

Rice Production and Methane

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IRRI's Previous Projects on Climate/ Climate Change

- **In 1961-62, studies on the effect of temperature on rice in the growth chamber**
- **In 1971-72, studies on the effect of CO₂ enrichment on rice in open-top chambers**
- **1991-1999, studies on CH₄ emissions, Temp/CO₂ + UV-B effects and modeling**
- **Since 2006, Rice and Climate Change Consortium as a platform for assessing mitigation, adaptation and regional impacts**

US-EPA project (1991-1995)

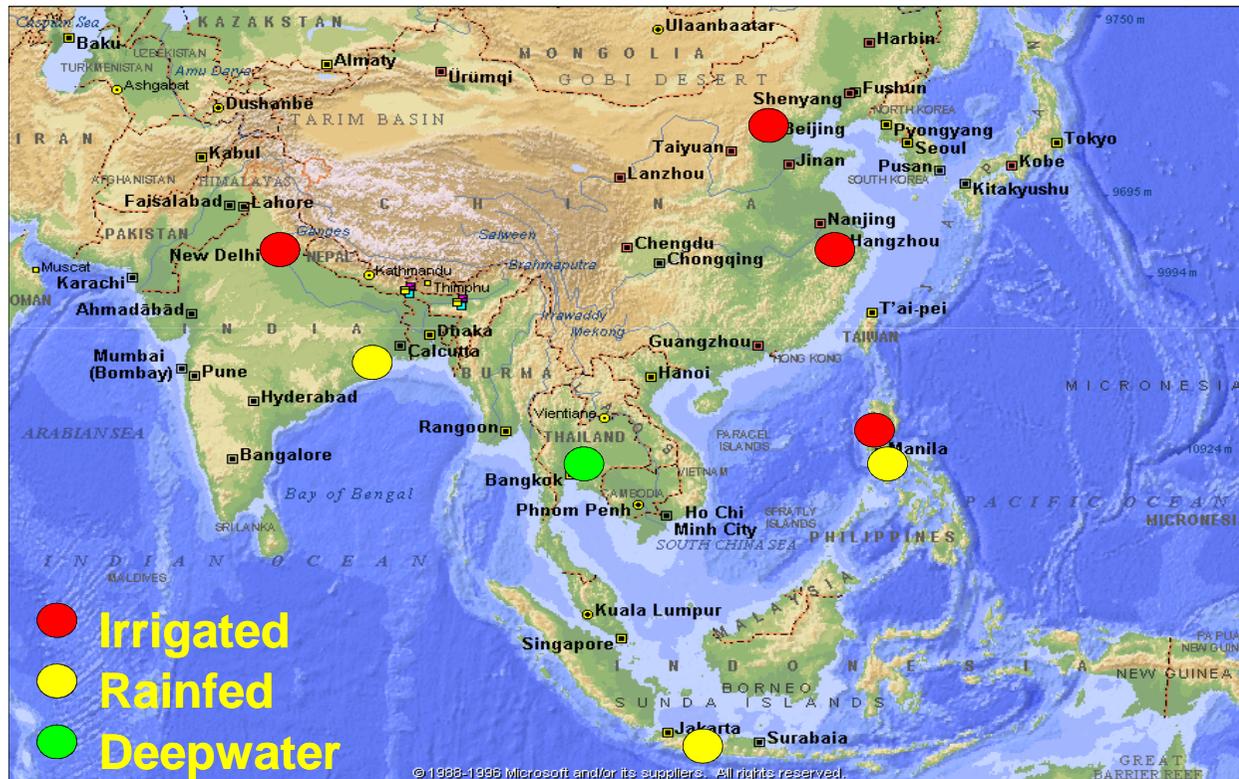


Open-top chambers
(Temp./ CO₂ effects)

