The food system, planetary boundaries and eating for 1.5°C: the case for mutualism and commensality within a safe and just operating space for humankind

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Introduction

More cultivated food is produced today than at any time hitherto and has enabled world population to grow to nearly 8 billion people. Yet while at least two-fifths of humanity do not eat or absorb sufficient nutrients for a healthy life (IFPRI, 2016) the global ecological costs of feeding the rest of us are becoming ever more apparent. Across a range of key biophysical indicators, the consequences of food system activities – from agricultural input manufacturing through farming and food processing to retail, consumption and waste – have been raising concern for some time (Foley et al., 2011; Sage, 2012; Tilman & Clark, 2014; Springmann et al., 2018; Rockström et al., 2020) and life cycle assessment (LCA) studies are providing an abundance of quantitative evidence (Cucurachi et al., 2019; Notarnicola et al., 2017; McAuliffe et al., 2016). However, it is the food system's contribution to global warming and impacts of climate disruption that has recently come under the sharpest focus and one which will preoccupy us here.

As highlighted in chapter one, voices from a range of policy fields have created a sense that the food system is 'in crisis'. As we saw, there are several different ways in which this 'crisis' has been framed and, consequently, the kinds of solutions that have been presented. One of the key 'saviour' terms to emerge from this process has been that of sustainability. Although deployed as something of a Trojan horse by those who wish to maintain business as usual, the frequent occurrence of the word 'sustainable' as a prefix to food systems reveals the extent to which the environmental consequences of current practices have become more widely recognised. In this respect it is relatively straightforward to itemise multiple first-order impacts associated with food production, putting to one side for the moment that of climate disruption.

Land use change in favour of food growing and livestock rearing has led to deforestation, habitat destruction, biodiversity loss and likely greater biological insecurity given the suspected origins of Covid-19 (Rulli et al., 2021). The expansion of high external input agriculture has resulted in the depletion of freshwater, soil fertility, and mineral resources and has been the primary contributor to the disruption of global geochemical flows (Poore and Nemecek 2018). The global food system, then, can be regarded as the primary driver of biodiversity loss through the conversion of natural ecosystems to crop production or pasture (Benton et al 2021; Dudley & Alexander 2017; Alexander et al 2015). Ecosystems perform multiple complex functions including the sequestration of atmospheric carbon, buffering the effects of adverse weather, and providing ecosystem services such as the purification of air and water and insect pollination of food crops. It is increasingly recognised that natural ecosystems provide other vital functions to human health and wellbeing, including psychological benefits. Yet with the widespread destruction of host ecosystems "biodiversity is declining faster than at any time in human history, and perhaps as fast as during any mass extinction" (Benton 2021: 5). In this process the production of food is primarily responsible having driven land conversion such that 50 percent of the world's habitable land is now under crop cultivation and animal grazing (Ritchie and Roser 2013).

Another concern arises from analysis of stocks and flows of *virtual water*: the amount of freshwater required to produce a certain volume of food and which might therefore be regarded as virtually embedded in it (Chapagain and Hoekstra, 2008; Allan, 2011). The mapping of international hydrological resources has revealed the considerable risk posed by local water scarcity to downstream economies through globalised supply chains (Qu et al., 2018). Moreover, global heating and climate breakdown are exacerbating regional and local issues around water management presenting societies with unprecedented challenges of both drought and flooding. Yet aquatic resources are also being damaged by pollution arising from intensive food production, particularly run-off from animal agriculture and heavily fertilised fields (Mateo-Sagasta et al 2017).

Drawing upon the framework of planetary boundaries (Rockström et al., 2009a, 2009b; Steffen et al 2015), serves to reveal nine key Earth system processes of which five are deeply affected by food production. These are changes to land-use, the climate system, freshwater availability, the biogeochemical cycles of nitrogen and phosphorus, and biosphere integrity (biodiversity loss). The other four – stratospheric ozone depletion, novel entities, aerosol loading and ocean acidification – may not be entirely disconnected from food but can be disregarded here. The value of the planetary boundaries model is that it helps to foster a more holistic and systemic approach to understanding the interconnected and cascading nature of the environmental consequences of all human activity – including food production - while proposing critical thresholds that represent limits to a 'safe operating space' for humankind. In this respect it invites us to consider a broader 'planetary turn' in our efforts to comprehend and act upon the conjoined conditions of human and global ecosystem health that are most closely entangled in the securing of food (Beacham 2021)[1].

Consequently, the chapter proceeds, first, by unpacking the planetary boundaries model before examining in greater detail one sector – climate - which is widely regarded as having breached 'safe limits' and in which the food system is playing a critical role (Campbell et al., 2017). Indeed, the entire food system is regarded as contributing between 21–37 percent of total greenhouse gas (GHG) emissions that are responsible for atmospheric heating and associated climatic changes (IPCC 2019, A3). Based on current trends food system emissions alone would prevent the achievement of the 1.5°C target established under the 2015 Paris Agreement - irrespective of fossil fuel emissions reduction (Clark et al., 2020).

