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Global Food Security
Sustainable, healthy food for all







insight

Paris-compliant healthy food systems

Overview

- A Paris-compliant healthy food system supplies sufficient nutritious, safe, stable and affordable food in ways that support both global health and the terms of the Paris climate agreement.
- The Paris climate agreement entered into force on 4 November 2016 and commits international signatories to avoiding dangerous climate change by limiting global warming to "well below" 2°C above preindustrial levels and to "pursue efforts" towards 1.5°C.
- It will be impossible to meet the terms of the Paris agreement without significant reductions in food-related greenhouse-gas emissions, as agri-food is predicted to take up nearly the entire annual carbon budget for a 2°C temperature rise by 2050 if current levels of growth continue.
- With 1 in 3 people currently malnourished, the unification of thinking around climate and nutrition goals through Paris-compliant healthy food systems presents an opportunity to find systemic solutions that benefit both environmental and health challenges, as well as the UN Sustainable Development Goals.
- In order to support food security under projected land and resource restrictions, Paris-compliant food systems will require greenhouse-gas emissions decreases from both reductions per unit of food produced via sustainable intensification of production, and reduction in absolute terms via behaviour change towards Paris-compliant diets.
- While there is no one vision of what a Paris-compliant healthy food system might look like, models show that the trajectories with the greatest probability of successfully limiting temperature rise to 2°C employ interventions to reduce greenhouse-gas emissions across the entirety of the food system.
- Research suggests that certain foods, and more broadly certain diets, can present win-wins for both climate and health goals. However, it cannot be assumed that a healthy diet will always be Paris-compliant, nor a Paris-compliant diet always healthy.
- A business-as-usual approach within the food system would see global temperatures rise above the 2°C limit set by the Paris agreement, with climate change to this degree having scope to threaten food security in a variety of ways.

Global Food Security (GFS) is a multi-agency programme bringing together the main UK funders of research and training related to food. The GFS Insight series provides balanced analysis of food related research, for use by policy-makers and practitioners.

insight

What is a Paris-compliant healthy food system?

A Paris-compliant healthy food system supplies sufficient nutritious, safe, stable and affordable food in ways that support both global health and the terms of the Paris climate agreement.

This kind of food system would simultaneously:

- Produce sufficient food to feed the growing global population in an equitable way, considering this population is projected to reach 9-10 billion by 2050[1].
- Supply good quality, safe, culturally appropriate and affordable food to meet the nutritional needs of every individual, preventing malnutrition and associated non-communicable disease.
- Reduce the environmental impact of our food supply to protect natural resources and mitigate climate change, specifically limiting greenhouse-gas emissions to levels that allow global temperature rise to be kept well below 2°C above preindustrial levels.

Yann Caradec

What is the Paris Agreement?

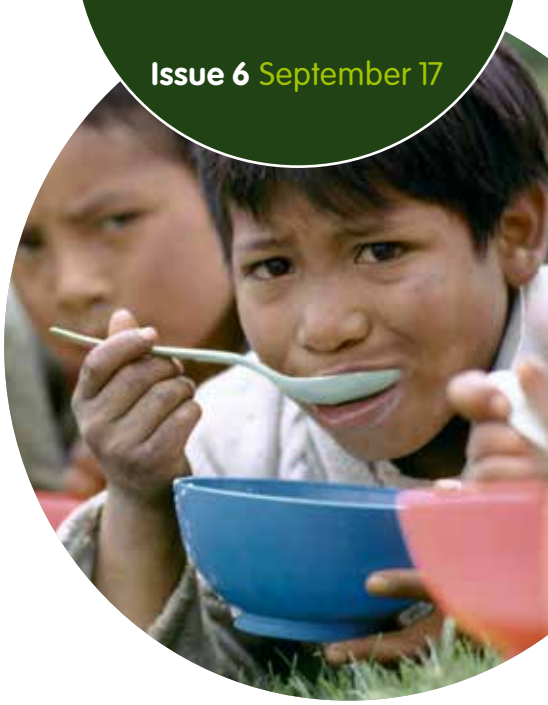
The Paris climate agreement entered into force on 4 November 2016, committing international signatories to a number of climate change goals[2], including:

- Avoiding dangerous climate change by limiting global warming to 'well below' 2°C above preindustrial levels and to 'pursue efforts' towards 1.5°C
- Strengthening global ability to address impacts of climate change
- Improving financial support for climate mitigation and adaptation between nations
- Committing to development of new climate change mitigation technology
- Enhancing national capacity building
- Greater transparency of national climate mitigation action

Nationally Determined Contributions (NDCs) are put forward by all signatories, outlining targets for national greenhouse-gas emissions reductions and proposed action to reach them. The 'ratcheting' system behind the agreement requires countries to renew NDCs every five years, periodically increasing their ambition.

