alpro Foundation
Knowledge in plant-based nutrition

More plant-based eating for the planet

Mark Driscoll

July 2019

What's an e-book?

Alpro Foundation has compiled an e-book focusing on the global dietary shift towards **more plant-based products** needed to improve **human and planetary health**.

This book is an **interactive document** that you can read on all digital devices. It contains lots of **scientific data, figures and videos** that will give you a better insight into this complex and challenging topic.

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Introduction

It was Michael Pollan, an American bestselling author and professor of journalism at Berkeley, who famously wrote '*Eat food. Not too much. Mostly plants*'.[1] From a sustainability perspective Michael Pollan got it right. The single biggest step that will significantly reduce our environmental impact of the food that we eat and grow, is **to ensure we consume more plant-based proteins within our diets**. Increasing the proportion of plants within our diets, whilst reducing overall levels of meat consumption, is **key to enhancing both planetary and human health**.

There are 3 main pillars to a sustainable food system: **economic, environmental, and social sustainability** (including human health). If any pillar is weak then the food system is unsustainable. Our food systems are key to **delivering a number of international global commitments on health and sustainability**. These include the UN Sustainable Development Goals which aim to end poverty, protect the planet and ensure prosperity for all and our global commitments on climate change, to limit global warming to below 1.5 degree threshold.

Our food system plays a **significant contribution towards the breaching of a number of environmental limits**, including biodiversity loss, nitrogen cycle disruption and climate change. Our food system contributes up to **29% of global human made Greenhouse Gas Emissions** (GHGe), **uses 70% of all freshwater** and has been the **main driver behind the loss of 60% of our biodiversity over the last 40 years**. Conversion of protein from feed crops into animal protein for human consumption is inherently resource-inefficient and has driven many of these impacts.

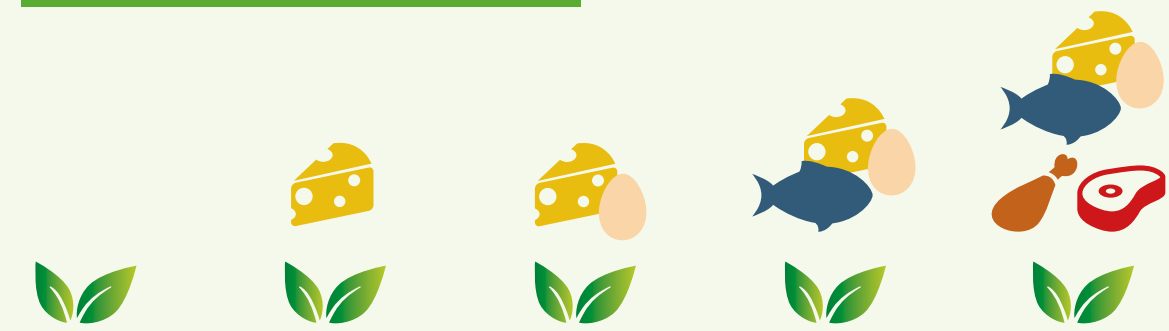
Currently, we are witnessing a rise in veganism, vegetarianism and flexitarianism and people who want to reduce animal-based food consumption across Europe, driven by **increased consumer concerns about the impact of food on health and sustainability**.

This review outlines studies which demonstrate **the benefits of plant-based diets on the health of our planet**. The challenge today is **to turn this science into action**.

What is plant-based eating?

There are different forms of **plant-based eating**, from vegan over vegetarian to flexitarian-type diets. Plant-based eating does not necessarily exclude all animal products. In a plant-based diet, plant-based foods such as fruits, vegetables, legumes, wholegrains, nuts, seeds, fungi, vegetable oils and plant-based alternatives to meat and dairy are at the core of the diet.

SPECTRUM OF PLANT-BASED EATING



VEGAN	LACTO-VEGETARIAN	LACTO-OVO VEGETARIAN	PESCETARIAN	FLEXITARIAN
Avoid all animal products	Avoid meat, fish and eggs but eat dairy foods	Avoid meat and fish but eat dairy foods and eggs	Avoid meat but include fish and/or shellfish, dairy foods and eggs	Occasionally eat small amounts of meat or fish

The Global Sustainability Challenges: An Overview

1. Key messages

- **To address multiple sustainability challenges we need to look at a set of economic, social and environmental interventions which can deliver multiple outcomes, benefiting both human and planetary health**.
- **Key global trends include a population which may reach 9.7 billion by 2050, increasing global demand for meat and changing consumer expectations**.
- **We are breaching environmental limits especially with regards to biodiversity loss, nitrogen cycle disruption and climate change. The global demand for meat and other livestock products is one of the most significant factors contributing to the breach of these limits**.
- **To restore planetary and human health we need a combination of major dietary change (a greater proportion of plants within diets), improved food production through enhanced agriculture and technology changes, and reduced food waste across the food chain from production to consumption.**

2. What is a sustainable food system?

In 1987 the United Nations' (UN) Brundtland Report on Environment and Development: 'Our Common Future'[2] noted that sustainable development '*meets the needs of the present without compromising the well-being of future generations*'. There is no one legal or universally accepted definition of sustainable food and there are many different views as to what constitutes a 'sustainable' food system. However, in general, there are **3 main pillars[3] of a sustainable food system: economic, environmental, and social sustainability (including human health)**. If any pillar is weak then the food system as a whole is unsustainable.

The UN's Food and Agriculture Organisation (FAO) defines a sustainable food system as a '*food system that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised*'.[5]

Our food system is highly interconnected and so the decisions all stakeholders make, whether a producer, food business, investor, government or consumer, will have far-reaching implications on the environment, societies and economies around the world. To address any of the sustainability challenges highlighted here, will require interventions which can deliver multiple outcomes, benefiting both human and planetary health.

Figure 1 - Only if we address all 3 pillars is the food system sustainable - From Economist Intelligence Unit: UNDP[4]

3. Key trends impacting on our food system and planetary health

There are a wide variety of trends that will impact on the global food system over the next few years. These include:

DEMOGRAPHIC SHIFTS

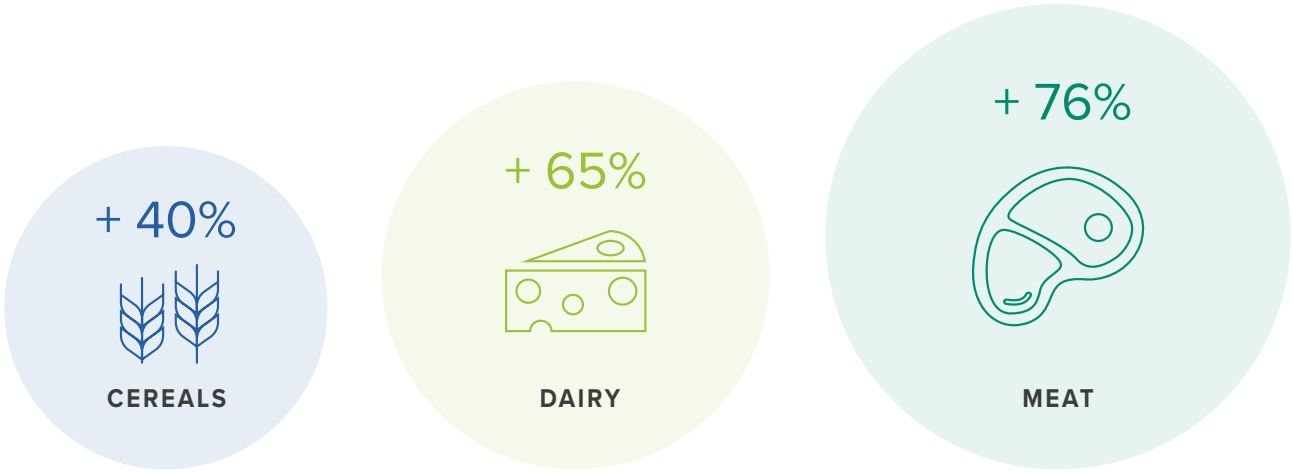
The global population is forecast to grow from 7.3 billion in 2015 and reach 9.7 billion by 2050[6] (with two thirds of these living in cities). According to the UN, food production will need to increase by 60% by 2050[7], while many others predict a doubling, based on business as usual scenarios.[8]

Projections of population growth [6]

INCREASING DEMAND FOR ANIMAL PRODUCTS

By 2050, global consumption of meat and dairy is expected to have risen by 76% and 65% respectively against a 2005-07 baseline, compared with 40% for cereals.[9] The latest OECD-FAO Agricultural Outlook datasets[10] indicate a 15% rise in global meat consumption over the next 10 years alone, driven by increasing demand in sub Saharan Africa, India and China. Today, some of the biggest meat-consuming countries include China, the European Union, the United States, Australia and South America.[11]

Expected rising of the global consumption [9]



