



## *Strategic Programme*



## **Greenhouse gas emissions and CAP reform**

**Bob Rees**

**SRUC**

**4 March 2013**

# 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

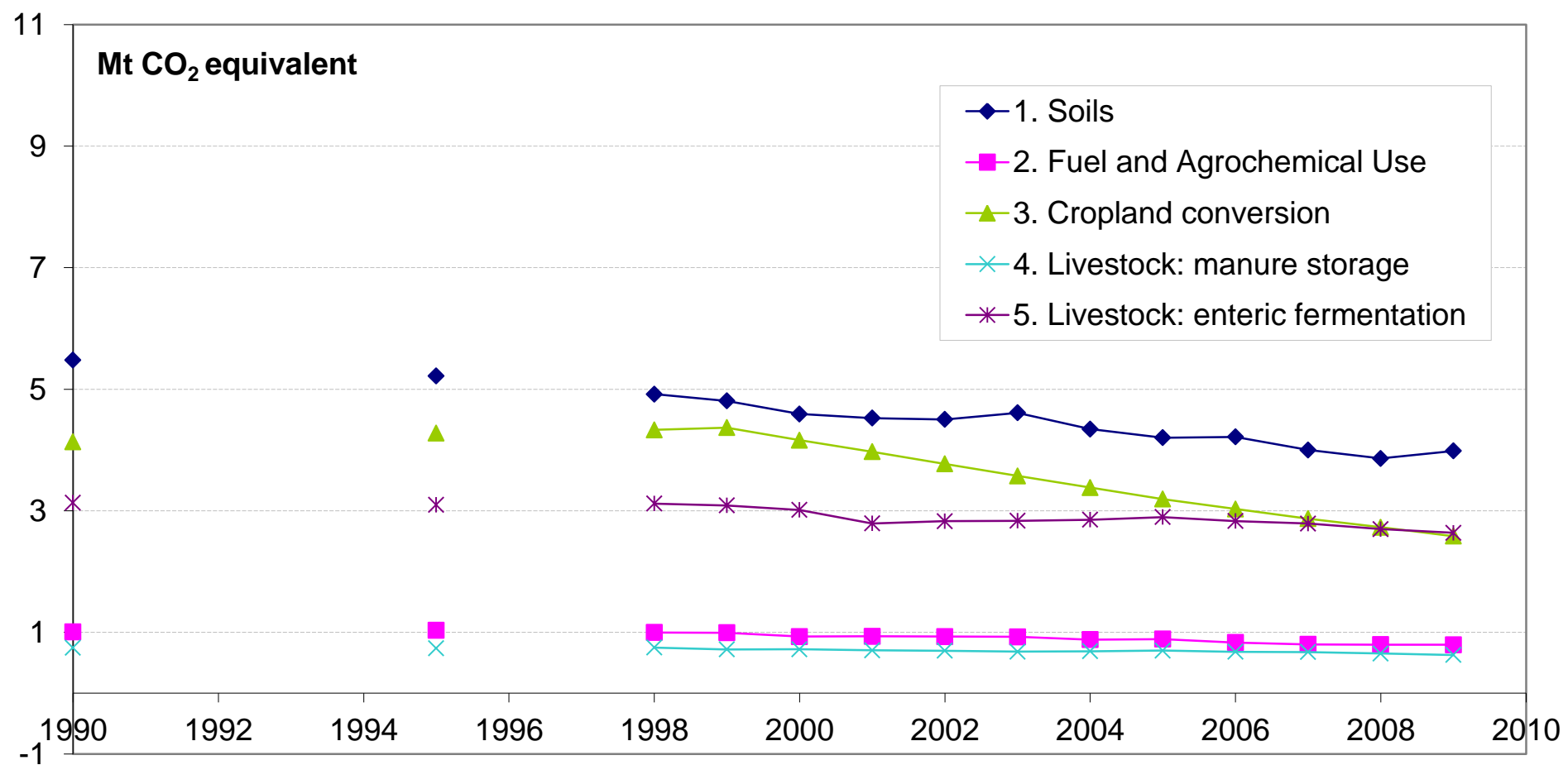


**The CAP towards 2020: Meeting the food, natural resources and territorial challenges of the future, EC 2010**

# Research on greenhouse gas mitigation at SRUC



# Net Scottish GHG Emissions from