



Strategic Programme



Greenhouse gas emissions and CAP reform

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SRUC

4 March 2013



The James
Hutton
Institute



Moredun



Rowett Institute
of Nutrition and Health



Royal
Botanic Garden
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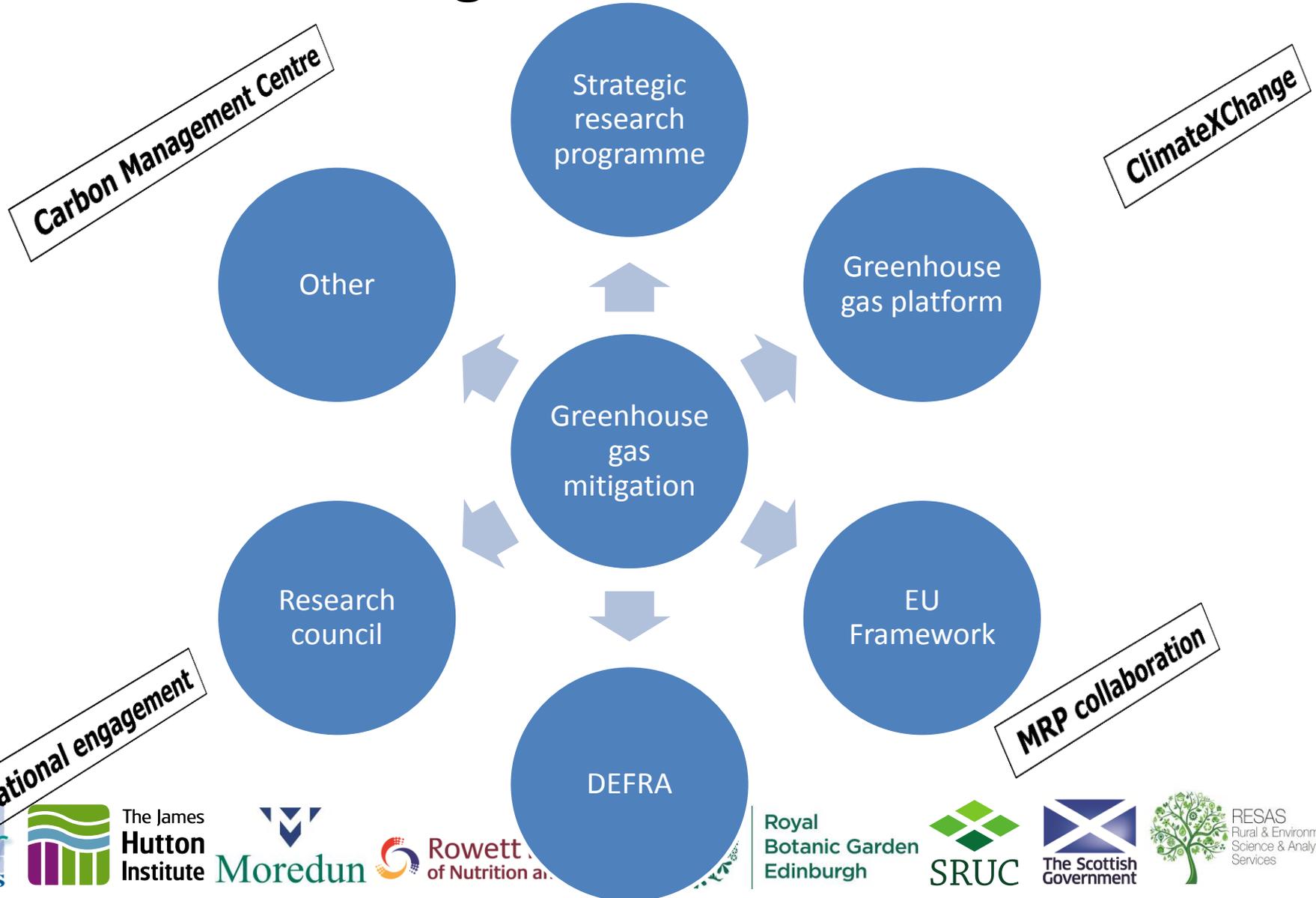
Objectives of Future CAP reform

- Sustainable management of natural resources and climate
 - to pursue climate change mitigation and adaptation actions thus enabling agriculture to respond to climate change