Meat production by region

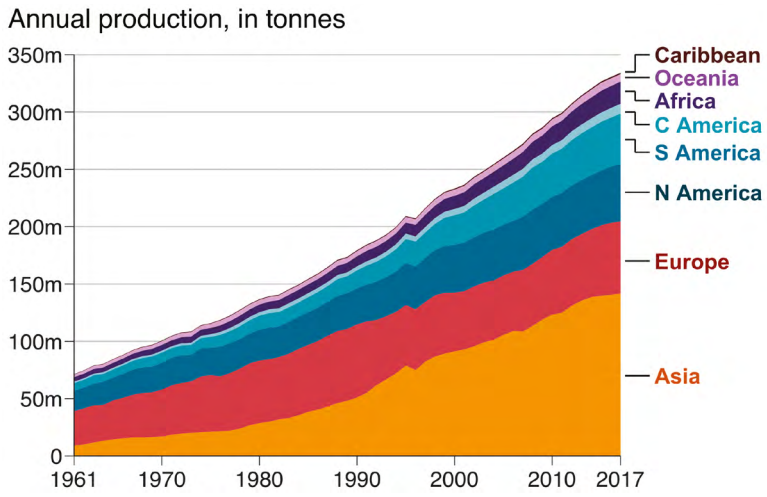


Figure 2 - From UN FAO, Our World in Data (2017)[12]

Over recent years the way we produce and consume protein has emerged as a key issue which is at the heart of many environmental and health impacts of food production and consumption.[13, 14] Today, the world population uses approximately 50% of total habitable land for agriculture. 77% of this land is used to raise animals (supplying 17% of our calories), through growing crops for animal feed and through the use of pastures as grazing land and 23% to grow crops for human consumption (supplying 83% of our calories).[15] The shift towards industrialised animal farming systems creates significant demand for grain and other plant proteins as feed for animals, as well as contributing to a host of other environmental impacts highlighted below.[13]

Animal-based foods are more resource-intensive than plant-based foods

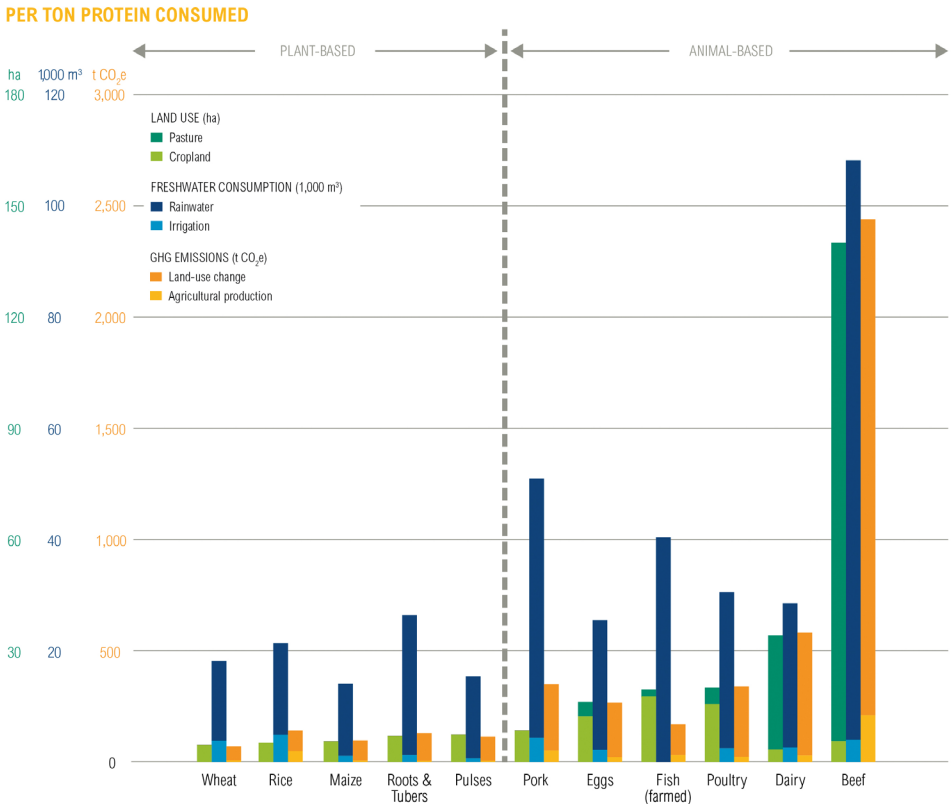


Figure 3 - From WRI, Shifting diets for a sustainable food future (2016)[16]

LIVESTOCK ARE INEFFICIENT FEED CONVERTERS

It takes much more grain, land and water to grow an animal to produce a kg of meat than it does to produce the same number of calories in the form of any grain or plant that is eaten directly. **The protein efficiency of meat and dairy production is defined as the percentage of protein inputs as feed effectively converted to animal protein**.

Poultry for example have an efficiency of about 20% (for every 5 kg of protein in, you get 1 kg out) and beef has an efficiency of about 3.8%[16] (see figure 4) although this does depend strongly on the type of production system (e.g. extensive vs intensive, organic vs inorganic etc.). The underlying cause is that beef cattle have multiple stomachs, geared to metabolize resistant lignins of grasses, rather than easily digestible carbohydrates from maize. For economic efficiency, they are fed maize to grow faster, but the caloric and protein efficiency is low. In fact, they cannot be fed maize for longer than about 3 months, for it turns them ill.[17]

Protein efficiency of meat and dairy production

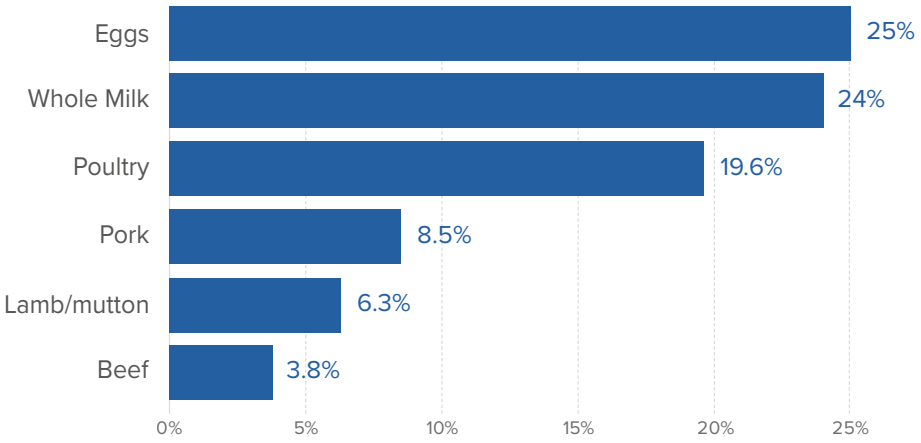


Figure 4 - From Alexander, P. (2016), Human appropriation of Land for Food: The role of diet[16]

CHANGES IN CONSUMER EXPECTATIONS

Driven by concerns about health, sustainability and animal welfare, many consumers across Europe and North America are turning towards more plant-based diets (flexitarian, vegetarian and/or vegan based diets) and are making conscious decisions to reduce quantities of meats within diets. For example, recent European research has shown that 57% of Germans, 55% of Poles and 45% of people in France and Italy consciously have meat free days.[18] All signs point to continued rapid growth in plant-based product sales in the long term, driven by the rise in flexitarian, vegetarian and vegan diets as consumers continue to look for products that reduce health and sustainability impacts.[19]


DISCOVER
Six Plant Based
Innovation
Trends for 2019

4. Planetary boundaries framework and our food system

In 2009, a group of 29 internationally renowned scientists, led by Johan Rockström, identified nine human impacts on processes that regulate the stability and resilience of the Earth system.[20]

1. Climate change
2. Biodiversity integrity
3. Land-use change
4. Freshwater use
5. Biochemical flows: nitrogen and phosphorus flows and cycle disruption
6. Ocean acidification
7. Atmospheric aerosol loading
8. Stratospheric ozone depletion
9. Chemical pollution and release of novel entities

Society's activities have already pushed climate change, biodiversity loss, shifts in nutrient cycles (nitrogen and phosphorus), and land use beyond the boundaries into unprecedented territory[21] and our food system is one of the most significant drivers behind the breaches of these planetary boundaries.[22] They were subsequently ranked, with the top 3 issues breaching environmental limits being biodiversity loss, nitrogen cycle disruption and climate change.[23,24,25] The global demand for meat and other livestock products is one of the most significant factors contributing to the breach of these limits.