agriculture and related land use activities



**Scottish Government 2012**

# Management as a mitigation tool

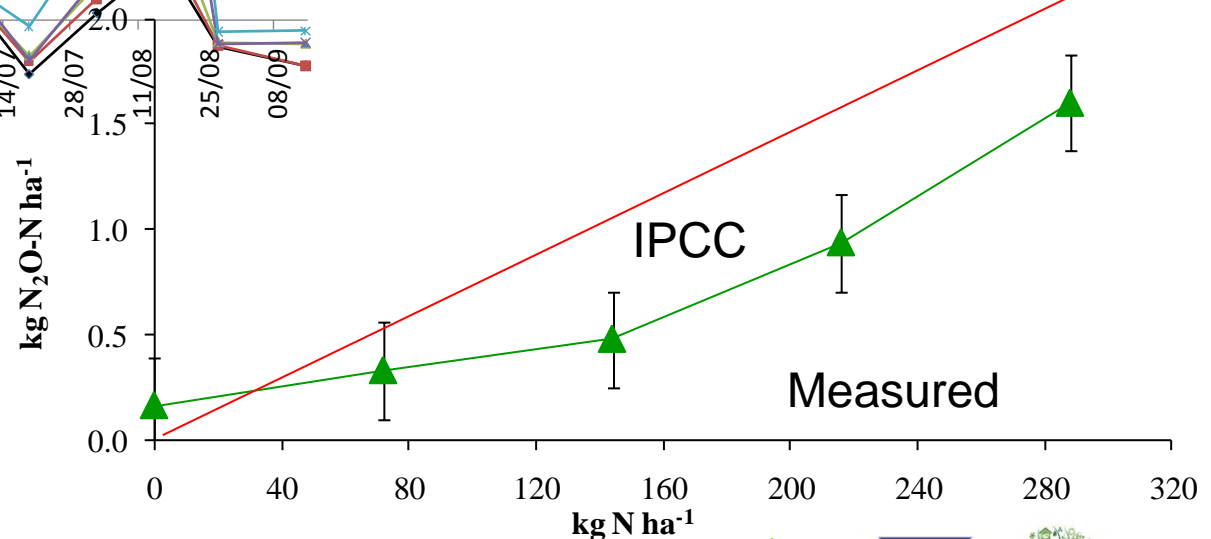
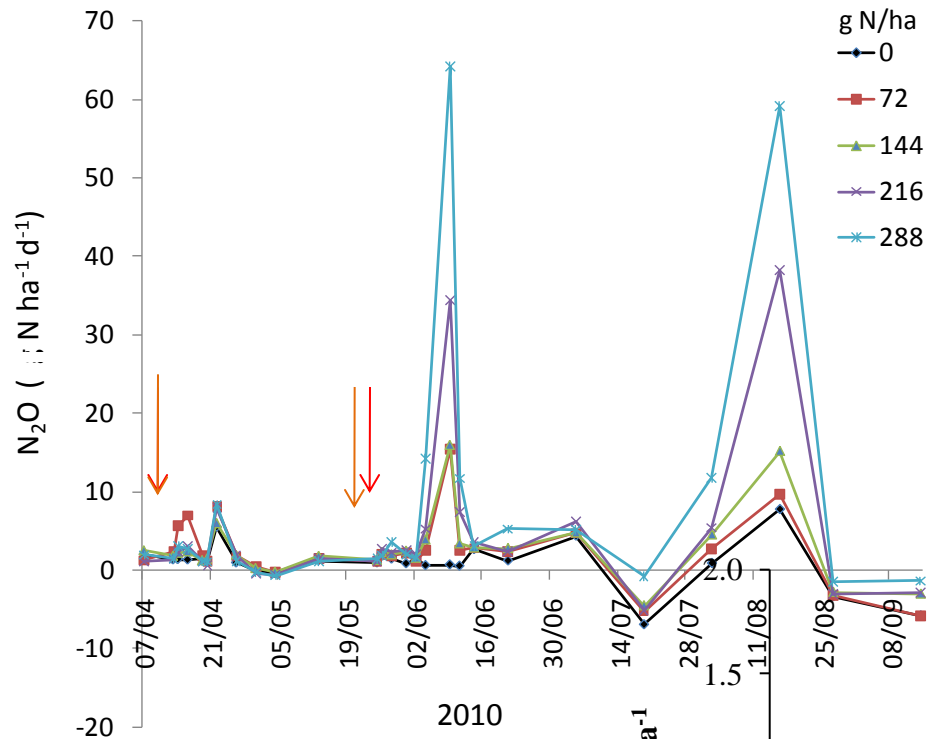
- **Nitrogen input**
  - Form/rate
  - Biological inputs
  - Timing
  - Inhibitors
  - Slurries and manures
- **Soil and water management**
  - Tillage
  - Irrigation/drainage
- **Crop rotation/agronomy**
  - System changes



