THE NATIONAL AGRICULTURAL NITROUS OXIDE RESEARCH PROGRAM (NANORP)

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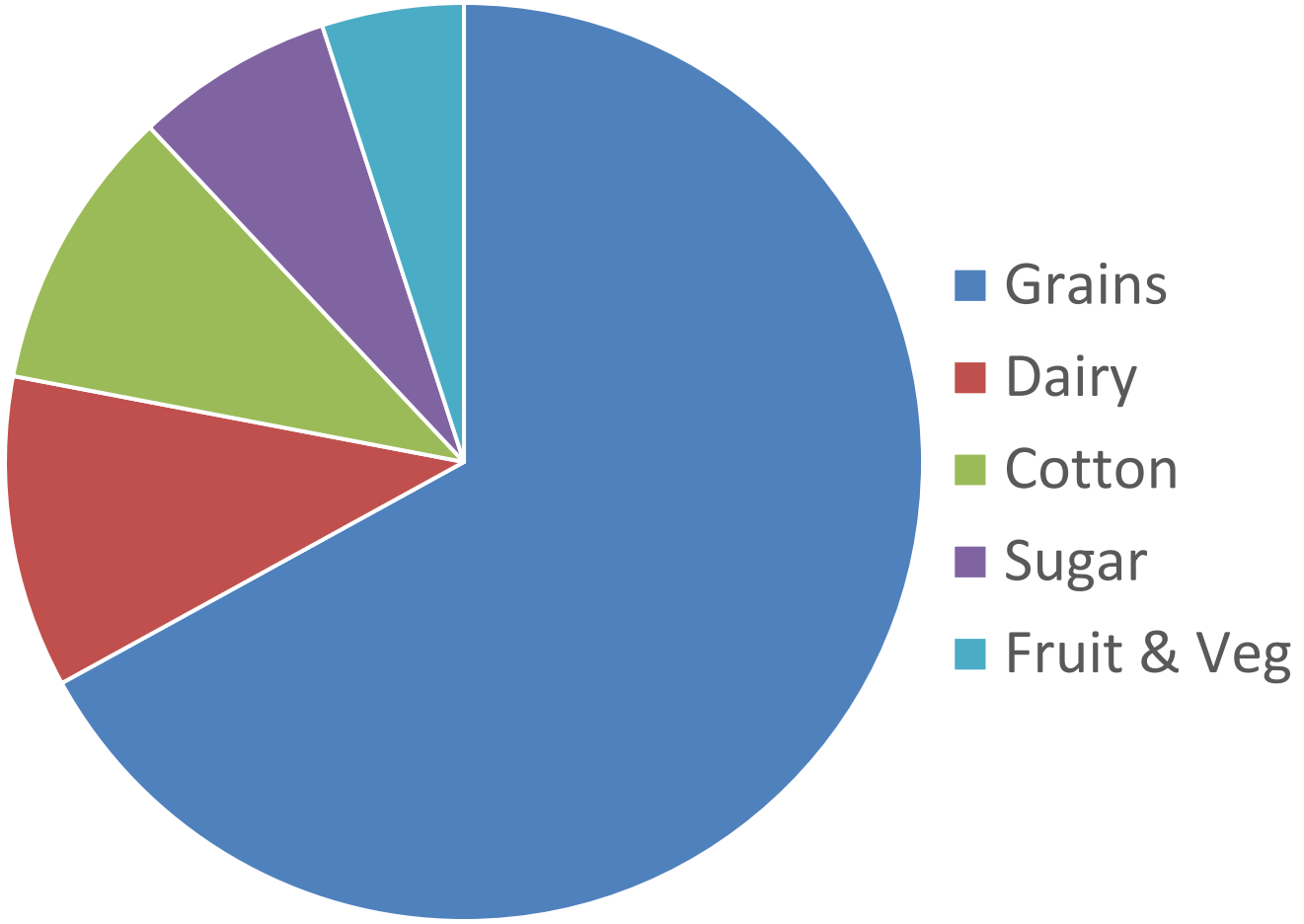
Commodity Nitrogen Fertiliser Applied (%) Australia



*IFA (2013)

Australian N_2O Network

Federal Dept of Agriculture & Water Resources

- Filling the Research Gap Round 1 – NANORP (2012-15)
  - ***17 projects***
- Filling the Research Gap Round 2 – NANORP (2013-16)
  - ***6 projects***
- Rural Development Corporations (Sugar, Cotton, Dairy, Hort) (2016-21)
  - ***10 projects***


N2O Network
www.n2o.net.au
Australian Government
QUT
Queensland University of Technology
THE UNIVERSITY OF QUEENSLAND
AUSTRALIA
QAAFI
Queensland Alliance for Agriculture and Food Innovation
UTAS
LA TROBE UNIVERSITY
AUSTRALIA
THE UNIVERSITY OF WESTERN AUSTRALIA
UNSW
THE UNIVERSITY OF NEW SOUTH WALES
State Government Victoria
Department of Primary Industries
GRDC
Grains Research & Development Corporation
Australian Government
Cotton Research and Development Corporation
tiar
TASMANIAN INSTITUTE OF AGRICULTURAL RESEARCH
SARDI
NSW GOVERNMENT
Primary Industries
Queensland Government
SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE
Charles Sturt University
THE UNIVERSITY OF MELBOURNE
piccc
Primary Industries Climate Challenges Centre
THE UNIVERSITY OF NEWCASTLE
AUSTRALIA
CSIRO
Incitec Pivot Fertilisers
THE UNIVERSITY OF SYDNEY
Dairy Australia
une
University of New England

NANORP Mission

Delivery of practical cost-effective management strategies that reduce N_2O emissions promote productivity and profitability in Australian agriculture.

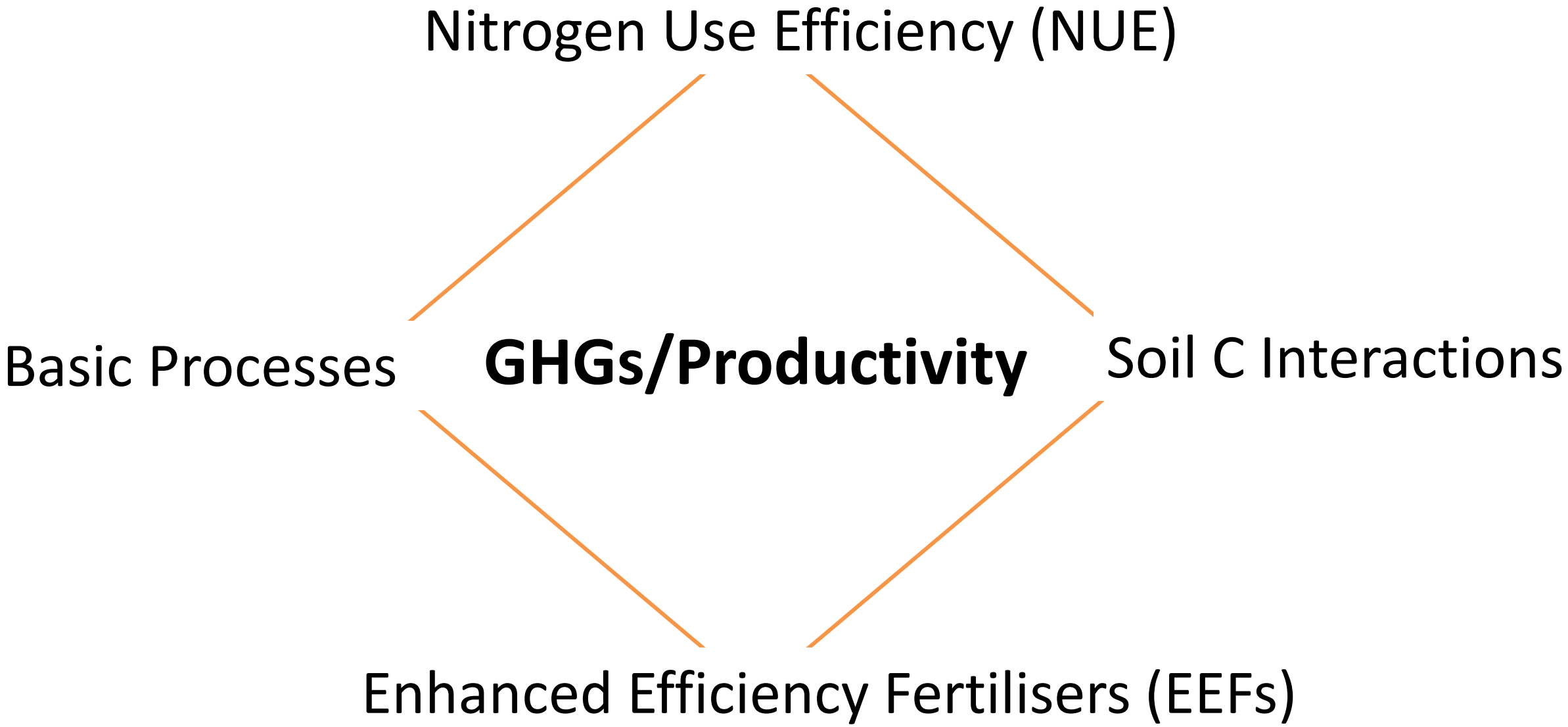
NANORP Core Research Hypothesis

- Nitrogen losses reduced and production increased by:
  - Matching fertiliser N supply with plant N demand
  - Reducing fert N inputs by increasing N supply from SOM/legumes
  - Enhanced Efficiency Fertilisers (EEFs)
  - Better soil structure/drainage

