed their minds on that again." (BM#5)*
>
> *"It'll [dietary advice] contradict itself in a couple of years." (DRM#3)*
>
> *"... it's constantly evolving and changing and that's the big thing. It's never okay, this is what we have, this is the framework and it's accurate. But because they're constantly changing ... [you] don't know where you stand ..." (CLM#4)*

Perceived vested interests were also raised by several participants, resulting in further distrust of advice and knowledge concerning food and in encouraging more sustainable dietary choices.

> *"It's all money, it's all about money basically ..." (CSM#4).*
>
> *[would not trust advice from] "... anyone connected to the supermarkets or groups, anyone connected to the people selling it." (BWM#1)*
>
> *"There's a lot of economics involved in it too. I mean, you try and tell that to a dairy farmer in Westmeath or a beef farmer. Jesus you'd be pitchforked out of it, it's a big, it's*

> *huge business in Ireland. It's that the beef and the cattle trade and that and lamb and, you know, pig meat and that. So, I mean it's huge, it will take massive effort relating to change from our society. It will take a massive change." (DRM#2)*
>
> *"There's a stigma that if you move to vegan, you'll cause all the slaughterhouses and the all the butcher shops [to close] … everyone's trying to protect their own patch." (CLM#6)*

On the other hand, participants in one group took the view that *"if it [certain food] was really bad for you, they wouldn't be allowed sell it,"* (DRF#2) and that dietary advice is regulated at the European level, indicating again that health, and more specifically food safety, are central concerns.

> *"Like, all those regulations around food safety? Yeah. I kind of just assumed that the EU and the government are looking after that." (DRF#3)*

As illustrated in Table 25, GPs and dieticians were the most reported professionals that people would trust to provide them with advice on sustainable and healthy eating guidance. Family and friends were also frequently mentioned, along with social media and online sources. The Health Service Executive (HSE) and Ireland's food promotion board, Bord Bia, were considered a trusted source by those concerned with food safety and traceability. Others felt that Bord Bia have been 'tainted' by horse meat scandal (CCF#2) and tend to voice the farmers' perspective. Some participants voiced concerns that the HSE are not "*not up to it today … and living in the dark ages*" (CSF#1) while several others reported a general distrust of government agencies.

> *"… the World Health Organization would be one I'd read … and the Food Safety Authority or the HSE. But then you see Bord Bia would produce other studies … that I think it's gonna be [from a] farmer's perspective …"(CLM#2)*
>
> *"No government." (BWM#4)*
>
> *"No way, no shape, no form." (BF#6)*

Given the several considerations to contend with when developing and promoting sustainable dietary guidelines, including issues of distrust and past controversies associated with various public bodies, it was suggested by one focus group that a new entity may be required. However, as illustrated in the proposed name, and in the list of trusted sources (Table 3), health professionals are central to encouraging a wider appreciation and knowledge of what a sustainable diet means.

> *"You probably need something, a new kind of a setup, you know, healthy eating Ireland or something like that …" (CCM#4)*

Table 25: Trusted sources for dietary guidance

Trusted sources for dietary guidance
"I suppose you trust the official advice from government …" (BM#5)
"articles in the newspaper… if there's a general consensus" (BF#2)
"family and friends" (BM#3; BF#6F#; DSF#4; DSF#1)

"people that have shown results" (BF#6; BM#3)
GPs and dieticians (BM#1; CCF#1; BWM#4; CCF#3)
Nutritionist (CCF#3)
Dietitian (CSF#3; DRCI5; DSF#3; DSF#2)
Healthy Ireland [because they backed Operation Transformation] (CLCIX)
Food Safety Authority (CLM#2)
HSE [because they do inspections] (CLM#6)
Supermarket chains [because they have independent audits] (CLM#6)
Bord Bia [because of traceability re. meat and dairy] (CLM#2; CLM#6)
World Health Organisation (CLM#2)
HSE/National Health Service (CCM#4: DRF#6; DSF#3; BWM#4)
Personal trainers (DRF#4)
Packaging (DRM#1)
"Government source" (DRM#3)
EU (DRF6)
Online information (DSF#6,DSF#5)
Public health nurse (DSF#6)
Community workers (DSF#1)

Focusing on food practices and broader food education as well as specific foods

People's dietary needs are increasingly complex, which makes offering very specific guidance difficult. In each focus group either the participants themselves or a family member was living with diabetes, dairy or gluten intolerances, fish or nut allergies, or were following specific diets where certain foods are excluded in an attempt to address Crohn's or IBS-like symptoms. This seemed to be particularly evident in the lower income groups. Others, meanwhile, are cutting out entire food groups, or watching calories, to lose weight.

> *"I have a son and he's a diabetic ..."(DCF#3)*

> *"Like, my daughter is off dairy and gluten ..." (DCF#2)*

> *"[My] GP suggested Crohn's and I went along and found a diet that suits me by watching my symptoms." (CSF#3).*

Taking these complexities into account, broad guidance that is focussed on food practices as well as particular foods, where necessary, may encourage a wider appreciation of dietary guidance more generally and resonate with people better.

Throughout all focus groups, participants frequently contrasted current food practices with those of their parents or grandparents, or their own childhood. Many of these tended to be practices based on central tenets of more sustainable diets, such as supporting local producers and knowing where their food came from, cooking from scratch, transferring cooking skills between generations and the absence of a snacking culture.

> *"So, like, we go back to our grandmother's time, she's made everything at all ... we actually need to go backwards ..." (CLM#6)*

> *"I think the biggest problem with why we have so much, such processed food is that connection between local producers and people has actually dwindled down through the years. Like, if you go back 50 years. People bought locally. Everybody knew where stuff came from." (CLM#2)*
>
> *"I learned [how to cook] from my mother and it's been passed down." (BWF#3)*
>
> *"They [past generations] weren't snacking on … cookies and sweets … today you are snacking constantly." (BM#4)*

On the other hand, 'traditional' diets were also used to qualify concerns with some of dietary guidance discussed.

> *"I mean, in the olden days it was quite common to eat red meat …" (CSM#4).*
>
> *"Well, there was much less obesity in the olden days despite all the lard and sausages they ate." (BM#5).*

Broadening dietary guidance to include the more traditional and social aspects of Ireland's food culture while also creating awareness about how diets and food production have changed over previous decades may assist in ensuring the guidance resonates with people and in creating further awareness as to why sustainable dietary guidance is needed. Currently, human health appears to be central to sustainable dietary discussions and there does appear to be a lack of understanding of the relationship between food, health and the environment.

For instance, when the environmental impact of red meat was mentioned by participants in two focus groups, a disconnect between consumption and production was apparent. In both instances, it was felt that there are other industries causing more damage that should be addressed first before any action relating to red meat consumption or production should be taken.

> *"… apparently red meat is very damaging to the environment? So it's actually one of the highest things to be damaging." (CCF#5)*
>
> *"Do you mean the cattle now or the red meat? … this environment thing always sort of annoys me in the sense that if you were blaming the Irish cattle for … the methane and everything else …I was in Spain last week visiting my daughter … I did more damage traveling over there than a herd of cattle will do in 12 months. But if you're sitting in a highway with six lanes of traffic on either side stopped. What Ireland is doing is a dot in the ocean as far as the world is concerned." (CCM#6)*
>
> *"They are talking about us cutting back on red meat and sure they are opening a coal-fired electric station in China every month, so do we start 'right cows you are going out first'? No. We have to start at the top and work our way down." (BWM#4)*

Similarly, climate change was only mentioned twice throughout the seven focus groups. Both references were in the context of climate change impacting production patterns across geographical regions and its potential impact on what foods can and will be produced in the

future. Climate change as an outcome of diets was not raised by any participant. This highlights a potential knowledge gap and an awareness-raising opportunity.

