

Agriculture

Trade, Climate, and Net Zero Pathways: Scenarios and Implications for Developing Countries and Climate- Resilient Development

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About This Series of Sectoral Briefing Notes

This briefing note is part of a series of sectoral notes commissioned by TESS intended to inform a final report on *Trade and climate scenarios on the road to 2050: Implications for developing countries and climate-resilient development*.

The series and the report aim to provide an overview of current and anticipated transformations in trade on the road to 2050 in the context of the unfolding climate crisis and the international community's climate action agenda and to discuss potential scenarios and implications for developing countries.

A wider objective of the series is to contribute to a better understanding of emerging trade and trade policy trends and dynamics and their implications within the various sectors, with a focus on supporting developing countries in identifying and advancing their climate change trade-related interests and priorities in international discussions.

The sectors covered in the series include agriculture, carbon markets, critical minerals, digital trade, fisheries, energy transition, heavy industries, shipping, and textiles, each authored by experts in these respective fields.

Abbreviations

CH ₄	Methane
CO ₂	Carbon Dioxide
CO ₂ eq	Carbon Dioxide Equivalent
COP	United Nations Climate Change Conference
FAO	Food and Agriculture Organization of the United Nations
GHG	Greenhouse Gas
Gt	Gigatonnes
IFPRI	International Food Policy Research Institute
IPCC	Intergovernmental Panel on Climate Change
LDC	Least Developed Country
N ₂ O	Nitrous Oxide
OECD	Organisation for Economic Co-operation and Development
UNCTAD	UN Trade and Development
UNEP	United Nations Environment Programme
WTO	World Trade Organization

1. Introduction

Land-based agriculture provides the bulk of world food supply and represents a critical source of feedstock, fuel, and livelihoods. Yet, the sector is failing to deliver food and nutrition security for all and its sustainability is increasingly threatened. Rising temperatures, changing precipitation patterns, and greater frequency of extreme weather events as a result of climate change are already affecting production, disrupting food supply chains, and displacing communities, particularly in developing countries. By 2050, climate change is expected to put millions of people at risk of hunger, malnutrition, and poverty. At the same time, agriculture contributes both directly and indirectly to environmental degradation, including soil and water pollution and biodiversity loss. Between 2000 and 2018, the Food and Agriculture Organization of the United Nations (FAO) estimates that agricultural expansion drove 88% of global deforestation, with cropland expansion and livestock grazing respectively responsible for 50% and 38% (FAO, 2022). Food systems, including on-farm activities, land-use change, and pre- and post-production, contributed more than a third of the global greenhouse gas (GHG) emissions in 2022, placing the sector as both a contributor to global warming and a critical sector for adaptation (FAO, n.d.).

In the coming years, one of the greatest challenges facing the agricultural sector will consist in feeding and providing adequate nutritious food to a growing

population while reducing GHG emissions, adapting to climate change, and fostering a fair transition to climate-resilient agriculture systems. With roughly 80% of the world population living in net food-importing countries or relying on imports to meet at least some of its nutrition needs, international trade and trade policies will play a critical role in this equation. Trade is also likely to play a key adaptation role to offset imbalances between supply and demand resulting from climate-induced production shortfalls. More generally, trade and trade-related policies will be essential to strengthening developing countries' mitigation efforts as well as their ability to cope with, and recover from, climate change.

This briefing note looks at the future implications of the climate crisis for agriculture, trade, and sustainable development and highlights some of the key implications for developing countries. It reviews existing agricultural market projections in light of the likely impact of climate change on agricultural production, prices, and food insecurity. It also provides an overview of the GHG emissions associated with the sector and their projected evolution over time. Based on these considerations, it highlights key trade and trade policy implications for developing countries and suggests options for international cooperation to align trade policies with climate objectives to ensure a fair transition reflecting broader, long-standing development priorities.

2. Global Production and Trade Outlook

Global trade in food products has grown significantly over the last 30 years to reach over \$2 trillion annually, driven by rising demand for red meat, dairy, and poultry products in developing countries, and by increases in non-food uses of cereals, mostly for biofuels. Since the beginning of the century, the growth in developing countries' agricultural exports and imports has outpaced that of more advanced

economies (UNCTAD, n.d.). Today, developing countries account for over 40% of total world agricultural trade. With demand growing faster than domestic supply in these countries, import penetration—i.e. the share of imports in global consumption—has also been growing significantly, particularly for products such as wheat, maize, rice, soybeans, vegetable oil or meat (IFPRI, 2022).

Over the next decade, demand in emerging economies will continue to drive global market development. According to the OECD-FAO Agricultural Outlook 2024–2033, total consumption is projected to reach 20.6 million terra calories in 2033 (OECD & FAO, 2024). Nearly 94% of this increase should occur in middle- and low-income countries driven by growing and wealthier urban populations, with South and Southeast Asia expected to account for about 40%. Diets in middle-income developing countries are expected to shift towards higher-value foods, including more fruits and vegetables, processed foods, and animal-source foods. By contrast, income constraints in low-income countries are likely to slow the transition to more nutrient- and protein-rich diets based on animal products and fruits and vegetables, leading to a continuing heavy reliance on staples (OECD & FAO, 2024).

Projections show that Latin America and the Caribbean, North America, Europe, and Central Asia will reinforce their positions as major net exporters of agricultural commodities. Net imports by Asia and Africa will continue to expand as rising demand outpaces growth in production (OECD & FAO, 2024). While volumes of commodities traded globally are expected to grow further between net exporting and net importing regions, the traded share of production will remain stable with approximately 23% of all calories crossing borders before being consumed. However, as illustrated in Table 1, this average hides significant variations across commodities.

Table 1. Exports of Selected Commodities as a Percentage of Production (2011–2033)

	2011-13	2021-23	2033
Roots and tubers	5.4	7.4	7.3
Rice	7.8	9.4	8.2
Poultry	12	11.4	10.5
Maize	11.7	15	15.5
Beef	15.5	18.3	17.9
Wheat	21.7	24.6	25.3
Sugar	36.4	35.9	42.6
Cotton	41.6	37.2	35.3
Vegetable oils	34.3	37.5	38
Soybeans	38.4	43.6	41.7

Source: Author's elaboration based on OECD and FAO (2024).

