

ECOLOGY

Grassland gas

*Oecologia* <https://doi.org/10.1007/s00442-019-04424-x> (2019)



Credit: Maiquel Jantsch / Moment / Getty Images

Nitrous oxide (N<sub>2</sub>O) is a potent greenhouse gas predominantly emitted to the atmosphere by agriculture. However, natural systems account for nearly 20% of global emissions, and changes in these may be dictated by human influence. The amount of N<sub>2</sub>O released depends on direct factors, such as soil temperature, nitrate or water content, as well as more distal controls, like climate and plant cover, that are more difficult to constrain but potentially easier to include in plans.

To quantify these indirect effects, Juan Manuel Piñeiro-Guerra from the University of Buenos Aires and colleagues investigate the N<sub>2</sub>O emissions from natural grasslands in the Rio de la Plata, Argentina, for a year. They find that decreasing plant biodiversity and increasing plant productivity are associated spatially with

higher N<sub>2</sub>O emissions. Over time, however, temperature and precipitation determine the magnitude of N<sub>2</sub>O fluxes. The different spatial and temporal effects mean that biodiversity, primary productivity and climate must be considered in determining and limiting greenhouse gas emissions in natural systems. AF

<https://doi.org/10.1038/s41558-019-0548-z>

FOOD SECURITY

Crops already affected

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Credit: Gary K Smith / Alamy Stock Photo

Climate change will affect global food production, with crop vulnerability to temperature and precipitation changes differing depending on species and region. It is important to quantify the regional impacts, as these will influence food security. To understand the current effects of climate change on crop yields, Deepak Ray of the University of Minnesota Saint Paul, USA, and co-authors use weather and crop data to

construct linear regression relationships for the top 10 global crops — barley, cassava, maize, palm oil, rapeseed, rice, sorghum, soybean, sugarcane and wheat — which account for about 83% of global crop calorie production.

Of the countries studied, 53 are classified as having a serious or worse hunger index. From these, 27 have already experienced some reduction in consumable calories produced due to climate change, particularly in parts of southern and western Africa, as well as Asia. In Zimbabwe, an example of a larger decrease, the decline was 7.2%. Yields generally decreased across Europe, sub-Saharan Africa and Australia, whereas Latin America had increased yields. Information on these current impacts needs to be used to improve cropping to cope with further changes. BW

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HADLEY CIRCULATION

In models we trust

*Nat. Geosci.* <https://doi.org/10.1038/s41561-019-0383-x> (2019)

The Hadley circulation (HC) — defined by tropical ascent near the Equator and subtropical descent on either side — constrains tropical precipitation, subtropical dry zones and poleward atmospheric heat transport. Climate models predict that the HC will weaken in response to anthropogenic warming, estimating that this has already occurred in the past four decades. Reanalyses (assimilated data sets that serve as proxies for observations) instead show a strengthening HC since 1979. Elucidating the source of this disagreement in the historical past is necessary to accurately assess HC projections in models.

Rei Chemke and Lorenzo Polvani of Columbia University, USA, set out to understand this discrepancy. They use a multi-model archive and single-model initial condition ensemble to show that this disagreement is not a result of internal variability within the climate system, but rather an erroneous representation of latent heat of moist processes in reanalyses. While the origin of the flawed latent heating remains unclear, these findings suggest that reanalyses may be unreliable for analysing tropical circulation trends and associated moist processes. Furthermore, these results reinforce trust in model simulations of recent and long-term HC behaviour. BL

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Alyssa Findlay, Baird Langenbrunner, Bronwyn Wake and Adam Yeeles

MITIGATION

Counting tree contributions

*Agric. Ecosyst. Environ.* <https://doi.org/10.1016/j.agee.2019.106569> (2019)

Agroforestry — growing trees along with crops and livestock — has emerged as a way to meet climate goals but has been accompanied by uncertainty over measurement, reporting and verification (MRV).

Todd S. Rosenstock of the World Agroforestry Centre, Democratic Republic of Congo, and colleagues have carried out a desk review of National Communications and Nationally Determined Contributions (NDCs) to the UNFCCC, as well as conducting key informant interviews to appraise national-level interest in agroforestry and the extent to which it is represented in MRV systems. They find that agroforestry is featured widely in NDCs of African countries and, to a lesser extent, countries in the Americas, Asia and Oceania, but very few countries include explicit quantification of agroforestry in greenhouse gas inventories. Some non-forest trees are included in carbon stock inventories, but the breadth of agroforestry practice is not well represented. Interviews suggest that there are both technical and institutional impediments limiting the inclusion of agroforestry in MRV systems. AY

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