Issue 23
February 28, 2025

NEWSLETTER

Smart & Net-Zero Project

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.

Overview

Sustainable Rice Production:

Technology Overview, Regional Contexts and Emerging Practices

Rice feeds half the global population, supplying 20% of dietary energy, yet it accounts for 48% of cropland GHG emissions, with methane (CH_4) as the dominant contributor. With demand projected to rise 40% by 2030, adopting sustainable practices is crucial to balancing productivity and environmental sustainability.

This Issue 23 overviews the integrated low-carbon rice farming practices and the regional and national perspectives in mitigation strategies, trade-offs, and net system approaches, as well as the emerging practices highlighted in the **Research** section.

The **News** section features IRRI-led collaborations, Thailand's AWD adoption, hybrid rice, and the GloRice dataset for global rice mapping in the **Open Data** section. The **Policy** section explores non-CO_2 GHG mitigation, IFAD's methane reduction guidance for NDCs, the US EPA's long-term emissions projections, and Japan's MIDORI initiative supporting innovations for sustainable agriculture.

Content

RESEARCH

01 THEME: GHG emission reduction

Greenhouse gas emissions and mitigation in rice agriculture

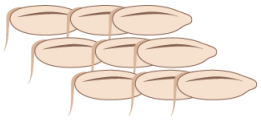
September 26, 2023 | Nature Reviews Earth & Environment | Source |

Introduction: This collaborative review, conducted by researchers from 3 universities in China, University of Exeter (UK), UC Davis, (US), JIRCAS, IRRI and other institute across the globe, examines the spatial and temporal scales of greenhouse gas (GHG) emissions in rice cultivation, climate change effects, and potential mitigation strategies. Focusing on field-scale research, it assesses mitigation effectiveness of emission reductions and identifies key research gaps to improve emission estimates and enhance sustainability in rice agriculture.

Key findings: Rice paddy GHG emissions vary widely with agricultural practices, climate, and geography. While higher yields have reduced yield-scaled CH_4 emissions, N_2O emissions are rising with increased nitrogen use and non-continuous flooding (NCF). Climate change, particularly elevated CO_2 and warming, is expected to further increase emissions, with China, India, and Indonesia as major contributors. Effective management strategies, identified as the following lists, are key to reducing rice paddy GHG emissions, outweighing the impact of climate and soil type.

- **Rice Variety Selection:** High-yielding, low-emission cultivars can reduce CH_4 emissions by altering root oxygen release and rhizodeposition patterns.
- **Water Management:** Optimizing drying frequency, timing, and severity enhances GHG mitigation. NCF methods, such as AWD and mid-season drainage, reduce CH_4 emissions by 53%, outweighing associated increases in soil carbon loss and N_2O emissions.
- **Organic Matter Management:** Straw removal, composting, and optimized organic matter type, timing, and application reduce CH_4 emissions while maintaining soil fertility. Biochar application further lowers both CH_4 and N_2O emissions.
- **Nitrogen Management:** Optimizing fertilizer use and adopting enhanced-efficiency fertilizers can cut N_2O emissions by up to 60%, while targeted application methods improve overall nitrogen use efficiency.
- **Tillage and Crop Establishment:** No-till and direct seeding reduce CH_4 emissions by 40–60% compared to conventional tillage. Ratoon cropping, which harvests a second crop from previous stubble, also influences GHG emissions.
- **Emerging Practices:** Lime application lowers CH_4 emissions by 20% in acidic soils, while biochar, oxygen-releasing fertilizers, and microbial inoculations offer additional mitigation potential.

The study highlights the need for region-specific strategies to address CH_4 emissions, improve data accuracy, and refine GHG models. Given the projected rise in GHG emissions, integrating multiple management practices and quantifying their interactions will be essential for reducing environmental impact while sustaining global rice production.



Rice cultivar

Select local high-yield cultivars with low GHG emissions

Water management

- **Rice season: apply non-continuous flooding practices**
  - Timing: if possible, drain at high CH_4 emissions stages
  - Numbers: multidrain if possible, or single drain
  - Severity: moderate drain (i.e. soil water potential, −10 to −20 kPa; water level below soil surface, 10–25 cm)
  - Days: unflooded days as long as possible
- **Fallow season: if possible, maintain unflooded**

Organic matter management

- Low SOC content: compost manure and straw addition (if possible, at fallow or upland crop season), plant low C/N green manure
- High SOC content: if possible, straw removal or return at fallow or upland crop season

Mineral N management

- N rate: optimal N rate at which maximum yield is achieved
- N placement: place fertilizer to ~10 cm of soil depth
- N type: if possible, apply enhanced efficiency N fertilizers or ammonium sulfate

Tillage and crop establishment

- **Tillage:**
  - Rice season: apply no tillage, if no tillage transplanting equipment and technology to sustain rice yield are available
  - Fallow season: if possible, apply conventional tillage
- **Crop establishment:**
  - Apply direct seeding, if direct-seeding equipment and technology to sustain rice yield are available
  - Plant ratoon rice when thermal energy exceeds requirements for single rice but falls short of requirements for double rice

Liming

Acidic soils (pH <5.5): lime addition

Figure | Potential mitigation strategies.
Overview of management practices in rice agriculture to achieve high yields and low greenhouse gas (GHG) emissions.

02 THEME: GHG emission reduction; Carbon sequestration

Opportunities for mitigating net system greenhouse gas emissions in Southeast Asian rice production: A systematic review

February 28, 2024 | Agriculture, Ecosystems & Environment | Source |

Introduction: Despite existing mitigation efforts, integrated approaches addressing system-wide emissions—including soil organic carbon (SOC), energy use, and residue management—remain underexplored. This systematic review, conducted by researchers from the University of California Davis (USA), IRRI (Philippines), and INIA Uruguay, synthesizes scientific evidence across four components using a net system emissions framework. The study assesses cross-component effects and highlights effective mitigation opportunities critical for sustainable rice practices in SEA amidst growing global climate commitments.

Key findings: The study identifies key opportunities for mitigating net GHG emissions in SEA rice production across four components:

- **Field GHG Emissions:** Effective mitigation strategies include alternate wetting and drying (AWD) irrigation, mid-season drainage, straw removal or burning, and biochar application. These methods significantly reduce CH_4 emissions but may increase nitrous oxide (N_2O) emissions or lower SOC, requiring balanced management.

- **Energy Inputs:** Synthetic nitrogen fertilizers and fossil fuels are major emission sources. Mitigation strategies involve optimized fertilization through site-specific nutrient management, alternative nutrient sources like biochar, and reduced water-intensive irrigation methods such as AWD.

