



The Future of Protein: Nourishing the World Sustainably

Policy and Information Package

BRIEF No.5

Culinary Change in the Future of Protein

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Introduction

This brief discusses the theme of ‘**culinary change**’ as it pertains to the future production and consumption of protein foods. Enabling a successful transition to food system sustainability will require not only a shift in the way we produce food, but also in the way we consume it. Nevertheless, a universal definition of the 21st century sustainable diet remains elusive due to the ambiguity of the concept of ‘sustainability’ and the range of available sustainable outcomes. Various schools of thought offer unique perspectives on consumers’ role in fixing the broken system and the culinary traditions, food habits and tastes that comprise sustainable eating; and while some incorporate economic and social dimensions into their framework of sustainability, others narrowly focus on the urgency of climate change mitigation. This brief tries to capture competing interpretations of the 21st sustainable diet as objectively as possible, while also giving consideration to the barriers that limit consumers’ willingness or ability to adopt sustainable eating patterns.

As noted in Brief No. 1 (Introduction), we make an important distinction between Animal-Sourced Protein Foods (**ASPFs**), Plant-Sourced Protein Foods (**PSPFs**), and Novel Protein Food Products (**NPFs**) and further we track the discussion surrounding each theme as it is primarily tackled by three main pathways addressing the future of protein (see Brief No. 1 for further details):

- a. The **REPAIR** pathway aims to ‘fix’ existing problems relating to the protein agri-food subsystem, primarily through an approach prioritizing technological innovations and improvements.
- b. The **REPLACE** approach seeks a broader overhaul of the protein subsystem, prioritizing the replacement of ASPFs with PSPFs as the dominant protein source in the human diet, in addition to the introduction of new food commodities and consumption practices.
- c. The **RESTORE** ‘school’ aims to address the problem by ‘restoring’ a holistic balance between humans and nature within the protein subsystem. This includes an emphasis on maximizing biodiversity, biomimicry, and natural resilience in the production process, as supported socio-economically through consumption practices.

In this brief, we tackle the following core questions:

- *Are emerging trends in protein consumption – in North America and globally – congruent with a sustainable future of protein?*
- *In what ways will the 21st century sustainable diet prompt shifts in taste, culinary traditions and food consumption habits?*
- *What barriers limit consumers’ willingness or ability to adopt sustainable diets?*

Consumers' Role in a Sustainable Protein Future

The three pathways interpret the protein problem from three different angles and provide different recommendations as a result. Each pathway accepts that a growing human population will increasingly demand protein rich diets, but as one might expect, they have unique interpretations of 'the 21st century sustainable diet' and the protein foods it should include. This brief will attempt to provide some clarity to the ongoing 'protein problem' in relation to culinary change, focusing on consumers' level of responsibility in fixing the broken food system.



The **REPAIR pathway focuses primarily on achieving sustainability through technological innovation and efficiency improvements at the production level**, which ensure the availability of affordable, healthy and sustainable protein foods for those who struggle to access or afford them. **Bioengineering** is interpreted as a key tool to enhance nutritional quality, improve agricultural resilience and preserve culinary traditions. Consumers play a limited role in achieving the repair pathway's vision of a sustainable protein future, and as such, the dietary shifts they are asked to make are minimal. Namely, they are asked to consume meat types that are less resource and emissions intensive.



The **REPLACE camp sees a shift in consumer behaviour towards plant-based diets as the most effective strategy for achieving healthy and sustainable diets**. Such a transition, whereby ASPFs are replaced with plant-based proteins (i.e. pulses, beans, nuts, etc.) and novel protein foods (i.e. plant-based 'meats', insect protein, cell-based meat, etc.), will contribute meaningfully to climate change mitigation, shrink the food system's environmental footprint and improve the nutritional quality of diets. Consumers in this pathway are further asked to embrace **genetically modified foods** and **replace beef consumption** especially with that of less resource and emissions intensive protein foods.



Finally, the **RESTORE pathway is primarily focused on reconnecting consumers with their local farmers and the foods they eat**. Those in this camp tend to call for the consumption of whole, naturally-produced foods, eaten in moderation and in balance with regional traditions and seasonal availability. In contrast to their counterparts, the restore camp considers ruminant meat to be an essential component of the 21st century sustainable diet due to the environmental services provided by certain methods of production. A restoration of traditional agri-food knowledge and methods (as interpreted through the present era) will strengthen the linkage between diet and seasonality, enable the resurgence of native foods, reconnect consumers to their local farmers, and change our societal norms about what portions and cuts of animal protein are part of a balanced diet.

