Nitrogen Use Efficiency

Potential for on farm monitoring

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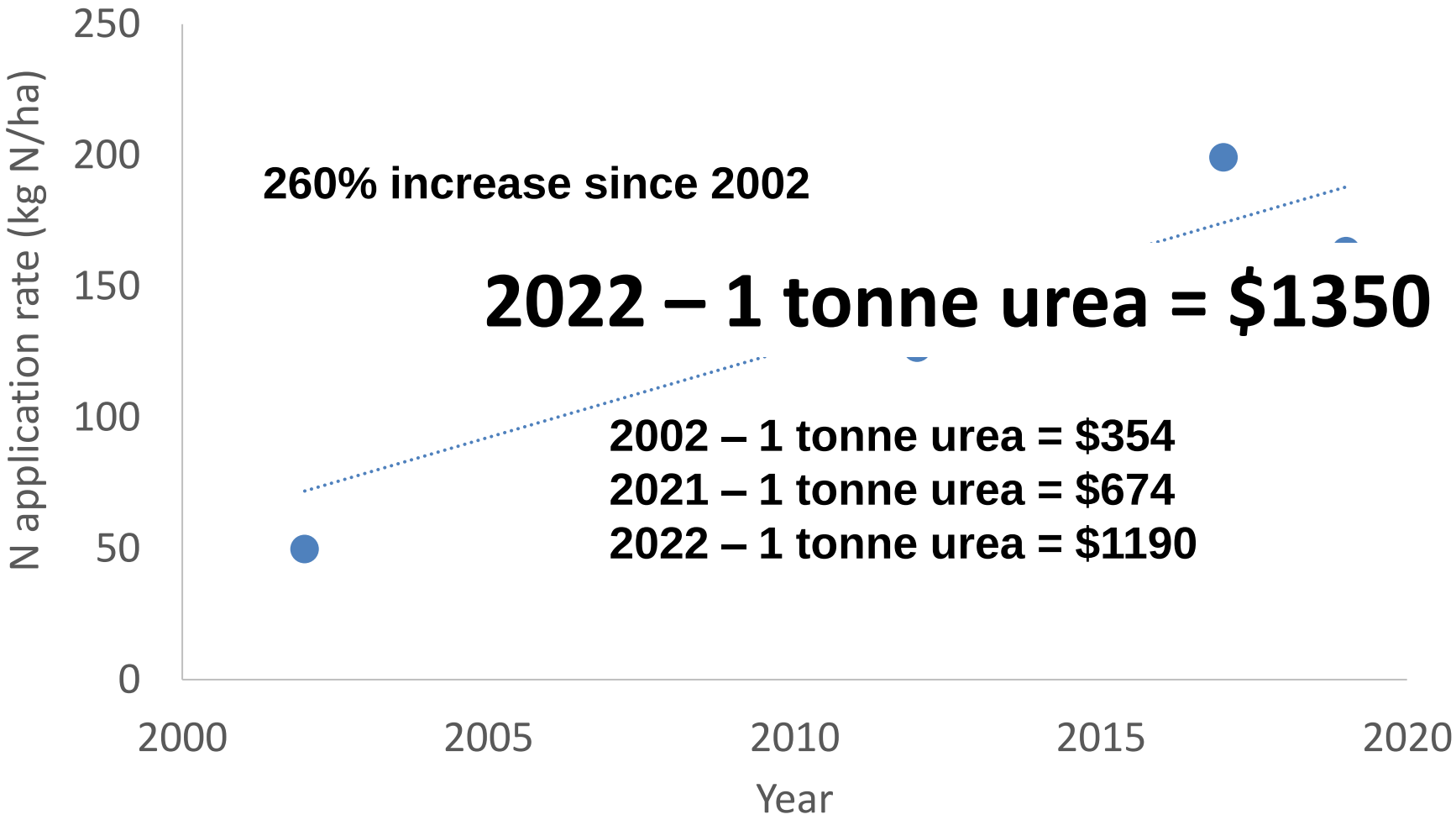
Economic motivation for efficiency



Source: Stats NZ Agricultural Production Statistics 2017 & 2020
Price source: AgKnowledge PriceWatch (2002), Ballance Price list Jan 2022.

Environmental and compliance motivators

- Mid 2022 - Fresh water farm plans will be needed for all growers with more than 20 hectares of arable land use

- 2025 - Pricing for on farm green house gas emissions. Current price estimates – $9.20 extra per tonne of urea.

