Taking a fresh look at urea performance in grassland

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First a question for you:

What happens on your farm, have you used urea in the past year?

- **Yes**
- **No**

Urea, **Why** look at it now?

Cost & yield

- Urea-N costs less than CAN-N: 26% less (CSO, 2014)
- Is there a yield penalty?
- Internationally urea is more available than CAN

GHG

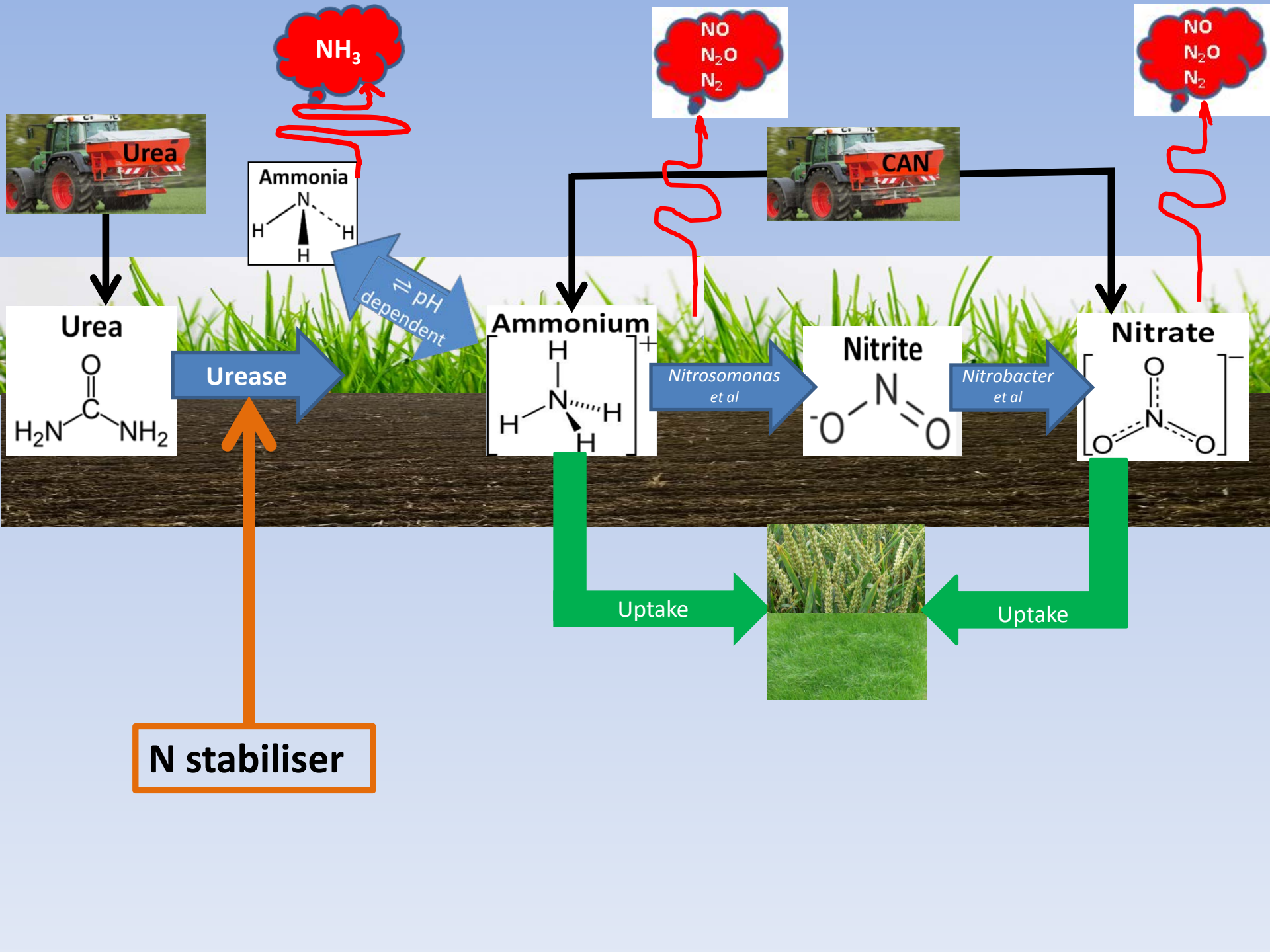
- Ag. approx. 1/3 national emissions
- committed to reduce by 20% by 2020
- N addition causes N_2O loss
- Smart solutions

Ammonia (NH_3)

