



Issue 22 January 30, 2025

NEWSLETTER

Smart & Net-Zero Project

Overview

The Smart Net-Zero (SNZ) project team under the Food and Fertilizer Technology Center (FFTC) for the Asian and Pacific Region regularly collects and shares information related to sustainable agrifood systems and climate-smart agriculture, including research, news, policy, data and event updates around the world on the project website.

Smallholders, who produce a third of global food, have faced \$3.8 trillion in disaster-related losses over the past 30 years, while receiving less than 1% of climate finance. Meanwhile, agrifood systems contribute nearly a third of global GHG emissions. Recent COP discussions underscore the critical role of agrifood systems in climate action, emphasizing systematic approaches to mitigate emissions, balance trade-offs, and promote synergies. This issue highlights diversified, integrated, and climate-smart practices aligned with global goals through nexus thinking. COP29, known as the "Finance COP," advocated for a just transition for smallholders, emphasizing accessible finance and farmer-led solutions. Latest reports from OECD, FAO, and IPBES echo the urgency of sustainable reforms, systemic changes, and financial and technological support. Tools like the EU Food System Dashboard and initiatives from the Alliance of Bioversity International and CIAT offer valuable resources to advance these efforts.

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RESEARCH

01 THEME: GHG emission reduction

Greenhouse gas mitigation requires caution

June 6, 2024 | Science | Source |

consume CH₄ to produce CO₂.

Introduction: Methane (CH₄) and nitrous oxide (N₂O), greenhouse gases (GHGs) far more potent than CO₂, are emitted via microbial activity in diverse ecosystems. Biologists from the University of Alberta (Canada) and the University of Washington (USA) investigate the trade-offs and unintended consequences of CH₄-N₂O mitigation strategies, emphasizing their complex interplay and the need for integrated approaches.

Key findings: Methanotrophs interact with nitrogen cycles, sometimes increasing N₂O emissions in low-oxygen environments, while nitrification inhibitors can suppress methanotrophic activity, inadvertently raising CH₄ levels. Promising biology-based CH₄ mitigation methods, such as biofilters and compost biocovers, can reduce CH₄ emissions but may increase N₂O levels, underscoring the need for careful monitoring of nitrogen interactions. Critical zones, including rice paddies and landfills, illustrate the complexity of CH₄-N₂O trade-offs. Closed bioreactor systems show promise for controlling emissions and producing sustainable bioproducts, though scalability and economic feasibility remain significant challenges. To maximize climate benefits, effective mitigation strategies must integrate comprehensive monitoring, nutrient management, and innovative amendments. Tailored interventions across diverse environmental contexts are crucial for achieving sustainable outcomes globally.



methanotrophs produce N_2O or N_2 from using NO_3^-

(and NO_2^-).

Figure | Microbial processes controlling methane and nitrous oxide production. Nitrification inhibitors (NI) can block both nitrification and aerobic methanotrophy, preventing methane (CH₄) consumption and nitrous oxide (N₂O) production. Methanobactin (Mb) blocks N₂O consumption, potentially increasing N₂O emissions.

02 THEME: GHG emission reduction; Others

Conventional agriculture increases global warming while decreasing system sustainability

November 4, 2024 | Nature Climate Change | Source |

Introduction: The research, led by scientists from South China Agricultural University (China) with a global team from Egypt, Russia, and Germany, examines the impacts of conventional agriculture on greenhouse gas (GHG) emissions and system sustainability from 1961 to 2020. Using a cradle-to-gate life cycle assessment, the study evaluates global warming potential (GWP) and sustainability index (SI) for major grain crops, linking intensive practices—including synthetic fertilizers, irrigation, and mechanization—to increased emissions and decreased sustainability.

Key findings: Since 1961, conventional agriculture has increased GWP eightfold while decreasing SI threefold, primarily due to synthetic fertilizers, irrigation, and tillage, which together contribute 90% of emissions. Rice production exhibited the highest GWP per grain unit, surpassing maize and wheat. Regional disparities were evident: South Asia recorded high GWP and declining SI due to heavy reliance on fertilizers and irrigation, while Europe maintained higher SI with moderate GWP increases, attributed to efficient resource use. Without mitigation, GWP could triple by 2100, and SI could decline fourfold due to inefficient input usage. However, adopting climate-smart practices, such as renewable energy integration and enhanced input efficiency, could reduce GWP to 2.3 PgCO₂e and quadruple SI. The study emphasizes the urgent need for region-specific sustainable practices to mitigate emissions while balancing food security. Future research should refine life cycle assessments to address spatial variability in soil and climate conditions and develop technologies tailored to regional crop systems to optimize sustainability and reduce emissions.



Figure | LCA of the global warming conventional of agriculture. Values between brackets are the global averages (MgCO₂eMg⁻¹ grain) of the three crops (maize, rice and wheat) in 2020. Values after ± are the standard deviations (n = 187, indicating number of the included countries. The stage (bounded by cradle dashed blue line) includes production, Gate stage (1,163 ± 1,440) packaging and of transportation seeds. fertilizers and pesticides. The gate stage (bordered by dashed orange line) includes farm-gate operations (application of fertilizers, soil emissions, tillage, irrigation and harvesting).

RESEARCH

O3 THEME: Policy incentives, financing, pricing; Others

Joint environmental and social benefits from diversified agriculture

April 4, 2024 | Science | Source |

Introduction: This study, conducted by an interdisciplinary group of scholars from various international agencies, investigates the simultaneous social and environmental benefits of agricultural diversification. Utilizing data from 24 studies across 11 countries and 2,655 farms, the research addresses the impact of five diversification strategies—livestock integration, crop rotation, soil conservation, non-crop plantings, and water management. It aims to fill gaps in understanding how these strategies affect biodiversity, ecosystem services, food security, and human well-being, providing insights into sustainable agriculture's role in mitigating environmental degradation.