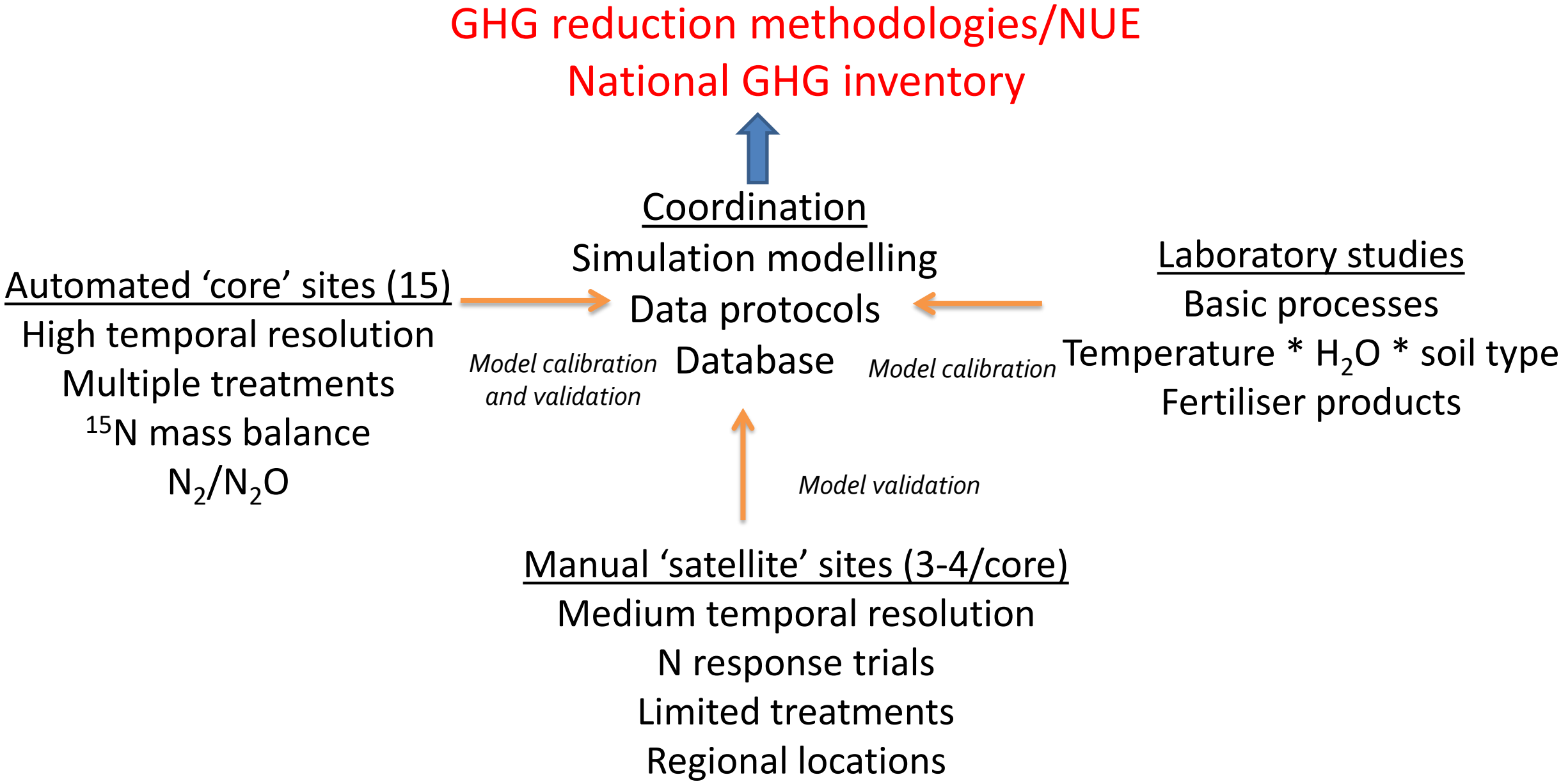
NANORP NUE / N_2O Mitigation Strategies

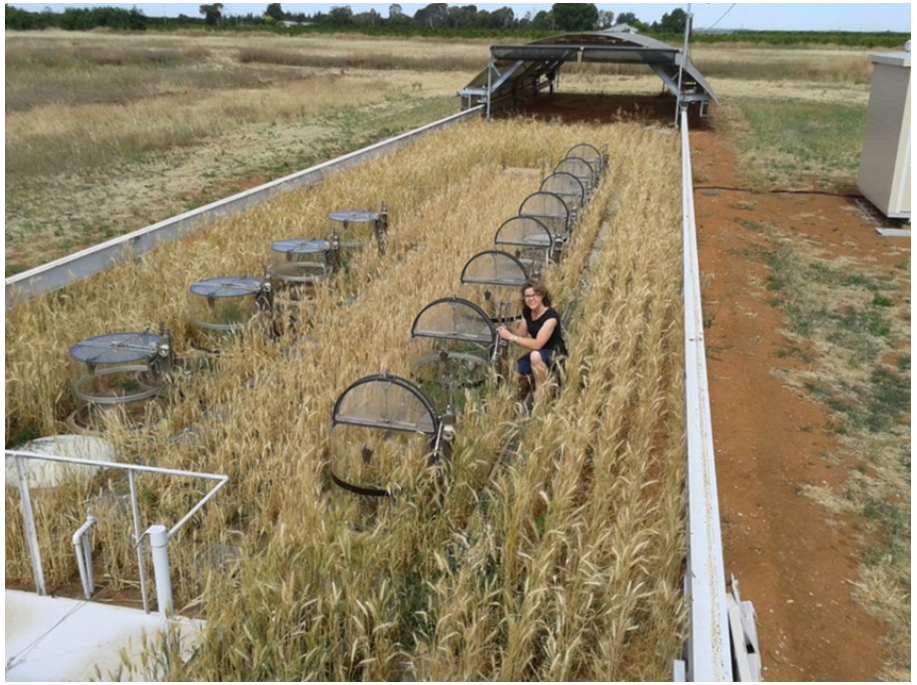
- <u>N Fertiliser Management</u>
  - Rate
  - Timing
  - Placement
  - *Enhanced Efficiency Fertilisers (EEFs)*
    - ❖ *Polymer coated urea*
    - ❖ *Urease inhibitors*
    - ❖ *Nitrification inhibitors*
      - ➢ *DMPP*
      - ➢ *Nitrapyrin*
- <u>Rotations</u>