In short, the tastes, culinary traditions and food habits in a sustainable future of protein depend on the pathways' respective interpretation of the **21st century sustainable diet** and the outcomes they prioritize.

The Issue in Brief

In order to achieve a sustainable protein future, a shift in diet is necessary—particularly in high-income countries where protein is consumed in excess. Nevertheless, there are a number of challenges in defining the “21st century sustainable diet”; promoting the adoption of some eating patterns over others will inevitably disrupt invaluable culinary traditions. Moreover, a wide-range of factors influence consumer food choices, and the current protein landscape is rife with barriers that inhibit consumer autonomy. In seeking out the 21st century sustainable diet, there are a number of issues that must be considered:

- A growing appetite for animal-based foods will see global meat consumption increase 76 percent by 2050.¹ Demand-side management is considered by many to be necessary for food system sustainability and climate change mitigation.
- In North America, consumers are becoming increasingly interested in the origins of their food and its broader impacts. Nevertheless, consumers’ actual behaviour is often inconsistent with their stated preferences.²
- Meat remains the protein food of choice for sensory, cultural and psychological reasons. Despite recent successes, novel proteins have struggled to win over meat-eaters craving the real thing and their market remains miniscule.
- Price and convenience are key determinants of food choice. Within the current framework of food valuation, sustainable and ethical food products often cost more than their industrial counterparts. Most consumers remain unwilling to spend more to align their moral values and food behaviour.
- Despite an abundance of protein in high-income countries, access and affordability barriers prevent individuals with lower-incomes from having food choice autonomy. In Canada, one in eight households is considered to be food insecure.³
- By delivering on the sensory pleasures of conventional meat, cell-cultured meat has the potential to render industrial livestock production obsolete, at least in theory. However, its rise to the top may be stifled by the perception that cultured meat and other genetically modified (GM) foods are unnatural and potentially unsafe.
- The food-climate relationship is reciprocal. The impacts of climate change will affect agricultural productivity, challenging our ability to choose the food systems we want and threaten the stability of longstanding culinary traditions.

In short, there are a number of challenges to demand side management and promoting the adoption of sustainable eating patterns. In order to realize their respective interpretation of the 21st century sustainable diet, each pathway recognizes the need to mitigate the barriers in the current protein landscape that either hinder the success of their proposed solutions.

The Current Protein Landscape

A Growing Appetite for Meat

By the Numbers

Global meat consumption has grown considerably, doubling on a per capita basis since 1961.⁴ Satisfying this demand has seen world meat output steadily incline to an all-time high of 337 million tonnes in 2018.⁵ Global seafood consumption, absolutely and per capita, has experienced similar increases.⁶ Despite absolute growth for all meat types, chicken is most consumed, followed by pork and beef.⁷ Meat consumption per capita is **highest across high-income countries**, led by the United States, Australia and Israel. The average American consumes nearly 100 kilograms (kg) of meat annually, three times the global average of 35 kg.⁸ Canadians are not far behind, consuming an average of 70kg each year, or two daily servings of three-ounces. Conversely, meat is least consumed in low-income countries where PSPFs remain the dominant source of protein.⁹