A central feature of taking a food systems perspective is not to attribute responsibility for environmental harms solely to the realm of production without fully acknowledging all other actors at different stages of the system including that of human consumption. It is vital to challenge received 'wisdom' that consumers are simply acting in economic self-interest and responding to the incentives placed before them by producers and retailers. But food purchasers have agency and the choices that they make have consequences, with demand driving market signals upstream leading to agricultural expansion, specialisation, and intensification. For this reason, the chapter regards current dietary practices within rich and upper middle-income countries as shouldering particular responsibility for the ways in which environmental pressures have developed. (Wiedmann et al., 2020; Loki, 2021). This has had the effect not only of pressing against and, ultimately, forcing the transgression of planetary boundaries, but of undermining the social and ecological foundations that support people in low-income countries making them more vulnerable to environmental hazards. Utilising the notion of a safe and just operating space for humanity the chapter makes the case for higher-income consumers to make radical shifts in dietary practices such that these achieve a lower environmental footprint that will help enable others of lower-income to achieve nutritional security. This sense of mutualism echoes the contraction and convergence model originally proposed by Aubrey Meyer over three decades ago (www.gci.org.uk) and more recently by discussion of what constitutes 'fair shares' (Rajamani et al., 2021). It also resonates strongly with the 'consumption corridors' model that represents a metaphorical space between a minimum level that ensures the satisfaction of all basic needs and maximum consumption standards that provides a check on levels or ways of consuming that prevent others from realising their needs. Consumption corridors "combine the pursuits of a good life and of justice within planetary boundaries" (Fuchs et al., 2021: 4). Building a sense of commensality – the act of eating *together* (Jönsson et al., 2021) – within the food system might just provide a metaphorical crystallisation of the need for nutritional security within a safe operating space bounded by a social minima and an ecological maxima and guided by the principle of intra- and inter-generational justice.

Planetary Boundaries

The framework of planetary boundaries originally set out by Rockström et al (2009a, 2009b) and further developed by Steffen et al. (2015a) highlighted nine key Earth system processes previously mentioned. Each of these processes are directly affected by human activity and for each the cited authors have attempted to establish critical thresholds that represent limits to a safe operating space for human societies. The framework has emerged as a way of monitoring trends in Earth system processes with particular concern for deviation from the conditions that marked the past 12,000-year Holocene era which, Steffen et al. (2015a) suggest, is the only state of the planet that has appeared capable of supporting contemporary human societies. It presents a precautionary, systems integrity approach in establishing boundary limits at a distance from possible tipping points, thus establishing parameters for stable and resilient global ecosystems to support human wellbeing (Häyhä et al., 2016). However, while planetary boundaries emphasize the urgency of global environmental problems, the model has been subject to critique for using a language of universals that fail to speak to the differentiated interests, concerns and capabilities of people (Hajer et al., 2015). Others have argued that the framework deploys a narrow conception of planetary thresholds (Cornell, 2012) while different behaviours and practices can give rise to breaching some regional boundaries, which may not affect other regions. Criticisms have also been levelled at the accuracy of singular quantitative measure to mark boundary thresholds (Jaramillo and Destouni, 2015). Consequently, the planetary boundaries framework should be regarded as a work in progress that may involve translating global boundaries into specific national and regional contexts for effective policy making besides further development and refinement of what constitutes a 'safe operating space'.

Steffen et al (2015a) have contributed to such work, especially by introducing a two-tier approach for several of the Earth system processes to account for regional heterogeneity; and by updating boundary limits in light of new findings. Their paper also makes clear that the segmented architecture of the framework should not disguise the complex interactions between processes. They argue that two of the boundaries—climate change and biosphere integrity—are highly integrated, emergent system phenomena that are connected to all of the other planetary processes that operate at the level of the whole Earth system, and provide the planetary-level overarching systems within which the other boundary processes operate. Furthermore, large changes in the climate or in biosphere integrity have likely, on their own, pushed the Earth system out of the Holocene state and into a new era widely recognised as the Anthropocene (Steffen et al., 2015b; Castree, 2017).

The planetary boundaries framework has also undergone an important and extended development with the emergence of the Doughnut model. This is an idea developed by the economist Kate Raworth (Raworth 2012, 2017). The model takes the nine sectors of the planetary boundaries framework and assumes the safe operating space for each to constitute an 'environmental ceiling'. However, its novelty derives from its close alignment with the UN Sustainable Development Goals to establish twelve dimensions that constitute a social foundation comprising food, water, health, energy, and other basic human needs including gender equality, social equity, and peace and justice. It is between these social and planetary boundaries where an environmentally safe and socially just space exists within which humanity can flourish (O'Neill et al., 2018) (see Figure 3.1).