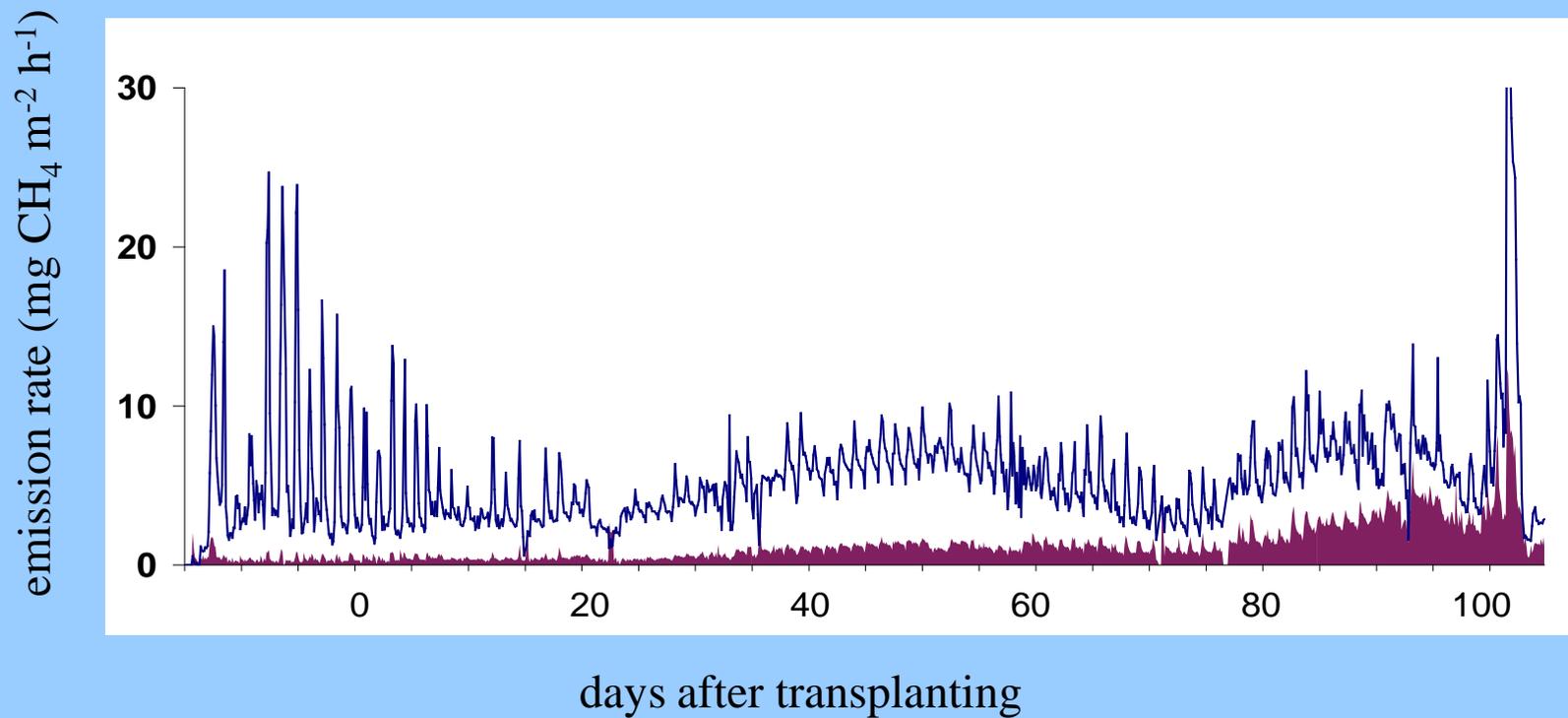


Closed chambers
(Methane emissions)

Interregional Program on Methane Emissions from Rice Fields (funded by UNDP/GEF, 1993-1999)

