

How does urea and protected urea compare to CAN for spring barley production

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Background

- **Greenhouse gas emission (GHG) reduction targets**
 - Agriculture is responsible for 33% of GHGs
 - N fertiliser contributes to GHGs
- **Ammonia emission reduction targets**
 - Agriculture is responsible for 98% of ammonia emissions
 - Urea contributes to ammonia emissions
- **Water Quality**
 - Losses of N fertiliser is damaging to water quality
 - Requirements under Water Framework and Nitrates directives
- **Food Wise 2025**
 - Increase the value of primary production by 65%

Background – N Fertiliser

CAN

- 27% N
- 13.5% of N in CAN is nitrate and can be easily lost
- N losses as nitrous oxide (potent greenhouse gas) and nitrate leaching
- Using urea could reduce these losses

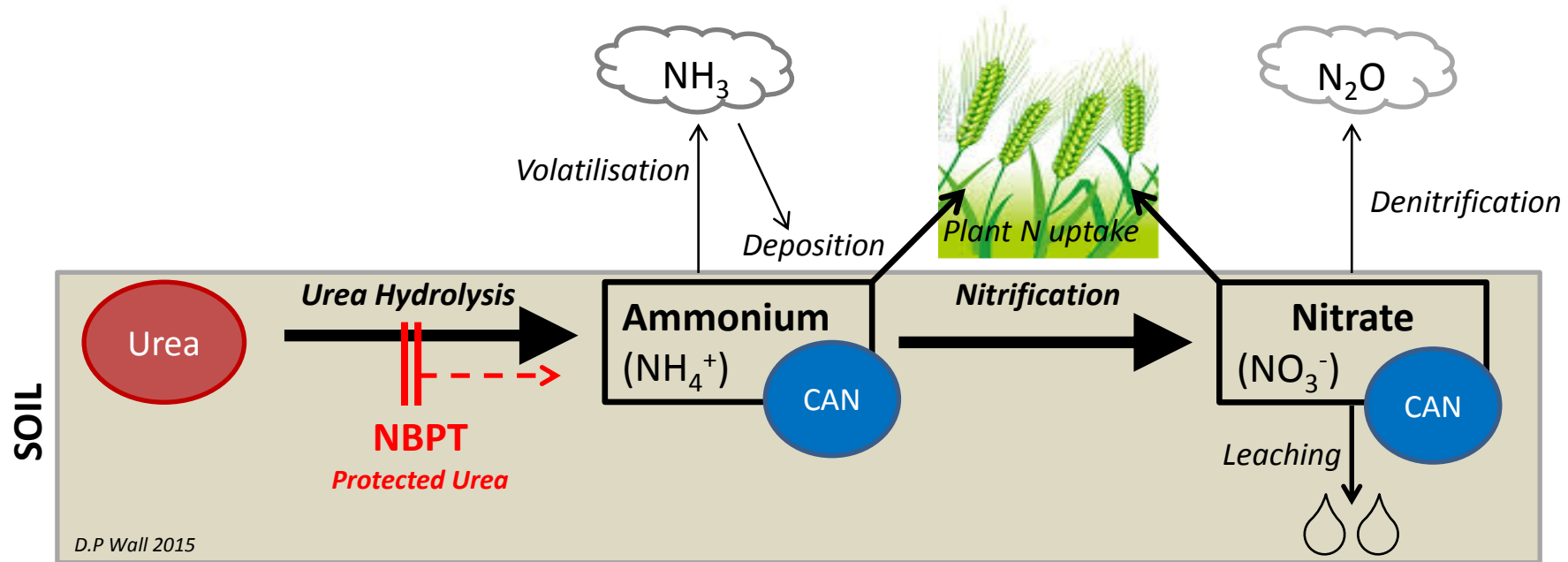
Urea

- 46% N
- Urea must go through two conversions before N converts to nitrate
- N loss as ammonia volatilisation (indirect greenhouse gas)
- Use of protected urea



Protected Urea

- Protected urea fertilisers are now available on the market in Ireland
- In this study – urea + N-(n-butyl) thiophosphoric triamide (NBPT) is used
- The protected urea product used in these trials contained NBPT at 660 ppm.



