16è Rencontres

DE LA FERTILISATION RAISONNÉE ET DE L'ANALYSE

30 ans

21, 22 et 23 novembre 2023

Palais des congrès de Tours

comifer

Gemas

16è Rencontres

DE LA FERTILISATION RAISONNÉE ET DE L'ANALYSE

30 ans

Crop Nutrition: Measure to Manage

Roger Sylvester-Bradley, ADAS, UK

comifer

Comité Français d'Étude et de Développement de la Fertilisation Raisonnée

ADAS

Gemas

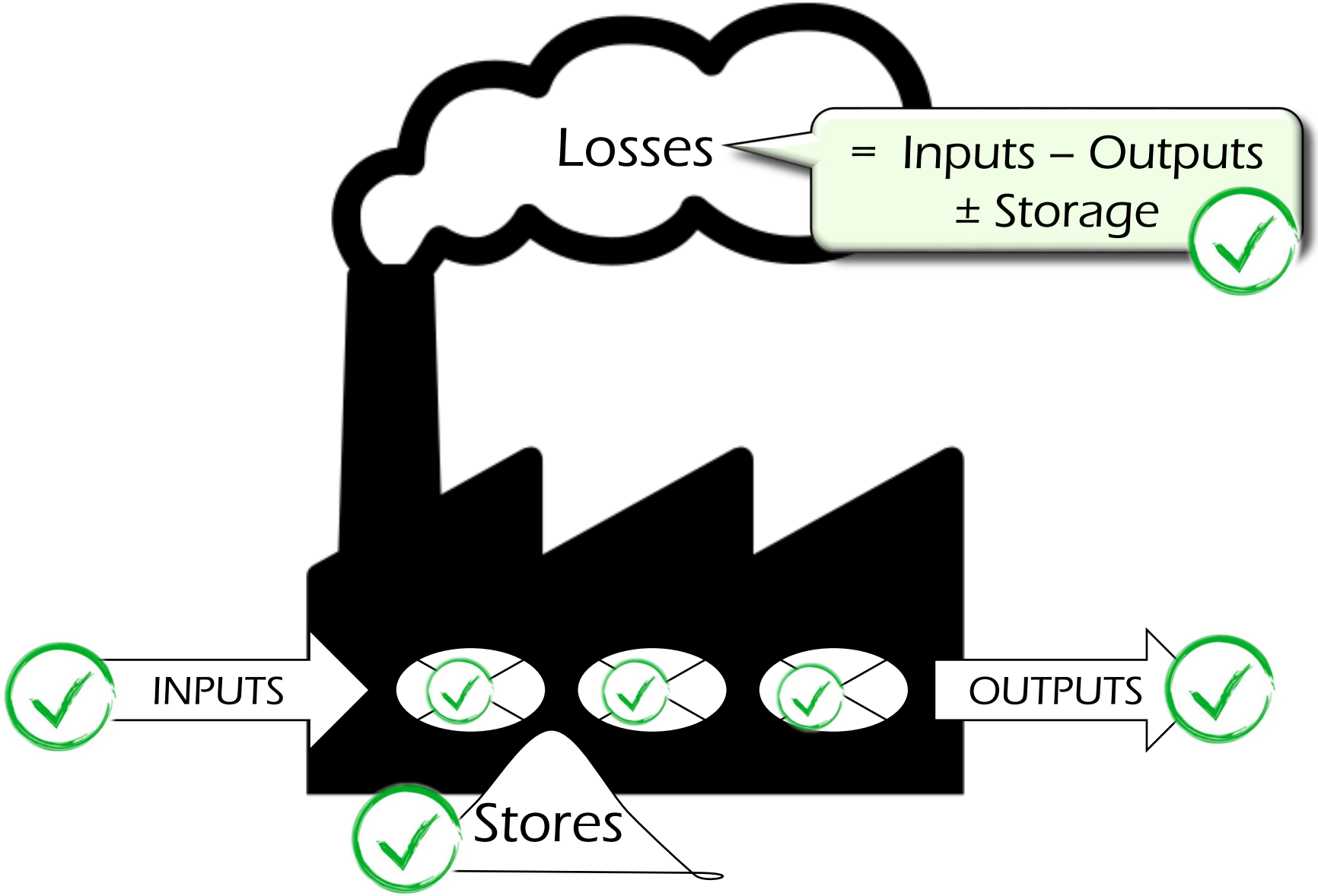
Groupement d'études méthodologiques pour l'analyse des sols

ADAS is the UK's largest independent agric. & environment consultancy

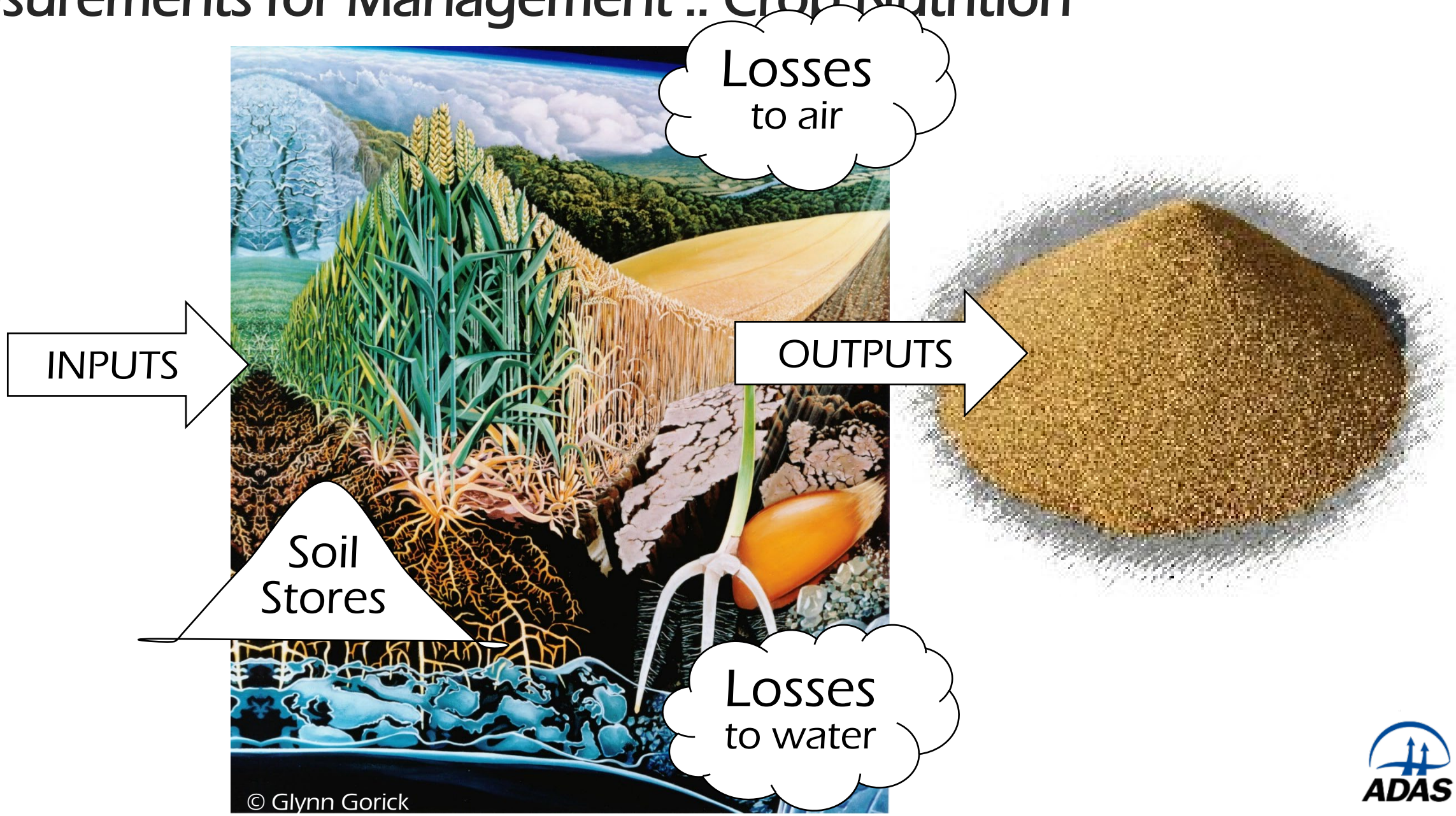
ADAS's Crop Physiology Team
... we manage the YEN, and much more

