# Climate Tools and Prospects

## FOR LOW-EMISSION RICE PRODUCTION

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IRRI

The International Rice Research Institute (IRRI) is the world's premier research organization dedicated to reducing poverty and hunger through rice science. We have over 600 research and development partners worldwide, with offices in 15 countries across Southeast Asia, South Asia, and Africa.

irri.org

IRRI is a member of CGIAR, a global research partnership for a food-secure future.

cgiar.org

# Rice, the global food staple

Daily staple for **over half of the global population**, primary food for 2/3 of the world's poor

Grown in over **100 countries**, produces **470M tons** milled rice/year

Asia accounts for **91% of global rice production** and **87% of global consumption**

Consumption growth in Sub-Saharan Africa is fastest in the world, at **5% year over year**

**Feeds 4 billion**
56% of world population

**Grown by 144M families**
25% of world farmers

**Annual value $206 billion**
13% of world crop value

**Land Use 158M ha.**
10% of total crop land

**Fertilizer Use**
15% of world total

**Irrigation Use**
35% of world total

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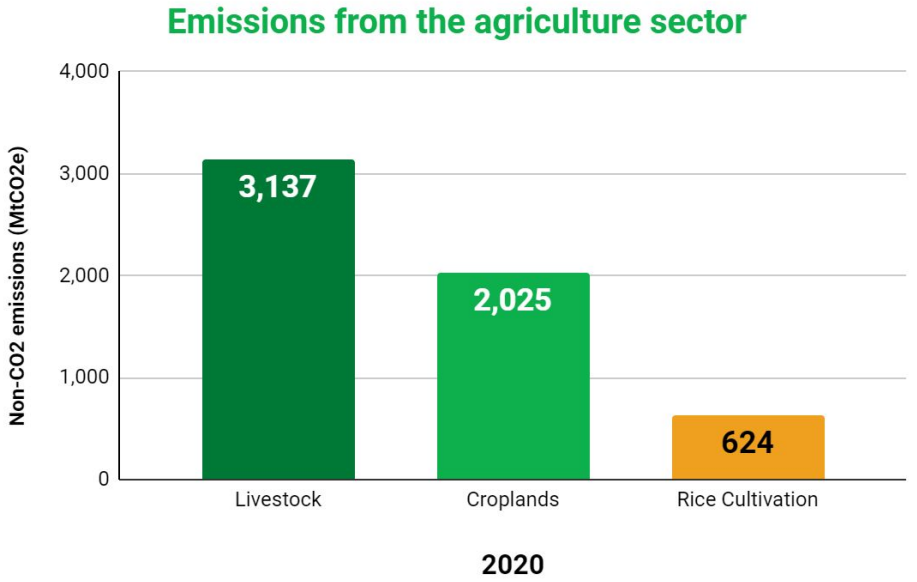
# Rice production and climate change

- Livestock contributes 40-50% to food system emissions compared to **rice cultivation at 6-8%**
- Globally rice cultivation is the **third-largest source of non-CO2 greenhouse gas emissions** in agriculture, next to livestock and all croplands (EPA, 2021)
- This is mostly due to the traditional method of paddy farming, where **flooded fields release methane** and other greenhouse gases through anaerobic decomposition