Key findings: The study confirms that diversified agriculture improves outcomes more effectively than individual strategies. Key benefits include increased nonagricultural biodiversity and improved food security. Specific combinations, such as livestock diversification and soil conservation, were found to generate significant synergies by simultaneously enhancing biodiversity and food security. The positive effects were particularly strong when multiple strategies were combined, highlighting the interdependence of environmental and social outcomes. Diversification improves sustainability but requires region-specific adaptations and mitigation of labor and cost trade-offs. Policymakers should provide targeted incentives combined with regulations, support multi-strategy approaches, and promote participatory research to address resource disparities and tailor practices to local contexts.



Figure | Effects of agricultural diversification on environmental and social outcomes. (A to G)

Agricultural diversification strategies include livestock diversification, temporal crop diversification, soil conservation, noncrop diversification, and water conservation. Flower diagrams indicate the effects of diversification strategies on three environmental outcome variables (nonagricultural biodiversity, regulating ecosystem services, and reduced environmental externalities) and three social outcome variables (human well-being, food security, and yield). Also shown are the effects of the total number of diversification strategies (up to a total of five) and their associated diversification practices (up to a total of 23, excluding livestock diversification) applied. Effect sizes are measured in units of SD, with the black circle indicating an effect size of 0.0. The size of the flower petals is proportional to the effect size; error bars indicate ± 1 SE. Asterisks indicate statistically significant effects of diversification strategies on outcomes (gray asterisks, P < 0.00119 using Bonferroni correction for multiple comparisons; 42 estimates).

RESEARCH

04 THEME: Policy incentives, financing, pricing

Harness agrifood value chains to help farmers be climate smart: Incentives and structures exist to improve farming practices

November 28, 2024 | Science | Source |

Introduction: At the 2023 COP28, the Emirates Declaration recognized the critical role of agrifood systems in addressing climate change. With over 160 countries signing the Declaration, it underscored opportunities in agricultural value chains (AVCs) to enable farmers to adopt climate-smart practices. This study, conducted by researchers from IFPRI and the World Bank, examines how AVC structures can overcome challenges in technology access, management changes, and financial resources for smallholder farms, particularly in the Global South.



Key findings: AVCs in the Global South, contributing 73% of global agricultural output, are crucial for promoting farm-level climate-smart practices. They employ tools such as resource provision contracts, training, and financial support to enhance productivity and sustainability. Comprising 80–90% of AVC companies, micro, small, and medium enterprises (MSMEs) are pivotal to these efforts but face challenges, including financial constraints, regulatory barriers, and technical limitations, which hinder their ability to scale climate-smart solutions effectively.

Private-sector engagement drives climate-smart innovations in water management, energy efficiency, and resilient farming practices. Collaborative efforts between science and policy, coupled with supportive regulations and investment incentives, are critical to amplifying the impact of AVCs. Future research should address MSME challenges and integrate technological, economic, and social solutions. Case studies on successful MSME initiatives or policy support mechanisms can refine strategies to scale climate-smart agriculture effectively.

RESEARCH

05 THEME: GHG emission reduction; Policy incentives, financing, pricing

Keeping the global consumption within the planetary boundaries

November 13, 2024 | Nature | Source |

Introduction: Researchers from Shandong University (China) and the University of Maryland (USA) investigate the global distribution of environmental footprints across 168 countries, covering 98% of the global population. The study categorizes 201 global consumption groups by expenditure using the environmentally extended multi-regional input-output (EE-MRIO) model. This model estimates direct and indirect environmental impacts of consumption, quantifying six environmental indicators tied to planetary boundary (PB) transgressions, including CO₂ emissions, land-system change, nitrogen fixation, phosphorus fertilizer use, blue-water consumption, and biosphere integrity. By addressing consumption inequality, the research aims to guide sustainable policymaking to restore ecological balance.

Key findings: The study reveals that the top 10% of global consumers are disproportionately responsible for 43% of CO₂ emissions, 23% of land-system changes (HANPP), 26% of nitrogen fixation, and 25% of phosphorus use, alongside significant contributions to blue-water consumption and biosphere degradation. In contrast, the bottom 50% largely remain within planetary boundaries. Key drivers include food production, manufacturing, and services. Wealthier groups rely more on animal-based foods, while poorer groups depend on plant-based diets. Mitigation strategies aimed at reducing overconsumption among the wealthiest 20%, particularly in food and service sectors, could decrease environmental pressure by 25–53%, helping restore ecological balance and biodiversity.

Targeted policies, such as progressive taxation, efficiency improvements, and equitable resource distribution, are essential to curb overconsumption and promote sustainability. However, data gaps and socioeconomic disparities pose challenges for universal implementation. Future research should broaden planetary boundary indicators, improve data tracking, and foster collaboration between governments, industries, and communities to enhance global sustainable practices.

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Figure L The footprints of the six environmental indicators and the shares of each global expenditure decile in the total footprints in 2017. Bar and doughnut pie chart refers to capita the per footprints and the percentage share of each global decile in the total footprints, respectively. The expenditure level of each decile group increases as the colour deepens. The red circle represents the level of per capita boundaries.

RESEARCH

06 THEME: ICT in agrifood sustainability; MRV (measurement, reporting, verification); GHG emission reduction

Context-specific assessments of carbon footprints of the rice value chain: from product labeling to potential mitigation impacts

June 5, 2023 | International Journal of Life Cycle Assessment | Source |

Introduction: The study, led by researchers from the International Rice Research Institute (IRRI), investigates innovative tools for assessing greenhouse gas (GHG) emissions and carbon footprints (C-footprints) in rice production. It introduces a digital information system tailored for tracking and labeling rice C-footprints and evaluates mitigation strategies using context-specific GHG metrics. Addressing rice's significant contribution to agricultural emissions (13–14%), the research supports efforts to align rice production with climate goals.