> *"There are places where you used to grow things, now you can't grow them because number one, it's too hot to grow them ..."(BWM#4)*

Animal welfare as a motivation for choosing certain foods over others was raised by several participants and mostly in the context of hens and processed meat more generally.

> *"I just have a picture of battery hens and it makes me sad to be honest." (CSF#2).*
>
> *"... I think what's blatantly obvious about this is how the animals are treated, you know, that's the underlying thing [processed meat], unfortunately." (CCF#5)*
>
> *... the other ones [conventional production] are bad for the hens, they aren't kept right." (BWM#6)*
>
> *"I am not a vegetarian but I don't like the idea of chickens in battery farms. I prefer to pay a wee bit more for the eggs and they are likely to be a certain way or the chicken or the meat." (BM#5)*

Other participants suggested that creating more awareness about how meat and various foods are produced leads to lower consumption in some instances. However, as evidenced in the quotes below, social networks and education do appear to be important in terms of encouraging an emotional connection with the foods they do eat.

> *"Phillip Hayes did a thing a couple of years ago and he was going around [looking at] the food that was being served in the delis and a lot of petrol stations ... he saw the stuff that was put into it was, like, it was literally mix it up. They grind the bones with the chicken and all the waste bits of the chicken. And that was the chicken fillet. But they put a nice coating on it and people were eating it away happy but I don't think people realize that ... [it] forever put me off chicken fillet rolls." (CLM#2)*
>
> *"My partner ... he's vegetarian ... he didn't care about me eating meat or anything but I don't eat as much just because when you're cooking for two you do think about it more ... you need to think about actually eating animals. So it is sort of about education ..." (BF#6)*
>
> *"Education, someone to bring this up with the family and explain to them about what the food is that they're eating. A lot of people don't know what it is and they mix it up in a big pot and dish it out and everyone just eats it. I didn't care about eating meat, I didn't think about it. But then when my girlfriend, she's a vegetarian, started talking about it more I kind of realized. Like, I didn't stop, I reduced it and I did think about it more." (BM#3)*

6 Discussion

Ireland's food system is a key driver of detrimental environmental changes and as the burden of diet-related ill-health grows, encouraging more sustainable eating patterns and diets has never been more important. This multi-method report, based on the knowledge, experience and views of a diverse range of academics, NGOs, professionals and experts spanning multiple fields and the general population, identifies key challenges and opportunities that require consideration and action in order to move policy and people towards more sustainable diets on the island of Ireland.

This research aimed to identify best practice and practical approaches to building sustainability in healthy eating guidelines and the potential policy implication, based on the literature and the lived experience, knowledge and expertise of a broad range of actors on the island of Ireland. A mixed methods research approach was adopted, which included five linked tasks to address the research objectives. Through the five tasks a number of commonalities and consistent themes emerged.

A range of factors influencing the uptake of more sustainable dietary practices were identified. These included how consumers conceptualise sustainable diets, and consumers' knowledge gaps. The literature varies somewhat in terms of which socio-economic factors determine more sustainable dietary practices, and this is likely attributed to the various socio-economic and cultural contexts within and between regions and countries. Nonetheless, and regardless of context, a broad consensus emerged across the different research tasks that people's knowledge of the relationship between diets and the environment is low, and that environmental, along with cultural and social, impacts are not important dietary motivations. The findings suggest that consumers, insofar as they are interested in sustainability and have the capacity to engage with the concept, approach the concept of sustainable diet from a human health perspective primarily. However, the interconnectedness of human health and well-being with planetary health is poorly understood. This highlights the need for (i) sustained efforts to create awareness of the relationship between food and the wider physical and social environment when promoting more sustainable consumption, (ii) a broader research lens focussed on the multidimensional concept of sustainability within the literature exploring consumer attitudes and behaviours, and (iii) public health to work with other sectors and disciplines to develop clear, simple and coherent messages and narratives based on established and emerging evidence.

From a consumer perspective:

- There is an evident confusion and lack of understanding by consumers as to what a 'sustainable diet' is;
- Health and affordability remain high priorities in relation to decision making when purchasing food;
- Environmental considerations are less considered in relation to decision making when purchasing food;
- There is an apparent lower level of environmental (impact) knowledge of food products compared to health knowledge;
- A need for clear, consistent, non-ambiguous messaging in relation to sustainable food choices is evident;
- While acknowledging the need to reduce red and processed meat consumption, and despite agreement from experts that this guidance should be included in FBDG, there was a reluctance from consumers to follow this guidance, with almost half of respondents reporting that they 'were not interested in doing this at the moment.'

Building sustainability into existing policies and embedding new sustainable policy goals

The policy action review highlighted several policy actions for both strengthening and prioritising sustainability within existing policies in Ireland. These policies are updated periodically, and the actions identified by multi-disciplinary expert panel may be used to guide the inclusion of sustainability concerns when these policies are being updated. Although the actions vary and are specific to a particular policy, they can be summarised as ensuring policy alignment, financial and physical access, transparent monitoring of progress, building fairer value chains, and addressing knowledge and awareness gaps. The expert panel workshop identified several challenges pertaining to both the development and adoption of more sustainable dietary recommendations, and in encouraging a population-wide shift towards a more sustainable and healthier diet. These challenges included the influence of the meat and dairy industry on the discourse on the climate-health debate across multiple spectrums; the costs barriers associated with encouraging children to consume more perishable food which can result in higher volumes of food waste; and the influence on the social determinants of health on dietary habits, particularly for the more vulnerable. An additional barrier noted was the marketing of, and perceptions of, plant-based diets as a lifestyle choice for a few rather than a regular diet for everyone. Critically, while current and previous policies have supported the increase of plant-based foods such as fruits and vegetables, they have not supported or promoted the reduction of animal-based foods.

Unified and simple messaging promoting more sustainable diets, based on evidence and supported by all government departments, was also suggested as central to encouraging a

shift towards more sustainable diets. The importance of clarity in guidance was also highlighted in the consumer focus groups.

The challenges raised by the experts sit within five key actions/goals:

1) Ensuring policy coherence and shared responsibility across multiple sectors
2) Promoting plant-based diets as the norm rather than the exception
3) Redefining people's relationship with food, encouraging sustainable food literacy, and further collaboration between research and practice
4) Addressing vested interests and counteracting industry narratives
5) Addressing inaccuracies presented within policy and media frameworks

Sustainable dietary guidance: convergence and divergence of agreement and further research needs

Widespread support across various sectors is required to adopt and integrate sustainability within national FBDG(10). The survey results indicate an overall support for the inclusion of sustainable concerns within FBDG and highlights specific guidelines that have widespread support across various disciplines (Table 26). It further identifies where more work is required to explore why there are lower levels of agreement concerning some of the guidance.

Table 26: Well supported and less supported guidance on the island of Ireland

High levels of support (> 80% agreement and importance)
To limit/reduce foods high in fat, salt and sugar (agreement: 91%, importance: 91%)
Promotion of diet diversity/variety of whole foods (agreement: 81%, importance: 88%)
To limit/reduce processed meat consumption (agreement: 84%, importance: 89%)
To limit the consumption of ultra-processed foods (agreement: 82%, importance: 89%)
Medium and lower levels of support (<60% agreement and importance)
To limit the consumption of dairy products (agreement: 25%, importance: 44%)
To purchase and support organic food (agreement: 28%, importance: 51%)

Although surveys are not a robust method of capturing nuance and complexity, the results suggest that one possible barrier may be the terminology used. For example, the promotion of plant-based, wholefood diets are central to encouraging more sustainable diets. This recommendation was not well supported in either jurisdiction in terms of expert agreement but was noted as very/extremely important by 70% of those surveyed. Therefore, the lower levels of agreement may be linked to the terms 'plant-based' and 'wholefoods' rather than the premise, or a perceived consumer confusion in understanding these terms. The confusion in these terms was also evident in the consumer survey and the focus groups. Given the growing use of these terms, further research is required to explore if the terminology used is problematic in both professional and lay populations.