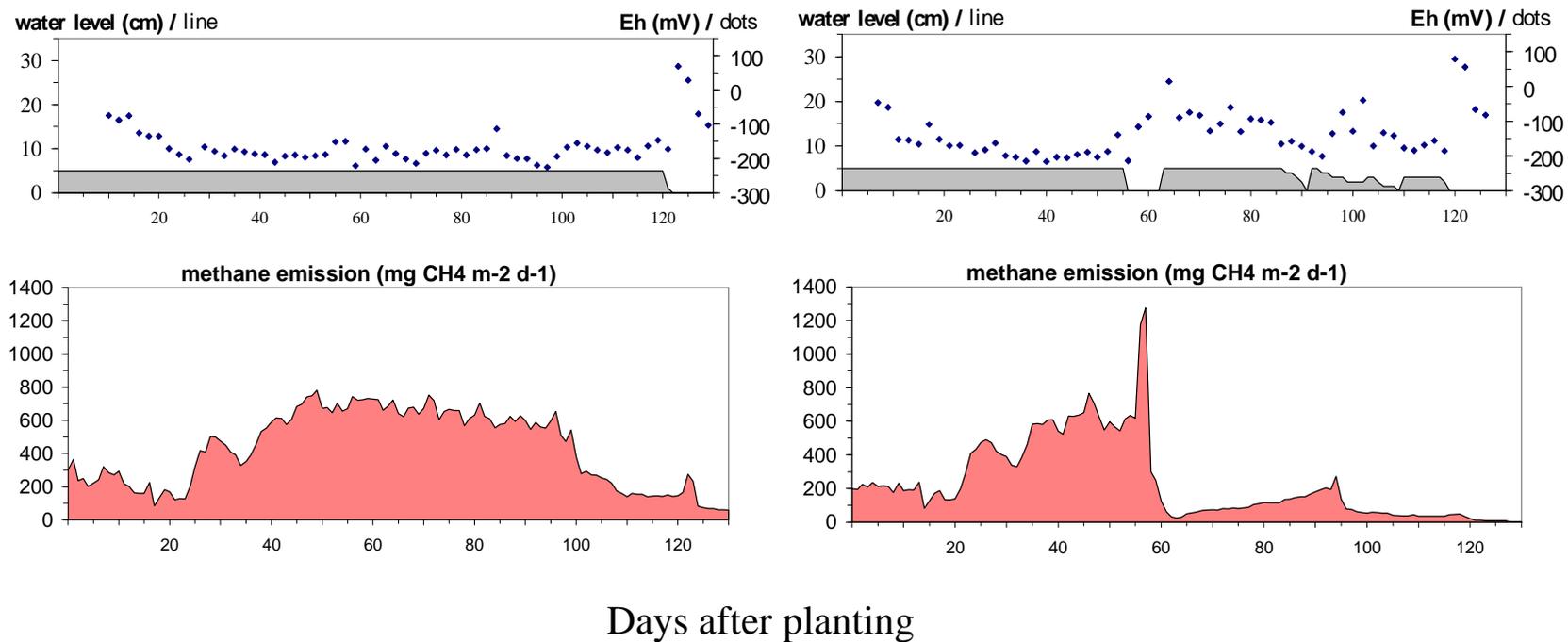


Temporal patterns under different amendments (IRRI, 1993 wet season)



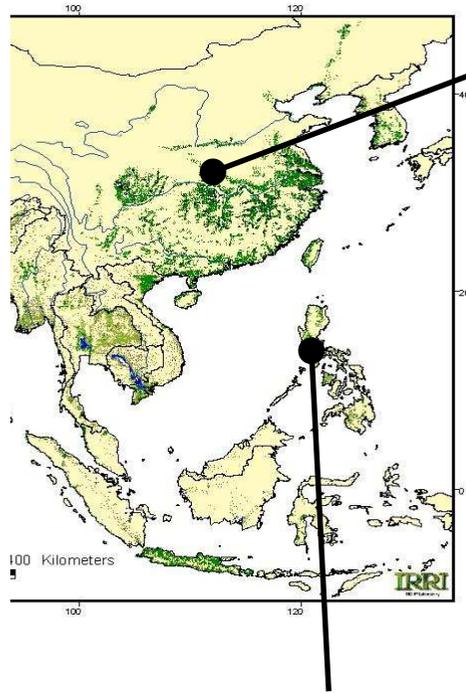
Wassmann et al. 2000