Roger Sylvester-Bradley
Head of Crop Performance

Measurements for Management



Measurements for Management .. Crop Nutrition



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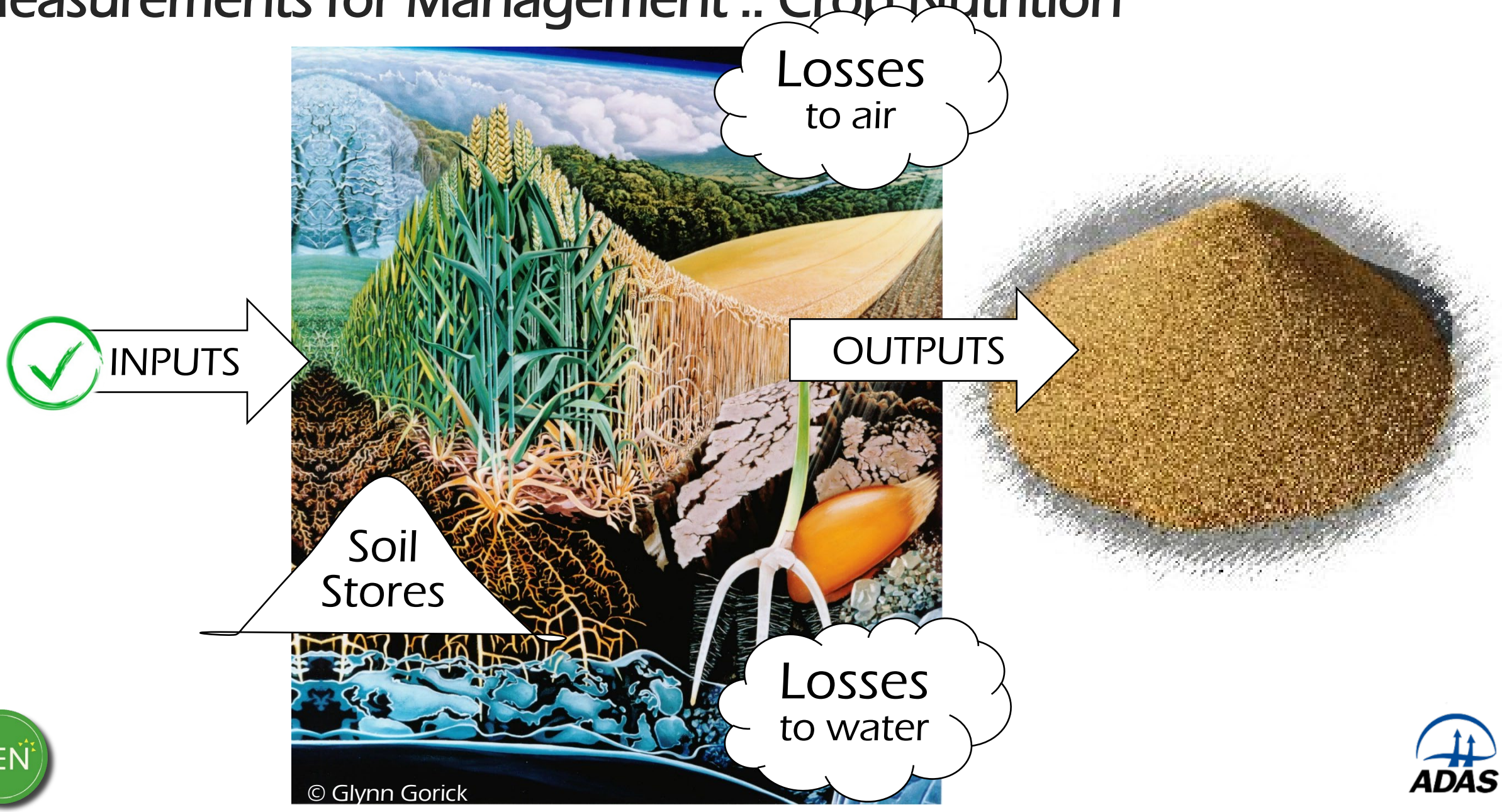

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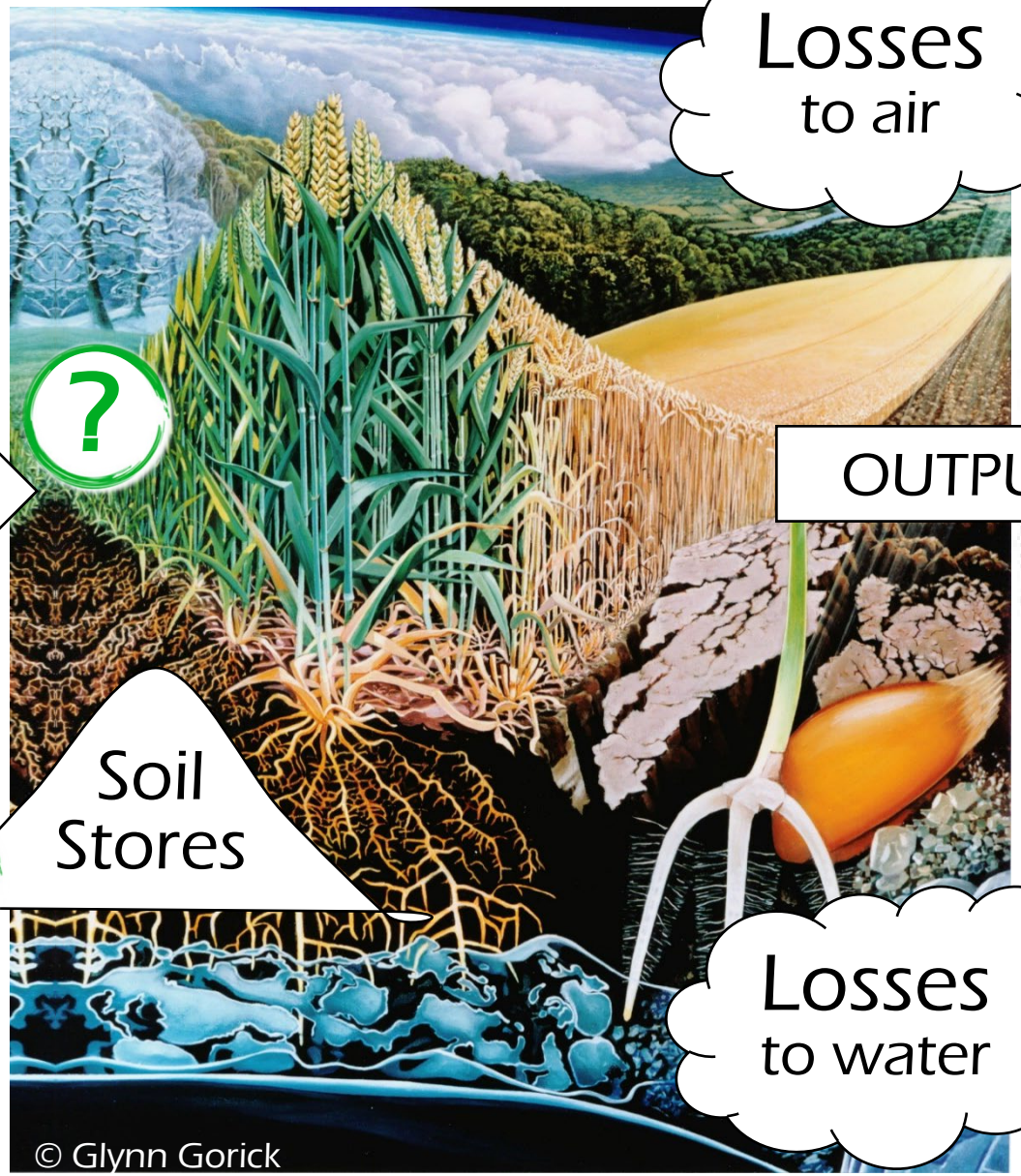

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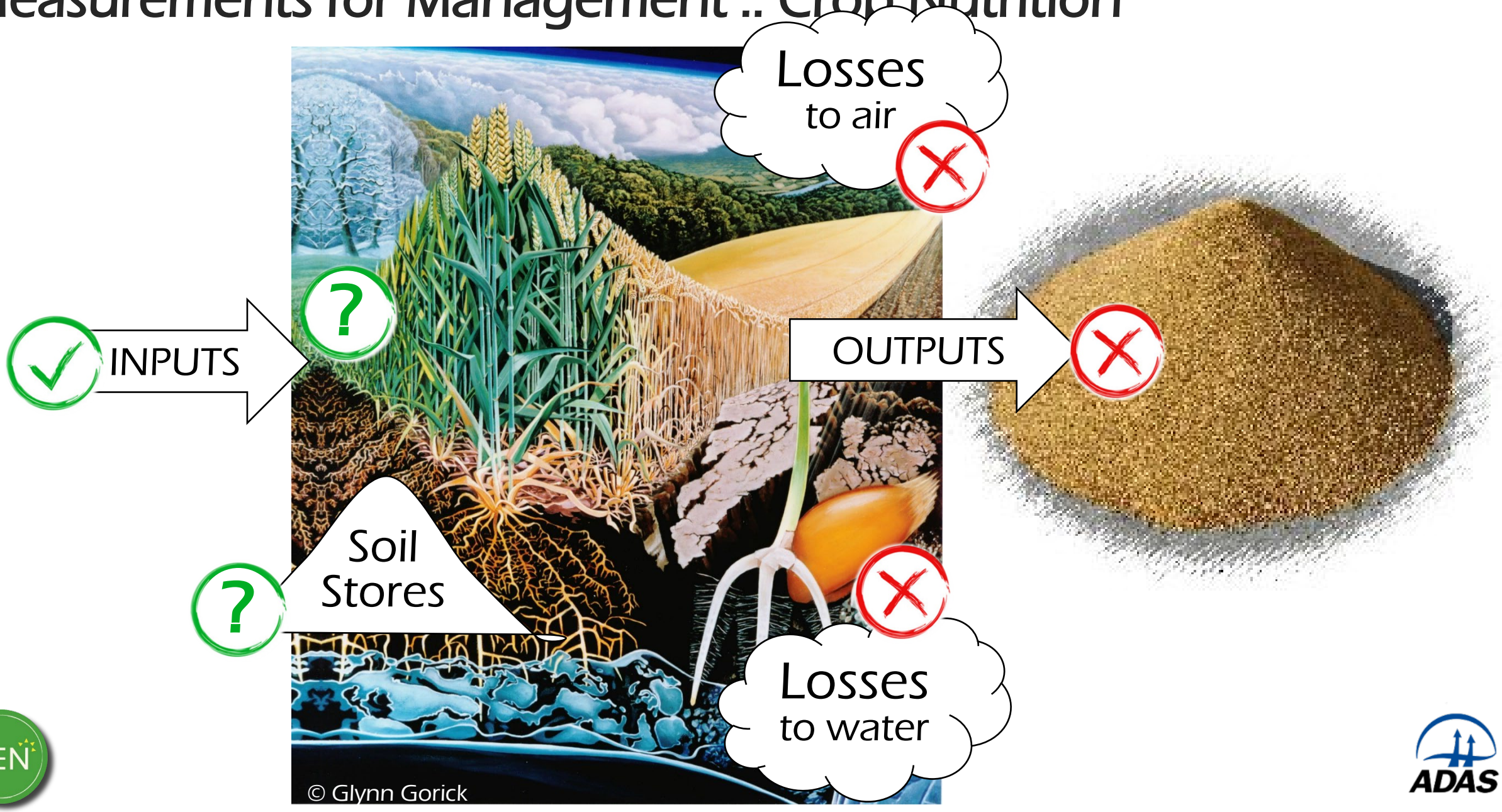