The CAP towards 2020: Meeting the food, natural resources and territorial challenges of the future, EC 2010

Research on greenhouse gas mitigation at SRUC



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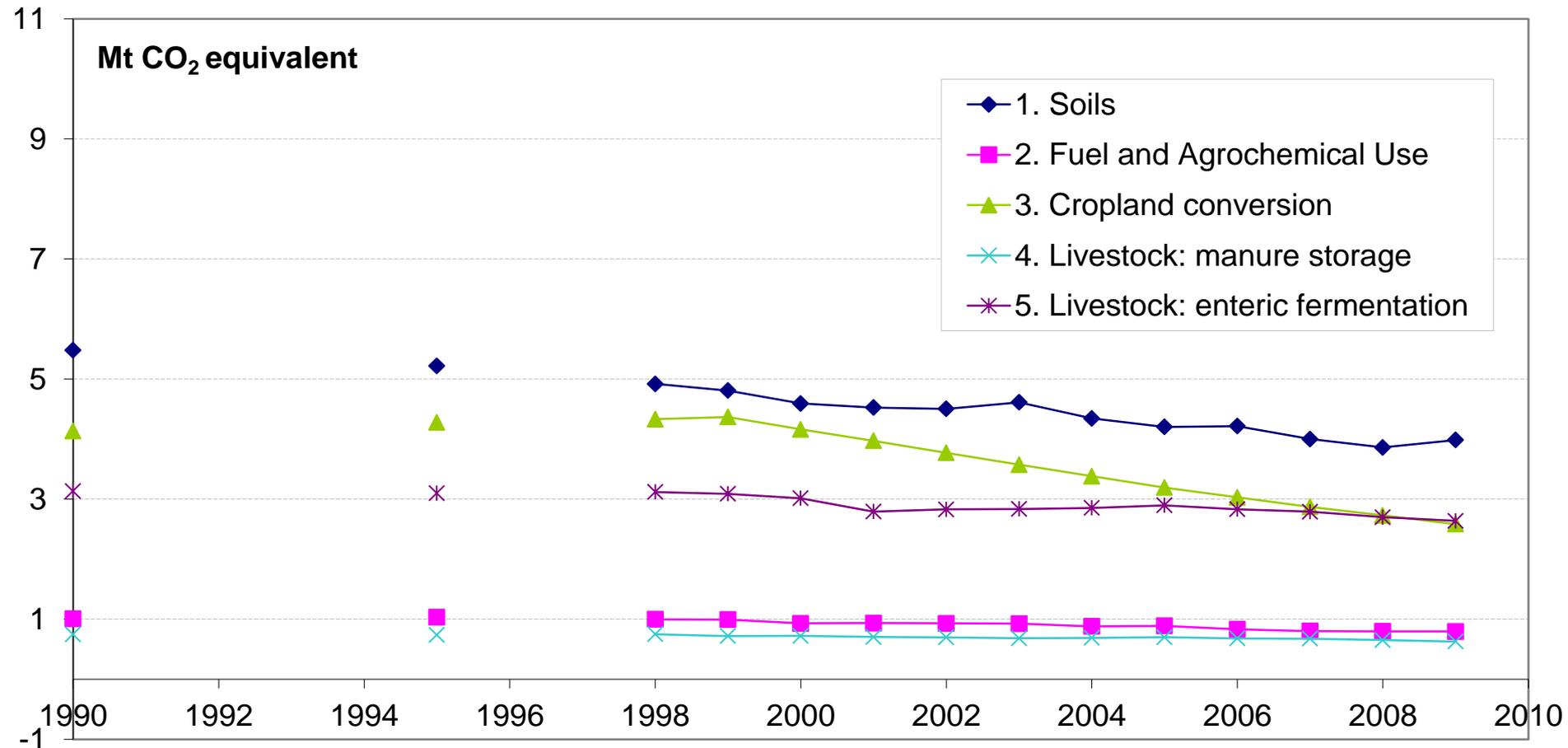


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RESAS Rural & Environment Science & Analytical Services