Encouraging organic food consumption and support received the lowest level of support and further research is also required here to understand why these guidelines are not supported. Ireland has the lowest levels of organically produced food within the European Union and this, along with the perceived higher cost of purchasing organic food identified by the experts, may explain the low support for the promotion of organic food consumption within dietary guidance. However, as outlined in the European Green Deal, supporting organic production and consumption is critical in the transition towards a more sustainable food system and thus a more sustainable diet. The low support for this guidance suggest that further awareness of the multiple benefits of producing and consuming organic foods will be necessary to encourage multidisciplinary support.

With regards to limiting dairy consumption, some experts did express concern from a nutritional and food miles perspective. However, dairy as a food group comprises a wide range of foods, some of which would be classified as ultra-processed. For example, a recent study based on UK consumption data suggests that the main food groups contributing to high levels ultra-processed food intake are beverages, sugary products and ultra-processed dairy (136). The high support for the recommendation to limit ultra-processed food, and low

support for limiting dairy consumption, suggests that some experts may not consider dairy as part of the ultra-processed food category and that further research, specific to consumption patterns on the island of Ireland, is required to ascertain the role of dairy in UPF consumption in Ireland.

Reducing red meat consumption in high-income countries will be necessary to achieve a more sustainable food system and consequently a more sustainable diet. However, strong support for the inclusion of a recommendation to reduce or limit red meat consumption was not evident in the survey, with only 58% experts strongly agreeing with its inclusion. Despite lower levels of agreement in comparison to other guidelines, three-quarters of the experts surveyed still believed this to be a very/extremely important recommendation. Given the importance of unified and simple public messages, further research is required to understand why agreement for including a recommendation to reduce red meat consumption would be beneficial to address any potential concerns.

Although some divergent views on which guidelines are important, should be included and would be challenging to integrate was evident, there was also a very high level of support for the inclusion of several suggested guidance proposals. Across the island of Ireland, the most widely supported guidance in terms of agreement and level of importance were the recommendations to limit/reduce foods high in salt, sugar and fat, processed meats and ultra-processed food. While these recommendations provide a useful starting point for developing sustainable dietary guidelines in Ireland, several practical and ideological challenges need to be addressed, and provisions put in place, to encourage widespread policy, public and industry support.

Consumer perceptions of sustainability

With the exception of one focus group (Clonmel) that seemed to be more aware of sustainability as a concept, knowledge and awareness of sustainable diets was low for the majority of participants. It appeared that food choices and practices are primarily influenced by affordability, convenience, health attributes, and the 'localness' of the food in question, suggesting that sustainability messaging and advice may be more successful if they were built upon these attributes. For instance, making clear connections between human health and planetary health, and highlighting the limitation of 'local' when moving towards diets less reliant on animal-based foods. While some people do consider additional sustainable dietary components, such as packaging and food waste, when making decisions about what foods to purchase and consume, the general consensus is that a sustainable diet is 'hard work', a lifestyle choice, and more expensive, time-consuming and less accessible, particularly for families. Outside of the high concern evident regarding food waste and

packaging, the environmental impacts of food production and consumption do not appear to influence dietary choices. This is complicated further by a general confusion concerning terminology, distrust of information, the positioning of certain foods as 'bad', perceived vested interests, conflicting narratives, and a legacy of changing dietary advice.

Some people rely on food package labels for health and nutrition information, mostly traffic-light nutrient labelling. However, they find it difficult to trust labelling concerned with origin of production, and, to a lesser extent, animal welfare. While participants described the usefulness of labels in helping them to make decisions about what food to purchase, most suggested that changes would need to be made at a broader policy level to make sustainable choices more available, affordable, accessible and convenient within food environments. This includes retail outlets, workplaces and schools.

Despite much media attention given to the issue of climate change in recent years, climate change as an outcome of food production and consumption was not recognised by participants, suggesting that much greater awareness will be required to support a transition towards diets conducive to human and planetary health. While environmental motivations appear to be low, consumers are interested in acquiring more information about sustainable and healthy diets, but find it difficult to navigate the abundance of information that is already present in the public domain.

Creating awareness of the multiple components of sustainability is essential to encouraging more sustainable dietary patterns in the future. In the absence of a better understanding of the broader health, social, environmental and economic impacts from dietary choices as a whole, it is unlikely that sustainability messaging would be understood, and consequently well received and implemented.

Eating more plant-based whole foods.

Key point

There is a clear need for guidance on the term 'plant-based' in particular. For most consumers, particularly those not familiar with more plant-based wholefoods, perceptions of plant-based diets as being another fad diet, associated with vegan and vegetarian diets, and a commercialised industry containing many highly processed foods, appears to be prevalent. The distinction made between traditional vegetarian diets containing plant-based wholefoods such as legumes, versus new vegetarian diets which were considered by some to be highly processed, is an important one that can be used to raise more awareness of plant-based wholefoods.

Eating less red meat

Key point

It is important to note that consumption of red meat was not high in any group, with most participants suggesting they eat red meat about three times per week. However, there also appeared to be some confusion around what red meat is. There is a need for further awareness of what meats are classified as red meat, accompanied by a clear 'eat less' not 'exclude' message based on actual consumption patterns. Given the dissonance evident in some of the discussions on reducing red meat, many of which were concerned with the potential economic and nutritional impacts, consumers require and desire clear and transparent reasoning as to why they are being encouraged to consume less red meat, so that those with the resources to do so can make an informed decision. In the context of sustainable diets and making the relationship between people, food and the environment clear, expanding the lens beyond carbon footprints and nutrients, and highlighting potential economic gains, will be essential in encouraging a reduction in red meat consumption. Participants spoke about 'two sides of the story' being portrayed in relation to red meat reduction; however, in the context of sustainable diets, there are several additional health, social, environmental and economic considerations beyond the producers and manufacturers that have not yet entered the public domain.

Eating less processed meats

Key point

Much of the food we eat today is processed in some form. However, the degree of processing is an important distinction not entirely, or at all, understood by most people. There is a negative connotation associated with the term 'processed' which may be causing further confusion amongst consumers and creating a stigma around some processed foods. Further awareness of what processed meat is, which food products are included in this category, clear explanations as to why these foods should be consumed, and more easy swaps for parents substituting processed meat in lunches, would be useful to consumers.

Moreover, and as suggested by some participants, food products commonly associated with the term 'processed meats', such as burgers or chicken goujons, can be made using raw and minimally processed ingredients such as fresh mincemeat or chicken breast, which may not pose the same health risk as some of their highly processed counterparts. Thus, less of a focus on end product and more of a focus on the ingredients, form and process may be a useful distinction that avoids demonising particular foods and promotes consumer education.

Eating less or avoiding ultra-processed foods

Key point

While consumers appear very open to recommendations on limiting ultra-processed foods, they require more knowledge of how to identify UPFs, which must be accompanied by making more minimally or unprocessed foods more accessible. Most people are not familiar with the term ultra-processed and there are overlaps between some 'processed meats' and 'ultra-processed meats'. For instance, industrially produced chicken nuggets are considered as processed meat by some, but as ultra-processed by others. While the language of ultra-processed foods is not mainstream yet, given the growing evidence concerning these foods in the context of the multiple dimensions of sustainable diets and the growing use of the terms within media and academic circles, equipping consumers with the knowledge of how to distinguish such foods may be beneficial to avoid further confusion. This would also help clarify some of confusion between processed foods and ultra-processed foods, and bring the issue of concern back to the degree of processing, the purpose of the processing and the ingredients added rather than the food itself.