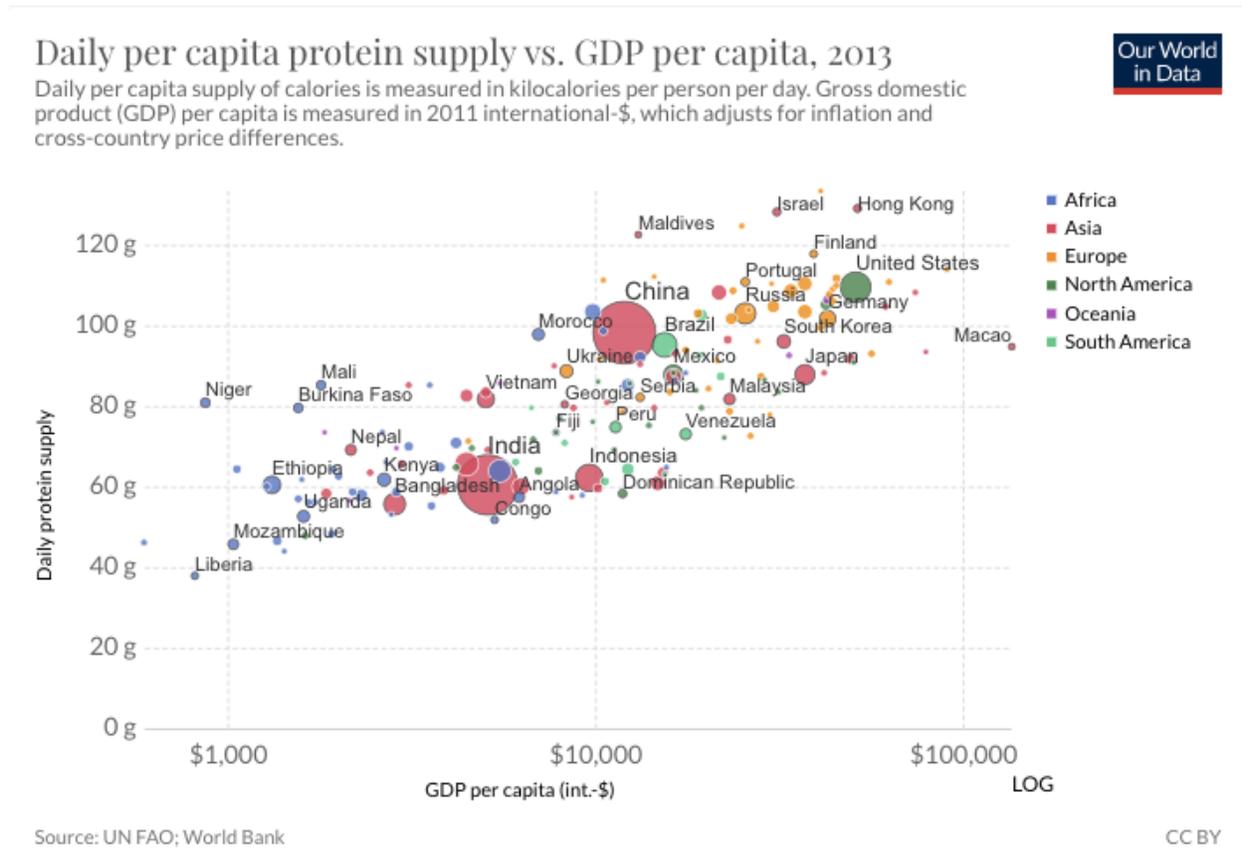
Drivers of Change

Two key drivers of a growing appetite for meat have been **increasing affluence** and **urbanization**.¹⁰ It is well-documented that as people become wealthier, they tend to increase their calorie consumption and shift toward resource-intensive foods—including meat and dairy (see Figure 5.1)¹¹ As individual incomes increase, they also shift their meat consumption from poultry and pork to more expensive meats such as beef and lamb.¹² Countries having undergone **strong economic transitions** have experienced the greatest increases in their per capita meat and dairy consumption.¹³ In China for instance, rapid growth in per capita income has seen a major shift to a diet with more animal protein foods and per capita meat consumption has increased threefold since 1990.¹⁴ India appears to be the one exception to this pattern due to the high prevalence of Hindus following lactovegetarian diets. Despite unprecedented economic growth, its meat consumption per capita is almost the exact same as it was 50 years ago.¹⁵

Outlook

Moving forward, global per capita income will increase as developing countries continue to grow their economies. Conjointly, population and economic growth will necessitate a **greater demand for protein**, specifically ASPFs¹⁶ [see **Brief 2: Feeding the World**]. Global meat consumption is expected to increase 76 percent by 2050¹⁷ and similarly, global seafood consumption is projected to increase 30 percent over the next decade.¹⁸ There is some concern amongst those in both the replace and restore pathway as to whether a sustainable future of protein can be inclusive to these trends given the environmental impacts and negative health outcomes associated with the production and consumption of ASPFs [see **Brief No. 6: Climate Change and Biodiversity** and **Brief No. 2: Nutrition and Health**].

