

# The effect of fertilizer nitrogen source and N stabilizers on spring barley grain yield

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## Introduction

- Calcium ammonium nitrate (CAN) is the dominant N fertilizer used in Ireland.
- N fertilizer applications contribute substantially to environmental N losses.
- These N losses also represent an economic loss to farmers.
- An alternative N source is Urea which is cheaper per unit N.
- However, Urea can contribute to increased ammonia losses.
- Governmental legislation limits quantity of N that can be applied which may negatively impact production in high yielding crops (e.g. spring barley).
- N stabilizer technologies used with Urea fertilizers could maintain or improve yields while simultaneously reducing environmental N losses.

## Methods

- Two field sites located in the south east of Ireland.
  - Long-term arable – free-draining loam
  - Short-term arable – moderately draining sandy loam
- N fertilizers evaluated @ 150 kg N ha<sup>-1</sup>
  - CAN (27%N),
  - Urea (46%N),
  - Urea + DCD,
  - Urea + n-BTPT
  - Urea + n-BTPT + DCD
- Randomised block design with 5 replicates of each treatment
- Fertilizer N applied in two splits: sowing (30 kg N ha<sup>-1</sup>) and tillering (120 kg N ha<sup>-1</sup>).
- Crop sown in April and harvested in August where yield and yield quality was measured.

## Objective

- Evaluate the effect of N fertilizer sources (including the urease inhibitor n-BTPT and the nitrification inhibitor DCD) on spring barley grain yield and apparent fertilizer recovery.

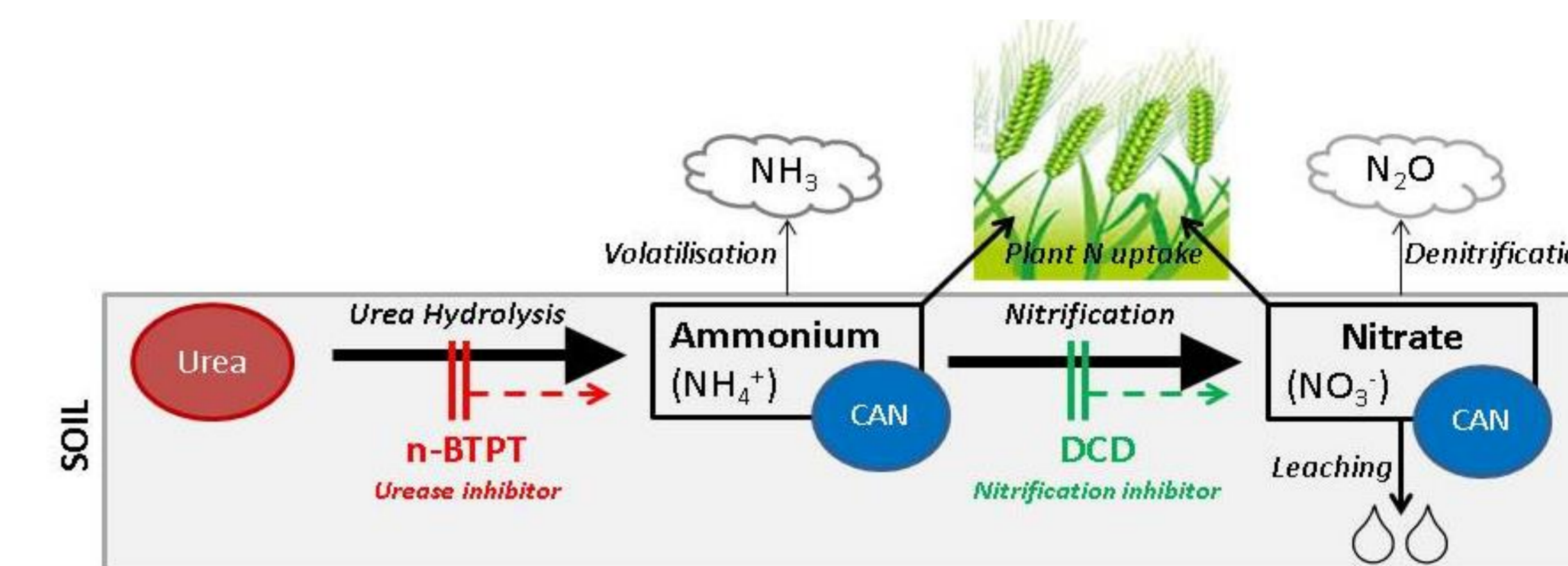


Figure 1. Interaction of N fertilizer formulations with soil N pools

## Results

Table 1. Apparent fertilizer recovery for both sites in both years

	CAN	Urea	Urea + n-BTPT	Urea + DCD	Urea + n-BTPT + DCD
<b>2013</b>					
Long-term arable	47	49	58	50	46
Short-term arable	62	46	68	58	44
<b>2014</b>					
Long-term arable	63	57	69	60	62
Short-term arable	60	52	53	41	55
Mean AFR	58	51	62	52	52

## Yield

- Grain yield was consistently higher on the short-term arable site compared to the long-term arable site (Figure 2).
- N fertilizer (@150 kg N ha<sup>-1</sup>) significantly increased grain yield compared to the unfertilized control at both sites in both years (Figure 2).
- There were no significant differences in grain yield between the different N fertilizer sources at either site in either year (Figure 2).

