

# Calcium Ammonium Nitrate, Urea or Stabilized Urea: The Impact on Yield and Apparent Fertilizer Recovery in Intensive Grassland.

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## Introduction

- 38% of national agricultural emissions come from N fertilizer applications in the form of nitrous oxide (N<sub>2</sub>O)
- Calcium ammonium nitrate (CAN) is the most common form of straight nitrogen (N) used in Ireland. CAN is at risk of loss as N<sub>2</sub>O though denitrification in wet conditions.
- An alternative N source is Urea which is cheaper per unit N.
- However, Urea can contribute to increased ammonia losses.
- N stabilizer technologies used with Urea fertilizers could maintain or improve yields while simultaneously reducing environmental N losses.

## Methods

- Three grassland field sites in Ireland:
  - Drainage impeded at Hillsborough, Co. Down
  - Moderately drained at Johnstown Castle, Co. Wexford
  - Well drained at Moorepark, Co Cork
- Granular fertilizer N formulations evaluated over two years: CAN(27%N), Urea(46%N), Urea + urease inhibitor N-(n-butyl) thiophosphoric triamide (n-BTPT) source Agrotain®, Urea with the nitrification inhibitor dicyandiamide (DCD) and Urea with both inhibitors
- Fertilizer N rates (0 – 500 kg N ha<sup>-1</sup> yr<sup>-1</sup>) applied in five equal splits, the 200 kg N ha<sup>-1</sup> yr<sup>-1</sup> rate is presented
- Yield and apparent fertilizer recovery over six harvests per site year

## Objective

Evaluate the effect of switching from CAN to urea or urea + n-BTPT and/or DCD on yield and apparent fertilizer recovery