In this context, a challenge relates to the relatively lower level of internationalization of certain key staple foods such as roots and tubers, rice, and maize. The fact that most of this staple food is used domestically results in fairly thin international markets, with a large number of importing countries depending on a small number of exporters to meet their domestic needs. This can expose net food-importing countries and least developed countries (LDCs) to food insecurity risks, making them particularly vulnerable to external shocks

as illustrated by the food and energy price crises associated with the Covid-19 pandemic, the conflict in Ukraine, or recent trade disruptions in the Red Sea and the Panama Canal. These interdependencies highlight the importance of well-functioning markets and the need for collective action to ensure sustainable and resilient food systems allowing access to safe and nutritious food, while supporting income generation across agricultural industries.

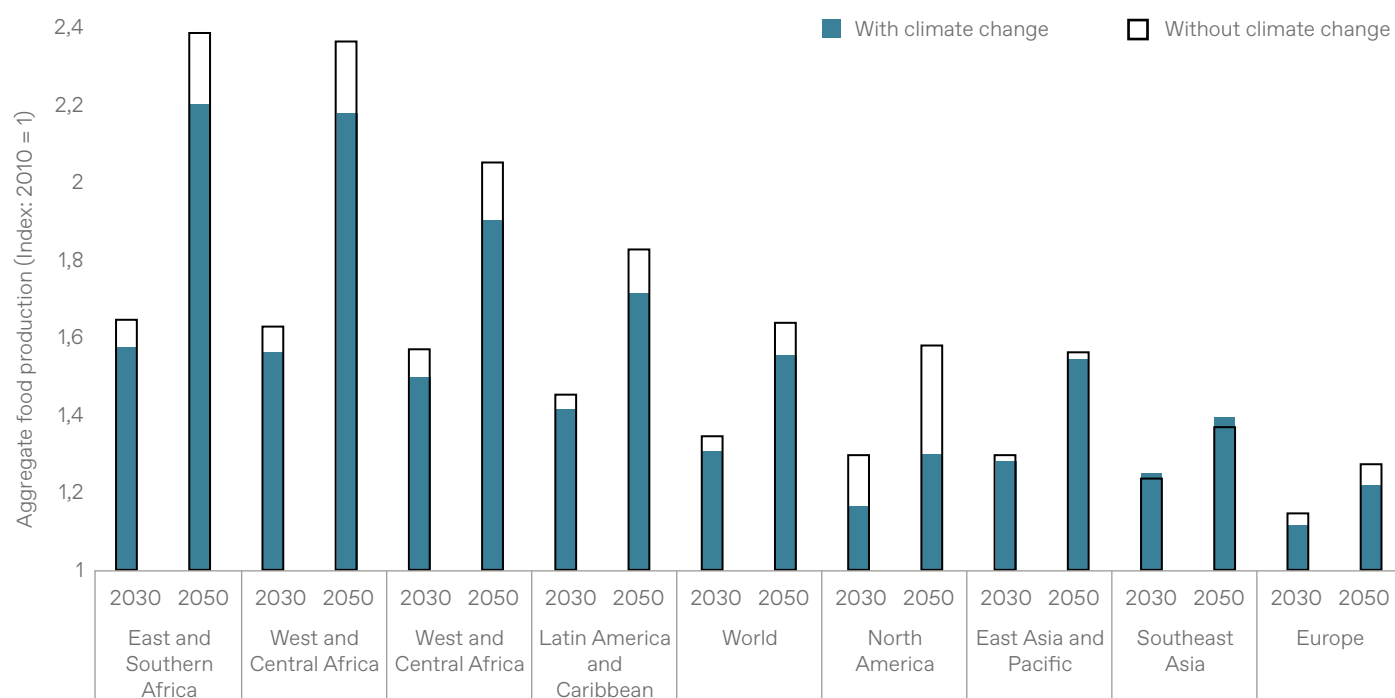
3. Impact of Climate Change on Agricultural Production and Trade

The physical impacts of climate change—such as increasing temperatures, changing precipitation patterns, and greater frequency of extreme weather events like droughts, floods, extreme heat, and cyclones—are already affecting production, disrupting food supply chains, and displacing communities. Over the coming decades, these impacts will continue to alter crop yields and productivity, reducing the effectiveness of synthetic inputs and accelerating the damage caused by crop pests and soil erosion (The Nature Conservancy, 2024). Declining yields and fertility loss could in turn lead to increased clearing of land for food production, causing the loss of wildlife habitat and biodiversity, while also necessitating increased application of fertilizers and pesticides to maintain productivity, with knock-on effects for surrounding

ecosystems. Such impacts tend to hurt developing countries the most, particularly small island developing states and LDCs.

While the scope and magnitude of these effects depend on different climatic and agro-ecological conditions, most models predict that regions in the high latitudes may see increases in production but anticipate major disruptions in lower latitudes, particularly in Africa and South Asia. Figure 1 shows regional food projections by the International Food Policy Research Institute's (IFPRI) IMPACT model for 2030 and 2050 under a scenario that includes the impacts of climate change and a “baseline” scenario that assumes no climate change.¹

Figure 1. Aggregate Food Production Projections for 2030 and 2050



Source: IFPRI (2022).