Figure 5.1. Protein Supply and Prosperity



Credits: Max Roser and Hannah Ritchie, 2013.¹⁹

Food Consciousness

The factors that drive consumer food choices are diverse, the most influential factors being price, taste, perceived freshness and convenience.²⁰ More recently however, those in the West are becoming increasingly interested in the **origins of their food** and its broader social, ethical and environmental implications.²¹ With this growing food consciousness and consumers prioritizing foods that are perceived as healthy, sustainable and just, a number of food trends have taken hold in North America and Europe.²² Two of critical importance in the context of a sustainable protein future are the **local food movement** and a growing interest in **reducing meat consumption** (see next section). Born out of consumers' craving for **transparency, the local food movement allows consumers to reconnect** with local food producers through farmers markets and community-supported agriculture (CSA) programs. Resultantly, consumers are better able to understand where their food is coming from and how it was produced.²³ It also allows the conscientious consumer to **reduce their food miles** – the distance a product travels to your table, support their local economy and consume fresher and more flavourful produce, while in theory reducing the transport footprint.

The New Meat Eater

In contrast to continuing growth in developing economies, meat consumption in high-income countries has plateaued and even decreased in some including Canada and the United Kingdom.²⁴ Consumers have reduced meat consumption for a number of reasons, including both changing moral values and also information about the health impacts of meat. This introspection has introduced the **new meat-eater**, who is changing their consumption in one of three ways; eating less meat, replacing beef with meat types perceived to be less harmful (i.e. chicken), or only eating meat which is produced in ways deemed to be ethically acceptable.²⁵

Motivations for Change

There are three key motivations for eating less meat; the environment, animal welfare and health.²⁶ Eating less meat – beef in particular – has been prescribed as a change individuals can make **to reduce their carbon footprint**.²⁷ Although this message is not necessarily new, moral environmentalism becoming mainstream has brought greater attention to the issue, sparking more consumers to eat less meat for the planet.²⁸ Just as climate justice has gained traction in recent years, so too has **concern for the treatment of animals** (see Brief 4 for a further discussion on Ethics and Welfare in the protein sub-system). Lastly, consumers are interested in how their eating habits affect their health. Excessive meat consumption has been associated with a number of **negative health outcomes**.²⁹ A number of governments have revised their dietary guidelines, recommending that individuals more frequently source their protein from plant-based foods (see Brief 3 for further discussion, including competing health claims).³⁰

Who's Eating Less Meat?

Not surprisingly, attentiveness to the broader impacts of eating meat has seen a rise in the number of people adhering to some form of a plant-based diet. There are an estimated 2.7 million vegetarians and 450,000 vegans in Canada, combining for a 10 percent share of the total population.³¹ However, the above-mentioned study and others like it may be overestimating plant-based dieting.³² In Canada, one-third of those who self-identify as vegetarians and more than half of those who self-identify as vegan, were found to eat meat occasionally.³³ It is suggested this is a result of **virtue signaling**; social pressure and the aspiration to go meat-free tempts people to say they abstain from it. Even in India, the home to the world's largest vegetarian population, cultural pressures influence self-identity.³⁴ Reductions in meat consumption are actually being driven by **flexitarians** – those who still eat meat, just less of it. According to the above-mentioned Dalhousie study, 6.4 million Canadians are restricting the amount of meat in their diet.³⁵ Similarly in the US, 66 percent of consumers are interested in cutting back on amount of meat they eat.³⁶ At the other end of the spectrum, the number of individuals turning to a 'Ketogenic diet' (or other Low Carb High Fat diets which typically include larger share of ASPFs) has also been on the rise in wealthy countries, though exact statistics on the extent of its growing popularity are not yet available.³⁷

The Alternative Protein Boom

Plant-based diets going mainstream has allowed the **novel protein market** to flourish. With plant-based meat replacements fairly new in the marketplace, the bulk of NPFS sales are attributable to plant-based milk and dairy products.³⁸ Dairy milk consumption in Canada has gone down 20 percent in the last 10 years and consumers are turning to a variety of non-dairy alternatives (i.e. soy, almond, coconut, etc.) as replacements. One trend observed in Canada is the considerable rise in oat milk, considered by its proponents to be a more environmentally sustainable non-dairy product and one that is “truly Canadian”.³⁹

Where’s the Beef?