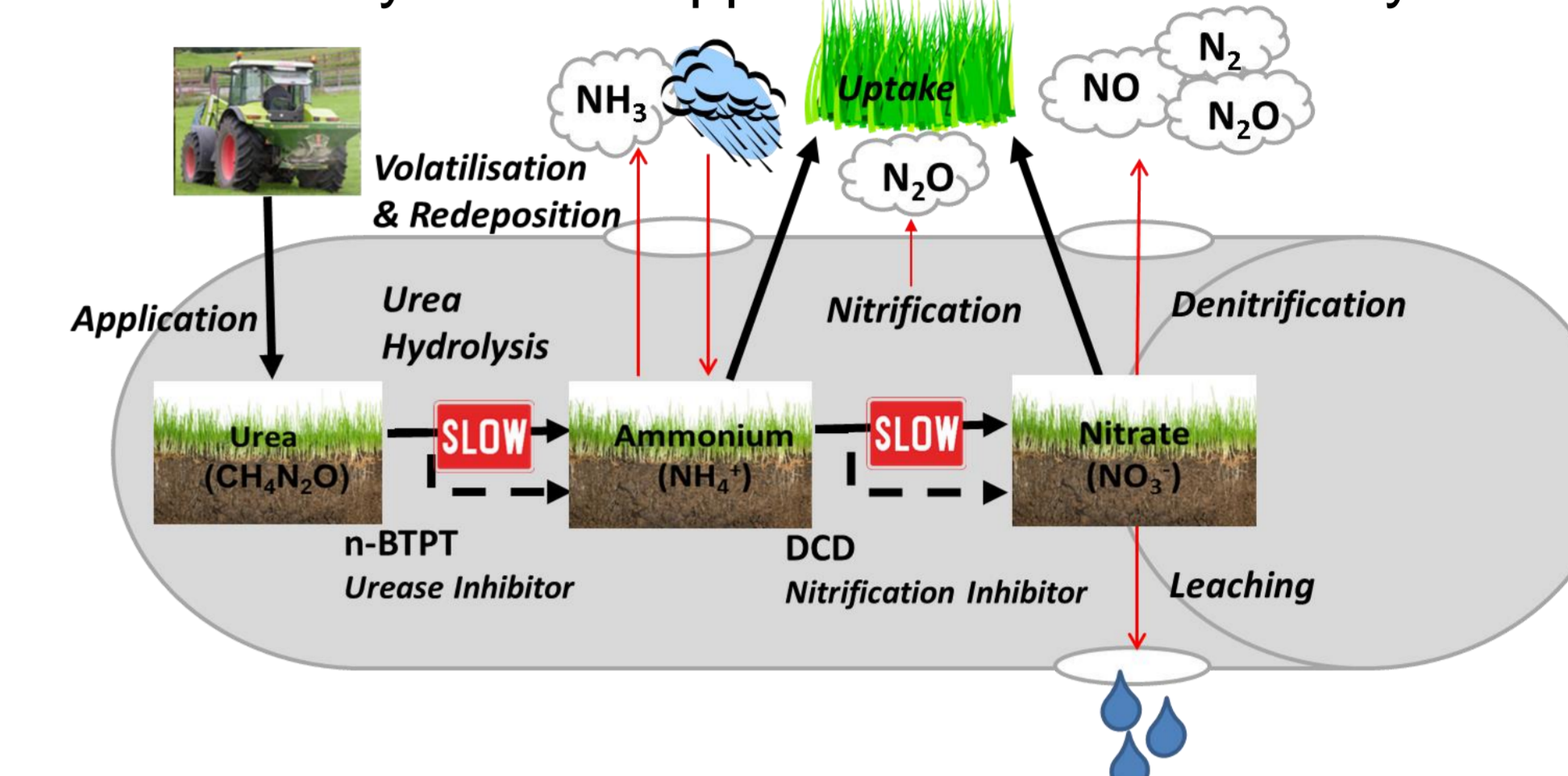


Figure 1. Interaction of N fertilizer formulations with soil N pools

## Results

Table 1. Apparent fertilizer recovery (%), all formulations over six site years

Siteyear	C.A.N.	Urea	Urea		
			n-BTPT	DCD	Urea DCD n-BTPT
%					
Hillsborough 2013	48	51	55	39	54
Johnstown 2013	74	57	66	51	65
Moorepark 2013	87	79	96	72	75
Hillsborough 2014	70	72	72	73	70
Johnstown 2014	72	64	71	51	64
Moorepark 2014	95	103	91	86	89
<b>Average</b>	<b>74</b>	<b>71</b>	<b>75</b>	<b>62</b>	<b>70</b>

## Yield

- No single formulation generated consistently highest grass DM yield across all site years (Figure 2) but Urea + DCD generated significantly lower DM yield than CAN in three site years.

## Apparent Fertilizer Recovery (AFR)

- Urea + n-BTPT produced the highest mean AFR (Table 1).
- Urea and Urea + DCD fertilizer produced lowest mean AFR (Table 1).

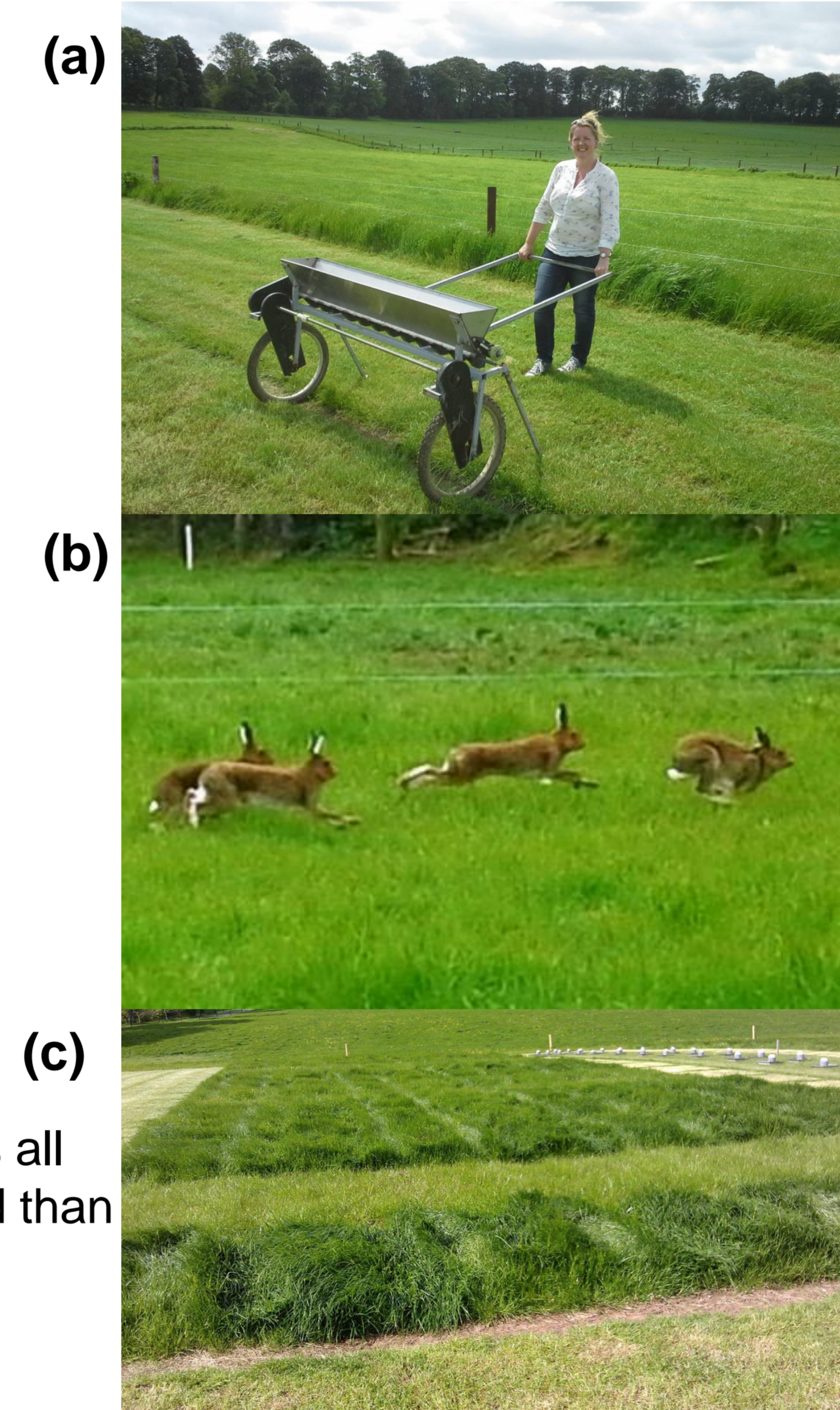


Figure 3. Grass site activities (a) applying basal dressing (b) site visitors and (c) grass harvest