Mid-season drainage



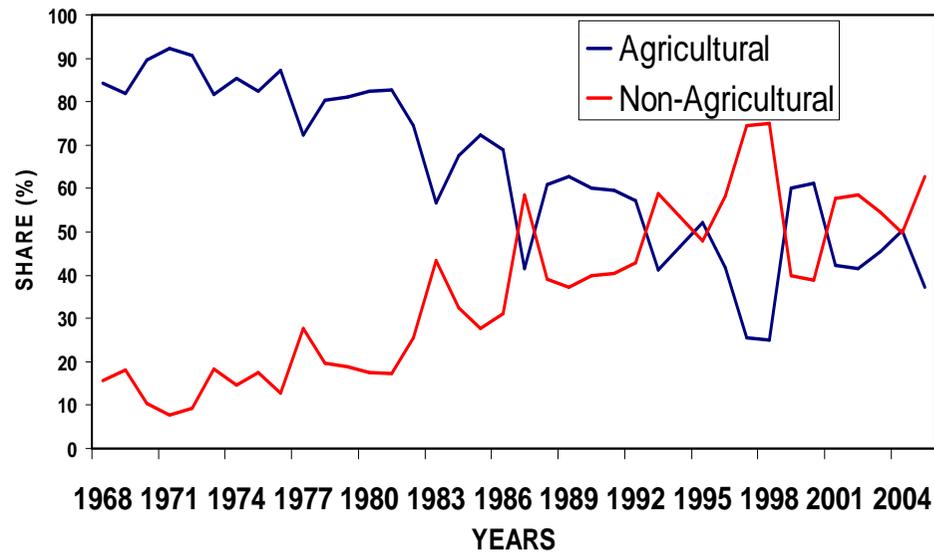
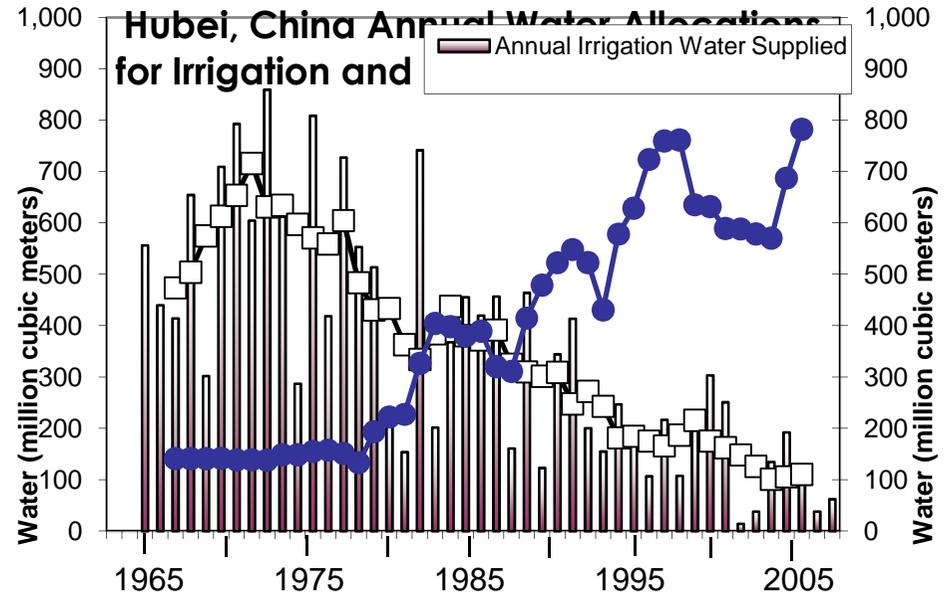
Field experiment at Hangzhou, China (Wassmann et al., 2000)

