

Science for Environment Policy

Dietary changes will help more sustainable agriculture meet increased global food demand

Researchers have assessed how changes in production efficiency and dietary patterns can combine to ensure food supply whilst minimising the global environmental impact of food production. The gain in the production efficiency of [agriculture](#) was found to be insufficient to meet future food demand whilst preventing additional environmental burdens, if dietary trends continue to grow based on GDP. Changing consumption patterns, including switching to less resource-demanding diets, would contribute towards ensuring future food security whilst preventing further increases in agriculture's environmental burden. Reducing terrestrial animal production offers significant advantages, but alternative diets can also present environmental and production trade-offs.

Global food production has considerably modified natural environments, causing effects ranging from the depletion of rivers and groundwater and nutrient pollution, to habitat loss and greenhouse gas (GHG) emissions. The combined pressures of globalisation, population growth, [urbanisation](#) and [climate change](#) mean that developing sustainable agriculture in the future will be a major challenge. A growing and wealthier global population is likely to increase this impact and so solutions are required to increase food production whilst also minimising environmental impacts (sustainable intensification).

This study analysed to what extent agricultural productivity will need to increase in order to maintain current levels of resource use and global emissions from food production. The researchers measured 'footprint intensity' (a ratio of inputs to product output, indicating the amount of food produced per unit of resource used), using the potential environmental burdens of water, GHG emissions, nitrogen and land for agriculture by 2050, in order to calculate the increase in production that would be required to meet food demand under the current pattern of a 'GDP-based' diet, associated with increases in refined sugars and fats, oils and meat and increasing global affluence.

The researchers estimated that 776 cubic metres (m³) of water, 15.3 kilograms (kg) of nitrogen, 299 kg of carbon dioxide (CO₂) and 0.85 hectares (ha) of land are required annually to support an average global diet for one person in 2015. Animal products account for much of the water (43%), nitrogen (58%), GHG emissions (74%) and land (87%) required.

They calculated that footprint intensity would need to increase substantially to prevent further increases in environmental burdens by 2050 (65% for water, 85% for nitrogen, 72% for GHG and 97% for land area). The research highlights that increasing agricultural footprint intensity is not likely to be enough to achieve food security while preventing further increases in agriculture's environmental burden in the future; changes in diets and consumption patterns are likely to be required as well.

The researchers then modelled how different types of alternative diet would contribute to resource efficiency gains. The diets assessed included Mediterranean-style (i.e. an increase in consumption of fruits/vegetables/milk and a decrease in consumption of cereals/beef), vegetarian, a so-called pescatarian diet (based on fish and milk for protein intake) and, lastly, changes in beef consumption, which had the most significant influence on land use, contributing to a large increase under the GDP-based scenario. A 'Mediterranean-like' diet showed trade-offs in environmental impacts, reducing the additional land and GHG demand, but increasing water and nitrogen demands. A vegetarian diet was shown to have the greatest reductions in projected environmental impacts, whilst bringing other benefits, notably on human health; for example, reducing 'non-communicable diseases' such as heart disease, diabetes and cancer.

Continued on next page.

25 November 2016
Issue 478

[Subscribe](#) to free
weekly News Alert

Source: Davis, K.F., Gephart, J.A., Emery, K.A., Leach, A.M., Galloway, J.N. & D'Odorico, P. (2016). Meeting future food demand with current agricultural resources. *Global Environmental Change*, (39): 125–132. DOI: 10.1016/j.gloenvcha.2016.05.004.

Contact:
kfd5zs@virginia.edu

Read more about:
[Agriculture](#), [Resource efficiency](#), [Sustainable consumption and production](#), [Water](#)

The contents and views included in *Science for Environment Policy* are based on independent, peer-reviewed research and do not necessarily reflect the position of the European Commission.

To cite this article/service: "[Science for Environment Policy](#)": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.

Science for Environment Policy

Dietary changes will help more sustainable agriculture meet increased global food demand (continued)

25 November 2016
Issue 478

[Subscribe](#) to free
weekly News Alert

Source: Davis, K.F., Gephart, J.A., Emery, K.A., Leach, A.M., Galloway, J.N. & D'Odorico, P. (2016). Meeting future food demand with current agricultural resources. *Global Environmental Change*, (39): 125–132. DOI: 10.1016/j.gloenvcha.2016.05.004.

Contact:
kfd5zs@virginia.edu

Read more about:
[Agriculture](#), [Resource efficiency](#), [Sustainable consumption and production](#), [Water](#)

The contents and views included in *Science for Environment Policy* are based on independent, peer-reviewed research and do not necessarily reflect the position of the European Commission.

To cite this article/service: "[Science for Environment Policy](#)": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.

The researchers acknowledge that, as the study focuses on a global scale using national-level data, it does not reflect variability in diets or food inequality within countries. The study also only explores a limited number of future food scenarios and does not account for the potential impact of climate changes on food production. Nonetheless, the study does provide an indication of how changes in diet could influence the energy, water, land and nutrient consumption of food production worldwide.

The researchers note that local cultural preferences play an important role in determining reasonable options for more sustainable diets, and that economic solutions that more accurately incorporate the environmental cost of a food product can play an important role in shifting dietary preferences to more sustainable choices. They point to the limited effect that public policies have had on diet until now.

The researchers say that the stagnation of crop yields (or diminished returns despite increased fertiliser use) in many agricultural areas, the diminished nutrient content of high-volume cereal crops and a greater reliance on food trade all point towards the need for a new food 'revolution', which needs to combine a shift in consumption patterns with existing technologies as well as innovative solutions that increase agricultural production.