Net Scottish GHG Emissions from agriculture and related land use activities



Scottish Government 2012

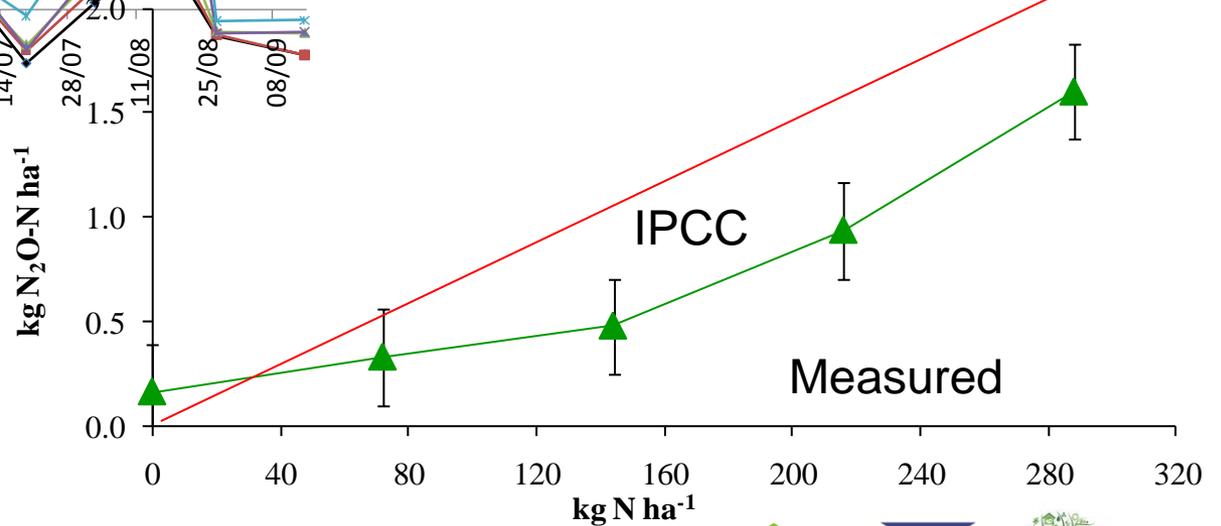
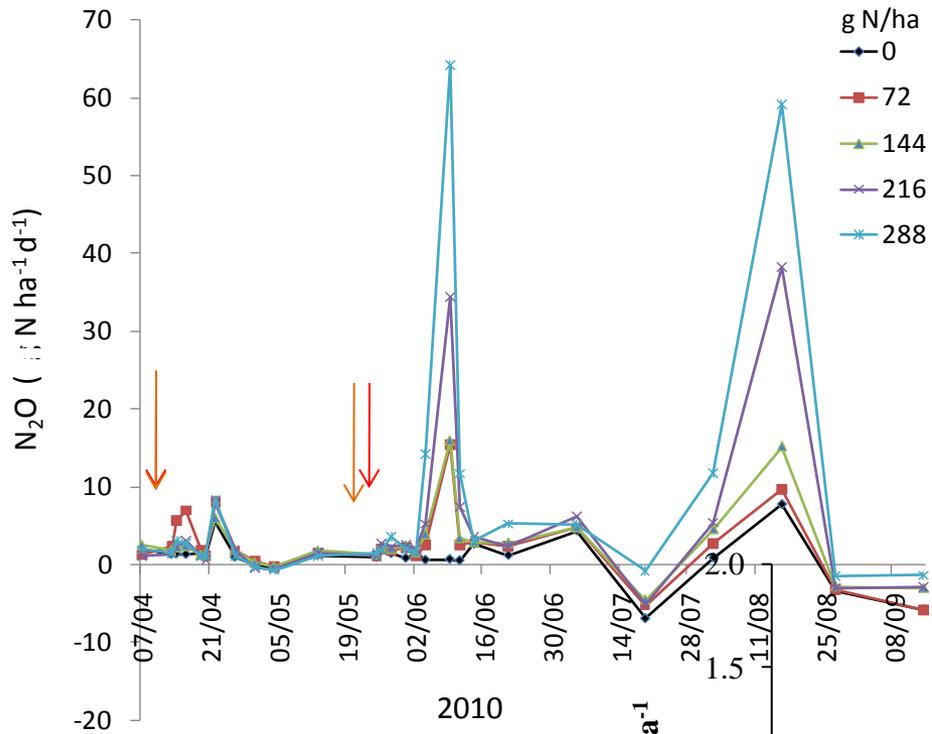
Management as a mitigation tool