# NITROGEN INPUT



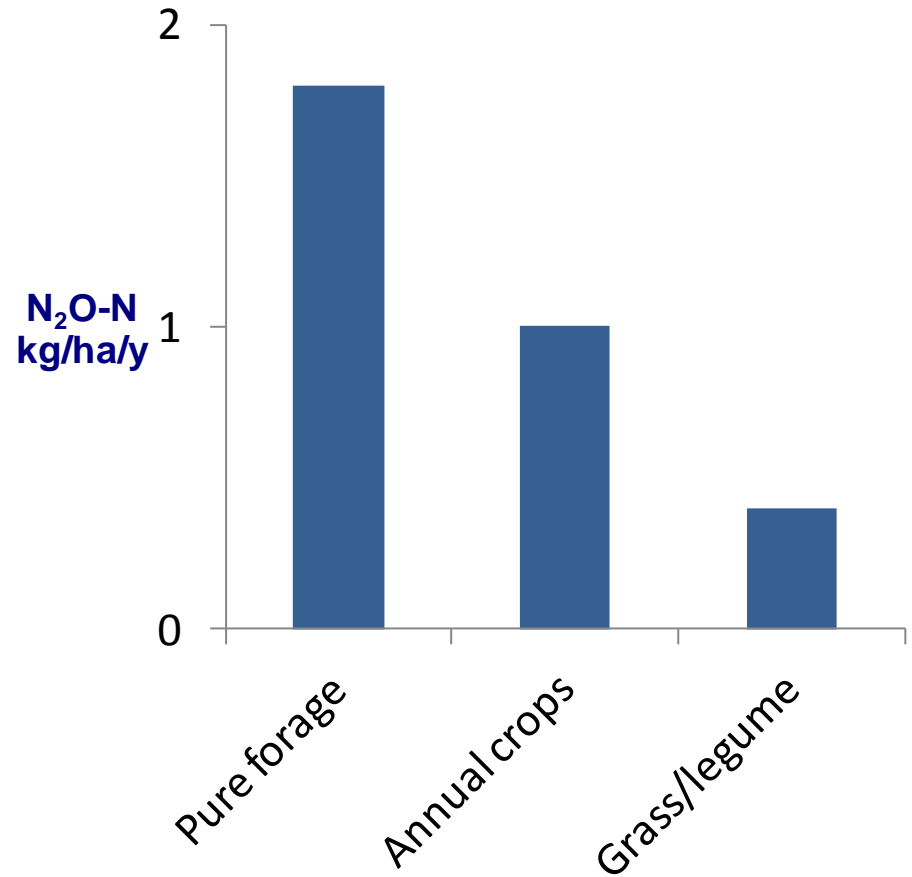
# Reducing N applications



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

# Biological N fixation

- Direct emission factor for  $\text{N}_2\text{O}$  release from legumes reduced from 1.25% to 0 in 2006
- Emissions now restricted to residue inputs