## Apparent Fertilizer Recovery (AFR)

- Urea + n-BTPT produced the highest mean AFR (highest for both sites in 2013 and for the long term arable site in 2014) (Table 1).
- Urea and urea + DCD fertilizer treatments produced lower mean AFR across both sites and years (Table 1).

## Spring barley grain yield (150 kg N ha<sup>-1</sup> applied)

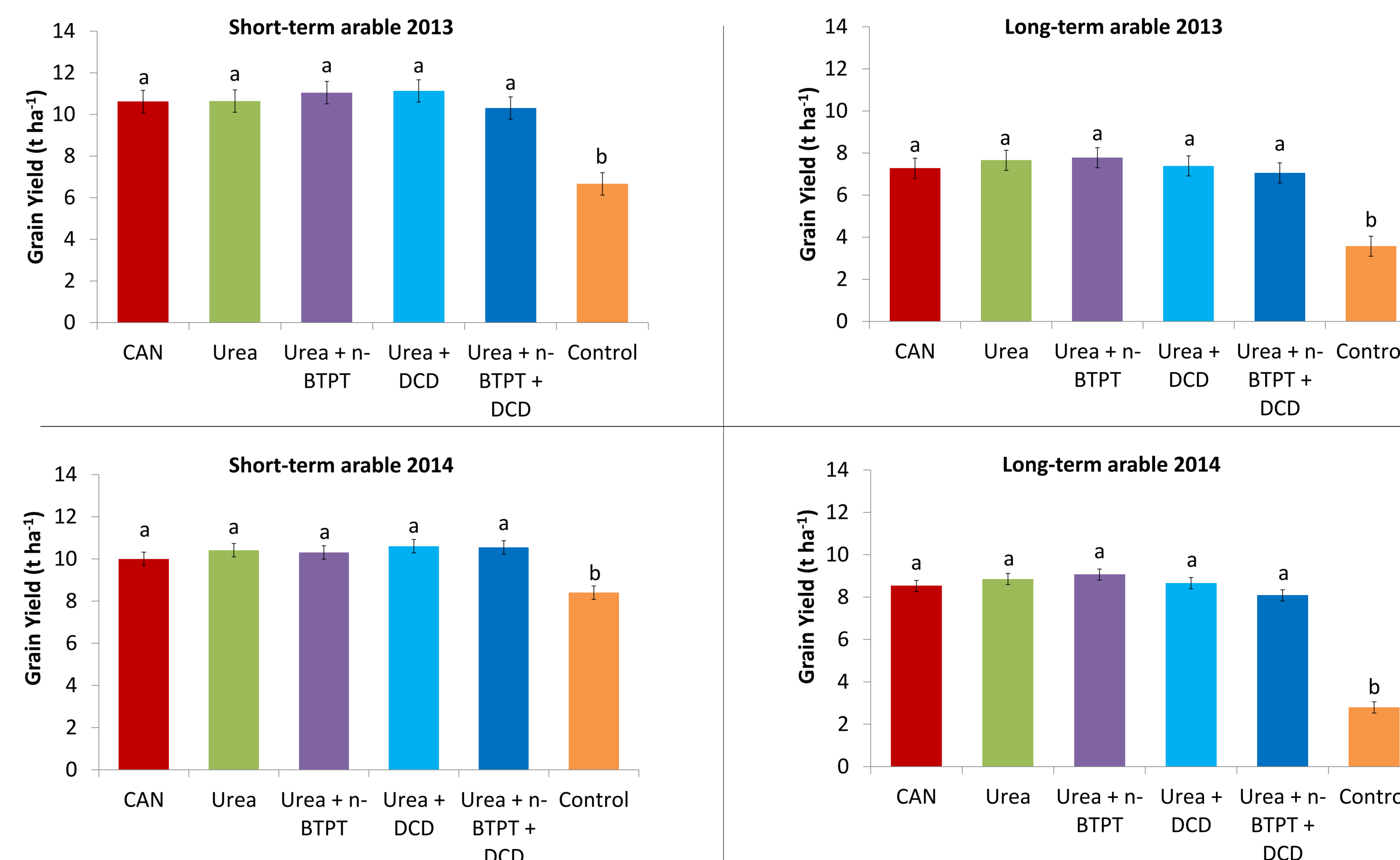


Figure 2. Spring barley grain yield for both sites in both years  
\*Mean comparisons using F-protected LSD test (P<0.05) \*Different letters represent significant differences within graphs

## Summary

- Grain yield was similar regardless of the N fertilizer source used.
- Apparent fertilizer recovery was increased using urea + the urease inhibitor n-BTPT compared with CAN.
- Overall this data shows that changing N fertilizer source (i.e. from CAN to Urea) can maintain (if not improve) grain yields.
- Applying Urea + n-BTPT increases recovery and efficiency of this N source.



Figure 3. Spring barley plots at the long-term arable site

## Acknowledgements

- This work was funded by the Department of Agriculture, Food and the Marine, Research as part of RSF 11-138 (SUDEN) and RSF 10-716 (AGRI-I) and the Teagasc Walsh Fellowship Fund.
- We would like to acknowledge all technical staff at Teagasc.