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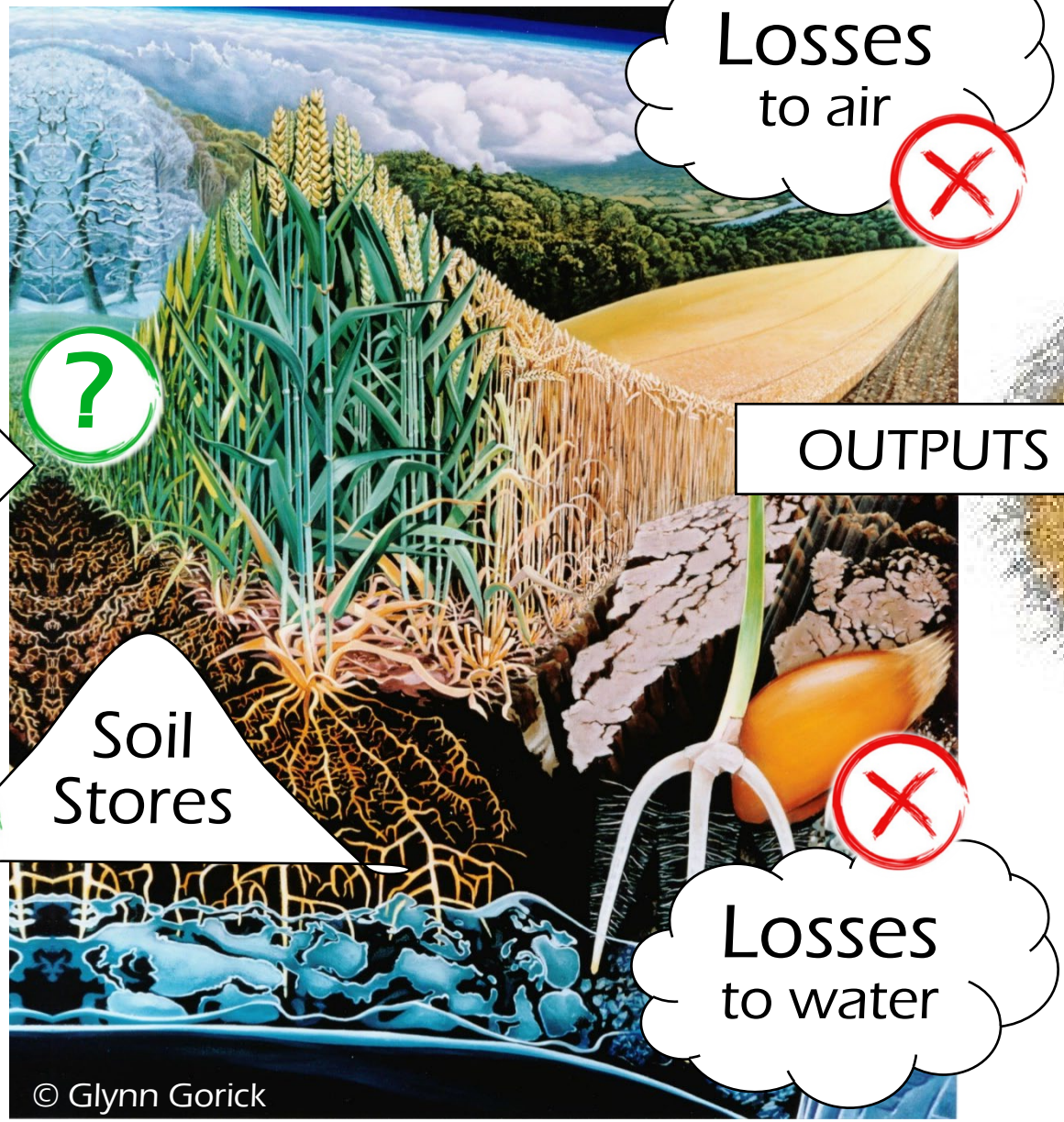

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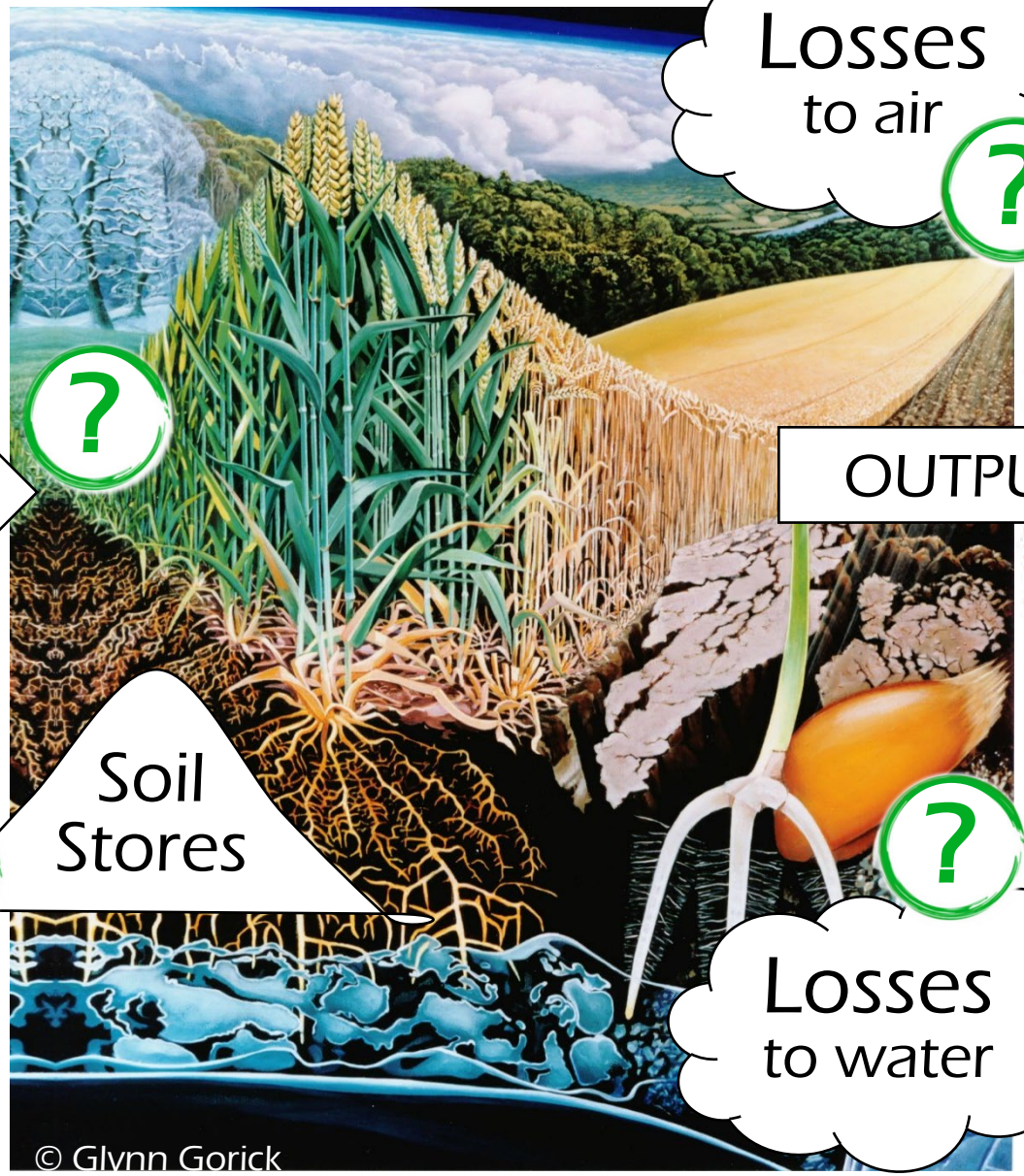


Losses to air

?

= Inputs – Outputs ± Storage

INPUTS

?

OUTPUTS

?

Soil Stores

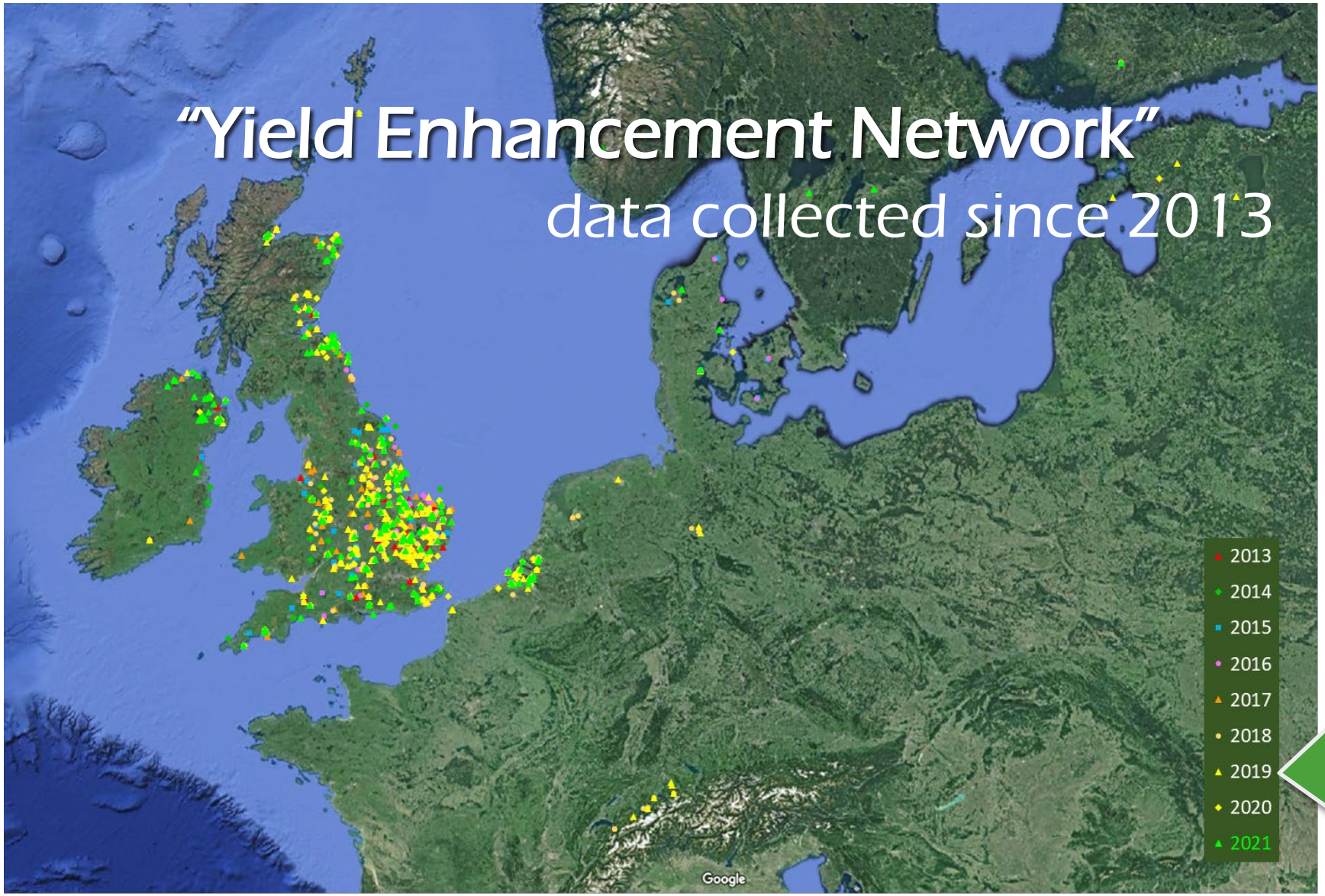
?