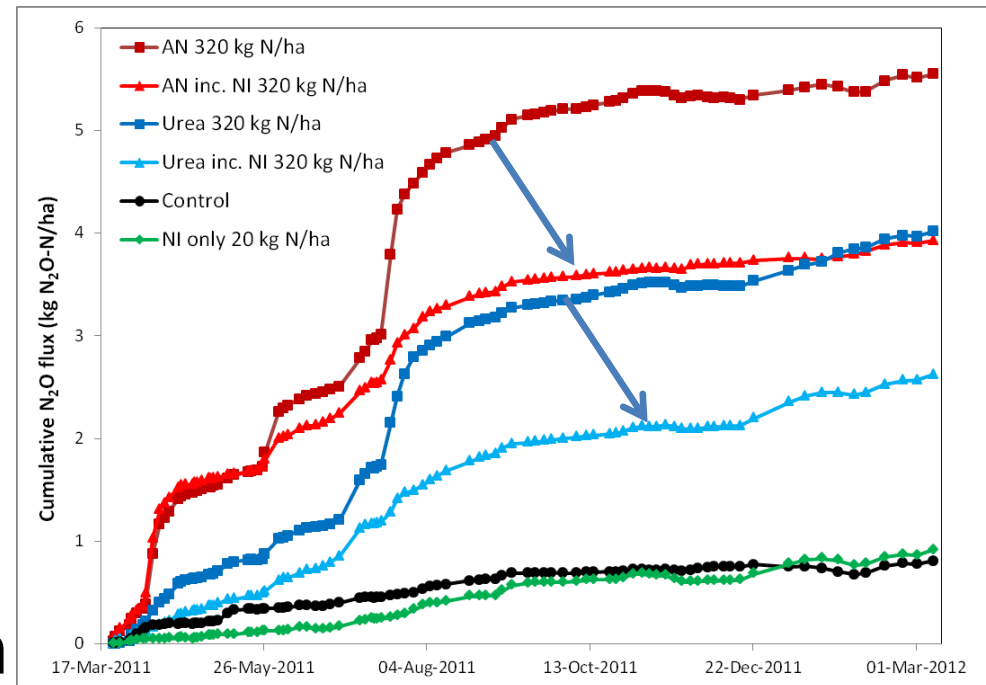
Rochette and Janzen 2005, *Nutrient Cycling in Agroecosystems*, 73, 171-179