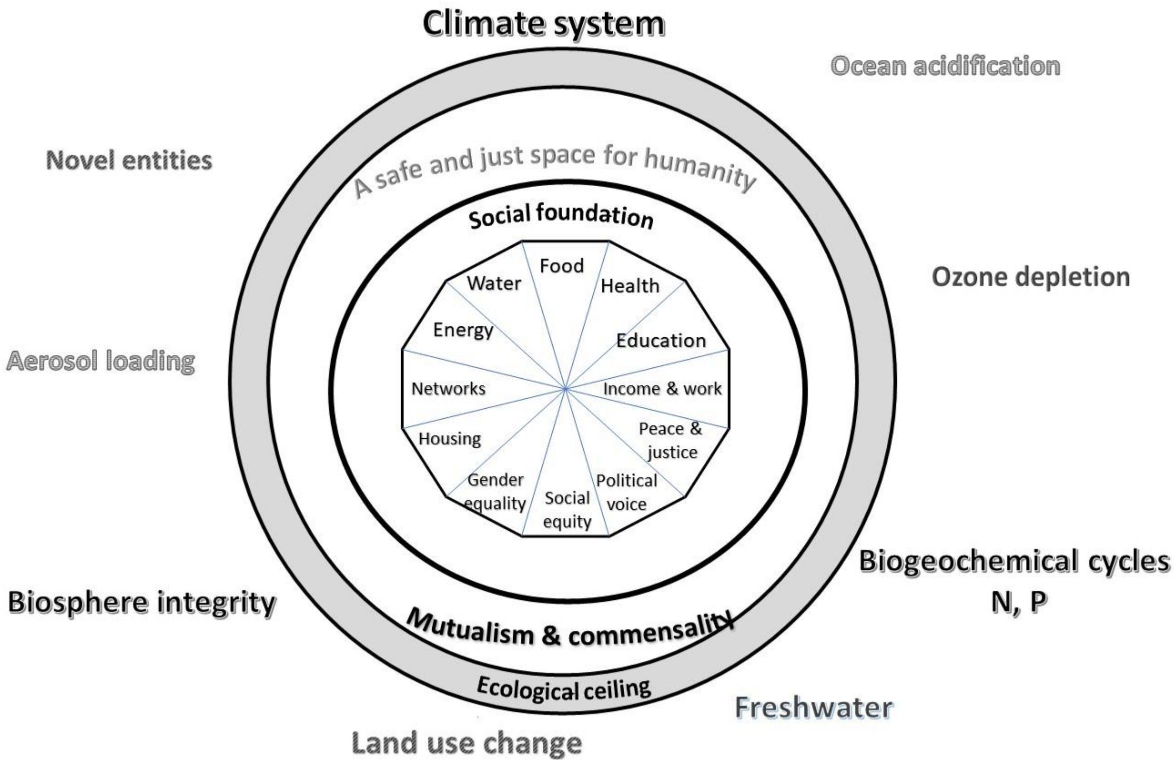

Figure 3.1: The Doughnut model: Locating mutualism and commensality between the ecological ceiling and social foundation

The doughnut model has attracted interest as a potential 'bottom-up' approach to the planetary boundaries framework that otherwise appears somewhat neglectful of scale and the differentiated responsibilities arising from past and present levels of resource use. The doughnut's visual simplicity and holistic approach provides for a certain 'cosmological vision' that encompasses shared assumptions, values and attitudes around social justice, and where a common 'world view' presents an effective means of translating international scientific discourse ('planetary boundaries') into the potential for social and political action (Sage 2014). The Doughnut Economics Action Lab (DEAL) provides an online community platform sharing tools and stories designed to encourage a proto-movement of interested activists to apply the doughnut model and turn a radical idea into transformative action at local level (DEAL, 2021). The work of translating planetary boundaries insights into supporting the development of local and regional plans is clearly important and part of the growing network of globally connected civic initiatives motivated by a different vision for greater social justice, climate action, and sustainable food systems (Sage et al., 2021) . Critically, it presents an argument for a 'safe operating space' that sits between a planetary ceiling and a social floor that establishes both a minimum threshold for all human beings and a constraint on consumption for the wealthiest. To what extent, then, might this **s**afe **o**perating **s**pace serve as an 'SOS' providing a metaphorical frame through which we might come to recognise the indispensable state of mutual co-existence under which the inhabitants of rich, middle and low-income countries live? Indeed, could this mark the beginning of a new planetary imaginary no longer rooted in the nation state but where there is a profound understanding of the inextricable interdependence of human beings and other forms of life on Earth? (Pedersen 2020)

Given what we know about the environmental burden of affluence (Wiedmann et al., 2020) it is vital that efforts are made to reduce the ecological footprint of modern lifestyles caught up in a web of conspicuous consumption. And it is with regard to food production systems and the kinds of dietary consumption patterns they support in rich and upper-middle income countries where action needs to focus by making the case for mutual co-existence within planetary boundaries alongside guaranteed assurance of food and nutritional well-being. Although the planetary boundaries work has identified three sectors where thresholds have been transgressed - climate, biodiversity and biogeochemical flows – it is with respect to climate which presents the most urgent and, arguably, best opportunity for leveraging the kinds of collective behavioural changes which are needed to ensure that global heating stays below 1.5° C.