- **Residue Utilization:** Removing rice straw from fields to prevent open burning significantly reduces GHG emissions. Opportunities include repurposing residues for energy production, such as electricity or bioethanol, which offsets fossil fuel emissions and enhances energy efficiency.
- **Soil Organic Carbon (SOC):** Practices like biochar application, residue incorporation, and compost enhance SOC stocks, offsetting emissions. Biochar shows significant soil carbon gains, but high application rates may present practical challenges. Long-term research is needed to understand the combined effects of practices like drainage and straw removal.

The review emphasizes the importance of integrated approaches that address cross-component synergies and trade-offs. While field GHG emissions and SOC changes offer the largest mitigation potential, strategies like water and carbon management often involve trade-offs, such as SOC reductions from drainage. Long-term research is crucial to optimize integrated practices, balancing emissions reductions and SOC preservation effectively.

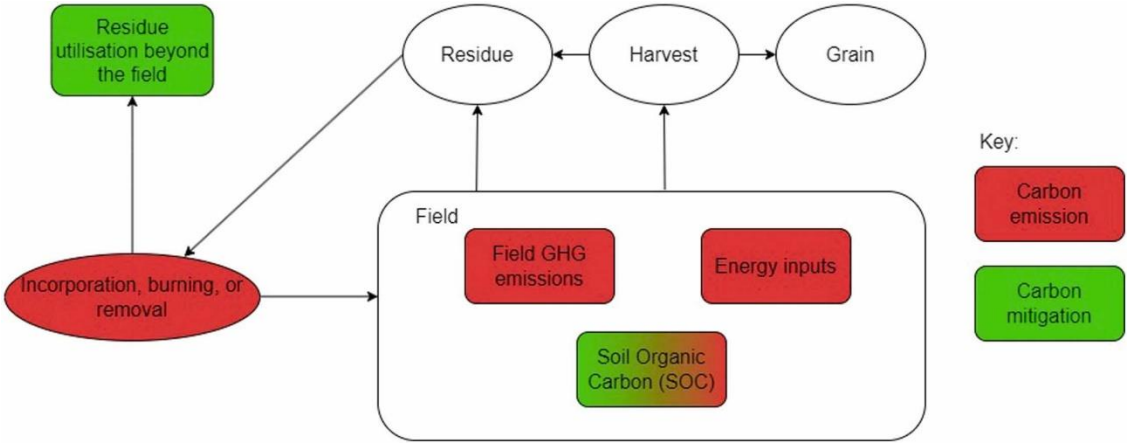


Figure | Schematic of net system emissions conceptual framework guiding the literature search and review (each colored box represents a pool of C flux, with red representing emissions and green representing mitigation).

03 THEME: GHG emission reduction

Greenhouse gas emission from rice fields: a review from Indian context

April 27, 2021 | Environmental Science and Pollution Research | Source |

Introduction: This review, led by scientists from the Department of Environmental Sciences at Central University of Jharkhand in India, examines the methane (CH_4) and nitrous oxide (N_2O) emissions from rice fields in India. It analyzes data from various locations to assess the impacts of field and crop management practices, highlighting the need for precise quantification to inform effective mitigation strategies.

Key findings: Research indicates that the highest CH_4 emissions occur under continuously flooded conditions, while intermittently flooded rice fields produce less CH_4 but more N_2O. The primary strategies for reducing emissions in Indian rice fields covered include:

- **Irrigation Management** – Alternate wetting and drying (AWD) can cut CH_4 emissions by 22-75% compared to continuous flooding.
- **Tillage Practices** – Zero and reduced tillage methods help lower CH_4 emissions by reducing soil organic matter decomposition.
- **Fertilizer Management** – Applying slow-release fertilizers, nitrification inhibitors (e.g., dicyandiamide), and organic amendments like biochar reduces both CH_4 and N_2O emissions.
- **Rice Cultivar Selection** – Certain cultivars with lower aerenchyma transport CH_4 and N_2O less efficiently, making them more sustainable options.
- **Manure Management** – Incorporating green manure and compost instead of synthetic fertilizers can significantly reduce GHG emissions.

The review highlights the urgent need for integrated mitigation strategies tailored to India's diverse rice ecosystems. Adoption of improved water, soil, and fertilizer management techniques can help balance high rice productivity with environmental sustainability while aligning with India's climate commitments.

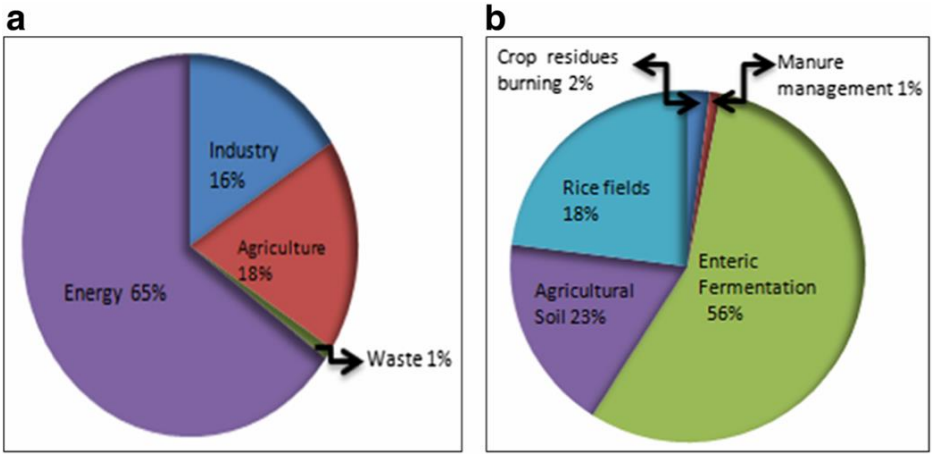


Figure | Emanation of greenhouse gas from a. different sector from Indian economy and b. sub sectors of agriculture in 2010