Key findings: The study presents a framework featuring three tools to assess C-footprints and GHG emissions in rice production. The application *"DISPLAY"* enhances transparency with QR-coded labels, allowing users to customize emission factors based on local practices and technologies. *"CF-Rice"* monitors emissions along the value chain, enabling detailed tracking of GHG outputs at different stages, while *"SECTOR"* evaluates mitigation strategies under various scenarios. Key findings reveal that harvest losses contribute 22% of emissions, higher yields reduce C-footprints but increase fertilizer-related emissions, and mitigation strategies, such as multiple drainage systems, reduce methane emissions. Site-specific nutrient management improves nitrogen efficiency by 30–40%, reduces fertilizer use by 25% without yield loss, and significantly decreases nitrous oxide emissions. Together, these tools advance sustainable rice production with the potential for broader applications, particularly in crops like wheat or maize. Their effectiveness depends on high-quality localized data and coordinated stakeholder collaboration to address challenges in scalability and regional adaptability.



Figure |

Accumulation of GHG emissions and product mass balance along the value chain under baseline conditions (a) alongside the yield-scaled emission (b) and carbon footprint (c); arrows indicate the respective stages when these parameters are calculated.

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01 **THEME:** Policy incentives, financing, pricing

Agriculture at COP29: A Vital Conversation for Climate and Food Security November 20, 2024 | CGIAR Climate Impact Platform |



COP29 in Baku, Azerbaijan, has brought agriculture to the forefront of climate discussions, emphasizing its critical role in building resilience and ensuring food security. Despite supporting over 2.5 billion smallholders, agriculture has often been sidelined in climate debates. This year, the concept of a just transition—helping farmers adapt sustainably without undue burdens—has emerged as a key theme. Over the past 30 years, climateinduced disasters have caused \$3.8 trillion in crop

and livestock losses, disproportionately affecting poor countries.

A recent <u>CGIAR brief</u> outlines a holistic strategy for a just transition, centered on three pillars: advancing climate-smart research, providing financial and technical support to farmers, and ensuring policy coherence by integrating agriculture into National Adaptation Plans (NAPs) and Nationally Determined Contributions (NDCs). Yet, with only 1.7% of global climate finance reaching smallholders, a significant funding gap remains. While the Loss and Damage Fund offers hope, its impact depends on the political will to prioritize agriculture as a central pillar of climate resilience and a vital solution to the climate crisis.

02 THEME: Policy incentives, financing, pricing

COP29 – Transforming Agri-Food Systems

November 20, 2024 | Carbon Action |

COP29's Food, Water, and Agriculture Day highlighted the dual role of agri-food systems in mitigating and adapting to climate change. These systems, responsible for nearly a third of global

greenhouse gas emissions, also face severe climaterelated risks, making resilience and sustainability essential.

FAO analyses revealed significant gaps in Nationally Determined Contributions (NDCs), with only 40% of agricultural emissions addressed and major shortfalls in livestock and pre- and post-production emissions. Denmark's groundbreaking emission tax on livestock sets a precedent for closing these gaps.



New initiatives, such as the <u>Reducing Methane from Organic Waste Declaration</u> and the Baku Harmoniya Climate Initiative for Farmers, were introduced to prioritize methane reduction and empower farmers. However, inadequate climate finance persists, with funding for agri-food systems dropping to 23% of climate-related aid, leaving smallholder farmers—who receive less than 1% of this funding and produce a third of the world's food—especially vulnerable. The Agri-Food Systems Summit underscored the need for innovation, equitable finance, and farmer-led solutions to ensure a just transition toward resilient food systems.

03 THEME: Policy incentives, financing, pricing; ICT in Agrifood Sustainability

Agri-Food Systems Summit Highlights

November 22, 2024 | Carbon Action |

The Agri-Food Systems Summit showcased global efforts to transform agriculture into a sustainable and climate-resilient engine for change. Central to the dialogue was the urgent need for accessible climate finance, particularly smallholder farmers who for remain marginalized in funding allocations. Sessions spotlighted regenerative farming, Al-driven innovations, and partnerships between governments, financial institutions, and the private sector.



The panel "From the Ground Up - Farmer-led Pathways to a Just Transition" emphasized empowering farmers with resources, financial support, and tools to lead equitable and climate-resilient agricultural transitions. In "Financing Climate Action through Agriculture and Food Systems," experts highlighted scaling green bonds, carbon credits, and inclusive investments to derisk and accelerate climate-smart agriculture. The "Agri-Food Innovation - Pioneering Solutions for Climate Action" panel focused on cutting-edge research and collaboration to boost productivity while preserving natural resources and addressing sustainability challenges.

The *Future Food Systems Hackathon* explored practical strategies to foster equity, resilience, and biodiversity, emphasizing transparency, inclusive partnerships, and alignment with climate goals. In the keynote *"Empowering Women to Lead the Agri-Food Revolution,"* speakers advocated for gender-responsive policies and equitable resource access to unlock women's transformative potential in agriculture. The summit concluded with a call for coordinated innovation, finance, and policy to achieve sustainable and resilient food systems for a changing world.

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04 THEME: Policy incentives, financing, pricing; GHG emission reduction

COP29: New FAO Analysis Maps Nationally Determined Contributions, Identifies Opportunities, Gaps, and Risks Related to Agri-food Climate Solutions

December 6, 2024 | FAO |



The FAO's <u>Agrifood Systems in Nationally Determined</u> <u>Contributions: Global Analysis</u> highlights agrifood systems as pivotal to climate action, with 94% of countries prioritizing adaptation and 91% targeting mitigation in their Nationally Determined Contributions (NDCs). However, critical gaps remain.

Food insecurity and biodiversity loss, cited by 88% of NDCs, are major risks, particularly in sub-Saharan Africa.

Only 40% of agriculture-related greenhouse gas (GHG) emissions are addressed, with significant neglect of livestock and supply chain emissions—posing challenges to achieving the Paris Agreement goals. Adaptation plans also lack feasibility and robustness, risking inefficiency amid escalating climate crises.

The financial shortfall is stark: transforming agrifood systems requires \$1.15 trillion annually by 2030, yet current funding averages just \$28.5 billion—one-sixth of the required amount. Bridging this gap demands a 40-fold investment increase. FAO urges alignment of agrifood goals with broader sustainable targets (SDGs) to drive transformational change. With 2025 NDC updates approaching, bold plans and enhanced financing are essential for climate resilience and sustainable development.