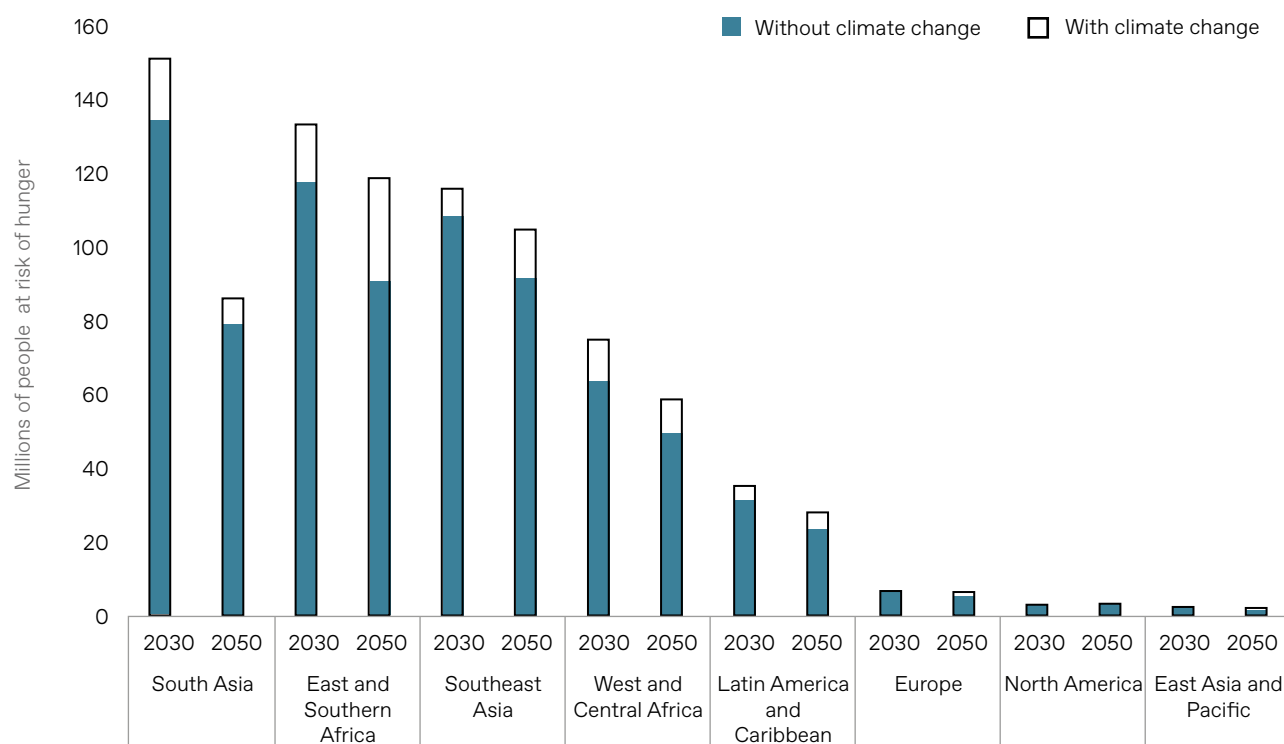
1. IFPRI's IMPACT framework is an integrated system of models that links information from climate models, crop simulation models, and water models with a core global, partial equilibrium, multimarket model focused on the agricultural sector. The economic model simulates national and global markets of agricultural production, demand, and trade associated with 62 agricultural commodities across 158 countries (IFPRI, n.d.).

Overall, IFPRI anticipates a 60% growth in global food production over 2010 levels by 2050 but estimates that food production will be 8 percentage points less than would be the case without climate change, with particularly strong differences in Africa, South Asia, and North America. World prices show increasing trends for most commodity groups. Prices of cereals, fruits and vegetables, and other crops are each projected to increase by over 20% by 2050 compared to 2020 levels. Oils and sugars are projected to be 7% higher, with animal product prices beginning to decline after a peak in 2035. Roots and tubers have the highest projected price increase of 37% above 2020 prices (Rosegrant et al., 2024). Small-scale farmers—who produce more than 70% of the food consumed by people in Asia and sub-Saharan Africa—will be the most vulnerable to climate change and the resulting volatility of commodity prices. Overall, IFPRI projects that nearly 500 million people will remain at risk of hunger by 2050 (see Figure 2). Globally, about 70 million more people will be at risk of hunger because of climate change, including more than 28 million in East and Southern Africa. Thus, beyond its direct

impacts on agricultural production, climate change will create cascading effects on livelihoods and sustainability through interconnections among economic, environmental, social, and political spheres (IFPRI, 2022).

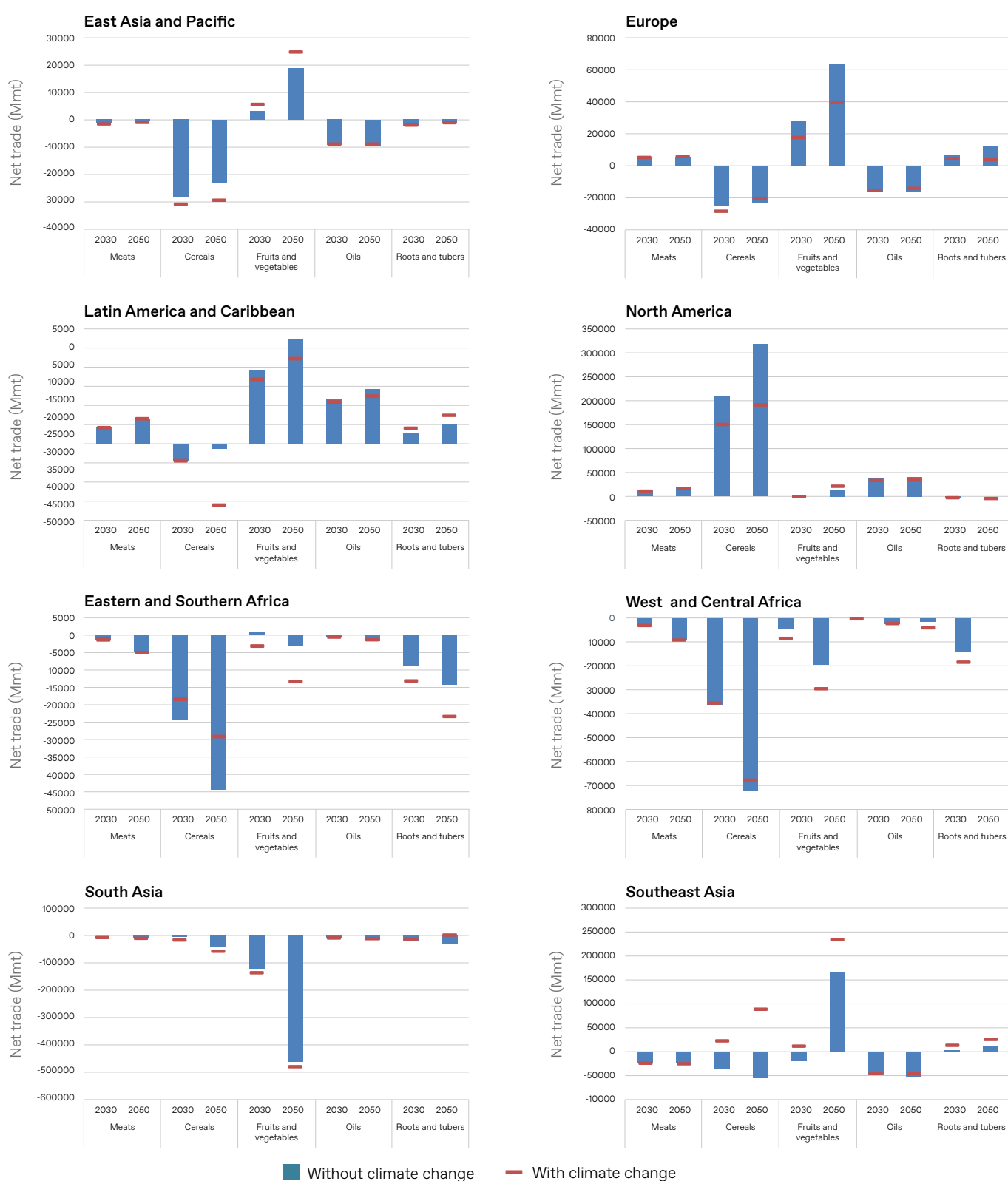
Climate induced changes in production and prices will in turn affect the geography and composition of global agricultural trade flows. While the impacts are likely to be region and product specific, climate shocks will tend to limit the ability of affected countries to export food to generate income and employment while forcing them to rely more heavily on imports to meet domestic food and nutrition needs. To illustrate this point, Figure 3 shows differences in net trade projections for various regions and food products by 2030 and 2050 when comparing scenarios with and without climate change. As the effects of climate change alter yields and productivity, well-functioning international agricultural commodity markets will remain critical to address imbalances between supply and demand and also mitigate the impacts of localised shocks such as crop failures or extreme weather events.