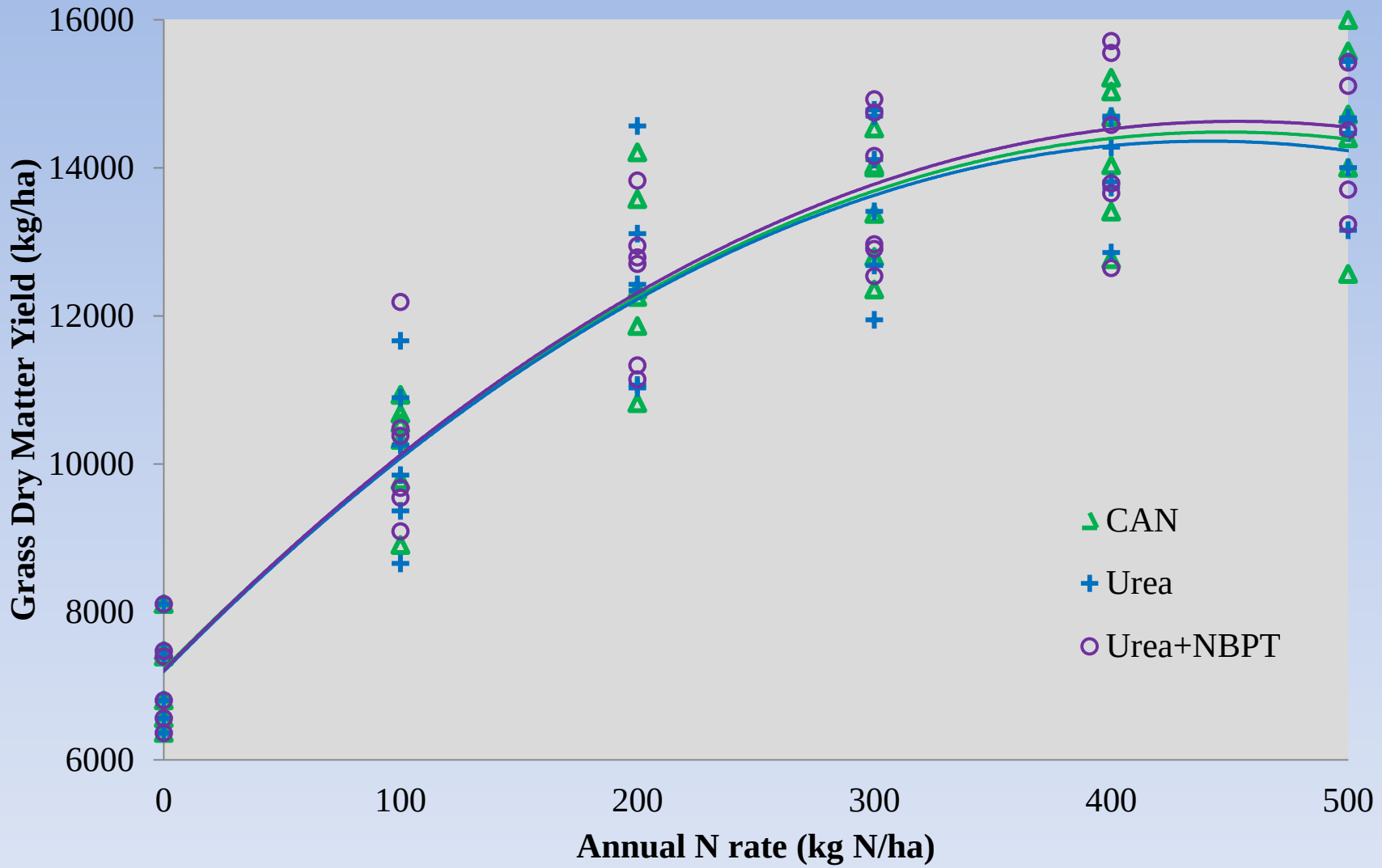
- Urea looses NH_3
- Ag. accounts for c. 98.5% of national emissions
- Substantial pressure to reduce these emissions on horizon