The nine planetary boundaries

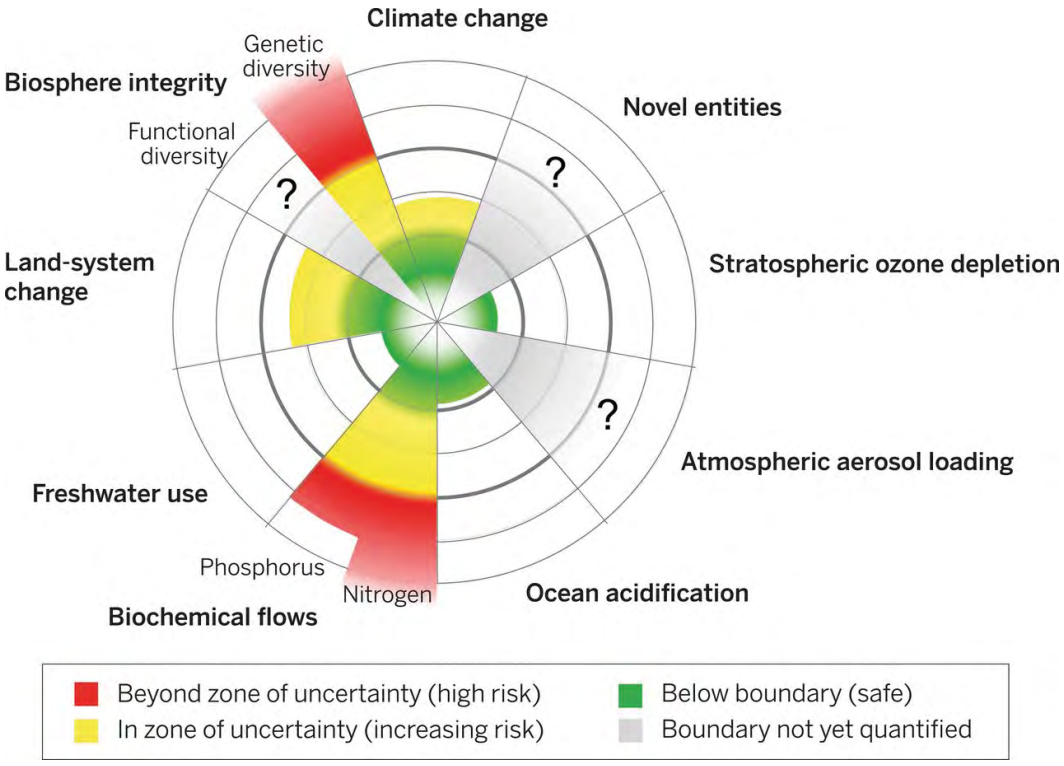


Figure 5 - From The Stockholm Resilience Centre[21]

5. International commitments - Sustainable Development Goals (SDGs), Paris Climate Change agreements and biodiversity commitments

In 2015, UN Member States endorsed two global agreements, which underpin the international interest in and the need to take a systemic approach to many of the health and sustainability opportunities and challenges associated with the food system. These include the Agenda for Sustainable Development[26] which identified **17 Sustainable Development Goals (SDGs) and the Paris Agreement on Climate Change**[27], which highlighted the need for urgent action to keep global warming below the 1.5 degrees threshold. Both agreements require far-reaching commitments and action from all countries of the world for their successful implementation, with a sustainable system key to the success of both of these agreements.

The Global Nutrition Reports 2017 & 2018[28], highlighted that the SDGs present an unprecedented impetus for universal and integrated change.

Johan Rockström and Pavan Sukhdev also noted that the delivery on the full range of SDGs is based first on achieving what they called 'biospheric' or ecological goals[29] (6, 13, 14, 15), i.e. it is a necessary but not sufficient condition of achieving social goals and the determinants of health (e.g. SDG 1 on poverty, SDG 4 on education, and SDG 10 on reduced inequalities) and economic goals that we have resilient and stable ecosystems. This is reflected in their 'wedding cake' structure in figure 7.

FOR MORE INFORMATION WATCH Johan Rockstrom 2018 TED talk

The 17 Sustainable Development Goals

Figure 6 - From Sustainable Development Goals[26]

SDG Wedding Cake

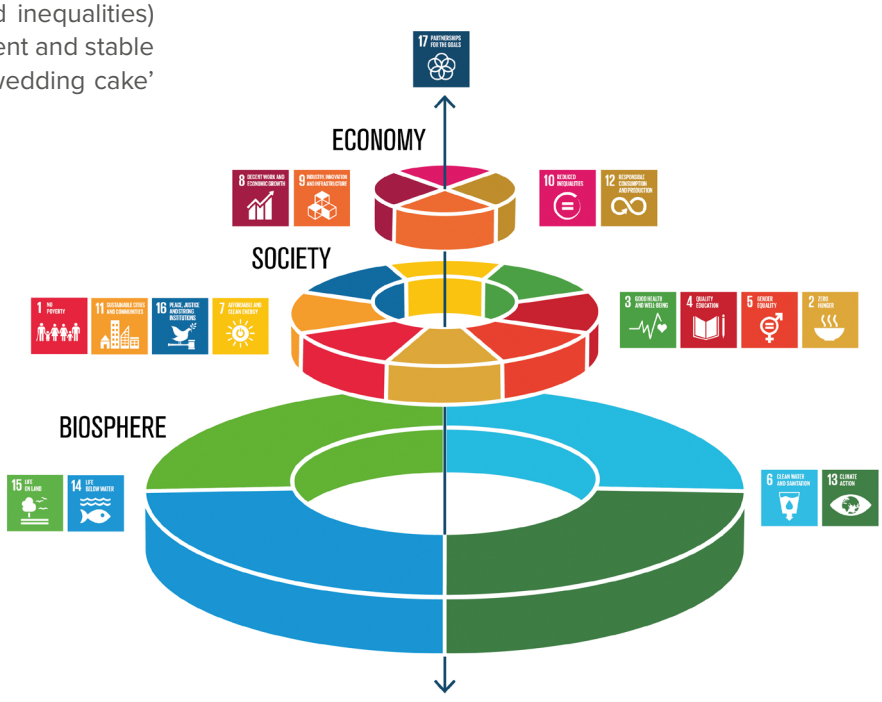


Figure 7 - From Stockolm Resiliance Centre[29]

Planetary Impacts of Food Production & Consumption

1. Key messages

- **Livestock contribute 14.5% of GHGe and significant quantities of land would be released by moving towards more plant-based diets.**
- **Nature is declining globally at rates unprecedented in human history, with over 1 million species threatened with extinction. One estimate suggests 30% of global biodiversity loss is linked to livestock production.**
- **Dietary shift could significantly reduce the total quantity of energy used within the food system, reduce water stress and improve water quality.**
- **The environmental and social impacts of food production and consumption are not truly reflected in the price of food many consumers pay. True cost accounting approaches, which recognise the external environmental and health costs of diets, will continue to influence the debate around the use of fiscal measures which drive consumer behaviours.**

Food production, distribution and consumption lie at the centre of many of the key sustainability challenges we confront today. Food is responsible for a major part of the environmental impacts in both developing and developed countries[30], with significant advances in Life-cycle analysis (LCA) methods[31] capturing a wide variety of environmental impacts across the food value chain, from production of inputs to agriculture, through farming, industry and retail to household (end consumer). The main sustainability impacts associated with food production and consumption are highlighted below.

2. Food security

Food security is a concept that is used to think systemically about how and why malnutrition arises, and what can be done to address and prevent it, alongside other key sustainability impacts. Underlying it is the international goal of food as a human right.[32] The FAO provides this well-accepted definition of a state of food security '*Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life*'.[33] It reflects an individuals' accessibility to food, where accessibility includes affordability. Many countries are facing the double burden of hunger and undernutrition alongside overweight and obesity, with one in three people across the globe currently suffering from some form of malnutrition.[34] Plant-based eating is key to ensuring long term food security. The use of crops and arable land for livestock production indirectly places rich meat and dairy consumers in competition for calories with those who need them most. Moreover, 6 kg of plant protein is required to yield 1 kg of meat protein, on average. Consequently, only 15% of protein and energy provided by feed crops will be consumed by humans indirectly.[35] Incidentally, the 85% of these crops that are lost for human consumption (and so for food security) strongly contribute to ammonia emissions from degradation of livestock manure, one of the major drivers of biodiversity loss.