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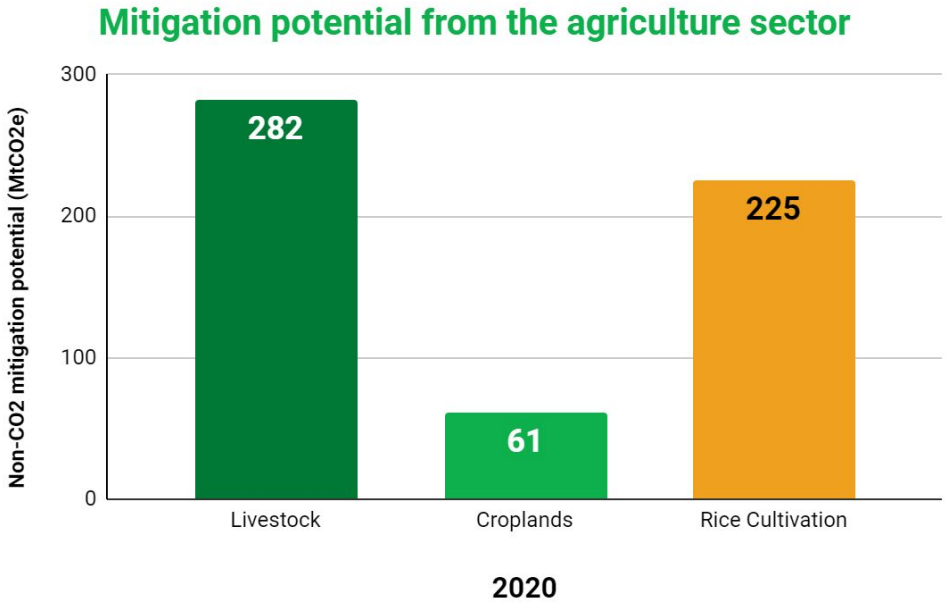
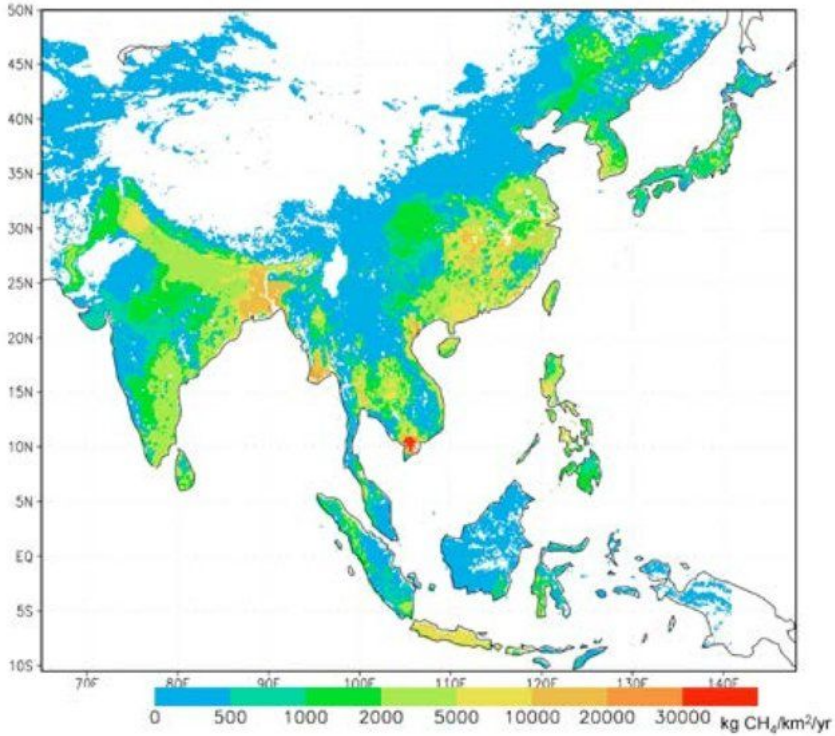
# Overlooked opportunity

- However, the relative **mitigation potential for rice (36%)** is much higher than that of livestock (9%), and croplands (3%) (Roe et al., 2021; EPA, 2021)
- This presents immense opportunities for channeling climate funding to rural communities and smallholder rice farmers
- By 2030, approximately **28% of the potential abatement** in rice, or 62 $MtCO_2e$, can be abated **at prices below $0/tCO$_2$e** with an **additional 26% reduction from baseline possible between $0 and $20/tCO$_2$e (EPA, 2021)**.