Field trials to evaluate urea performance compared with CAN

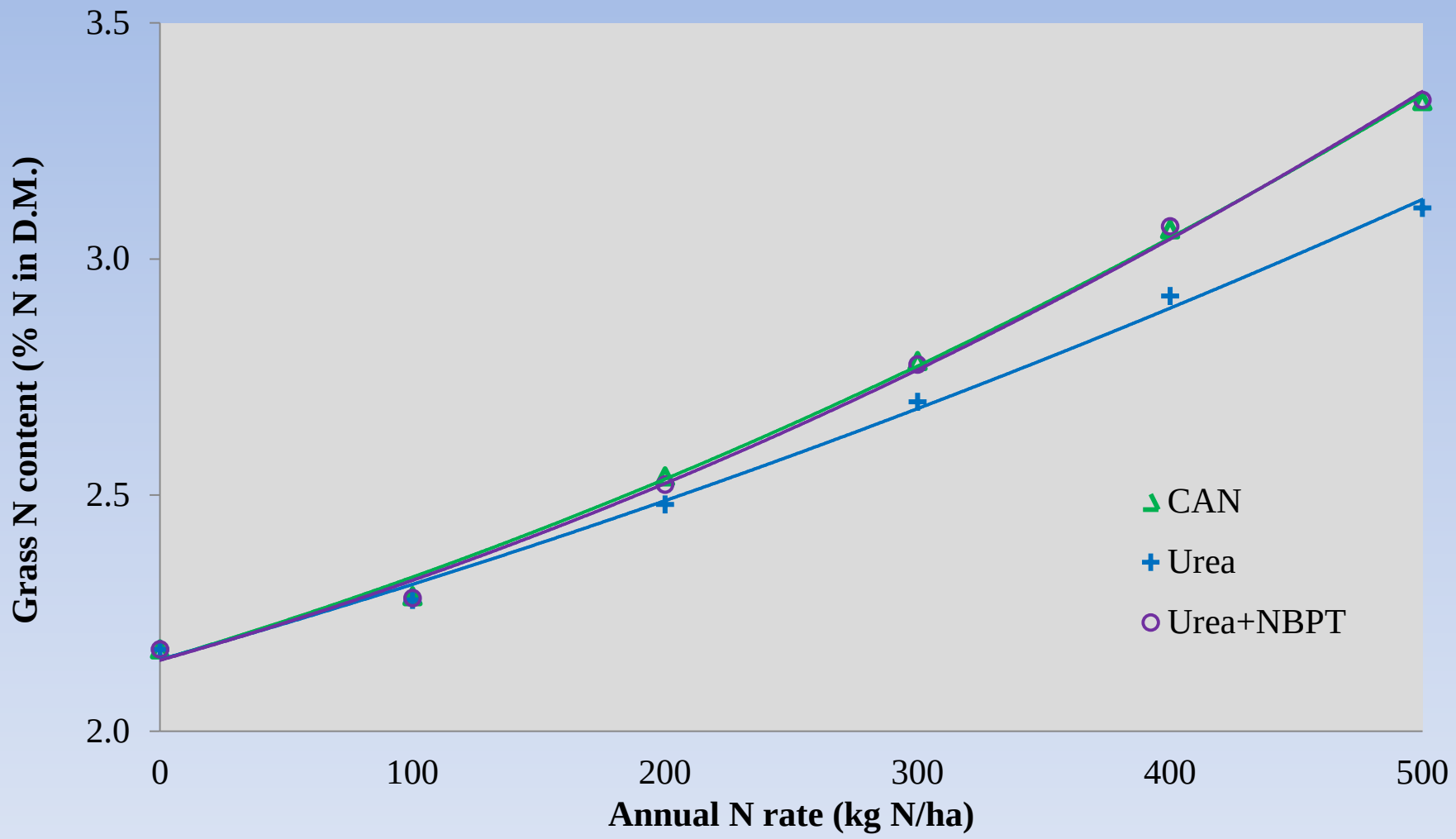
- Sites covering a range of conditions
- Urea and stabilised urea compared with CAN
- Applied throughout the year, rates 0–500 kg N/ha/yr in 5 splits
- Yield response measured by cutting
- Applied on a pre-selected day


NH3
NO
N2O
N2
NO
N2O
N2
Urea
Ammonia
CAN
Urea
⇌ pH dependent
Ammonium
Urease
Nitrosomonas et al
Nitrite
Nitrobacter et al
Nitrate
Uptake
Uptake
N stabiliser