Figure 2. Estimates of Number of People at Risk of Hunger for 2030 and 2050



Source: IFPRI (2022).

Figure 3. Net Agriculture Trade Projections for 2030 and 2050 By Region



Note: Net trade is shown in million metric tonnes (Mmt). It includes negative and positive numbers indicating that a region is a net importer or exporter of food. Projections for 2030 and 2050 assume changes in population and income as reflected in the Intergovernmental Panel on Climate Change (IPCC) shared socioeconomic pathway 2. Climate change impacts are simulated using the IPCC's representative concentration pathway 8.5 and the HadGEM general circulation model (IPCC, 2023).

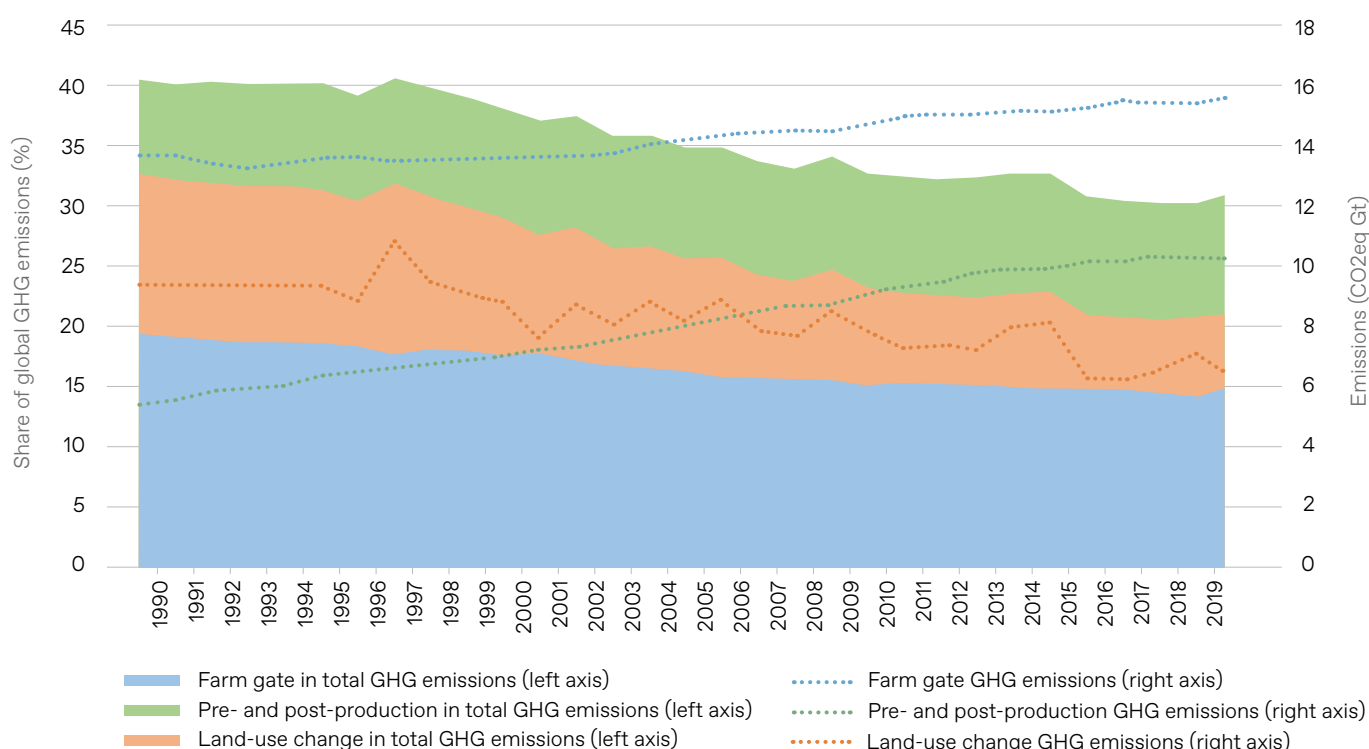
Source: IFPRI (2022).

4. Greenhouse Gas Emissions From the Agricultural Sector

The agricultural sector is not only affected by climate change, it is also a major source of global GHG emissions from different gases, usually expressed as their carbon dioxide equivalents (CO₂eq). These include emissions of carbon dioxide (CO₂), emanating for example from forest conversion, methane (CH₄), coming mostly from ruminant livestock and rice production, and nitrous oxide (N₂O), predominantly associated with fertilizer use. According to FAO (n.d.) data, on-farm emissions were 7.8 gigatonnes (Gt) CO₂eq in 2022 (14.3% of global anthropogenic emissions) while agricultural land-use change accounted for another 3 Gt CO₂eq (5.6% of global emissions). Finally, during the same year, pre- and post-production emissions generated by food manufacturing, retail, household consumption, and food disposal represented 5.3 Gt CO₂eq, bringing the total share of emissions from the entire agri-food system to 29.7% of global GHG emissions.