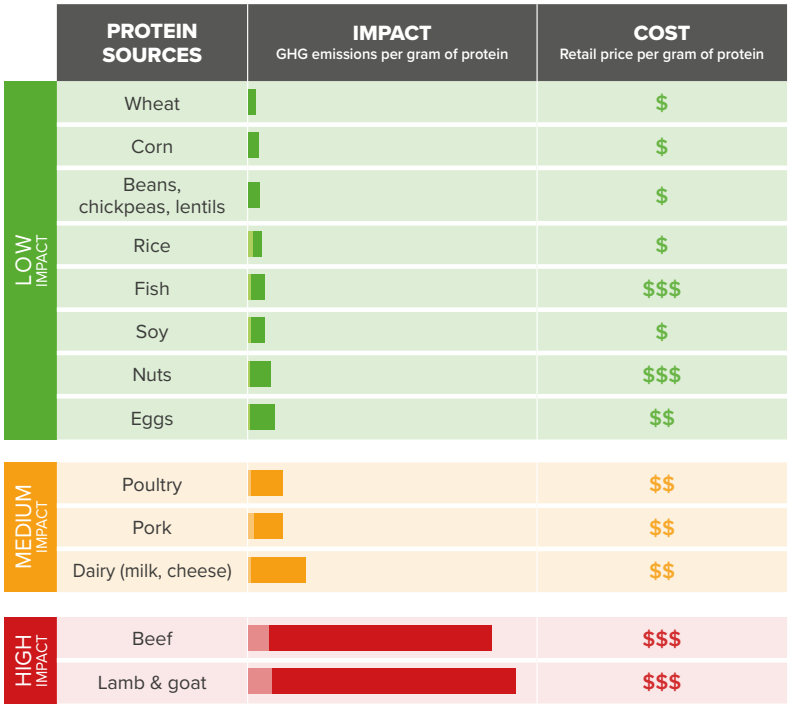
3. Climate change and greenhouse gas emissions (GHGs)

Food and agriculture are major contributors to climate change. Including land-use change, the food system is estimated to contribute approximately 19-29% of global human made GHGs.[36] The major impacts come from farming/agriculture and land-use change, with fertilisers, pesticides, manure, farming and land-use change together contributing as much as around 24% of global GHGs.[37] Livestock alone contribute 14.5% of total GHG emissions, more than the direct emissions for the transport sector. Livestock production is the largest global source of methane (CH_4) and nitrous oxide (N_2O) - two particularly potent GHGs.

Very high calorie diets are common in high-income countries and are associated with high total per capita GHGe (3.7-6.1 kg of carbon dioxide [CO_2] equivalent per day) due to high carbon intensity and high intake of animal products.[38] If everyone were to reduce their meat consumption, or even switch completely to plant-based protein food, up to 3,500 million hectares of pasture and 375 million hectares of cropland could be abandoned, resulting in a large carbon uptake from re-growing vegetation.[39] Altogether abolishing consumption of grazing animals is not an optimal solution for sustainability and food security with an important role more extensive grazing systems play within regenerative agriculture for example.[40]

A Lancet Commission report, 'The Global Syndemic of Obesity, Undernutrition, and Climate Change (2019)'[42], explored the interconnections between climate change, obesity and undernutrition. It highlighted that malnutrition in all its forms, including obesity, undernutrition, and other dietary risks, is the leading cause of poor health globally and that climate change will exacerbate these health challenges. An increasing body of evidence indicates that reducing levels of carbon dioxide in the atmosphere would increase concentrations of protein, micronutrients (zinc, iron, calcium and potassium), and B vitamins, in key food crops that provide global populations with most of our calories, including wheat, rice, millet, barley, potatoes, and rice.[43]

A Comparison of the GHG impacts of different protein sources

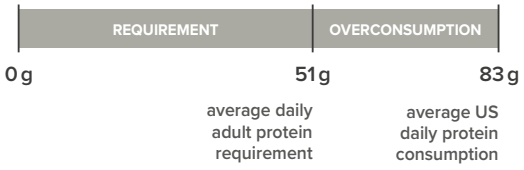


Lighter shade shows emissions from agricultural production, darker shade shows emissions from land-use change.

Figure 8 - From WRI 2016[41]

How Much Protein Do You Need?

The average daily adult protein requirement is **56 g** for a man and **46 g** for a woman but many people consume much more than they need.



4. Land-use change and biodiversity

Over the last several hundred years human uses have come to dominate the earth's land surface, progressively eroding the area that is in a natural state. As figure 9 demonstrates, humans use half of global habitable area for agricultural production[44] with 77% of agricultural land used for the rearing of livestock through a combination of grazing land and land used for animal feed production. Despite being dominant in land allocation for agriculture, meat and dairy products supply only 17% of global caloric supply and only 33% of global protein supply. Eleven million square kilometres used for crops supply more calories and protein for the global population than the almost 4-times larger area used for livestock.

Global surface area allocation for food production

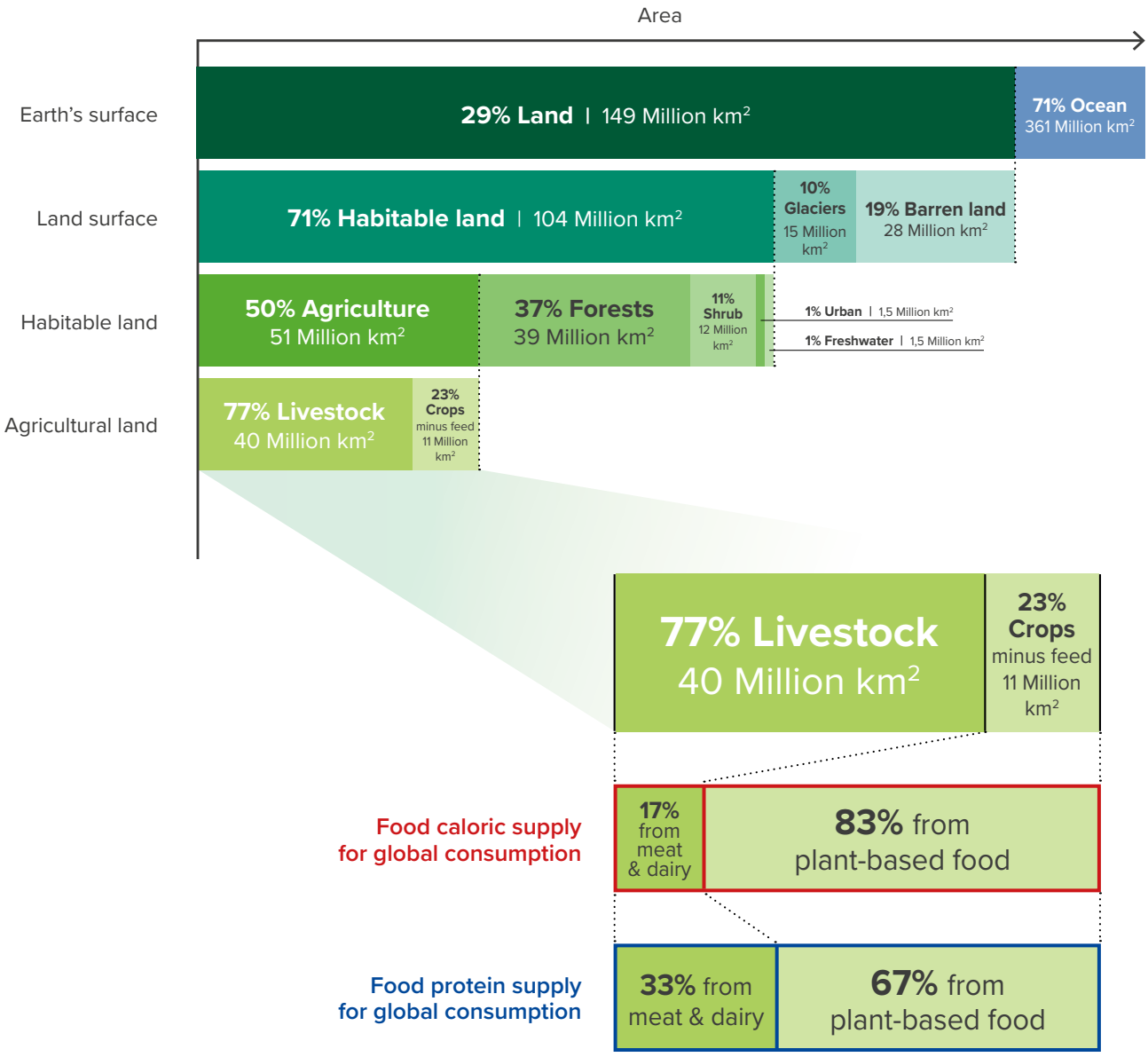


Figure 9 - From UN Food and Agriculture Organization Statistics[44]

According to one estimate, 30% of global biodiversity loss is linked to livestock production, driven by livestock's role in deforestation and land conversion, overgrazing and degradation of grasslands, and desertification.[45] Another United Nations Convention to Combat Desertification report showed that food production accounts for 80% of global deforestation.[46] The World Resources Institute has estimated that the area of land needed for agriculture could shrink by 800 million hectares and be liberated for reforestation, through a combination of measures including reducing food waste, the move towards more plant-based diets and improvements in productivity (see figure 10).[47]

More recently (2019) the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) reported that nature is declining globally at rates unprecedented in human history, with over 1 million species threatened with extinction.[48] The average abundance of native species in most major land-based habitats has fallen by at least 20%, mostly since 1900. More than 40% of amphibian species, almost 33% of reef-forming corals and more than a third of all marine mammals are threatened. WWFs Living Planet Index[49] reveals that global populations of fish, birds, mammals, amphibians and reptiles decreased by 60% globally between 1970 and 2014.