Climate

At the time of writing this chapter the IPCC had just published the Working Group 1 documentation for its Sixth Assessment Report (AR6; IPCC 2021). The Report's headline findings are stark particularly given its moment of publication (August 2021). It highlights, for example, that each of the last four decades has been successively warmer than any decade that preceded it since 1850 and that this process will continue for at least the next three decades due to existing concentrations of atmospheric greenhouse gases (IPCC 2021, SPM A.1.2). One of the consequences of atmospheric warming is the intensification of the water cycle, that is the movement of moisture between oceans, atmosphere, cryosphere and land. With a warmer atmosphere capable of holding greater amounts of moisture, more extreme precipitation events are becoming a more regular feature: the catastrophic flooding that resulted in loss of life in Germany, UK, India, Japan and China during July-August 2021 bears testament. Meanwhile drought, "an exceptional lack of water compared with normal conditions" (UNDRR 2021: xi), remains a dominant hazard of climate in major food-producing regions including the western United States, Southern Australia, Southern Europe, West Africa, Mexico and South America. Exceptionally hot and dry conditions have also given rise to fire events that have swept through forest areas and rural communities in 2021 in western North America, Siberia and Mediterranean countries.

All of these climate-induced hazards – flooding, drought, fire - present a challenge to primary food production and threaten the livelihoods of farmers with their episodic destructive effects. Yet such hazards will have quite different consequences for local food systems, the food security of their populations and the livelihoods of food producers depending upon the extent and nature of their interconnections with regional networks, national government supports and global commodity markets. In this respect it is vital to acknowledge the growing divergence between high and low latitudes (aka the Global 'North' and 'South'; or ''minority' and 'majority' worlds) in terms of exposure to climate and other risks and the availability of welfare supports – emergency provision, social safety nets, compensation for crop loss etc – both to farmers and their wider populations. Recognising the vulnerability of local populations to environmental hazards is a first step in helping to identify ways in which this can be mitigated across individual, household, community, and regional scales. For wealthier and comparatively more secure food purchasers in the Global North, however, even preliminary analysis motivated by long-term self-interest would reveal the vulnerabilities of global supply chains that currently deliver tropical food commodities to their supermarket shelves.

Within the tropics there is particular concern for the effects of sustained higher temperatures, with resulting heat stress on crops, animals, and farmers; changing precipitation patterns, disrupting established cycles of rain-fed farming, and associated livelihood activities; rising sea levels that will not only cause inundation of coastal farmland but trigger saline intrusions of freshwater aquifers used for drinking and irrigation; as well as the emergence of new pests and disease. For example, changes in temperature and in the amount, timing, and intensity of rainfall can result in reduced yields and lower overall levels of food production. This leaves households with inadequate amounts to sustain their consumption needs until the next harvest and/or sell into local and regional markets. This decline invariably exacerbates price fluctuations which are likely to be transmitted into national urban food markets. Here access to food will be determined by the ability to pay higher prices and, depending on how these price rises occur alongside changes in income, can make existing food secure populations vulnerable to food insecurity in the future. In urban areas, food availability is seldom the major constraint, but rather it is lack of access to food for the urban poor, especially children.

It may be possible to make agricultural systems more resilient to climate change effects by changing farming practices, for example, from staggering planting dates to practicing water conservation methods such as using mulches or rainwater harvesting techniques. The introduction of more heat- or drought-tolerant varieties of existing crops, or replacing those with new crop species, may also be an option but may have profound implications for household labour and other resources. Amongst resource poor, low-income households, agriculture has a significant bearing on poverty reduction and therefore in reducing hunger and malnutrition, every effort must be made to make farming systems in vulnerable regions more resilient to the effects of climate change. Might this involve prioritising food sovereignty and ensuring greater provisioning of staple crops for domestic markets over engagement in global supply chains? What might be the implications of such policy decisions for food importing countries of both North and South?

Climate change can deepen the fault lines of existing inequalities that operate along multiple social axes, principally of gender, age, marital status, ethnicity, and ascribed status within the prevailing society (e.g., caste). This has implications for entitlement relations and access to food, as outlined above, and consequently for nutritional security. Even within the household under normal conditions, it has been well documented that the allocation of food frequently favours males over females. Tightening stocks may disproportionately affect women and girls who eat what remains in the pot after the men have fed. Yet the work performed by women and girls may increase as a consequence of climate warming and drying. The gender roles of water and fuel collection may make journeys longer and leave women little time to pursue income-generating activities.