In the past, consumers’ embrace of meat alternatives was largely stymied by the inability of food producers to replicate its taste and texture using plants. More recently however, food tech innovation has enabled significant progress, allowing corporations like *Beyond Meat* and others to fill a major void in the market.⁴⁰ Plant-based meat substitute sales have grown considerably since 2010,⁴¹ and analysts predict the market could be worth \$140 billion in just 10 years.⁴² At the same time, Memphis Meats and other cell-based meat companies have successfully produced **animal tissue using cell-culture technology** instead of live animals.⁴³ The end result is a final product nearly identical to that of conventional meat production – in short, a novel protein food which is not plant-based at all. Although the latter products are not available at the moment, the top three companies in the market have announced intention to start selling their product in 2021 (see Brief 7 for further details on new protein markets and commercial developments).⁴⁴

Business is Booming

The booming business of novel proteins has driven food producers to change their direction. A number of the largest ASPF companies, including Tyson Foods, Smithfield, JBS S.A., Maple Leaf Foods and Danone, have now introduced or invested in plant-based alternatives, recognizing the market opportunity of diversifying their supply chain.⁴⁵ Retailers and restaurants have similarly adjusted their offerings to accommodate plant-based eating, offering a range of new products and allowing customers to substitute animal-based ingredients with plant-based ones.⁴⁶ As expected, the number of restaurants serving vegan or vegetarian food exclusively has also grown.⁴⁷

Ongoing Challenges to Culinary Change and Sustainable Eating

In spite of the alternative protein boom, the number of people willing to adopt a plant-based or lesser-meat diet remains a small share of the population and the novel protein market remains miniscule in comparison to the meat industry.⁴⁸ Meat consumption remains very high in wealthy economies and is now increasing in the US after a period of decline.⁴⁹ Making sense of this resistance to change requires a better understanding of how consumers make purchasing decisions and the impediments they encounter within the current food system.

Meat's Symbolism in Western Culture

For many people, eating meat is a **source of pleasure** and intrinsic to the **social gatherings** and **cultural traditions** in which they participate.⁵⁰ These deep roots limit consumers' willingness to change their food habits. One aspect of meat's embodiment in Western culture is the gendered association between meat and masculinity.⁵¹ Men who eat meat are perceived to be more masculine than those who abstain from it, an association explicitly reinforced in food advertisements. The literature also suggests that through the act of eating meat, masculinity can be restored when under threat.⁵²

A related cultural attitude is the idea that being strong or active requires an amount of protein only obtainable through ASPFs. There is a tendency in Western cultures to idolize protein.⁵³ The might explain why meat consumption remains unscathed in spite of growing demand for novel proteins. There is also the widespread belief that only ASPFs provide all of the essential amino acids, and conversely, that plant-based proteins are of lesser quality.⁵⁴ In the end, preconceived notions of meat as a determinant of masculinity and strength limit individuals' willingness to explore new protein foods. These dominant perceptions are being challenged by documentaries like *The Game Changers* and the growing number of athletes and celebrities choosing to adopt plant-based diets.⁵⁵

Meat's cultural symbolism and the resistance to change also involves psychological processes. Individuals with strong attachments to meat justify their consumption through defence mechanisms and rationalizations resembling **moral disengagement strategies**.⁵⁶ Through these rationalizations, meat-eaters attempt to resolve their cognitive dissonance – the conflict between their moral values and their actual behaviour.⁵⁷ This is often referred to as the '**meat paradox**'.⁵⁸

The four main justifications meat-eaters use to distance themselves from challenging presuppositions are that meat eating is:

Natural – humans have evolved to be omnivorous;

Normal – eating meat is an acceptable and encouraged social custom;

Necessary – abstaining from meat would deprive one of essential nutrients; and

Nice – people enjoy the sensory pleasures of eating meat.⁵⁹

Public Attitudes Towards Genetic Engineering

The promise of cell-cultured technology rests in part on meeting the sensory pleasures of meat without placing a toll on the environment, public health and animal well-being.⁶⁰ As such, cultured meat has the theoretical potential to make conventional livestock production a thing of the past.⁶¹ Nevertheless, it is difficult to discern consumers' readiness to accept this technology given that cell-based food products are not yet available. A limited number of studies have examined public attitudes towards cultured meat; their findings may be limited by the fact that stated preferences are often inconsistent with actual purchasing behaviour. Many consumers are not even aware that