Figure 4 shows the evolution of these emissions since 1990 both in absolute terms (right axis) and as a share of global emissions (left axis). Overall, the share of on-farm and land-use change emissions has consistently declined from more than 32% in 1990 to around 20% in 2022. This was mainly driven by a decline in absolute terms of land-use change emissions from 4.6 to 3 Gt CO₂eq. While on-farm emissions experienced a slight increase from 6.8 to 7.8 Gt CO₂eq, steady declines in emission intensity resulting from increases in crop and livestock production efficiency explain the declining share of on-farm emissions over the last three decades, even as production continued to increase. By contrast, emissions associated with pre- and post-production stages saw a constant increase both in absolute and relative terms, rising from 7.7% of global emissions in 1990 to nearly 10% in 2022.

Figure 4. Evolution of GHG Emissions From the Agri-Food Systems (1990–2022)



Source: Author's elaboration based on FAO (n.d.).

A further breakdown of GHG emissions from the agri-food system highlights the relative importance of different production and process activities (see Figure 5). In 2022, the most important contributors to global agricultural emissions were CO₂ emissions from net forest conversion (2.9 Gt CO₂eq) and CH₄ emissions from ruminant livestock (2.9 Gt CO₂eq). These two activities represent

53.6% of on-farm and land-use change emissions and more than a third of all emissions from the agri-food sector. Other important activities in terms of GHG emissions in 2022 were CO₂ emissions from agri-food waste disposal and household consumption, CH₄ emissions from livestock manure, and on-farm energy use and the draining of organic soils.

Figure 5. Composition of GHG Emissions From the Agri-Food Systems (2022)



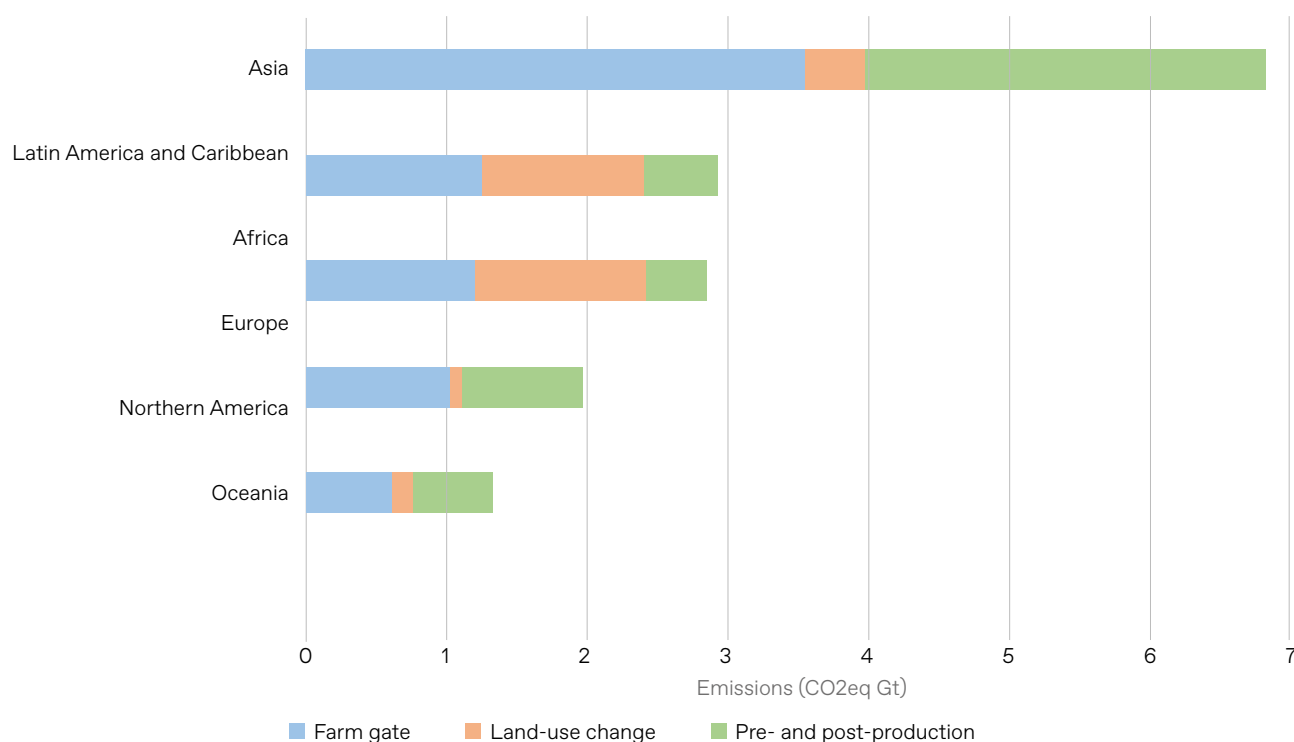
Source: Author's elaboration based on FAO (n.d.).

However, these highly aggregated data and indicators hide significant variations in GHG emissions across different regions, production methods, or agro-ecological conditions. Figure 6 shows, for example, that emissions from land-use change in 2022 accounted for a much larger proportion of total emissions in Africa and Latin America and the Caribbean compared to Asia, Europe, or Northern America, while pre- and post-production emissions were proportionally much smaller. Similarly, aggregate figures hide significant differences in emission intensities—i.e. CO₂eq emissions by kilo of production—across agricultural systems (e.g. rain fed or irrigated) or farm management (e.g. traditional, mixed, or modern agriculture). Improvements in production technologies, for example, largely contribute to reducing GHG emission intensities by more effectively targeting fertilizers, pesticides, or energy and water use. Higher yields in turn lead to lower GHG emissions per unit of product. Figure 7 illustrates this reality by comparing average on-farm emission intensities of cattle and rice production

across different regions and categories of countries such as LDCs, small island developing states, or low-income food deficit countries.