04 THEME: GHG emission reduction

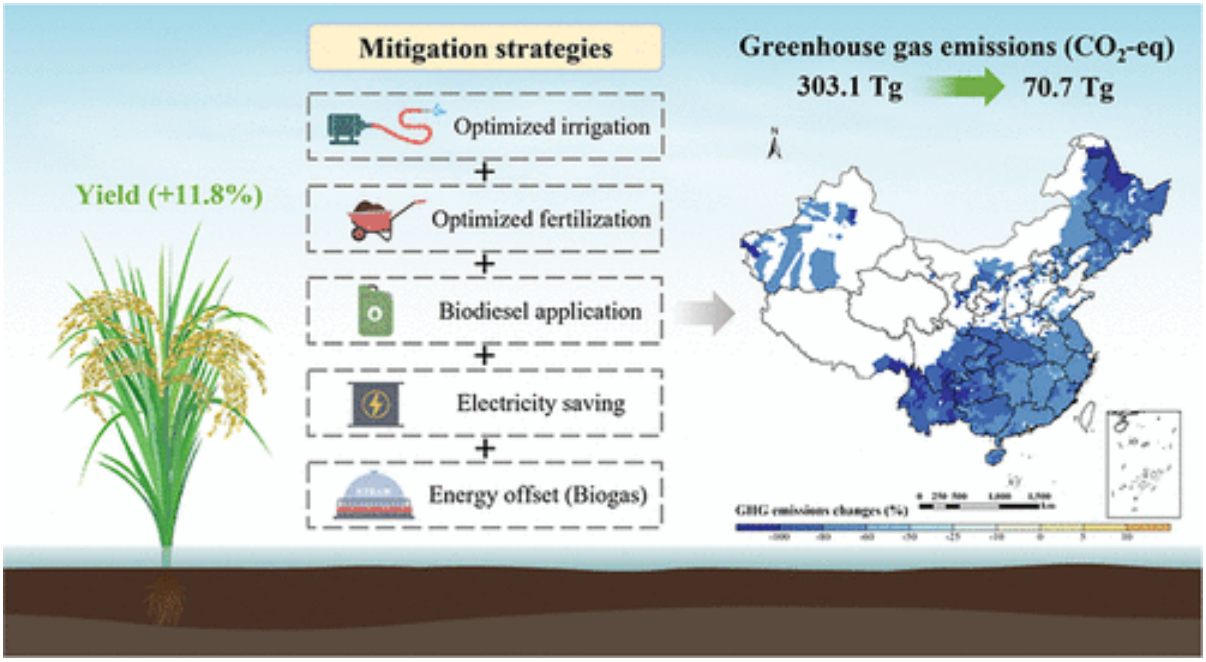
Toward Low-Carbon Rice Production in China: Historical Changes, Driving Factors, and Mitigation Potential

March 19, 2024 | Environmental Science & Technology | Source |

Introduction: This study, conducted by researchers from Hunan University and the Chinese Academy of Sciences, evaluates the historical carbon footprint (CF) of rice production across China's counties from 2007 to 2018. By integrating Life Cycle Assessment (LCA) with the Denitrification-Decomposition (DNDC) model, the study quantifies spatial and temporal variations in CF and identifies key driving factors and mitigation strategies.

Key findings: The farm-based carbon footprint (FCF) of rice production increased by 74.3 kg CO_2-eq ha^{-1} per year between 2007 and 2018, while the product-based carbon footprint (PCF) remained stable. CH_4 emissions from paddy fields were the dominant contributor to FCF, followed by diesel consumption and soil organic carbon (SOC) sequestration. Spatial analysis revealed significant regional disparities, with high FCF concentrated in the North China Plain and the Middle-Lower Yangtze Plain.

Scenario analysis showed that optimized irrigation, particularly alternate wetting and drying (AWD), could reduce national GHG emissions from rice production by 48.5%, while utilizing rice straw for biogas production could cut emissions by 18.0%. Combining multiple mitigation strategies—including improved crop management, optimized fertilization, and biodiesel use—could achieve a 76.7% reduction in emissions while increasing rice yield by 11.8%. The study underscores the need for targeted policies to implement AWD irrigation, optimize nitrogen fertilizer use, and promote bioenergy utilization to advance China's low-carbon agriculture goals.



05 THEME: GHG emission reduction; Carbon sequestration

An overview of underutilized benefits derived from *Azolla* as a promising biofertilizer in lowland rice production

January, 2023 | Heliyon | Source |

Introduction: *Azolla*, an aquatic fern with nitrogen-fixing capabilities through its symbiotic association with *Anabaena azollae*, has the potential to serve as an eco-friendly and cost-effective alternative to chemical fertilizers. Despite its benefits on soil fertility, nitrogen use efficiency, reducing weed competition, and mitigating emissions—its adoption remains limited among rice farmers. This study, conducted by researchers from the Ministry of Education and Vocational Training, and Sokoine University of Agriculture in Tanzania, systematically reviews the benefits, constraints, and application strategies of Azolla in lowland rice production using the PRISMA method.

Key findings: The study highlights several key aspects of *Azolla*'s role as a biofertilizer:

- **Soil Fertility and Nutrient Cycling:** *Azolla* significantly enhances soil organic matter, increases microbial biomass, and improves soil nutrient availability. Its incorporation into rice fields can replace up to 60 kg N ha^{-1} of synthetic fertilizer.
- **Nitrogen Fixation and Release:** *Anabaena azollae* within *Azolla* fixes atmospheric nitrogen, providing an essential nutrient source for rice. When used as green manure, 56–75% of its nitrogen content becomes available to the rice crop within 3–6 weeks after application.
- **Weed Suppression:** A dense *Azolla* mat reduces light penetration, suppressing weed emergence and decreasing reliance on herbicides.
- **Reduction of Ammonia Volatilization:** *Azolla* lowers floodwater pH and temperature, thereby reducing nitrogen loss due to ammonia volatilization.
- **Enhanced Rice Yield:** Studies indicate that incorporating Azolla into rice fields can increase grain yield by 27–36%, comparable to full nitrogen fertilization.
- **Constraints to Adoption:** Despite its benefits, *Azolla* cultivation faces several challenges, including high labor requirements for incorporation, the need for phosphorus supplementation, and the difficulty of maintaining consistent biomass production across different agroecological zones.

To enhance the adoption of *Azolla* as a biofertilizer, strategic initiatives should focus on farmer education, research into species-specific performance, development of cost-effective application methods, and policy support for integrated nutrient management. Expanding its use in sustainable rice production could significantly contribute to improving soil health, reducing dependency on synthetic fertilizers, and promoting climate-smart agricultural practices.