- **Nitrogen input**
 - Form/rate
 - Biological inputs
 - Timing
 - Inhibitors
 - Slurries and manures
- **Soil and water management**
 - Tillage
 - Irrigation/drainage
- **Crop rotation/agronomy**
 - System changes



NITROGEN INPUT

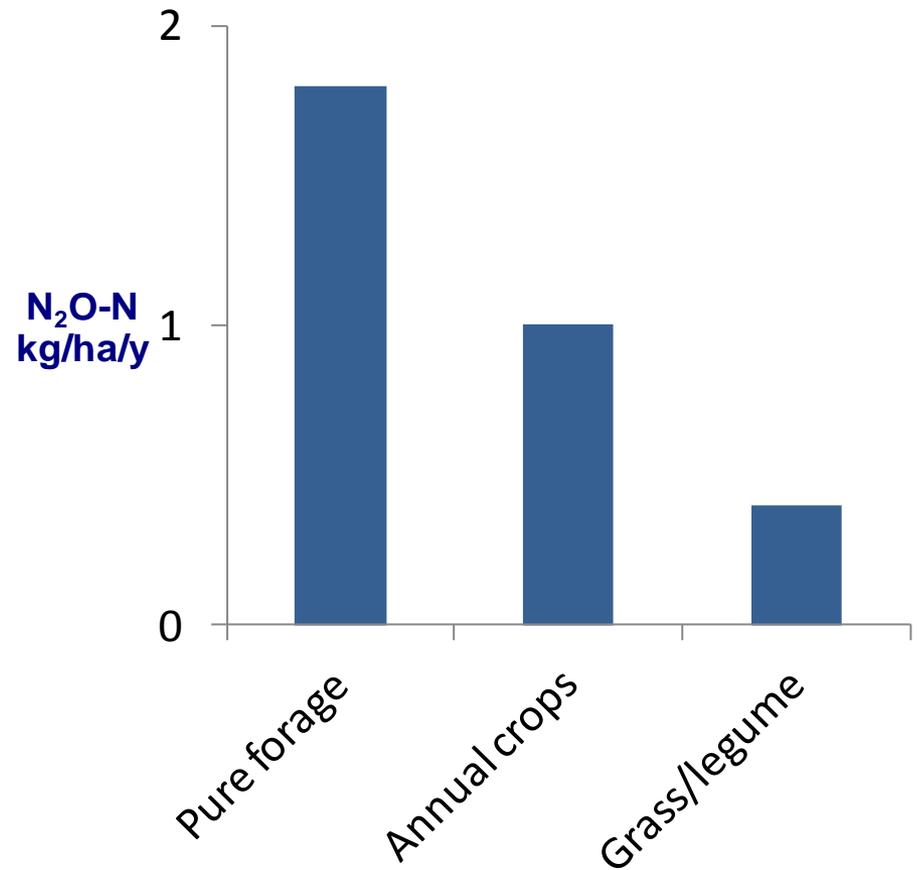
Reducing N applications



DEFRA project ' Min-No '
Pappa & Rees, SAC

Biological N fixation

- Direct emission factor for N₂O release from legumes reduced from 1.25% to 0 in 2006
- Emissions now restricted to residue inputs