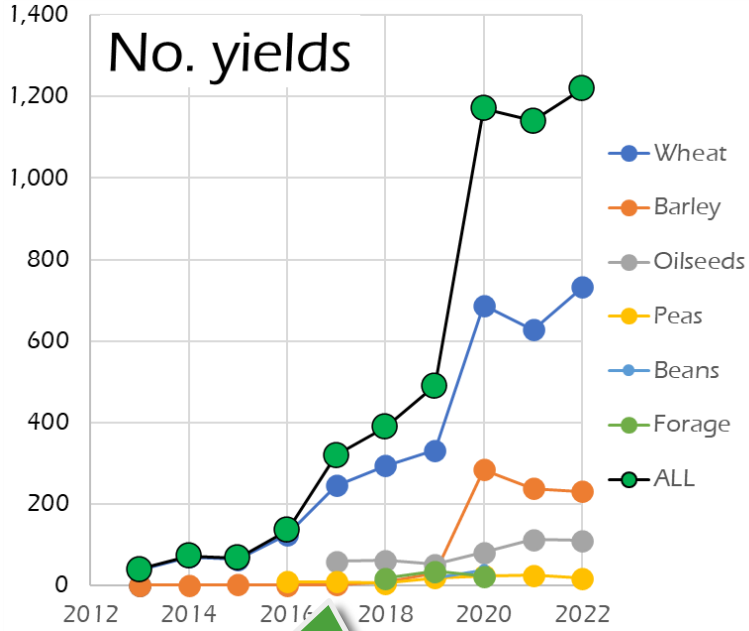
Losses to water

= Inputs – Outputs ± Storage

"Yield Enhancement Network"

data collected since 2013





~3,140 crop yields & explanatory data to 2021

YEN YEN YEN YEN YEN Nutrition YEN ZERO

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Aim 1. Balancing Inputs & Harvests

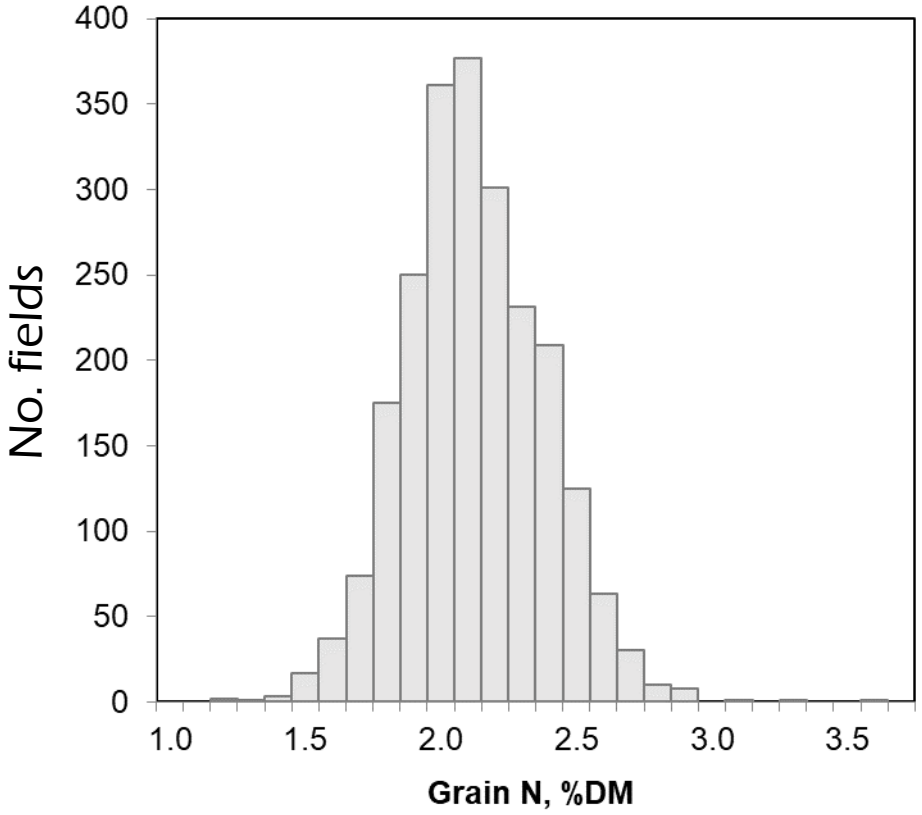
(Aim 2: Diagnosing nutrient deficiencies)


Record nutrients bought ... and how much applied to each field
Record nutrient harvests from each field = yield x % nutrient
?
Aim 1. Balancing Inputs & Harvests
(Aim 2: Diagnosing nutrient deficiencies)
YEN
ADAS