Competition, some examples in rice areas....

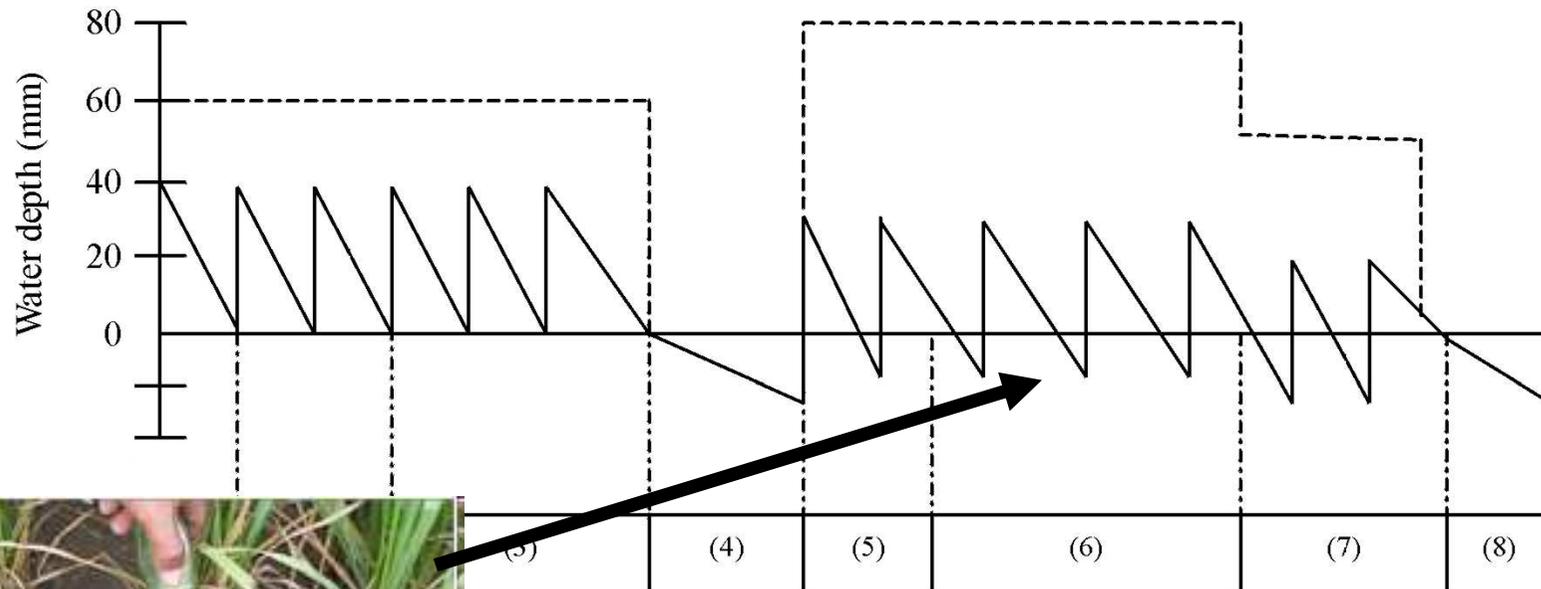


**Angat Dam,
Philippines**

Zanghe Reservoir, China

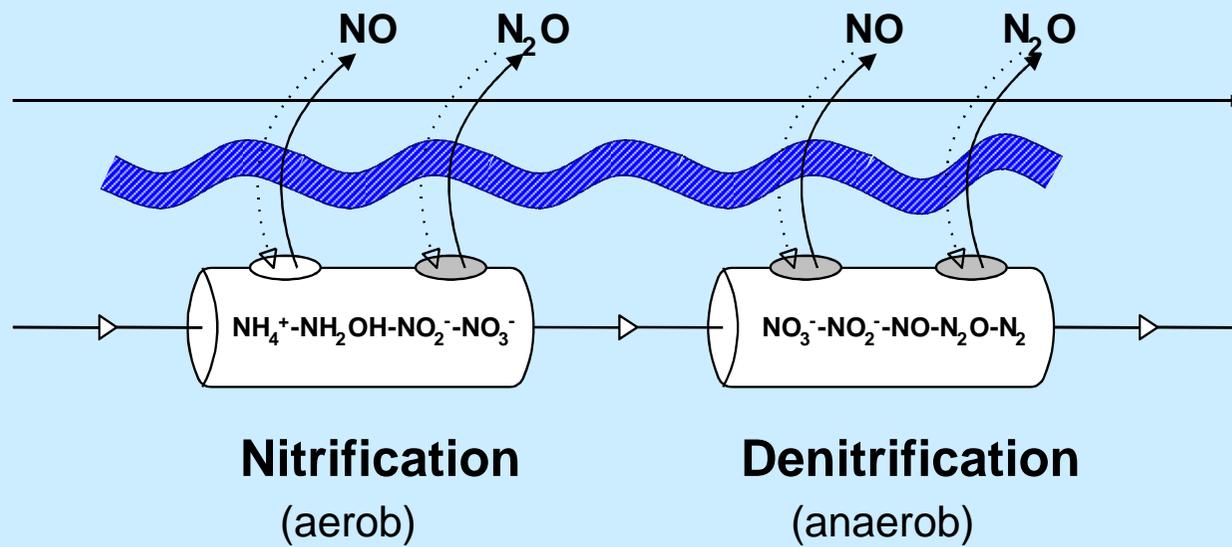


Alternate wetting and drying (AWD)



(1) Revival of green, (2) Revival of green, (3) Early & middle stages of tillering, (4) Late tillering, (5) Elongating & booting, (6) Heading & flowering, (7) Milk ripening, (8) Yellow ripening (SMC = Saturated Moisture Content)

"hole-in-the-pipe"-
Modell

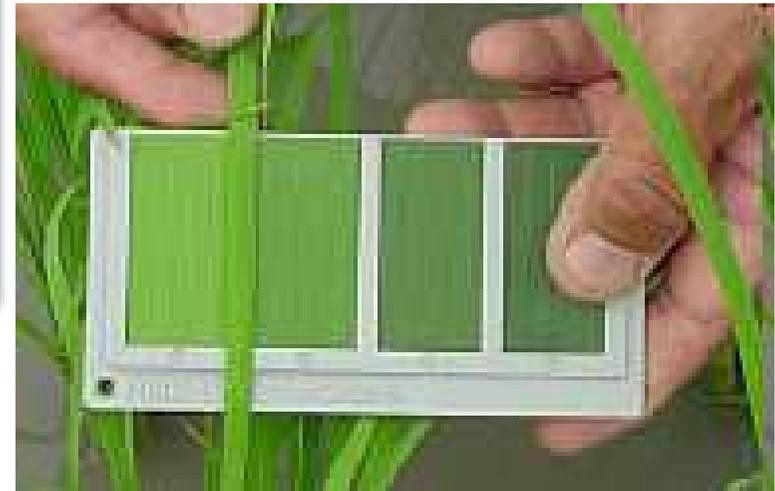


Davidson, 1991

'Site-Specific Nutrient Management' (SSNM)