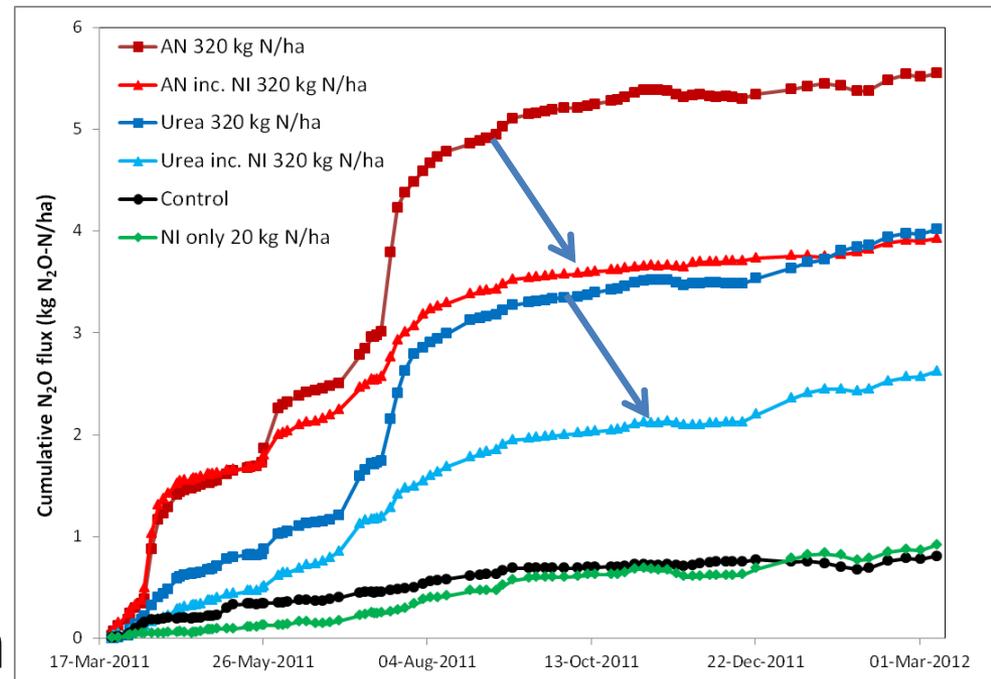


Rochette and Janzen 2005, *Nutrient Cycling in Agroecosystems*, 73, 171-179

Nitrification inhibitors

- Nitrification inhibitors demonstrate significant mitigation potential
- Can contribute to lower overall loss, therefore reducing fertiliser input
- Costs remain high, which limit wider current use