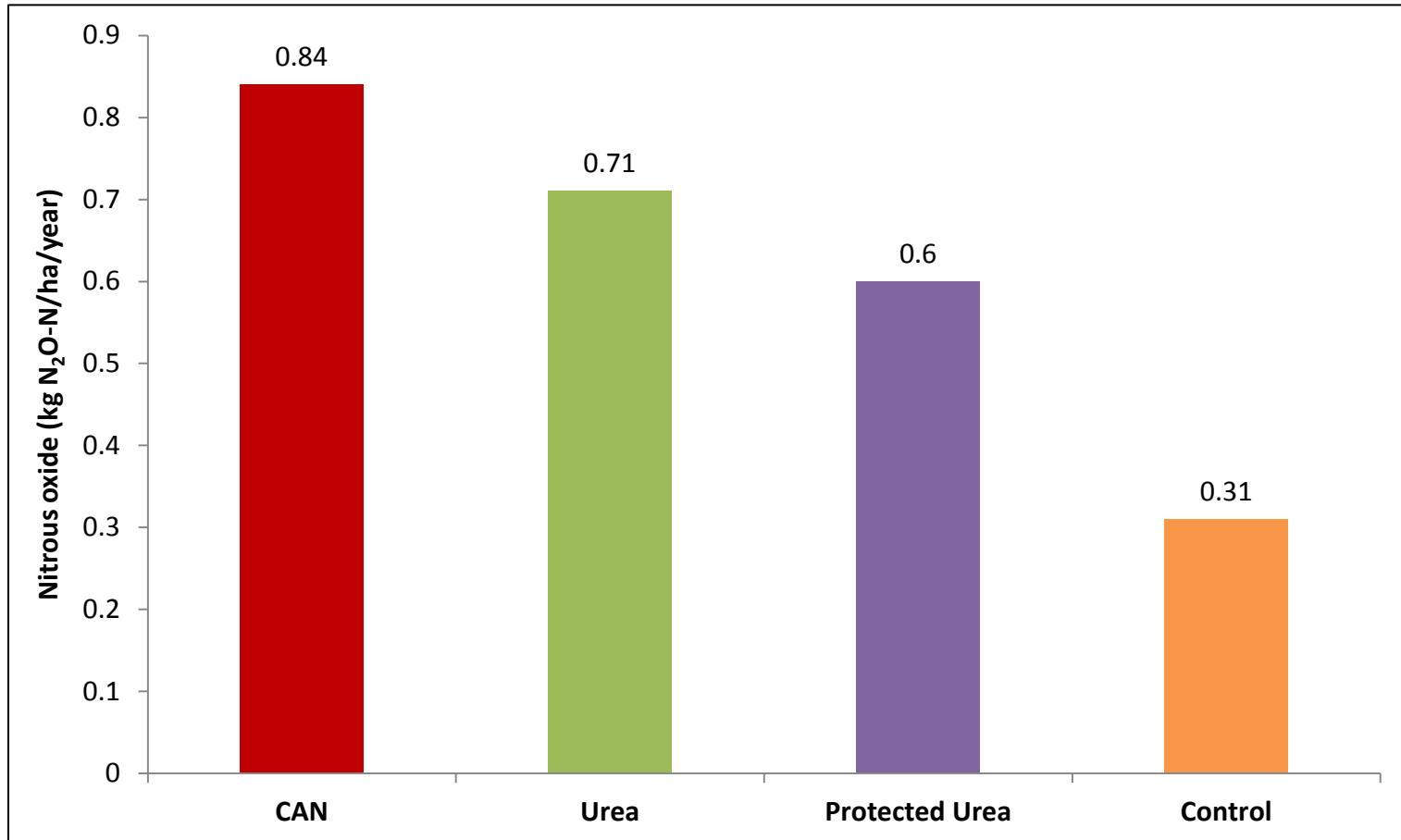
Experimental Design

- Field site
 - Marshalstown, Co. Wexford – free draining loam
 - >20 years spring barley production
- Randomised block design with 5 replicates of each treatment
- N fertiliser treatments used (N rate 150 kg N/ha)
 - Unfertilised control
 - CAN
 - Urea
 - Protected urea (Urea + NBPT)
- Fertiliser N applied in 2 splits
 - 1st split – 30 kg N/ha applied at sowing
 - 2nd split – 120 kg N/ha applied at mid-tillering
- Nitrous oxide emissions measured after N application
- Crop Harvested in late August each year

