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SOPHIE CASSON FOR *NATURE*

Healthy people, healthy planet

To provide 2050's estimated 10 billion people with a healthy diet, global eating habits need to become more sustainable. **By Chris Woolston**

Every morsel of food from every plate, bowl and cooking pot around the world takes a small bite from Earth's resources. The human diet places a strain on the environment, water resources, biodiversity and just about every other measure of planetary health. With so much at stake, researchers have turned their attention to a pressing question: what sort of diet can the planet realistically support?

The answer requires insights from fields such as nutrition, agriculture and climate research. "We need to produce food groups that are good for health in ways that are restorative to the planet, rather than extractive," says Corinna Hawkes, director of the Centre for Food Policy at City, University of London. The particular foods on the plate will vary from one place to another, she says, but those meals need to add up to something more sustainable than society's current fare.

"When you look carefully at the big systems that regulate the stability of our planet, food is a dominant player in essentially all of them," says Johan Rockström, an environmental scientist at Stockholm University. In 2019, Rockström, Hawkes and other members of an international group of scientists proposed the EAT-*Lancet* diet[1], a global meal plan that could, in theory, feed 2050's estimated population of 10 billion people (see 'Planetary-health diet'). That plan called for drastic cuts in meat consumption and a much higher intake of fruits and vegetables. But it proved controversial with meat-industry proponents and economists, and the quest for a planetary diet

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Elizabeth Kimani-Murage addresses community members at a meeting about food insecurity in Nairobi, Kenya.

continues. When researchers and policy-makers convene at the United Nations Food Systems Summit in late 2021, a healthy-planet diet will be near the top of the agenda.

The goal will be a basic framework, not an item-by-item menu, says Agnes Kalibata, a food-policy specialist in Kigali, Rwanda, who will be leading the summit as the UN special envoy. "Diets are influenced by cultures and custom," she says. "We can come up with the principles of what a good diet will look like. We need to find a balance."

Sustainability on a plate

Most researchers agree that the current diet is not sustainable. A 2018 analysis[2] estimated that food production releases the equivalent of 13.7 gigatonnes of carbon dioxide in greenhouse gases into the air each year – more than one-quarter of all human-caused greenhouse gases. The same report estimated that agricultural irrigation accounts for about two-thirds of all fresh water used by humans. And about 37% of the planet's land area, excluding deserts and ice sheets, is already dedicated to food production. That footprint is likely to grow as the population increases.

Some foods take up many more resources than others. At the upper end, just 100 grams of beef protein can result in the release of the equivalent of 105 kilograms of CO_2. The same amount of protein from a well-managed field of peas, by contrast, typically releases the equivalent of only about 0.2 kg of CO_2. These orders-of-magnitude differences mean that any vision of a more sustainable diet has to include marked reductions in the meat consumption of high-income countries, Hawkes says. She notes that consuming a lot of red meat can raise the risk of cancer and heart disease. "It's not great for our health, and it's not great for our planet," she says. "There's a strong alignment between health and sustainability."

"We have to rethink our diets based on who are the most vulnerable among us".

This convergence of nutrition and conservation is a central message of the EAT-*Lancet* diet. The authors started by reviewing the best evidence for constructing a diet that would optimize human health and reduce the global toll of food-related health conditions, such as diabetes, heart disease, cancer and obesity. The researchers didn't even consider the impacts on climate or sustainability until the nutritional framework had been set, Rockström says.

The EAT-*Lancet* commission ultimately proposed a 'flexitarian' diet that spans a spectrum of food groups. It also suggested vegan and vegetarian options. Plants form the foundation of the commission's flexitarian diet, which recommends the daily consumption of 300 g of vegetables, 200 g of fruit, around 230 g of whole grains and 125 g of plant-based protein-rich foods, such as lentils, nuts and dry beans. The diet calls for a mere five servings of animal protein per person per week, including about 200 g of fish and 200 g of white meat. Controversially, the diet allows for just 100 g or so of red meat, around one and a half servings, per week. Rockström notes that's a significant reduction from the roughly 700 g of red meat consumed each week by people in places such as North America and Europe, but it's much more than the amount typically eaten by people in low-income countries.

