

CamEATS ZERO Scientific Evidence to support Sustainable Food Guidance and FAQs

Building on the Sustainable Food Policies of both the University Catering Service (UCS) and the Catering Managers' Committee, the CamEATS ZERO Sustainable Food Guidance focuses on four priority actions to be implemented by October 2026:

- i. Increasing the proportion of plant-based (vegan) meals offered with a view to these being at least half the meals offered.
- ii. Reducing ruminant meats (beef, lamb, venison) offered with a view to phasing them out.
- iii. Serving only sustainably sourced seafood.
- iv. Reducing food waste by at least 50%.

Why these four?

- They cover the main sources of greenhouse gas emissions from food systems.
 - *See Scientific Evidence for each priority action, below.*

What about other actions?

- Other actions will help reduce greenhouse gas emissions – such as “buying locally” – but others won't – such as “buying organic”.
 - *See Frequently Asked Questions, below.*

Scientific evidence for each Priority Action

i. Increasing the proportion of plant-based (vegan) meals

Shifting to largely plant-based diets is critically important for mitigating the catastrophic consequences of climate change and the extinction crisis^{1,2,3}. In richer economies, like the UK, such a move could also substantially lower mortality and morbidity from coronary heart disease, type 2 diabetes, stroke and certain cancers^{1,5}. The EAT-Lancet Commission's Planetary Health Diet recommends eating up to about 16kg of meat/person/year (though even this figure would not achieve net-zero targets)⁶, but average consumption in the UK and EU is 81kg/year.

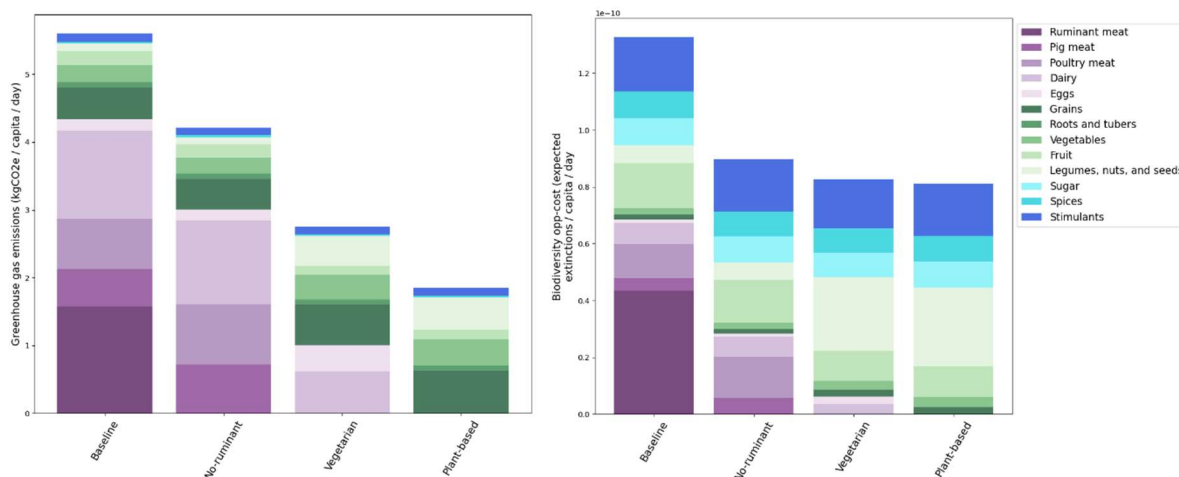
The University of Cambridge with its global reputation for science and educating future leaders has a significant role to play in modelling and disseminating sustainable practices. In Cambridge Colleges, attempts to eliminate meat from entire menus (such as meat-free Mondays) are often short-lived. However, in a detailed series of observational and experimental studies across Cambridge Colleges, doubling the relative availability of vegetarian and vegan meals (*e.g.*, from 1 in 4 to 2 in 4 main-meal options) resulted in a 40-80% increase in their uptake, without any reduction in overall sales⁷. In the University Catering Service an essential additional element in reducing overall meat use has been to focus training on vegan cookery classes and site visits so that chefs are empowered to design and prepare tasty and nutritious plant-based meals⁸.

ii. Phasing out ruminant meat

Agriculture, which occupies roughly half of all usable land⁹, is a significant contributor to human-caused greenhouse gas emissions¹⁰ and the biggest driver of the global extinction crisis^{11,12}. Livestock uses up 75% of agricultural land and causes well over half of all emissions from farming, but only contributes about 30% of human dietary protein^{1,4}. Because they require a lot of area for feed or grazing, grow relatively slowly and produce methane (a particularly powerful greenhouse gas), ruminant animals (cows, sheep, goats and deer) have especially high greenhouse gas and land footprints. Emissions per kg are over 40 times greater for ruminant meat than for pulses (five times higher than for pork), and land use per kg is around ten times greater¹³. While removing meat and dairy from menus entirely would have a substantially greater effect^{1,14} removing ruminant meat is a very significant first step.