Reducing meat consumption more generally and normalising plant-based wholefood

Key point

The word 'vegetarian' was referenced more than 20 times in three focus group and 'vegan' more than 20 times in two focus groups. Ensuring people know that a mostly plant-based diet does not mean following a vegan or vegetarian diet will be essential to encouraging a diet less reliant on meat. Acknowledging the clear issues with the terminology of 'plant-based' foods, it was evident that people tended to refer to different animal-based foods, mostly poultry, pork (not considered as red meat by some people) and fish as replacements for both red and processed meat (RPM). This will require further consideration in terms of wider impacts and future trajectories using a much broader sustainability lens to shape consumer perspectives. Encouraging people to explore non-animal-based wholefood alternatives through means such as 'easy swaps' to replace red and processed meat, while offering clear guidance on how to do this without comprising nutrition, will be essential to encouraging less reliance on animal-based foods. While not all consumers are concerned with animal welfare, greater knowledge on how animals are raised and processed does appear to alter consumption practices in relation to both eating and purchasing.

Creating awareness of how the food environment and food production methods, including farming, have changed over the last five decades in Ireland. Several people spoke about how their parents or grandparents ate in a particular way and 'it did them no harm'. This was also used to justify current eating practices which do require altering to create a fairer, healthier, and more ecologically friendly diet compatible with the challenges of the 21st century. Altering both ideologies and food practices will require creating awareness of these changes,

and their impacts on both human and planetary health. On the other hand, participants also highlighted several food-related practices such as supporting small businesses, not relying entirely on supermarkets, cooking from scratch, and eating seasonally, as traditional practices that could be used to promote more sustainable dietary practices. However, the food environment in which people live make these suggestions very difficult to achieve without significant policy supports.

Development and dissemination. While participants made several important suggestions to encourage engagement with the guidance discussed, and highlighted several methods of dissemination via social media, schools, workplaces and celebrity endorsement, two important points were raised which align with best practices already identified in previous literature (WP 0, 1, 3). This includes the potential development of a new body that people could trust to develop and disseminate sustainable dietary guidelines, and the use of a framework that rationalises and explains such guidance. This broadly aligns with international literature on how to encourage engagement with sustainable dietary recommendations. Health is central to the concept of sustainable diets, and health professionals are a trusted source of information in relations to diets given that health is a primary consideration when making food choices. However, human health is dependent on ecological health, and while nutrition experts are central to the development of national dietary guidance, using a clear framework to rationalise guidance, and ensuring transparent multidisciplinary engagement, is essential in the context of sustainable dietary advice.

7 Project conclusions

Facilitating dietary change is a critical component of the transition towards more sustainable diets. This report provides an overview of the range of issues that need to be addressed in promoting the uptake of more sustainable dietary practices. The findings contribute to understanding how we can generate support for the necessary structural and system-level changes that are required to support behaviour change. Consumers, insofar as they are interested in sustainability and have the capacity to engage with the concept of sustainability, approach it from a human health perspective primarily; however, the interconnectedness of human health and well-being with planetary health is poorly understood and under-researched in the context of consumer behaviours and attitudes.

This report highlights the need for (i) sustained efforts to create awareness of the relationship between food and the wider physical and social environment in all efforts aimed at promoting more sustainable consumption from awareness raising to policy development, (ii) a broader research lens focussed on the multi-dimensional concept of sustainability within the literature exploring consumer attitudes and behaviours, and (iii) public health to work with other sectors and disciplines to develop clear, simple and coherent messages and narratives based on established and emerging evidence. While further research that accounts for country-specific considerations will be essential to developing the messages and strategies for supporting more sustainable diets, the existing literature highlights several strategies that can be pursued in the meantime to encourage and support more sustainable diets.

Current healthy eating guidelines do not appear to resonate with people and are perceived as something associated with schools and young children mostly. Sustainability was poorly interpreted and understood by most participants, and sustainable diets are perceived mostly as a diet for others. However, it is also clear that certain public health messages, particularly concerning nutrients, do resonate with people, that health professionals are a valued source of guidance, and that people are interested in eating more sustainably even if their understanding of this term is currently limited. The challenge for policymakers will be to develop sustainability messages that encourage people to think about foods more holistically. Creating awareness of the multiple components of sustainability is essential to encouraging more sustainable dietary patterns in the future.

A challenge for future guidelines incorporating sustainability concerns will be in merging broad guidance that promotes the necessary cultural changes, such as specific guidance on

the food groups known to carry the heaviest environmental and health burden, as a starting point before expanding this assessment to explore the social, cultural and economic impacts. To accurately assess trade-offs, potential synergies, and the resilience of specific food supply chains, an in-depth and holistic assessment of national food systems and their relationship with global food systems will be essential.

The report identifies both a set of broad guidance that can be used as a starting point to build sustainable dietary guidelines for the population in Ireland, along with practical approaches that can be used to strengthen existing policies that influence how we produce and consume food.

8 Recommendations

The recommendations of this research are divided into two broad areas: (i) recommendations and guidance for policy makers aimed at incorporating sustainability into FBDG; and (ii) guidance specific to empowering and encouraging consumers to transition to more sustainable eating patterns.

Policy makers

- Countries who have currently incorporated sustainability into FBDGs have based their guidelines on current eating patterns and health challenges, have complementary policies in place, and assume a wholefood rather than a nutrient approach. The majority also facilitated public consultations and workshops during and after the development of the initial draft and pre-tested for understanding.
- Most of the guidelines speak to food waste reduction. All recommend choosing local, seasonal or regionally produced foods, and all outline the relationship between food and the environment, although to varying degrees.
- Several offer guidance specific to the environmental benefits of limiting overconsumption; in most instances, this is specific to highly processed foods.
- Further certainty in dietary guidance, particularly pertaining to animal-based foods, will be required for future food-based dietary guidance.

Several considerations pertaining to the various stages of development were also highlighted for consideration:

- The process should be guided by experts representing the multiple dimensions of sustainability, led by strong guiding principles and with a clear statement of intent.
- Capturing citizens' expectations and the challenges associated with past guidance will be beneficial in pre-development.
- Protective measures to limit potential conflicts of interest in the development process will be essential.

In relation to the guidance itself, considerations were also noted in the context of the guidelines explored and emerging literature:

- Highlighting a clear link between each guideline and its relationship with the various dimensions of sustainability.

- Recognition of the influence of food environments (e.g., marketing) and advice on how to navigate same.
- Specific guidance on seafood in terms of species to favour over others, and portion size.
- Specific guidance for vegetarian and vegan diets.
- The promotion of breastfeeding as a cornerstone of sustainable diets.

To support sustainable dietary guidelines, further 'multi-level, multi-actor and multi-sector' complimentary actions will also be required. These include:

- Incorporating joint human and environmental health remits and objectives within the working of key state bodies.
- Aligning national (agricultural production) efforts with proposed consumer efforts - recognising the interdependence of production and consumption.
- These should be complimented by further actions and collaborations celebrating dietary diversity, healthy eating practices, and sustainability.
- Developing guidelines, along with introducing or updating national food policy.

Based on the challenges raised by the expert panel, five goals and 26 actions are proposed to assist in moving both people and policy towards more sustainable diets. These goals include:

- Ensuring policy coherence and shared responsibility across multiple sectors.
- Promoting plant-based diets as the norm rather than the exception.
- Redefining people's relationship with food, encouraging sustainable food literacy, and further collaboration between research and practice.
- Addressing vested interests and counteracting industry narratives.
- Addressing inaccuracies presented within policy and media frameworks.

Consumers

Several factors influence people's capacity to access more sustainable diets. In addition to numerous structural barriers, low awareness of the environmental impact stemming from diets, scepticism of the scientific evidence, and the belief that individual habits play a minimal role in the global context of climate change, contribute to a resistance in shifting towards more sustainable diets.

- The concept of sustainable diets encompasses multiple meanings at the level of the individual, with human health representing the strongest. People find the terminology used to capture and measure the ecological impacts of diets confusing,

and have difficulty in discerning which dietary behaviours carry the heaviest environmental burden. In this regard, clear guidance and information awareness campaigns need to consider a targeted approach with consistent use of terminology. This consistency in terminology needs to take an inter-agency and cross-government approach to ensure that guidance and advice from different sectors is standardised.

