

Changing global diets is vital to reducing climate change

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A new study, published today in *Nature Climate Change*, suggests that – if current trends continue – food production alone will reach, if not exceed, the global targets for total greenhouse gas (GHG) emissions in 2050.

The study's authors say we should all think carefully about the [food](#) we choose and its [environmental impact](#). A shift to healthier diets across the world is just one of a number of actions that need to be taken to avoid dangerous climate change and ensure there is enough food for all.

As populations rise and global tastes shift towards meat-heavy Western diets, increasing [agricultural yields](#) will not meet projected food

demands of what is expected to be 9.6 billion people - making it necessary to bring more land into cultivation.

This will come at a high price, warn the authors, as the deforestation will increase [carbon emissions](#) as well as biodiversity loss, and increased livestock production will raise methane levels. They argue that current food demand trends must change through reducing waste and encouraging balanced diets.

If we maintain 'business as usual', say the authors, then by 2050 cropland will have expanded by 42% and fertiliser use increased sharply by 45% over 2009 levels. A further tenth of the world's pristine tropical forests would disappear over the next 35 years.

The study shows that increased deforestation, fertilizer use and livestock methane emissions are likely to cause GHG from food production to increase by almost 80%. This will put emissions from food production alone roughly equal to the target [greenhouse gas](#) emissions in 2050 for the entire global economy.

The study's authors write that halving the amount of food waste and managing demand for particularly environmentally-damaging food products by changing global diets should be key aims that, if achieved, might mitigate some of the greenhouse gases causing climate change.

"There are basic laws of biophysics that we cannot evade," said lead researcher Bojana Bajzelj from the University of Cambridge's Department of Engineering, who authored the study with colleagues from Cambridge's departments of Geography and Plant Sciences as well as the University of Aberdeen's Institute of Biological and Environmental Sciences.

"The average efficiency of livestock converting plant feed to meat is less

than 3%, and as we eat more meat, more arable cultivation is turned over to producing feedstock for animals that provide meat for humans. The losses at each stage are large, and as humans globally eat more and more meat, conversion from plants to food becomes less and less efficient, driving agricultural expansion and land cover conversion, and releasing more [greenhouse gases](#). Agricultural practices are not necessarily at fault here – but our choice of food is," said Bajzelj.

"It is imperative to find ways to achieve global food security without expanding crop or pastureland. Food production is a main driver of biodiversity loss and a large contributor to climate change and pollution, so our food choices matter."

The team analysed evidence such as land use, land suitability and agricultural biomass data to create a robust model that compares different scenarios for 2050, including scenarios based on maintaining current trends.

One scenario investigated by the team is on the supply side: the closing of 'yield gaps'. Gaps between crop yields achieved in 'best practice' farming and the actual average yields exist all over the world, but are widest in developing countries – particularly in Sub-Saharan Africa. The researchers say that closing these gaps through sustainable intensification of farming should be actively pursued.

But even with the yield gaps closed, projected food demand will still require additional land – so the impact on GHG emissions and biodiversity remains. Bajzelj points out that higher yields will also require more mineral fertiliser use and increased water demand for irrigation.

Food waste, another scenario analysed by the team, occurs at all stages in the food chain. In developing countries, poor storage and transportation

cause waste; in the west, wasteful consumption is rife. "The latter is in many ways worse because the wasted [food products](#) have already undergone various transformations that require input of other resources, especially energy," said Bajzelj.

Yield gap closure alone still showed a greenhouse gas increase of just over 40% by 2050. Closing yield gaps and halving food waste still showed a small increase of 2% in [greenhouse gas emissions](#). When healthy diets were added, the model suggests that all three measures combined result in agricultural GHG levels almost halving from their 2009 level – dropping 48%.

"Western diets are increasingly characterised by excessive consumption of food, including that of emission-intensive meat and dairy products. We tested a scenario where all countries were assumed to achieve an average balanced diet - without excessive consumption of sugars, fats, and meat products. This significantly reduced the pressures on the environment even further," said the team.

The 'average' balanced diet used in the study is a relatively achievable goal for most. For example, the figures included two 85g portions of red meat and five eggs per week, as well as a portion of poultry a day.

"This is not a radical vegetarian argument; it is an argument about eating meat in sensible amounts as part of healthy, balanced diets," said Cambridge co-author Prof Keith Richards. "Managing the demand better, for example by focusing on health education, would bring double benefits – maintaining healthy populations, and greatly reducing critical pressures on the environment."

Co-author Prof Pete Smith from the University of Aberdeen said: "unless we make some serious changes in food consumption trends, we would have to completely de-carbonise the energy and industry sectors to

stay within emissions budgets that avoid dangerous climate change. That is practically impossible – so, as well as encouraging sustainable agriculture, we need to re-think what we eat."

"Cutting food waste and moderating meat consumption in more balanced diets, are the essential 'no-regrets' options," added Bajzelj.

More information: *Nature Climate Change*,
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