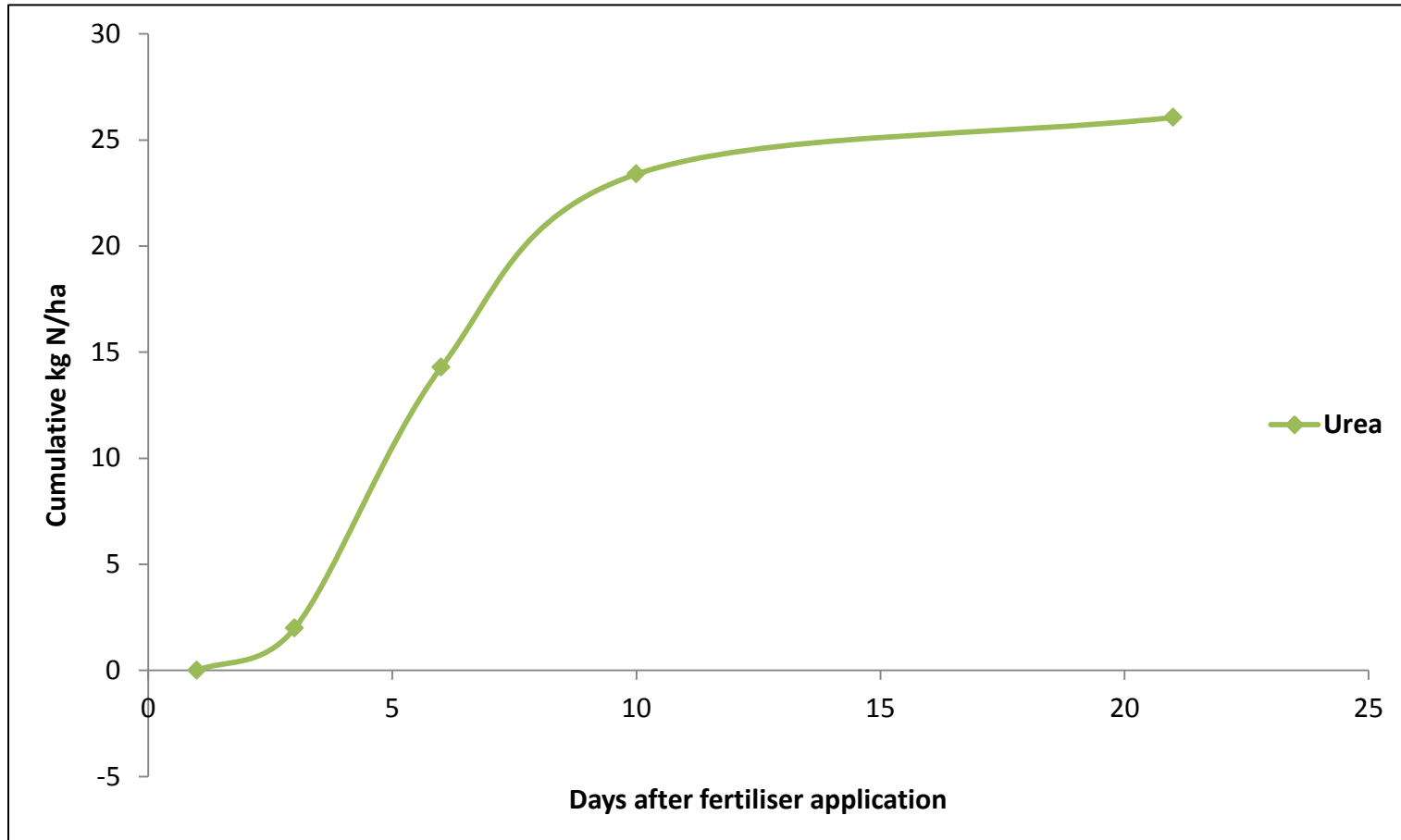


Results

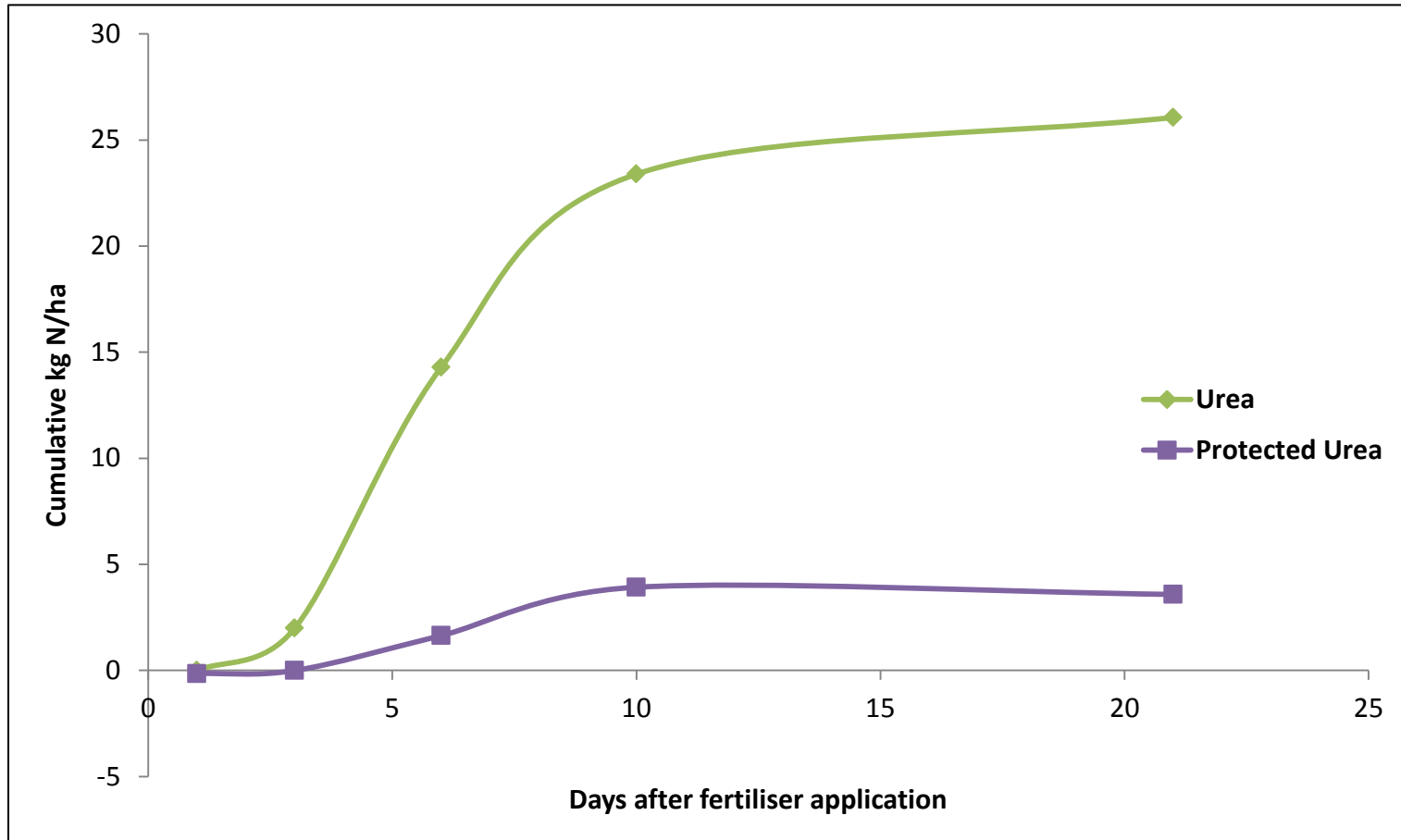