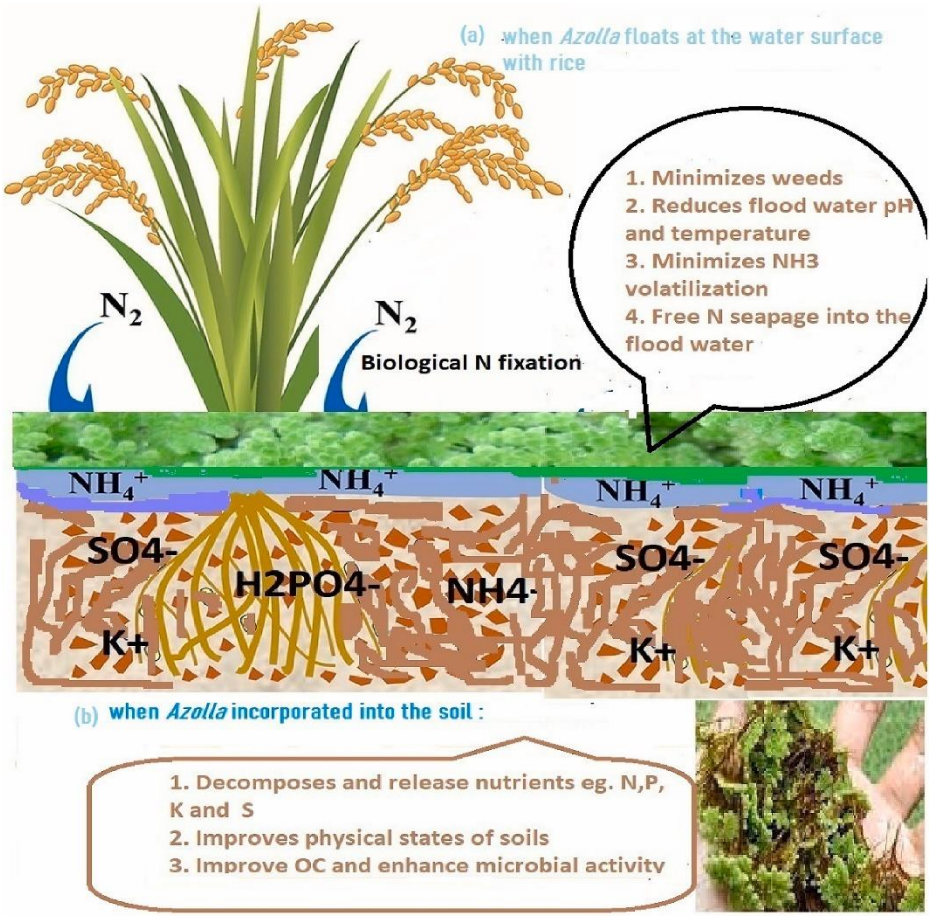


Figure | Illustration showing some benefits of *Azolla* biofertilizer when either left flooded (a) or incorporated in the soil (b).

NEWS

01 **THEME:** GHG Emission Reduction

IRRI and Kubota partner up on experiment to reduce GHG emissions

February 2, 2025 | International Rice Research Institute (IRRI) |

The International Rice Research Institute (IRRI) and Kubota Corporation have launched a field experiment to evaluate strategies for reducing greenhouse gas (GHG) emissions in rice cultivation. The project combines Alternate Wetting and Drying (AWD) and rice straw removal to mitigate emissions while maintaining rice growth, yield, and quality to support food security. Funded by Japan's Ministry of Agriculture, Forestry, and Fisheries (MAFF), the initiative aligns with ASEAN's carbon neutrality and circular agriculture goals. IRRI Senior Scientist Dr. Kazuki Saito emphasized the partnership's role in co-developing integrated low-carbon practices for rice, aiming to achieve both food security and carbon neutrality. By collaborating with Kubota Corporation, IRRI aims to scale these solutions for broader adoption. Kubota Philippines President Mr. Yodo Kawase reaffirmed the company's commitment to advancing mechanized and sustainable agricultural innovations.

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02 **THEME:** GHG Emission Reduction; ICT in agrifood sustainability

Hybrid rice + innovations: a path forward for climate-smart agriculture

January 7, 2025 | International Rice Research Institute (IRRI) |

A recent study "Advanced technologies for reducing greenhouse gas emissions from rice fields: Is hybrid rice the game changer?", published in Plant Communications by researchers from IRRI, USDA, and the University of the Philippines Los Baños (UPLB), highlights hybrid rice as a promising solution to reduce greenhouse gas (GHG) emissions while ensuring food security. The study shows hybrid rice emits 19% less methane due to its shorter growth duration and enhances nitrogen-use efficiency, reducing nitrogen emissions. Innovations such as machine learning, gene editing, and high-throughput phenotyping further accelerate climate-resilient rice breeding. Integrating hybrid rice with nutrient optimization, controlled irrigation, and soil organic matter management could significantly lower emissions while improving productivity. However, understanding plant genetics, soil microbiota, and environmental interactions remains a challenge, and widespread adoption will require research, farmer incentives, and policy support.

03 **THEME:** Policy incentives, financing, pricing; GHG Emission Reduction

Verra Updates on 4.5 Million Over-Issued Carbon Credits from Rejected Rice Projects in China

January 10, 2025 | CarbonCredits.com |

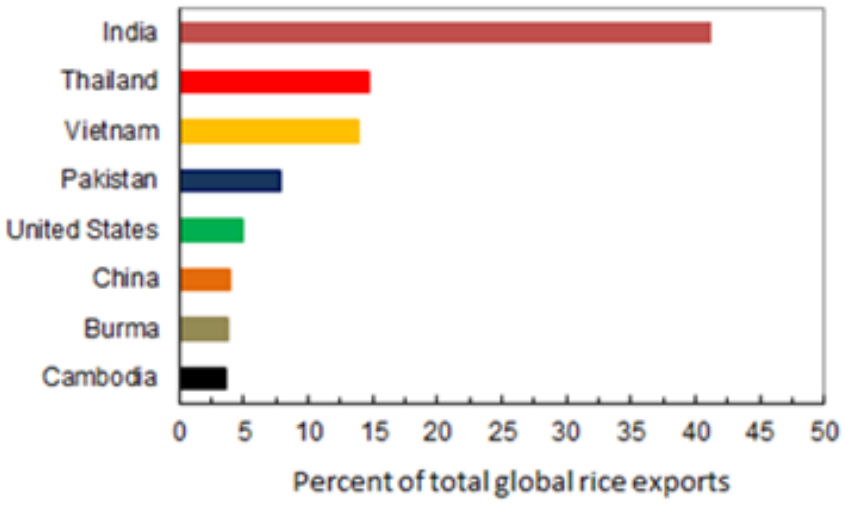
Verra has updated the compensation process for 4.56 million over-issued Verified Carbon Units (VCUs) linked to 37 rejected rice cultivation projects in China. An August 2024 review found that 25 projects issued more credits than earned, undermining carbon market integrity. To date, 480,000 VCUs from five projects have been compensated by Vitol (China) Energy and Timing Carbon Asset Management, while 4.08 million VCUs remain outstanding. Search CO2 (Shanghai) Environmental Science & Technology and Hefei Luyu Agriculture Technology, responsible for these credits, face registry account suspensions until full compensation is made. Verra is also reviewing validation and verification bodies (VVBs) involved, with potential sanctions or suspensions for non-compliance. This decisive action reinforces Verra's commitment to transparency, accountability, and strengthening the integrity of voluntary carbon markets.