This is illustrated in Box 1 below.

Box 1 Impact of different UK diets on greenhouse gas emissions and global biodiversity



Draft analysis of the impacts of different UK diets on greenhouse gas emissions (left) and global biodiversity (right). The baseline diet (left-most column on each plot) represents total impacts for UK food and feed production plus imports, net of exports, expressed on a per capita per day basis and broken down into major foods. Other columns show (from left to right) the estimated footprints of a no-ruminant diet; a vegetarian diet; and a plant-based diet. Emissions estimates are based on the Poore and Nemecek dataset^{Error! Bookmark not defined.} and include the greenhouse gas opportunity costs of forgone sequestration^{Error! Bookmark not defined.}. Biodiversity impacts are an index of the estimated impact of an individual's diet on the cumulative probability of global extinction of ~29,000 terrestrial vertebrate species (using the method of Duran et al. 2020 *Methods Ecol. Evol.* **11**: 910). The provenance of food and feed is estimated by combining FAO trade data with a national input-output model. Because there are no directly comparable data for wild-caught seafood and aquaculture this preliminary assessment excludes fish.

In 2016 the University Catering Service removed all ruminant meat from the outlets it runs, reducing its greenhouse footprint (kg CO₂e/kg food purchased) by 33% and land footprint (m²/kg food purchased) by 28% almost instantaneously - without attracting complaints from its customers and while slightly increasing profits⁸. One College has since stopped serving ruminant meat entirely, and beef, lamb and venison consumption across other colleges is generally falling.

iii. Serving only sustainably sourced seafood

Seafood can be highly nutritious, but wild-harvested fish stocks are under exceptional pressure, primarily from overexploitation. Despite ever-increasing effort, the global marine fish catch is in steady decline, with over 90% of all assessed stocks either fully exploited or overfished¹⁵. Fishing (for direct consumption or to provide meal for aquaculture or livestock) is by far the biggest driver of marine extinctions¹¹. In the UK and EU, annual seafood consumption averages 23kg/person, but the Planetary Health Diet recommends lowering that to 10kg⁶. Removing all unsustainably-sourced fish from menus should greatly reduce our at-sea footprint. Options for achieving this include avoiding all fish that are on the Marine Conservation Society's "fish to avoid" list, buying only those wild-derived products which have been certified as sustainable by the Marine Stewardship Council, and using the Aquaculture Stewardship Council's list to find sustainably-farmed seafood.

iv. Reducing food waste

Between 30 and 40% of all food is wasted^{16,17}. Drastically cutting food waste is central to achieving net-zero targets and slowing the decline of biodiversity. Food gets wasted on farms, in food processing, by retailers, in the hospitality and food service sector (HaFS), and in people's homes. In the UK, about 1 million tonnes of food is wasted in HaFS annually¹⁸. In Cambridge Colleges, waste occurs during preparation, from food that's produced but never served, and from what's left uneaten on plates. Efforts to address these in UCS saw the volume of food wasted in UCS outlets fall by 6% in just 9 months⁸. Better portion control, reducing plate sizes, avoiding paper plates and discounting or giving away already-prepared meals after service can all help drive down waste while cutting costs. Weighing of remaining waste, ensuring it never goes to landfill (where it can lead to very high emissions of methane) and mandatory reporting of food waste are also key.

Seven Frequently Asked Questions

1. Why isn't *buying local* a top priority?

One of the biggest misconceptions about reducing greenhouse gas emissions from food is the advice that "eating locally" will make a substantial difference¹⁹. Transport does of course lead to emissions, but it is most often only a small share of food's final carbon footprint, especially if transport is not by air. Buying locally-sourced food can help reduce emissions from transporting food over long distances. One recent estimate²⁰ suggests up to 20% of all food-systems emissions are from food-miles – a figure much greater than previous estimates²¹. However, even if confirmed, this is still far less than emissions from meat production. In addition, different regions and countries vary widely in the efficiency of their farm sectors, so producing all of our food locally would in some instances increase emissions and negative impacts on biodiversity.

2. Why aren't we prioritising organic food?

While use of pesticides and antimicrobials is usually lower on organic farms (and use of synthetic fertilisers is prohibited), yields (production per unit area) are lower as well. Once the area needed to grow green manures and the greater use of fallow periods are taken into account, long-run yields average 25-40% lower on organic than conventional farms^{22,24}. For UK dairy systems, soil loss and nitrogen and phosphorus runoff (per kg of milk produced) are also far greater on organic farms²⁵. Because land use is critical to the impacts of farming on the climate and biodiversity, increasing organic consumption would substantially increase global heating and accelerate species loss^{22,26}.