cultured meat exists,⁶² and there is uncertainty surrounding its eventual retail price. Setting these limitations aside, one study found that in the two most populous countries, China and India, 59 and 50 percent of consumers respectively, were very likely to purchase cultured meat regularly.⁶³ On the flip side, a study in the US found that although people might be willing to try in vitro meat for its novelty, few would commit to eating it regularly.⁶⁴ Similarly, choice experiments in both Canada and the US found that when given the choice between farm-raised, cell-cultured and plant-based meat, an overwhelming number of consumers chose conventional beef, even when taste and price are equal.⁶⁵ These latter studies may be more predictive of actual behaviour given their reproduction of actual market settings.

A key concern identified in the literature is the impression that lab-grown meat is “unnatural”.⁶⁶ Similar to the cautionary narrative surrounding genetically modified foods more broadly, these concerns are rooted in the belief that modifying foods at the cellular level is a violation of naturalness and potentially harmful, despite any evidence warranting such concerns.⁶⁷

Food Illiteracy and the Food-Climate Knowledge Gap

Another challenge is the lack of food literacy. Most people are **unaware and misinformed** about how their food is produced, its broader impacts and the true denotation of labels they support.⁶⁸ This is particularly the case for urban residents whose exposure to food starts and ends in globalized grocery stores. Consumers are also cooking less, further distancing them from the food on their plate.⁶⁹

Food illiteracy is most pronounced in the low awareness of the **food-climate relationship**. People may be interested in making climate friendly food choices, but most are confused about what that entails. Generally speaking, consumers tend to underestimate the environmental impacts of food production,⁷⁰ incorrectly rank food-related mitigation options⁷¹ and have low recognition of the livestock sector’s contributions to climate change and biodiversity loss.⁷²

Food marketing and labelling – as currently expressed – seem only to exacerbate the problem. Food marketers use certain words and images which have connotations of environmental friendliness (i.e. organic, natural, local, etc.) or animal well-being (i.e. cage-free, free-range) in some cases specifically for the purpose of shaping consumer beliefs.⁷³ However, organic, natural, or local labeling does not in itself guarantee sustainability.⁷⁴ Sustainability is also a key driver of seafood product choices.⁷⁵ However, poor seafood labelling requirements in Canada have made it difficult to know which producers are in fact sustainable – and in fact many seafood options are mislabeled in the first place.⁷⁶

Artificial Food Prices and Globalization

A consequence of food being traded as a commodity in global capitalism is that food prices are exclusively determined by labour and capital inputs. Hidden ecological, health and socio-economic costs – often referred to as ‘externalities’ – are not considered in costing equations.⁷⁷ Globally,

these externalities amount to US\$12 trillion each year.⁷⁸ Industrial protein food producers are thus able to offer **artificially low food prices**, skewing public perception of what it costs to produce food. On the flip side, sustainable and ethical practices are not financially rewarded. As a result, foods produced in these systems often cost more than their industrial counterparts. Globalization of the food supply chain has also provided consumers affordable access to foods produced on the other side of the world year-round. This is one of many barriers to sustainable eating, additionally degrading food literacy by making consumers oblivious to the seasonality of food production.

Unequal Access and Affordability

The reality of the current food system is that millions of people remain **food insecure** (for further discussion see **Brief No. 2: Feeding the World**).⁷⁹ Recent research by Food Secure Canada found that despite having an interest in buying healthy, sustainable, and ethically-sourced foods, many Canadians lack the financial capacity to do so.⁸⁰ Furthermore, in many marginalized neighbourhoods across North America nutritious food is a luxury few residents can afford.⁸¹

Climate Change's Disruption of Culinary Traditions

Culinary traditions and food habits will change, not only in our search for sustainable diets, but also out of necessity as the impacts of climate change affect agricultural productivity, growing seasons, and crop ranges.⁸² Foods that for centuries have grown in certain regions will suddenly not be suitable for the warmer regional climate. While this will present opportunity for northern regions where growing seasons will be extended, it will disrupt longstanding culinary traditions that are associated with different regions and groups of people.