Furthermore, in developing countries as a whole, women constitute approximately 43 percent of the agricultural labour force yet are typically disadvantaged in terms of access to inputs (water, fertilizers, and seeds) and credit and lack titles to land. This affects farm productivity and leaves female-headed households more vulnerable to food insecurity. Women farmers are generally more likely to produce a greater variety of foods for household consumption than men who are more connected with extension services encouraging commodity production. Small-scale production of fruits and vegetables by women has a greater chance of maintaining nutritional security.

Improving access to food will not automatically result from increased agri-commodity production especially under the prevailing model of highly mechanized, large-scale, high-input farming that dominates throughout the developed world and is being promoted as the solution for the South by agri-food corporations and philanthropic organisations such as the Bill and Melinda Gates Foundation. While this industrial model currently produces enough food to feed the world, almost one billion are hungry and food insecure and demonstrate that such technologies do not enhance the human right to adequate food (De Schutter 2011).

Overall, then, we begin to see the multiple and cascading consequences that climate change will have in poorer countries, and although these will vary between regions, the impacts on people's lives will be enormous if not catastrophic. In light of the publication of the IPCC WG1 AR6 report, which has brought into much sharper relief the role of shorter-lived greenhouse gases in atmospheric heating and which are more closely tied to agriculture, it becomes vitally important to ask whether, in the interests of the most vulnerable, immediate efforts must be made in the food system to move away from the production of certain foods and farming methods in order to stay within this planetary boundary.

The Food System inside the Global Greenhouse

Around two-thirds of the atmospheric warming that has occurred since 1750 is attributed to the release of CO_2 from the burning of fossil fuels (coal, oil, gas) that generates energy for industrial, commercial and domestic use and for the transportation of goods and people. Until recently there has been little popular appreciation about the contribution of the food system to climate beyond, perhaps, the sense that extended supply chains and the carbon emissions resulting therefrom ('food miles') had a role. This is now changing as media coverage of deforestation in Amazonia and South-East Asia has highlighted the extension of the agricultural frontier for soybeans, palm oil and cattle ranching. The intensity of arable and livestock operations across many high and middle-income countries has also come under increased scrutiny and revealed that agriculture has become one of the most important anthropogenic activities contributing to climate disruption. As previously noted, the entire food system - from agricultural input manufacture to waste disposal – is responsible for between 21–37 percent of anthropogenic greenhouse gas emissions (IPCC 2021) and agriculture (along with forestry and other land use) represent 23 percent (IPCC 2019). Critically, agricultural activities emit large amounts of important non-CO_2 greenhouse gases – methane (CH_4, 44 percent of emissions arising from human activity) and nitrous oxide (N_2O, 81 percent) - while land use change (deforestation) accounts for 13 percent of CO_2. Beyond the farm gate in its processing, refining, manufacturing, distribution, and retail activities the food system and ancillary activities also emit significant amounts of CO_2.[2]

Methane (and nitrous oxide) levels are now higher than at any point in the past 800,000 years. According to AR6 methane has contributed about 0.5° C of warming (compared to 0.75° C for CO_2) when assessing 2010-2019 warming relative to 1850-1900 (IPCC 2021). Methane is a powerful greenhouse gas and although it has an atmospheric lifetime of only a decade or so it is attributed with a 100-year global warming potential (GWP) 28-34 times that of CO_2 and over a 20-year period that ratio grows to 84-86 times (Costa et al., 2021; further discussion below). Although it has a number of different sources - with around one-third comprising fugitive emissions from hydrocarbon extraction, with smaller shares from the decomposition of organic material, and, in agriculture from rice paddies - its growing significance has been most closely tied to the expansion in numbers of ruminant livestock, especially dairy and beef cattle. Methane is a consequence of enteric fermentation, the microbial process by which ruminants digest plant matter and convert this into carcass tissue and/or milk. This source accounts for almost one-third of anthropogenic methane and two-thirds of all agricultural methane (Lynch 2019).

The overall number of animals reared worldwide for their meat, milk or hides has risen dramatically over the past 60 years, with an estimated 80 billion creatures slaughtered in 2018 (Ritchie and Roser 2019). It has been estimated that global meat production has quadrupled since 1961 reaching 340 million tonnes in 2018. Despite continuing growth of output in North America, Europe and Oceania, the most dramatic increase has been witnessed in Asia where meat production has increased 15-fold since 1961 with China achieving the most spectacular growth (Ritchie and Roser 2019). Given the high unit cost reduction achieved through the pursuit of economies of scale, the inevitable consequence has been ever-larger herd and flock sizes managed in high capacity, more technologically sophisticated enterprises (confined animal feeding operations or CAFOs), with a consequent fall in the price of meat to consumers. It is this which has led to the apparently insatiable demand for meat across large parts of the world and the 'meatification' of diets (Neo and Emel 2017; Weiss, 2013).