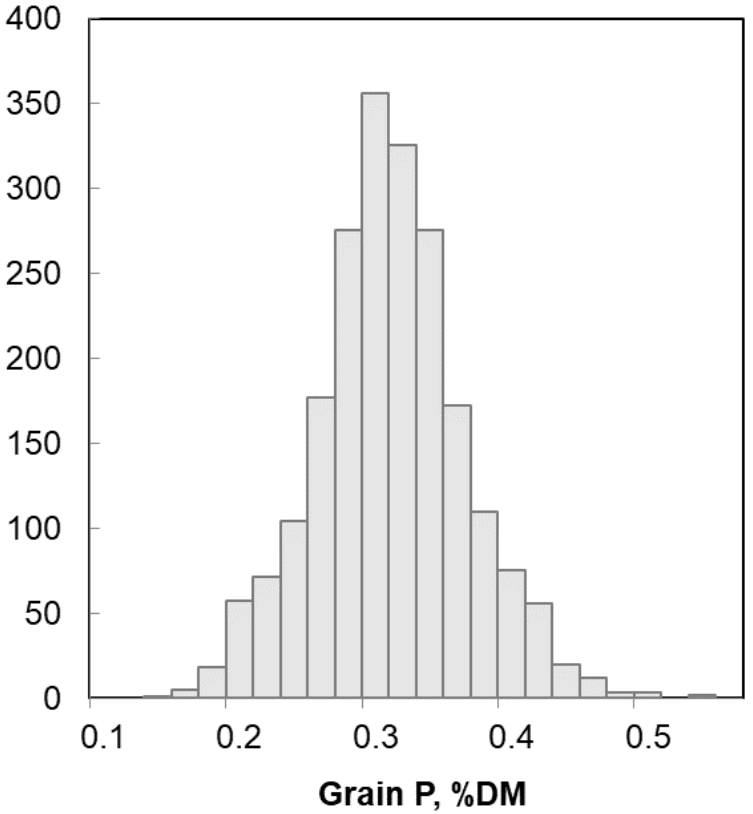
GRAIN CONCENTRATIONS VARY

~1,700 Wheat crops, 2013-2021

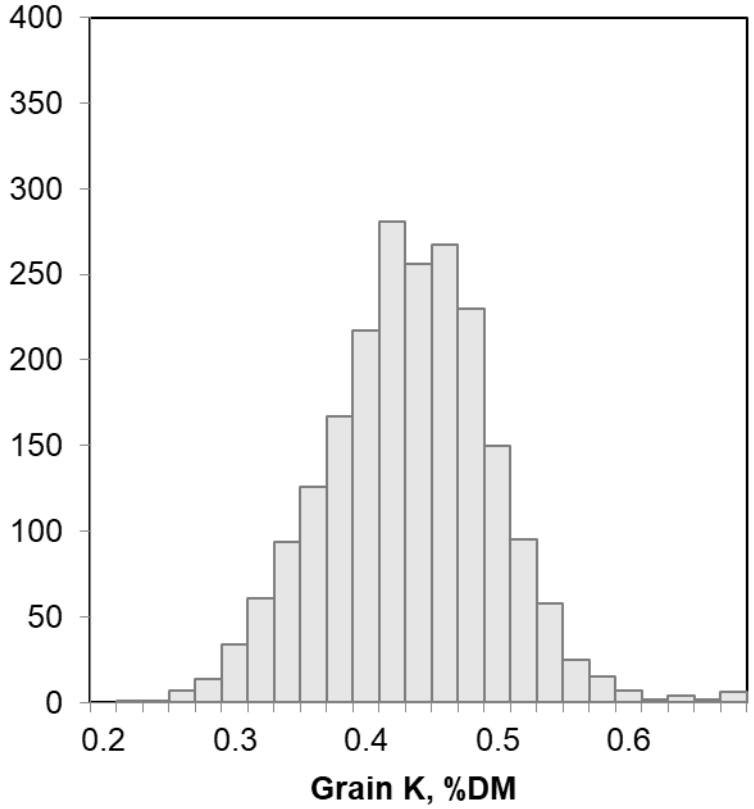
Nitrogen



Phosphorus



Potassium



GRAIN CONCENTRATIONS VARY

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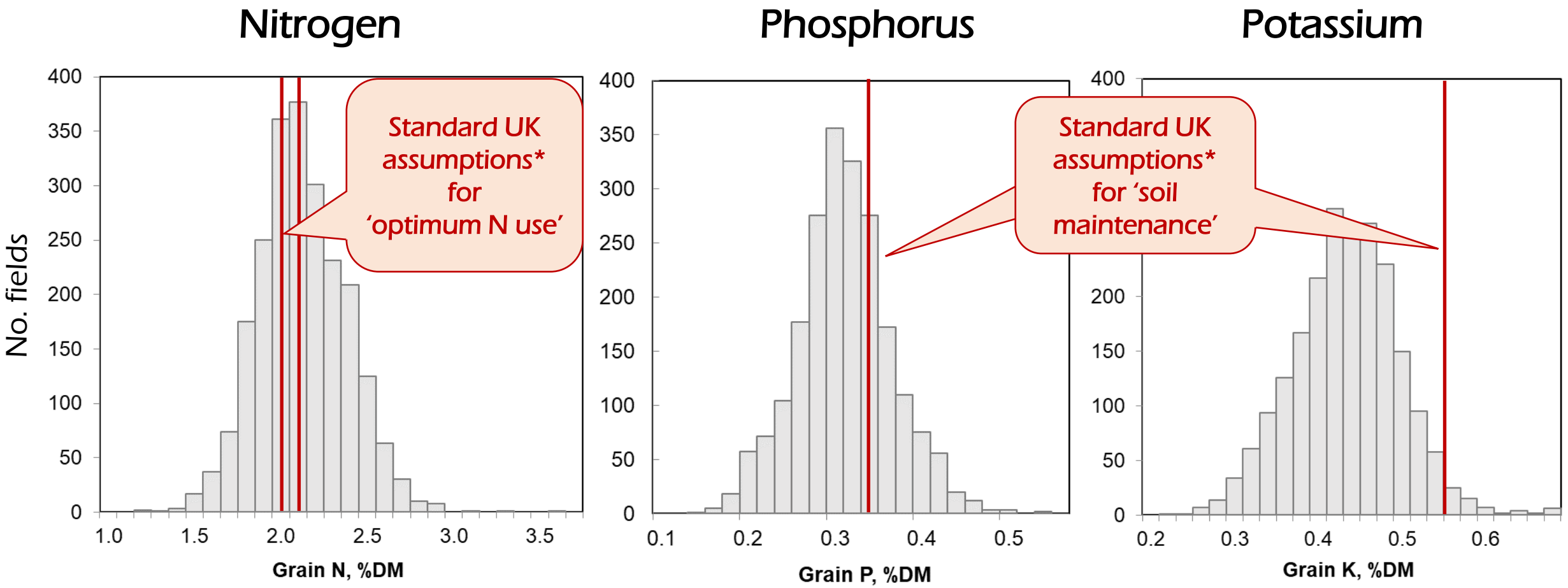
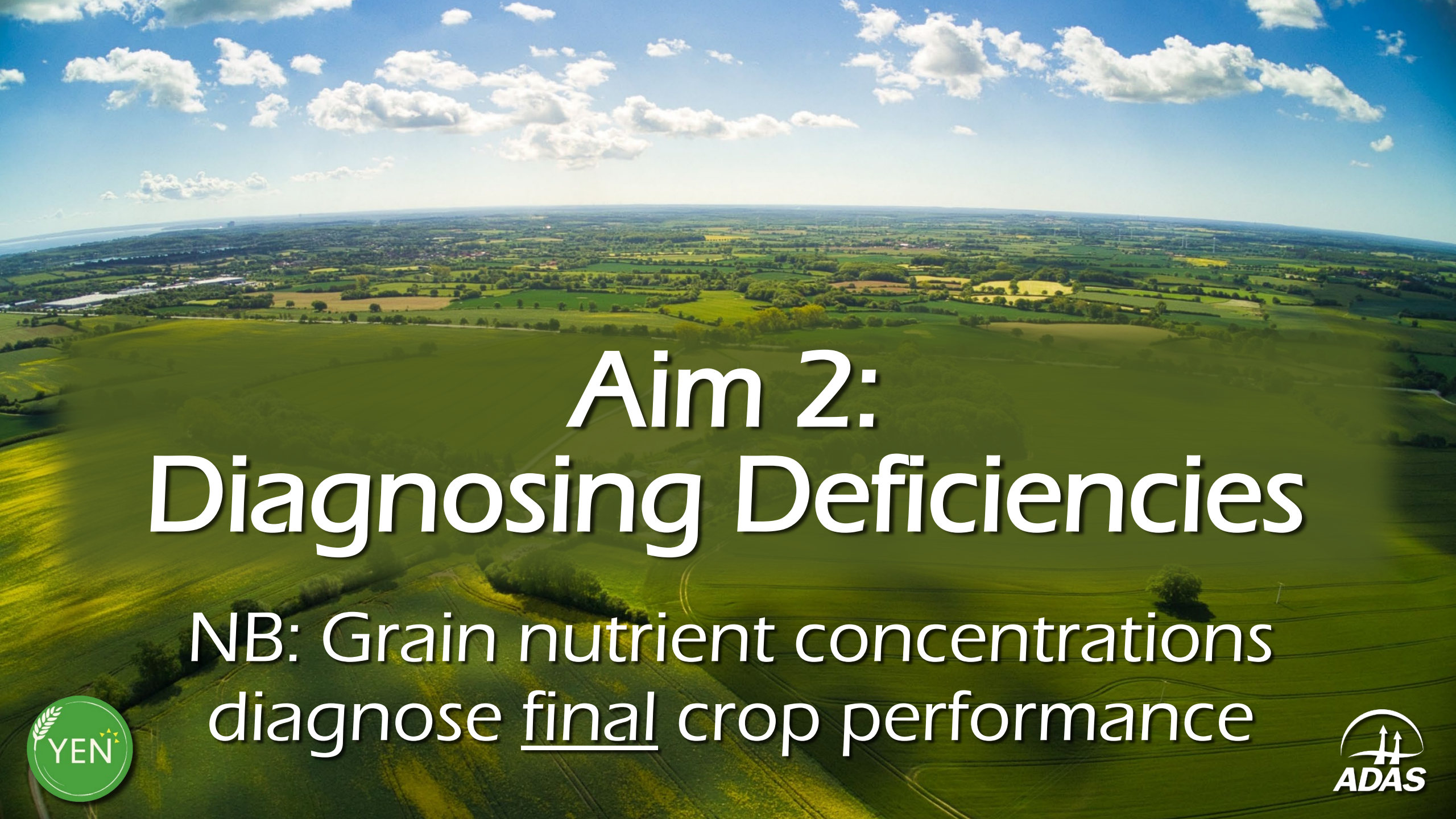


* from: RB209 (AHDB, 2022) & www.pda.org.uk/pda_leaflets/nutrients-in-crop-material

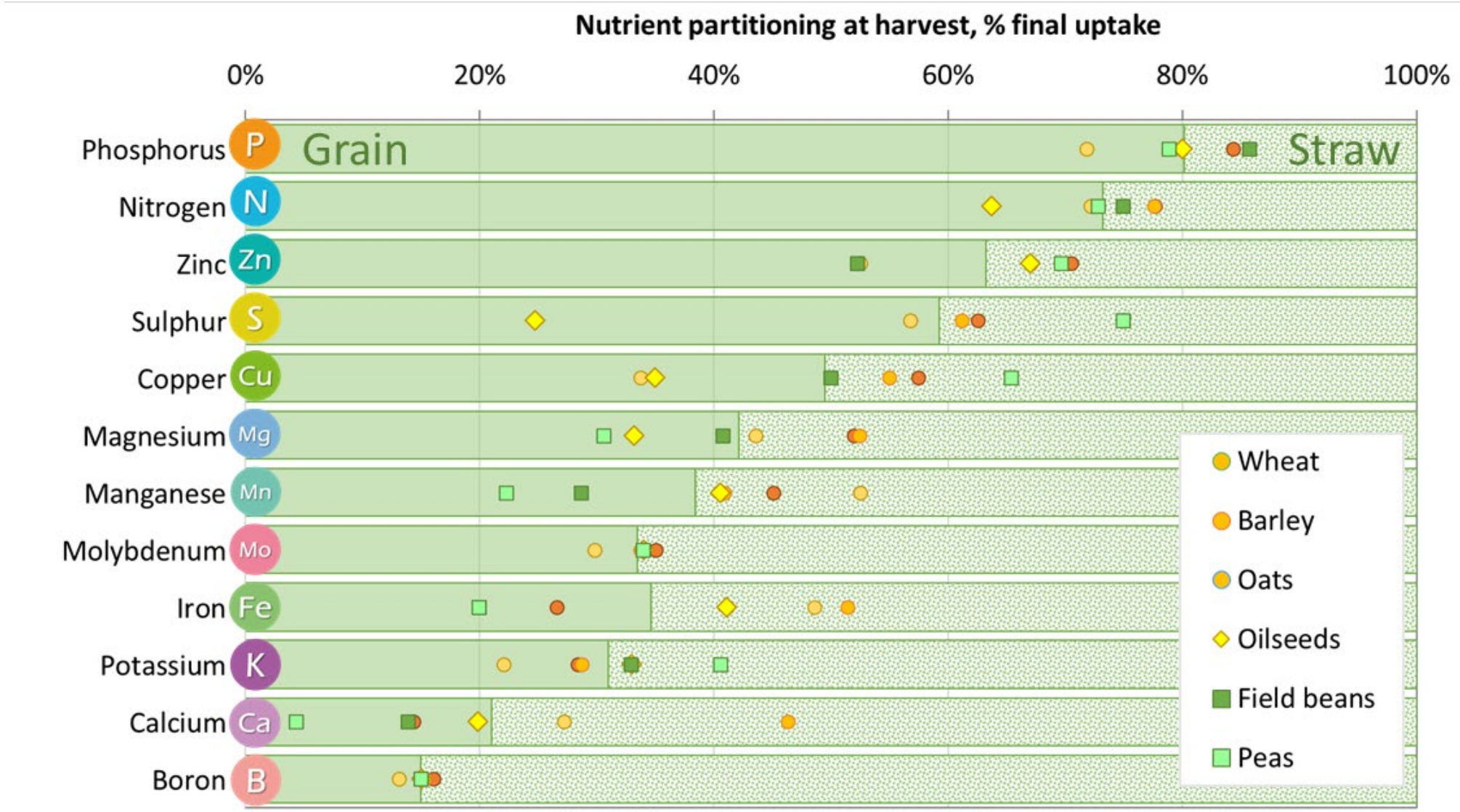

Accurate Nutrient Balancing requires
harvest sampling and analysis
field by field