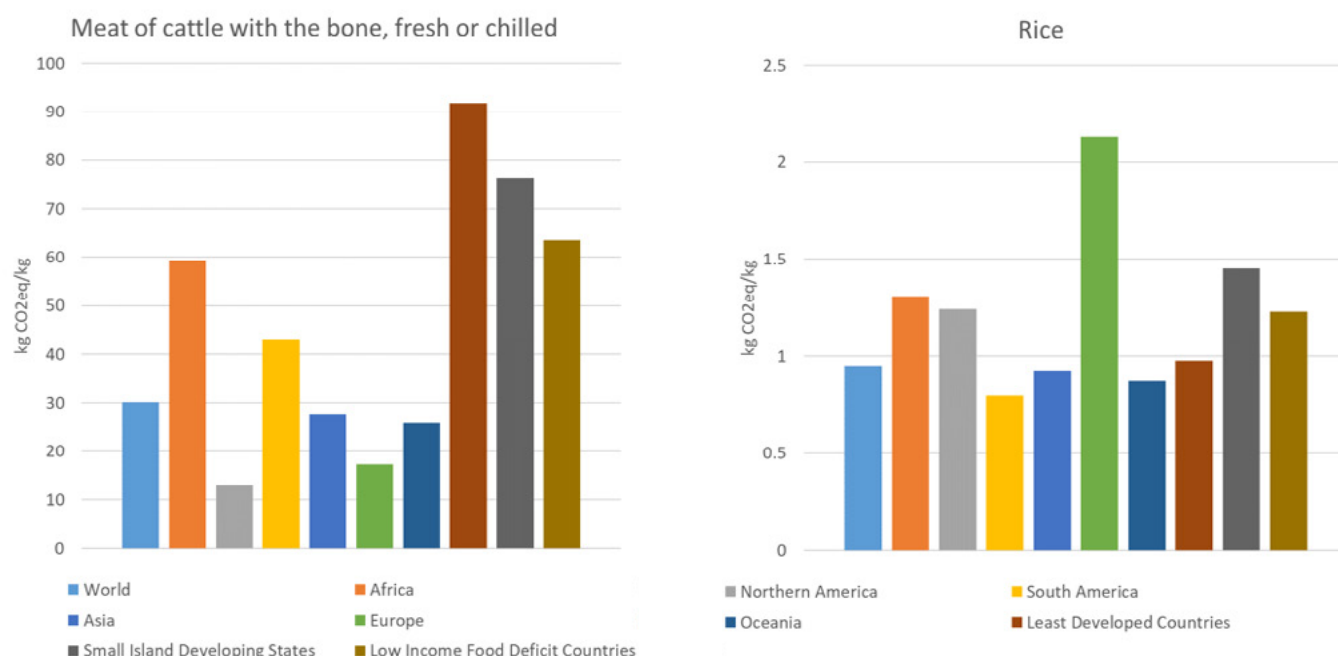
Over the coming decade, the carbon intensity of agricultural production is projected to fall as direct agricultural GHG emissions grow more slowly than agricultural production. Growth in crop production is projected to be driven primarily by productivity increases on existing land, rather than an expansion of the cultivated area. Similarly, a significant proportion of the growth in livestock and fish production is also expected to result from productivity improvements, although herd expansions will also contribute to production growth (OECD & FAO, 2024). In spite of this relative decoupling, growing agricultural production will nonetheless lead to a 5% absolute increase in direct GHG emissions from agriculture and significant productivity gaps are projected to persist, challenging farm incomes and food security and increasing countries' dependence on food imports.

Figure 6. GHG Emissions From the Agri-Food Systems By Region (2022)



Source: Author's elaboration based on FAO (n.d.)

Figure 7. Farm Gate GHG Emission Intensity By Region (2022)



Source: Author's elaboration based on FAO (n.d.)

5. Trade Policy Implications

Governments have a wide range of trade-related policy tools at their disposal to build resilience, adapt to the impacts of climate change, or reduce GHG emissions from the agricultural sector. These include border measures (e.g. tariffs, licenses, quantitative restrictions on imports or exports), regulatory measures (e.g. standards, labelling schemes, regulations, conformity assessment procedures, government procurement), and economic incentives (e.g. internal taxes, fees and charges, subsidies, intellectual property rights) designed either to encourage climate-friendly agricultural production and trade or discourage unsustainable practices (Bellmann, 2022).

Faced with the pressing need to act on mitigation, governments are already implementing or considering a variety of trade-related climate measures and

policies aimed at reducing GHG emissions from the agricultural sector. A review of World Trade Organization (WTO) notifications of trade measures implemented for climate change reasons in the agricultural sector shows that nearly 250 measures have been implemented by WTO members between 2009 and 2022, mostly in the form of subsidies but also technical regulations and standards (WTO, n.d.). In recent years, tensions have focused on measures targeting more specifically imports as illustrated by the controversy around the European Union's deforestation regulation or proposals for mirror clauses. While existing or planned border carbon adjustment mechanisms in the European Union, United Kingdom, or Australia do not currently cover agricultural products besides fertilizers, this may change in the future as the scope of such schemes evolves and concerns about carbon leakage grow.

Finally, a number of private sector initiatives and international organizations are working to improve the sustainability of global supply chains, for example, through voluntary standards and traceability and transparency requirements.

While these environmental efforts can present a range of opportunities for business, including in developing countries, there are growing concerns that the fragmented nature of trade-related climate measures and the cost of complying with a myriad of new requirements risk marginalizing further developing countries. The need for approaches that are fair, and that reflect broader, long-standing development priorities and concerns, is especially high in countries facing significant difficulties in meeting new climate-related requirements, lacking the fiscal space and resources to support large-scale economic transformation and affordable access to relevant technologies or climate financing aligned with the Paris Agreement goals.

Meanwhile, as developing countries respond to these new requirements affecting their exports, they simultaneously need to adapt their productive sector to the disastrous effects of climate change, help producers and communities adapt to the new conditions brought on by climate change, and build a more climate-resilient agricultural sector. In practice, this calls for significant investment in the sector to increase productivity across the supply chain, including through new technologies, crop varieties, inputs, and agricultural equipment and smart agricultural practices adapted to a changing

climate, and also through enhanced processing and marketing facilities or production diversification. It also implies building regional and domestic supply chains and associated infrastructure (e.g. roads, storage capacity, distribution networks, and markets) as well as reducing time delays in transportation and transit formalities, including the simplification and harmonization of cross-border regulations. On the demand side, for many developing countries, particularly low-income food-deficit countries, securing continued availability and access to affordable food in the face of external shocks and increased price volatility will be equally important. This should happen both through imports and the provision of food assistance, ideally through cash transfers to avoid trade distortions or through local or regional food procurement in case of in-kind food assistance.