05 THEME: Policy incentives, financing, pricing; ICT in Agrifood Sustainability

Scaling Sustainable Rice Farming and Nutrition-Focused Resilience in Asia-Pacific: A COP29 Call to Action

November 18, 2024 | Asian Development Bank (ADB) |

The Asia-Pacific region is tackling the dual challenges of climate resilience and food security, as highlighted during COP29's multistakeholder panel hosted by the Asian Development Bank (ADB). ADB's \$14 billion commitment to food security was paired with a call for transformative innovations and partnerships to foster sustainable, inclusive agricultural systems.

ADB Senior Director Dr. Qingfeng Zhang outlined three priorities: shifting to demand-side nutrition security, advancing smart agriculture and natural resource restoration, and leveraging digital technology for equitable growth. Initiatives like the ADB-CGIAR Clearinghouse aim to integrate tailored technological solutions, addressing fragmentation between research, development, and private sectors.

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Experts also emphasized the role of AI in optimizing farming and the need for nutrition-focused interventions. Programs in Indonesia, led by GAIN (Global Alliance for Improved Nutrition), demonstrated effective alignment of climate goals with nutrition outcomes. The session concluded with a unified call for investments in science and partnerships to build resilient, food-secure systems.



06 **THEME:** Policy incentives, financing, pricing;

Farmers must be front of the line for climate compensation after COP29

November 19, 2024 | World Economic Forum |



COP29 provided a pivotal moment to expand the historic Loss and Damage Fund. Agriculture, the sector hardest hit by climate change, has suffered an estimated \$3.8 trillion in losses over three decades, with low- and middle-income countries (LMICs) disproportionately affected, experiencing agricultural GDP losses of 10-15%.

Disaster-driven crop and livestock losses

severely impact food security, health, and the environment, with LMICs facing significant caloric deficits. Disasters have increased fivefold in the past 50 years, and without urgent action, vulnerable nations risk becoming trapped in cycles of destruction and dependence on food aid. Projections

warn that crop yields, such as rice in Asia, could drop by 50% by century's end, threatening food security amid population growth.

Smallholder farmers, representing 35% of LMIC populations, urgently need financial support for climate-resilient technologies and training. Advancing climate attribution science and monitoring systems can guide targeted aid and adaptation strategies, quantifying climate impacts and informing compensation claims. Investments in tools like CGIAR-led initiatives to address data gaps are essential to improve real-time loss tracking and ensure resources reach those most affected. Experts stress that prioritizing farmers in the Loss and Damage Fund is crucial for equitable climate justice, food security, and sustainable development.

07 **Тнеме:** Policy incentives, financing, pricing

New \$282 Million Program Targets Climate and Environment Action Through Agriculture and Food Systems

December 6, 2024 | <u>ReliefWeb</u> |



The Food and Agriculture Organization of the United Nations (FAO) and the International Fund for Agricultural Development (IFAD) have launched the Food Systems Integrated Program (FSIP), funded by the Global Environment Facility (GEF), with a \$282 million investment and \$1.8 billion in co-financing. Announced at the 16th Conference of the Parties of the United Nations Convention to Combat Desertification (UNCCD COP16) in Riyadh, Saudi Arabia, this initiative aims to transform agrifood

systems across 32 countries to be sustainable, resilient, and inclusive.

Targeting crops, commodities, livestock, and aquaculture, FSIP focuses on mitigating methane emissions, reducing deforestation, and promoting integrated landscape management. The program supports sustainable practices for biodiversity, land restoration, and climate resilience, while enhancing food security and livelihoods. FSIP aligns with commitments under the Kunming-Montreal Global Biodiversity Framework and the Paris Agreement. Building on a decade of GEF-backed initiatives, it introduces global coordination hubs to drive policy, private-sector investment, and innovation. This program underscores growing recognition of agrifood systems' role in combating climate change and biodiversity loss, addressing their underfunding in global climate finance.

08 **THEME:** Others; Policy incentives, financing, pricing

Taiwan Demonstrates Leadership in Biodiversity Conservation at CBD COP16

November 14, 2024 | Central News Agency (CNA) (In Chinese) |



The 16th Conference of the Parties to the Convention on Biological Diversity (CBD COP16) concluded in Colombia, addressing 2030 biodiversity targets, climate-biodiversity synergies, Indigenous rights, and benefit-sharing of genetic resources. Taiwan participated as an NGO observer, sharing innovative conservation practices and fostering international collaboration.

At the International Partnership for the Satoyama Initiative (IPSI) meeting, Taiwan's delegation showcased the Nanzhuang (苗栗南庄) Tribal co-management model, demonstrating achievements in ecosystem services, Indigenous knowledge revitalization, and policy implementation. During the PANORAMA side event, they presented an integrated strategy combining "community forestry," the "Satoyama Initiative," and the "Taiwan Ecological Network (國土生態綠網)," highlighting advances in local governance, biodiversity conservation, and green economy development. At the UNDP Biodiversity Finance Initiative (BIOFIN) event, the team shared approaches on ecological data integration, habitat connectivity, and corporate ESG strategies for equitable conservation outcomes.

COP16's key decisions included establishing a permanent Indigenous issues body and the "Cali Fund" to ensure fair use of genetic resources. Taiwan's updated National Biodiversity Strategy and Action Plan (NBSAP) and Taiwan Ecological Network reflect its commitment to climate adaptation, ecological connectivity, and harmonious coexistence with nature. 09 THEME: Policy incentives, financing, pricing

Blended Finance: A Solution for Climate Change

December 2, 2024 | UDN (United Daily News) (In Chinese) |



At the "Next Steps for Taiwan's Economy" summit, Cathay Financial Holdings President Lee Chang-Keng called for a "Climate Industrial Revolution" to achieve net-zero emissions by 2050. He emphasized that current climate finance is far from sufficient to meet the Paris Agreement's 1.5°C target and needs to increase sixfold by 2030.

Blended finance, which leverages concessional capital from governments, NGOs, and international organizations to attract private investment, was highlighted as a practical solution. Lee pointed to successful applications, such as "Pay-for-Success" models and ecological insurance in wildlife conservation and rainforest protection.