04 **THEME:** GHG Emission Reduction

ASEAN leadership to bend the curve on climate by strengthening food systems

January 21, 2025 | World Economic Forum |

Figure 6. Share of global rice exports, 2021–23



Note: Trade share based on milled-equivalent basis of actual shipments. These exporters account for almost 90 percent of annual global rice exports. 2023 export data are based on September 2023 forecasts.
Source: USDA, Economic Research Service using USDA, Foreign Agricultural Service, *Production, Supply and Distribution* database.

Rice, a staple for over half the world's population, also contributes 1.5% of global greenhouse gas (GHG) emissions, largely due to inefficient fertilizer use and methane from flooded paddies. With 90% of the world's rice grown in Asia, ASEAN nations are at the forefront of driving climate-smart solutions. Sustainable rice farming practices, such as Alternate Wetting and Drying (AWD), direct

seeding, and the System of Rice Intensification (SRI), have demonstrated significant potential to reduce emissions, enhance yields, and optimize water use.

Thailand, a global rice export leader, has taken bold steps to advance low-emission rice farming. Since 2018, the Thai Rice NAMA project has expanded from 500,000 to 750,000 hectares, integrating policy support, financial incentives, and farmer training to scale sustainable practices. However, logistical, technical, and financial barriers still limit full adoption. To further drive systemic change, Thailand has also joined the First Movers Coalition (FMC) for Food, leveraging aggregated procurement to increase demand for sustainable rice and encourage infrastructure investment. By scaling these innovations across ASEAN, nations can ensure food security while reducing agriculture's climate impact, demonstrating that sustainable rice is both viable and in demand.

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05 **THEME:** Policy incentives, financing, pricing; GHG Emission Reduction

Thailand switching to low-carbon rice to meet net-zero goal

January 6, 2025 | The Nation |

Thailand's Agriculture and Cooperatives Ministry is promoting low-carbon rice cultivation to reduce greenhouse gas (GHG) emissions, advance its climate goals, and enhance global market competitiveness. Agriculture is Thailand's second-largest GHG-emitting sector, with methane from rice cultivation accounting for 40% of its agricultural emissions. To mitigate this, the Rice Department is expanding wet-and-dry rice cultivation, a water management practice that can cut emissions by 30%, benefiting 3,300 farmers across 22 provinces. Additionally, Thailand is scaling up microbial-based rice straw management to replace burning, further reducing emissions and improving soil fertility. With 10 million rai (1.6 million hectares) of low-carbon rice now cultivated in the Chao Phraya River basin, Thailand is making steady progress toward carbon neutrality by 2050, while supporting farmer livelihoods and driving a low-carbon economy.

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

Indonesian forestry minister proposes 20m hectares of deforestation for crops

January 9, 2025 | Mongabay |

Indonesia's Forestry Minister Raja Juli Antoni has announced a plan to convert 20 million hectares of forest into food and biofuel estates, raising concerns over deforestation, biodiversity loss, and massive carbon emissions. Experts warn this could release up to 22 billion metric tons of CO_2, undermining global climate efforts.

While the government claims agroforestry will mitigate environmental damage, critics argue it cannot prevent large-scale deforestation if intact forests are cleared. Palm oil expansion is also a growing concern, as past food estate projects have shifted to oil palm cultivation, a major driver of deforestation. The plan also risks agrarian conflicts, as many targeted areas overlap with Indigenous and community lands.

Parliament has urged caution, advocating for yield improvements on existing farmland instead of forest clearing. Without strong safeguards, clear boundaries, and transparency, experts warn this plan may repeat past failures, exacerbating the climate crisis.

07 **THEME:** Policy incentives, financing, pricing; GHG Emission Reduction

Taiwan Launches 20 Flagship Carbon Reduction Projects for 2050 Net-Zero Transition

January 23, 2025 | Newtalk News (In Chinese) |

The 3rd meeting of the Taiwan's National Climate Change Committee has unveiled a comprehensive decarbonization plan involving six key ministries to drive the country's 2050 net-zero transition. The plan includes 20 flagship carbon reduction projects and six innovative mechanisms across energy, manufacturing, transportation, construction, agriculture, and the environment, aiming for a 28±2% emissions reduction by 2030.

Key initiatives focus on accelerating renewable energy deployment, voluntary industrial emission cuts, net-zero buildings, resilient agriculture, circular economy practices, and electric commercial vehicles. Additionally, Taiwan is advancing innovation, green finance, carbon pricing, regulatory reforms, and sustainability workforce development to support this transition. By integrating

technology, finance, and community-driven solutions, the government aims to ensure an inclusive and just transition, laying a strong foundation for sustainable growth and climate resilience.

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08 **THEME:** Policy incentives, financing, pricing; GHG Emission Reduction; Carbon sequestration

Taiwan's Ministry of Agriculture Advances Low-Carbon and Circular Agriculture for Net-Zero Goal

January 23, 2025 | CNA NetZero (In Chinese) |

Taiwan's Ministry of Agriculture outlined three key strategies to support the nation's net-zero goal during the 3rd meeting of the Taiwan's National Climate Change Committee: deep carbon reduction, circular agriculture, and carbon sequestration. While agriculture accounts for only 2.16% of national emissions, the forestry sector could offset 7.64% of total greenhouse gas (GHG) emissions. Targeted initiatives aim to cut emissions and enhance carbon sinks, including biogas energy from livestock waste, precision feeding, fuel-efficient fisheries, and energy-saving aquaculture. Circular agriculture will repurpose agricultural residues into feed, materials, and fertilizers. To boost carbon sequestration, efforts focus on forest expansion, soil management, and marine restoration, such as seagrass beds, wetlands, and mangroves. Partnering with 70–80 private enterprises through ESG-driven initiatives, the ministry is promoting corporate engagement in sustainable agriculture. By 2030, these efforts aim to cut emissions by 2.82 million tons and increase carbon sinks by 1.37 million tons, reinforcing agriculture's role in Taiwan's climate transition.

POLICY

01 THEME: Climate-smart agriculture

Strategy for Sustainable Food Systems in Japan, "MIDORI"

Japan International Research Center for Agricultural Sciences (JIRCAS) | Source | Outline |

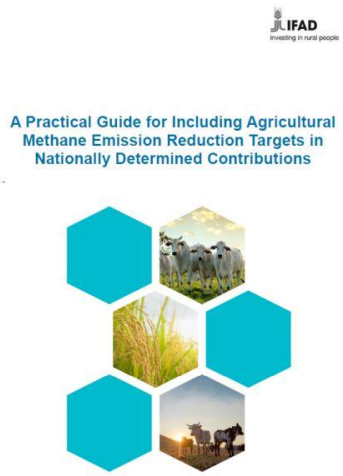
Japan's Strategy for Sustainable Food Systems "MIDORI", launched in 2021, aims to enhance agricultural productivity and sustainability through innovation. To support this goal, the Japan International Research Center for Agricultural Sciences (JIRCAS) is implementing the Green Asia Project (2022–2025) to accelerate the application of agricultural technologies in the Asia-Monsoon region.