In the entire agriculture sector, paddy rice production offers one of the most promising options for reducing emissions

Estimated CH4 emission from rice paddy in Asia




Source: Yan et al., 2009

# Mitigation potential

1 hectare of rice (or 2.5 football fields of rice) emits on average 12.7 tons CO2 equivalent per year, compared to the average US household that emits 8.5tCO2e/yr

With low-emission cultivation technologies, a rate of up to 65% reduction can be achieved, as much as 9tCO2e/yr/ha in high baseline locations

This would be comparable to converting a home from fossil fuels to solar power

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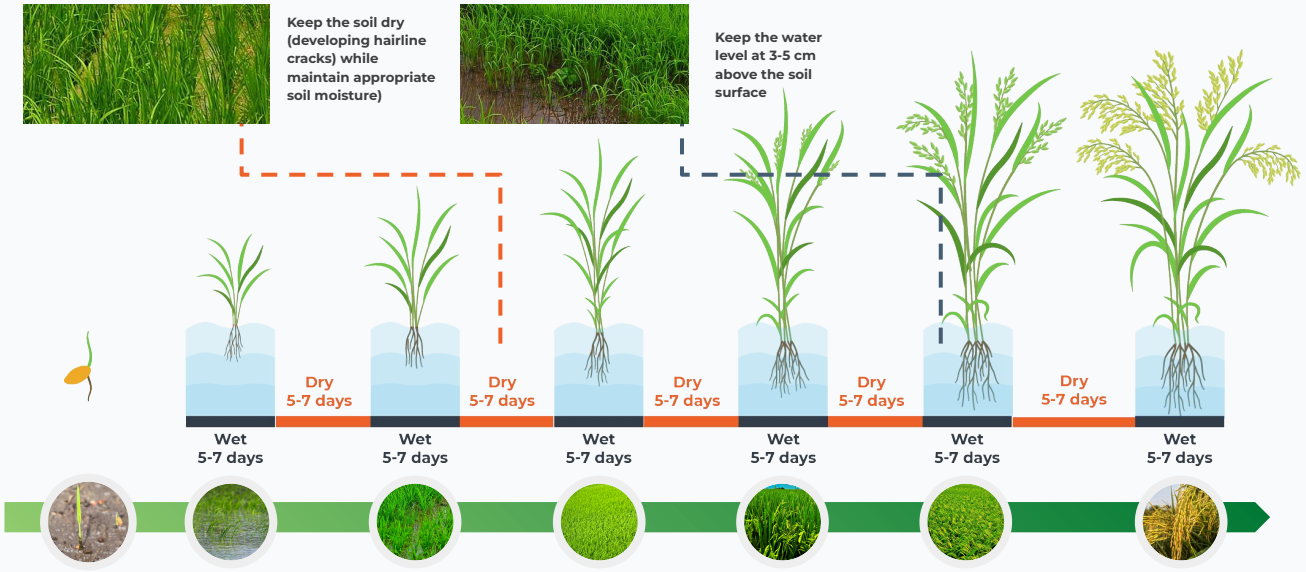
# Reducing methane while saving water

## ALTERNATE WETTING & DRYING (AWD)

AWD is a water-saving technology that farmers can apply to reduce their irrigation water use in rice fields without any yield penalty. In AWD, irrigation water is applied a few days after the disappearance of the ponded water. Hence, the field is alternately flooded and non-flooded.




**Applied for rice varieties with growing cycle from 90-100 days**

**$$**

Low-emission technologies can often also save farmers money through more efficient use of water and other inputs, upwards of $150 per hectare, without sacrificing yield.

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# How much can emissions be reduced?