He also cited Taiwan's organic agriculture as an example, where

early concessional funding helped overcome challenges like reduced yields. With strong consumer support, the sector achieved environmental sustainability. While scaling blended finance faces challenges such as standardization and low returns, Lee called for ongoing innovation to replicate successes and accelerate global climate action.

POLICY

POLICY

O1 THEME: Climate-smart agriculture; Sustainable production

OECD- Agricultural Policy Monitoring and Evaluation 2024

OECD | Source | Download |



OECD

Agriculture faces challenges from geopolitical conflicts, climate change, and market pressures, necessitating sustainable policy reforms to enhance productivity and address environmental and social needs. This OECD report-"Agricultural Policy Monitoring and Evaluation 2024" highlights that while agricultural support averaged \$842 billion annually from 2021–2023, it has declined since its 2021 peak. Persistent market distortions and limited investments in research, innovation, and environmental initiatives threaten sustainable productivity growth.

The report emphasizes inequities in support distribution, with China, the United States, India, and the European Union accounting for nearly 80% of total support, while countries like Brazil contribute less despite significant output. Agricultural support relative to producer receipts and

consumer expenditures has declined since 2000, with disparities across countries, as some impose implicit taxes while others reduce public investments.

A transition to environmentally beneficial policies, focused on sustainable farming practices, climate-resilient infrastructure, and research and development (R&D), is essential. Aligning agricultural policies with food security, economic efficiency, and sustainability goals requires innovation, reforming harmful subsidies, and balancing trade-offs. The report calls for a comprehensive approach to achieve these outcomes.

Policy Agenda for Sustainable Productivity Growth

- Set clear objectives for sustainable productivity growth
- Address harmful measures and reorient support
- Link producer support to sustainable practices
- Align innovation with productivity and sustainability goals
- Eliminate highly distorting support measures
- Strengthen risk management systems
- Reduce inefficient income support transfers

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POLICY

02 THEME: Sustainable production; Sustainable consumption; Supply chain

OECD-FAO Agricultural Outlook 2024-2033

OECD and FAO | Source | Download |

The OECD-FAO Agricultural Outlook 2024-2033 analyzes medium-term global agricultural market trends, emphasizing critical challenges like climate change, geopolitical tensions, and macroeconomic uncertainties. Global agricultural production is projected to grow by 1.3% annually, driven by innovation and sustainable practices, reducing GHG emissions intensity. However, direct agricultural emissions are expected to rise by 5%. Halving food loss and waste could cut emissions by 4% and reduce undernourishment by 153 million by 2030.

Emerging economies, especially India and Southeast Asia, will shape future demand, with India surpassing China as the key market influencer. Despite growing demand in lowincome countries, calorie intake growth is limited to 4%, delaying progress toward SDG2. Income constraints hinder



CONCECD Food and Agricultur Organization of the United Nations

dietary diversification, sustaining reliance on staples and widening productivity gaps in low- and middle-income countries, increasing import dependence.

Addressing resource constraints, GHG emissions, deforestation, and biodiversity loss is vital to building sustainable food systems. Trade remains essential, with 20% of global calories traded, but risks from protectionism persist. While international commodity prices may decline, retail prices are likely to remain high due to domestic factors. Policymakers must focus on international cooperation, innovation, and inclusive strategies to ensure food security, sustainability, and resilience.

Projected evolution for 2024-2033

- Consumption: Low- and middle-income economies drive consumption growth, with rising calorie intake, slow dietary diversification, increasing protein consumption, high food expenditure in poor countries, and expanded feed and biofuel use.
- Production: Agricultural production growth is supported by yield improvements, limited land expansion, dairy-focused livestock growth, slower fish production, reduced emissions intensity, and challenges posed by climate change.
- **Food Loss and Waste:** Halving food loss and waste is essential for sustainable food systems, as scenario analyses reveal their significant implications for global food security and efficiency.
- **Trade:** Agricultural trade growth will slow, stabilizing exports and increasing shipments between regions, highlighting trade's vital role in resilience and supply-demand balancing.
- **Prices:** After peaking in 2022, prices will return to long-term trends, with simulations indicating potential variations in future price trajectories.

Regional outlook

- **Developed and East Asia:** China's slowing demand and nutritional stability, coupled with sustainable productivity, influence a diverse trade profile of net importers and exporters across the region.
- South and Southeast Asia: Robust income and population growth sustain strong demand, with India dominating consumption; productivity is essential as declining exports shift the region towards net imports.
- **Sub-Saharan Africa:** Population-driven food demand and slow dietary diversification increase import dependence, with food security challenged by limited productivity gains and slow regional trade progress.
- Near East and North Africa: Rising import dependence and affordability issues persist, emphasizing productivity-led growth amid severe resource constraints and a growing import bill.
- **Europe and Central Asia:** Sustainability and conflict risks slow production, with diverging trends in animal-sourced food consumption and Ukraine's trade recovery tied to the war's resolution.
- North America: Productivity-driven crop growth supports global output, with shifting consumer preferences and a diminishing trade surplus shaping the region's agricultural outlook.
- Latin America and the Caribbean: Export-led growth driven by productivity and expansion faces rising risks in a fragmented global trade environment, with evolving but diverse dietary patterns.

03 THEME: Net-zero strategy

FAO- Climate-related Development Finance to Agrifood Systems, 2024 Update

FAO | Source | Download |



This report examines trends in climate-related development finance for agrifood systems, emphasizing alignment with global climate and sustainability goals. Allocations to agrifood systems fell from an average of 37% in 2000–2010 to 24% in 2011–2022. Despite record contributions in 2022 (USD 29 billion), critical gaps persist in achieving transformative action.

Key Findings

• **By Provider Type:** the OECD Development Assistance Committee (DAC) members contributed 59% of agrifood finance from 2013–2022. In 2022, multilateral development banks (MDBs) sharply increased their share, driven by the World Bank doubling

its contributions (USD 13 billion) and growth from the Asian Development Bank (ADB) and Development Bank of Latin America (CAF).

