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CLIMATE INSIGHTS

Your fortnightly update on the latest publications



Hello! Welcome to Issue #17 of *Climate Insights* 2025, CGIAR's fortnightly roundup of the latest publications on climate change impacts and adaptation, mitigation measures, and the physical science from the literature. We're tracking trending topics in the climate space and linking them to our work for a food secure future with a brief comment on the implications of this new research on our own portfolio of climate research for development.

Here's your roundup from the last week:

CLIMATE CHANGE IMPACTS AND ADAPTATION



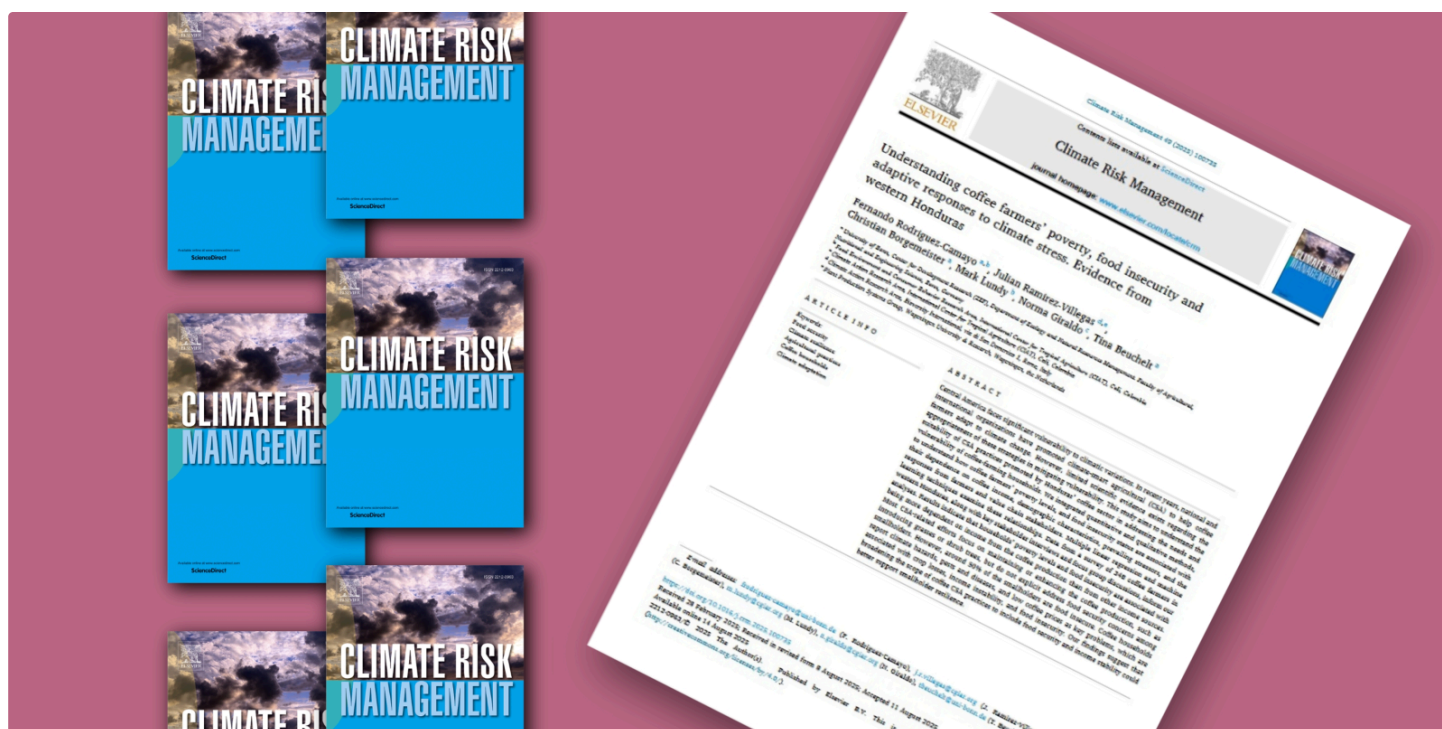
Are the risks and uncertainties as constraints to investing in climate-smart innovations a red herring? Financial cost-benefit analysis evidence from 11 countries in Africa and Asia.

Ng'ang'a, Stanley, D. Akinyi and E. Girvetz (2025), Are the risks and uncertainties as constraints to investing in climate-smart innovations a red herring? Financial cost-benefit analysis evidence from 11 countries in Africa and Asia, *Climate Risk Management*.

Climate-Smart agricultural (CSA) practices such as drought resistant varieties, water saving techniques etc. have gained considerable attention due to their potential to address climate change impacts. However, uncertainties remain regarding their financial profitability and risk implications across diverse conditions, which may contribute to low adoption rates. This study conducted a comprehensive cost-benefit analysis using data from 11 countries to assess the financial viability of these practices. The analysis revealed a range of net present values (NPV) associated with the innovations, from US\$ 508 to US\$ 38,793 (2020 dollars). The internal rate of return (IRR) varied between 20 % and 490 %. Sensitivity analysis affirmed the financial profitability and minimal risk of the studied innovations. Considering the influence of discount rates, a reduction of 50 % and 100 % in the discount rate resulted in an average NPV increase of 20 % and 35 %, respectively. The NPV was found to be most sensitive to changes in yield, followed by the discount rate. Measures and incentives aimed at providing access to capital at lower or subsidized rates were identified as potential drivers for increasing adoption rates. Monte Carlo simulation demonstrated that the adoption of these innovations is worthwhile, with a low risk of capital loss. To facilitate the widespread adoption of promising CSA practices, governments should support strategies that minimize risks faced by smallholder farmers. Additionally, efforts to enhance climate adaptation at scale should be coupled with financial and policy support. This study underscores the importance of evidence-based analysis in guiding decision-making and emphasizes the need for continuous support and resources for CSA implementation.