However, this has been accompanied at considerable cost to natural capital and ecological services. Livestock now account for 75 percent of all agricultural land, including pasture and rangeland, with over one-third of global arable land given over to the production of animal feeds, which account for around a quarter of global crop production by mass. As feed crops are dense in both calories and protein content, feed crops now account for 36 per cent of global calorie production and 53 per cent of global plant protein production (Cassidy et al. 2013). Moreover, it is calculated that livestock are now directly responsible for around 37 per cent of anthropogenic methane, 65 per cent of nitrous oxide and 9 per cent of carbon dioxide. Taken together this suggests that livestock rearing – and the consumption of their products – is contributing significantly to the destabilisation of the climate system as well as placing pressures on other planetary boundaries including the global nitrogen cycle, freshwater stocks, biosphere integrity and land use change. How should such challenges be addressed?

First, it should be emphasised that this discussion puts to one side extensive pastoral systems which, though not generally regarded as commercially significant, are vital to support livelihoods in often marginal environments. Rather, it is the intensive livestock production system which has become largely disconnected from its local resource base, has scaled up numbers of animals, output volumes of meat, milk, and eggs, and driven multiple ecological consequences that is the concern.

Secondly, dietary patterns that are high in the consumption of animal products are closely linked to escalating rates of chronic non-communicable diseases. Red and processed meat consumption has been associated with an increased risk for heart disease, stroke, type 2 diabetes, certain types of cancer, and mortality (Health Care Without Harm, 2017). Consequently, planetary and human health are becoming inextricably intertwined as the combined burden of existing dietary practices are exposed by mounting ecological and epidemiological evidence (Swinburn et al 2019). It is in this context that the growing narrative around the contribution that plant-based diets could make to biospheric and human wellbeing is met by the powerful commercial interests of the meat industry. Inevitably, there has been a significant push-back by the industry anxious to retain business-as-usual practices[3]. Rose and colleagues have recently outlined some of the strategies used by the meat industry in the United States by which it has successfully shaped the federal Dietary Guidelines for Americans in order to exclude sustainability from consideration, amongst other practices (Rose et al 2021). Such strategies illustrate the kinds of instrumental, discursive and structural power enjoyed by the 'Big Food' corporations in protecting their interests (Sievert et al 2020). Yet it is not simply business that seeks to maintain the status quo, as governments too can be fearful of change.

In Ireland the Department of Agriculture has recently published its latest agri-food strategy, 'Food Vision 2030 – A World Leader in Sustainable Food Systems'[4]. Containing a level of hubris that even outshines its previous strategies - Food Harvest 2020, FoodWise 2025 (Kenny et al., 2018; Sage & Kenny, 2017) - all of the discursive power that can be enrolled is brought to bear through portentous deployment of key buzz words such as 'climate smart', 'environmentally sustainable', 'resilience' and even 'regenerative'. Such terms are an attempt to disguise the fact that agriculture was the sector with the largest greenhouse gas emissions in Ireland over the 1990-2017 period with 33% of the total in 2017 which helped ensure that it had the third highest per capita emissions in the EU28 at 13.3 tonnes CO_2-equivalent, which was 51% higher than the EU average (CSO 2019). This is because Irish agriculture is now largely based around a national herd of over seven million cattle (and rising) and an export strategy focussed upon beef, infant formula, and cheese.

‘Food Vision 2030’ and its proponents in government, research and extension, the food industry and farming organisations, variously deploy many of the various discourses identified by Lamb and colleagues (2020) in their analysis of climate delay tactics. Those discourses that resonate most strongly include the ‘free rider’ excuse (“if we don’t produce beef then the Brazilians will”); ‘whataboutism’ (as in “our carbon footprint is tiny; what about China?); ‘all talk, little action’ (“we are world leaders” and other forms of illusory rhetoric); and, above all, technological optimism. As one might expect, Food Vision 2030 makes a strong case for finding technological fixes to reduce methane emissions – its single biggest problem. This involves work on novel feed additives and supplements (e.g., seaweed), animal genetics, and exploiting emerging technologies (whatever these might be). In other words, a great deal of hope is pinned upon achieving new efficiencies (feed conversion to carcass weight and milk yield without co-production of methane) while rising livestock numbers promise to outstrip whatever marginal reductions are made in emissions per animal. The irony here, of course, is that a notion of commensality is drawn upon through a discourse of Irish agriculture as contributing to ‘feeding the world’ yet is entirely disregarded when it is clear that many of Ireland’s export target markets (Asia, the Middle East, Africa) will experience the worst effects of climate breakdown. It illustrates how the selective and self-serving deployment of buzz-words such as sustainability are believed to convey the same concealing properties as Harry Potter’s invisibility cloak: while that garment enabled him to move undetected along the corridors of Hogwarts, so rhetorical greenwash will magically disappear the environmental costs of excessive livestock numbers. Consequently, intransigent, export-focussed governments can present as big an obstacle to staying within planetary boundaries as Big Food corporations. How, then, will the food system operate within a 1.5°C threshold?