Aim 2: Diagnosing Deficiencies

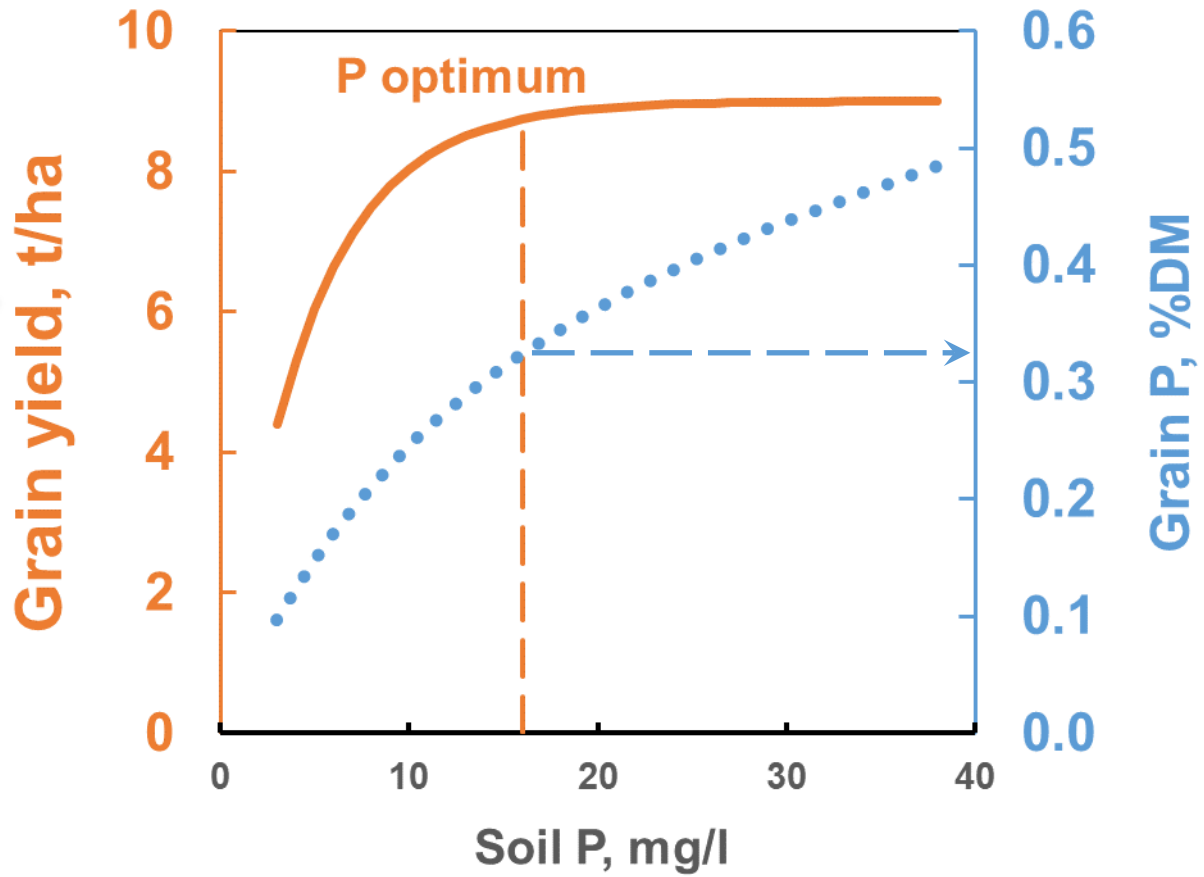
NB: Grain nutrient concentrations diagnose final crop performance

N, P etc. are redistributed to grain … K etc. are left in straw



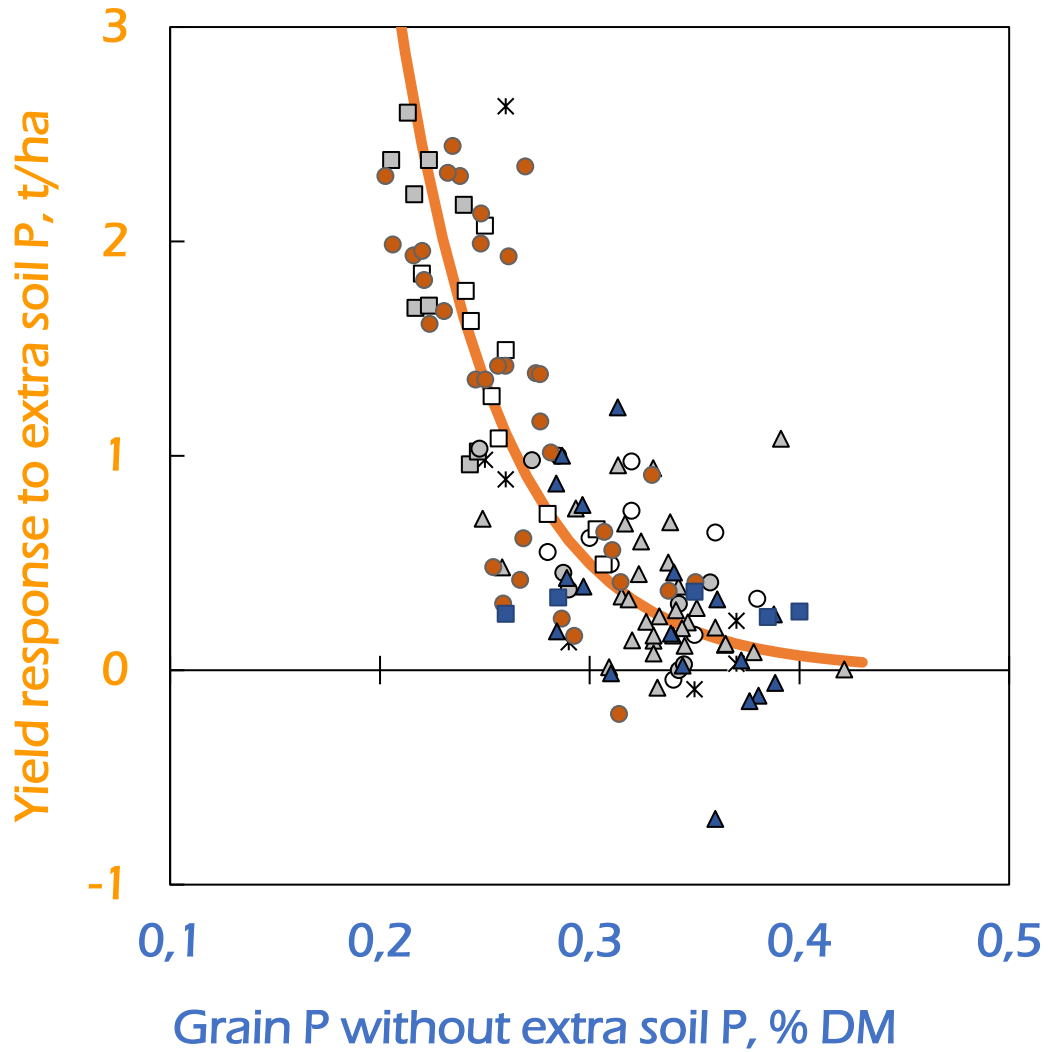
Grain Nutrients .. more sensitive to nutrition than Grain Yield

EXAMPLE :
Phosphorus



Sylvester-Bradley *et al.*, 2019
modelled on Johnston *et al.*, 2016

Evidence for critical P concentration in cereal grain ...