Options to reduce land-use

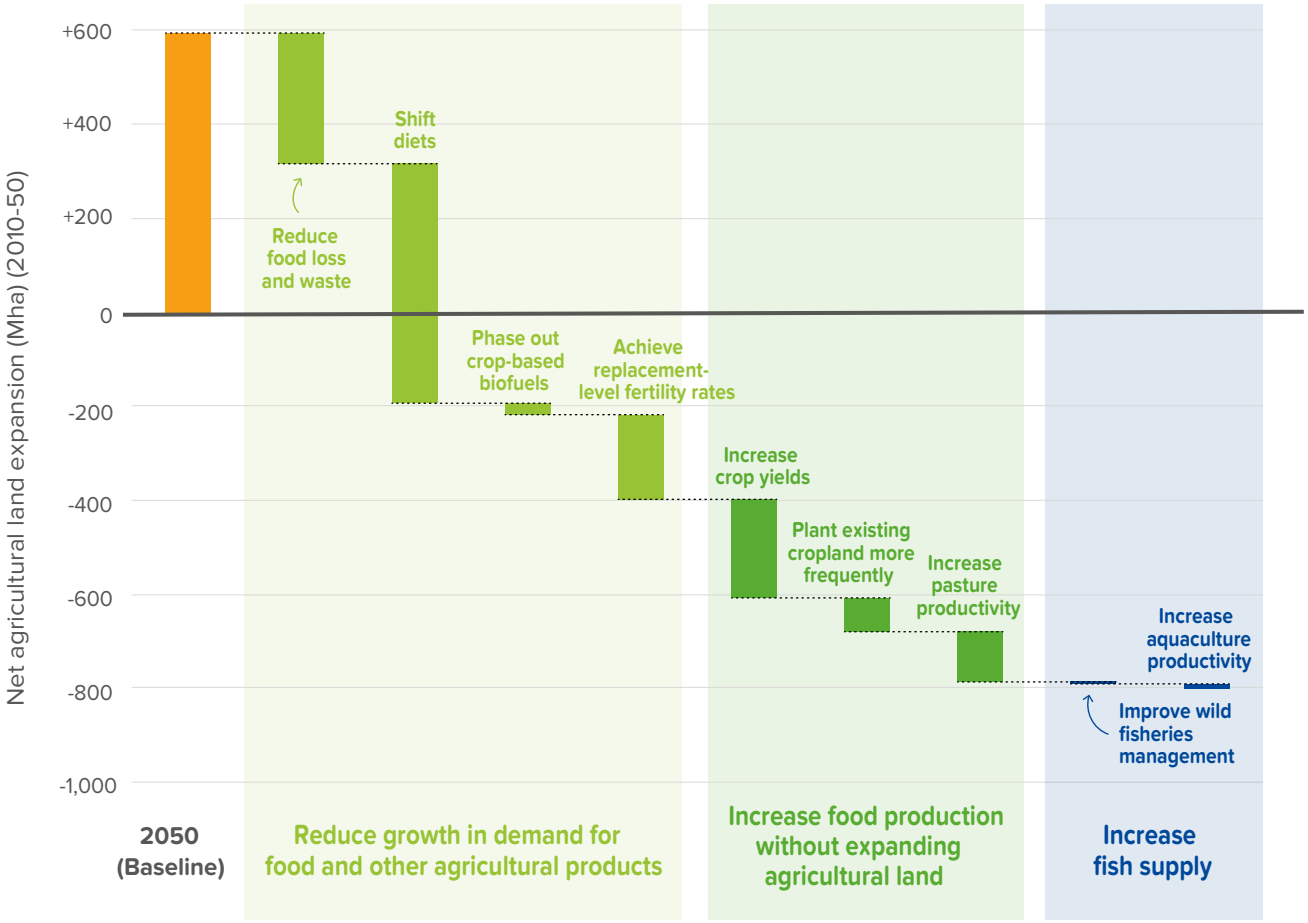


Figure 10 - From Searchinger (2018), The World Resources Institute[47]

5. Energy usage

The food systems energy demands are diverse and include fossil fuels for the production of fertilizers, pesticides, irrigation, food distribution, manufacturing, refrigeration and packaging. In industrialized economies, food production, processing, and household-level activities, such as refrigeration and cooking, account for the largest proportions of total energy used in the food system, whilst in many emerging economies agricultural production accounts for the highest proportion of energy usage. Energy use per unit of caloric output in intensive livestock and aquaculture production is typically much higher than for agricultural crops. Energy associated with feed inputs has been estimated to account for 53% to 86% of the total energy intensity of livestock products.[50] Given the wide variation in energy intensity within and between plant and livestock products, dietary choice is a key determinant of food system energy use.

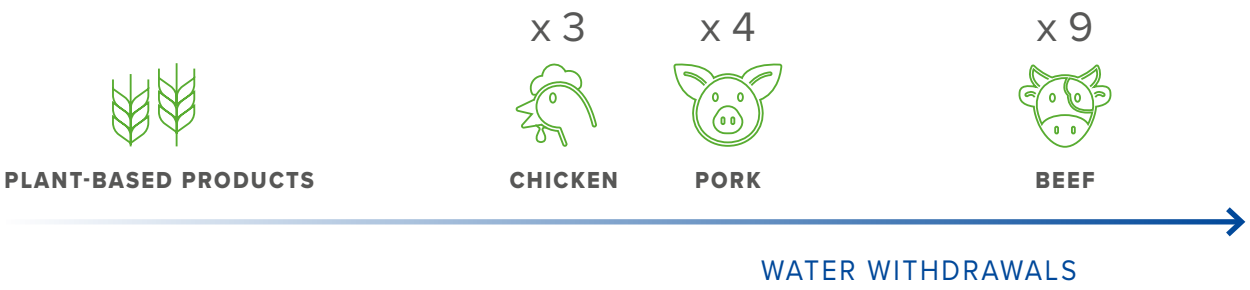
6. Water quality and quantity

Food production requires significant amounts of freshwater. Some foods are more water intensive than others, e.g. livestock products (livestock have extensive direct and indirect water demands - e.g. drinking/washing and irrigation of feed crops, respectively), many horticultural products and processed foods. Agriculture is responsible for 70% of water withdrawals (primarily for irrigation). According to the UN, today nearly half the global population are already living in water scarce areas with some estimated 700 million people worldwide being displaced by intense water scarcity by 2030.[51]

The production of beef, pork and chicken respectively uses around nine, four and three times as much irrigation water as plant-based products[52], such as cereals, but when rainfed crops are also included these estimates can be considerably higher (10-1000) under more intensive production systems[17]. According to recent research by the European Joint Research Centre[53], which compared the water footprint of different diets, greater compliance with national dietary guidelines would result in water reductions of 11% to 35% for diets with meat, 33% to 55% for pescatarian diets and 35% to 55% for healthy vegetarian diets.

Agricultural run-off containing nitrates and phosphates from excessive fertiliser use or more manure/slurry management can lead to waterways (both freshwater and marine) becoming enriched with nutrients, beyond levels that can be absorbed or dissipated by the natural system. This enrichment, which is of particular concern from more intensive livestock systems, can promote algal blooms that damage ecosystems through the release of toxins. Many countries in Europe, USA, Canada, India and New Zealand experiencing major environmental degradation due to water pollution via animal waste. Pesticides (insecticides and herbicides) sprayed onto fields which can accumulate in sediments that become washed into water bodies, are another concern. In the last few years, a new class of agricultural pollutants has emerged in the form of veterinary medicines (antibiotics, vaccines and growth promoters [hormones]), which move from farms through water to ecosystems and drinking-water sources.[54]

Comparison of irrigation water needs[52]



7. Food waste, packaging waste and trade-offs

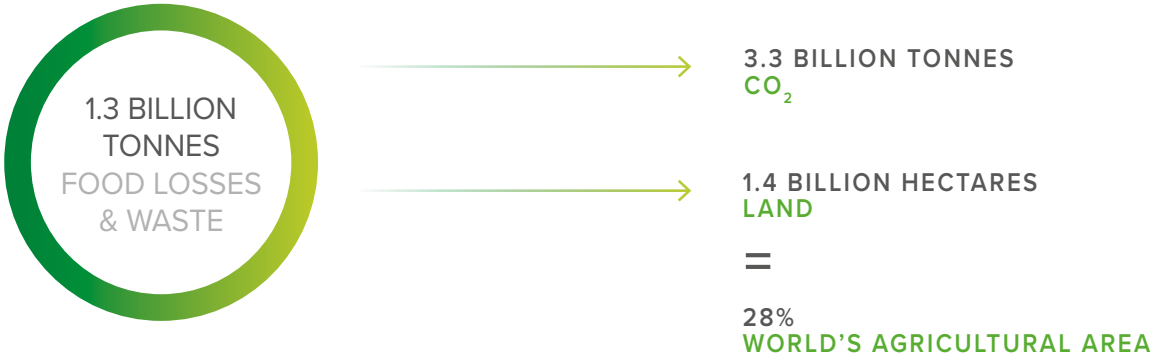
One third of the food produced in the world for human consumption every year, approximately 1.3 billion tonnes, gets lost or wasted.[55] **Food losses and waste** amount to roughly US$ 680 billion in industrialized countries and US$ 310 billion in developing countries. Food waste drives a range of environmental impacts, across the food system (plant and animal foods) including the generation of 3.3 billion tonnes of GHGe, uses up to 1.4 billion hectares of land, or 28% of the world's agricultural area.[56]

Food packaging has been demonstrably linked with high levels of waste, terrestrial and marine litter, as well as low rates of re-use or recycling. Food and beverage packaging items are amongst the most commonly found marine litter items globally. A UN study puts plastics from the global food industry to be responsible for $13 billion in natural capital impacts annually.[57]

The issue of plastics in relation to food sustainability and their impacts on the marine environment is of significant concern to many consumers, particularly since the EU have announced plans to ban the use of single use plastics, such as plastic cutlery and plates, cotton buds, straws and drink-stirrers.