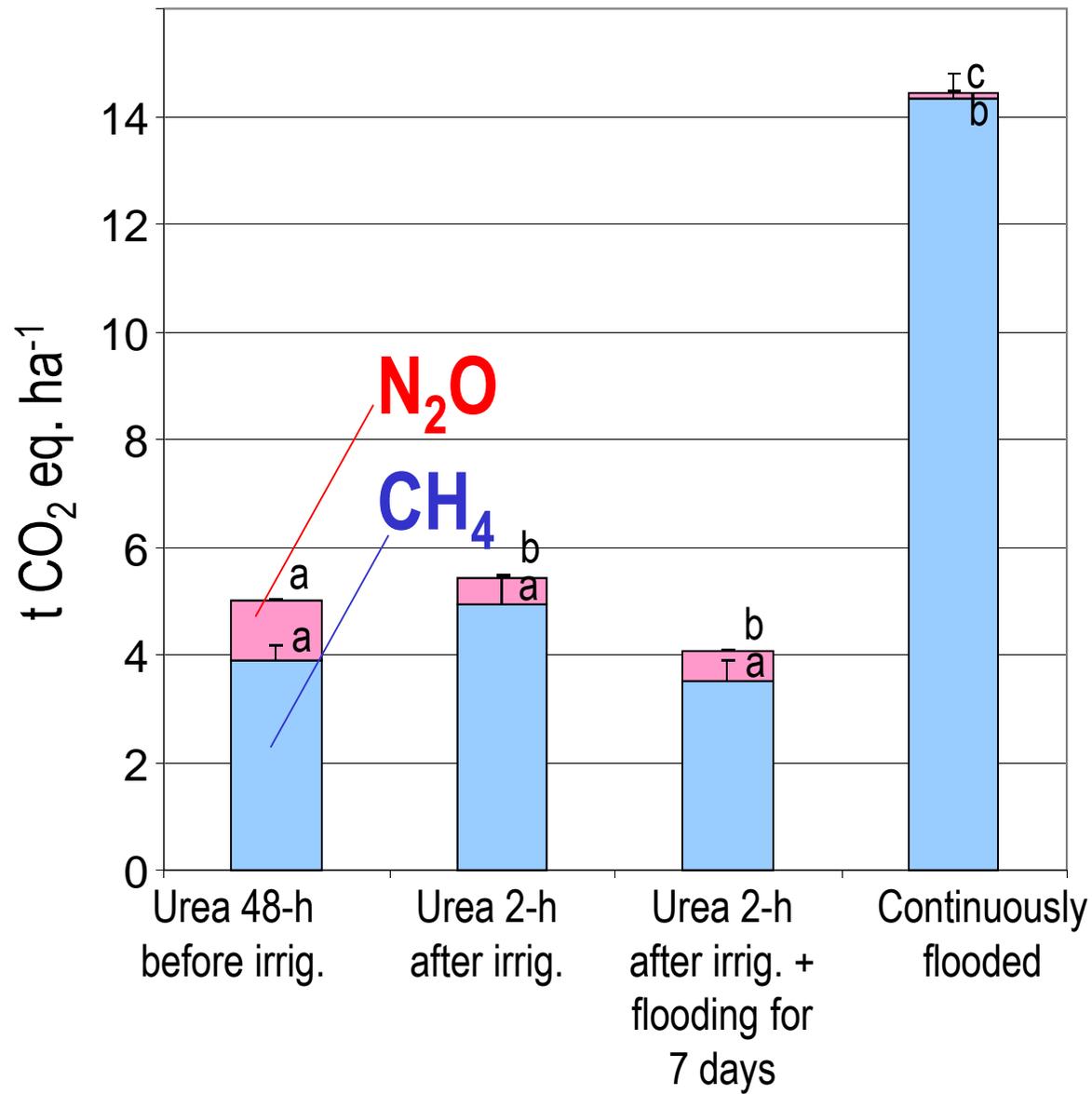


- Applying nutrients as and when needed
- Adjusting nutrient application to crop needs in given location and season



Leaf Color Chart

GWP of CH₄ and N₂O under AWD



'Other' mitigation options for rice

- High-yielding, short duration cultivars

No Contradiction between High Yields and Low Methane Emissions

<http://news.bbc.co.uk/2/science/nature/2203578.stm>

BBC NEWS WORLD EDITION

NEWS SPORT WEATHER WORLD SERVICE A-Z INDEX SEARCH Go

You are in: Science/Nature
Monday, 19 August, 2002, 22:09 GMT 23:09 UK

Better rice, less global warming



WATCH/LISTEN ON THIS STORY
The BBC's Richard Forrest
"If more rice is grown, less methane is produced"

See also:

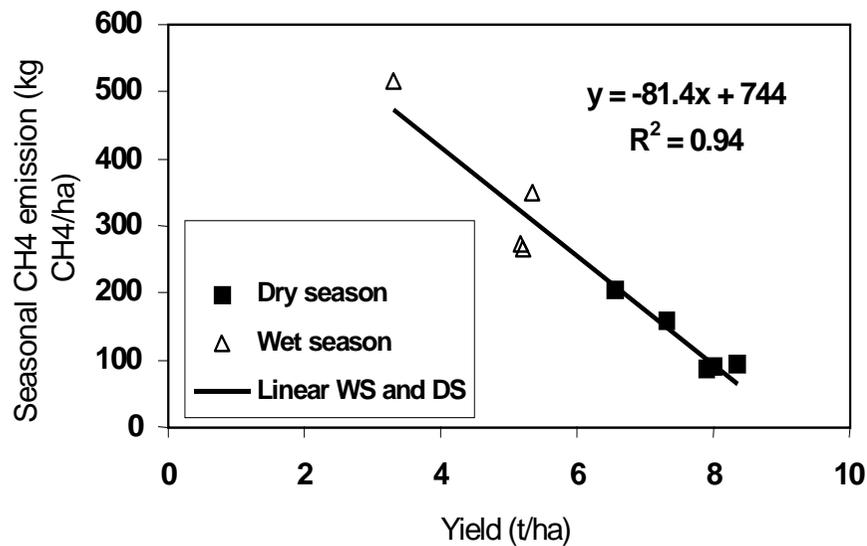
- 03 Jun 02 | Americas: Humans cause global warming, US admits
- 19 Aug 02 | Asia-Pacific: Australia slammed over environment
- 05 Jul 02 | Africa: Stark warning for Africa's environment
- 04 Apr 02 | Science/Nature: Scientists detail rice code
- 04 Apr 02 | Science/Nature: Rice: Food for the world
- 28 Mar 02 | Africa: High-yield rice for West Africa

By Richard Black
BBC science correspondent

Rice plants which produce higher yields make less of the potent greenhouse gas methane, researchers have discovered.