[Learn more.](#)

This paper is co-authored by two CGIAR scientists, including Stanley Ng'ang'a and Evan Hartunian Girvetz at the Alliance of Bioversity International and CIAT.



Understanding coffee farmers' poverty, food insecurity and adaptive responses to climate stress. Evidence from western Honduras.

Rodriguez-Camayo, Fernando, *et al.* (2025), Understanding coffee farmers' poverty, food insecurity and adaptive responses to climate stress. Evidence from western Honduras, *Climate Risk Management*.

Central America faces significant vulnerability to climatic variations. In recent years, national and international organizations have promoted climate-smart agricultural (CSA) to help coffee farmers adapt to climate change. However, limited scientific evidence exists regarding the appropriateness of these strategies in mitigating vulnerability. This study aims to understand the suitability of CSA practices promoted by Honduras' coffee sector in addressing the needs and vulnerability of coffee-farming households. This study integrated quantitative and qualitative methods, to understand how coffee farmers' poverty levels, and food insecurity status are associated with their dependence on coffee income, demographic characteristics, prevailing stressors, and the responses from farmers and value chain stakeholders. Multiple linear regression and machine learning techniques examine these relationships. Data from a survey of 348 coffee farmers in western Honduras, along with key stakeholder interviews and focus group discussions, inform these analyses. Results indicate that households' poverty levels and food insecurity are associated with being more dependent on income from the coffee production than from other income sources. Most CSA-related efforts focus on maintaining or enhancing the coffee production, such as introducing grasses or shrub trees, but do not explicitly address food security concerns.

among smallholders. However, around 50% of the smallholders are food insecure. Coffee households report climate hazards, pests and diseases, and low coffee prices as key problems, which are associated with crop losses, income instability, and food insecurity. Findings suggest that broadening the scope of coffee CSA practices to include food security and income stability could better support smallholder resilience.

[Learn more.](#)

This paper is co-authored by three CGIAR scientists, including Fernando Rodriguez-Camayo, Mark Lundy and Norma Giraldo at CIAT.



Global assessment of population exposure to multiple climate-related hazards from 2003 to 2021: a retrospective analysis

Stalhandske, Zélie, *et al.* (2025), Global assessment of population exposure to multiple climate-related hazards from 2003 to 2021: a retrospective analysis, *The Lancet Planetary Health*.

The climate crisis is increasingly recognised as a health crisis, driven in part by the growing frequency and intensity of climate-related hazards, such as heatwaves and wildfires. These hazards can coincide, potentially leading to compound impacts. However, little is known about where and how often such combinations occur globally. This study aims to map historical population exposure to multiple interacting climate-related hazards and identify regions that have been most affected. In this retrospective study, the authors analysed global data from the 2024 Lancet Countdown on health and climate change, International Best Track Archive for Climate Stewardship, The Inter-Sectoral Impact Model Intercomparison Project, and WorldPop from 2003 to 2021 at a 0.25° resolution to examine the population that was exposed to combinations of six climate hazards: heatwaves, droughts, wildfires (PM2.5), extreme precipitation, river floods, and tropical cyclones. The authors identified administrative level 1 regions based on several hotspot definitions and did detailed case studies in the most exposed regions. This study details how frequently people at each grid point have been exposed to various combinations of hazards, revealing both regular patterns and rare, region-specific occurrences. Analysis indicates an increase in per-person exposure to many hazards during the study period, with a more pronounced rise in multihazard exposure than single-hazards. Between 2003–12 and 2012–21, per-person exposure to three or more hazards increased by 69%. Heatwaves were the most common hazard and also showed the clearest trend, largely driving the observed increases in both single-hazard and multihazard exposure. Multihazard hotspots vary depending on the specific definition used. For instance, exposure to multiple hazards is explained by the seasonality of hazards, which leads them to co-occur in the same months. Additionally, incorporating specific vulnerable age groups into this analysis reveals hotspots that consider the sociodemographic characteristics of the regions.

[Learn more.](#)

CGIAR scientists from the Climate Resilience Initiative published a study mapping out Ghana's multi-hazard risk of flood and drought, using machine learning models to assess the population's vulnerability and exposure.

[Read here](#)



Co-production of knowledge on climate change, its effects, and adaptation measures: A gender-responsive qualitative study of smallholder farmers

Bwalya, Bridget and K. Mwanza (2025), Co-production of knowledge on climate change, its effects, and adaptation measures: A gender-responsive qualitative study of smallholder farmers, *PLOS Climate*.