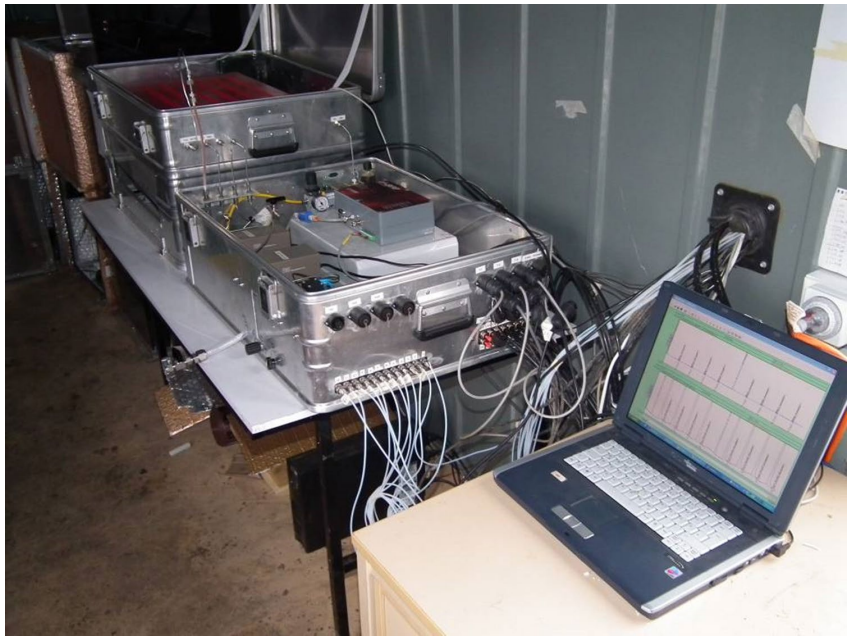
NANORP Research Themes

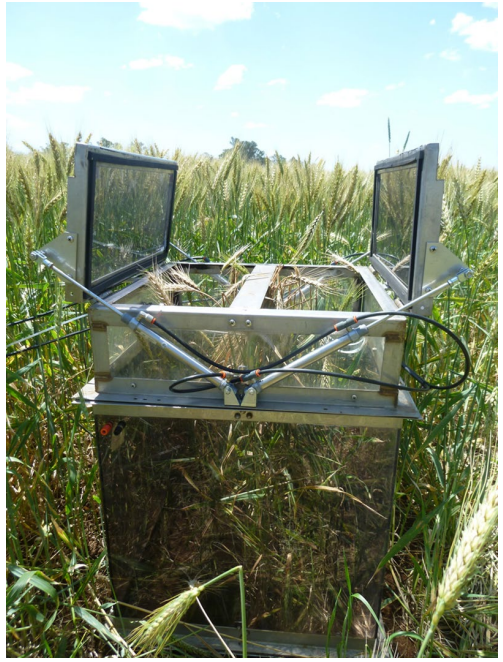


NANORP – Network Structure

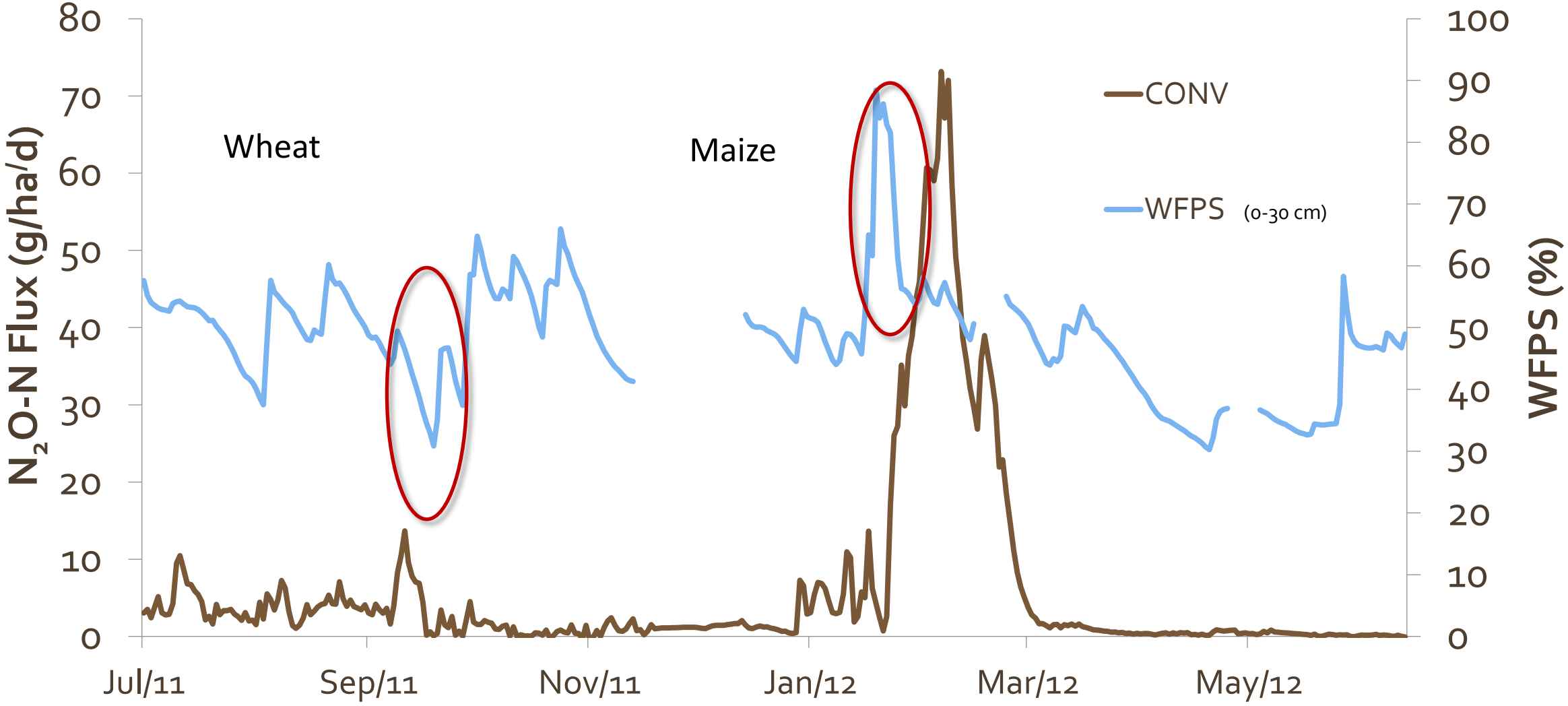






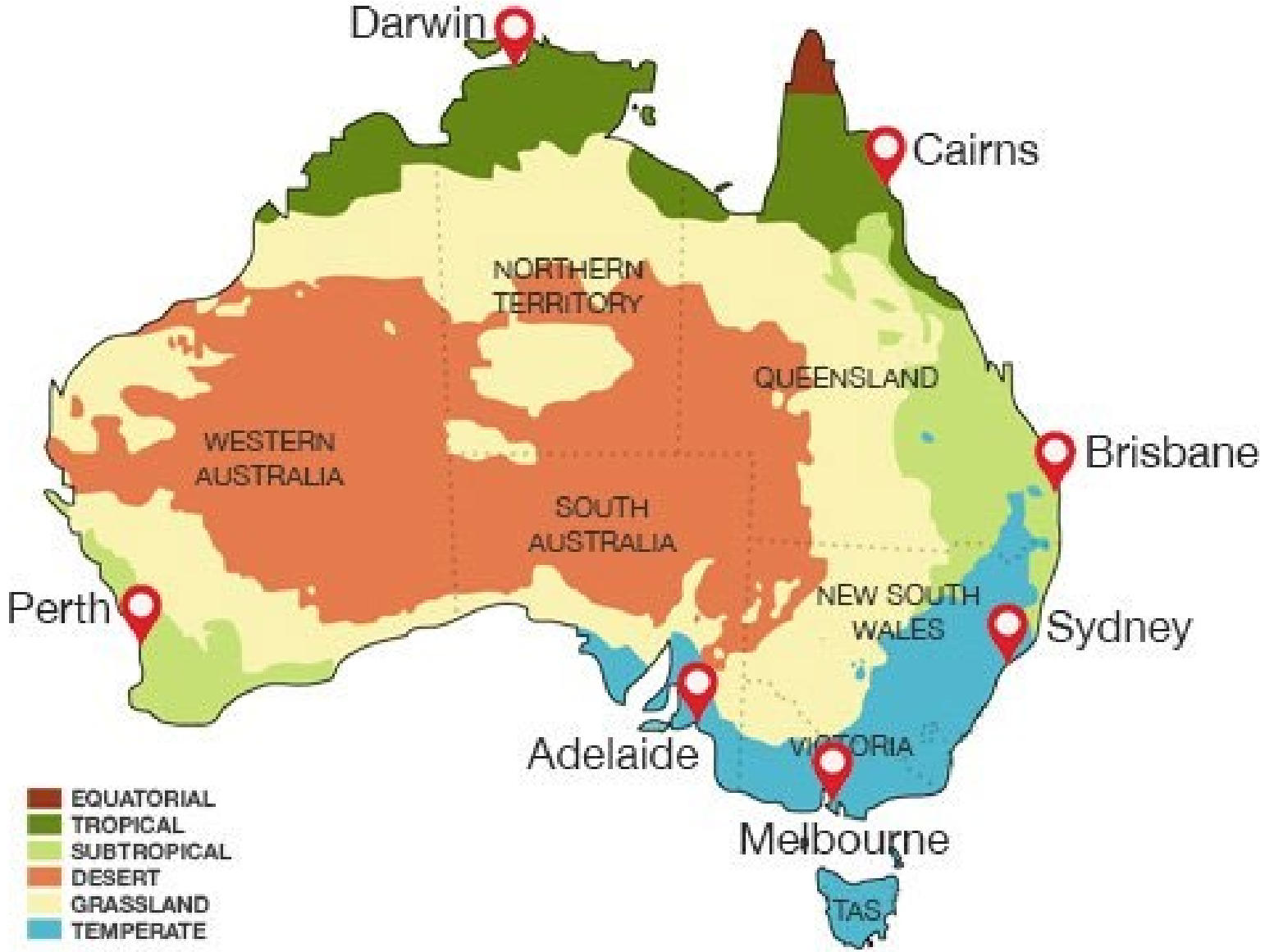


N_2O vs Water Content (WFPS) – Kingaroy (Ferrosol)