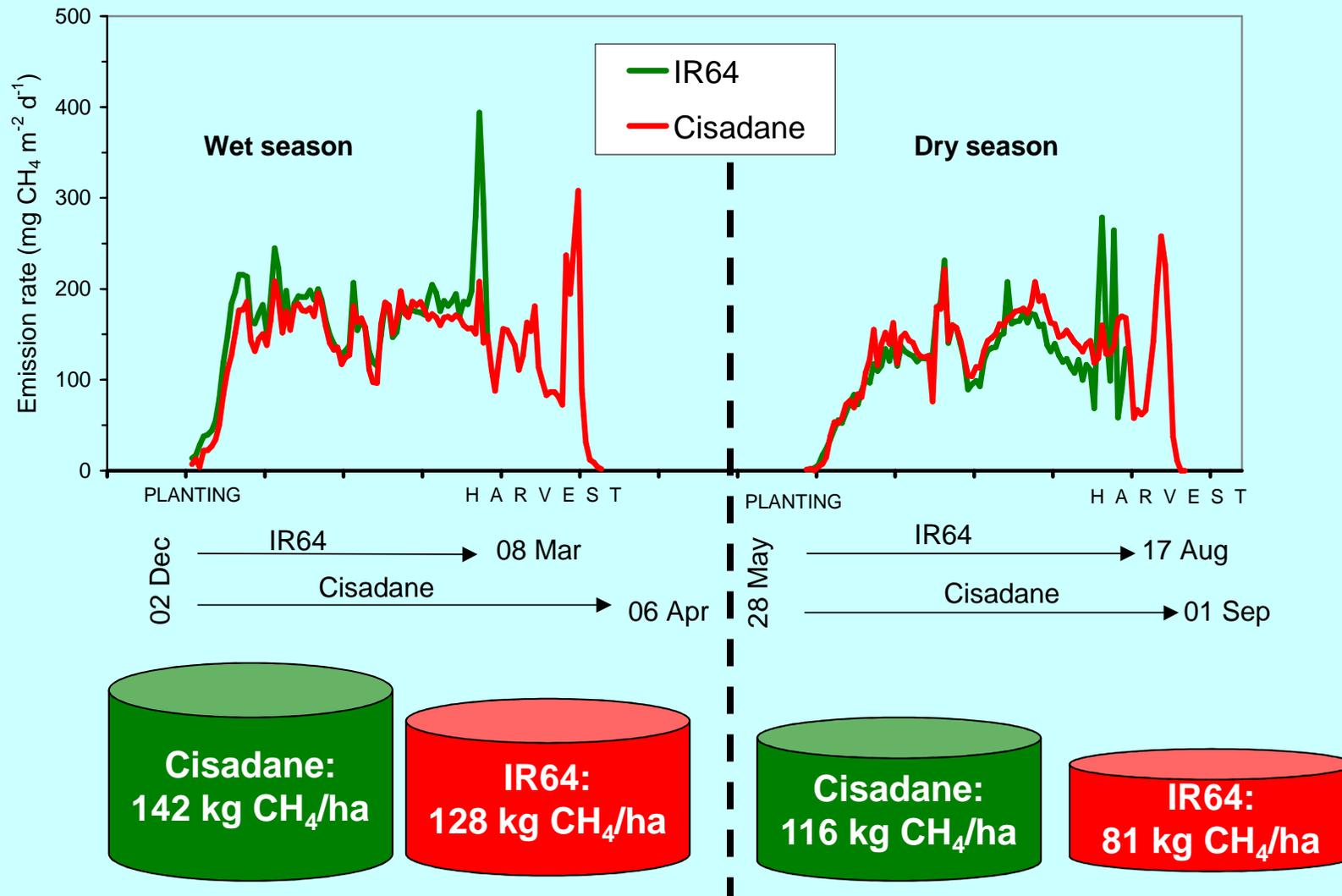
Plants which use the carbon they absorb from the atmosphere efficiently put less carbon into the soil, where it can be converted into

Internet links:
Proceedings of the National Academy of Sciences
Wageningen University
International Rice