What is considered climate change varies across space and time, partly due to micro-level differences in weather events and human experiences of climate change effects mediated by socio-cultural factors such as gender. It is essential to understand micro-level variations in climate, their effects, and adaptation measures adopted by men and women smallholder farmers, who constitute a large proportion of the population of Sub-Saharan Africa. This study employed a qualitative participatory research tool to co-produce knowledge on smallholder farmers' perceptions of climate change, its effects on their crop and livestock production, and the adaptation measures they have instituted. Data was collected from ten farmers in each of six chiefdoms from three districts in eastern Zambia. The data was transcribed and analyzed for common themes guided by the study's research questions. Results show similarities in perceptions of micro-level climate change across the study sites, with subtle differences influenced by the interaction of gender and other factors. The most common climate change effects on livestock production are increased incidences of diseases, fodder and water shortages and lower productivity. For crop production, yields and pest infestations were reported. Autonomous adaptation measures for livestock production included fodder and water supplementation, investments in medicines and vaccines, and improved shelter construction. Crop production risk was mediated through early planting, crop diversification, crop residue retention, and applying fertilizers, pesticides, and lime. The adaptation measures were perceived to be effective to varying degrees, with those contingent on purchased inputs seen as less effective by women. Co-production of knowledge helped research participants learn about adaptation measures used in other chiefdoms and enhanced their understanding of the micro-scale similarities and differences in climate change. The study recommends that practitioners, policymakers, and researchers pay attention to micro-level climate variations in their design and implementation of interventions to ensure they are appropriate for all community subgroups.

[Learn more.](#)

CGIAR scientist at IFPRI recently published a study where they developed a critical approach to co-producing knowledge for improved development outcomes in food systems.

[Read here](#)



Gender-group membership intersectionality and determinants of indigenous climate adaptation of smallholder farmers for climate risk management in northern Ghana

Guodaar, Lawrence (2025), Gender-group membership intersectionality and determinants of indigenous climate adaptation of smallholder farmers for climate risk management in northern Ghana, *Climate Risk Management*.

This study examined the intersection of gender and group membership as well as the determinants influencing indigenous adaptation strategies of male and female smallholder farmers to moderate climate risks for sustainable food security in dryland communities. It used survey data from 299 farming households across six rural communities in northern Ghana. Household data were analyzed using descriptive statistics and a binary logistic regression model. The results reveal that smallholder farmers' indigenous solutions, such as soil and water management strategies, were gender-differentiated. The most significant indigenous adaptation strategies of farmers include organic manure, rainwater harvesting, and spiritual consultations. From an intersectional perspective, group membership was found to be gendered and facilitated the reduction of climate adaptation costs. Several factors differently shape the indigenous adaptation strategies of male and female smallholder farmers. While age, education, and wealth status influence gender responses to climate change, male farmers' indigenous strategies are significantly affected by farm size, whereas female farmers' practices are mainly shaped by farm experience, farm ownership, and membership in local associations. These findings indicate that social, economic, demographic, and farm-related characteristics are essential for developing climate resilience. The findings offer insightful guidance for policymakers and practitioners to develop gender-sensitive adaptation plans and strengthen farming groups to enhance adaptive capacity for resilient and sustainable food systems in dryland indigenous communities.

[Learn more.](#)

Under the CGIAR Sustainable Animal and Aquatic Foods (SAAF) Science Program, stakeholders, including policymakers, researchers, fish farmers and private sector actors co-designed inclusive, sustainable aquaculture business models tailored for northern Ghana.

[Read here](#)