What's FAR's goal?

2025 – Nitrogen use efficiency is **monitored** and improved.

80% of arable farmers have nitrogen use efficiency within the low environmental risk boundary for the sector's major crops

The challenge is we don't currently have a universal method for monitoring NUE across multiple crops.

Efficient N management

Residue N

3. Fertiliser N

2. Mineralised N
- PMN test
- AMN
- Quick test N

1. Initial soil N
- Soil mineral N

Nitrogen use efficiency defined

$$NUE = \frac{\text{  }}{\text{  }}$$

(Semenov et al. 2007)

Nitrogen supply from soil, fertiliser and residue

Can a simple indicator work?

Maize silage

Feed wheat

Ryegrass seed

Partial Nitrogen Balance (PNB)

N% ✖  ➗ 

N in product (kg N/ha)

N fertiliser used (kg N/ha)

Agronomic efficiency of applied N (AEN)

N Fertilised yield (kg) − Un-fertilised yield (kg) = Kg product/ kg N applied

N Fertiliser applied (kg)

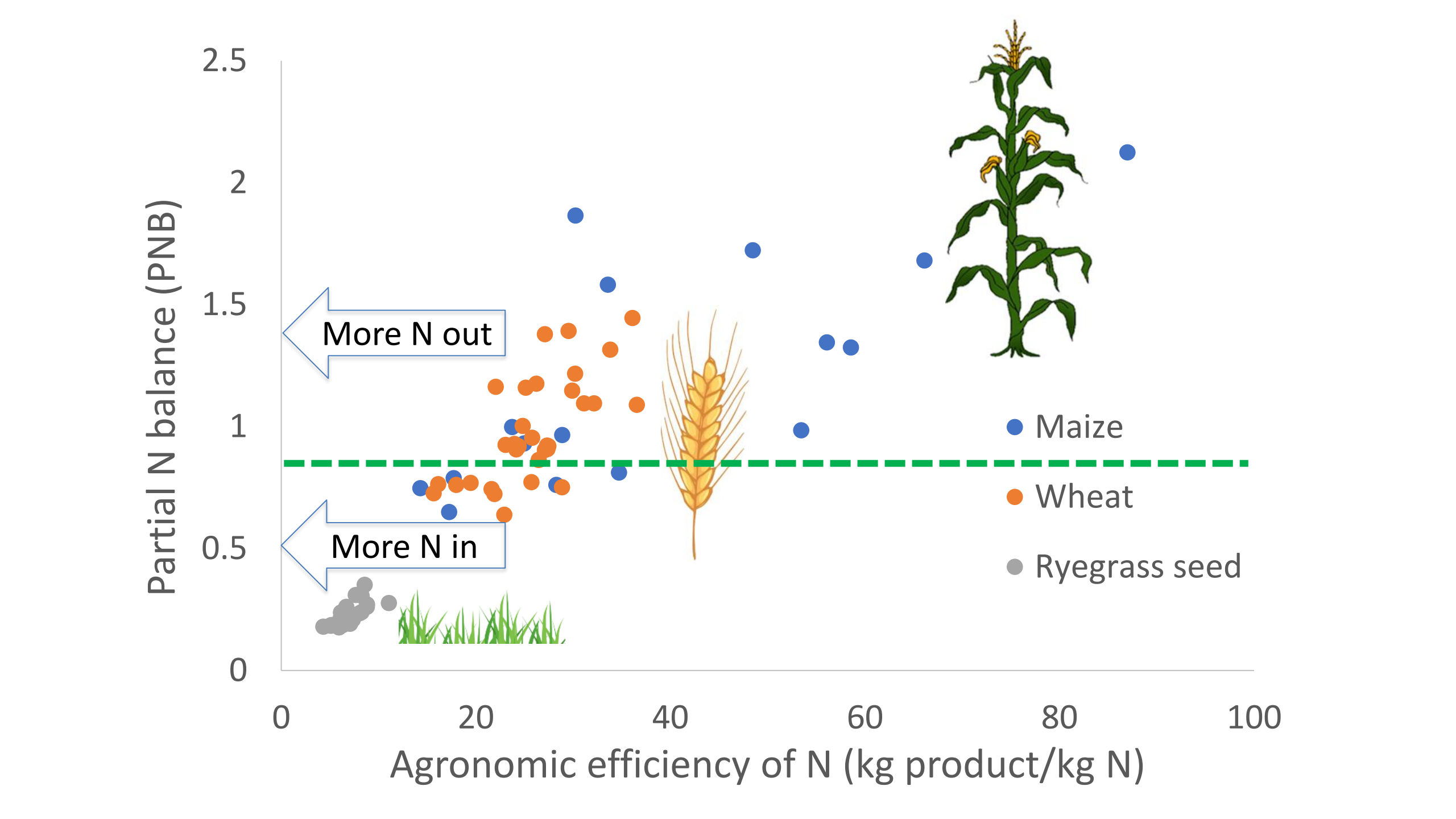
Data origins

Three trials – all conducted in 2021/22 season

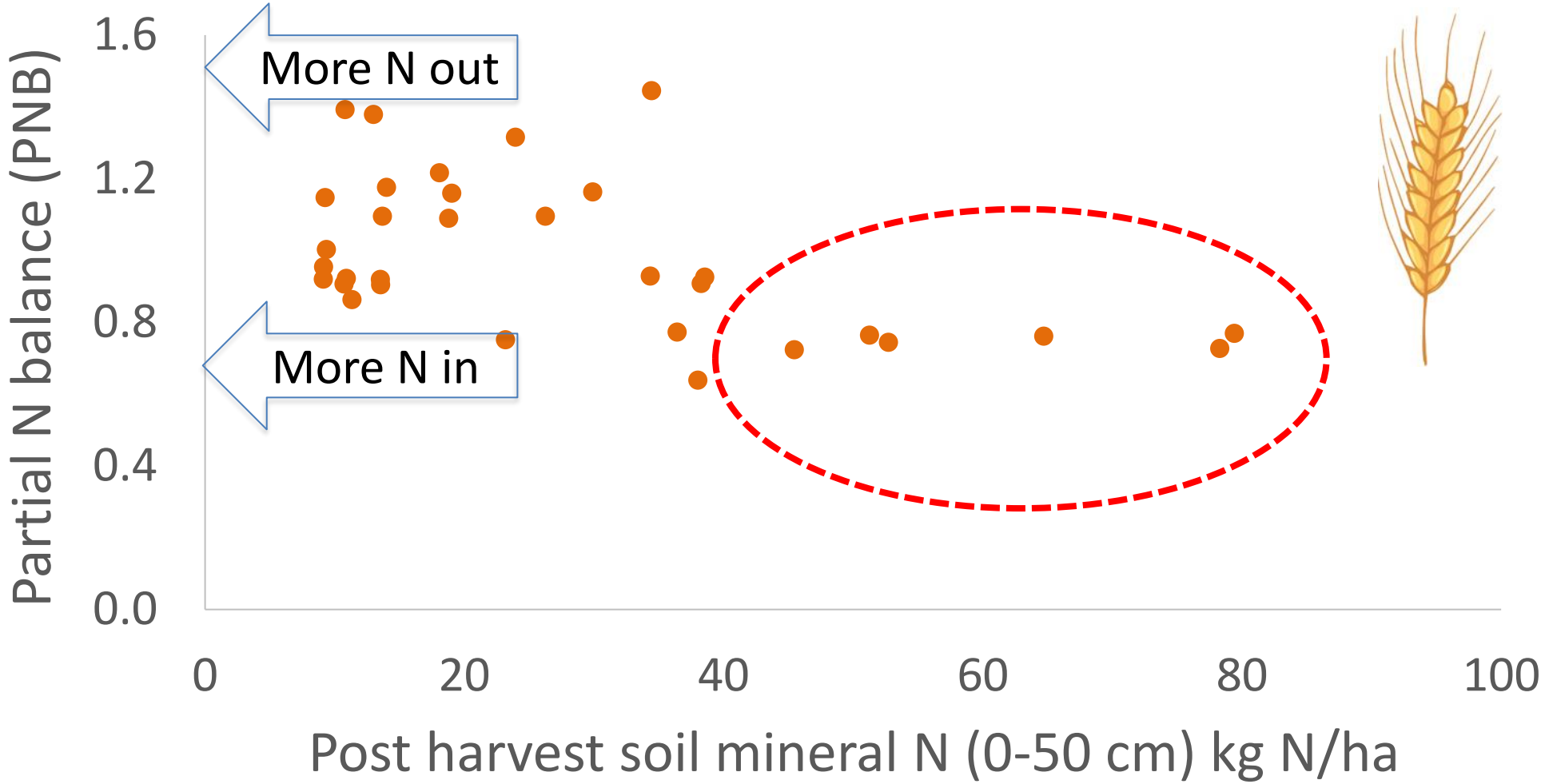
Tamahere, Waikato – Maize silage

Chertsey, Canterbury – Irrigated and non-irrigated autumn feed wheat

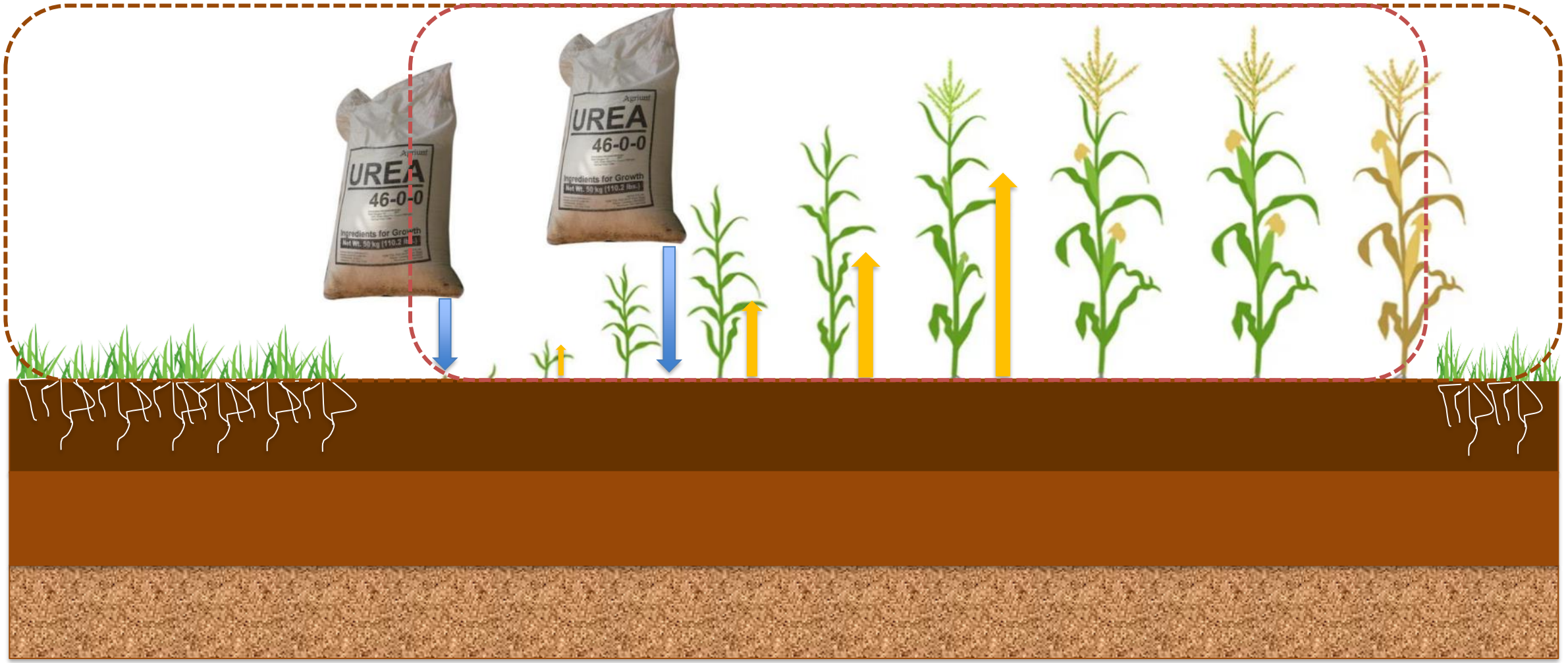
Chertsey, Canterbury – Irrigated and non-irrigated ryegrass seed


2.5
2
1.5
1
0.5
0
Partial N balance (PNB)
More N out
More N in
Maize
Wheat
Ryegrass seed
0
20
40
60
80
100
Agronomic efficiency of N (kg product/kg N)

Inefficiency = risk?



Crop to rotation N management



Summary

Benefit - A common NUE indicator could work in arable seed, grain and forage crops.

Tradeoff – Each crop in a rotation will have different indicator boundaries. Preceding crop history will need to be accounted for.

Challenge – How do we aggregate NUE up from the crop level? Rotation is also used to manage N, can we account for this?

Questions?