- Several strategies were highlighted which can be used to facilitate access to more sustainable diets. For instance, targeting people before strong values are formed (e.g., at primary school level), widespread promotion of the co-benefits of more sustainable food choices, or targeting the perception that individual diets do not matter to the global picture.
- Much work has to be done in reconnecting human and ecological health, building awareness and knowledge of sustainable diets, and in making the more sustainable choice the easier and acceptable choice for all.
- Affordability, accessibility, nutrition and health are the most important characteristics of sustainable diets that influence food purchases. These need to be considered in the development of key messages. Any guidance developed needs to take an equitable approach, to ensure affordable, healthy and sustainable diets are accessible to all in society.

9 References

1. Leme ACB, Hou S, Fisberg RM, Fisberg M, Haines J. Adherence to Food-Based Dietary Guidelines: A Systemic Review of High-Income and Low- and Middle-Income Countries. Nutrients. 2021 Mar 23;13(3):1038.

2. Ahmed S, Downs S, Fanzo J. Advancing an Integrative Framework to Evaluate Sustainability in National Dietary Guidelines. Front Sustain Food Syst. 2019 Sep 25;3:76.

3. Swinburn BA, Kraak VI, Allender S, Atkins VJ, Baker PI, Bogard JR, et al. The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission report. The Lancet. 2019 Feb;393(10173):791–846.

4. Bergman K, Persson-Osowski C, Eli K, Lövestam E, Elmståhl H, Nowicka P. Challenging the status quo, or reinforcing it? 2017;12.

5. Brink E, van Rossum C, Postma-Smeets A, Stafleu A, Wolvers D, van Dooren C, et al. Development of healthy and sustainable food-based dietary guidelines for the Netherlands. Public health nutrition. 2019;22(13):2419–35.

6. Johnston JL, Fanzo JC, Cogill B. Understanding Sustainable Diets: A Descriptive Analysis of the Determinants and Processes That Influence Diets and Their Impact on Health, Food Security, and Environmental Sustainability 1–3. 2014;12.

7. Lang T, Mason P. Sustainable diet policy development: implications of multi-criteria and other approaches, 2008–2017. Proc Nutr Soc. 2018 Aug; 77(3):331–46.

8. Burlingame B, Dernini S. In: Sustainable diets and biodiversity: Directions and solutions for policy, research and action. Rome: FAO; 2010. p. 307.

9. Food Research Collaboration. Putting climate on everyone's table: Summary of what the IPCC WG3 report says about food and diet. Centre for Food Policy, London; 2022. Report No.: ISBN: 978-1-903957-68-4.

10. Gonzales-Fischer CG, Garnett T, University of Oxford, Food Climate Research Network, Food and Agriculture Organization of the United Nations. Plates, pyramids, and planets: developments in national healthy and sustainable dietary guidelines : a state of play assessment [Internet]. 2016 [cited 2021 Apr 15]. Available from: http://www.fao.org/3/a-i5640e.pdf

11. Kumanyika S, Afshin A, Arimond M, Lawrence M, McNaughton SA, Nishida C. Approaches to Defining Healthy Diets: A Background Paper for the International Expert Consultation on Sustainable Healthy Diets. Food and nutrition bulletin. 2020;41(2_suppl):7S-30S.

12. Poore J, Nemecek T. Reducing food's environmental impacts through producers and consumers. 2018;7.

13. Springmann M, Spajic L, Clark MA, Poore J, Herforth A, Webb P, et al. The healthiness and sustainability of national and global food-based dietary guidelines: modelling study. BMJ. 2020;370(Journal Article):m2322–m2322.

14. Willett W, Rockström J, Loken B, Springmann M, Lang T, Vermeulen S, et al. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. The Lancet (British edition). 2019;393(10170):447–92.

15. Cobiac LJ, Scarborough P. Modelling the health co-benefits of sustainable diets in the UK, France, Finland, Italy and Sweden. European Journal of Clinical Nutrition. 2019;73(4):624–33.

16. Kidd B, Mackay S, Vandevijvere S, Swinburn B. Cost and greenhouse gas emissions of current, healthy, flexitarian and vegan diets in Aotearoa (New Zealand). BMJNPH. 2021 Jun 9;bmjnph-2021-000262.

17. Tuomisto HL. The complexity of sustainable diets. Nature ecology & evolution. 2019;3(5):720–1.

18. Mason P, Lang T. Sustainable diets: How Ecological Nutrition Can Transform Consumption and the Food System. London: Routledge; 2017. 368 p.

19. Tetens I, Birt CA, Brink E, Bodenbach S, Bugel S, De Henauw S, et al. Food-Based Dietary Guidelines - development of a conceptual framework for future Food-Based Dietary Guidelines in Europe: report of a Federation of European Nutrition Societies Task-Force Workshop in Copenhagen, 12-13 March 2018. British Journal of Nutrition. 2020;124(12):1338–44.

20. Costa Leite J, Caldeira S, Watzl B, Wollgast J. Healthy low-nitrogen footprint diets. Global Food Security. 2020 Mar;24:100342.

21. Mazac R, Renwick K, Seed B, Black JL. An Approach for Integrating and Analyzing Sustainability in Food-Based Dietary Guidelines. Front Sustain Food Syst. 2021 Apr 6;5:544072.

22. Comerford KB, Miller GD, Boileau AC, Masiello Schuette SN, Giddens JC, Brown KA. Global Review of Dairy Recommendations in Food-Based Dietary Guidelines. Front Nutr. 2021 May 25;8:671999.

23. Mozaffarian D, Rosenberg I, Uauy R. History of modern nutrition science—implications for current research, dietary guidelines, and food policy. BMJ. 2018;361(Journal Article):k2392–k2392.

24. Scrinis G. Ultra-processed foods and the corporate capture of nutrition—an essay by Gyorgy Scrinis. BMJ. 2020 Dec 7;m4601.

25. Grant JD, Jenkins DJA MD DSC. Resisting influence from agri-food industries on Canada's new food guide. CMAJ. 2018;190(15):E451–2.

26. Vandenbrink D, Pauzé E, Potvin Kent M. Strategies used by the Canadian food and beverage industry to influence food and nutrition policies. Int J Behav Nutr Phys Act. 2020 Dec;17(1):3.

27. Lang T. Feeding Britain: Our Food Problems and How to Fix Then. UK: Pelican Books; 2020. 565 p.

28. Fernandez MA, Bertolo RF, Duncan AM, Phillips SM, Elango R, Ma DWL, et al. Translating "protein foods" from the new Canada's Food Guide to consumers: knowledge gaps and recommendations. Applied physiology, nutrition, and metabolism. 2020;45(12):1311–23.

29. Monteiro CA, Lawrence M, Millett C, Nestle M, Popkin BM, Scrinis G, et al. The need to reshape global food processing: a call to the United Nations Food Systems Summit. BMJ Glob Health. 2021 Jul;6(7):e006885.

30. Baker P, Machado P, Santos T, Sievert K, Backholer K, Hadjikakou M, et al. Ultra-processed foods and the nutrition transition: Global, regional and national trends, food systems transformations and political economy drivers. Obesity Reviews [Internet]. 2020 Dec [cited 2021 Apr 16];21(12). Available from: https://onlinelibrary.wiley.com/doi/10.1111/obr.13126

31. Fardet A, Rock E. Ultra-Processed Foods and Food System Sustainability: What Are the Links? Sustainability (Basel, Switzerland). 2020;12(15):6280.

32. Seferidi P. The neglected environmental impacts of ultra-processed foods. 2020;2.

33. Spector T. Spoon Fed: Why almost everything we've been told about food is wrong. UK: Penguin Random House; 2022.

34. Howard PH. ``Protein'' Industry Convergence and Its Implications for Resilient and Equitable Food Systems. Frontiers in Sustainable Food Systems. 2021;5:15.