CLIMATE CHANGE MITIGATION

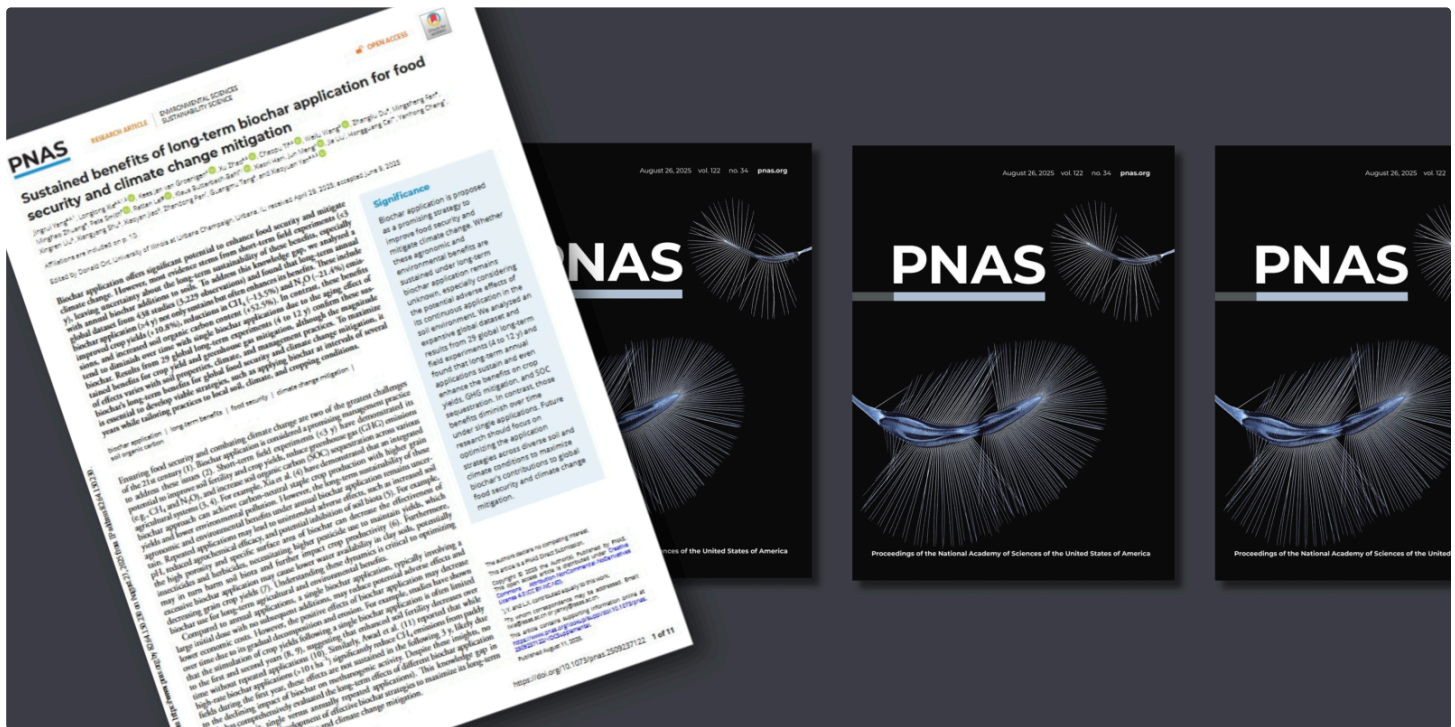


The unrealized potential of agroforestry for an emissions-intensive agricultural commodity

Becker, Alexander, *et al.* (2025), The unrealized potential of agroforestry for an emissions-intensive agricultural commodity, *Nature Sustainability*. Reconciling agricultural production with climate change mitigation is a formidable sustainability problem. Retaining trees in agricultural systems is one proposed solution, but the magnitude of the current and future potential benefit that trees contribute to climate change mitigation remains uncertain. In this study, the authors help to resolve these issues across a West African region that produces ~60% of the world's cocoa, a crop contributing one of the highest carbon footprints of all foods. Using machine learning, this study mapped shade-tree cover and carbon stocks across the region and found that the existing average shade-tree cover is low (~13%) and poorly aligned with climate threats. Yet, increasing shade-tree cover to a minimum of 30% could sequester an additional 307 MtCO₂e, enough to offset ~167% of contemporary cocoa-related emissions in Ghana and Côte d'Ivoire—without reducing production. This approach is transferable to other shade-grown crops and aligns with emerging carbon market and sustainability reporting frameworks.

[Learn more.](#)

This paper is co-authored by two CGIAR scientists including Christian Bunn and Fabio Castro-Llanos at CIAT.



Sustained benefits of long-term biochar application for food security and climate change mitigation

Yang, Jingrui, *et al.* (2025), Sustained benefits of long-term biochar application for food security and climate change mitigation, *PNAS*.

Biochar application offers significant potential to enhance food security and mitigate climate change. However, most evidence stems from short-term field experiments (≤ 3 y), leaving uncertainty about the long-term sustainability of these benefits, especially with annual biochar additions to soils. To address this knowledge gap, the authors analyzed a global dataset from 438 studies (3,229 observations) and found that long-term annual biochar application (≥ 4 y) not only sustains but often enhances its benefits. These include improved crop yields (+10.8%), reductions in CH_4 (–13.5%) and N_2O (–21.4%) emissions, and increased soil organic carbon content (+52.5%). In contrast, these benefits tend to diminish over time with single biochar applications due to the aging effect of biochar. Results from 29 global long-term experiments (4 to 12 y) confirm these sustained benefits for crop yield and greenhouse gas mitigation, although the magnitude of effects varies with soil properties, climate, and management practices. To maximize biochar's long-term benefits for global food security and climate change mitigation, it is essential to develop viable strategies, such as applying biochar at intervals of several years while tailoring practices to local soil, climate, and cropping conditions.

[Learn more.](#)

CGIAR scientists from the Alliance of Bioversity International and CIAT recently explored the feasibility of biochar technology to support the sustainable intensification and decarbonization of cocoa production in West-Africa, evaluating different scenarios.

[Read more](#)



Global decarbonization corresponding with unseasonal land cover change

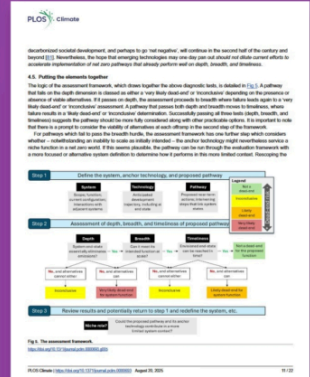
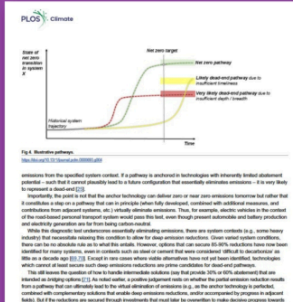
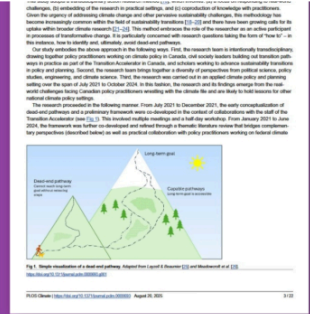
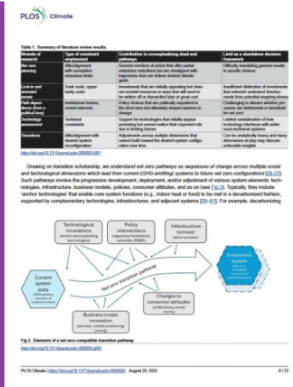
He, Kehan, L. Wang and Z. Liu (2025), Global decarbonization corresponding with unseasonal land cover change, *Nature Communications*.