DCD applications at Crichton, 2011



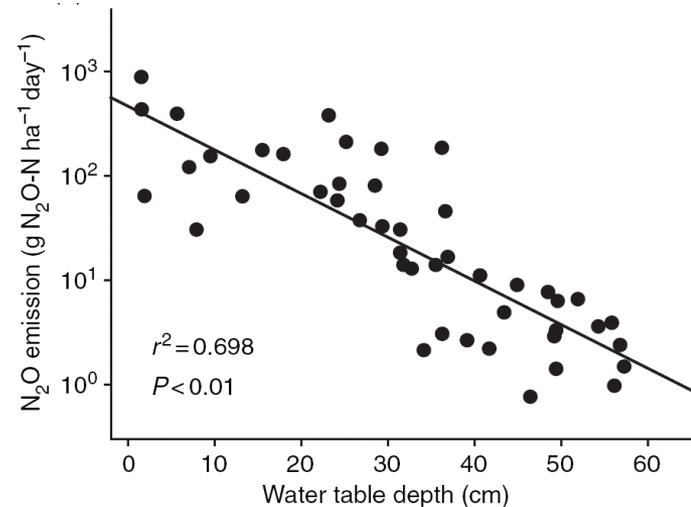
Cloy and Rees, 2012



SOIL AND WATER MANAGEMENT

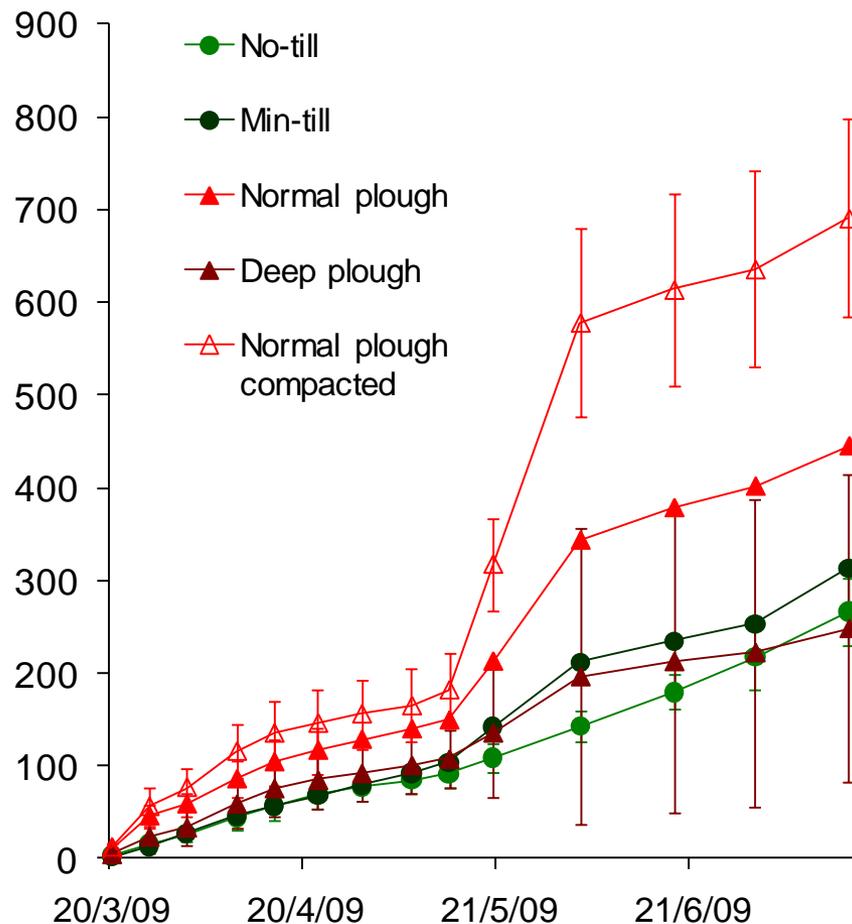
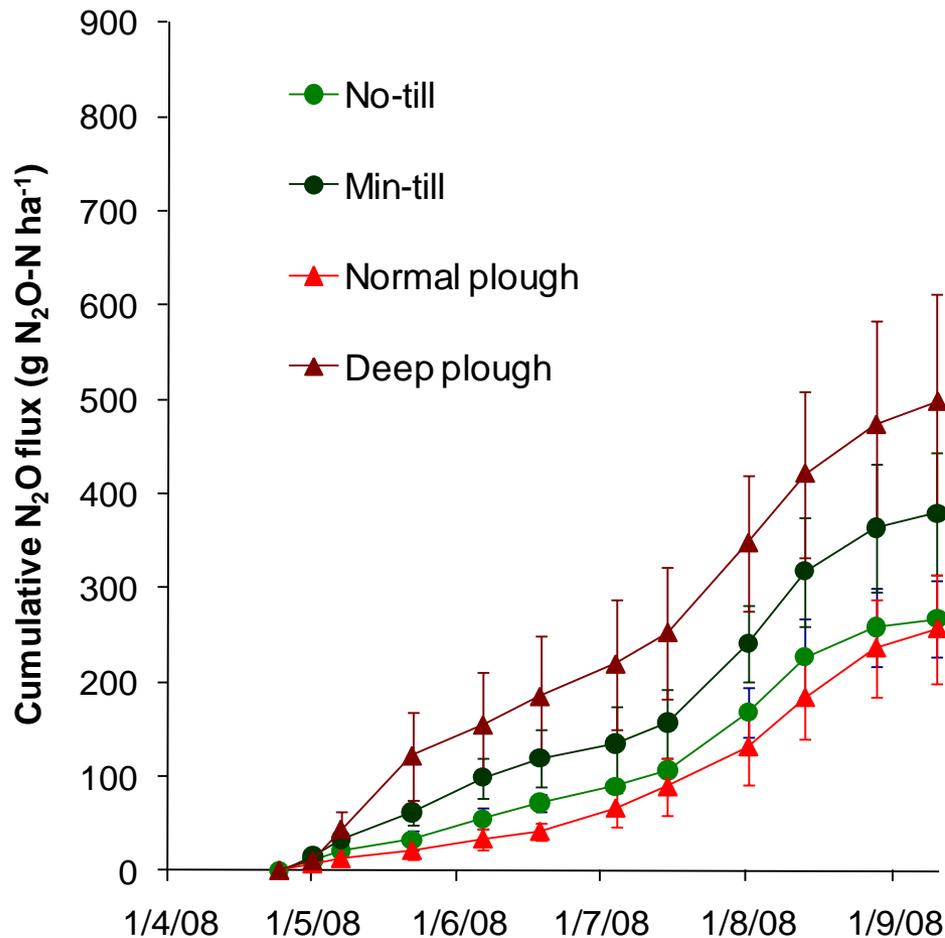
Drainage

- Impeded drainage increases the water filled pore space and denitrification
- Regional assessments of drainage efficiency are difficult



