



AGRICULTURE AND CLIMATE CHANGE

Highlights

- Agriculture is particularly vulnerable to climate change, but is also a major source of greenhouse gas (GHG) emissions.
- Adverse effects of climate change are already visible and increasing. The sector must take actions to develop resilience to shocks by facilitating on-farm adaptation over the short to long run as climate change intensifies.
- Agriculture lags behind other sectors in terms of climate commitments and actions. Yet it can become an important part of the overall mitigation solution by reducing GHG emissions and removing CO₂ from the atmosphere by sequestering carbon.
- Unlocking this potential will involve reorienting agricultural support and employing pricing instruments to curtail emissions and stimulate innovation and the uptake of better adapted and lower-emission technologies and practices, while limiting adverse impacts on livelihoods.

What's the issue?

Agriculture faces a complex and unique challenge in the context of climate change. First, agriculture is particularly vulnerable due to its dependence on weather and climatic conditions. The sector is already experiencing negative impacts from higher temperatures, more variable rainfall, invasive pests, and more frequent extreme weather events, which will worsen as climate change accelerates.

At the same time, agriculture is itself a major source of global greenhouse gas (GHG) emissions, both directly (through on-farm emissions linked to production) and indirectly (through land use change due to agricultural expansion). Overall, agriculture, forestry and other land use (AFOLU) represents around one-fifth (22%) of global anthropogenic GHG emissions. Half of this stems from on-farm emissions of methane and nitrous oxide, and the other half from CO₂ emissions resulting from land use, land use change and forestry (LULUCF). Methane has a particularly strong influence on temperatures in the short term, and mitigation of this gas is important for stabilising climate change by mid-century. In the absence of action, emissions from agriculture will continue to rise, and the sector's share of total emissions may increase as other sectors decarbonise.

Yet there are ample opportunities for agriculture to reduce both direct and indirect emissions. Furthermore, agriculture also offers nature-based options to remove CO₂ from the atmosphere, through carbon sequestration in biomass and soils. Moreover, this can be achieved through practices that raise productivity. [OECD research](#) shows that with a comprehensive policy package combining global emissions taxes and carbon sequestration subsidies the sector could contribute to mitigation at a rate of 8 Gt CO₂eq/year in 2050, which represents two thirds of current AFOLU emissions. Direct (agriculture) emission reductions would represent 29% of this total, soil carbon sequestration 9%, and reduction of deforestation and other land use change emissions 62%.

Despite this potential, agriculture lags behind other sectors in terms of climate change commitments and actions. [By mid-2022, only 16 countries of OECD and key major emerging economies had set emissions reduction targets specific to the agricultural sector.](#) Agriculture is generally exempt from mitigation policies such as carbon pricing or equivalent regulatory measures, and only a few countries use targeted subsidies to incentivise mitigation. Indeed, while agriculture receives considerable policy support, very little of this stimulates innovation or is aligned with climate objectives. In particular, the share of support directed to general services-including agricultural knowledge and innovation systems and infrastructure) has declined over the past two decades from 16% to 13%, which constrains the transition to more resilient and sustainable production. A large share of existing support to agricultural production in many countries also potentially contributes to increasing their GHG emissions. Although greater attention is being given to adaptation among OECD countries, current plans place more weight on short- and medium-run measures, and less emphasis on developing the transformative capacity necessary to adapt to large and persistent changes in the environment.

What should policy makers do?

Tackling the climate change challenge in agriculture is a complex task, as the reduction of emissions needs to be achieved while facilitating adaptation to harsher conditions in order to minimise adverse effects on food security and nutrition, safeguard livelihoods and protect the environment. However, this still leaves considerable scope for action.

More specifically, it is recommended that governments:

- Further develop concrete adaptation plans that facilitate both on-farm adaptive response as well as long-run sectoral transformation to avoid or mitigate damages from recurring and increasingly severe climate shocks.
- Phase out barriers to adaptive transformations of production systems, such as subsidised insurance schemes that distort farmers' decisions and potentially environmentally harmful forms of support that can increase GHG emissions.
- Reorient budgetary support towards innovation to foster emission-saving and sustainable productivity growth and ensure emergence of new mitigation technologies, as well as new varieties and breeds more resistant to extreme events. Such investments would benefit from stronger partnerships between the public and private sectors to enhance synergies in research and development.
- Implement an effective pricing system for agricultural GHG emissions to incentivise the transition to low-emissions agriculture. This may include a mix of emissions taxes and tradeable permit schemes, and in some cases carbon offsets, free permit allocations and abatement subsidies to shelter poor farmers and consumers from higher costs or to ease the transition to full emission pricing.
- Approach transformations for adaptation and mitigation from a food systems perspective, by also shifting consumption to better adapted and lower-emission production systems, and by lowering resource pressures through reduction of food loss and waste.
- Ensure, through coordination between relevant ministries, that agricultural policy is fully aligned and coherent with long-term strategies and policies to fulfil international climate commitments, including those that emerge from the 27th Conference of the Parties of the UNFCCC Conference (COP27).

Some policies to reduce emissions and transform production systems may create trade-offs with food security and nutrition for consumers and livelihoods for producers. Social safety net policies targeting farmers and households most in need will thus be required to accompany climate policies. A stronger resilience toolkit will in particular be needed to facilitate agriculture's adaptation to a world of diverse risks and increasing extreme weather events and natural disasters.

Further reading

Guerrero, S., et al. (2022), "The impacts of agricultural trade and support policy reform on climate change adaptation and environmental performance: A model-based analysis", *OECD Food, Agriculture and Fisheries Papers*, No. 180, OECD Publishing, Paris, <https://doi.org/10.1787/520dd70d-en>.

Henderson, B., et al. (2022), "Soil carbon sequestration by agriculture: Policy options", *OECD Food, Agriculture and Fisheries Papers*, No. 174, OECD Publishing, Paris, <https://doi.org/10.1787/63ef3841-en>.

OECD (2019), *Enhancing Climate Change Mitigation through Agriculture*, OECD Publishing, Paris, <https://doi.org/10.1787/e9a79226-en>.