Nitrous Oxide emissions



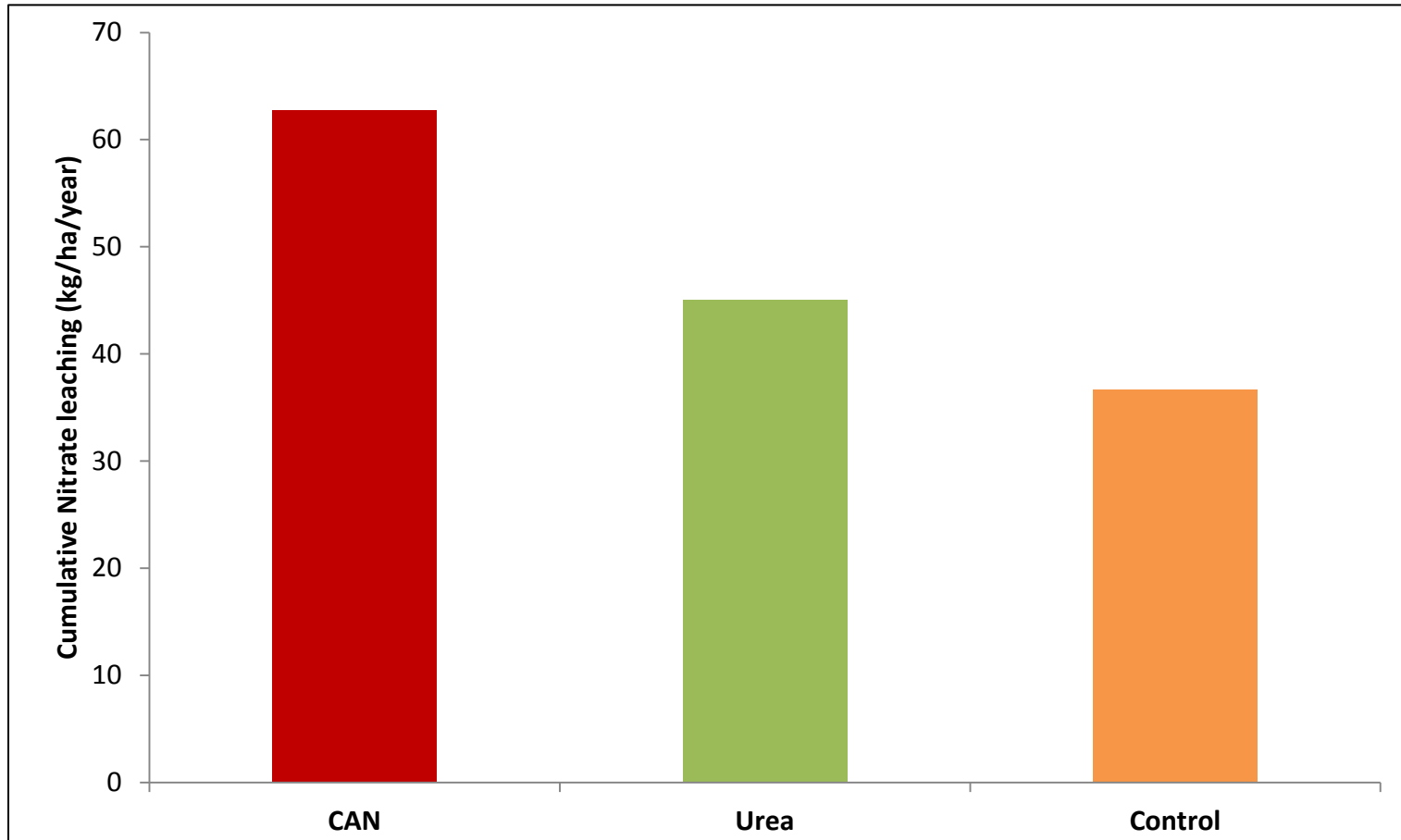
Ammonia Emissions