Trade-related mitigation and adaptation measures can be implemented nationally on an autonomous basis, including through nationally determined contributions (UNCTAD, 2023). These measures can range from payments for environmental purposes or mandatory environmental requirements to removing tariff and non-tariff measures on environmentally preferable products. To the extent that they are designed as good faith environmental policies and do not discriminate arbitrarily between countries where the same conditions prevail, they will most probably not violate existing WTO rules. The effectiveness of these measures will increase significantly, however, if they are pursued collectively and applied consistently among a range of countries.

6. The Case for International Cooperation on Trade-Related Climate Measures

The imperative to act both on mitigation and adaptation in agriculture has been widely recognized at the international level. At the 2022 United Nations Climate Change Conference (COP27) in Egypt, the parties adopted the “Sharm el-Sheikh joint work on

implementation of climate action on agriculture and food security.” This four-year joint work includes implementation of the outcomes of the “Koronivia joint work on agriculture” and previous activities addressing issues related to agriculture. With a

slightly stronger emphasis on trade, the Leaders' Declaration on Forests and Land signed by 141 countries at COP26 in Glasgow in 2021 pledged to facilitate trade and development policies that do not drive deforestation or land degradation. Under the Forests, Agriculture and Commodity Trade (FACT) Dialogue, 28 countries—including key global exporters and importers of agricultural commodities—are already cooperating on trade in forest and agricultural commodities. Similarly, ongoing work at the OECD, UN Environment Programme (UNEP), and the FAO is increasingly focusing on the sustainability dimension of the sector.

Acknowledging this reality, several countries have emphasized the need to address collectively the sustainability dimension of agriculture in the WTO. Discussions have already started in different regular WTO bodies and committees, including the Committee on Trade and Environment as well as ongoing negotiations in the Special Session of the Committee on Agriculture. The environmental dimension of agricultural subsidies has also been addressed under the member-led Trade and Environmental Sustainability Structured Discussion (TESSD), launched in November 2020. More recently, members agreed to initiate a structured dialogue on sustainable agriculture based on a proposal by Brazil, starting with a dedicated retreat in early 2025. As growing international tensions and increased fragmentation threaten progress to address the climate crisis and development prospects, there is an urgent need for a comprehensive multilateral agenda for cooperation on trade and climate. Such an agenda could be structured around the following objectives.

Managing and Reducing Trade Tensions

While harmonizing existing trade-related climate measures at the global level is likely to remain elusive, international cooperation can contribute to reducing fragmentation and differences in approaches in the design and implementation of those measures. This would include ensuring that environmental

regulations, due diligence requirements, standards, or agriculture-related labelling schemes are applied in a way that ensures interoperability across countries, minimizes trade frictions, and takes into account broader sustainable development imperatives. In particular, there is scope for defining international guidance reflecting a shared understanding of good practices that should inform the design and implementation of trade-related climate measures to ensure they achieve their legitimate objectives while minimizing trade frictions and also take into account equity and development concerns. In the short term, these efforts could significantly contribute to reducing trade tensions and avoiding conflicts in a pre-emptive manner.

Reforming Environmentally Harmful Agricultural Subsidies

Government subsidies to agriculture are a critical topic for attention given their influence on international production and consumption patterns and their impacts on the environment. Out of the almost \$540 billion spent annually on global support to producers, the FAO, UNDP, and UNEP (2021) estimate that two-thirds can be considered price distorting and harmful to the environment. A significant part of agricultural support relies on policy instruments such as output or input subsidies that are environmentally harmful and generate increased GHG emissions (Ash & Cox, 2022). The Kunming-Montreal Global Biodiversity Framework, adopted at the 2022 United Nations Biodiversity Conference, calls for action to address subsidies harmful to biodiversity, in a “proportionate, just, fair, effective and equitable way.” While eliminating trade and production distorting agricultural subsidies is highly unlikely, and if not offset by less distortionary forms of support could have a negative impact on nutrition, repurposing agricultural support towards development and adoption of climate-smart agricultural practices would help contribute to global climate goals of sustainability, resilience, and emissions reduction.²

2. If the reduction of trade and production distorting agricultural subsidies is not offset by less distortionary forms of support, this could have a negative impact on nutrition (Laborde et al., 2021).

Facilitating Access, Diffusion, and Uptake of Climate-Related Goods, Services, and Technologies

Cooperation on tariffs, non-tariff measures, and support measures, including trade and investment facilitation measures, can play a critical role in fostering the access, diffusion, and uptake of climate-related goods, services, and technologies. These may be related to adaptation and resilience while increasing productivity, including new crop varieties that can better withstand climate shocks and improve yields, or water management and conservation technologies such as drip irrigation and solar power pumps. They may also be related to climate mitigation such as improved cold chain technologies powered by solar energy. Similarly, continued technological progress in the energy and transport sectors can reduce fossil fuel use and emissions across food systems, including in processing, transport, cold storage, and waste recycling where emissions are currently increasing. Beyond a traditional market access discussion for which there is limited appetite, such cooperation could be built around public-private partnerships involving a range of measures such as government procurement, regulatory cooperation, investment facilitation, and also technical assistance, financing, and technology cooperation.

Disciplining Export Restrictions and Prohibitions

Most developing countries rely at least partially on imports to ensure their food security and are therefore vulnerable to the impact of external shocks and excessive price volatility. As seen during the price spikes of 2007–08 and 2010–11 and more recently during the Covid-19 pandemic, countries sometimes try to buffer the impact of global price shocks by restricting exports to avoid shortages and limit price increases on the domestic market. However, such export restrictions exacerbate price volatility by limiting world supply, which then encourages other exporting countries to follow suit with their own

restrictions (Anderson et al., 2014). With production volatility likely to increase because of climate change, countries will be more likely to impose export restrictions. In practice, however, unlike the rules applicable to imports, WTO disciplines on export restrictions are very limited. In the coming years this will constitute an area where further rules may be required to avoid supply chain disruptions and limit excessive price volatility threatening access to affordable food in developing countries.