Despite its dire environmental impacts, meat still has an important place in the global diet. On a nutritional level, the proteins and minerals from animal products could be a real boost for malnourished populations around the world, Hawkes says. "For infants who otherwise eat rice or starchy cassava, meat is an incredibly efficient way of boosting micronutrient status," she says. What's more, she says, "meat has tremendous cultural significance in people's lives – it's associated with high status".

Expensive gains

After investigating the potential environmental impacts of the EAT-*Lancet* diet, the authors concluded that a nutritious diet for people could also be good for the planet. "We found that a healthy diet combined with sustainable agricultural practices would have positive impacts on biodiversity, land, water, nutrients and climate," Rockström says. The most significant improvements tied to a change in diet would come from a reduction in phosphorus and nitrogen pollution in waterways and greenhouse-gas emissions. The commission estimated that the new meal plan could cut related greenhouse-gas emissions by about half – down to

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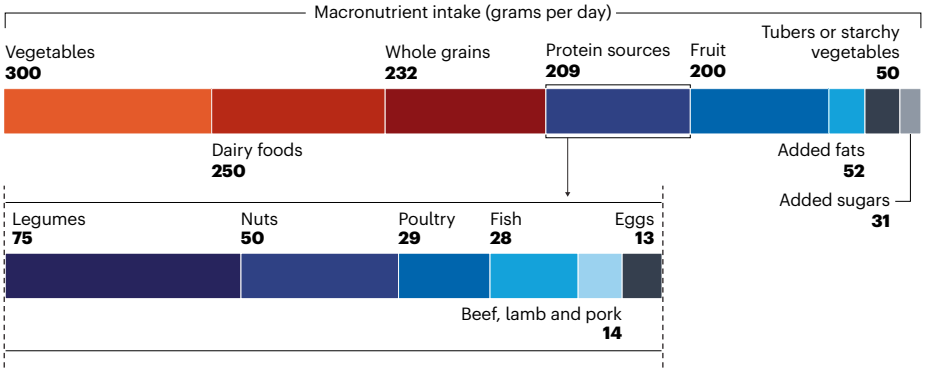
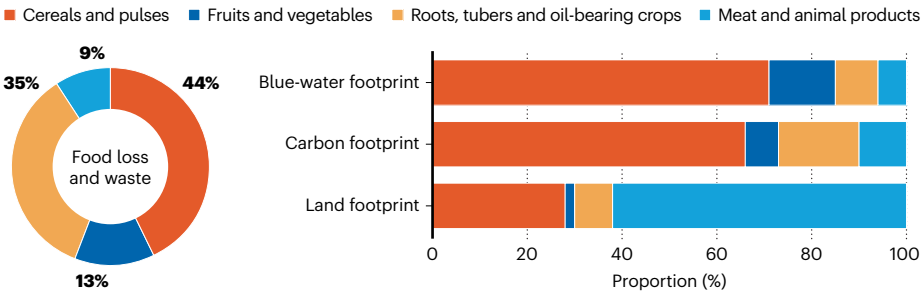
PLANETARY-HEALTH DIET

If every person had a daily food allocation to sustain not only their health but also that of the planet, what would it look like? The answer to this question in a study[1] from the EAT-*Lancet* commission, places an emphasis on plant-based foods, and recommends an amount of animal-derived protein much lower than that eaten in high-income countries but much higher than the amount consumed in low-income countries.



IMPACT OF UNUSED FOOD

Food loss (from post-harvest through the supply chain and up to, but not including, retail) and waste (at retail and consumption level) from the main food groups have negative environmental impacts. They all have a blue-water (cubic metres of water wasted), carbon (tonnes of carbon dioxide equivalent omitted) and land (hectares of land used) footprint per tonne of food lost or wasted.



about 5 gigatonnes of CO_2 equivalent.