Understanding the link between unseasonal land cover changes and CO₂ emissions can indicate the decarbonization progress of a region, but limited modeling tools exist for analysis in near-real-time. In this study, the authors developed a modeling framework to reveal a strong and robust relationship between the two quantities. By applying the Butterworth filter, unseasonal changes in land cover and fuel-consuming sectors are extracted for Autoregressive Distributed Lag regression analysis in major economies. Among all investigated economies, Russia has demonstrated the strongest co-relationship (R-squared value of 0.730) between unseasonal CO₂ emissions and land cover changes, indicative of its heavy reliance on fossil fuels. Both Brazil (1200 km²/MtCO₂e on average) and Russia (10,700 km²/Mt CO₂ e) exhibit greatest sensitivity in land cover changes to CO₂ emission changes. This research provides an effective tool to assess the coupling between unseasonal land cover change and CO₂ emitting economic activities, presenting an alternative indicator to monitor decarbonization in real-time.

[Learn more.](#)

CGIAR scientists from ICRISAT recently organized a training for officials in 14 nations to combat land degradation and achieve carbon neutrality, fostering south-south collaboration in the fight against climate change.

[Read here.](#)



Dead-end pathways: Conceptualizing, assessing, avoiding

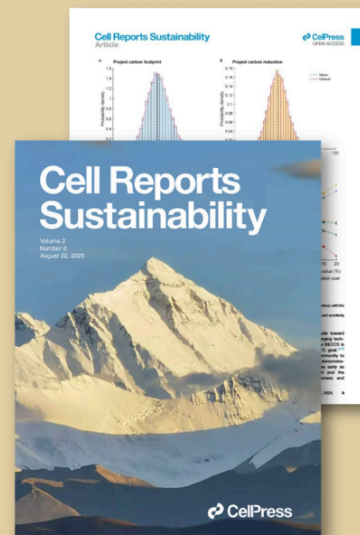
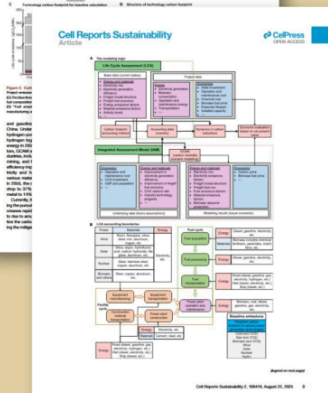
Rosenbloom, Daniel *et al.* (2025), Dead-end pathways: Conceptualizing, assessing, avoiding, *PLOS Climate*

Despite rising climate urgency, decision-makers continue to support emission reduction options that appear promising on the face of it but hinder progress in practice. Whether through more efficient gasoline engines or waste heat recovery from fossil fuel combustion, many proposed solutions encourage partial emissions reductions without adequate consideration of whether they can build toward net zero systems of the future. As a result, it is essential that policy decisions are interrogated in terms of their alignment with net zero pathways (or lack thereof) and that decision-makers are both informed about and held to account for the compatibility of near-term choices with long-run system change. This study conceptualizes particularly problematic directions as 'dead-end pathways' and outlines a framework for identifying and avoiding them. The framework assesses pathways in relation to three dimensions: depth (how close they can come to virtually eliminating emissions in a stipulated system context), breadth (how widely they can be applied across the specified system), and timeliness (how rapidly they can be deployed). The study then applies this framework to three brief case studies drawn from road transportation, each of which fails on one of these dimensions.

Learn more.

CGIAR scientists at IFPRI recently published a study identifying the main linkages between gender and mitigation in agrifood systems, showcasing best practices to mainstream gender in mitigation actions in a substantive and sustainable way.

Read here.



Carbon assets alone are insufficient to sustain China's agroforestry biomass power generation

Ma, Xueqing, *et al.* (2025), Carbon assets alone are insufficient to sustain China's agroforestry biomass power generation, *Cell Reports Sustainability*.

With the phasing out of feed-in tariff subsidies, China's agroforestry biomass power generation (AFBPG) industry seeks to monetize carbon reductions to sustain its development. In this study, the authors develop a modeling framework integrating life cycle assessment (LCA) with the integrated assessment model (global change analysis model [GCAM]) to evaluate the dynamic reduction potential of China's AFBPG under carbon neutrality and the impact of incorporating carbon assets on industry's economic viability. This analysis estimates that the current annual carbon footprint of a typical 30 MW AFBPG project is 16.6 kt CO₂, primarily from biomass fuel acquisition and processing. As the carbon footprint factor of China's power system rapidly declines to 15 g CO₂/kWh by 2050, the carbon assets of China's AFBPG shrink rapidly, raising economic challenges. Deploying bioenergy with carbon capture and storage could sustain growth of carbon assets and improve industry's economic feasibility. Introducing a rural waste disposal compensation mechanism that covers 20% of biomass procurement costs could enable the AFBPG industry to approach breakeven.