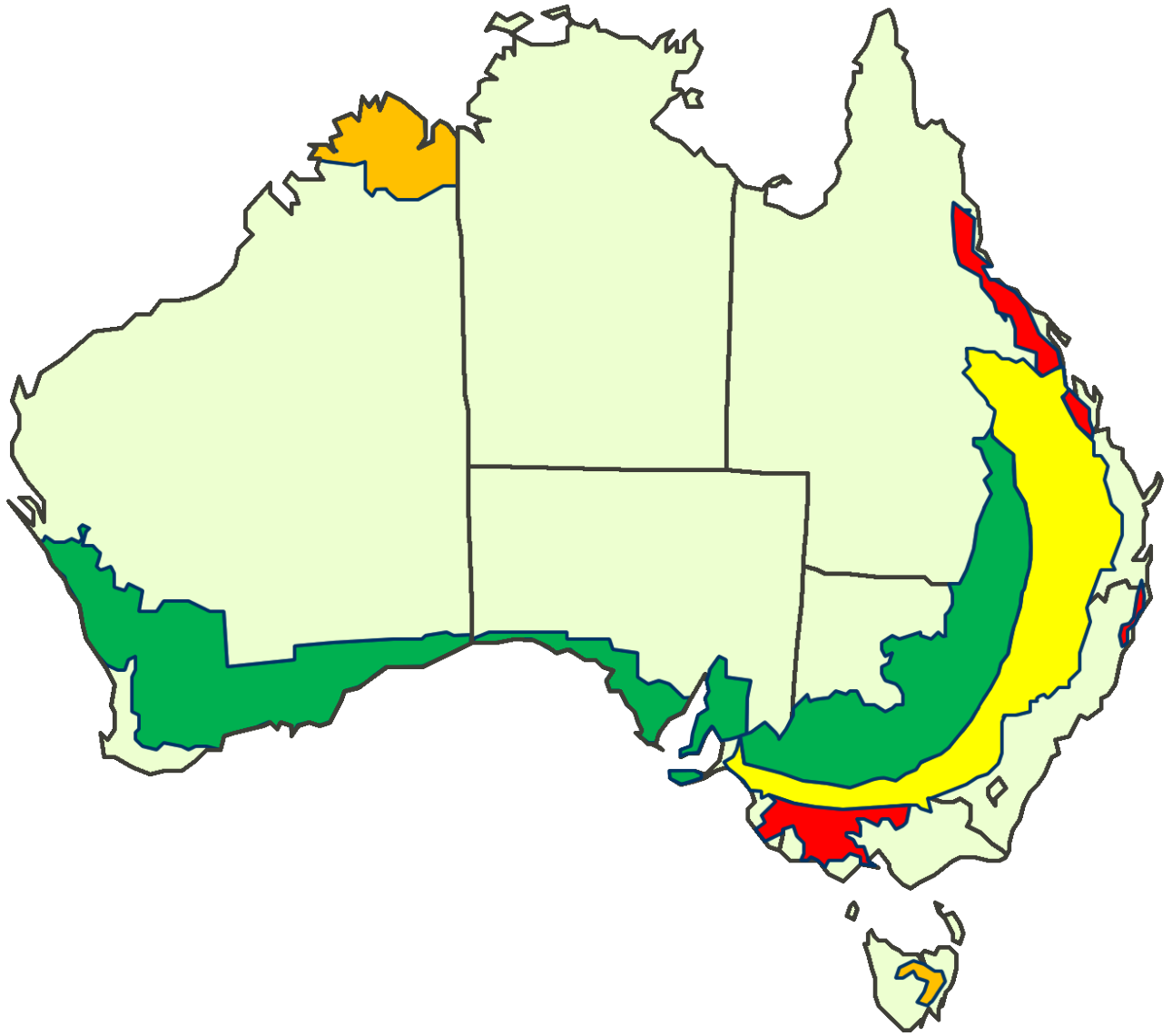


Migliorati et al. (2014) NCAE 100

Australian Climatic Zones



N_2O Emissions vs Agricultural Production Zones



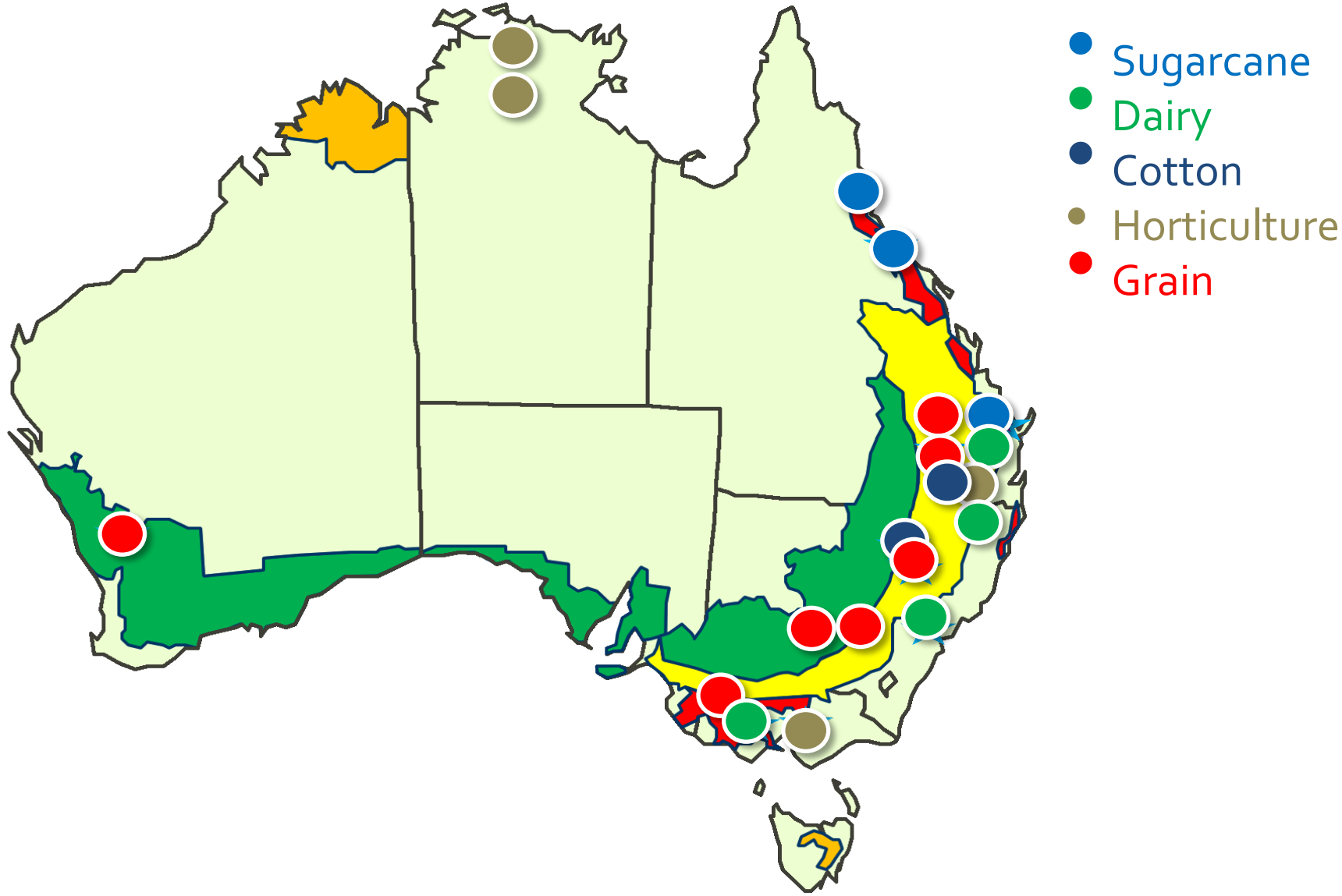
Low

Medium

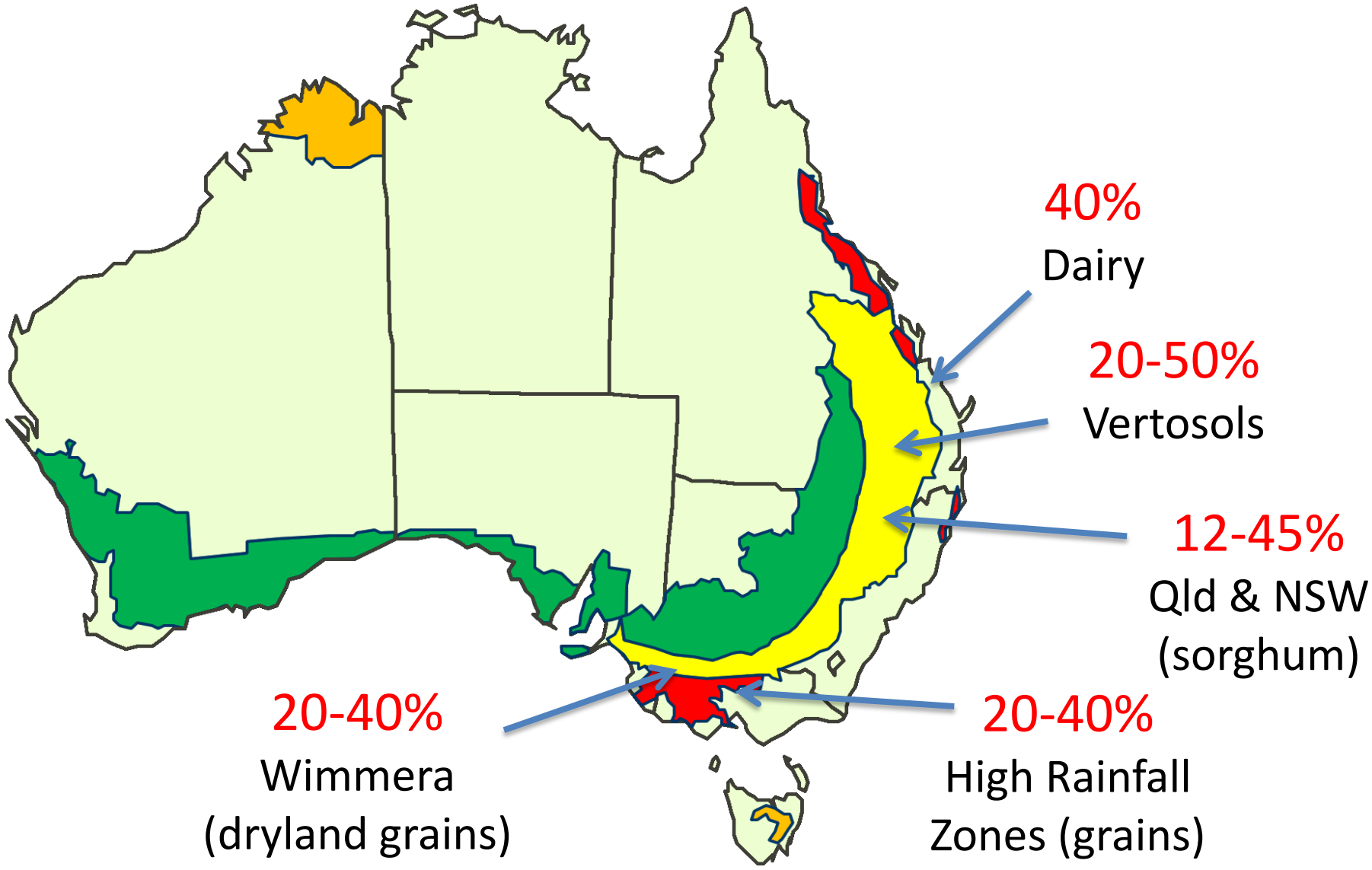
High

No data/uncertain

NANORP – Core (automated) sites (2016-2020)