Cooperation on Maintaining Global Food Security Stocks

Maintaining large physical food stocks in excess of modest levels strictly for emergency use is beyond the financial capacity of most developing countries. Having an adequate level of physical stocks may however not be necessary for each individual country as long as global stocks are at adequate levels and can be released in times of critical shortages or high and volatile prices. This can take the form of food aid but also imports below the market price. In this area, it will be critical to ensure that WTO disciplines on export competition do not prevent such practice because they would constitute an export subsidy. In cases of food shortages or high and excessively volatile prices it may therefore be important to clarify existing disciplines—and, if needed, envisage appropriate flexibilities—under the WTO's Nairobi decision to eliminate agricultural export subsidies or ongoing discussions on public stockholding to allow for exports from acquired stocks to be sold below the market price when requested by some developing countries for domestic consumption. Alternatively, international organizations such as the World Food Programme could be employed to oversee the logistics of transferring supplies to countries in need, while the Agricultural Market Information System (AMIS) at the FAO could maintain up-to-date information on global food security stocks in the context of its ongoing monitoring of overall food stocks globally.

International Food Assistance and Food Import Financing Facilities

For several low-income food-deficit countries, food assistance remains a critical tool to meet their food and nutrition needs. Over time there have been important improvements in the international food aid system in terms of assessing more precisely the specific needs of recipient countries and responding to them with more flexibility. However, as surplus stocks in donor countries have declined, the levels of food aid have gone down considerably. While this has coincided with an increasing share of food assistance being provided in cash, which allows donors to respond much more effectively to emergency needs,

the combined effect of declining volumes of food aid and growing emergency situations worldwide have resulted in food aid being increasingly limited to emergency operations. Recently, there have been discussions to revive the FAO idea of a Food Import Financing Facility from which low-income food-deficit countries could borrow short-term loans in the event of soaring food import bills. A multilateral instrument of this type would significantly help secure affordable food imports. Similarly, creating a credit guarantee facility, ideally within regional development banks, could help provide the necessary guarantees for the public sector in financially restrained poor countries to enter into futures and options contracts for the importation of basic foodstuffs.

7. Conclusion

Several elements of the agenda for international trade cooperation outlined in the previous section can be pursued in existing multilateral fora and processes such as the WTO, including in the context of member-led initiatives on sustainable agriculture, but also in relevant UN agencies such as the United Nations Framework Convention on Climate Change (UNFCCC), UNCTAD, FAO, or specialized agencies such as the World Food Programme. Similarly, organizations focused on economic cooperation such as the OECD or regional economic commissions provide a relevant venue to ensure transparency, consistency, and alignment in the design and implementation of trade-related climate measures. At the political level, cooperation

on trade can be prompted in the context of initiatives such as the coalition of trade ministers on climate. At the sectoral level, there is also a role for issue-specific initiatives through public-private partnerships involving a broader set of stakeholders beyond traditional cooperative arrangements focused primarily on governments and international organizations. Regardless of where such discussion takes place, there is an urgent need for an open and inclusive dialogue on trade cooperation. Importantly, these discussions should take a comprehensive approach integrating not only concerns around environmental aspects but also critical public policy objectives around equity and sustainable development considerations.

References

- Anderson, K., Ivanic, M., & Martin, W. (2013). *Food price spikes, price insulation and poverty*. Working Paper 19530. National Bureau of Economic Research: Cambridge, MA. <https://www.nber.org/papers/w19530>
- Ash, K. & Cox, A. (2022). *Desktop analysis of agricultural subsidies and environmental impacts*. Institute for International Trade, The University of Adelaide. <https://iit.adelaide.edu.au/news/list/2022/09/12/desktop-analysis-of-agricultural-subsidies-and-environmental-impacts>
- Bellmann, C. (2022). *Trade and sustainability in the agriculture sector: Options for multilateral trade cooperation*. Forum on Trade, Environment, & the SDGs (TESS). <https://tessforum.org/latest/trade-and-sustainability-in-the-agricultural-sector-options-for-multilateral-trade-cooperation>
- Food and Agriculture Organization of the United Nations (FAO). (n.d.) *FAOSTAT – Emissions totals*. <https://www.fao.org/faostat/en/#data/GT>
- Food and Agriculture Organization of the United Nations (FAO). (2022). *The State of the World's Forests 2022. Forest pathways for green recovery and building inclusive, resilient and sustainable economies*. Rome, FAO. <https://doi.org/10.4060/cb9360en>
- Food and Agriculture Organization of the United Nations (FAO), United Nations Development Programme (UNDP), & United Nations Environment Programme (UNEP). (2021). *A multi-billion-dollar opportunity – Repurposing agricultural support to transform food systems*. FAP: Rome. <https://doi.org/10.4060/cb6562en>
- Intergovernmental Panel on Climate Change (IPCC). 2023: *Climate Change 2023: Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC: Geneva. <https://www.ipcc.ch/assessment-report/ar6/>
- International Food Policy Research Institute (IFPRI). (n.d.). *Foresight modeling with IFPRI's IMPACT model*. <https://www.ifpri.org/project/ifpri-impact-model/>
- International Food Policy Research Institute (IFPRI). (2022). *2022 Global food policy report: Climate change and food systems*. International Food Policy Research Institute (IFPRI): Washington, DC. <https://doi.org/10.2499/9780896294257>
- Laborde, D., Mamun, A., Martin, W., Piñeiro, V., & Vos, R. (2021). Agricultural subsidies and global greenhouse gas emissions. *Nature Communications* 12: 2601. <https://doi.org/10.1038/s41467-021-22703-1>
- Organisation for Economic Co-operation and Development (OECD) & Food and Agriculture Organization of the United Nations (FAO). (2024). *OECD-FAO Agricultural Outlook 2024-2033*. OECD Publishing: Paris/FAO: Rome. <https://doi.org/10.1787/4c5d2cfb-en>
- Rosegrant, M., Sulser, T., Dunstun, S, et al. (2024). Food and nutrition security under changing climate and socioeconomic conditions. *Global Food Security*, Volume 41. <https://doi.org/10.1016/j.gfs.2024.100755>
- The Nature Conservancy. (2024). *Growing threats: How climate change will exacerbate agriculture's environmental impacts*. <https://www.nature.org/en-us/newsroom/growing-threats-how-climate-change-will-exacerbate-environmental-impacts-agriculture/>

UN Trade and Development (UNCTAD). (n.d.). *UNCTADstat data centre*. <https://unctadstat.unctad.org/datacentre/>

UN Trade and Development (UNCTAD). (2023). *Mapping trade-related measures in the nationally determined contributions: Technical note*. UNCTAD: Geneva <https://unctad.org/publication/mapping-trade-related-measures-nationally-determined-contributions>

World Trade Organization (WTO). (n.d). *Environmental Database*. <https://edb.wto.org/>

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