Eating for 1.5°C

In advance of the COP26 Summit in November 2021, much of the policy chatter revolved around efforts by countries to commit to new nationally determined contributions (NDCs) that will achieve net zero carbon by 2050 – and which must involve the effective elimination of fossil fuel use. Yet the AR6 makes clear the vital importance of immediate and significant efforts to reduce emissions of short-lived climate pollutants (SLCP, including methane and nitrous oxide) in order to slow the pace of climate disruption. Here a lifeline is offered in its statement that “Strong, rapid and sustained reductions in CH_4 (methane) emissions would also limit the warming effect” (IPCC SPM 2021: 36).

This rather hopeful tone has been recently echoed in a short paper (Costa et al 2021) which examines the global warming potential (GWP) metric used by climate scientists. While this has conventionally focussed upon the capability of a greenhouse gas to warm the atmosphere over a 100-year time horizon (GWP_{100}), the paper argues for a different calculation - GWP* - that better reflects the short-lived, non-cumulative behaviour of methane. In other words, unlike CO_2 which maintains a cumulative warming effect for thousands of years, methane’s decade-long lifespan permits relatively quick gains in atmospheric concentration if emissions were lowered. As the paper argues: “The application of GWP* to CH_4 emissions accounting suggests that avoiding further warming due to CH_4 emissions in agriculture is more attainable than previously understood. CH_4 reductions can have a rapid and highly substantial impact, which underscores the importance of making significant cuts in CH_4 emissions immediately” (Costa et al 2021: 5).

While methane has other anthropogenic sources it is a stark fact that if the livestock sector were to continue with business as usual, this sector alone would account for almost half of the emissions budget for 1·5°C by 2030, requiring other sectors to reduce emissions beyond a realistic or planned level. Consequently, it is becoming an unavoidable conclusion that substantially reducing if not avoiding meat and dairy products is the single biggest way to reduce our environmental impact on the planet (Poore & Nemecek 2019). Moreover, the human health co-benefits would be considerable given the weight of clinical evidence pointing to the deleterious consequences of diets rich in red and processed meats. Yet warnings about unsustainable and unhealthy diets by experts in the fields of planetary science and public health (each embracing many different specialist disciplines) seems to have had an imperceptible influence over a global food system driven by powerful corporate interests and the relatively benign disinterest of governments. Amongst the first serious effort to outline a road map toward a healthier food future operating within planetary boundaries was the Eat-Lancet report (Willett et al., 2019). Yet that ‘experts’ would have the audacity to propose a ‘Reference Diet’ comprising a healthy, fair and just food intake for the entire global population within a safe operating space was met with considerable criticism (Garcia et al., 2019)[5].

Tackling dietary practices in the wealthiest countries has to be a priority for it would immediately ease environmental burdens while improving human health (Tilman and Clark, 2014). Healthier diets – comprising more vegetables, fruit, and plant-based oils rather than animal products - require less cropland, ease pressure on freshwater resources, provide more opportunities for co-existence with nature, create more potential for nutrient cycling without excessive disruption to the global nitrogen cycle and, above all, lower level of greenhouse gas emissions. But while the necessary direction of travel is clear, the obstacles to moving forward are numerous.

One potential hazard in focussing upon methane is the demonising of meat and dairy which would invariably prove a counter-productive strategy that will serve to rally more than the usual roster of denialists[6]. Within wealthier countries there are those who would be disproportionately affected by, say, the imposition of carbon taxes on meat and dairy. These would include livestock farmers in upland environments with few, if any, alternative livelihood options, while low-income households with few resources (time, budget, skills) with which to make dietary changes would underline the socially regressive nature of such measures. In middle-income countries, too, there will be highly differentiated concerns particularly amongst populations which have only relatively recently experienced an improvement in income and diets and will be reluctant to sacrifice such gains. To speak of a ‘just transition’ is therefore to recognise that any food system transformation will require long and arduous discussions across societies with all stakeholders represented. This means building more participatory fora such as civic assemblies, citizen juries, public deliberation, digital tools and so on to enable effective and inclusive conversations through which to identify potential transition pathways to emerge.

With respect to public policy more generally small steps are being made to reform a food system that is currently structurally unsuited to operate within a safe operating space. At EU level the Farm to Fork Strategy is emerging but hamstrung by the lobbying power of Big Food and the vested interests of farmers' organisations unwilling to relinquish the system of Common Agricultural Policy subsidies. Individual member states have their own agendas, too, as we have seen in the case of Ireland. The UK is in transition following Brexit but where the current Conservative government appears to be more interested in long-distance trade arrangements than building sustainable food sovereignty at home. Meanwhile the global food system carries on as before with unprecedented rates of deforestation in Amazonia opening new lands for soybeans that are harvested to feed poultry sold in UK supermarkets and fast-food restaurants (Watts et al 2020).