[Learn more.](#)

CIFOR-ICRAF published a report outlining seven policy measures to accelerate the transition to a low-carbon agriculture in China.

[Read here.](#)

PHYSICAL BASIS OF CLIMATE CHANGE



Projections of precipitation and temperature changes in the Neelam River Basin, western Himalaya: a CMIP6-based assessment under shared socioeconomic pathways

Iqbal, W., *et al.* (2025), Projections of precipitation and temperature changes in the Neelam River Basin, western Himalaya: a CMIP6-based assessment under shared socioeconomic pathways, *Earth Systems and Environment*.

This study assessed the past and future precipitation and temperature changes in the Neelam River basin, which is located in the western Himalayas. The projections of five General Circulation Models (GCMs) from the Coupled Model Intercomparison Project Phase 6 (CMIP6) were used to analyze the future climate change in the basin. The delta change method was used for the bias correction of the GCMs. The anticipated changes in temperature and precipitation for the near future (2021–2050) were computed under three Shared Socioeconomic Pathways (SSPs; SSP2–4.5, SSP3–7.0, and SSP5–8.5) relative to the baseline period (1985–2014). The Modified Mann-Kendall (MMK) test was used to assess the significance of temperature and precipitation trends, and the Theil-Sen (TS) slope estimator was used to examine the slope of the trends. According to projections made under all SSPs, the average annual precipitation may decrease in the future. The possible reduction of precipitation varies between – 4.56% (under SSP2–4.5) and – 4.77% (under SSP5–8.5). All SSPs showed a significant decrease in future spring precipitation, with rates of –0.49 mm/year, –6.21 mm/year, and – 4.74 mm/year under SSP2–4.5, SSP3–7.0, and SSP5–8.5, respectively. Under all SSPs, both the minimum temperature (TMin) and maximum temperature (TMax) exhibited significant increases, with the most notable increase in annual TMin under SSP5–8.5, at a rate of 0.07 °C/year. The projected changes in precipitation and temperature may result in more frequent and severe droughts, which would negatively affect the ecosystem, crop production, and hydropower generation in Pakistan. This study provides critical insights for policymakers to devise targeted adaptation and mitigation measures for the Neelam River basin to address the impacts of climate change.

[Learn more.](#)

This paper is co-authored by CGIAR scientist Muhammad Jehanzeb Masud Cheema at IWMI.



Systematic anomalies in the recent global atmospheric CO₂ concentration

Francey, Roger J. and J. S. Frederiksen (2025), Systematic anomalies in the recent global atmospheric CO₂ concentration, *PLOS Climate*.

Atmospheric CO₂ is the major contributor to climate change and ocean acidification resulting from human activities. Over recent decades of improving measurement precision of CO₂, of its isotopic composition and of air mass history, highly systematic variation has emerged in data selected for minimal exposure to regional air–surface exchange and maximum spatial representation. Between 2009 and 2015, anomalous behaviour is observed in air samples collected in baseline conditions from globally distributed sites. It is evident in atmospheric CO₂ amount, in its stable carbon isotope ratio, in individual sample data and in annually averaged data, and in the interhemispheric difference between primary baseline sites. The behaviour is also anomalous with respect to the widespread CO₂ response to El Niño–Southern Oscillation. It is clearly observed as a residual from either the 10-year running mean or smooth exponential curves that describe the CO₂ increase and isotopic decrease, due to anthropogenic emissions. In Southern Hemisphere annual data, there is uniformity throughout 71° of extratropical latitudes, and the isotopic data exclude an ocean–atmosphere contribution. The 2009–2015 anomaly is globally apparent in our data, but not previously reported in conventional global carbon budget studies using CO₂ growth rate changes where it is less evident. It is preceded by the Global Financial Crisis and bracketed by unprecedented activity in interhemispheric exchange indices. The robust and precise anomaly in Southern Hemisphere baseline data provides an unusual opportunity to calibrate causal studies with conventional CO₂ transport models used to verify anthropogenic CO₂ emission estimates and air–surface exchange.

[Learn more.](#)

The CGIAR research program CCAFS developed the Big Facts website to showcase latest scientifically-backed evidence on climate change, agriculture and food security—including food systems emissions and mitigation strategies—across various regions of the world.

[Explore here.](#)



Shifts in precipitation regimes exacerbate global inequality in grassland nitrogen cycles

Zheng, Miao, *et al.* (2025), Shifts in precipitation regimes exacerbate global inequality in grassland nitrogen cycles, *Nature Communications*.