Old UK & Foreign data:

- Stapleford '76-88
- ADAS '70s, 9 sites
- Tumby Bay wheat
- Tumby Bay barley
- Tylstrup, Denmark
- Finland, 17 sites

New AHDB data:

- Peldon 2015 & 2016
- Gt Charlton 2016
- Cholsey 2016

Rollett & Sylvester-Bradley, 2019; Sylvester-Bradley *et al.*, 2019

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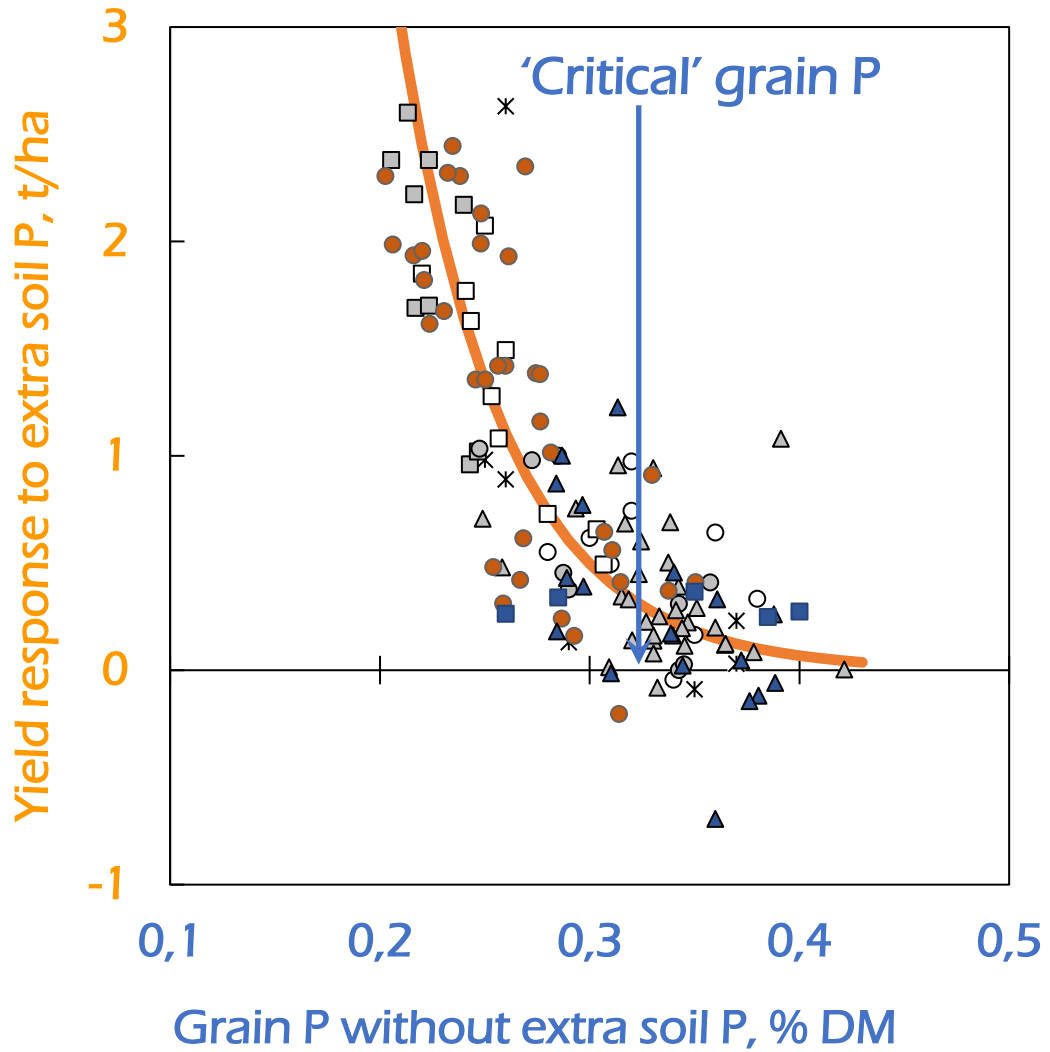

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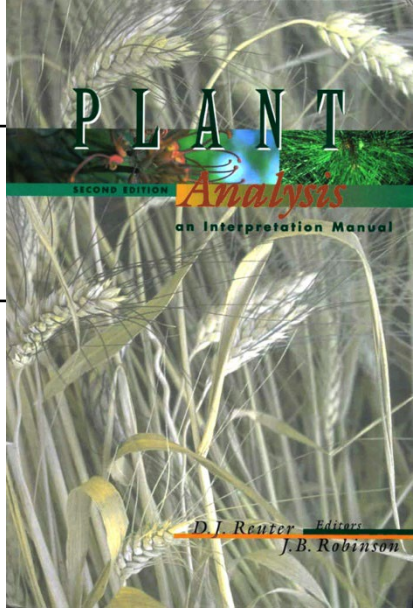
- Cholsey 2016

Rollett & Sylvester-Bradley, 2019; Sylvester-Bradley *et al.*, 2019

Summary: 8 critical levels in cereal grains ...

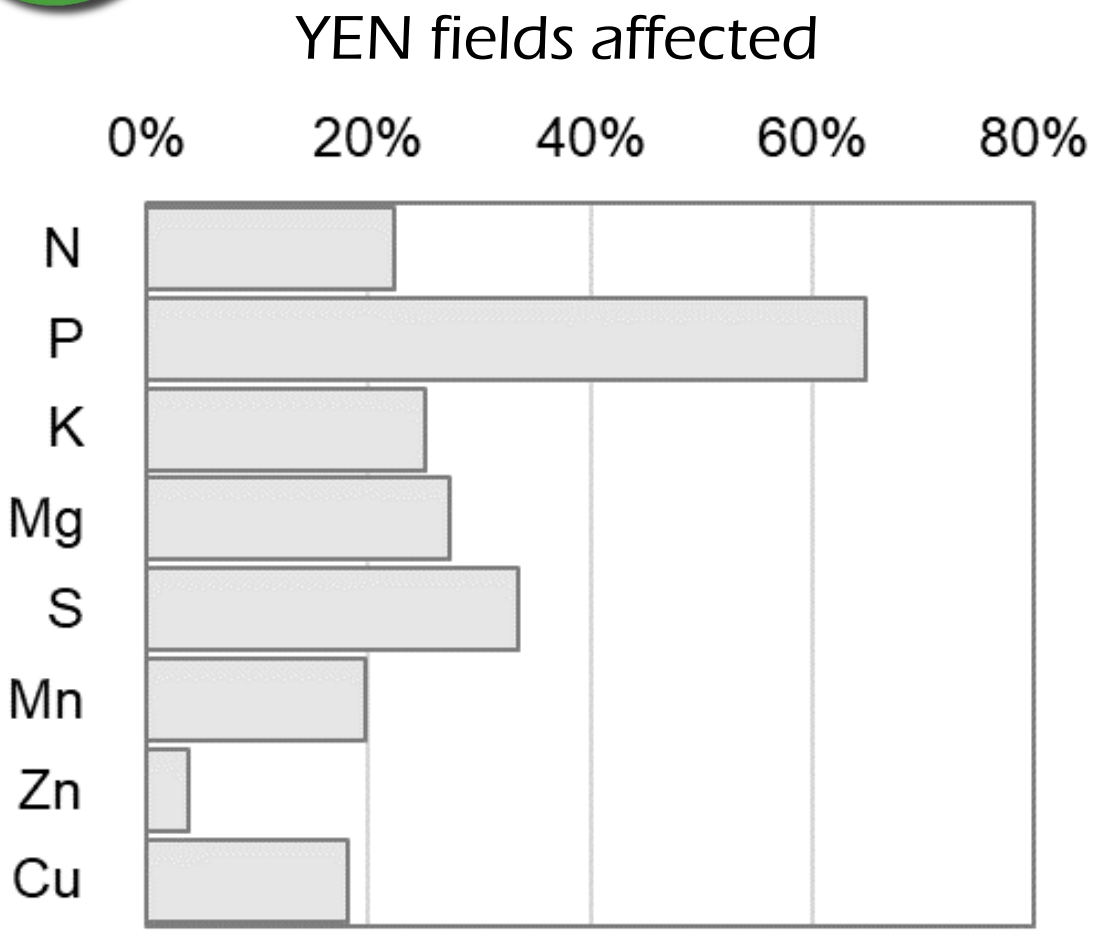
Nutrient	Concentration in grain DM	References, additional to Reuter & Robinson (1997):
N	~2%#	Sylvester-Bradley & Clarke (2009); AHDB (2022)
P	0.32%	Rollett & Sylvester-Bradley (2019); Bolland & Brennan (2008); Whitehouse (1973).
K	0.38%	Zhan *et al.* (2016)
S	0.12% or 17 N:S	McGrath (pers. comm.); McGrath *et al.* (1999)
Mg	0.08%	Ceylan *et al.* (2016)
Mn	20 mg/kg	McGrath *et al.* (2013);
Zn	15 mg/kg	McGrath *et al.* (2013); Khokhar *et al.* (2018)
Cu	3 mg/kg	Davies *et al.* (1971); Khokhar *et al.* (2018); Wadsworth, (1977; 1989); Curtin *et al.* (2008); Karamanos *et al.* (1986; 3003; 2004; 2005); Malhi *et al.* (2005); Sinclair & Withers (1995); Rehm (2008).