UP TO
**10%**
***Timing* of residue incorporation in field**

→

UP TO
**7%**
**Planting short-duration rice varieties**

→

average
**33%**
**Alternate Wetting & Drying, Efficient use of fertilizer**

→

UP TO
**15%**
***Amount* of residue left after harvest, no straw burning**

As much as **65%** reduced emissions in high-baseline locations

# What's needed to implement low-emission initiatives

Knowledge on how to calculate emissions based on farmers' practices

Information about practices that reduce emissions in rice production

Capacity to monitor, report, and verify changes in practices that reduce emissions

Financing for low-emission rice projects

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# IRRI Climate Change Research

- The IRRI climate change team has been doing research on emissions in rice for over 20 years and are global leaders in this field
- Our extensive data and expertise has allowed us to develop robust and innovative technologies and methodologies for measuring, analyzing, and mitigating emissions across rice ecosystems and the entire rice value chain

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# OUR TECHNOLOGY TOOLS

SECTOR

CF-Rice

MapAWD

COMPARE

RiceMo

CGIAR

IRRI

SECTOR

# Greenhouse Gas Calculator for Rice

- A new GHG calculation tool based on the IPCC approach for rice and other crops
- High flexibility in terms of emission-and scaling factors
- Easy data transfer from crop statistics for entering activity data and detailed specification of GHG scenarios
- Add-on to field measurements for upscaling
- GHG inventory at subnational/national/sectoral scale with possible GIS-link
- Planning, monitoring, reporting and verification of agriculture projects with low-emissions goals


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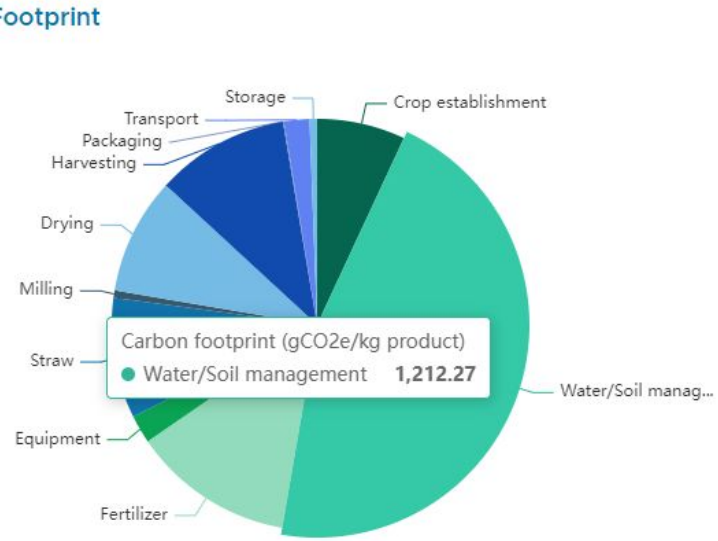
CF-Rice

# Carbon Footprint Assessment of Rice Value Chains

- Incorporates the emissions from field activities and off-field processes
- Accounts for losses during harvest and post-production processes and calculates emissions resulting from food loss
- Product-scaled emission results (kgCO2e per kg of product)
- Includes default measurements and the ability for users to enter values manually
- Tool for monitoring, reporting, and verification of low-emission practices along the entire rice value chain




| Summary | |
|---|---|
| Carbon footprint | 2,647.93 gCO2e/kg product |
| Total product | 2.8 tons |
| GHG emissions | 7,334.3 CO2e/ha |
| GHG intensity | 1,809.7 CO2e/kg paddy |