Grasslands, the Earth's largest terrestrial ecosystem, provide crucial ecosystem services through biogeochemical cycles. However, these cycles are disrupted by climate change, particularly precipitation changes, limiting grassland productivity. By synthesizing 2944 experimental observations and integrating multiple models, this study shows that under the middle-of-the-road scenario, global nitrogen input, harvest, and surplus from grasslands are projected to increase by 10, 7, and 3 million tonnes per year (Tg yr^{-1}), respectively. Substantial regional inequalities are expected. Regions with increased precipitation (mainly the United States, northern Australia, much of Asia) may see a 16 Tg yr^{-1} increase in nitrogen harvest. Conversely, regions with decreased precipitation (mainly Sub-Saharan Africa, Latin America, Southeast Asia) will see a 9 Tg yr^{-1} reduction. Timely adaptation measures could reduce nitrogen input and surplus by 12 and 22 Tg yr^{-1} , respectively, while boosting nitrogen harvest by 10 Tg yr^{-1} , potentially averting losses of 238 billion USD by 2050.

[Learn more.](#)

CGIAR scientists at CIMMYT recently published an article presenting a sustainable strategy for enhancing nitrogen management utilising 4R nutrient stewardship.

[Read here.](#)



Recent asymmetric tropical ocean warming has altered regional propagation of Madden-Julian Oscillation

Kim, Hye-Ryeom, *et al.* (2025), Recent asymmetric tropical ocean warming has altered regional propagation of Madden-Julian Oscillation. *Communications Earth & Environment*.

Tropical sea surface temperature warming displays distinct regional patterns, but its influence on Madden-Julian Oscillation propagation remains unclear. In this study, the authors investigate how a shift toward La Niña-like conditions around 1999 has affected Madden-Julian Oscillation propagation by comparing two periods: 1979–1998 and 2003–2022. Using satellite observations and reanalysis data, they show that propagation accelerated over the Indian Ocean and the Maritime Continent but slowed over the western Pacific in the later period. These contrasting responses are linked to changes in sea surface temperature patterns and associated atmospheric conditions. Over the Indian Ocean, enhanced low-level horizontal moisture gradients and increased upper-tropospheric stability facilitate propagation, while weakened moisture gradient and suppressed convection hinder it over the western Pacific. Despite complex terrain and atmospheric interactions over the Maritime Continent, background changes still favor enhanced propagation. These findings highlight the sensitivity of Madden-Julian Oscillation behavior to regional ocean–atmospheric conditions, with implications for improving subseasonal prediction.

Learn more.

WorldFish, along with the FAO and the Duke University, conducted a global study uncovering the contributions and impacts of small-scale fisheries to sustainable development.

Read here.



Uncertainty in projected changes of Indian Summer Monsoon Rainfall by CMIP6 models

Sooraj, K.P., P. Terray and A.M. Aswale (2025), Uncertainty in projected changes of Indian Summer Monsoon Rainfall by CMIP6 models, *Atmospheric Research*.

A robust and trustworthy rainfall projection over the Indian landmass is vital for devising climate adaptation strategies. However, past studies show large inter-model spread in Indian Summer monsoon (ISM) rainfall projections, thus calling for more detailed investigations on the underlying process. In the present study, the authors investigate this aspect using Coupled Model Intercomparison Project Phase 6 (CMIP6) model projections (Shared Socioeconomic Pathways, SSP5–8.5) and historical simulations. The Multi-Model Ensemble mean (MME) results show intensification of ISM rainfall at the end of the 21st century with ISM rainfall increasing by 1.6 ± 0.8 mm/day under SSP5–8.5 scenario. A moisture budget analysis for the MME further infers that the thermodynamic effect (TH) due to global warming plays a dominant role in enhancing ISM rainfall in the projections, with its dynamic counterpart (DY) assuming an additional contribution. It is also revealed that both DY and TH terms contribute to the inter-model uncertainty in ISM rainfall, but with DY dominating over the other this time. The inter-model uncertainty in DY and ISM rainfall changes is linked to inter-model spread in interhemispheric thermal contrast which in-turn depends on the diversity in Equilibrium Climate Sensitivity (ECS) and Global Mean Temperature (GMT) among the models. Intriguingly, when the authors remove the inter-model diversity in ECS through a GMT scaling, an Atlantic meridional surface temperature gradient, involving both land and ocean, emerges as a crucial driver in controlling the uncertainty in both DY and ISM rainfall changes, and drives large-scale monsoon circulation changes over African and the Indian subcontinents.

[Learn more.](#)

CGIAR scientists at the Alliance of Bioversity International and CIAT developed a data-driven approach to sub- seasonal drought forecasting in Bihar, India.

[Read More.](#)



The climatic patterns that control regional fire activity in the Brazilian savanna

Silva, Patrícia S., et al. (2025), The climatic patterns that control regional fire activity in the Brazilian savanna, *Agricultural and Forest Meteorology*.