35. Cotter T, Kotov A, Wang S, Murukutla N. 'Warning: ultra-processed' — A call for warnings on foods that aren't really foods. BMJ Glob Health. 2021 Dec;6(12):e007240.

36. Koios D, Machado P, Lacy-Nichols J. Representations of Ultra-Processed Foods: A Global Analysis of How Dietary Guidelines Refer to Levels of Food Processing. Int J Health Policy Manag. 2022 Feb 16;1.

37. Nestle M. Regulating the Food Industry: An Aspirational Agenda. Am J Public Health. 2022 Jun;112(6):853–8.

38. Popkin BM. Using front-of-the-package warning labels to remove foods high in added sugar, sodium and saturated fats [Internet]. 2021. Available from: https://cdn.who.int/media/docs/default-source/thailand/ncds/ppt_popkinthail-fopllecture-jan2021rev.pdf?sfvrsn=5abaf52c_3

39. Davidove ME, Dorsey JW. Breastfeeding: A Cornerstone of Healthy Sustainable Diets. Sustainability. 2019 Sep 11;11(18):4958.

40. Long A, Mintz-Woo K, Daly H, O'Connell M, Smyth B, Murphy JD. Infant feeding and the energy transition: A comparison between decarbonising breastmilk substitutes with renewable gas and achieving the global nutrition target for breastfeeding. Journal of Cleaner Production. 2021 Nov;324:129280.

41. Baker P, Russ K, Kang M, Santos TM, Neves PAR, Smith J, et al. Globalization, first-foods systems transformations and corporate power: a synthesis of literature and data on the market and political practices of the transnational baby food industry. Global Health. 2021 Dec;17(1):58.

42. Dadhich J, Smith JP, Iellamo A, Suleiman A. Climate Change and Infant Nutrition: Estimates of Greenhouse Gas Emissions From Milk Formula Sold in Selected Asia Pacific Countries. J Hum Lact. 2021 May;37(2):314–22.

43. Joffe N, Webster F, Shenker N. Support for breastfeeding is an environmental imperative. British Medical Journal. 2019;367:15646.

44. Binns CW, Lee MK, Maycock B, Torheim LE, Nanishi K, Duong DTT. Climate Change, Food Supply, and Dietary Guidelines. Annual review of public health. 2021;42(Journal Article):233–55.

45. Zadkovic S, Lombardo N, Cole D. Breastfeeding and Climate Change: Overlapping Vulnerabilities and Integrating Responses. Insights into Practise and Policy. 2020;37(2):323–30.

46. Randerson J. Government urged to introduce 'omni-standards' for food. The Guardian [Internet]. 2008 Sep 9; Available from: https://www.theguardian.com/environment/2008/sep/09/food.ethicalliving

47. Bunge AC, Wickramasinghe K, Renzella J, Clark M, Rayner M, Rippin H, et al. Sustainable food profiling models to inform the development of food labels that account for nutrition and the environment: a systematic review. The Lancet Planetary Health. 2021 Nov;5(11):e818–26.

48. Narciso A, Fonte M. Making Farm-to-Fork Front-of-the-Pack: Labelling a Sustainable European Diet. 2021;17.

49. Ghvanidze S, Velikova N, Dodd TH, Oldewage-Theron W. Consumers' environmental and ethical consciousness and the use of the related food products information: The role of perceived consumer effectiveness. Appetite. 2016;107:311–22.

50. European Commission. Directorate General for Health and Food Safety., Kantar., European Commission. Directorate General for Communication. Making our food fit for the future: citizens' expectations. [Internet]. LU: Publications Office; 2020 [cited 2021 May 6]. Available from: https://data.europa.eu/doi/10.2875/826903

51. Scrinis G. On the Ideology of Nutritionism. Gastronomica. 2008;8(1):39–48.

52. Mudry J. Counting on dinner: Discourses of science and the refiguration of food in USDA nutrition guides. Environmental Communication. 2010;4(3):338-354.

53. Brown K, Timotijevic L, Barnett J, Shepherd R, Lähteenmäki L, Raats M. A review of consumer awareness, understanding and use of food-based dietary guidelines. Br J Nutr. 2011;15–26.

54. Bergman K, Persson-Osowski C, Eli K, Lövestam E, Elmståhl H, Nowicka P. Challenging the status quo, or reinforcing it? 2017;12.

55. Baum F, Fisher M. Why behavioural health promotion endures despite its failure to reduce health inequities. Sociology of Health & Illness. 2014;36(2):213–25.

56. Swinburn BA, Kraak VI, Allender S, Atkins VJ, Baker PI, Bogard JR, et al. The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission report. The Lancet. 2019 Feb;393(10173):791–846.

57. Broeckhoven I, Verbeke W, Tur-Cardona J, Speelman S, Hung Y. Consumer valuation of carbon labeled protein-enriched burgers in European older adults. Food Quality and Preference. 2021 Apr 1;89:104114.

58. Levitt T. 'Embarrassing': Denmark forced to U-turn on meat ban for state canteens. The Guardian [Internet]. 2020 Nov 3; Available from: https://www.theguardian.com/environment/2020/nov/03/embarrassing-denmark-forced-to-u-turn-on-meat-ban-for-state-canteens

59. Carvalho AM de, Selem SS de C, Miranda AM, Marchioni DM. Excessive red and processed meat intake: relations with health and environment in Brazil. British Journal of Nutrition. 2016;115(11):2011–6.

60. zu Ermgassen EKHJ, Godar J, Lathuillière MJ, Löfgren P, Gardner T, Vasconcelos A, et al. The origin, supply chain, and deforestation risk of Brazil's beef exports. Proc Natl Acad Sci USA. 2020 Dec 15;117(50):31770–9.

61. Verly-Jr E, de Carvalho AM, Marchioni DML, Darmon N. The cost of eating more sustainable diets: A nutritional and environmental diet optimisation study. Global public health. 2021;online first(Journal Article):1–14.

62. Levitt T. Netherlands announces €25bn plan to radically reduce livestock numbers. The Guardian [Internet]. 2021 Dec 15 [cited 2022 Jun 24]; Available from: https://www.theguardian.com/environment/2021/dec/15/netherlands-announces-25bn-plan-to-radically-reduce-livestock-numbers

63. Bottinelli S. Denmark invests 1.25 billion kroner to advance plant-based food research and production. [Internet]. Food Matters live. 2021 [cited 2022 Jun 24]. Available from: https://foodmatterslive.com/discover/article/denmark-invests-1-25-billion-kroner-to-advance-plant-based-food-research-and-production/

64. Askew K. https://www.foodnavigator.com/Article/2020/12/02/France-launches-100m-plant-protein-strategy-We-must-regain-agri-food-sovereignty [Internet]. Food Navigator. 2020 [cited 2022 Jun 24]. Available from: https://www.foodnavigator.com/Article/2020/12/02/France-launches-100m-plant-protein-strategy-We-must-regain-agri-food-sovereignty

65. Harrington J, Griffin C, Vandevijvere S. The Healthy Food Environment Policy Index (Food-EPI): Evidence Document for Ireland 2020. School of Public Health; 2020.

66. Solar O, Irwin A. A conceptual framework for action on the social determinants of health. Social Determinants of Health Discussion Paper 2 (Policy and Practice) [Internet]. Geneva: World Health Organization; 2010. Available from: https://apps.who.int/iris/handle/10665/44489

67. Graça J, Godinho CA, Truninger M. Reducing meat consumption and following plant-based diets: Current evidence and future directions to inform integrated transitions. Trends in Food Science & Technology. 2019;91:380–90.

68. Culliford A, Bradbury J. A cross-sectional survey of the readiness of consumers to adopt an environmentally sustainable diet. Nutrition journal. 2020;19(1):138–138.