Key initiatives include the International Center for Strategy "MIDORI", which collaborates with global and local research institutes to analyze and disseminate agricultural, forestry, and fisheries technologies. Resources such as Technology Catalog, Data Dashboard, and Green Asia Report Series provide stakeholders with actionable insights. For example, Report No.2, *"Accelerating Intermittent Irrigation for Low-carbon and Resilient Rice Production Systems in Asia"* highlights alternate wetting and drying (AWD) as a key practice for reducing water use, cutting methane emissions, and enhancing climate resilience in Asian rice production systems. With a focus on joint research, technology optimization, and climate-smart agriculture, Green Asia drives sustainable food systems transformation, tailored to the unique conditions of the region.

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

A Practical Guide for Including Agricultural Methane Emission Reduction Targets in Nationally Determined Contributions

International Fund for Agricultural Development (IFAD) | Source | Report |



This guide supports countries in integrating agricultural methane reduction targets into their Nationally Determined Contributions (NDCs). Methane abatement is critical for climate goals, offering rapid benefits due to its short atmospheric lifetime and providing co-benefits such as improved air quality and agricultural resilience.

The guide outlines key steps, including evaluating current emissions, identifying practical mitigation measures for livestock and rice production, and setting methane-specific targets. When assessing actions, countries should consider feasibility, cost-effectiveness, environmental trade-offs, and policy alignment. Effective methane targets must be practical, data-driven, globally aligned, and measurable.

Success depends on sector understanding, stakeholder engagement, and financial support, with methane abatement offering high climate impact per dollar invested. Transparency and clear methodologies are essential for accountability and implementation. By following these steps, countries can identify impactful strategies, raise ambition, and attract funding, fostering climate resilience in agriculture.

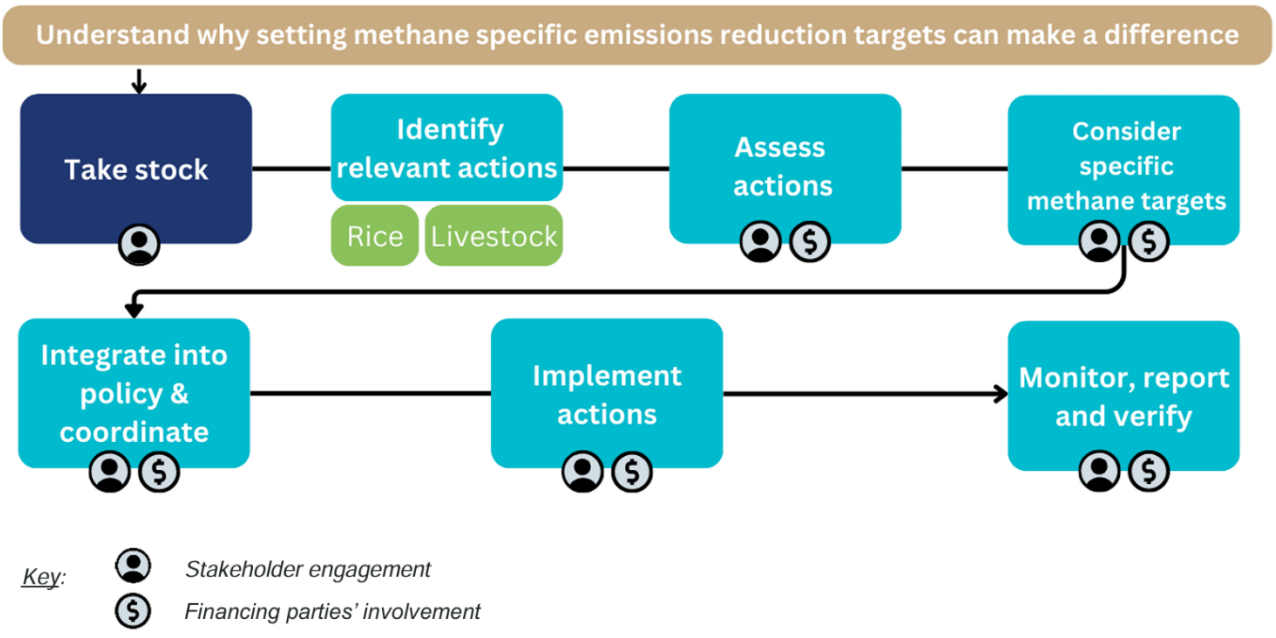


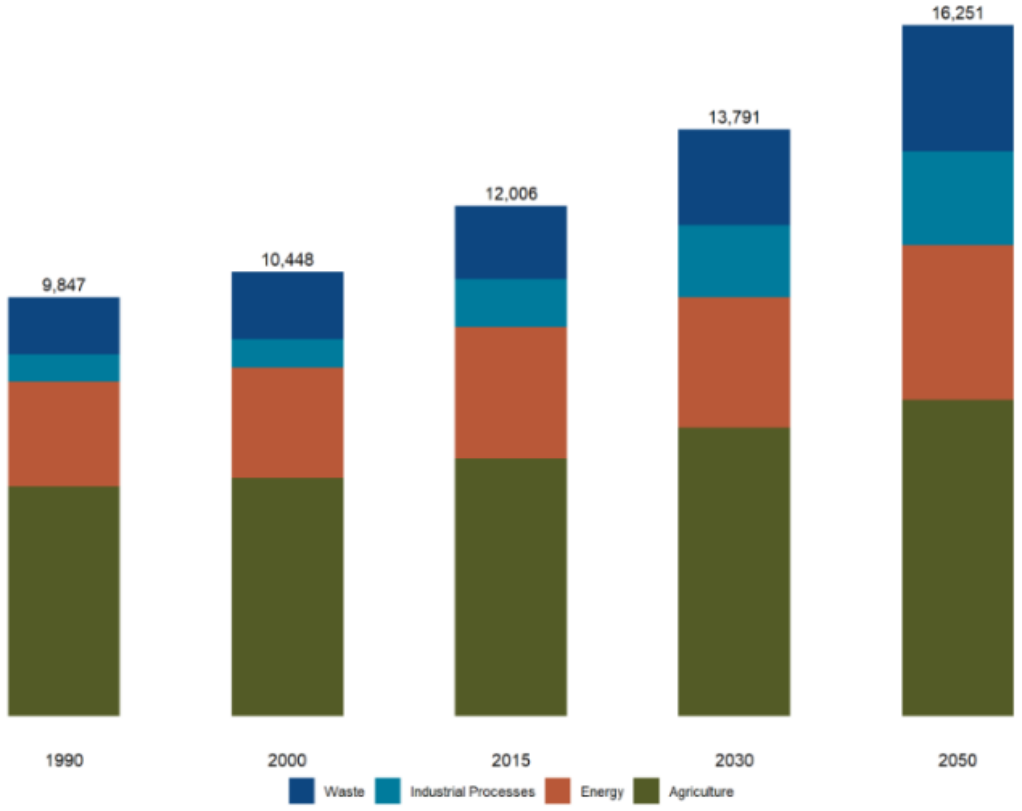
Figure | An overview of the steps to include methane reduction targets in NDCs 3.0.