## Grass dry matter (DM) yield for six site years (200kg N ha<sup>-1</sup> applied)

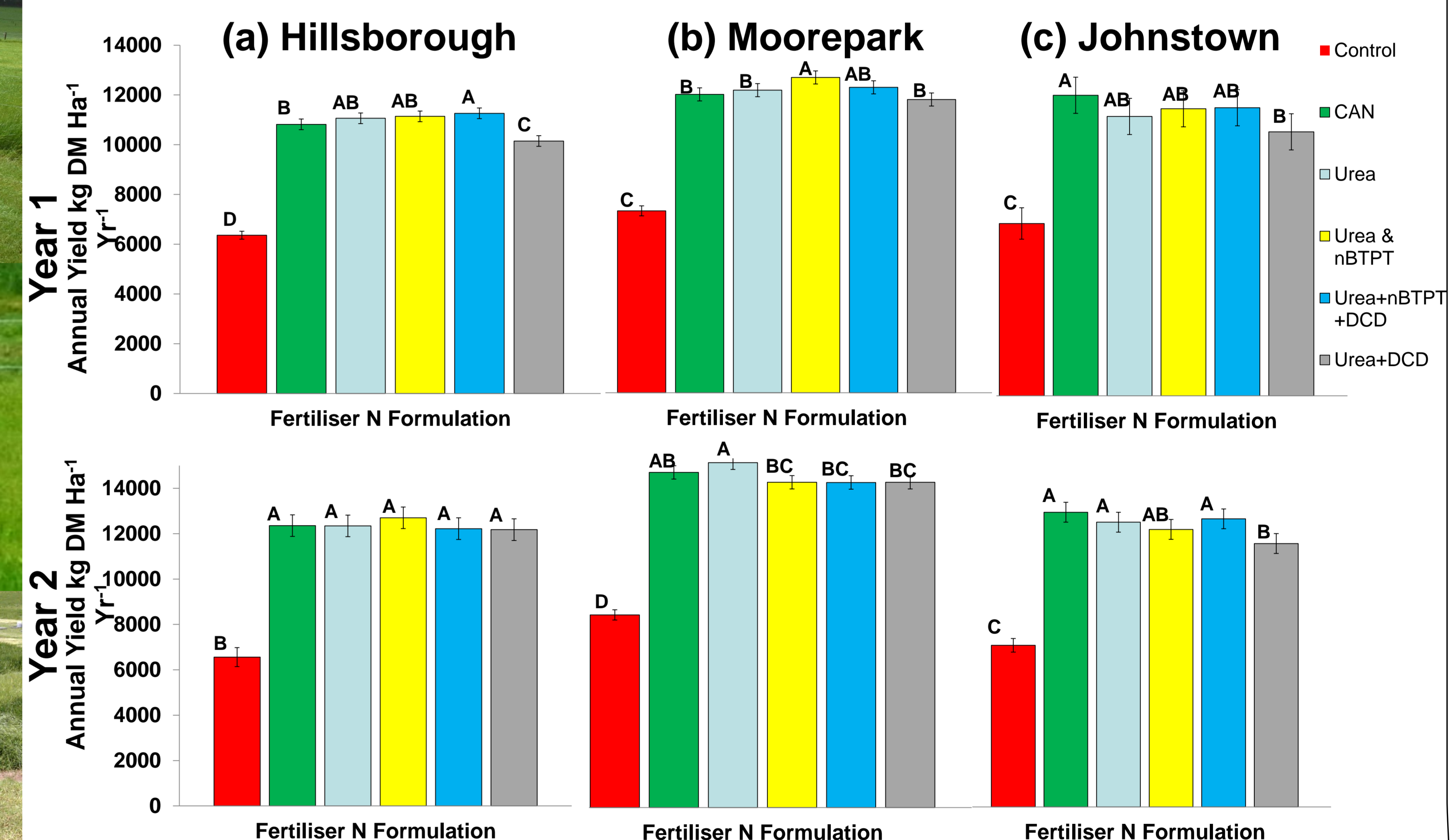


Figure 2. Grass DM yield for six site years  
\*Different letters within graphs represent significant differences according to F-protected LSD test (P<0.05)

## Summary

- Urea treatments performed as well as CAN did not impact yield except Urea+DCD which generated significantly lower yields than CAN in three site years
- On average Urea treatments generated similar apparent fertilizer recovery to CAN apart from Urea+ DCD which showed a trend for the lowest AFR in five of six site years (Table 1)
- Results indicate that the use of specific stabilized urea fertilizers also maintains yield and apparent fertilizer recovery at levels comparable to CAN in intensive grassland

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