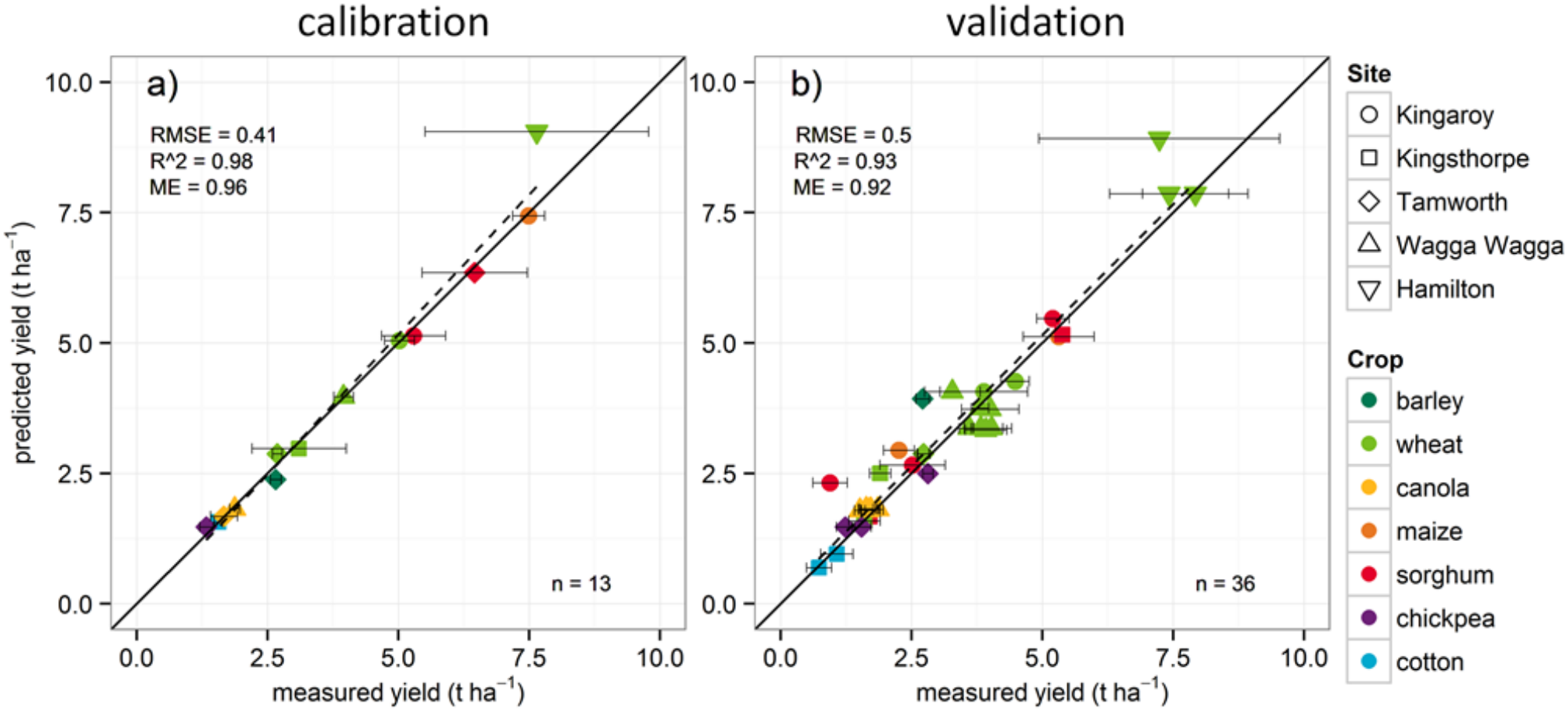
Nitrogen Use **Inefficiency** / ^{15}N Losses



Response Curves for DSS/Methodology Development

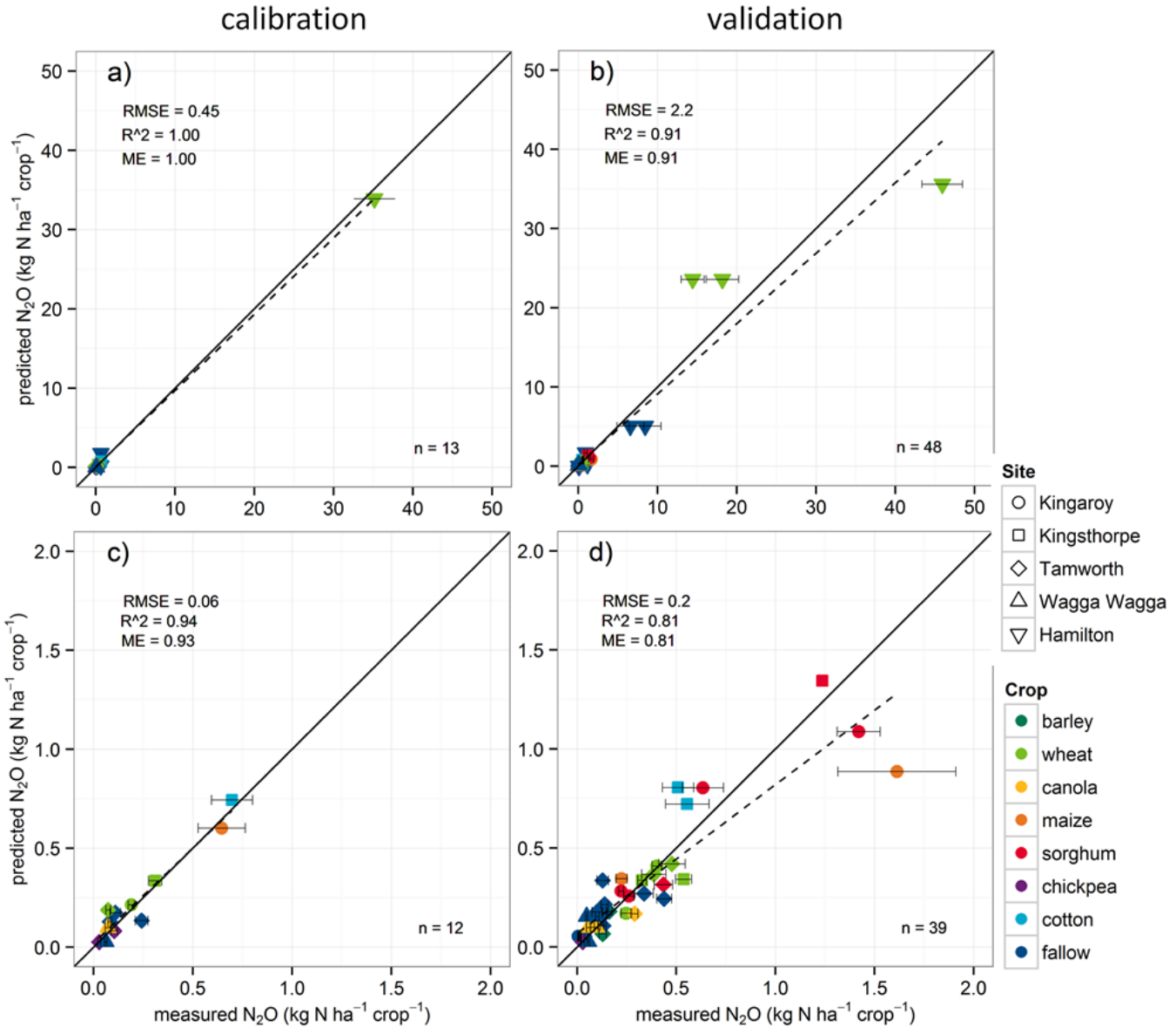
- APSIM
  - N management (including rotations) - Grains and sugar
- DayCent
  - N management - Dairy
  - EEFs - Grains, sugar and dairy