Field experiment in Maligaya/ Philippines

Early Maturing Rice Cultivars Reduce Methane Emissions

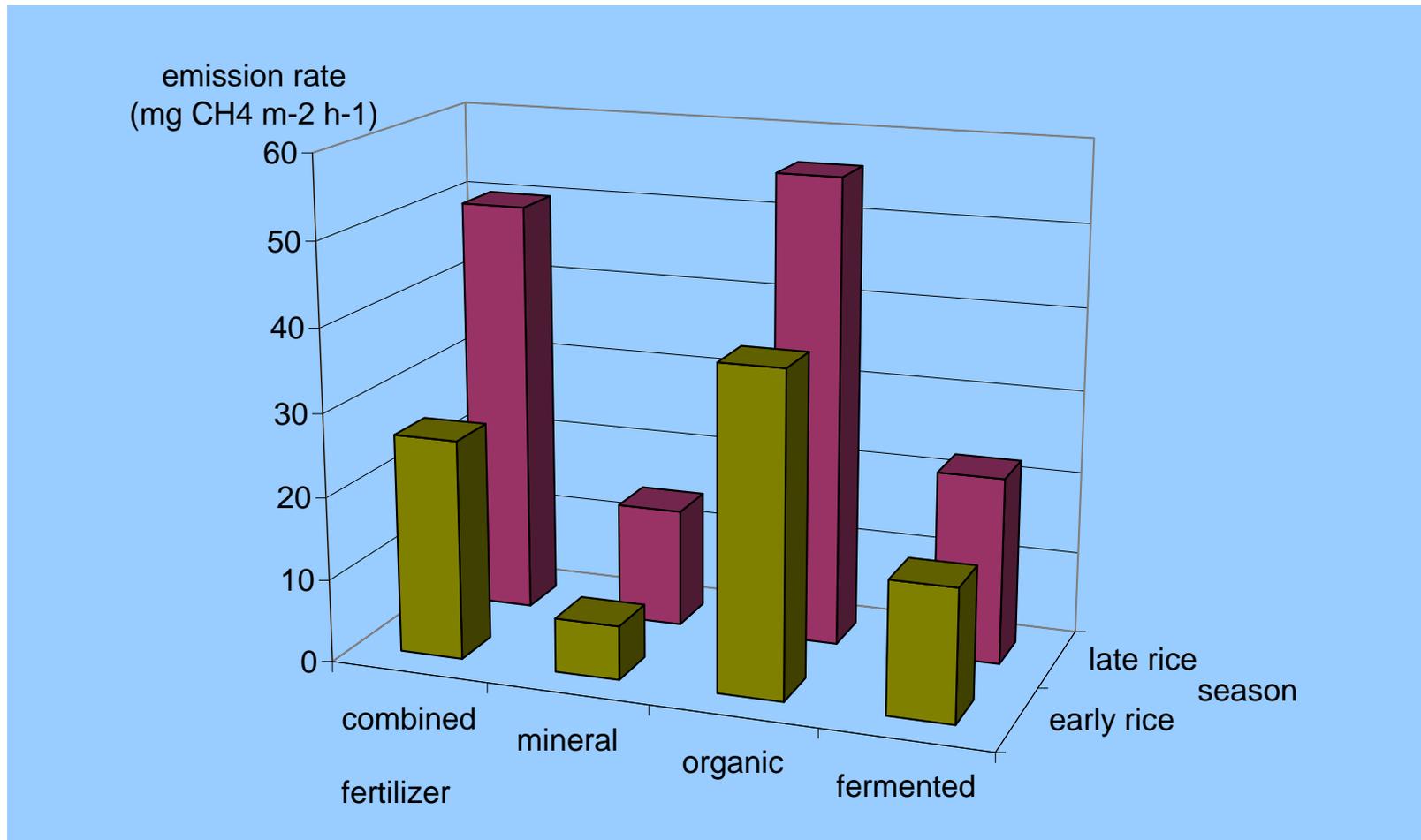


Field experiment in Jakenan/ Indonesia (Setyanto et al. 2000)

'Other' mitigation options for rice

- High-yielding, short duration cultivars
- Biogas technology for organic inputs
- Use of rice straw as biofuel

Effect of fermented manure (biogas residues)



Field experiment in Hunan Province, China (Wassmann et al. 1993)

Use of Rice Straw as Renewable Energy



“Globally, wasted rice grain and rice straw could produce 221 GL of bioethanol, replacing 159 GL of gasoline (about 14.3% of global gasoline consumption).”

Source: Kim and Dale 2004

Technological options:

- **combustion**
- **biogas technology (in combination with animal husbandry)**
- **bio-char technology and**
- **conversion of rice straw to ethanol**



'Other' mitigation options for rice

- High-yielding, short duration cultivars
- Biogas technology for organic inputs
- Use of rice straw as biofuel
- Modification of fertilizer type (e.g. sulfate)
- Soil amendments (industrial byproducts such as phosphogypsum, silicate iron slag)
- Direct seeding (with appropriate water management)

Submission to UNFCCC (Dec. 2009)

F-CDM-SSC-NM ver01

	<p>CDM: form for proposed new small scale methodologies (F-CDM-SSC-NM) (version 01)</p> <p><i>(To be used for proposing a new small scale methodology in accordance with article 15 and 16 of the simplified modalities for small-scale CDM project activity categories. This form is not to be used in case of large scale methodologies).</i></p>
<i>Name of person/entity submitting this form:</i>	Stephan Brunner Bayer CropScience
<i>Title of the proposed small scale methodology:</i>	Reduction of methane emissions by switching from Transplanted to Direct Seeded Rice practice with adjusted water management
<i>Please suggest type to which the new proposed methodology (category) belongs to:</i>	<input type="checkbox"/> Type I Renewable energy projects <input type="checkbox"/> Type II Energy efficiency improvements <input checked="" type="checkbox"/> Type III Other project activities

<http://cdm.unfccc.int/UserManagement/FileStorage/BA913K6D7SZMW4LOTFXJQCNRHV2085>

Conceptual

Approach