It should be noted that food packaging can help reduce food waste and improve shelf life and that there are trade-offs to be made. Packaging will continue to play a role in preventing damage and can triple shelf life according to researchers at Wageningen University.[58] The development of sustainable packaging materials, such as bio-degradable and compostable materials made from plants, whilst improving the recyclability of existing materials, will be key to the success of reducing both food and packaging waste.

Environmental impacts of food losses and waste[56]



Food packaging can help reduce food waste and improve shelf life and that there are trade-offs to be made.

FOR FURTHER INFORMATION: FAO Policy Series - Food Loss & Food Waste

8. Social and economic impacts - true cost accounting

The environmental and social impacts of food production and consumption are not truly reflected in **the price of food** many consumers pay.[59] As outlined within this paper, our food system is creating damage to not only our environment, but it impacts negatively on the lives of many communities and to human physical and mental health and well-being. We are paying for this damage in hidden ways, for instance through water charges to clean up drinking water; taxes which fund livestock focused agricultural subsidies and environmental clean-up costs or through costs of diet-related disease (obesity, diabetes cardiovascular diseases etc.). So, although our food appears never to have been cheaper, when we look beneath the surface, we are paying far more than is the case at initial face value.

Full Cost Accounting approaches, such as the TEEB Agri-Food Framework[60] can help to bring to light the true cost of cheap food, and ensure consideration is given to wider health and social costs. Many health impacts and their costs continue to fall disproportionally on the poorest and most disadvantaged in society, reinforcing health inequalities. According to McKinsey the annual global economic costs of obesity are about US$2 trillion, representing 28% of the world's gross domestic product.[61] The World Health Organization estimates the direct costs of diabetes at more than US$827 billion per year, globally and this is set to reach $2.5 trillion by 2030.[62]

Over the next few years there is likely to be a renewed focus and more research around the 'True Cost of Food' (and protein); this will continue to drive the debate around the use of various forms of fiscal incentives.

Several diet optimization studies have calculated that it is possible to create healthy diets with a significantly reduced environmental impact at an affordable cost. [63, 64, 65]

SUSTAINABILITY AND PROTEIN QUANTITY

The average protein consumption in many Western countries is 150-200% of recommended values.[65] Across Europe more generally protein consumption is above the population reference intake which is recommended for an average person of 0.83 g per kg of body weight per day (higher for pregnant women[66], infants and children). Current intake is between 67 g and 114 g per day for men and between 59 g and 102 g per day for women. From a sustainability perspective, therefore, there is a need in many Western countries in particular, to reduce average intakes of protein whilst moving from a meat heavy diet to a plant heavy diet.

The Need for Sustainable Diets

1. Key messages

- **A sustainable diet is a dietary pattern that provides us with the many nutrients we need for health, in appropriate amounts, but that is culturally acceptable, affordable and sustainable.**
- **All governments should be reflecting sustainability in their nutrition guidelines with specific recommendations for increasing the proportion of plant-based proteins within diets.**
- **Research from many countries demonstrate that diets aligned with national food based dietary guidelines reduce GHGe and land-use.**
- **Overall, in order to reduce ecological and human health impacts there is a need to reduce overconsumption of protein, reduce overconsumption of calories, reduce food waste and replace animal protein with plant protein.**

2. What is a sustainable diet?

Put simply, a sustainable diet is a dietary pattern that provides us with the many nutrients we need for health, in appropriate amounts, but that is culturally acceptable, affordable and sustainable. It is one which we can produce and consume within planetary boundaries whilst feeding the growing global population.

The FAO provides a more formal definition for sustainable diets in 2010 stating that '*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.*'

There is an increasingly body of robust evidence, as highlighted within this review, to suggest that dietary patterns, focussed on a greater proportion of plants within diets, have lower environmental impacts and can improve health outcomes.[67] In the past decade, **more and more countries have started to incorporate sustainability considerations into their food policies and consumer education programmes**. Recommendations that promote specific food practices and choices have been an obvious strategy for addressing sustainability, mainly in its nutrition and environment dimensions.

Many sustainable diets recommendations include for example:

- having a mostly plant-based diet
- focus on seasonal and local foods
- reduction of food waste
- consumption of fish from sustainable stocks only
- reduction of red and processed meats
- increased consumption of tap water
- reductions in sugars

Key elements to consider when defining a sustainable diet

Figure 11 - From FCRN, What is a sustainable healthy diet? [68]

WATCH the video of the EAT-Lancet Commission Launch in Oslo

3. The EAT-Lancet Commission Report

Over the last few years a significant amount of new evidence has emerged which support the need, from a sustainability perspective, to transition towards plant-based diets. One of the most notable and influential of these is the EAT-Lancet Commission Report.[69] The report provides the first scientific targets for a healthy diet from a sustainable food production system that operates within planetary boundaries for food. It specifically recommends '*diets consisting of a variety of plant-based foods, with low amounts of animal-based foods, refined grains, highly processed foods, and added sugars, and with unsaturated rather than saturated fats*'. The authors highlight the need to reduce, by more than 50%, the global consumption of foods such as red meat and sugar and increase the consumption of nuts, fruits, vegetables, and legumes by more than two-fold, with global targets being applied locally to reflect regional differences in needs.

Overall, they concluded that to stay within planetary boundaries, a combination of major dietary change, improved food production through enhanced agriculture and technology changes, and reduced food waste during all steps of the food chain from production to consumption (including farmers, processors, supermarkets, restaurants, and people at home) will be needed.

The great food transformation

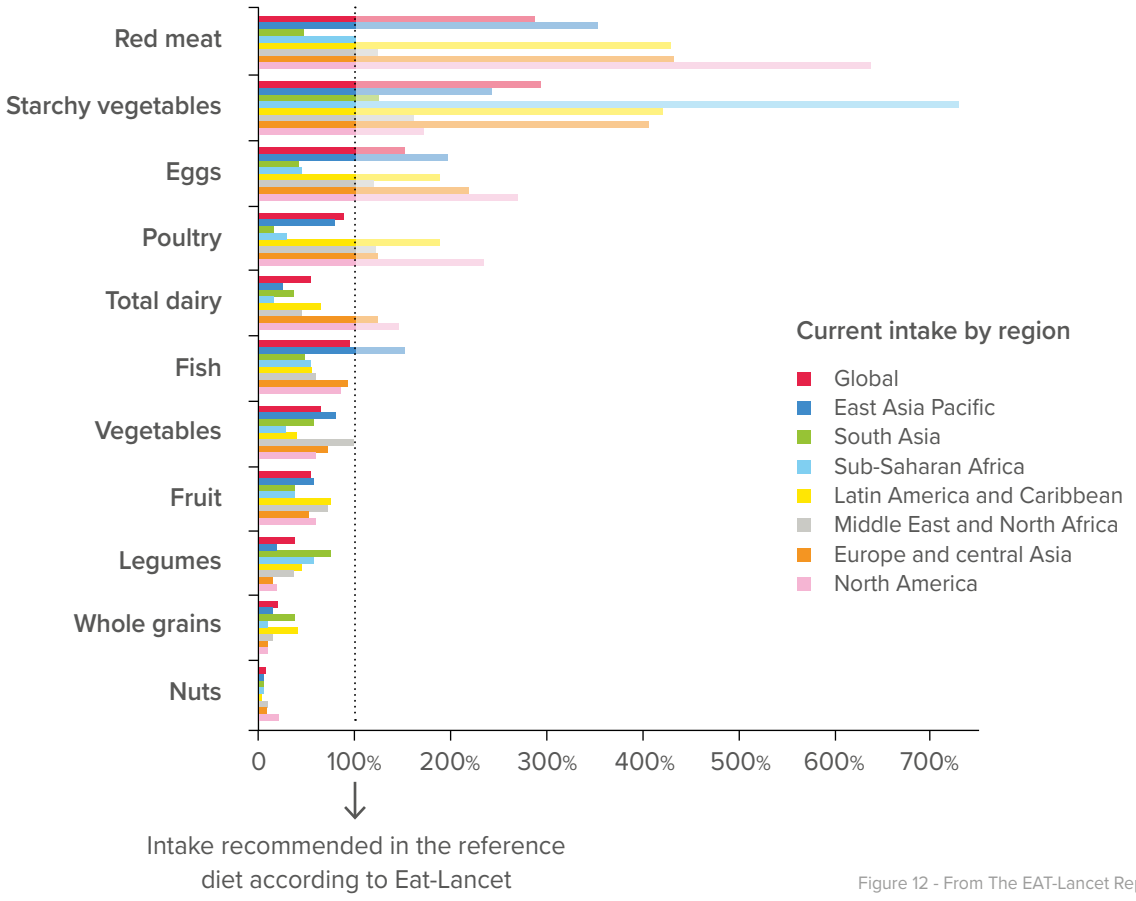


Figure 12 - From The EAT-Lancet Report [69]