69. Neff RA, Edwards D, Palmer A, Ramsing R, Righter A, Wolfson J. Reducing meat consumption in the USA: a nationally representative survey of attitudes and behaviours. Public Health Nutr. 2018 Jul;21(10):1835–44.

70. Allès B, Péneau S, Kesse-Guyot E, Baudry J, Hercberg S, Méjean C. Food choice motives including sustainability during purchasing are associated with a healthy dietary pattern in French adults. Nutr J [Internet]. 2017;16(1). Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85029601285&doi=10.1186%2fs12937-017-0279-9&partnerID=40&md5=111ad96bae0b32279e5757f2c4a110c8

71. Voinea L, Vranceanu DM, Filip A, Popescu DV, Negrea TM, Dina R. Research on Food Behavior in Romania from the Perspective of Supporting Healthy Eating Habits. Sustainability. 2019 Oct 1;11(19):5255.

72. Ferrao AC, Guine RPF, Correia P, Ferreira M. Influence of Environmental and Political Determinants on Food Choices in a Sample of Portuguese Population. Current Nutrition & Food Science. 2020;16(5):689–97.

73. Werner A, Spiller A, Meyerding SGH. The yoga of sustainable diets: Exploring consumers' mind and spirit. Journal of Cleaner Production. 2020 Jan 10;243:118473.

74. Sánchez-Bravo P, Chambers V E, Noguera-Artiaga L, Sendra E, Chambers IV E, Carbonell-Barrachina ÁA. Consumer understanding of sustainability concept in agricultural products. Food Quality and Preference. 2021 Apr 1;89:104136.

75. Van Loo EJ, Hoefkens C, Verbeke W. Healthy, sustainable and plant-based eating: Perceived (mis)match and involvement-based consumer segments as targets for future policy. Food Policy. 2017 May 1;69:46–57.

76. García-González Á, Achón M, Krug AC, Varela-Moreiras G, Alonso-Aperte E. Food sustainability knowledge and attitudes in the Spanish adult population: A cross-sectional study. Nutrients. 2020;12(10):1–21.

77. Rejman K, Kaczorowska J, Halicka E, Laskowski W. Do Europeans consider sustainability when making food choices? A survey of Polish city-dwellers. Public Health Nutr. 2019;22(7):1330–9.

78. Clonan A, Wilson P, Swift JA, Leibovici DG, Holdsworth M. Red and processed meat consumption and purchasing behaviours and attitudes: Impacts for human health, animal welfare and environmental sustainability. Public Health Nutr. 2015;18(13):2446–56.

79. Michel F, Hartmann C, Siegrist M. Consumers' associations, perceptions and acceptance of meat and plant-based meat alternatives. Food Quality and Preference. 2021;87:104063.

80. Péneau S, Fassier P, Allès B, Kesse-Guyot E, Hercberg S, Méjean C. Dilemma between health and environmental motives when purchasing animal food products: Sociodemographic and nutritional characteristics of consumers. BMC public health. 2017;17(1):876–876.

81. Graça J, Oliveira A, Calheiros MM. Meat, beyond the plate. Data-driven hypotheses for understanding consumer willingness to adopt a more plant-based diet. Appetite. 2015 Jul;90:80–90.

82. Mackenzie M, Shanahan L. Attitudes to meatless meals: A comparison of the general public and those with links to the agricultural economy. Nutrition & Food Science. 2018;48(6):858–72.

83. Macdiarmid JI, Douglas F, Campbell J. Eating like there's no tomorrow: Public awareness of the environmental impact of food and reluctance to eat less meat as part of a sustainable diet. Appetite. 2016;96:487–93.

84. McBey D, Watts D, Johnstone AM. Nudging, formulating new products, and the lifecourse: A qualitative assessment of the viability of three methods for reducing Scottish meat consumption for health, ethical, and environmental reasons. Appetite

[Internet]. 2019;142. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85069569014&doi=10.1016%2fj.appet.2019.104349&partnerID=40&md5=73f727dc8b5e39c55c6d973efaa22e65

85. Kemper JA. Motivations, barriers, and strategies for meat reduction at different family lifecycle stages. Appetite. 2020 Jul 1;150:104644.

86. De Boer J, Schösler H, Aiking H. 'Meatless days' or 'less but better'? Exploring strategies to adapt Western meat consumption to health and sustainability challenges. Appetite. 2014;76:120–8.

87. Charlebois S, McCormick M, Juhasz M. Meat consumption and higher prices: Discrete determinants affecting meat reduction or avoidance amidst retail price volatility. Br Food J. 2016;118(9):2251–70.

88. Possidónio C, Prada M, Graça J, Piazza J. Consumer perceptions of conventional and alternative protein sources: A mixed-methods approach with meal and product framing. Appetite. 2021 Jan 1;156:104860.

89. Austgulen MH, Skuland SE, Schjoll A, Alfnes F. Consumer Readiness to Reduce Meat Consumption for the Purpose of Environmental Sustainability: Insights from Norway. Sustainability. 2018 Sep;10(9):3058.

90. Stoll-Kleemann S, Schmidt UJ. Reducing meat consumption in developed and transition countries to counter climate change and biodiversity loss: a review of influence factors. Regional Environmental Change. 2017 Jun;17(5):1261–77.

91. McBey D, Watts D, Johnstone AM. Nudging, formulating new products, and the lifecourse: A qualitative assessment of the viability of three methods for reducing Scottish meat consumption for health, ethical, and environmental reasons. Appetite [Internet]. 2019;142. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85069569014&doi=10.1016%2fj.appet.2019.104349&partnerID=40&md5=73f727dc8b5e39c55c6d973efaa22e65

92. Graça J, Godinho CA, Truninger M. Reducing meat consumption and following plant-based diets: Current evidence and future directions to inform integrated transitions. Trends in Food Science & Technology. 2019;91:380–90.

93. Mullee A, Vermeire L, Vanaelst B, Mullie P, Deriemaeker P, Leenaert T, et al. Vegetarianism and meat consumption: A comparison of attitudes and beliefs between vegetarian, semi-vegetarian, and omnivorous subjects in Belgium. Appetite. 2017;114:299–305.

94. Mylan J. Sustainable consumption in everyday life: A qualitative study of UK consumer experiences of meat reduction. Sustainability [Internet]. 2018;10(7). Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85049454279&doi=10.3390%2fsu10072307&partnerID=40&md5=bcb6fbf02601db7ebd6e58409c93262a

95. Schösler H, de Boer J. Towards more sustainable diets: Insights from the food philosophies of "gourmets" and their relevance for policy strategies. Appetite. 2018;127:59–68.

96. Dixon J, Isaacs B. Why sustainable and 'nutritionally correct' food is not on the agenda: Western Sydney, the moral arts of everyday life and public policy. Food Policy. 2013 Dec;43:67–76.

97. Herziger A, Claborn KA, Brooks JS. Is There Hope for the Double Dividend? How Social Context Can Shape Synergies and Tradeoffs between Sustainable Consumption and Well-Being. Ecological Economics. 2020;176:106736.

98. Biasini B, Rosi A, Giopp F, Turgut R, Scazzina F, Menozzi D. Understanding, promoting and predicting sustainable diets: A systematic review. Trends Food Sci Technol. 2021;111:191–207.

99. Fink L, Strassner C, Ploeger A. Exploring External Factors Affecting the Intention-Behavior Gap When Trying to Adopt a Sustainable Diet: A Think Aloud Study. Front Nutr. 2021 Feb 19;8:511412.

100. Godin L, Sahakian M. Cutting through conflicting prescriptions: How guidelines inform "healthy and sustainable" diets in Switzerland. Appetite. 2018;130:123–33.

101. Scalvedi ML, Turrini A, Saba A. Which dietary patterns are more likely to be associated with aspects of eco-sustainable food behaviours in Italy? International Journal of Food Sciences and Nutrition. 2018;69(6):660–75.