Annual yield under CAN, Urea, Urea+NBPT
3 sites 2 years

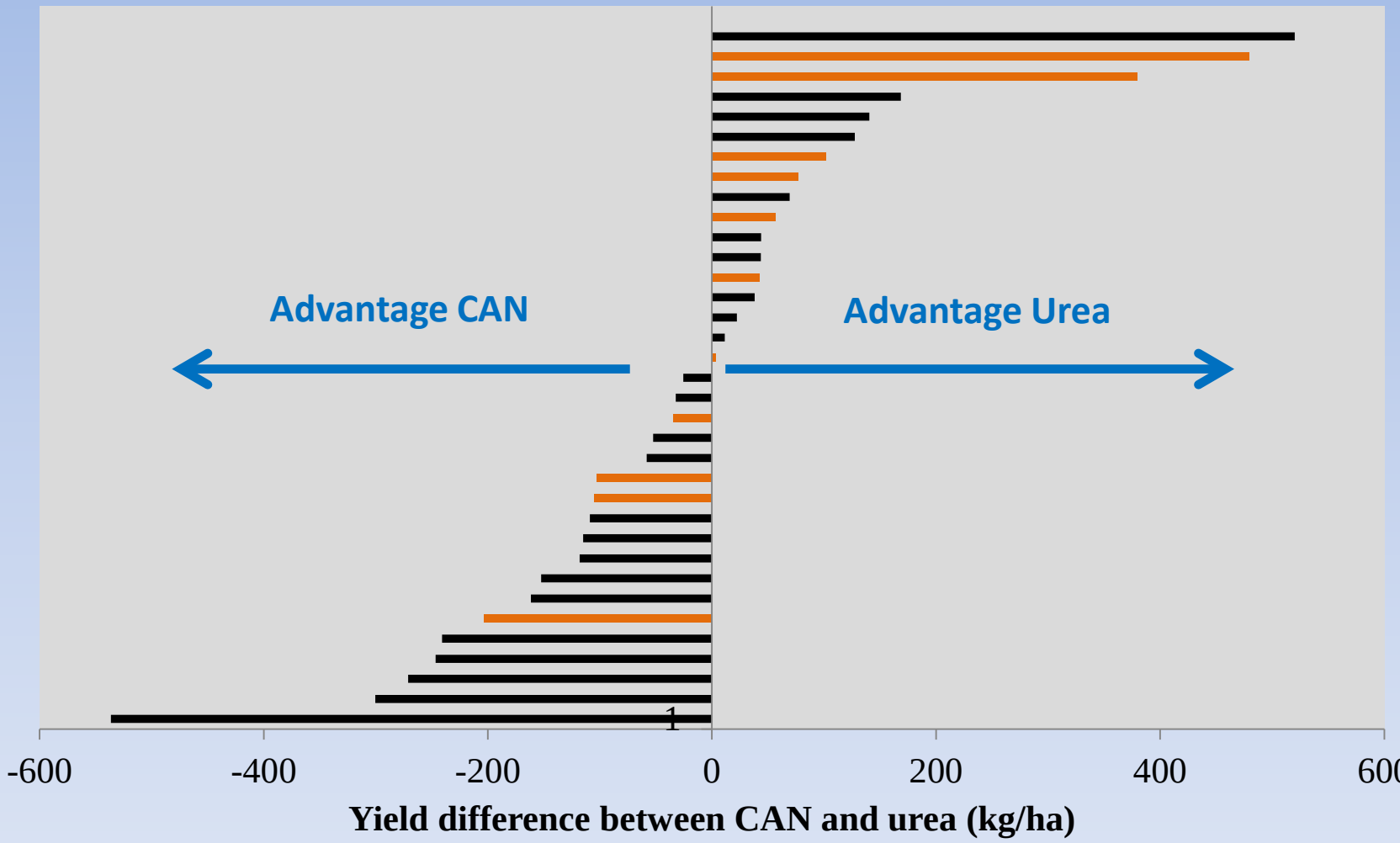


N concentration in grass

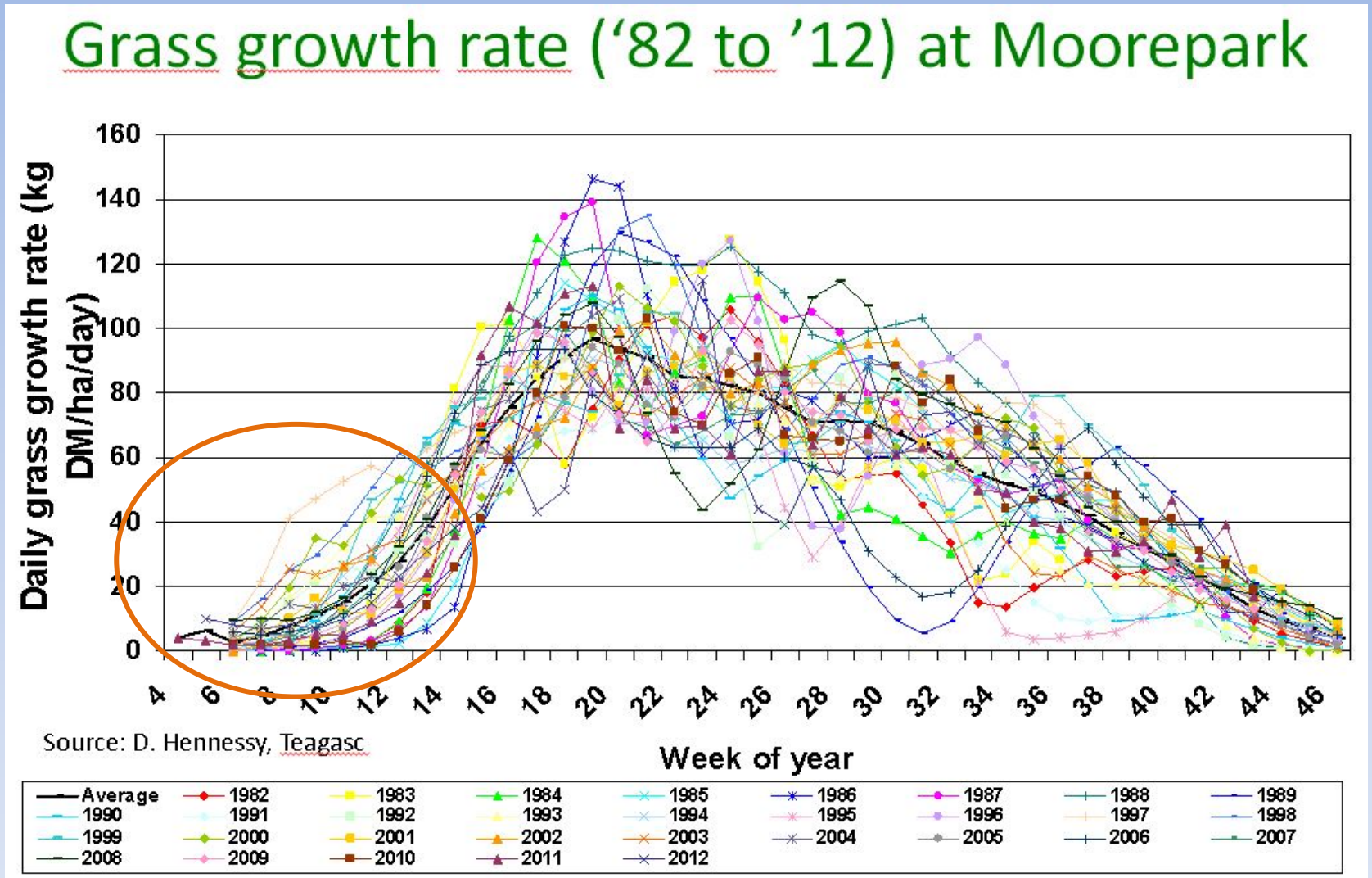