If global greenhouse-gas emissions continue to rise at current rates, climate models forecast that by 2100 global average temperature could increase by 2.6-4.8°C[3]. Studies show that in order to be consistent with the 2°C target, greenhouse-gas emissions (particularly, carbon dioxide, nitrous oxide and methane) across all sectors will need to be reduced by over 80% by 2050, with greater reductions required to meet a 1.5°C target[4].

While the Paris agreement has undoubtedly advanced the agenda for unified global action to mitigate climate change, the most difficult stage of the process is still to come – establishing and initiating the pathways by which this ambitious agreement can be achieved.



Why do we need a Paris-compliant healthy food system?

Projections suggest a business-as-usual approach within the food system would make it impossible to meet the terms of the Paris agreement, as agri-food is predicted to take up nearly the entire annual carbon budget for a 2°C temperature rise by 2050[5]. Climate change to this degree has scope to seriously threaten food security in a variety of ways, impacting productivity[6,7], compromising global nutrition[8,9] and devastating livelihoods.[10]

If we are to successfully limit temperature rise, there is a need to better understand the role that the food system could play in mitigating climate change. The global food system as a whole is responsible for around 30% of total human-induced greenhouse gases[11], making it a prime target for emissions reductions necessary to avoid dangerous climate change.

At the same time, it is important to ensure environmental impact is not the sole focus. Significant change is also needed to meet global nutrition goals, with 1 in 3 people currently malnourished[12] – 800 million chronically undernourished, 2 billion suffering micronutrient deficiencies, and another two billion overweight or obese[13]. This has led to significant increases in diet-related non-communicable disease in both higher income countries (HICs) and lower-middle income countries (LMICs), making malnutrition and diet by far the biggest risk factor for the global burden of disease.

The unification of thinking around climate and nutrition – through Paris-compliant healthy food systems – presents an opportunity to find food system solutions that benefit both challenges, as well as provide support for sustainable development and global livelihoods according to the targets set by the UN Sustainable Development Goals[14].

What is the starting point for Paris-compliant healthy food systems?

While some of the key requirements for a Paris-compliant healthy food system are widely agreed, and a great deal of progress has been made in developing mechanisms that improve efficiency and reduce greenhouse-gas emissions in certain areas of the system, more work is needed to understand what mixture of interventions will present the most effective routes for broader systemic change.

As it stands, there is no new land available for food production, with land availability limited by factors such as urbanisation and sea level rise[15]. Alongside greenhouse-gas emissions reductions, global scenarios with the greatest chance of successfully limiting temperature rise will also require extensive use of negative emissions technologies (NETs); these initiatives extract already emitted carbon dioxide from the atmosphere[16] and include land-sparing, reforestation and increased carbon storage in soils[17].

However, NETs require a great deal of land, as well as water and financial resource, creating further competition for land-use and compromising future food, water and energy security.

These trade-offs need to be balanced in any Paris-compliant food system, requiring a system that more efficiently delivers healthy diets using less land.

In order to support food security under projected land and resource restrictions, Paris-compliant food systems will need greenhouse-gas emissions reductions from both:

- **Reductions per unit of food produced** via sustainable intensification; increasing yields on the same land while decreasing environmental impact[18] through improved efficiency of production and manufacture, using less environmentally impactful production methods, closing yield gaps as far as possible and maximising resource use efficiency without compromising the nutrient content of crops.
- **Reduction in absolute terms** via Paris-compliant diets; moderating absolute demand for food by reducing overconsumption and food waste across the system, as well as moderating consumption of food items associated with higher emissions and resource use such as meat, dairy and dairy alternatives.