# 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



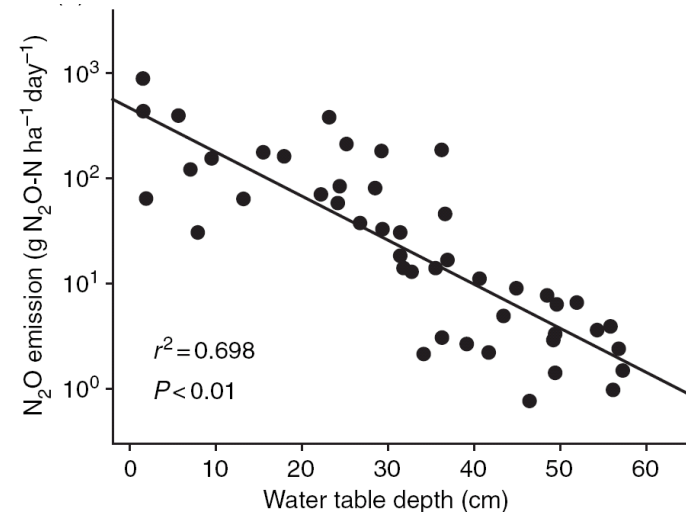
Cloy and Rees, 2012



# SOIL AND WATER MANAGEMENT

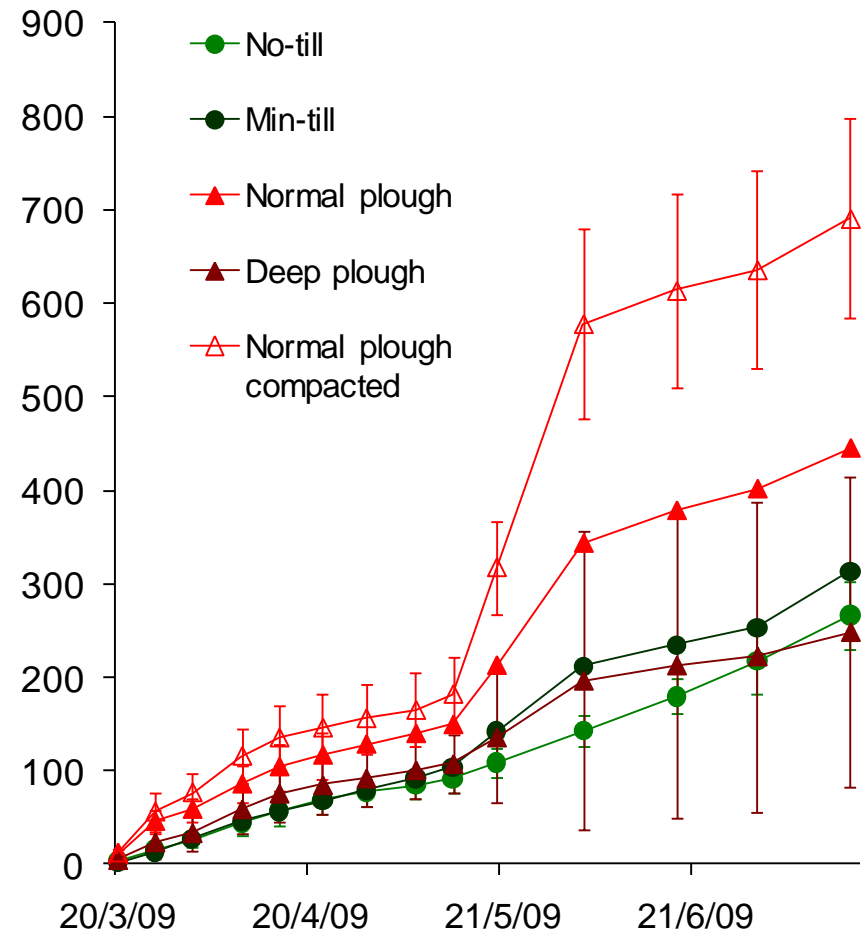
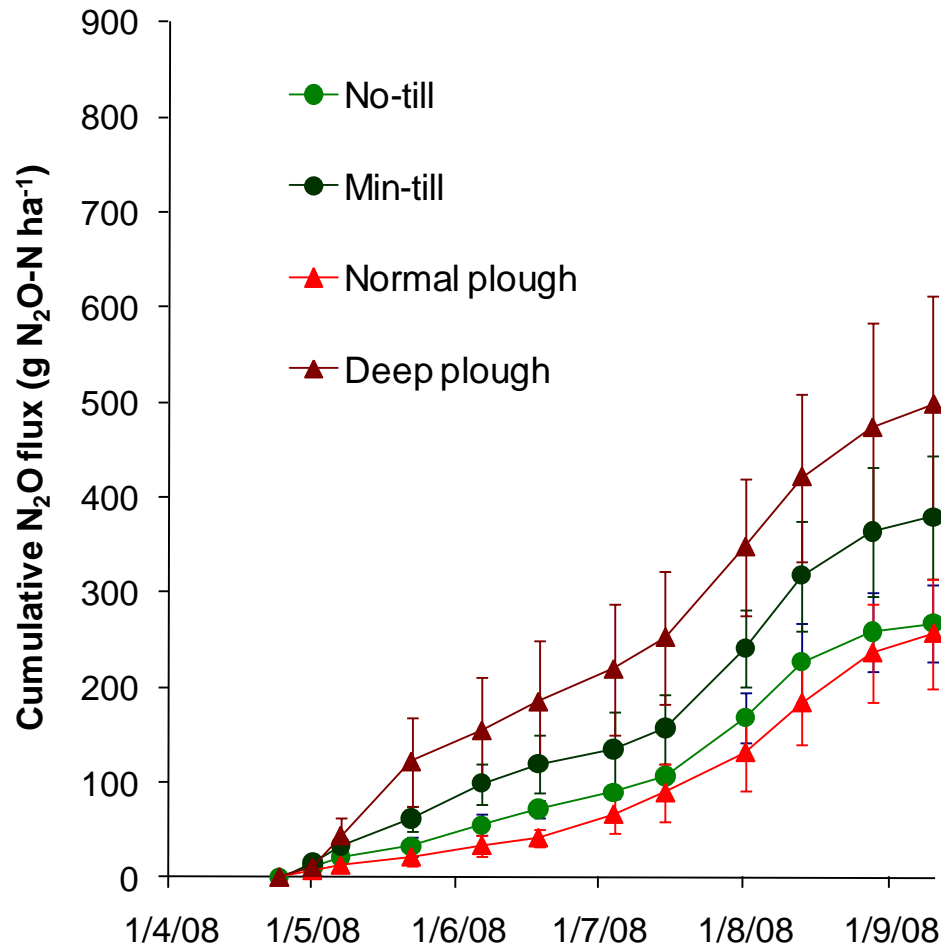
# Drainage