- **By Climate Objectives:** In 2022, 51% of agrifood climate finance targeted adaptation, followed by mitigation (26%) and cross-cutting objectives (23%). The top ten providers contributed 76% of adaptation funding, with the top three accounting for 43%.
- By Agrifood Systems Sectors: Agriculture received the largest share (USD 11.6 billion), benefiting Africa (38%) and Asia (27%). Environment and biodiversity ranked second, driven by DAC contributions, with food security in third, benefiting Africa (62%).
- By Region: Africa received the highest funding (USD 9.9 billion, 67% as grants), followed by Asia (USD 6.7 billion, 67% as debt). MDBs drove growth in the Americas (USD 6.3 billion, 80% debt), while SIDS reached record allocations (USD 731 million), led by DAC members (44%) and MDBs (42%).

Conclusion: Despite increased climate finance in 2022, addressing uneven distribution is critical to transforming agrifood systems. Multilateral contributions, led by the World Bank, have increased sharply, highlighting the need for coordination with DAC members. Careful assessment of debt instruments and innovative financing mechanisms is essential for sustainable transitions of farmers and agrifood systems. Sectoral monitoring of financial flows remains essential for informed policy decisions.

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04 THEME: Net-zero strategy; Climate-smart agriculture

FAO- Global Nitrous Oxide Assessment

FAO | <u>Source</u> | <u>Download</u> |



The FAO's Global Nitrous Oxide Assessment presents a comprehensive evaluation of Nitrous oxide (N₂O) emissions, their drivers, and mitigation strategies within agri-food systems. N₂O, a potent greenhouse gas (GHG) and super pollutant, drives 10% of global warming (~0.1°C) and is the leading ozone-layer-depleting emission. Predominantly from agriculture (synthetic fertilizers and manure), its emissions have risen 40% since the Green Revolution in the 1980s and could increase 30% by 2050 without intervention. Agriculture contributes 75% of emissions, with industrial and other sources like fossil fuel combustion and wastewater treatment accounting for the remainder.

Reducing N_2O emissions by over 40% by 2050 through sustainable nitrogen management offers benefits for climate goals, ozone

protection, air and water quality, food security, and ecosystem resilience. Effective measures include controlled-release fertilizers, soil-nitrogen testing, improved manure practices, and dietary shifts. Addressing regulatory, economic, and cultural barriers is crucial, with regions of excessive fertilizer use offering the greatest abatement potential while others require increased nitrogen-fixing inputs for food security. Additional reductions are achievable by improving wastewater treatment and limiting biomass burning and fossil fuel use.

Decarbonization measures, such as ammonia-based marine fuels and fertilized-crop biofuels, risk raising N_2O emissions. Understanding trade-offs among GHGs is essential for improving technologies and crafting mitigation policies. Sustainable nitrogen management, aligned with agreements like the Paris Agreement and Global Biodiversity Frameworks, supports emissions reductions while advancing food security, clean water and air, as well as sustainable agriculture under the SDGs.

05 THEME: Nature-based solutions; Sustainable production; Sustainable consumption

IPBES- The thematic assessment report on Interlinkages among Biodiversity, Water, Food and Health: Summary for Policymakers

ipbes (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) | <u>Source</u> | <u>Download</u> |

The IPBES Nexus Assessment addresses biodiversity loss, water scarcity, food insecurity, health risks, and climate change. Compiled by 165 scientists from 57 countries over three years, with 6,500 references, it examines trends and highlights nature's contributions to people. The report proposes synergetic solutions to mitigate trade-offs and drive transformative change toward sustainable futures, aligning with global goals like the SDGs, Kunming-Montreal Global Biodiversity Framework (GBF), and the Paris Agreement, while providing actionable insights for integrated governance and decision-making across nexus elements.



ipbes

Key Messages

- Past and current nexus interactions: Biodiversity supports food, water, and health systems while stabilizing the climate but has declined by 2–6% per decade, disrupting ecosystems and worsening inequalities. Over 50% of people face severe impacts from biodiversity loss, water scarcity, and climate change. Economic activities relying on nature generate ~\$58 trillion annually, but unsustainable practices impose external costs of \$25 trillion, disproportionately harming vulnerable populations.
- Future nexus interactions: Continuing trends will worsen biodiversity loss, food and water insecurity, and climate impacts. Food systems contribute 21–37% of greenhouse gas emissions, intensifying food insecurity for 800 million people. Integrated strategies, such as agroforestry in Niger that increased cereal yields by 30%, can enhance biodiversity, soil health, and align with global goals like the SDGs.
- Response options: Cost-effective solutions, including sustainable agriculture, urban greening, and ecosystem service payments (~\$42 billion annually), yield cross-sector benefits. Coordinated actions supporting frameworks like the SDGs and GBF amplify synergies. Measures such as reducing plastics improve water quality, and equitable approaches, like Brazil's Unified Health System, showcase effective integration across biodiversity, food, and health.
- Governing for just and sustainable futures: Transformative governance integrating policies and finance is vital for nexus management. Addressing biodiversity's \$1 trillion annual financing gap requires systemic reforms. Examples include transboundary water cooperation and urban infrastructure to mitigate floods and enhance food production, aligning with frameworks to protect 30% of global land and waters by 2030.

06 THEME: Carbon market

OECD- Pricing Greenhouse Gas Emissions 2024

OECD | Source | Download |

To achieve net-zero emissions, countries must enhance climate action and address policy gaps. The OECD's 2024 Pricing Greenhouse Gas Emissions report reviews the progress of emissions pricing and energy taxation from 2021 to 2023, focusing on emissions trading systems (ETS), carbon taxes, and energy subsidies in 79 countries, covering 82% of global GHG emissions. The report underscores the need for coordinated global efforts in carbon pricing to meet climate targets effectively.