03 THEME: Net-zero strategy

Global Non-CO_2 Greenhouse Gas Emission Projections & Mitigation Potential: 2020-2080

U.S. Environmental Protection Agency (EPA) | Source | Report |

The EPA report provides historical and projected emissions data for 195 countries, along with technical and economic mitigation estimates for non-CO_2 greenhouse gases (GHGs). The analysis helps assess national contributions to GHG emissions, historical progress in reductions, and mitigation opportunities. Updated projections indicate that overall non-CO_2 GHG emissions by 2050 remain consistent with the 2019 report, though the industrial processes sector's share has increased, while emissions from the waste sector have declined. By 2030, CH_4 emissions represent the greatest low or no-cost mitigation opportunities, including 55% of natural gas and oil systems and 65% of coal mines. Additionally, croplands and landfills account for over 68% of low or no-cost mitigation potential. By 2050, refrigeration and air conditioning will become the largest source of no-cost emission reductions. The total mitigation potential is estimated at 27% in 2030 and 33% in 2050, while no-cost mitigation options have decreased from 7% to 5% in 2030. The report's data annex and online tool offer detailed projections and mitigation data for policy and research applications.



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

Ireland – New Zealand Joint Research Mechanism

Government of Ireland | Source | Projects |

The Ireland – New Zealand Joint Research Mechanism (JRI) is a three-year pilot initiative (2022–2024) led by Ireland's Department of Agriculture, Food and the Marine (DAFM) and New Zealand's Ministry for Primary Industries (MPI) to enhance research collaboration and address shared challenges in the agrifood sector. It focuses on climate-smart agriculture, particularly reducing greenhouse gas (GHG) emissions from pasture-based livestock systems to support the transition of these systems to climate neutrality. The 2024 Joint Call for Research Proposals prioritizes emissions inventory refinement, mitigation technologies, and agri-digitalisation. €5.2 million has been awarded to three projects targeting methane emissions, urine patch emissions, and the development of emission factors.