APSIM – Grain Yield - Calibration and Validation[1]



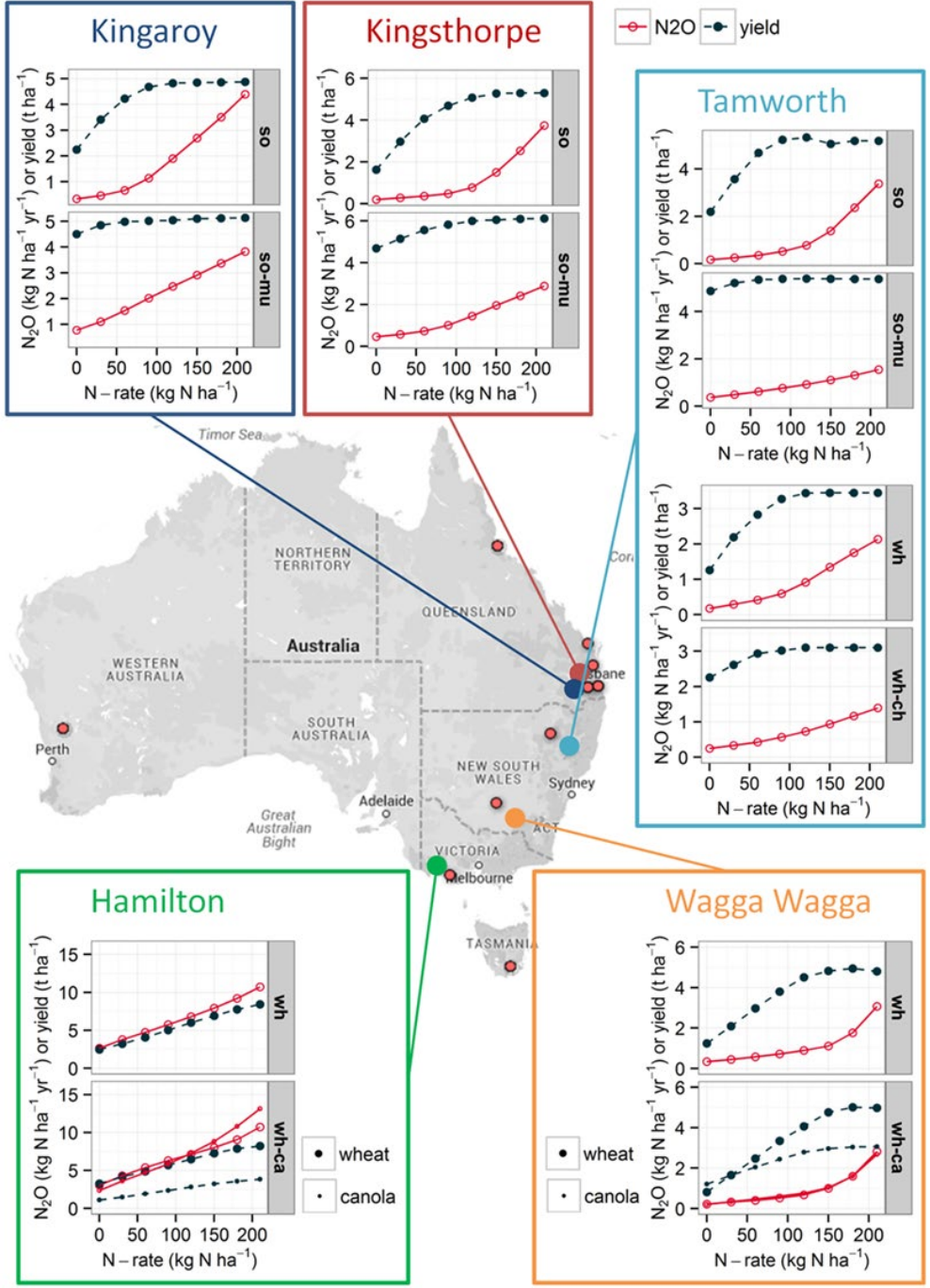
[1]Mielenz et al. (2016) Soil Research 54

APSIM – N_2O Emissions - Calibration and Validation[1]



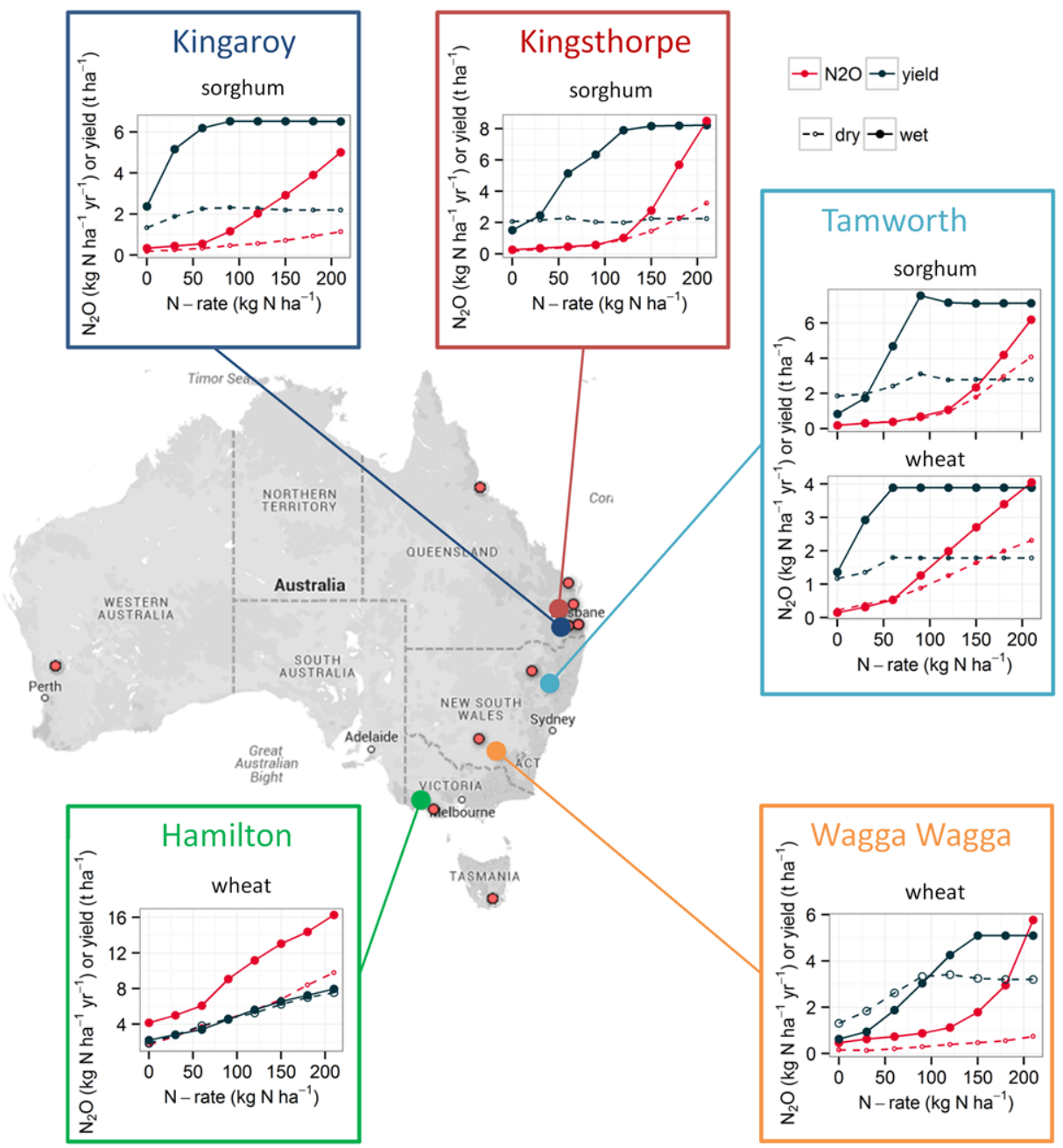
[1]Mielenz et al. (2016) Soil Research 54