OECD

Key Insights

• **Stalled progress:** Carbon pricing momentum slowed due to the 2022 energy crisis, leading many governments to delay or

reverse policies. Subsidies and tax exemptions reduced implicit carbon pricing, notably lowering the Net Effective Carbon Rate (Net ECR) for agriculture between 2021 and 2023, for example, to address energy affordability concerns.

- Advances in explicit pricing: Despite challenges, ETS and carbon taxes modestly expanded, with tighter emissions caps and mechanisms like Border Carbon Adjustments (BCA) and investment subsidies for low-emission technologies gaining traction.
- Diverse approaches and future outlook: Countries employ varied tools to meet climate goals. The expansion of ETSs, particularly in middle-income nations, could boost global emissions coverage by 7 percentage points. Targeted policies for complex sectors, such as waste incineration, are increasingly vital. The report calls for greater ambition, international coordination, and transparency in energy taxation to close implementation gaps and accelerate emissions reductions.

Though emissions coverage remains stable, new ETSs, sectoral expansions, carbon content pricing for imports, and investment in low-emission technologies form a network of complementary policies. Countries are tailoring solutions and exploring measures like BCA and free permits to address carbon leakage challenges.

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OPEN DATA

01 THEME: Agrifood system; Environment and climate

EU Food System Monitoring Dashboard

European Commission's Joint Research Centre (JRC) | Source | Framework |

The EU Food System Dashboard, developed by the European Commission's Joint Research Centre (JRC), monitors the sustainability of the EU food system across environmental, economic, and social dimensions (including health) using indicators from official data sources and peer-reviewed research. It provides a comprehensive overview of the food chain, supply including primary production, processing, distribution, and consumption, while addressing key sustainability aspects such as climate, pollution, biodiversity, economic viability, and the food environment.

Organized hierarchically, the dashboard covers three dimensions, 12 thematic areas, and 38 domains. It features two data views: the EU overview, displaying single indicators across the EU, and the Country profile, offering time-series comparisons of domains or dimensions for one or two countries. This tool supports policymakers, stakeholders, and citizens by assessing cumulative impacts on competitiveness, the environment, and health, advancing sustainable food systems in the EU.

Environmental	17 ^
Climate change	1 ¥
Pollution and antimicrobials	4 🗸
Sustainable use of resources	7 🗸
Biodiversity	3 🗸
Cross-cutting environmental	2 🗸
(A)	

Economic	12 ^
Fair economic viability in food value chain	9 🗸
Development and logistics	3 🗸
Social	15 ^
Fair, inclusive and ethical food system	6 🗸
Food environment	5 🗸
Nutrition and health	4 🗸

02 THEME: Agrifood system; Climate action plans and programs

Project FOODPathS

European Commission | Source | Summary |

Project FOODPathS, funded by the European Commission, aims to co-design the prototype for the European Partnership for Sustainable Food Systems (SFS) for People, Planet & Climate, launching in 2024. The initiative addresses



critical challenges such as climate change, biodiversity loss, and food insecurity by promoting systemic approaches and multi-actor collaboration.

OPEN DATA

The project develops innovative food system (FS) concepts, a network of Living Labs for co-creation and demonstration, an FS Observatory for monitoring the sustainability of EU FS, and Research, Innovation, Policy, and Education (RIPE) agendas to identify key priorities and leverage points. A diverse consortium unites public, private, and philanthropic stakeholders to design strategies, governance models, and a sustainability charter that ensures inclusivity and broad impact. By aligning EU-wide and local priorities, FOODPathS aims to transform food systems into sustainable, resilient, and equitable frameworks through co-funded research, strategic guidance, and capacitybuilding initiatives.

03 THEME: Agrifood system; Climate action plans and programs; Climate-smart and net zero toolkit

Food Innovation Hubs

World Economic Forum | Source | Summary |

The Food Innovation Hubs Global Initiative, supported by the World Economic Forum (WEF), accelerates global food system transformation through regional collaboration, innovation, and technology adoption. Addressing food insecurity, climate change, and environmental degradation, the initiative promotes open data sharing, multi-stakeholder partnerships, and scalable solutions for sustainable agri-food systems. Key features include six regional hubs (in Europe, India, Colombia, Kenya, UAE, and Vietnam) focused on regenerative agriculture, low-carbon farming, protein innovation, and data interoperability. The Food Innovators Network (FIN) connects over 200 global experts, advancing innovation in alternative proteins, soil health technologies, and data-driven decisions. Its knowledge platform highlights trends, technologies, and industry insights to inform decision-making. By bridging gaps in technology, investment, and policy, it fosters climate-smart agriculture and resilient food systems tailored to both local and global priorities.



04 THEME: Agrifood system; Climate action plans and programs; Environment and climate; Climate-smart and Net-zero toolkit

Alliance of Bioversity International and CIAT

CGIAR | Source |

The Alliance of Bioversity International and CIAT, established in 2019 as part of CGIAR, is committed to transforming agrifood systems through research and innovation. Their unified strategy addresses critical global challenges such as climate change, biodiversity loss, environmental degradation, and malnutrition by employing a whole-of-system approach.

Working across Latin America and the Caribbean (LAC), Sub-Saharan Africa, and Asia, the Alliance focuses on key research areas and cross-cutting themes, including Food Environments & Consumer Behavior, Multifunctional Landscapes, Climate Action, Agrobiodiversity, Digital Inclusion, Crops for Nutrition and Health, and Gender and Youth Inclusion.

The platform provides diverse resources, such as publications, datasets, and tools, supporting science-based decision-making, modeling, monitoring, data collection, outreach, training, and impact assessments. These empower stakeholders to drive sustainable, resilient, and inclusive agrifood systems with research-backed solutions.



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OPEN DATA

05 THEME: Climate action plans and programs; Climate-smart and Net-zero toolkit

International Climate Hub

USDA | Source |

USDA's International Climate Hub is a global platform for sharing research, tools, and best practices to enhance climate adaptation and mitigation for farmers, ranchers, and foresters worldwide. Building on the USDA Regional Climate Hubs model, it delivers science-based, region-specific resources to support climate-informed decision-making in agriculture, forestry, and natural resource management.