Interventions for a Paris-compliant healthy food system

A great deal of research is being conducted into Paris-compliant agri-food approaches, revealing a range of key intervention points and potential initiatives to encourage behaviour change and reduce greenhouse-gas emissions across the food system. Potential interventions include:

- **Improved agricultural practices** across agronomy, nutrient management, water management, and land management. Examples include[19]: use of wheat and maize varieties that inhibit the production of nitrous oxide; use of crop rotations with legumes to reduce reliance on fertiliser; weed control methods allowing minimal or no tillage.
- **Improved efficiency of livestock farming**, which is significant given that nearly half of agricultural emissions are currently related to livestock[20] through enteric fermentation and manure, high land and water use, as well as significant resource input to produce feed[21]. New breeding, feeding and housing strategies have scope to reduce the environmental footprint of meat and dairy production per unit[22], these include: developing new ruminant breeds that produce less methane; use of methane inhibitors in ruminant feed, already shown to reduce dairy cow methane emissions by 30% without affecting animal growth or milk[23]; and the 'ecological leftovers scenario', using land unsuited to other purposes for grazing and feed based on by-products to increase resource-use efficiency[24].
- **Improved efficiency post-production in food processing, manufacture, and transport** via adoption of energy efficient technologies in food processing and refrigeration, use of green energy sources, and simplification of supply chains and food distribution systems.
- **Regulation of food industry practice**, including mandatory standards as well as voluntary certification schemes and agreements to support Paris-compliant supply chains[25]. Such measures may encourage more responsible sourcing, greener packaging, or reformulation of products to reduce environmental footprint and improve nutrient profile.
- **Enhanced waste management practices across the system**, at a production and manufacture level through improved harvesting, storage and transportation practices, and at a consumer and retail level through improving consumer understanding of use by dates, restriction of bulk-buy offers on perishable items, and promoting better household food management.
- **Economic measures** such as levying a tax on greenhouse-gas emissions and use of ecosystem services, or subsidising products with low environmental impact. Evidence shows that, if appropriately designed, such measures could simultaneously support climate goals and promote health[26].
- **Information provision** to promote Paris-compliant healthy diets and empower consumer choice. This could be done through education campaigns, inclusion of sustainability in dietary guidelines, or improved sustainability labelling on packaging and menus. However, any such mechanism must acknowledge the value-action gap by which knowledge and attitude do not always translate into behaviour[27].
- **Change to physical food environments**[28] to nudge food choices towards health and Paris-compliance. This might involve increased focus on seasonal and low-impact foods in store through retail methods like shop layout or promotional offers, public procurement policy to support sustainable healthy catering, or advertising restrictions on products with greater environmental footprints.
- **Product diversification and expansion of the sustainable food market**, providing consumers with a greater number of healthy and Paris-compliant food options; for example, a wider range of culturally appropriate lower-impact meat alternatives.
- **Change to social norms and food culture**, using social marketing to normalise Paris-compliant healthy diets, encouraging dietary change and waste reduction.

The pathway to a Paris-compliant healthy food system

While there is no one vision of what a Paris-compliant healthy food system might look like, some core components of this kind of system are widely acknowledged, with models showing that the trajectories with the greatest probability of successfully limiting temperature rise to 2°C employ interventions to reduce greenhouse-gas emissions across the entirety of the food system.[23,29,30]

For example, while food demand is expected to grow as the global population increases, this growth is significantly compounded by the shift in global diets towards overconsumption, especially of fats and animal products[10], as well as significant waste from across the system[31]. Evidence suggests that if these trends continue, the required increases in absolute food production will see food-related emissions continue to rise, even if ambitious production-side efficiency measures are employed[32].

The core factors that will be necessary for any pathway towards a Paris-compliant healthy food system include:

- A systemic focus, including cross-sectoral working and stronger links between food supply and consumption to create positive change across the food system as a whole.
- Involvement of stakeholders from across the system, sharing responsibility while acknowledging and supporting differing interests.
- A combination of interventions across both food supply and demand, supported by research to better understand mechanisms that could be used to incentivise behaviour change, the potential reductions that could be achieved, and how interventions could be implemented.
- Greater focus on impacts of whole supply chains, considering emissions across all agricultural, processing, transport and retail activities, using mechanisms like life cycle assessment (LCA)[33] to compare alternatives and support decision-making in transitioning towards Paris-compliant methods, products, diets and systems.
- Addressing barriers to uptake of new interventions and technologies.
- Inclusion of food systems in international climate change talks, national climate change policy, NDCs and national emissions reporting.
- Setting of sectoral emissions targets to guide more ambitious mitigation interventions and track progress toward goals.
- Coordinated and ambitious policy mechanisms, including options that support both HICs and LMICs.