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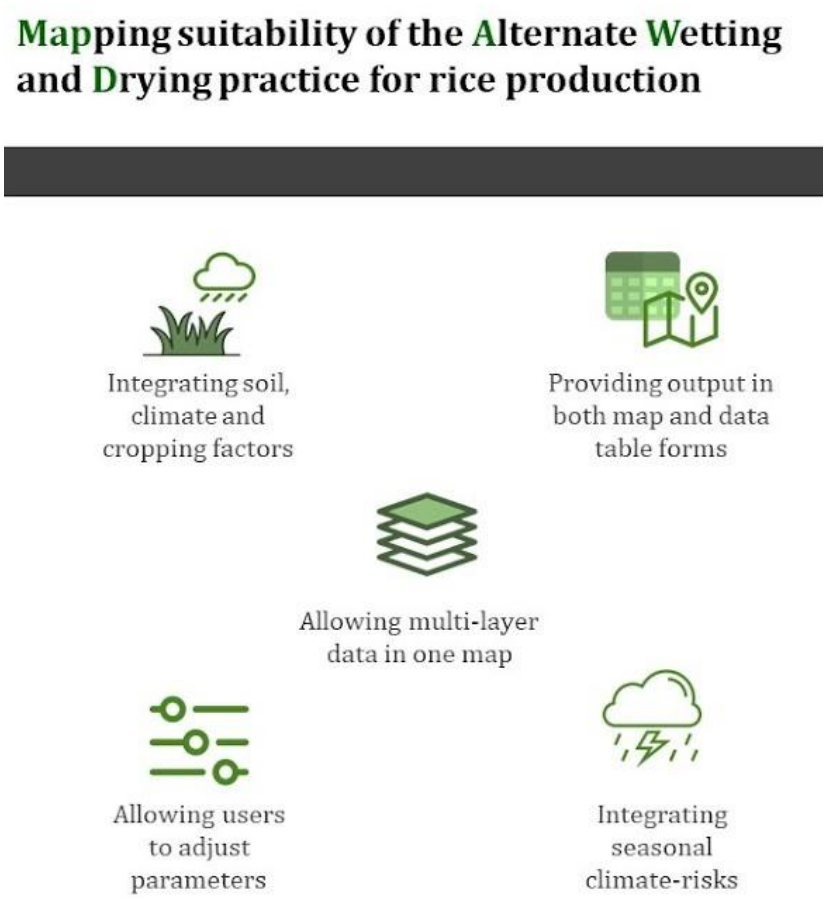
MapAWD

# Mapping suitability of the Alternate Wetting and Drying practice for rice production

- Evaluates and maps the climatic suitability for the AWD irrigation technique.
- Uses a spatially explicit water balance model. Integrating climate-risks and unfavorable soil conditions into the analysis.
- Applicable to all irrigated rice growing areas and at any geographical scale.
- User-friendly, simple, quick  input data requirements.

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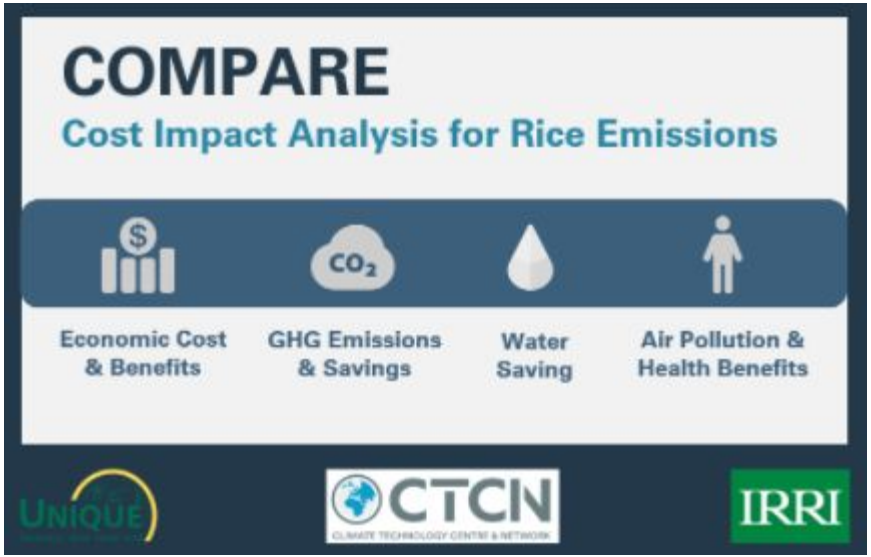
# Cost-Impact Analysis for Emission Reduction Projects

- 8 low-emission rice management packages included for comparison and planning
- Ability to include capital and operational expenditures
- Investment planning results include Net Present Value
- (NPV), annual annuity, return on investment, Marginal Abatement Cost Curve (MACC)