Grains industry: N_2O vs Yield (APSIM)[1]



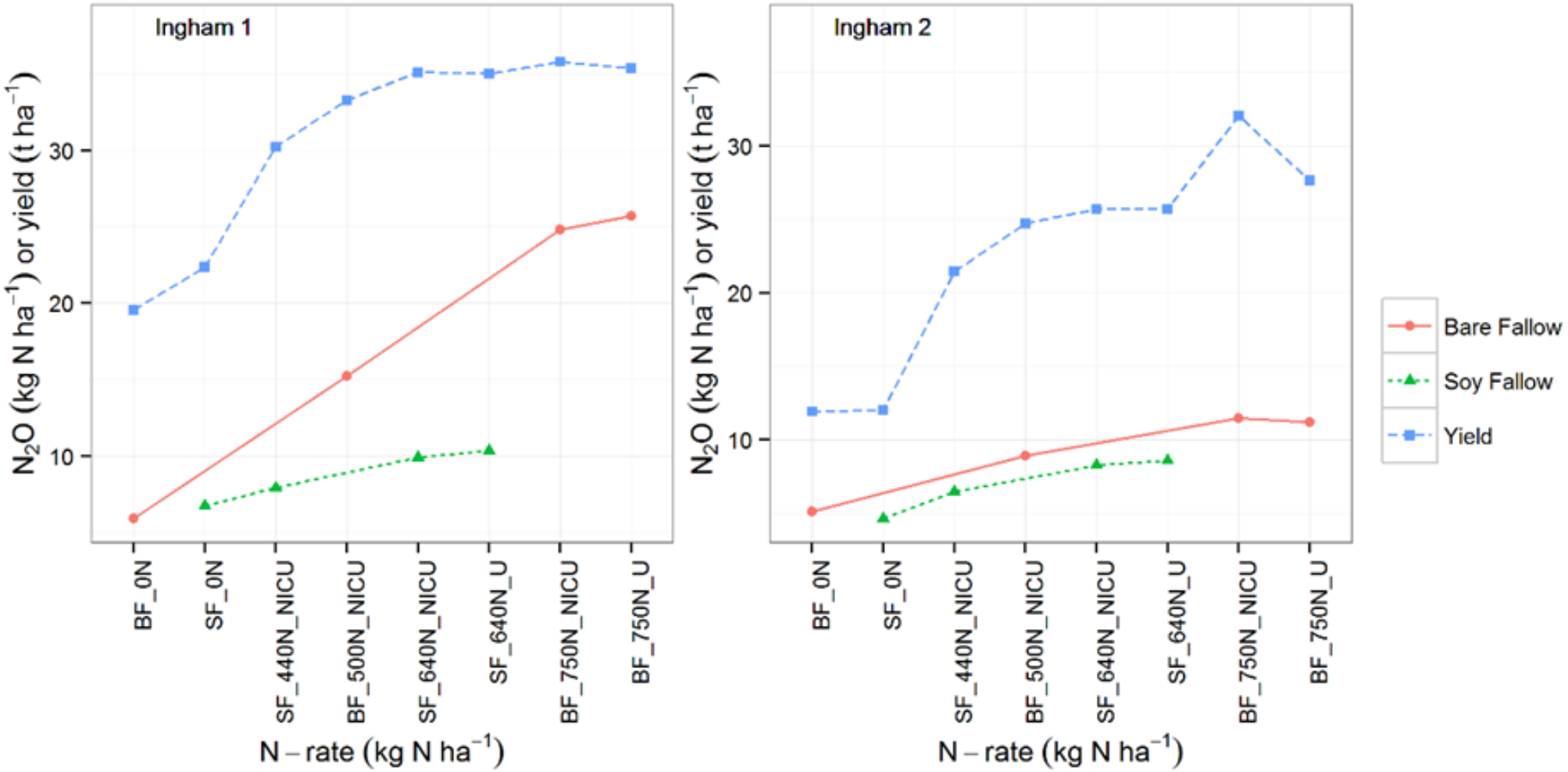
[1]Mielenz et al. (2016) Soil Research 54

Grains industry: N_2O vs Yield (APSIM)[1] Wet vs Dry year



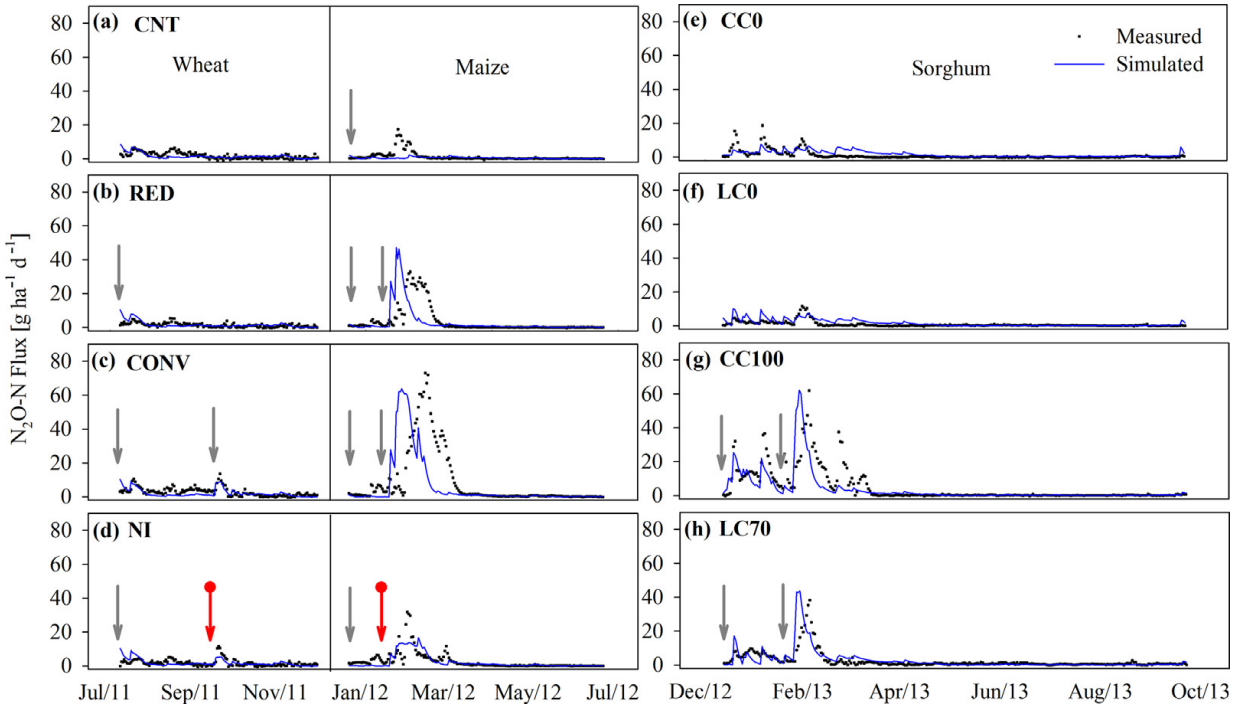
[1]Mielenz et al. (2016) Soil Research 54