3. Isn't grass-fed beef better?

Unfortunately not. Rearing cattle on pasture uses far more land (usually at the expense of native biodiversity) and results in substantially greater emissions (because animals grow slower and so reach slaughter weight later) than does rearing animals on field-grown feedstocks²².

4. What about changing the relative prices of meals, and buffet and menu layouts?

There is evidence that both these interventions can shift customer choices. However, the same study that found a strong consistent effect of doubling the relative availability of vegetarian and vegan meal options found a much smaller effect in Cambridge colleges of reducing their cost (while increasing the cost of meat meals)²⁷, and only a weak and inconsistent effect of manipulating the order of meal options in buffets²⁸.

5. Isn't red meat essential for students who menstruate?

Most vegetarians are not anaemic: while about 13% of pre-menopausal women who are vegetarian have anaemia so do about 9% of non-vegetarian women²⁹. Those eating a vegan diet can get all the nutrients they need from eating a varied and balanced diet including fortified foods and supplements³⁰. Some non-meat foods have higher iron content than others including dark green vegetables and shellfish, the absorption of which is enhanced in the presence of vitamin C from citrus fruits such as oranges. The American Academy of Nutrition and Dietetics position paper describes appropriately planned vegetarian and vegan diets as appropriate for all stages of the life cycle, including pregnancy, lactation, infancy, childhood, adolescence, older adulthood, and for athletes³¹.

6. Isn't red meat necessary to meet the protein needs of high-level athletes?

Animal proteins come not only from meat but also from other animal sources such as dairy products, eggs and fish. Plants also provide protein. For example, tempeh (fermented soybeans) provides 21g per 100g dry weight of protein³², compared with 30g/100g for chicken breast meat. Some plant proteins are less well digested than animal proteins, so vegan athletes need to eat roughly 10-15% more protein³³. Some plant-based proteins, such as quinoa and soya, contain all essential amino acids.³⁴ Others, such as, beans, whole grains, and vegetables, lack one or more essential amino acids. However, provided people eat a variety of plant-based foods, people with plant-based diets will get the amino acids they need³². Finally, it is worth remembering that the average intake of protein in adults in the UK is around 76g/day, about 50% higher than the recommended amount³⁵, a pattern evident in other wealthy regions of the world and becoming more evident in other regions too³⁶.

7. Will dropping beef, lamb and venison from conference menus mean cancelled events?

Prior to the implementation of the Sustainable Food Policy, the UCS catered for 1500 events a year. Throughout the period leading up to the publication of the Our Sustainable Food Journey⁸, no event was cancelled as a result of the policy. Event organisers not only accepted the organisational change to a more sustainable food offer but were also pleased that whatever the menu choice, delegates would be eating more sustainably, which they said was viewed positively by their delegates own organisations.

Darwin College also took the decision to only offer a no-ruminant meat menu. This has had no impact on bookings from outside groups.

One further college is now changing their website conference menus so that none contain ruminant meat. If requested, they will supply these menus at the same time as explaining why they are not routinely offered.