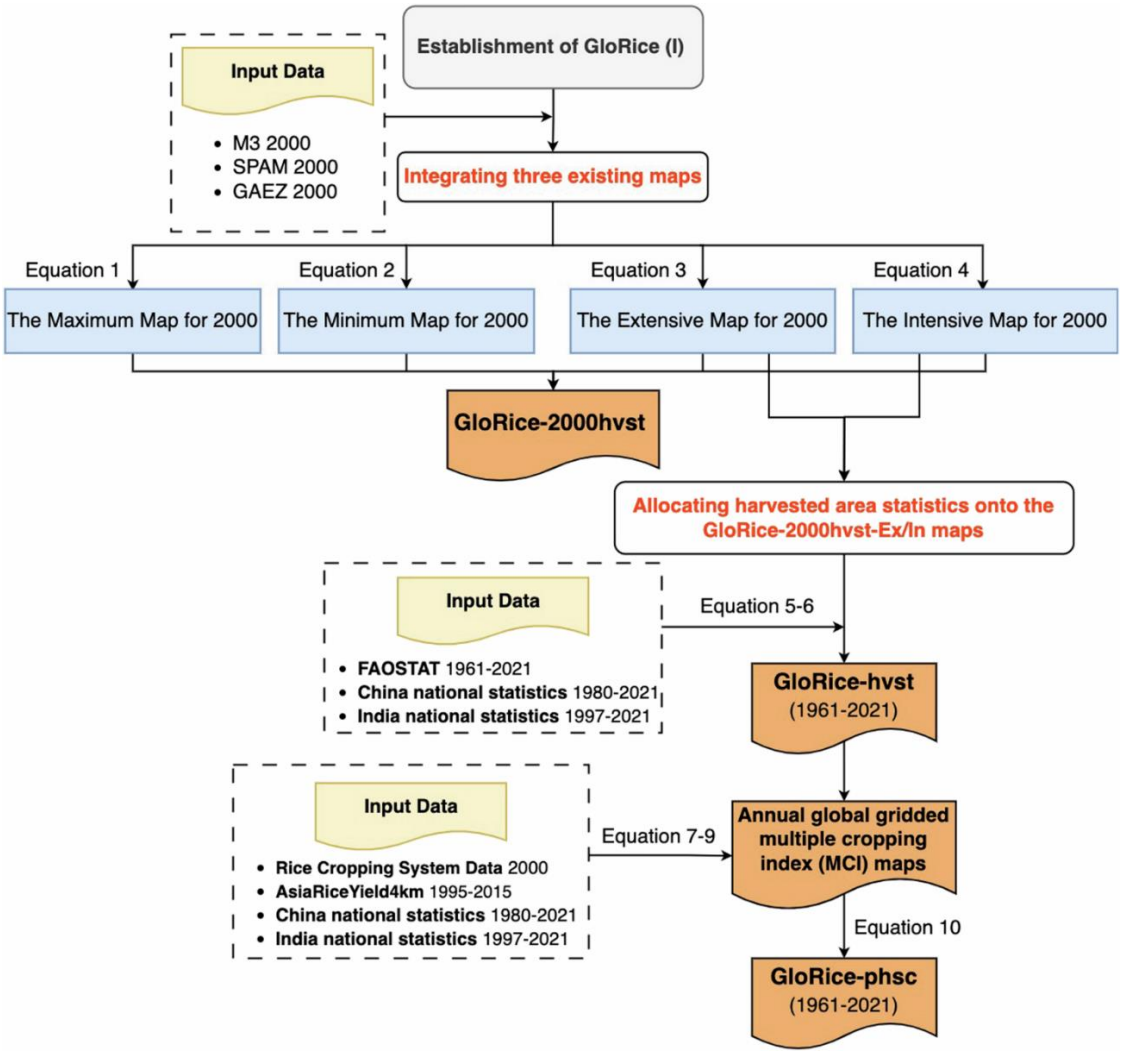
OPEN DATA

01 THEME: Climate-smart and net-zero toolkit

GloRice: Gridded Paddy Rice Distribution for the Years 1961 to 2021

Xie H, Li J, Li T, Lu X, Hu Q, Qin Z | Source | Download |

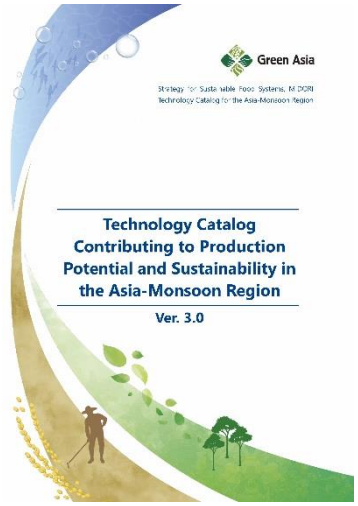
GloRice (v1.0) is a high-resolution global dataset mapping paddy rice harvested and physical areas from 1961 to 2021 at a 5-arcminute resolution. Developed by researchers from Sun Yat-sen University and the Chinese Academy of Sciences, it provides long-term data on rice-related variables for global modeling and estimation, including rice distribution, multiple cropping systems, water regimes, and residue treatment, capturing global and regional cultivation trends. The dataset integrates national and subnational statistics with established datasets (M3, SPAM, GAEZ) to generate annual rice distribution maps. It consists of three key components: (1) GloRice-2000hvst, a reference for the year 2000; (2) GloRice-hvst, annual harvested area maps; and (3) GloRice-phsc, annual physical area maps based on multiple cropping index data. Validation demonstrates strong accuracy at global, regional, and subnational levels, particularly for China, South Asia, and Southeast Asia. GloRice supports research in agriculture, climate modeling, and environmental sustainability, offering a valuable tool for assessing global rice production trends.



02 THEME: Climate-smart and net-zero toolkit

Technology Catalog Contributing to Production Potential and Sustainability in the Asia-Monsoon Region

Japan International Research Center for Agricultural Sciences (JIRCAS) | Source | Download |



The Technology Catalog (Ver. 3.0), developed by JIRCAS, aligns with Japan's MIDORI Strategy for Sustainable Food Systems. It currently compiles over 40 innovative agricultural technologies applicable to the Asia-Monsoon Region, aiming to enhance food system productivity and sustainability. The catalog covers key areas, including greenhouse gas (GHG) reduction, climate adaptation, chemical input reduction, labor productivity, resource management, and biomass utilization, supporting various agricultural commodities and addressing different stages of the supply chain. Featured technologies range from methane mitigation in rice paddies and precision irrigation to biochar-based soil carbon sequestration and smart agricultural machinery. As a valuable resource for researchers, policymakers, and stakeholders, the catalog promotes international collaboration and accelerates the transformation of sustainable agrifood systems in the region.

03 THEME: Climate-smart and net-zero toolkit

Controlled Environment Agriculture for Sustainable Development

United Nations Development Programme (UNDP) | Source | Download |

With global food demand expected to rise by over 50%, expanding agricultural land is not a viable or sustainable solution. Controlled Environment Agriculture (CEA) offers an alternative by using greenhouses, vertical farms, and other technologies to cultivate crops in non-traditional settings, optimizing resource efficiency while reducing environmental impact. Supported by the UNDP Singapore Global Centre and the Ministry of Sustainability and the Environment, this article explores CEA's potential to transform food systems, highlighting its benefits, challenges, and applications in lower- and middle-income countries. While CEA improves food security, resource-use efficiency, and resilience, high setup costs and energy demands remain barriers to broader adoption. Case studies from India, Kenya, Australia and UK demonstrate innovative models for scaling CEA. The article outlines pathways to support its adoption through multi-sector policy integration, investment in R&D, and hybrid approaches combining low- and high-tech solutions to enhance accessibility and sustainability.

EVENT

01

Pacific Regional Research Symposium 2025

May 22-23, 2025 | In-person | Nuku'alofa, Tonga | Source |

The Pacific Regional Research Symposium 2025 will take place in Nuku'alofa, Tonga, on May 22–23, 2025, under the theme *"Transforming Agriculture and Forestry in the Pacific through Science, Technology, and Partnerships."* Organized to foster collaboration among researchers, policymakers, and practitioners, the symposium invites abstracts for oral and poster presentations that highlight agriculture, forestry, and fisheries research in the Pacific. Submissions should demonstrate regional partnerships or engagement with local communities.

02

International Conference on Agriculture and Plantation Management (InCAPM) 2025

May 17, 2025 | Hybrid | Wayamba University, Sri Lanka | Source |

The International Conference on Agriculture and Plantation Management (InCAPM) 2025 will be held on May 17, 2025, at Wayamba University of Sri Lanka under the theme *"Think Big in Agriculture for a Boosting Bioeconomy."* Organized as part of the Silver Jubilee Celebrations of the Faculty of Agriculture and Plantation Management, the conference will feature research presentations on high-tech agriculture, food innovations, agro-environmental sustainability, and policy governance. The conference will be held in a hybrid format for international participants.

03

6th International Conference on Agriculture, Food Security, and Food Safety

August 6-7, 2025 | Hybrid | Kuala Lumpur, Malaysia | Source |

The 6th International Conference on Agriculture, Food Security, and Food Safety (AgroFood 2025) will be held on August 6–7, 2025, in Kuala Lumpur, Malaysia, with a hybrid format for global accessibility. Under the theme *"Feeding the World Sustainably: One Health, One World"* the conference will bring together leading researchers, policymakers, and practitioners to address pressing issues in agriculture, food security, and food safety. Key topics include sustainable and resilient agriculture, precision and digital farming,

alternative protein innovations, supply chain transparency, food safety and quality assurance, as well as bioengineering and AI-driven agrifood solutions. The early-bird registration deadline is March 4, 2025, and the final registration deadline is May 6, 2025.

04

23rd International Congress of Nutrition (IUNS-ICN 2025)

August 24-29, 2025 | In-person | Paris, France | Source |

The 23rd International Congress of Nutrition (IUNS-ICN 2025) will take place on August 24–29, 2025, at the Palais des Congrès, Paris, France, under the theme *"Sustainable Food for Global Health."* Organized by the French Society of Nutrition (SFN), the French Federation of Nutrition (FFN), the Federation of European Nutrition Societies (FENS), and the International Union of Nutritional Sciences (IUNS), the congress will cover a wide range of topics, including climate change and nutrition, public health, non-communicable diseases, precision nutrition, and food science. The event will feature lectures, symposia, oral presentations, and posters, with a strong emphasis on global and regional perspectives. A dedicated networking space and special support for young researchers from low- and middle-income countries (LMICs) will be provided.