Paris-compliance vs sustainability

While greenhouse-gas emissions – as the driver behind climate change and global temperature rise – are the key environmental concern of Paris-compliant food systems, it is important to consider other factors of food system sustainability, especially where actions to reduce greenhouse-gas emissions risks trade-offs with other environmental, social or ethical areas of concern.

For example, the food system also impacts biodiversity and animal welfare, consumes a number of vital natural resources, including land, soil, water and minerals, and supports global livelihoods as a major source of income.

Impacts any interventions may have on wider ecosystem services will vary with local context, meaning the most favourable pathways to reduce greenhouse-gas emissions while also supporting sustainability in other dimensions will vary from place to place. More research is needed to understand how interventions to reduce greenhouse-gas emissions impact other areas of concern in different environments and contexts, and how they can be balanced with to create a truly sustainable food system.

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Are Paris-compliant diets healthy?

In order to realise a Paris-compliant food system, global diets must become more sustainable. As the global food system is not currently delivering nutritious diets to all, this dietary transition also creates an opportunity to support change towards Paris-compliant diets that are also healthier. Research suggests that certain foods, and more broadly certain diets, can present win-wins for both environment and health[34]. That said, it cannot be assumed that a healthy diet will always be Paris-compliant, nor a Paris-compliant diet always healthy[35] – for example, sugar is relatively low in greenhouse-gas emissions but should be restricted in healthy diets.

The emissions associated with different diets are generally well understood since greenhouse-gas profiles for production of individual foods are widely available. To this end, a number of dietary patterns that are both nutritionally balanced and less greenhouse-gas intensive, while also being recognisable and culturally appropriate, have been modelled[36]. In general, the characteristics of Paris-compliant diets[37] that also comply with dietary guidelines[38] are:

- Balanced between intake and need for both energy and nutrients
- Diverse, comprising a wide range of different foods
- Based on minimally processed tubers, whole grains, legumes, fruits and vegetables – particularly those that are seasonal, field grown, less prone to spoilage and less requiring of rapid and energy-intensive transport
- Moderate in resource intensive products such as meat, dairy and dairy alternatives, at levels in line with – but not exceeding – dietary recommendations
- Including small quantities of fish and seafood from certified sources
- Limited in processed foods high in fat, sugar or salt

There are certainly synergies between health and Paris-compliance, with evidence showing that if UK diets aligned with the diet recommended by the World Health Organisation, national greenhouse-gas emissions would drop by 17%[39] while also saving 7 million life years (over a 30 year period) and increasing average life expectancy by 8 months[40].

The substitution effect

Understanding of what a Paris-compliant and healthy diet looks like on the plate is generally poor[41], which may result in self-selected diets which are lower in emissions but not nutritionally-balanced. For example, while reduced consumption of livestock products can contribute to a Paris-compliant diet that also brings health benefits via lower saturated fat and salt content, substitution of these products for low-emissions alternatives can result in diets high in sugar and lacking in essential micronutrients, leading to poorer health outcomes[42]. Any recommendations for Paris-compliant diets must take into account this potential substitution effect, in particular addressing sugar consumption and micronutrient intake.

The substitution effect also has impacts on the wider environmental footprint of diets; substitution of foods associated with high emissions for others that are relatively lower in emissions can result in a diet with greater overall environmental footprint due to increases in water use, impact on biodiversity and land use change. However, there is no agreed metric to include these wider environmental indicators in one measure of sustainability, and so trade-offs between different environmental objectives are not always clear. Additionally, the emissions profile of diets is highly context-dependent, as similar foods can have very different environmental footprints depending on variation in their production, processing and transportation. Thus, broad brush claims about the footprints of entire categories of agricultural or food products are not always representative.

The contract and converge scenario

On a global level, a "contract and converge" scenario is needed for diets. This would see those who currently overconsume – in terms of wasting food as well as consuming more than necessary, particularly too much meat-based protein which has high environmental impact and is widely overconsumed to exceed healthy levels[43] – moderate dietary intake, while those groups who are consuming too little should expand consumption up to healthy levels.

This approach may actually increase personal food emissions for some, but will act to decrease absolute greenhouse-gas emissions overall. This kind of model would also steer global focus towards dietary diversity and good nutrition, requiring the food system to better support LMICs and setting a precedent for more responsible global consumption. This is an especially important consideration as economies grow and diets transition, encouraging sufficient and equitable global diets and an efficient food system. However, greater focus on structural issues and food accessibility would be needed to support this kind of scenario.

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