The urgency of the warnings from climate science that implore strong and rapid action by governments does not then appear to be having the required response. It would appear that slow and incremental efforts in public policy simply will not be sufficient to stabilise the climate system. What about business interests operating through the market to bring about change? There are signs here of an emerging planetary awareness though mostly within the investment community which often takes a longer-term perspective. For example, the FAIRR Initiative is working "to leverage the power of institutional capital to effect change in the livestock and farmed fish sectors" which it pointedly observes has enjoyed a 'lack of scrutiny' which "has meant that these companies have been allowed to scale their operations, markets and production volumes without clear controls. This creates systemic risks: not just for companies, but also their global food customers, investors, consumers and society at large" (FAIRR 2020). While these appear to be strong words coming from business insiders, we must remind ourselves that they presage a likely investment surge into alternative proteins as a market solution to the climate crisis rather than a call to reduce consumption so as to ensure we remain within planetary boundaries. The notion of a new global ethic around the principles of mutualism and commensality are unlikely, then, to be received enthusiastically by the investment community desiring to present consumers with yet more choice from which they can derive profit, rather than restraint.

Conclusions

This chapter has sought to outline the range and depth of environmental consequences generated by the global food system in its headlong pursuit of increased output. Yet we must remind ourselves that while two-fifths of humanity do not eat sufficient nutrients for a healthy life, around two billion are overweight primarily as a consequence of excessive food energy intake. With 2.8 million people dying each year from overweight and obesity according to the WHO, this represents a human health crisis that sits alongside the crisis of planetary health. This is the predicament, arguably, to which the contemporary food system has brought us: a system that has enshrined the sovereign rights of consumers to eat what they like as the market delivers cheaper, more convenient novelties that titillate the palate but may do harm to our waistline, cardio-vascular organs and to the global ecological system.

Although there are many environmental problems that can be traced to the food system, the chapter has focussed upon the especially urgent matter of climate breakdown and the window of opportunity presented by methane reduction. It was suggested that efforts to reduce levels of meat consumption in rich and upper-middle income countries would offer a potential win-win outcome for climate and human health. Yet at this moment in time, one must ask the question: will the present governance arrangement comprising market-based solutions (e.g. the development of alternative proteins as a simple 'alternative' for animal-derived proteins) and public policy nudges that do not infringe consumer choice be sufficient to ensure global nutritional security within a safe and just operating space where climate heating does not exceed 1.5C? We must doubt that it will. Indeed, the present regime of food governance, where much is left to the market and to the conscience of individual consumers, appears unfit to tackle the gravity of the predicament before us. Simply offering more choice options such as the provision of plant-based burgers alongside conventional fare will not lower environmental impacts. In this respect it becomes clear that the market and the state work best by maintaining an ideology of individualism through which value extraction from our lives is most easily managed.

Creating a sense of mutual co-existence between human beings – in our buildings, neighbourhoods, cities, and across the world – is a first step in finding collective solutions to our climate predicament. Thinking AND acting both locally AND globally – no room for either/or here – demonstrates the new planetary imaginary that is required. Clearly there is enormous scope for truly vital transdisciplinary research to be undertaken in pursuit of better understanding the links between food consumption practices and climate breakdown and effectively communicating such knowledge in order to achieve social change. This chapter has made the case for two terms that might help us bridge this cognitive dissonance between recognition and action. Mutualism demonstrates our recognition that it is only through cooperation where we can harvest the synergies to be gained from working collectively to protect our precious biosphere. Commensality reminds us that ultimately the food system is supposed to feed people and we share whatever is available on that common platter at the centre of all humankind. Perhaps these and related ideas will help us to create a food system capable of ensuring global nutritional security within planetary boundaries.

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Endnotes

[1] A new documentary film, 'Breaking Boundaries: The Science of Our Planet' was released on Netflix in July 2021. Directed by Jon Clay and with narration by David Attenborough the film seeks to explain the planetary boundaries model and the urgency of action to stabilise the rate of environmental change on Earth. It makes impressive use of CGI to portray the transgression of critical thresholds by hordes of zombie like humans but this seems to suggest a neo-Malthusian cause ('over-population') rather than the responsibility of a neoliberal economic system driven by the avarice of huge corporations. Nevertheless, a formidable effort in tackling a complex subject for a TV audience.

[2] Any apparent anomalies in the attribution of emission figures must recognise the range reflecting different research findings, varying levels of confidence (critical to IPCC procedures) and the existence of carbon sinks (forestry, soils) that provide some (small) compensation on emissions.

[3] Although as Sexton and Goodman explain in chapter 8 of this volume, some of the biggest corporations are also hedging their bets and investing heavily in alternative protein initiatives.

[4] Available here: https://www.gov.ie/en/publication/c73a3-food-vision-2030-a-world-leader-in-sustainable-food-systems/

[5] I am grateful to Mike Goodman for suggesting this might yet be regarded as the opening salvo in the long-term Diet Wars.

[6] A constituency that appears to be growing albeit with very different core grievances – climate, Covid-19 and its vaccines, electoral fraud in the US, 5G etc.