For more information on the work of the Nordic Council of Ministers and their Nordic Food Manifesto
PLEASE SEE HERE

4. Sustainable diets in practice: best case examples

The Mediterranean diet is often highlighted as both healthy and sustainable.[70] It is characterised by high intake of fruits, vegetables, legumes, nuts, cereals, fish, and olive oil (coupled with low intake of saturated fats); low intake of meat and dairy products; low consumption of saturated fatty acids and high intake of fibre.[71] This diet dated back to Roman times and was common place in the Mediterranean region until the 1960s. Over recent years there has been a decreasing adherence to such **traditional food patterns** which has resulted in diets of a lower nutritional quality.[72,73] There is evidence that a Mediterranean diet can decrease the risk of diet-related chronic diseases, while also promoting living longer in good health and healthy aging.[74] One of the greatest attributes of a **Mediterranean diet** is that alongside the obvious health benefits, is its lower environmental impact (particularly with regards to GHGe) than typical Western diets.[75]

Another diet that has gained increasing attention in recent years is the **traditional Nordic diet**. The Nordic diet is a way of eating that focuses on locally sourced foods in the Nordic countries - Norway, Denmark, Sweden, Finland, and Iceland. Compared to an average Western diet, it contains less sugar and fat but twice the fibre and seafood.[76] These diets have been shown to have good health and positive environmental impacts.[77] The New Nordic diet has shown improved dietary intake and nutrition content among children, and is associated with weight loss and blood pressure reduction in obese individuals, and it improves blood lipid profiles and insulin sensitivity.[78] It has been estimated that change towards New Nordic diets in Denmark would save 18,000 Disability-Adjusted Life Years (DALYs) per year by preventing non-communicable diseases.[79] As a diet, that contains 35% less meat than the average Danish Diet (2019)[80], it uses fewer natural resources (such as water and fossil fuels) and create less pollution than meat-heavy diets. In addition, eating locally produced foods also reduces energy consumption and food waste.

Consensus is emerging that eating according to dietary guidelines is more sustainable than current dietary habits.[81,82,83] All governments should be reflecting sustainability in their nutrition guidelines with specific recommendations for increasing the proportion of plant-based proteins within diets, as a key priority. Despite this need, only a few countries have explicitly considered environmental factors in their main messaging (Germany, Brazil, Sweden and Qatar, UK, Belgium, The Netherlands).[84]

Within the European Union all countries have Food Based Dietary Guidelines (FBDGs), which are science-based recommendations in the form of guidelines for healthy eating.[85] Since country-specific nutrient intake levels, availability of food products, and cultural characteristics affect FBDG development, FBDGs are usually unique to the population or country that developed them. Many of these have similar characteristics including advice to eat less salt, eat a number of 'portions' of fruit and vegetables, consume a certain amount of fish, with a number recommending reducing and moderating levels of meat consumption, particularly with regards to red and processed meats. One study provided a comparison between the environmental impacts of average dietary intakes and a nation-specific recommended diet across 37 countries and found that **following a nationally recommended diet in high-income nations results in a reduction in GHGe by between 13% - 24.8%**.[86]

There is an increasingly body of robust evidence to suggest that dietary patterns, focussed on a greater proportion of plants within diets, have lower environmental impacts and can improve health outcomes.

A recent study in The Lancet Planetary Health (2018)[87] highlighted the environmental footprint of three different diets recommended in the 2015–20 Dietary Guidelines for Americans. These included the healthy US-style, healthy Mediterranean-style, and healthy vegetarian dietary patterns. By assessing six categories of environmental impacts (climate change, land use, water depletion, freshwater eutrophication, marine water eutrophication, and particulate matter or respiratory inorganics), they established that the healthy vegetarian diet produced a 42-84% lower burden than the other two diets. As a result of this work the authors called for better incorporation of environmental sustainability aspects into future dietary guidelines with the US.

In the UK, a study commissioned by the Department for the Environment, Food and farming (2018)[88] showed that achieving a national move to the Eatwell Guide (The UK governments dietary guidelines), which recommends more fruits, vegetables and fibre-rich starchy carbohydrates and fewer sugary foods and drinks, would have major environmental benefits in reducing emissions of GHG (14%), ammonia (28%), nitrate (12%) and acidifying gases (4%). The report also highlighted that a significant amount of land would be released (about 4.8 Mha of pastureland) with smaller increases in cropland requirements both in the UK (0.34 Mha) and overseas (0.48 Mha).

5. A review of studies evaluating environmental impact of plant-based diets

A systematic review of peer-reviewed journal articles assessing the GHG emissions and land use demand of in total 49 dietary scenarios[89] highlighted that dietary change, with an emphasis on more plants in diets, particularly in regions of the world where meat consumption is high, could play an important role in reaching environmental goals, with up to 50% potential to reduce GHG emissions and land use demand associated with the current diet.

A number of other analyses have highlighted the environmental benefits of reducing the fraction of animal-sourced foods in our diets including easing pressure on land use[90] and reducing GHG emissions.[91] Many of these have concluded that changing diets may be more effective than technological mitigation options for avoiding climate change[92] and may be essential to avoid negative environmental impacts such as major agricultural expansion and global warming of more than 1.5°C.

Recent work by the World Resources Institute (WRI)[93] considered the need for three interconnected diet shifts including:

1. reduction in overconsumption of calories
2. reductions in the overconsumption of protein by reducing consumption of animal-based foods
3. reductions in beef consumption specifically

For each shift they quantify the land use and GHG consequences of different foods, and then analyze the per person and global effects of the three diet shifts on agricultural land needs and GHGe. They found that these shifts, if implemented at a large scale can substantially reduce GHG emissions and land use by half (see figure 13).

Reducing consumption of animal-based foods reduces the agricultural land use and GHGe associated with the average US Diet by up to half per capita values 2009

Figure 13 - From WRI 2016 [93]

Alexander et al. (2017)[94] quantified the amount of food lost by overconsumption and leading to obesity. Rather shockingly, they found that it even surpassed the amount of food discarded in the household (which is about a third of food purchased). Subsequently, Aiking & De Boer (2019)[95,96] developed a priority list to improve current Western dietary patterns (in descending order of magnitude):

1. reducing overconsumption of protein
2. reducing overconsumption of calories
3. reducing food waste in the household
4. replacing animal protein with plant protein (analogues and/or whole foods)

This list not only resembles the above WRI transitions, but these authors explicitly mention the proposal to shift the current Dutch animal protein: plant protein consumption ratio of 60:40 to 50:50 by 2025 and to 40:60 by 2050, as proposed by the Green Protein Alliance, and backed by the Dutch government.

Springmann et al. (2017)[22] analysed several options for reducing the environmental effects of the food system, including dietary changes towards healthier, more plant-based diets, improvements in technologies and management, and reductions in food loss and waste. As illustrated in figure 14, they found no single measure is enough to keep these effects within all planetary boundaries simultaneously, and that **a synergistic combination of measures will be needed to sufficiently mitigate the projected increase in environmental pressures**.