Fire activity in the Brazilian savanna (Cerrado) is heavily constrained by climate, however the climate patterns that lead to extreme fire seasons are not yet well understood. Climate conditions during the fire season determine fire weather, but climate patterns prior to the fire season months may also modulate fuel availability and condition. In the context of a changing climate, understanding the climatic patterns that lead to extreme fire events, and their mediating factors, is crucial to build resilient landscapes and inform decision-making. In this study, the authors propose to uncover the nature of these relationships for Cerrado. They evaluate the regional temperature and precipitation patterns that lead to severe and mild fire seasons for each of the 19 ecoregions of Cerrado. This study identifies two periods that show contrasting behaviours in both extremes: the concurrent climate conditions during the fire season months (August to October) and pre-conditions during the austral autumn (March to May). Despite noteworthy regional discrepancies, in general findings indicate that severe fire seasons are preceded by hot and dry conditions during autumn and associated with hot and dry conditions during the fire season months. Mild fire seasons see the opposite pattern, with colder and wetter conditions both during and prior to the fire season. This research further investigates the influence of these climatic patterns in extreme fire activity for each month of the fire season and find that, over most ecoregions, early fire season burned areas are influenced by pre-conditions during autumn, whereas late fire season burned areas rely on concurrent favorable meteorological conditions. These results contribute to the understanding of the regional fire-climate dynamics of the second largest biome in South America and provide a starting point for regional fire outlooks. The authors further provide regionally tailored information that, considering recent Brazilian policies, may prove useful for fire management.

[Learn more.](#)

CGIAR scientists from CIFOR published a report in 2021 that maps pantropical future fire danger in 2050 (2025-2049), 2075 (2050-2074) and 2100 (2075-2099) to support adaptation, resilience and capacity building efforts.

[Read here.](#)

OTHER CLIMATE CHANGE PAPERS OF INTEREST

- Lee, Donghoon, et al. (2025), [HarvestStat Africa – Harmonized Subnational Crop Statistics for Sub-Saharan Africa](#), *Scientific Data*.

[Access publication here.](#)

- Pingault, Nathanaël and C. Martius (2025), [Prioritizing mitigation pathways in land use and food systems](#), *CGIAR Initiative on Low-Emission Food Systems*.

[Access publication here.](#)

- Redicker, S., et al. (2025), [Gender dimensions of adaptive capacity and adaptation responses to climate shocks in rural households: Ghana, Mali, Kenya, and Ethiopia](#), *Environmental Research Letters*.

[Access publication here.](#)

- Dagnachew, Anteneh G., et al. (2025) (2025), [Emission Pathways and Climate Targets: Exploring the emission gap and financing needs in low- and middle- income countries](#), *PBL Netherlands Environmental Assessment Agency*.

[Access publication here.](#)

- Naik, Vaishali, et al. (2025), [Climate models need more frequent releases of input data — here's how to do it](#), *Nature*.

[Access publication here.](#)

- Brodie, Jedediah F., et al. (2025), [The contribution of other effective area-based conservation measures \(OECMs\) to protecting global biodiversity](#), *Nature Communications*.

[Access publication here.](#)

- Khavarian-Garmsir, Amir Reza, et al. (2025), [How does the climate change and migration nexus result in maladaptation?](#), *Climate Policy*.

[Access publication here.](#)

- Cresto Aleina, Fabio and J. Beagley (2025), [Health: The missing metric in climate ambition: The case for health-inclusive NDCs – ambitious climate action to save lives](#), *PLOS Climate*.

[Access publication here.](#)

- Boas, Ingrid, et al. (2025), [Climate-induced redistribution of people is not inevitable](#), *Environmental Research Letters*.

[Access publication here.](#)

- Yan, Helen F., R. Morais and D. Bellwood (2025): [Species abundances surpass richness effects in the biodiversity-ecosystem function relationship across marine fishes](#), *Nature Communications*.

[Access publication here.](#)

- Deng, Yuanzhizi and Y. Zhang (2025), [The response of ecosystem marginal water use efficiency to soil drying](#), *Agricultural and Forest Meteorology*.

[Access publication here.](#)

- Han, Sungju, et al. (2025), [Beyond individual barriers: a systems approach to understanding and addressing nature-based solutions implementation challenges](#), *Climate Risk Management*.

[Access publication here.](#)

- Grisolia, Filippo, N. Holvoet and S. Dewachter (2025), [Facing climate change together? The role of the collective dimension in mediating cash transfer effects on climate adaptation](#). *Climate Policy*.

[Access publication here.](#)

-
- Slobodian, Lydia, *et al.* (2025), [Quantifying the presence and potential of national legal frameworks for global mangrove protection](#), *Cell Reports Sustainability*.

[Access publication here.](#)

-
- Wei, Yi-Ming, *et al.* (2025), [Navigating energy transition solutions for climate targets with minerals constraint](#), *Nature Climate Change*.

[Access publication here.](#)

-
- Panosetti, Fadia, T. Labadi and A. Heneiti (2025), [Agrarian questions in global Palestine: past, present and future](#), *The Journal of Peasant Studies*.

[Access publication here.](#)

-
- Alibudbud, Rowalt (2025), [Queering the framework of women's food environments: insights from the Philippines](#), *The Lancet Planetary Health*.

[Access publication here.](#)

-
- Cai, Jinyang and Z. Cheng (2025), [How do climate anomalies affect smallholder farmers' land transfer decisions? Evidence from China](#), *Climate and Development*.

[Access publication here.](#)

-
- Dwyer, Orla (2025), [Mapped: 16 times extreme weather drove higher food prices since 2022](#), *Carbon Brief*.

[Access publication here.](#)

-
- World Health Organization and World Meteorological Organization (2025), [Climate change and workplace heat stress: technical report and guidance](#), *WHO and WMO*.

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