If the EAT-*Lancet* diet was adopted, it would undoubtedly be a healthy step forward for people and the environment. But it has faced fierce opposition over its potential to devastate the animal-husbandry industry, and has been criticized as being too expensive for many consumers. One analysis[3] calculated that nearly 1.6 billion people would be too poor to buy the recommended mix of foods, especially the meat, fruits and vegetables. "No amount of nutritional knowledge is going to get them there because they can't afford it," says William Masters, one of the study's authors and a nutritional economist at Tufts University in Boston, Massachusetts. "They may have US$1 a day to spend on food but they would need $1.50," he says.

The analysis found that the EAT-*Lancet* model was about 60% more expensive than the cheapest alternative diet that could provide all 20 essential nutrients people need to survive. That bargain diet — which consists almost entirely of starchy staples, such as rice, cassava and flour, with very little fish, meat, fruits or vegetables — would also be more environmentally friendly, but Masters cautions that it is not healthy. It lacks, among other things, the fibre needed for optimal digestion, the phytochemicals that can protect against cardiovascular disease and cancer, and the healthy fats that support the brain.

Poverty is a crucial barrier to improved global nutrition, but, Masters says, it is important not to lose sight of the greater proportion of the world's population that could afford to eat better, but doesn't. "A vastly larger number of people could walk into a grocery store tomorrow and buy a healthier diet that's more environmentally sustainable than the one they eat now," he says.

Local eating, global impacts

Any modification to the global diet will have to start with changes at a local level. Elizabeth Kimani-Murage, a nutrition specialist with the African Population and Health Research Center in Nairobi, Kenya, predicts a future in which residents of her city feed themselves with locally grown foods from kitchen gardens and urban fruit trees. Small animals, such as chickens, rabbits, and even termites and crickets, would add much-needed protein. The balance of fruits, vegetables, grains and protein would look much like the EAT-*Lancet* diet, but with a decidedly East African flavour.

The proposal from her institute is one of ten to make the finals of the Food System Vision Prize, a global contest sponsored by the Rockefeller Foundation in New York City. The winners are due to be announced in December. Kimani-Murage says she wants Kenya to move away the sort of large-scale industrial farms that currently feed cities around the world. "Food has been so commercialized or commodified," she says. "It's produced for money and not for feeding people. We want to continue this local production of food even as the world urbanizes." She notes that local food production could also significantly reduce the costs of production and shipping, potentially increasing the affordability of an EAT-*Lancet*-style diet.

Feeding people at a local level is the key focus of the 2021 UN Food Systems Summit. The current global diet, Kalibata says, is unbalanced, largely because of gaps in wealth and opportunity. In poor areas around the world, people tend to fill their stomachs with starchy, carbohydrate-heavy food because they can't afford other, more nutritious alternatives. "We have to rethink our diets based on who are the most vulnerable among us," Kalibata says. She says that high-quality proteins, whether meat- or plant-based, need to replace many of the carbohydrates eaten in poorer areas.

Kalibata thinks it will be possible to meet nutritional needs in the future, but it will take concerted effort to reduce waste (see 'Impact of unused food'), localize production and expand the food options of the global poor. All these issues will be on the agenda at the summit, and Kalibata hopes they'll inspire a global plan of action in the years to come. "We've had food summits before," Kalibata says. "We have to make this one different. We have to deliver on the goals."

Rockström hopes that the EAT-*Lancet* plan, despite its shortcomings, will still serve as inspiration for efforts to put humanity's nutritional needs on a more sustainable footing. "It is not the final answer in any way," he says, "But it was the first time people got together from disciplines in health, agriculture and sustainability to try to answer the big questions. If we're going to take seriously that we'll have 10 billion citizens who all need to eat, we'll need to live in a certain balance."

Chris Woolston is a freelance writer in Billings, Montana.

1. Willett, W. *et al. Lancet* **393**, 447–492 (2019).
2. Poore, J. & Nemecek, T. *Science* **360**, 987–992 (2018).
3. Hirvonen, K., Bai, Y., Headey, D. & Masters, W. A. *Lancet Glob. Health* **8**, e59–e66 (2020).

SOURCE: REF. 1 (TOP); FAO (BOTTOM)