Reduction in environmental impacts when measures are combined

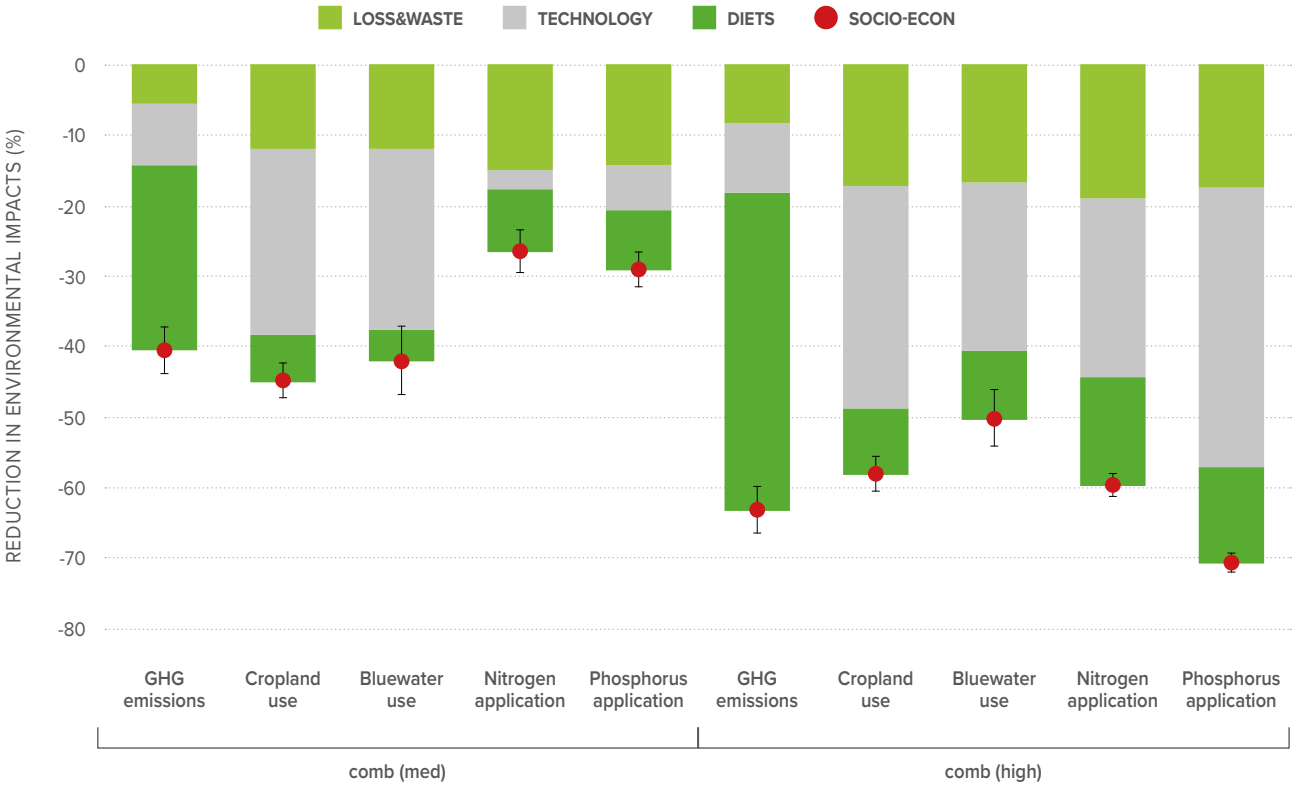


Figure 14 - From Nature, Options for keeping the food system within environmental limits (2017)[22]

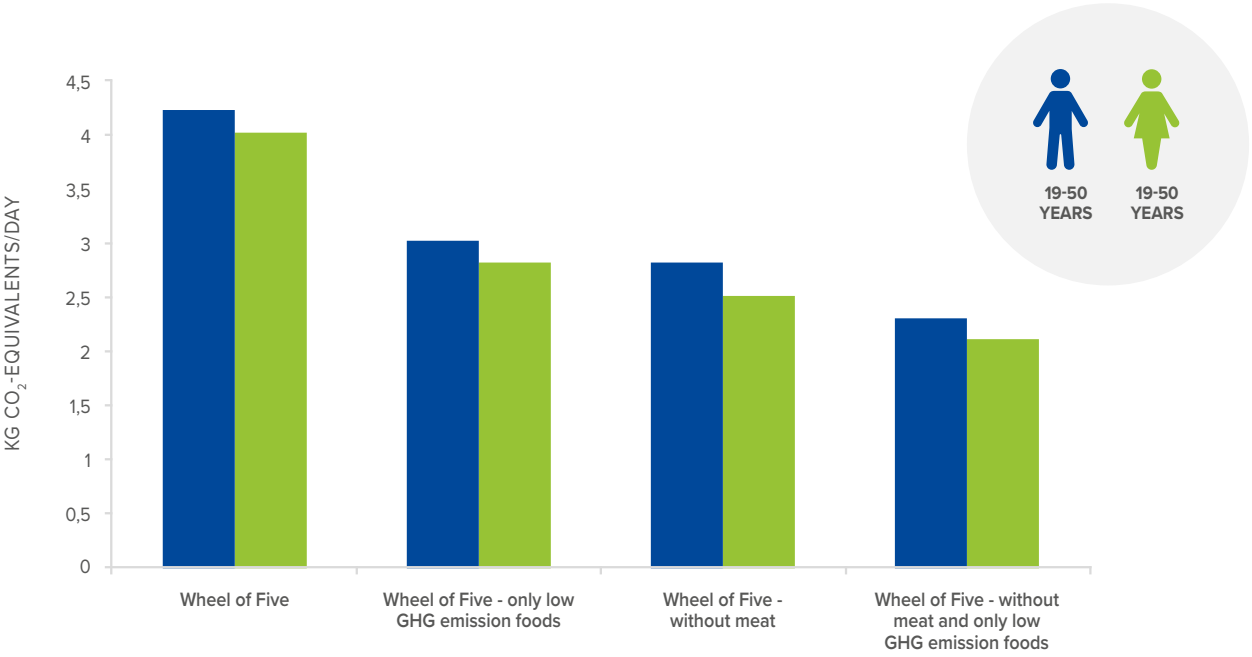
6. A review of studies evaluating the health impacts of sustainable diets

In recent years a number of studies have emerged which look at the interplay and effects of a sustainable diet on both health and sustainability. One recent study, published in the Lancet (October 2018) by Springmann et al.[97], used an integrated health and environmental modelling framework for more than 150 countries, and examined three different approaches to sustainable diets motivated by environmental, food security, and public health objectives.

Following **environmental objectives** by replacing animal-source foods with plant-based ones was particularly effective in high-income countries for improving nutrient levels, lowering premature mortality (reduction of up to 12% [95% CI 10-13] with complete replacement), and reducing some environmental impacts, in particular GHGe (reductions of up to 84%). However, it also increased freshwater use (increases of up to 16%) and had little effectiveness in countries with low or moderate consumption of animal-source foods.
Following **public health objectives** by adopting energy-balanced, low-meat dietary patterns that are in line with available evidence on healthy eating led to an adequate nutrient supply for most nutrients, and large reductions in premature mortality (reduction of 19% for the flexitarian diet to 22% for the vegan diet. It also markedly reduced environmental impacts globally (reducing GHGe by 54-87%, nitrogen application by 23-25%, phosphorus application by 18-21%, cropland use by 8-11%, and freshwater use by 2-11%) and in most regions, except for some environmental domains (cropland use, freshwater use, and phosphorus application) in low-income countries.

In another recent Dutch study[98], a research team looked at differences in environmental impact and nutrient content of the current Dutch diet and **four simulations of healthy diets aimed at lowering GHGe**. They found that replacing meat in this diet and/or consuming only foods with relatively low GHG emissions resulted in average GHG emission reductions varying from 28-46%. In the scenarios in which only foods with relatively

GHGe associated with food consumption according to the Dutch Wheel of Five*



* *food based dietary guidelines covering around 85% of estimated average energy requirements*

Figure 15 - From Food Research International [98]

low GHG emissions are consumed, fewer dietary reference intakes (DRIs)[99] were met than in the other healthy diet scenarios. However, in all healthy diet scenarios the number of DRIs being met was equal to or higher than that in the current diet.

Temme et al.[100] assessed the environmental (land use) as well as the nutritional (intakes of saturated fatty acids and iron) characteristics of individual food consumption in 398 young Dutch women. Meat was identified as the most important contributor to diet-related land use in this population (contributing 39% to land use). The authors **simulated the effects of replacing meat and dairy foods with plant-based products** on land use and intakes of saturated fatty acids and iron. In their scenarios, meat and dairy products were replaced by the same amount of a plant-based dairy- or meat-replacing food that had a usage similar to that of the food being replaced. When all meat and dairy foods were replaced by plant-based products, land use was halved, estimated saturated fatty acids intake decreased by 4% of total energy, and total iron intake increased by 2.5 mg/d compared with the observed diet.

Another Dutch study based on dietary intake of 3 818 individuals (7-69 years) participating in the Dutch National Food Consumption Survey 2007-2010[101], evaluated the GHGEs of diets in girls, boys, women, and men separately and explored associations with diet composition, total food and energy intake, and macronutrient intakes. They found that reducing energy intakes, especially from animal-based foods and sugar- and alcohol-containing drinks, will help reduce the environmental impact of diets.

Following public health objectives by adopting energy-balanced, low-meat dietary patterns led to a large reductions in premature mortality and markedly reduced environmental impacts globally.

Take Home Messages

A growing global population, urbanisation and income levels, are all driving increasing global demands for meat/ animal-based products, creating a planetary and human health crisis.

Our current patterns of food consumption and production are unsustainable and we are breaching safe operating limits, particularly with regards to climate change and biodiversity loss.

A global dietary shift towards more plant-based products is key for improving human health and planetary health (especially reduction in GHGe & reductions in land-use change/biodiversity loss).

Plant-based eating is key to delivering international environmental commitments including the global Sustainable Development Goals, food security and the global Climate Change agreements.

There is a need to shift mindsets from the prevailing 'productivist' narrative (produce more food) to one that focusses on optimising health, nutritional and sustainability outcomes from our food system.

Integrating sustainability criteria into national food based dietary guidelines is an important tool in encouraging more people to eat more plants.

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