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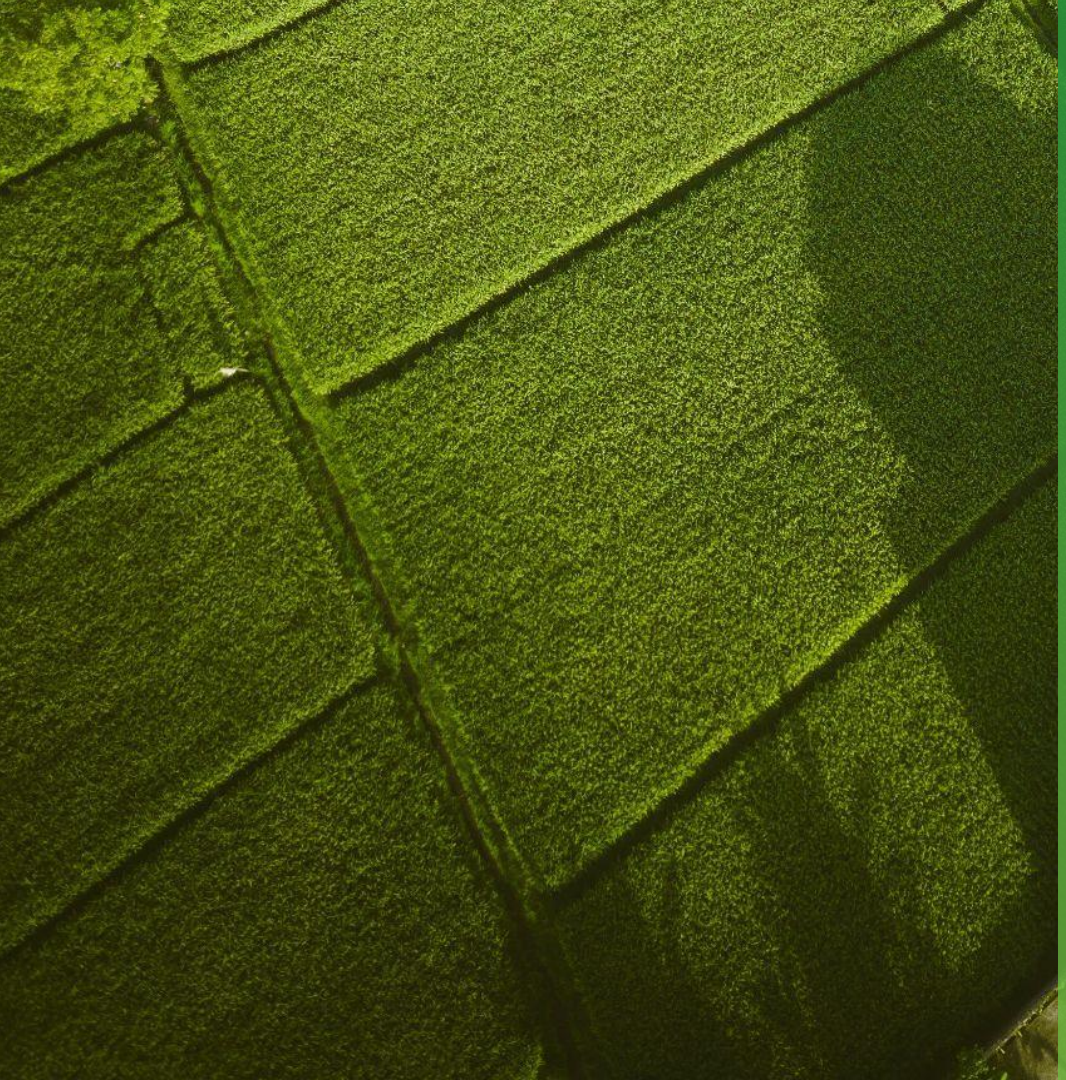

**Contact us**

IRRI Scientist Dr. Katherine Nelson
k.nelson@irri.org

**Visit our websites**

Main IRRI website: irri.org

GHG Mitigation in Rice: ghgmitigation.irri.org