Towards Solutions:

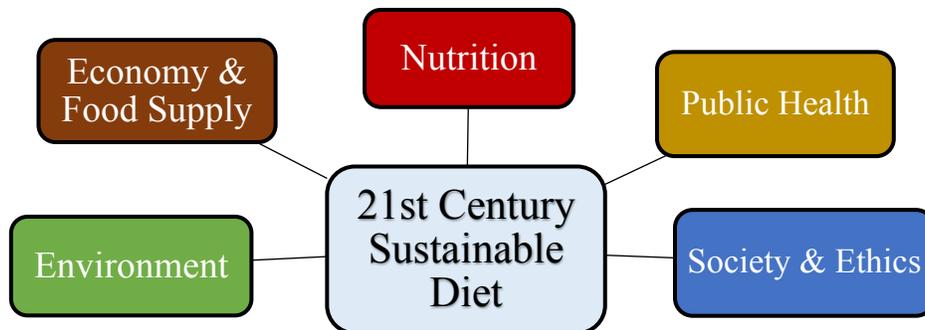
The need to shift to sustainable diets is well recognized, yet an agreed upon definition of “sustainable diet” remains elusive. While the FAO identifies key outcomes to which **sustainable diets** should contribute,⁸³ such broad definitions provide little guidance on what such a diet looks like on the plate, limiting their practical value.⁸⁴ There are also inevitable tradeoffs between these outcomes.

“Sustainable diets are 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.”

FAO, 2010, Sustainable Diets and Biodiversity

This competition is where the three pathways diverge in their interpretation of the **21st century sustainable diet**, prioritizing key outcomes in different ways. Some incorporate economic and social dimensions, while others narrowly focus on environmental sustainability and climate change mitigation (see Figure 5.2). These priorities determine consumer’s obligation to change their diet and the protein foods each pathway envisions in a sustainable protein future.

Figure 5.2. The 21st Century Sustainable Diet



Source: Reproduced from Garnett, 2014.⁸⁵

The remainder of this brief considers the how the three main approaches to the protein problem differ in their proposed paths forward for a transition to a sustainable diet.

REPAIR:



Preserving Culinary Traditions and Food Habits

Many subscribers of the repair pathway prioritize **economic** and **social dimensions** when defining the 21st century sustainable diet. The environmental impacts of protein production are often seen as an inevitable cost of feeding the world and should be addressed at the production stage, where most of these costs are incurred. Focusing on **meeting consumer demand** rather than asking them to dramatically shift their diet ensures **food security**, a **strong economy** and the **continuation of culinary traditions** (for instance, alternative approaches to sustainable diets are either inaccessible to large segments of the population or would disrupt food cultures predicated on local histories, traditions and seasonality).

Eat Efficiently-Produced Meat, Mostly Monogastrics

For some in the repair pathway, the conversation should focus on the type of meat people are eating rather than the amount.⁸⁶ Some point to the higher environmental footprints of beef compared to chicken and pork; others note that all foods have a wide range between those most efficiently produced and those with a larger footprint. Some thus call for reducing beef consumption in favour of chicken and pork as a means of improving food system sustainability and potentially mitigating a greater amount of GHG emissions than a switch to vegetarianism, whereas others advocate

efficient production across all food subtypes.⁸⁷ Most consumers, they suggest, remain unwilling to adopt plant-based diets, while simultaneously express a willingness to reduce meat consumption.

Embrace the Benefits of Biotechnology

For many, **bioengineering** of food is simply the **next progression of agriculture**. Gene editing allows scientists to extract a desired gene from one plant or animal and insert it into the genome of another organism.⁸⁸ Its application in agriculture – the outputs of which are often referred to as **genetically modified (GM) foods** – can enhance nutritional quality, reduce food prices and strengthen agricultural stability. Bioengineering will therefore play a critical role in preserving longstanding culinary traditions in the face of the climate crisis. Convincing consumers to eat **genetically-modified (GM) foods** remains an ongoing challenge due to their perceived unnaturalness.⁸⁹ With that being said, some food safety concerns have proven to be unfounded.⁹⁰ The use of biotechnology outside of agriculture, most notably in medicine, has proven beneficial and avoided criticism for the most part. Those in this camp assert that agriculture is in and of itself a form a **human intervention**. Selective breeding of domesticated plants and animals over thousands of years has shaped the foods we eat today, which share little resemblance to the wild plants and animals they evolved from.⁹¹

REPLACE:



Less meat, more plants

The replace pathway envisions a 'new normal' of protein, emphasizing the **health and climate co-benefits** of a widespread transition toward plant-based and novel protein foods.⁹² It is particularly the responsibility of consumers in high-income countries to reduce or replace their meat consumption entirely in order to achieve a sustainable protein future. Consumers turning to **vegetal proteins** to replace their meat consumption will influence food habits in a few ways. An emerging trend already gaining traction is a growing **demand for legumes** (i.e. pulses, beans, etc.), which are being sourced as a key ingredient in leading plant-based meats.⁹³ As more consumers turn to legumes, ethnic cuisines (e.g. Indian, Ethiopian, etc.) centered around PSPFs will grow in popularity, especially in a globalized system granting year-round food access. Accentuating the natural flavours of fruits and vegetables and incorporating those with textures similar to meat (i.e. mushrooms, jackfruit, etc.) may also become more popular.⁹⁴

Get ready for future protein foods

In the replace pathway's sustainable diet, future foods including insects, seaweed and cell-cultured meat will replace ASPFs as consumers' principal protein source.⁹⁵ The latter – engineering of meat, dairy and seafood at a molecular level – will replace conventional meat in future diets, likely rendering the conventional livestock industry obsolete.⁹⁶ These modern foods will be more nutritious and tastier than their conventional counterparts and require far fewer natural resources

and produce less GHG emissions.⁹⁷ Presently a boutique protein food in the Western world, the market for edible insects is expected to experience strong growth in the coming years.⁹⁸

Government intervention

A wide range of policy options are available to governments seeking to curb the demand for ASPFs, including education and awareness raising, nudge tactics and economics incentives, taxation and increasing the availability and affordability of plant-based and novel protein alternatives.⁹⁹ One fiscal policy that has gained attention recently is to impose a sin tax on meat in order to internalize its external costs on public health, the environment and animal well-being.¹⁰⁰ Alternatively in pursuit of the same goal, shifting subsidies in favour of fruits, vegetables and plant-based protein foods would have the same effect as a meat tax.¹⁰¹ Key awareness-raising strategies that can improve food literacy and shift consumption include an education campaign highlighting the food-climate relationship, an evidence-informed food guide that incorporates environmental considerations and the use of carbon labels. With respect to the latter, studies have found that providing information on the GHG emissions of a given product increase the likelihood of a consumer choosing the option with less GHG emissions.¹⁰²

RESTORE:



The 21st century sustainable diet needs to ensure **adequate nutrition** without **overriding planetary limits** or exhausting the capacity of our land and natural resources. Although many in the restore pathway agree with their replace camp counterparts that consumers ought to reduce the amount of meat in their diet, they fundamentally disagree with the notion that consumers should entirely eliminate it (some, in fact, argue for “more better meat” rather than “less and better meat”). For those in the restore camp **ruminant meat is a key component** of the 21st century sustainable diet, providing essential nutrients, vitamins, minerals and fats. Conversely, they argue, a vegan diet would be deficient in a number of minerals and vitamins, particularly B12. Moreover, there is concern with the motivations of the large corporations selling vegan products, many of which are ultra-processed.¹⁰³

Eat real food, mostly plants, and small amounts of ruminant meat

For those following Michael Pollan’s mantra (“eat real food, mostly plants, not too much”), the sustainable diet is inevitably omnivorous, consisting of whole foods; mostly plants but also a small amount of meat.¹⁰⁴ Consumers should obtain the foods they consume from local farmers if possible, preferably those who employ regenerative practices as they provide environmental services critical to biodiversity conservation and climate change mitigation. It can be expected that moving forward, dishes will include smaller portions of meat. In efforts to utilize all aspects of the animals, nose-to-tail eating and non-traditional cuts of meat will also grow in popularity, a trend already being observed.¹⁰⁵

Buy local and seasonal

Finally, those in the restore camp tend to emphasize geographical differences and complexity in the agri-food system. Throughout history, variabilities in climate have helped shape the food crops that are native to certain regions. Defining what a sustainable diet entails will therefore depend heavily on the region in which it is consumed and a return to traditional food sources that industrialization has turned its back on. As consumers have a growing interest in “buying local” and diversifying their protein intake beyond ASPFs, demand for crop foods native to one’s region will likely increase. At the same time, the linkage between diet and seasonality will strengthen as consumers attempt to support local farmers year-round.

NOTES

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