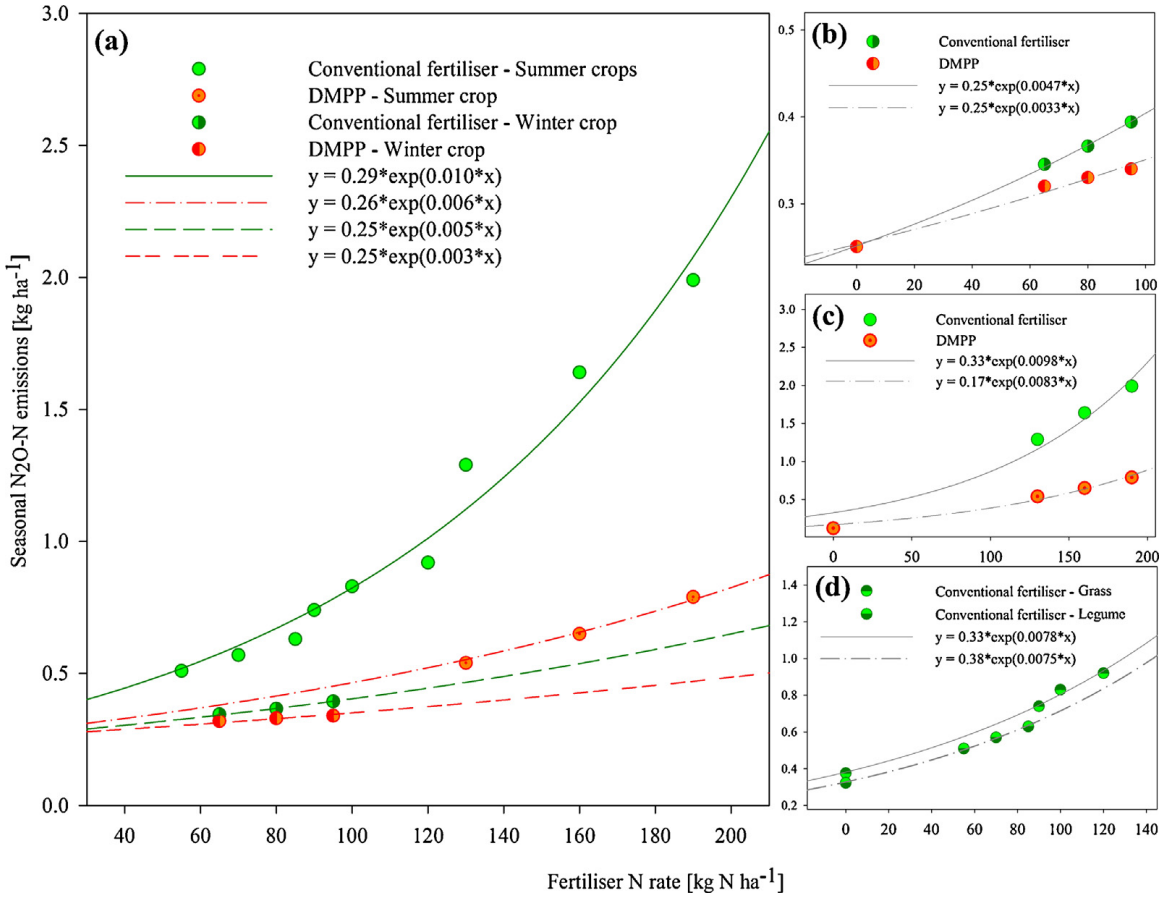
Sugar industry: EEFs & Fallow vs N_2O & Yield (DayCent)[1]



[1]Migliorati et al. (2023) AEE 306.

Grains industry: EEFs vs N_2O (DayCent)[1]

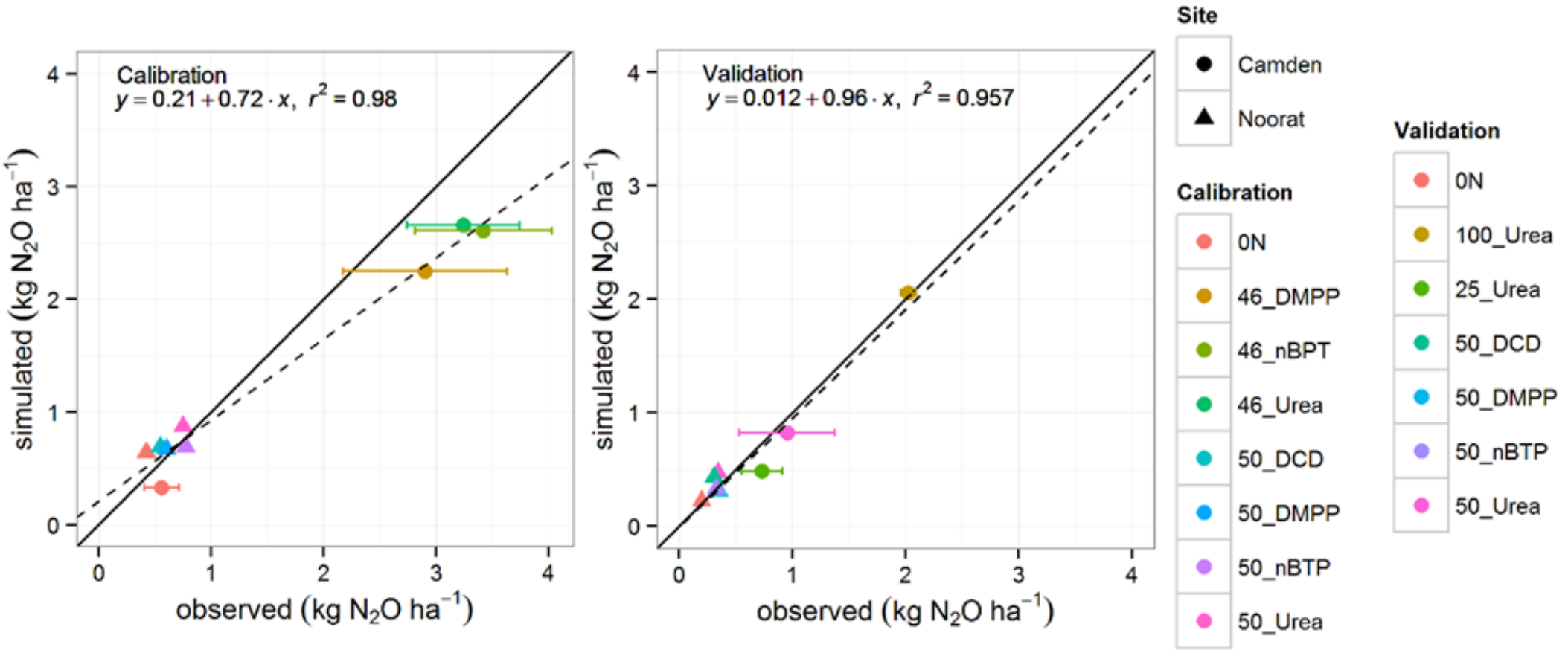




Measured (daily means) and simulated daily N_2O fluxes wheat–maize (a–d) and sorghum (e–h) seasons at Kingaroy, Queensland, Australia.

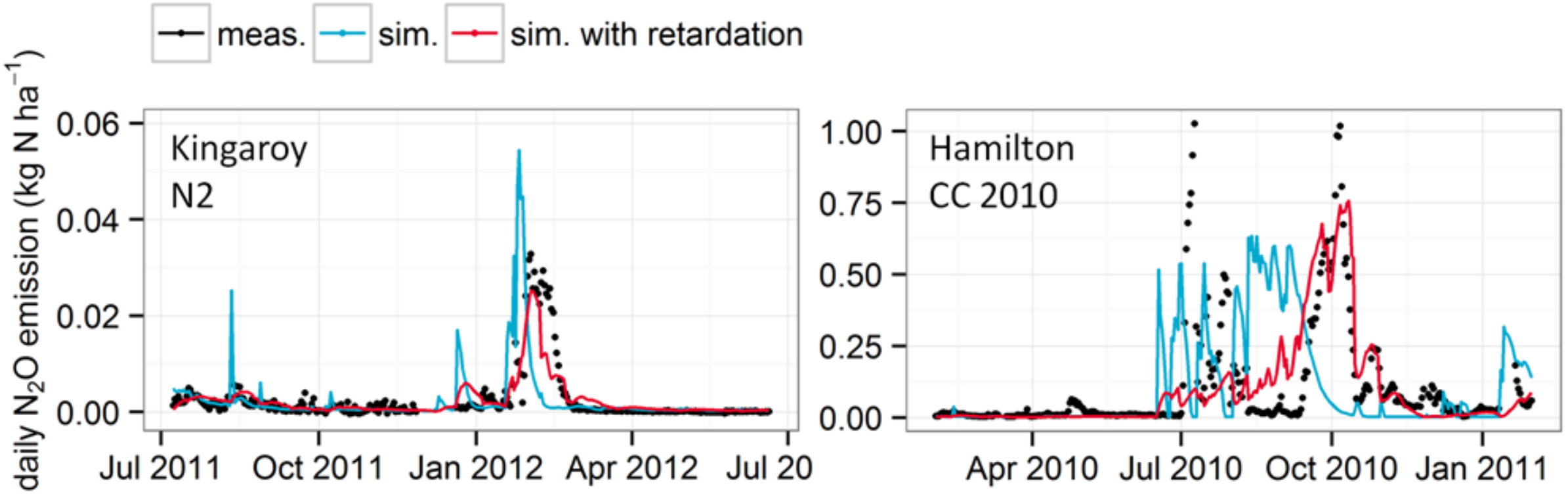
[1]Migliorati et al. (2015) AEE 213.

Dairy industry: EEFs vs N_2O (DayCent)[1]



[1]Migliorati et al. (unpublished)

APSIM – Gaseous Diffusion[1]



[1]Mielenz et al. (2017) EJA 32

Outputs

- 66 multiple datasets in n2o.net.au
- 50+ journal papers (including 20 additional papers in special issue of Soil Research)
- 76 Conference proceedings
- 37 Fact sheets
- 58 Field days