- 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

The James  
Hutton  
Institute

Moredun

Rowett Institute  
of Nutrition and Health



Royal  
Botanic Garden  
Edinburgh

SRUC

The Scottish  
Government

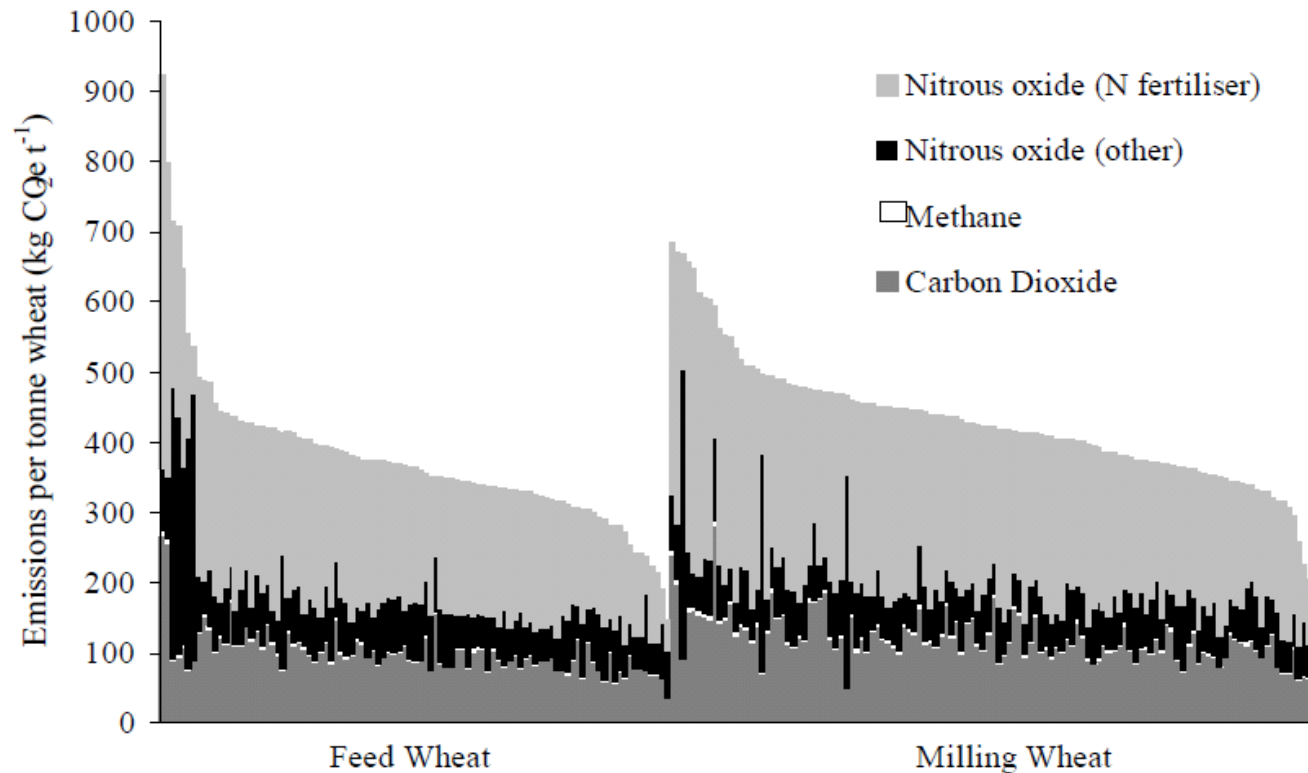
RESAS  
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# CROP ROTATION AND AGRONOMY

# Rankings based on emission intensity



Mean (kg CO<sub>2</sub>e t<sup>-1</sup>) 405 (Feed: 378 Milling: 427)

Range (kg CO<sub>2</sub>e t<sup>-1</sup>) 777 (Feed: 777 Milling: 486)

Wiltshire et al, 2012



# Conclusions

- Technologies are available that can contribute significantly to lowering emissions of  $\text{N}_2\text{O}$
- 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  $\text{CO}_{2e}$
- 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