Behind the average, individual cuts?

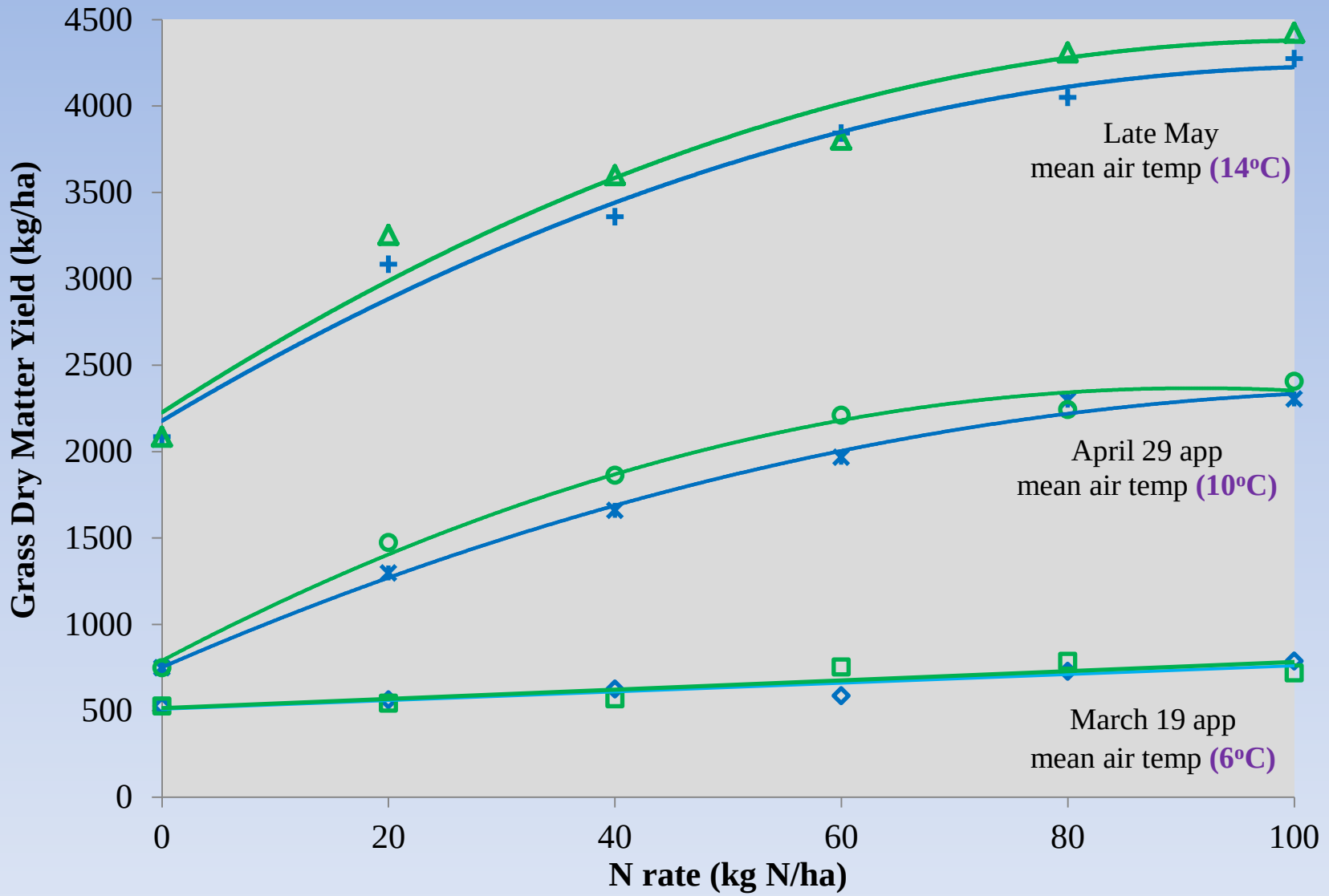
Orange: March/April applications, black summer applications