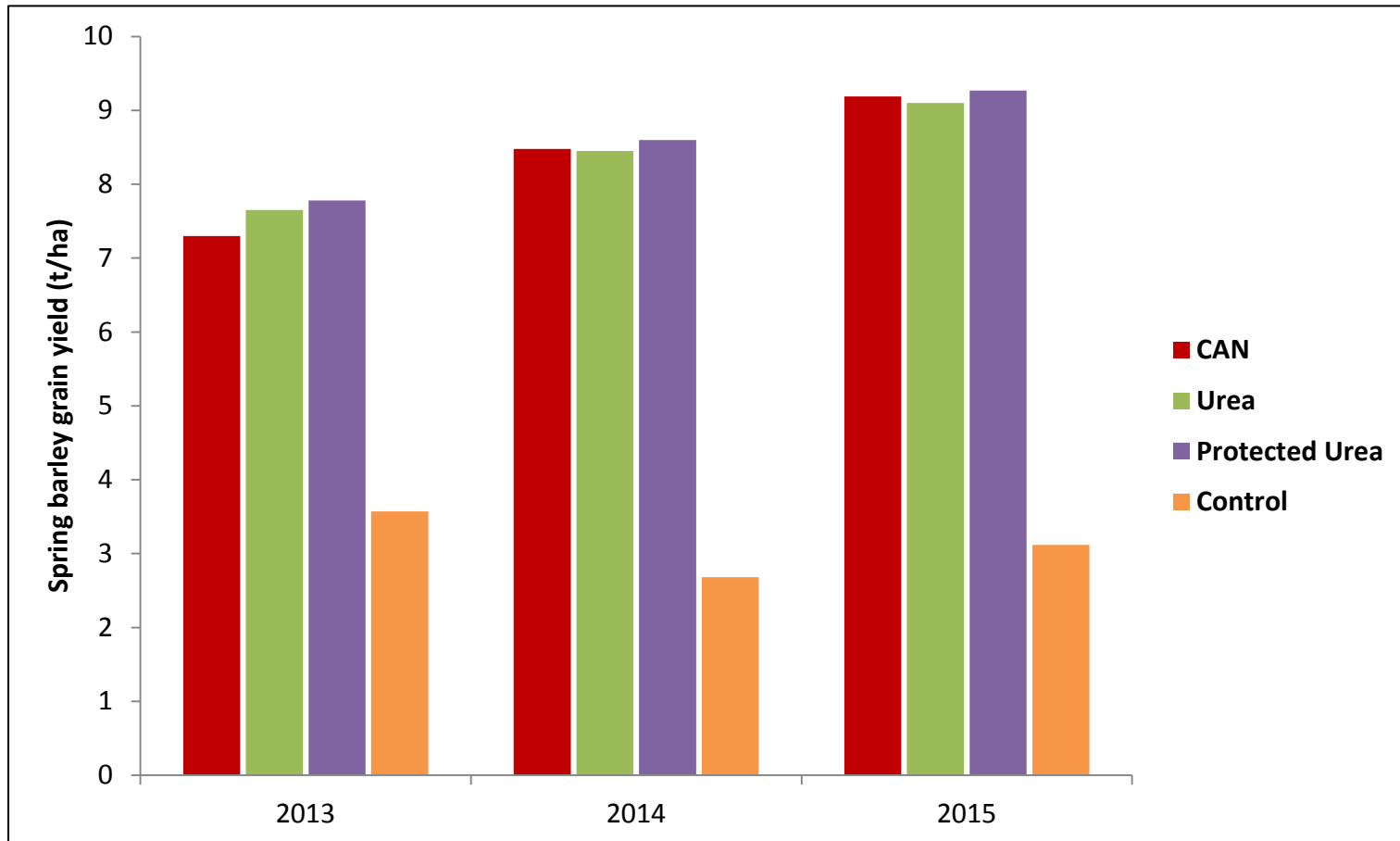
Ammonia Emissions



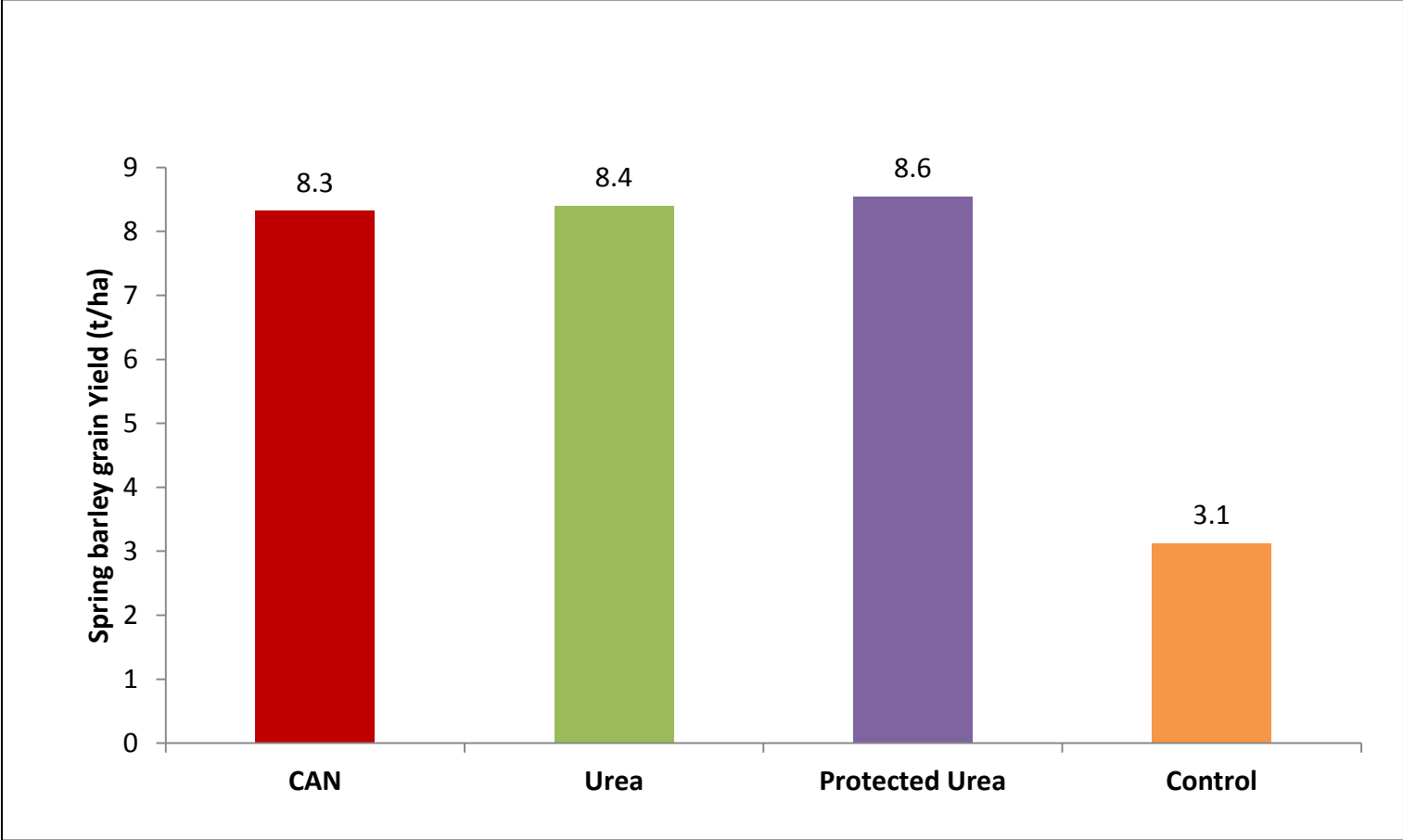