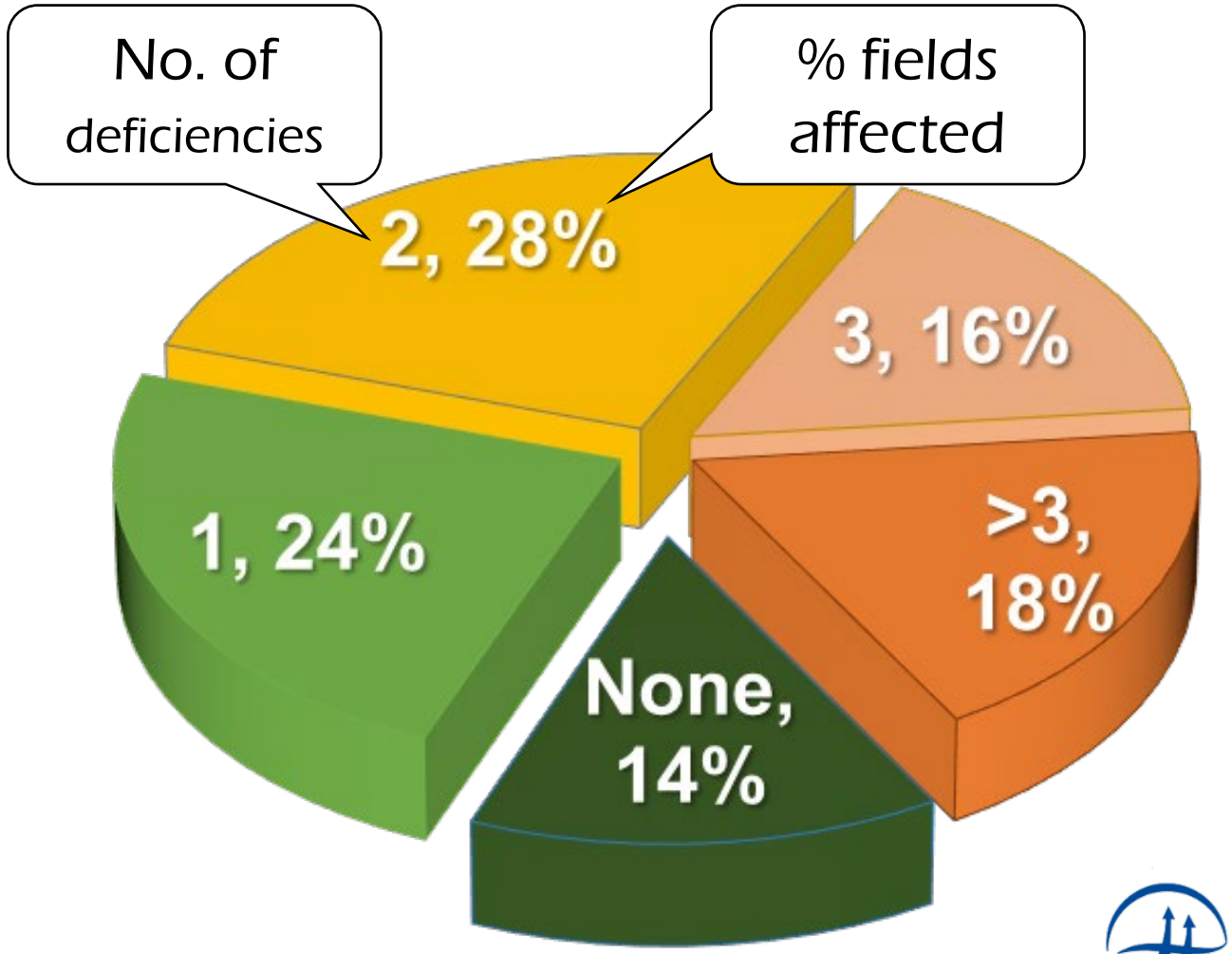


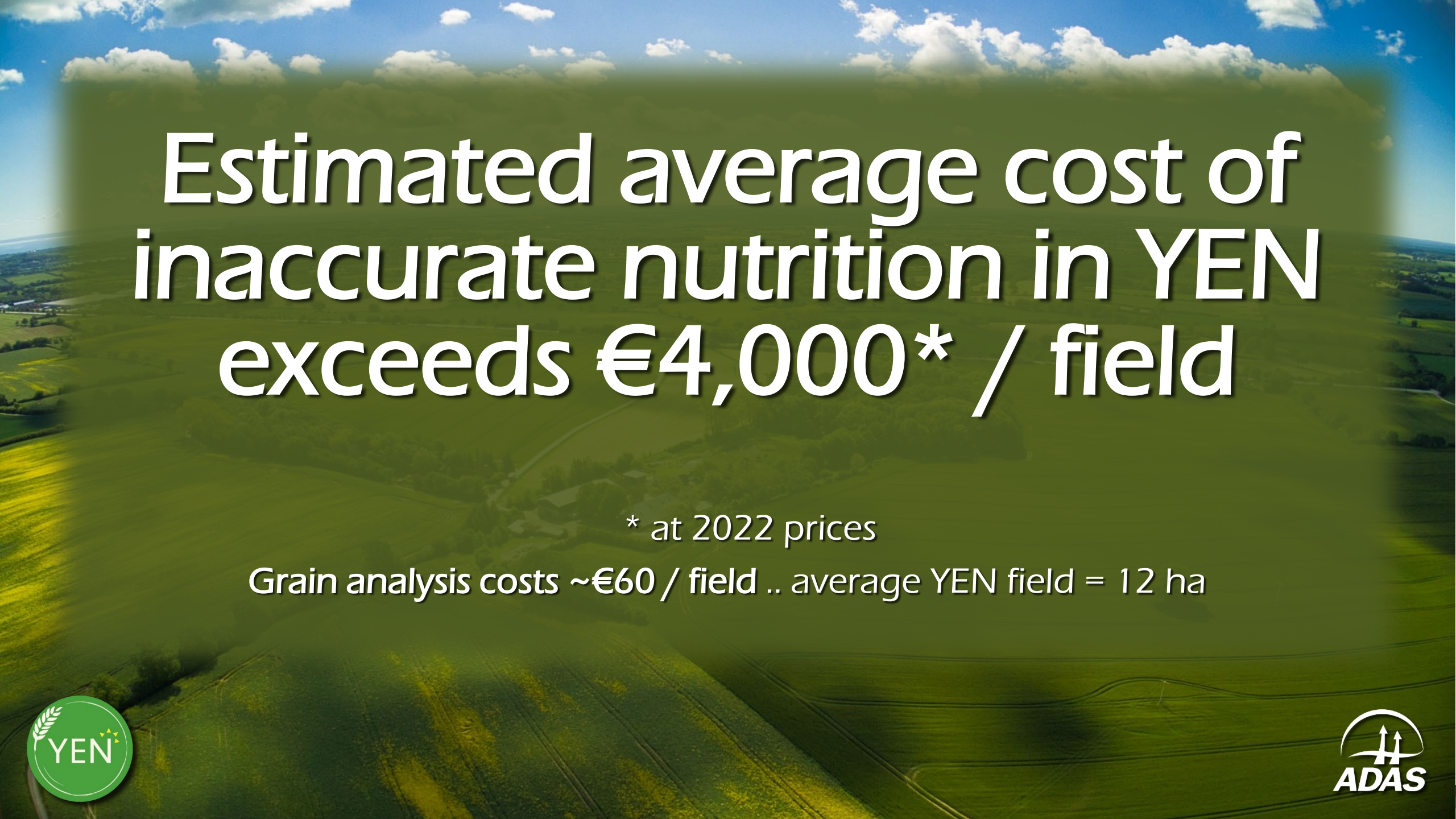
variety dependent

Frequencies of Deficiencies in YEN

Wheat 2013 – 2021



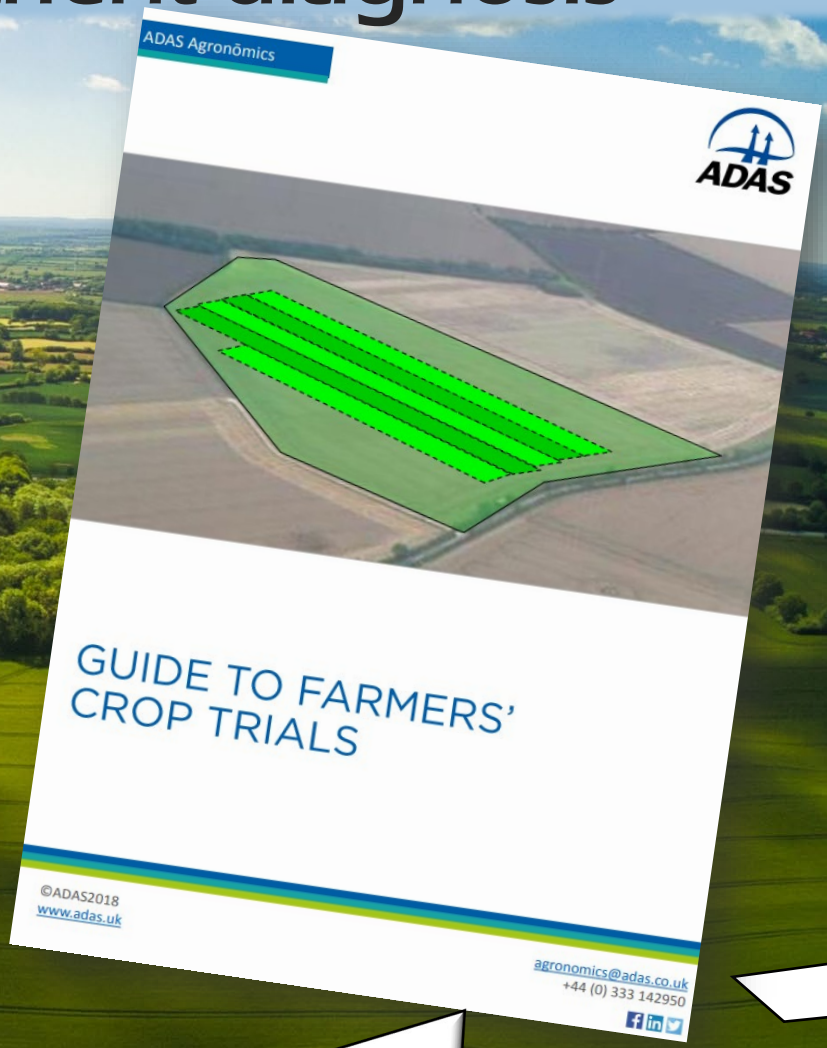



Estimated average cost of inaccurate nutrition in YEN exceeds €4,000* / field
* at 2022 prices
Grain analysis costs ~€60 / field .. average YEN field = 12 ha
YEN
ADAS

On-farm TESTS can confirm grain nutrient diagnosis

Product Application Patches: **PAPs**

Product Omission Patches: **POPs**



Available free from www.yen.adas.co.uk

ADAS

Conclusions:

- Nutrient Harvests vary substantially between fields
  - Many Causes: genetic, season, soil supplies, fertiliser & manure use, etc.
  - But mainly: **Farm-to-Farm**
- 85% crops have 'deficiencies' or 'excesses'
  - especially of N & P
- Routine checks of Nutrient Harvests are a "no-brainer"
  - Analyse Grain … and Straw? … as well as Soil & Leaf
  - Consider on-farm tests
- New "Measure to Manage" project, with ARVALIS *et al.* …

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From 2023 to 2025 ...

"To maximise site-specific precision in managing the nutrition of European arable crops"

Thank you

Roger.Sylvester-Bradley@adas.co.uk

comifer

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