Applying urea for early growth

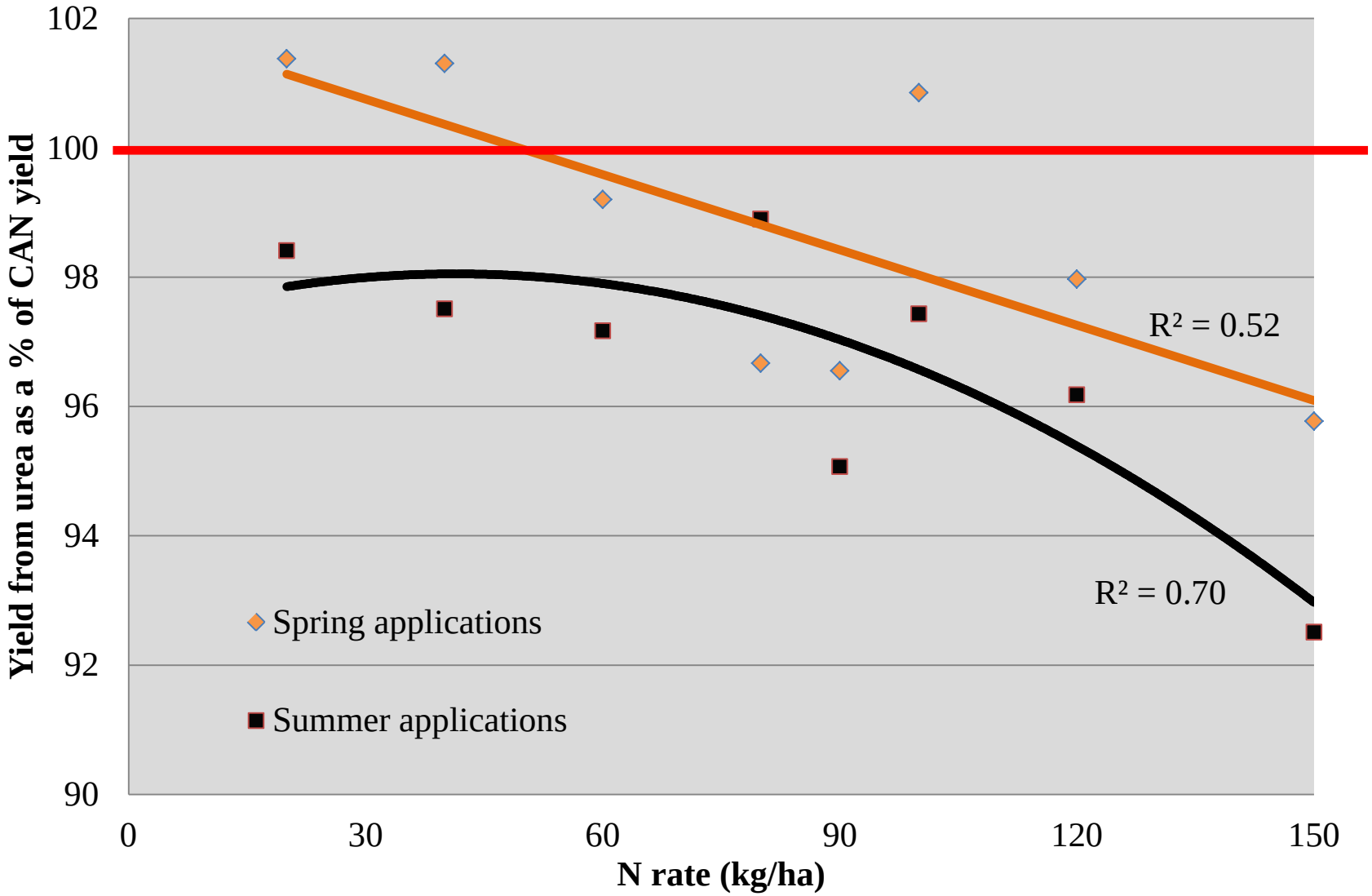


Spring 2013 Johnstown Castle

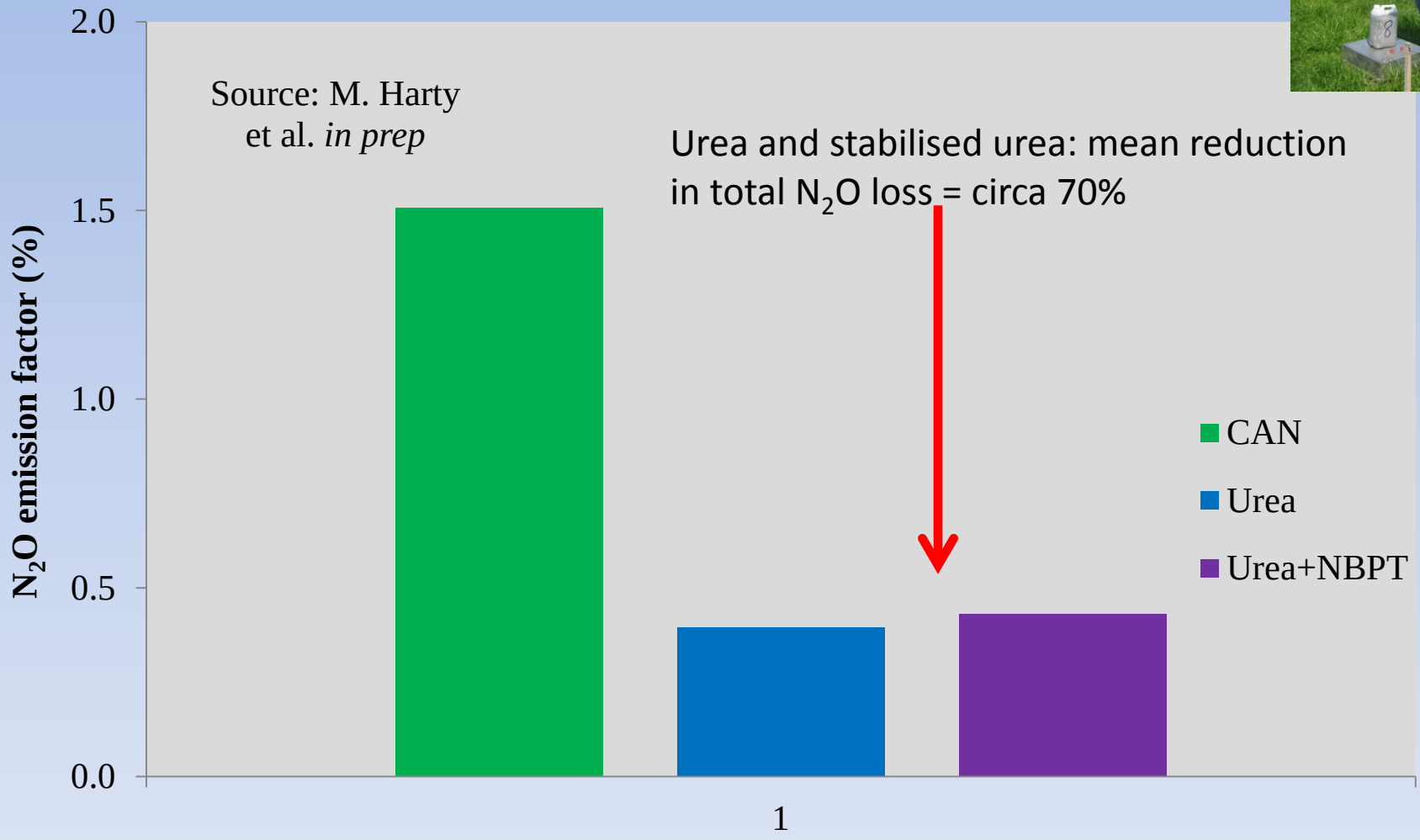


Urea compared with CAN for early growth vs summer

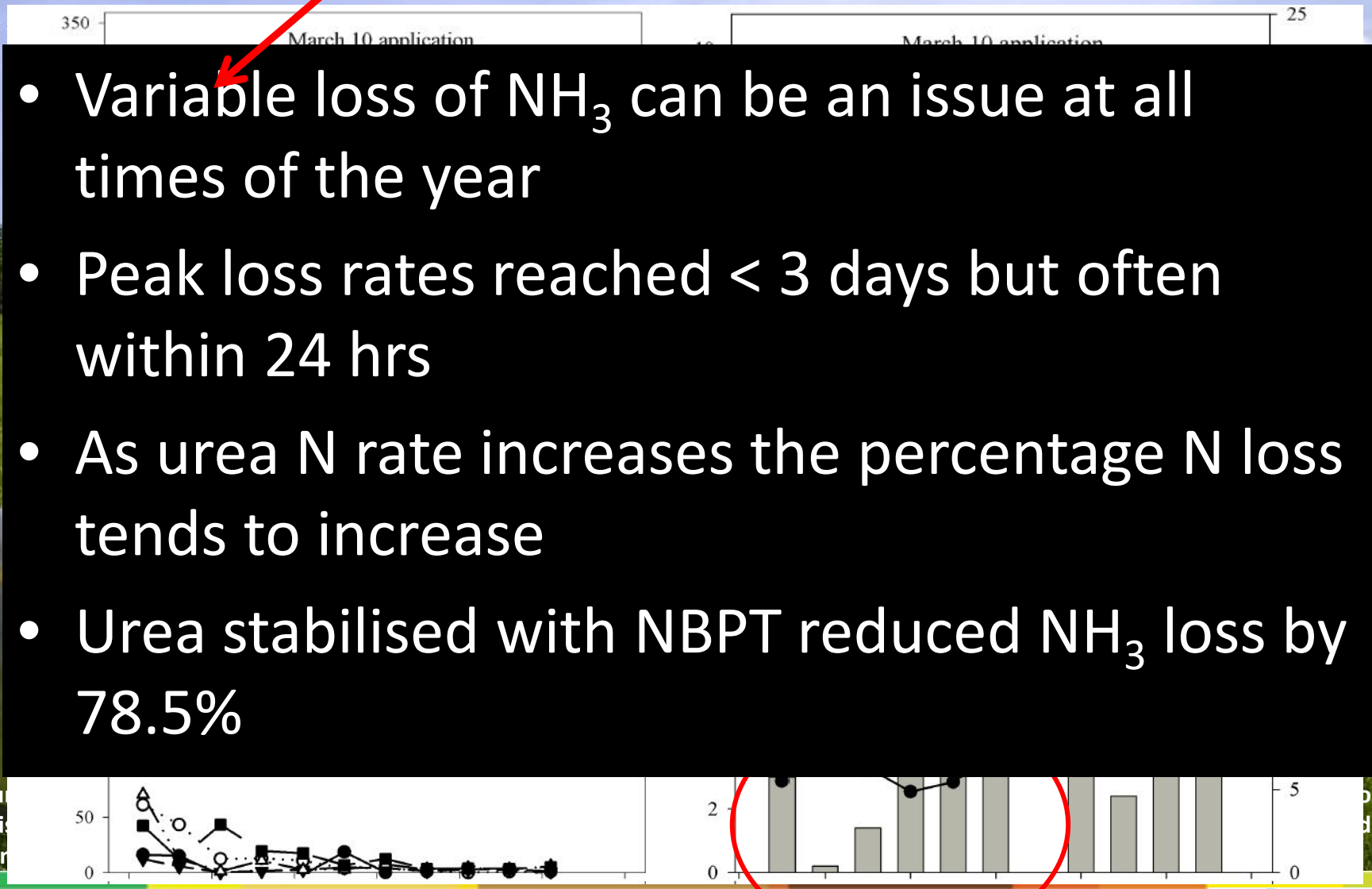
Combined data from current Teagasc trials and extensive work in late 1970's early 80's



Greenhouse gas mitigation?



Ammonia loss can be highly variable between applications



- Variable loss of NH_3 can be an issue at all times of the year
- Peak loss rates reached < 3 days but often within 24 hrs
- As urea N rate increases the percentage N loss tends to increase
- Urea stabilised with NBPT reduced NH_3 loss by 78.5%

Sou… emis… Mar… …onia …d

Conclusions

Cost & yield

- Urea costs less, gives comparable yield performance to CAN but total N recovery is lower.

GHG

- Urea based N offers potential to sustain or increase national N usage with reduced N_2O

Ammonia

- Urea stabilised with NBPT reduced ammonia loss by 78.5% on average
- Further understanding of ammonia loss and development of management solutions is needed

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Questions/comments welcome

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Agricultural Greenhouse Gas Research Initiative - Ireland

afbi Agri-Food and Biosciences Institute