Nitrate Leaching



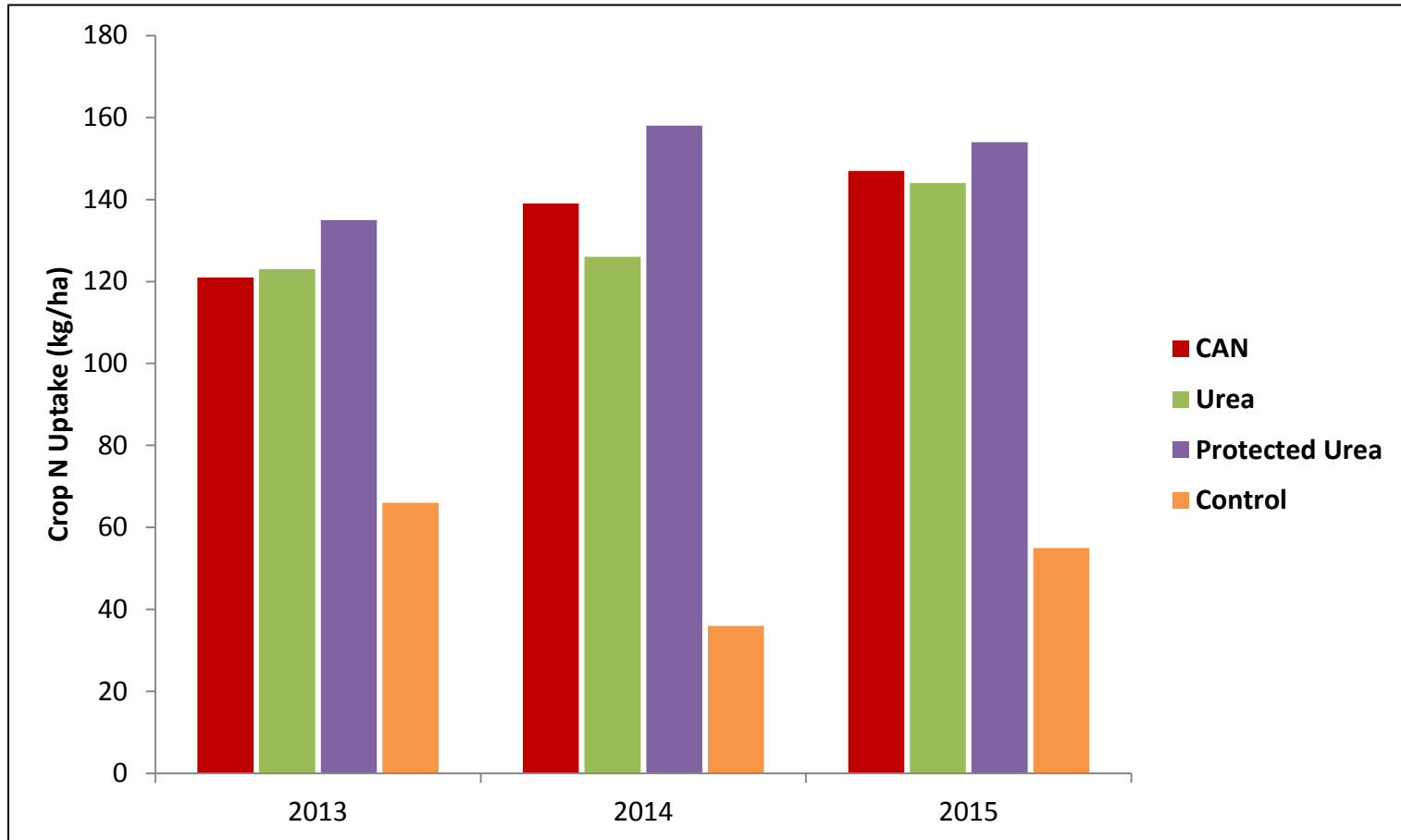
Grain Yield over 3 years (2013, 2014, 2015)