102. Graca J, Truninger M, Junqueira L, Schmidt L. Consumption orientations may support (or hinder) transitions to more plant-based diets. Appetite. 2019 Sep 1;140:19–26.

103. Tepper S, Kaufman-Shriqui V, Shahar DR. Mapping Young Adults' Concerns and Attitudes toward Food-Related Sustainability Issues in Israel: Implications for Food Policy. Nutrients. 2020 Oct;12(10):3190.

104. Hoek AC, Pearson D, James SW, Lawrence MA, Friel S. Shrinking the food-print: A qualitative study into consumer perceptions, experiences and attitudes towards healthy and environmentally friendly food behaviours. Appetite. 2017 Jan 1;108:117–31.

105. Asvatourian V, Craig T, Horgan GW, Kyle J, Macdiarmid JI. Relationship between pro-environmental attitudes and behaviour and dietary intake patterns. Sustainable Production and Consumption. 2018 Oct 1;16:216–26.

106. Lentz G, Connelly S, Mirosa M, Jowett T. Gauging attitudes and behaviours: Meat consumption and potential reduction. Appetite. 2018;127:230–41.

107. Harray AJ, Meng X, Kerr DA, Pollard CM. Healthy and sustainable diets: Community concern about the effect of the future food environments and support for government regulating sustainable food supplies in Western Australia. Appetite. 2018;125:225–32.

108. Voinea L, Vranceanu DM, Filip A, Popescu DV, Negrea TM, Dina R. Research on Food Behavior in Romania from the Perspective of Supporting Healthy Eating Habits. Sustainability. 2019;11(19):5255.

109. Biasini B, Rosi A, Giopp F, Turgut R, Scazzina F, Menozzi D. Understanding, promoting and predicting sustainable diets: A systematic review. Trends Food Sci Technol. 2021;111:191–207.

110. Hielkema MH, Lund TB. Reducing meat consumption in meat-loving Denmark: Exploring willingness, behavior, barriers and drivers. Food Quality and Preference. 2021;93:104257.

111. Mann D, Thornton L, Crawford D, Ball K. Australian consumers' views towards an environmentally sustainable eating pattern. Public Health Nutr. 2018 Oct;21(14):2714–22.

112. Sánchez-Bravo P, Chambers V E, Noguera-Artiaga L, Sendra E, Chambers IV E, Carbonell-Barrachina ÁA. Consumer understanding of sustainability concept in agricultural products. Food Quality and Preference. 2021;89:104136.

113. Voinea L, Popescu DV, Bucur M, Negrea TM, Dina R, Enache C. Reshaping the traditional pattern of food consumption in Romania through the integration of sustainable diet principles. A qualitative study. Sustainability [Internet]. 2020;12(14). Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85088664887&doi=10.3390%2fsu12145826&partnerID=40&md5=88fe796dda044cded12f15919bce3349

114. Rejman K, Kaczorowska J, Halicka E, Laskowski W. Do Europeans consider sustainability when making food choices? A survey of Polish city-dwellers. Public Health Nutr. 2019;22(7):1330–9.

115. Hielkema MH, Lund TB. Reducing meat consumption in meat-loving Denmark: Exploring willingness, behavior, barriers and drivers. Food Quality and Preference. 2021 Oct 1;93:104257.

116. Larson N, Laska MN, Neumark-Sztainer D. Do young adults value sustainable diet practices? Continuity in values from adolescence to adulthood and linkages to dietary behaviour. Public health nutrition. 2019;22(14):2598–608.

117. Vanhonacker F, Van Loo EJ, Gellynck X, Verbeke W. Flemish consumer attitudes towards more sustainable food choices. Appetite. 2013 Mar 1;62:7–16.

118. Lacroix K, Gifford R. Reducing meat consumption: Identifying group-specific inhibitors using latent profile analysis. Appetite. 2019 Jul 1;138:233–41.

119. Schösler H, Boer JD, Boersema JJ. Can we cut out the meat of the dish? Constructing consumer-oriented pathways towards meat substitution. Appetite. 2012;58(1):39–47.

120. Herziger A, Claborn KA, Brooks JS. Is There Hope for the Double Dividend? How Social Context Can Shape Synergies and Tradeoffs between Sustainable Consumption and Well-Being. Ecological Economics. 2020 Oct 1;176:106736.

121. Hartmann C, Siegrist M. Consumer perception and behaviour regarding sustainable protein consumption: A systematic review. Trends in Food Science & Technology. 2017 Mar 1;61:11–25.

122. Austgulen MH, Skuland SE, Schjoll A, Alfnes F. Consumer Readiness to Reduce Meat Consumption for the Purpose of Environmental Sustainability: Insights from Norway. Sustainability. 2018;10(9):3058.

123. Scalvedi ML, Turrini A, Saba A. Which dietary patterns are more likely to be associated with aspects of eco-sustainable food behaviours in Italy? International Journal of Food Sciences and Nutrition. 2018;69(6):660–75.

124. Barone B, Nogueira RM, Guimarães KRLSL de Q, Behrens JH. Sustainable diet from the urban Brazilian consumer perspective. Food Research International. 2019 Oct;124:206–12.

125. Biasini B, Rosi A, Giopp F, Turgut R, Scazzina F, Menozzi D. Understanding, promoting and predicting sustainable diets: A systematic review. Trends Food Sci Technol. 2021;111:191–207.

126. Lazzarini GA, Zimmermann J, Visschers VHM, Siegrist M. Does environmental friendliness equal healthiness? Swiss consumers' perception of protein products. Appetite. 2016;105:663–73.

127. Hartmann C, Siegrist M. Consumer perception and behaviour regarding sustainable protein consumption: A systematic review. Trends in Food Science & Technology. 2017;61:11–25.

128. Arbit N, Ruby MB, Sproesser G, Renner B, Schupp H, Rozin P. Spheres of moral concern, moral engagement, and food choice in the USA and Germany. Food Quality and Preference. 2017 Dec 1;62:38–45.

129. Hölker S, von Meyer-Höfer M, Spiller A. Animal ethics and eating animals: Consumer segmentation based on domain-specific values. Sustainability [Internet]. 2019;11(14). Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85073601415&doi=10.3390%2fsu11143907&partnerID=40&md5=b1380c8b6f32258098259c92f71aaf9d

130. Mullee A, Vermeire L, Vanaelst B, Mullie P, Deriemaeker P, Leenaert T, et al. Vegetarianism and meat consumption: A comparison of attitudes and beliefs between vegetarian, semi-vegetarian, and omnivorous subjects in Belgium. Appetite. 2017;114:299–305.

131. de Boer J, Aiking H. Pursuing a Low Meat Diet to Improve Both Health and Sustainability: How Can We Use the Frames that Shape Our Meals? Ecological Economics. 2017 Dec 1;142:238–48.

132. Boca GD. Factors influencing consumer behavior in sustainable fruit and vegetable consumption in Maramures County, Romania. Sustainability. 2021;13(4):1–20.

133. García-González Á, Achón M, Krug AC, Varela-Moreiras G, Alonso-Aperte E. Food sustainability knowledge and attitudes in the Spanish adult population: A cross-sectional study. Nutrients. 2020;12(10):1–21.

134. Mullee A, Vermeire L, Vanaelst B, Mullie P, Deriemaeker P, Leenaert T, et al. Vegetarianism and meat consumption: A comparison of attitudes and beliefs between vegetarian, semi-vegetarian, and omnivorous subjects in Belgium. Appetite. 2017 Jul 1;114:299–305.

135. Hoek AC, Pearson D, James SW, Lawrence MA, Friel S. Healthy and environmentally sustainable food choices: Consumer responses to point-of-purchase actions. Food Quality and Preference. 2017;58:94–106.

136. Huiping L, Shu L, Hongxi Y, Shunming Z, Yue M, Yabing H, et al. Association of Ultraprocessed Food Consumption With Risk of Dementia: A Prospective Cohort. Nuerology. 2022;PMID:35896436.

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