The Hub collaborates with international coalitions to address global climate challenges, advance forest conservation and restoration, and improve agricultural productivity. It covers topics like agriculture,



climate science, bioenergy, natural resources, and rural development, offering decision-support tools—including calculators, maps, models, and datasets—to estimate outputs such as crop production, GHG emissions, and species distribution. Additional resources include webinars, publications, and international events.

EVENT

01

The 99th Annual Conference of The Agricultural Economics Society

April 14-16, 2025 | In-person | Bordeaux, France | Source |



The 99th Annual Conference of the Agricultural Economics Society (AES) will take place from April 14 to 16, 2025, at the Bordeaux School of Economics, University of Bordeaux, France. The event features keynote addresses by leading experts on challenges in the agricultural sector and farm performance. Highlights include symposium а on sustainability metrics, masterclasses regression on discontinuity methods, and special sessions on machine learning and energy security in agriculture. Interactive workshops will explore cutting-edge issues, such as bioeconomic modeling and low-carbon

practices. The conference supports early-career researchers with prizes and travel bursaries. Conference registration opens on January 2.

02

2025 AIAEE Conference

April 14-17, 2025 | In-person | Inverness, Scotland | Source |



The Association for International Agricultural and Extension Education (AIAEE) conference will take place from April 14 to 17, 2025, in Inverness, Scotland, at the Kingsmills Hotel, celebrating 41 years

EVENT

of fellowship and scholarship. Highlights include student activities, professional development sessions, abstract presentations, and keynote speeches. Featured topics include *"Innovative Community Education and Development in the Highlands"* by Highlands & Islands Enterprise and *"Navigating International Development in Today's World"* by USAID. The conference also offers opportunities for proposal submissions, professional development, and award nominations. Regular registration is open until February 28, 2025, with late registration available through March 17, 2025.

03

START Conference: Green Minds Gather

April 29-30, 2025 | In-person | Copenhagen, Denmark | Source |

The Green Minds Gather Conference, hosted by the Centre for Sustainable Agrifood Systems (START), will take place on April 29–30, 2025, at Copenhagen Business School, Denmark. This event will convene 500 participants, including Danish and international researchers, agrifood professionals, and policymakers, to tackle the challenges of the green transition in agrifood systems. Structured as a dynamic laboratory setting, the conference will feature high-level keynotes, interactive workshops, and poster sessions spanning 13 themes, such as nature-based solutions, digital innovation, sustainable production, and policy frameworks. A key deliverable will be a policy input paper to inform Denmark's EU presidency beginning in July 2025. PhD and Postdoc researchers are encouraged to submit posters showcasing their work to peers, industry leaders, and policymakers, with awards for the best submissions. Registration is open now, and poster submissions are accepted until February 28, 2025, with notifications by March 14, 2025.

Invitation to START conference

Green Minds Gather | 29-30 April 2025 | Copenhagen

04

2025 Water for Food Global Conference

April 28-May 2, 2025 | In-person | Lincoln, Nebraska, USA | Source |

The 2025 Water for Food Global Conference, hosted by the Daugherty Water for Food Global Institute at the University of Nebraska, will take place from April 28 to May 2 in Lincoln, Nebraska. With the theme A Resilient Future: Water and Food for All, the 11th annual event brings together 400 global experts to address water and food security in the face of climate change. Discussions will focus on highproductivity agriculture, smallholder water management, and environmental health.



Attendees will benefit from research presentations, technical workshops, interactive tours, and invaluable networking opportunities. Registration is now open.

05

International Soil Science Conference (SOILS 2025)

May 6-8, 2025 | In-person | Penang, Malaysia | Source |



6th-8th May 2025, Bertam Resort & Water Park, Penang, Malaysia

The International Soil Science Conference (SOILS 2025), organized by the Malaysian Society of Soil Science (MSSS), will take place from May 6 to 8, 2025, in Penang, Malaysia, under the theme "Soil Health for a Sustainable Future: Bridging Soil, Agriculture, and Environmental Stewardship." The

event will address key sub-themes, including soil fertility, microbiomes, water management, pollution, and climate change. A highlight of the conference is the Stimulus Fund Assistance initiative, which offers full coverage of registration and accommodation for 10 outstanding postgraduate students or young scientists from ASEAN. To qualify, candidates must be under 35 years old, present research aligned with the conference themes. The abstract submission and final registration deadlines are both on February 28, 2025.

06

Living Planet Symposium 2025

June 23-27 2025 | In-person | Vienna, Austria | Source |

The Living Planet Symposium 2025 (LPS25), organized by the European Space Agency (ESA), will take place from June 23 to 27, 2025, in Vienna, Austria, under the theme "From Observation to Climate Action and Sustainability for Earth." LPS25 will delve into how Earth observation data can address critical environmental and societal challenges. The event features six core sessions: *Earth Science Frontiers, Climate Action and Sustainability Challenges, Earth Observation Missions, Digital Innovation and Green Solutions, Partnerships with Industry for New Applications, and Global Cooperation and Policy Support. Discussions will spotlight innovations in satellite technologies,*

climate monitoring, digital solutions, and global partnerships driving sustainability. Bringing together scientists, policymakers, industry leaders, and students, this premier event aims to foster collaborations that advance climate resilience and sustainable development through cuttingspace-based edge insights. Registration will be open from April to mid-June 2025.



EVENT

07

XVIII European Association of Agricultural Economists (EAAE) Congress

August 26-29, 2025 | In-person | Bonn, Germany | Source |



The XVIII EAAE Congress, hosted by the European Association of Agricultural Economists, will take place in Bonn, Germany, from August 26 to 29, 2025. Celebrating the EAAE's 50th anniversary, the

Congress will focus on "Food System Transformation in Challenging Times" addressing critical issues such as sustainability, equity, resilience, and technological innovation in the agri-food sector. With contributions spanning topics from environmental economics to consumer behavior, the event invites experts from Europe and the international community to explore solutions for reshaping food systems amidst climate crises, geopolitical disruptions, and social inequities. Submissions are open until January 31, 2025, and details regarding the registration process will be available in early 2025.