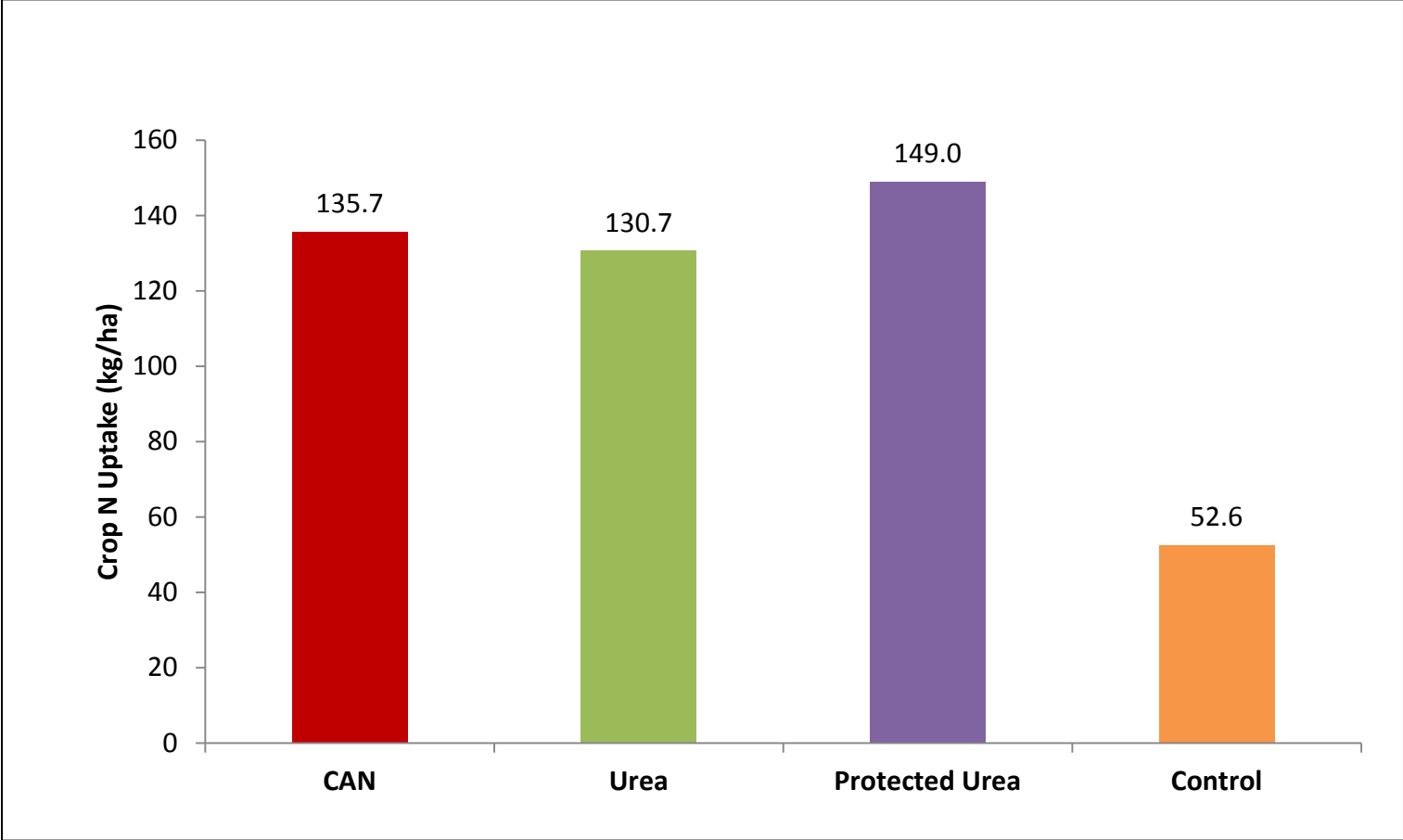
Average Grain Yield over 3 years



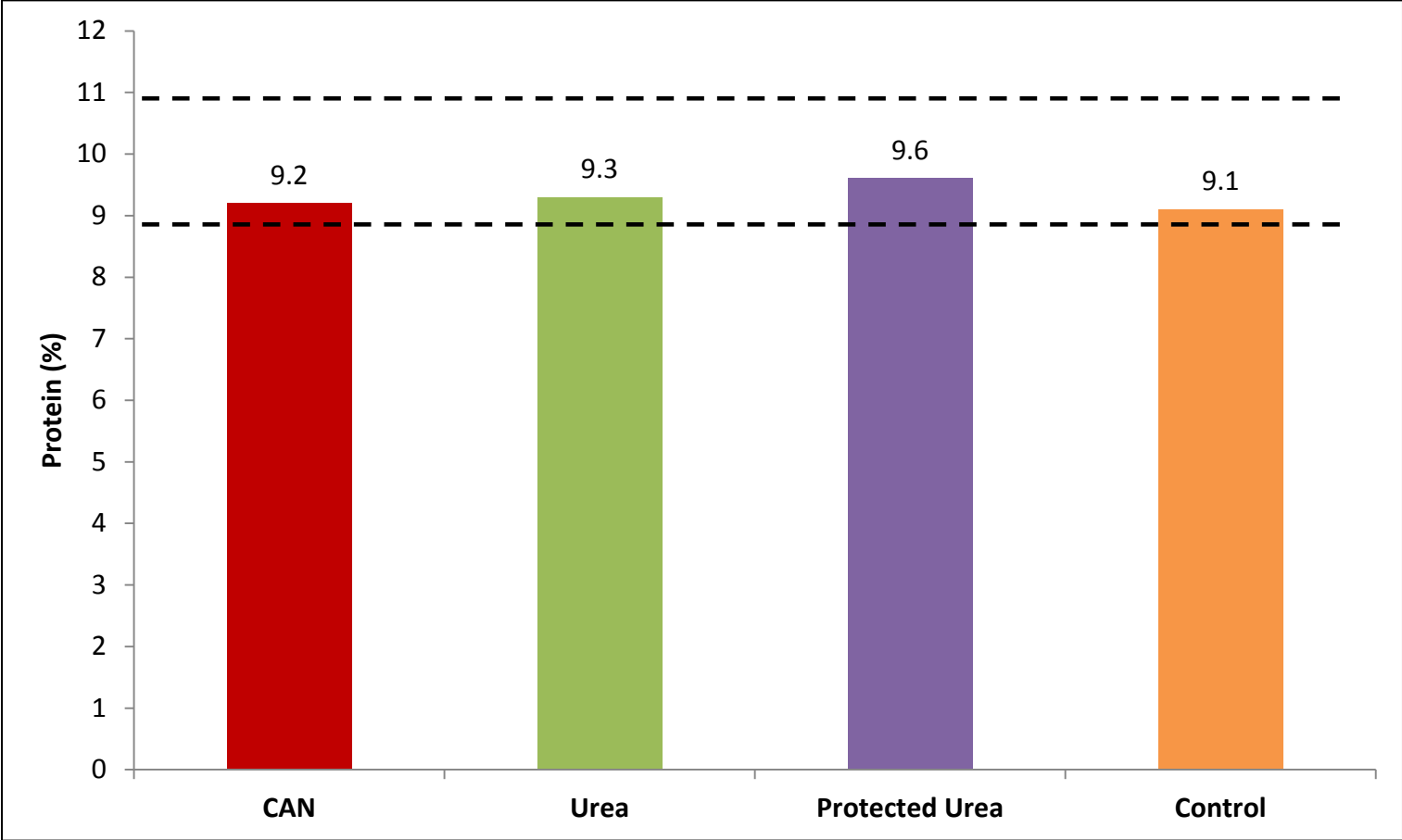
N uptake over 3 years (2013, 2014, 2015)



Average N uptake over 3 years



Average Protein % over 3 years



Relative Star rating of CAN, urea and protected urea

	CAN	Urea	Protected Urea
Cost of N	★★★★	★★★★★	★★★★
Yield	★★★★★	★★★★	★★★★★
N Uptake	★★★★	★★★★	★★★★★
Nitrous oxide	★★★★	★★★★	★★★★
Ammonia	★★★★	★★	★★★★
Leaching	★★	★★★★	*Not available

Conclusions

- **Greenhouse gas emissions**
 - Overall N₂O was low from all fertilisers
 - Protected urea had lower emissions than CAN
- **Ammonia Emissions**
 - Ammonia loss from urea approximately 25kg
 - Protected urea reduced ammonia loss to < 5 kg
- **Grain Yield**
 - Grain Yield similar for all fertilisers
 - On average 0.3 t/ha more yield with protected urea
- **N Uptake and Protein**
 - N Uptake and protein highest with protected urea

Overall, using protected urea is a win-win for farmers and environment

Thank you for your attention

Acknowledgments

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