Dobbie and Smith 2006. Soil Use and Management, 22, 22-28

Reduced tillage



Rainfall: May-August 321 mm

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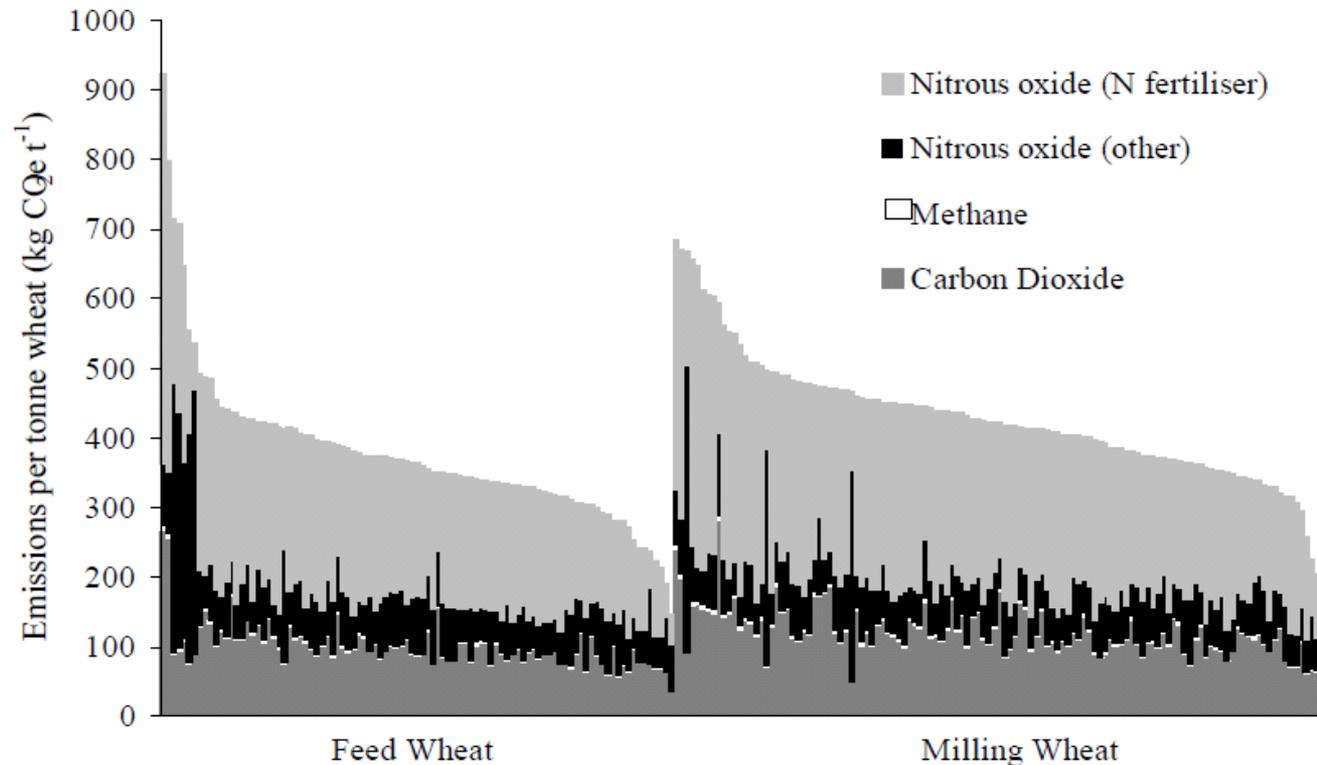
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CROP ROTATION AND AGRONOMY

Rankings based on emission intensity



Mean (kg CO₂e t⁻¹) 405 (Feed: 378 Milling: 427)

Range (kg CO₂e t⁻¹) 777 (Feed: 777 Milling: 486)

Wiltshire et al, 2012

Conclusions

- Technologies are available that can contribute significantly to lowering emissions of N₂O
- In Scotland for 2022 the full technical potential (100%) of all the measures we've considered in the MACC is 2.6 Mt, assuming 45% uptake it's 1.1 Mt CO_{2e}
- Much of this is achieved by increased efficiency
- We need to understand more about farmer behaviour
- There are opportunities in CAP reform to align subsidies with measures that promote better N use and reduce N loss to the environment