Scientists call for renewed Paris pledges to transform agriculture

The scientific consensus states CO_2 emissions must be limited to 420 billion tonnes and approximately 720 billion tonnes of CO_2 must be removed from the atmosphere to limit global warming to 1·5°C with 66% probability.[1] Restoring natural vegetation, such as forest, is currently the best option at scale for removing CO_2 from the atmosphere,[2] and must begin immediately to be effective within the required timescale of reaching net zero emissions by 2050.[1] The livestock sector, having largely displaced natural carbon sinks, continues to occupy much of the land that must be restored.[3] Without such land restoration, CO_2 removal from the atmosphere relies on methods currently unproven at scale, increasing the risk of temperatures rising high enough to tip various Earth systems into unstable states. This instability could result in the loss of coral reefs and major ice sheets, and increases the uncertainty of maintaining life-supporting ecosystems.[4]

If the livestock sector were to continue with business as usual, this sector alone would account for 49% of the emissions budget for 1·5°C by 2030,[5] requiring other sectors to reduce emissions beyond a realistic or planned level. Since the first Intergovernmental Panel on Climate Change assessment report in 1990, the production of meat, milk, and eggs increased from 758 million tonnes to 1247 million tonnes in 2017,[6] and is projected to further increase.[7] Continued growth of the livestock sector increases the risk of exceeding emissions budgets consistent with limiting warming to 1·5°C and 2°C, limits the removal of CO_2 from the atmosphere through restoring native vegetation, and threatens remaining natural carbon sinks where land could be converted to livestock production.[3,5,7]

To help reduce the risk of global temperature rising beyond 1·5°C or 2°C, we call on high-income and middle-income countries to incorporate four measures into their revised commitments to meeting the Paris Agreement, from 2020 onwards. First, declare a timeframe for peak livestock—ie, livestock production from each species would not continue to increase from this point forward. Second, within the livestock sector, identify the largest emissions sources or the largest land occupiers, or both, and set appropriate reduction targets for production. This process would be repeated sequentially, to set reduction targets for the next largest emitter or land occupier. Third, within a reconfiguration of the agriculture sector, apply a best available food strategy to diversify food production by replacing livestock with foods that simultaneously minimise environmental burdens and maximise public health benefits—mainly pulses (including beans, peas, and lentils), grains, fruits, vegetables, nuts, and seeds.[5,8] Fourth, when grazing land is not required or is unsuitable for horticulture or arable production, adopt a natural climate solutions approach where possible, to repurpose land as a carbon sink by restoring native vegetation cover to its maximum carbon sequestration potential,[2] with additional benefits to biodiversity.[9]

We propose that in creating Paris-compliant agriculture sectors, high-income and middle-income countries do not outsource their livestock production to other countries, and instead reduce demand for livestock products.

Although our suggestions are not a full list of mitigation actions for the agriculture sector, they are necessary to adhere to the equity component of the Paris Agreement, and are considered part of a suite of measures that are needed across all sectors to reduce the risk of reaching temperature levels beyond the Paris goals. We will provide further scientific evidence about these important topics during the ongoing revision of Nationally Determined Contributions to the Paris Agreement.

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1   Intergovernmental Panel on Climate Change. Summary for policymakers. In: Masson-Delmotte VP, Zhai H-O, Pörtner D, et al, eds. Global warming of 1·5°C. An IPCC Special Report on the impacts of global warming of 1·5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty World Meteorological Organization. Geneva: IPCC, 2018.
2   Lewis SL, Wheeler C, Mitchard E, Koch A. Restoring natural forests is the best way to remove atmospheric carbon. *Nature* 2019; **568:** 25–28.
3   Poore J, Nemecek T. Reducing food's environmental impacts through producers and consumers. *Science* 2018; **360:** 987–92.
4   Steffen W, Rockstrom J, Richardson K, et al. Trajectories of the Earth System in the Anthropocene. *Proc Natl Acad Sci USA* 2018; **115:** 8252–59.
5   Harwatt H. Including animal to plant protein shifts in climate change mitigation policy: a proposed three-step strategy. *Climate Policy* 2018; **19:** 533–41.
6   Food and Agriculture Organization of the UN. Livestock primary. World meat, egg and dairy production (excluding indigenous products and nes where items are not reported seperately) 1990 and 2017. 2019. http://www.fao.org/faostat/en/#data/QL (accessed Nov 14, 2019).

7   Springmann M, Clark M, Mason-D'Croz D, et al. Options for keeping the food system within environmental limits. *Nature* 2018; **562:** 519–25.

8   Springmann M, Wiebe K, Mason-D'Croz D, Sulser TB, Rayner M, Scarborough P. Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail. *Lancet Planet Health* 2018; **2:** e451–61.

9   Diaz S, Settele J, Brondízio E, et al. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. 2019. IPBES secretariat, Bonn, Germany.