References



- ¹ Tilman & Clark 2014 *Nature* **515**: 518. <https://www.nature.com/articles/nature13959>
- ² Machovina et al. 2015 *Sci. Tot. Env.* **536**: 419. <https://doi.org/10.1016/j.scitotenv.2015.07.022>
- ³ Williams et al. 2021 *Nature Sust.* **4**: 314. <https://eprints.whiterose.ac.uk/171788/>
- ⁴ Machovina et al. 2015 *Sci. Tot. Env.* **536**: 419. <https://doi.org/10.1016/j.scitotenv.2015.07.022>
- ⁵ Springmann et al. 2016 *PNAS* **113**: 4146. <https://doi.org/10.1073/pnas.1523119113>
- ⁶ Willett et al. 2019 *Lancet* **393**: 447. _
- ⁷ Garnett et al. 2019 *PNAS* **116**: 20923. <https://doi.org/10.1073/pnas.1907207116>
- ⁸ UCS 2019 *Our Sustainable Food Journey*, UCS. https://www.environment.admin.cam.ac.uk/files/uoc_sustainable_food_journey_report.pdf
- ⁹ Ramankutty et al. 2008 *Global Biogeochem. Cycles* **22**: GB1003. <https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1029/2007GB002952>
- ¹⁰ Xu et al. 2021 *Nature Food* **2**: 724. <https://doi.org/10.1038/s43016-021-00358-x>
- ¹¹ Maxwell et al. 2016 *Nature* **536**: 143. <https://doi.org/10.1038/536143a>
- ¹² BirdLife International. 2022 *State of the World's Birds 2022*, Birdlife. <https://www.birdlife.org/papers-reports/state-of-the-worlds-birds-2022/#:~:text=The%20data%20paint%20a%20deeply,are%20driven%20by%20human%20actions.>
- ¹³ Poore & Nemecek 2018 *Science* **360**: 987. <https://doi.org/10.1126/science.aag0216>
- ¹⁴ Scarborough et al. 2023 *Nature Food* **4**: 565-574 <https://doi.org/10.1038/s43016-023-00795-w>
- ¹⁵ Pauly & Zeller 2016 *Nature Comms.* **7**: 10244. <https://doi.org/10.1038/ncomms10244>
- ¹⁶ Gustavsson et al. 2011 *Global Food Losses and Food Waste*, FAO. <https://www.fao.org/3/i2697e/i2697e.pdf>
- ¹⁷ Porter et al. 2018 *J. Cleaner Prod.* **201**: 869. <https://doi.org/10.1016/j.jclepro.2018.08.079>
- ¹⁸ WRAP 2022 *Food Surplus and Waste in the UK – Key Facts*, WRAP. <https://www.zerowasteweek.co.uk/wp-content/uploads/2020/10/Food-surplus-and-waste-in-the-UK-key-facts-Jan-20201.pdf>
- ¹⁹ Ritchie 2020 *You want to reduce the carbon footprint of your food? Focus on what you eat, not whether your food is local*, Our World in Data <https://ourworldindata.org/food-choice-vs-eating-local#:~:text=Eating%20local%20only%20slightly%20reduces,very%20little%20for%20total%20emissions.>
- ²⁰ Li et al. 2022 *Nature Food* **3**: 445. <https://doi.org/10.1038/s43016-022-00531-w>
- ²¹ Weber & Matthews 2008 *Env. Sci. Technol.* **43**: 3508. <https://doi.org/10.1021/es702969f>
- ²² Clark & Tilman 2017 *Environ. Res. Lett.* **12**: 064016. DOI: 10.1088/1748-9326/aa6cd5
- ²³ Meemken & Qaim 2018 *Ann. Rev. Res. Econ.* **10**: 3. <https://doi.org/10.1146/annurev-resource-100517-023252>
- ²⁴ Alvarez 2022 *Archi. Agron. Soil. Sci.* **68**: 1947. <https://doi.org/10.1016/j.geoderma.2023.116619>
- ²⁵ Balmford et al. 2018 *Nature Sust.* **1**: 477. <https://doi.org/10.1038/s41893-018-0138-5>
- ²⁶ Smith et al. 2019 *Nature Comms* **10**: 4641. <https://doi.org/10.1038/s41467-019-12622-7>
- ²⁷ Garnett et al. 2021 *J. Env. Psychol.* **75**: 101589. <https://doi.org/10.1016/j.jenvp.2021.101589>
- ²⁸ Garnett et al. 2020 *Nature Food* **1**: 485. <https://api.repository.cam.ac.uk/server/api/core/bitstreams/f18d9ee2-d441-4302-a9ae-f4d230a96ad5/content>
- ²⁹ Tong et al. 2019 *The American Journal of Clinical Nutrition* **110**: 461-472. <https://doi.org/10.1093/ajcn/nqz072>
- ³⁰ NHS 2022 *The Vegan Diet*, NHS <https://www.nhs.uk/live-well/eat-well/how-to-eat-a-balanced-diet/the-vegan-diet/#:~:text=Healthy%20eating%20as%20a%20vegan&text=base%20meals%20on%20potatoes%2C%20bread,beans%2C%20pulses%20and%20other%20proteins>
- ³¹ Vesanto et al. 2016 *Academy of Nutrition and Dietetics.* **116**: 1970-1980. <https://doi.org/10.1016/j.jand.2016.09.025>
- ³² <https://www.webmd.com/food-recipes/tempeh-health-benefits>
- ³³ Ciuris et al. 2019 *Nutrients* **11**: 3016. <https://doi.org/10.3390/nu11123016>
- ³⁴ <https://www.hsph.harvard.edu/nutritionsource/food-features/quinoa/>
- ³⁵ Nutrition 2021 *The Science of Protein*, British Nutrition Foundation <https://www.nutrition.org.uk/healthy-sustainable-diets/protein/?level=Health%20professional>
- ³⁶ World Resources Institute 2016, *People Are Eating More Protein than They Need—Especially in Wealthy Regions* <https://www.wri.org/data/people-are-eating-more-protein-they-need-especially-wealthy-regions#:~:text=Global%20average%20protein%20consumption%20was,protein%20consumption%20was%20higher%20still>