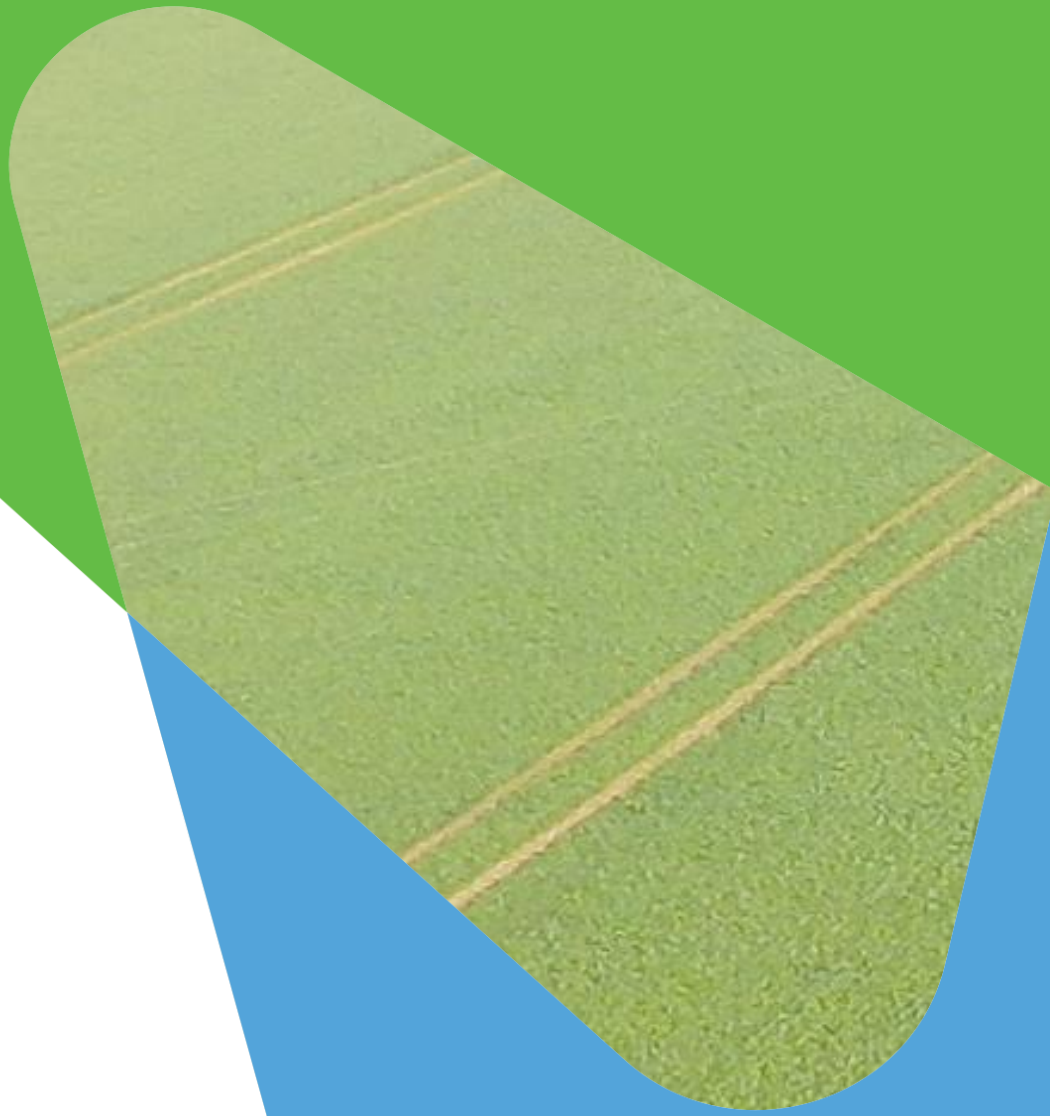
Is it worth measuring Soil Nitrogen Supply?

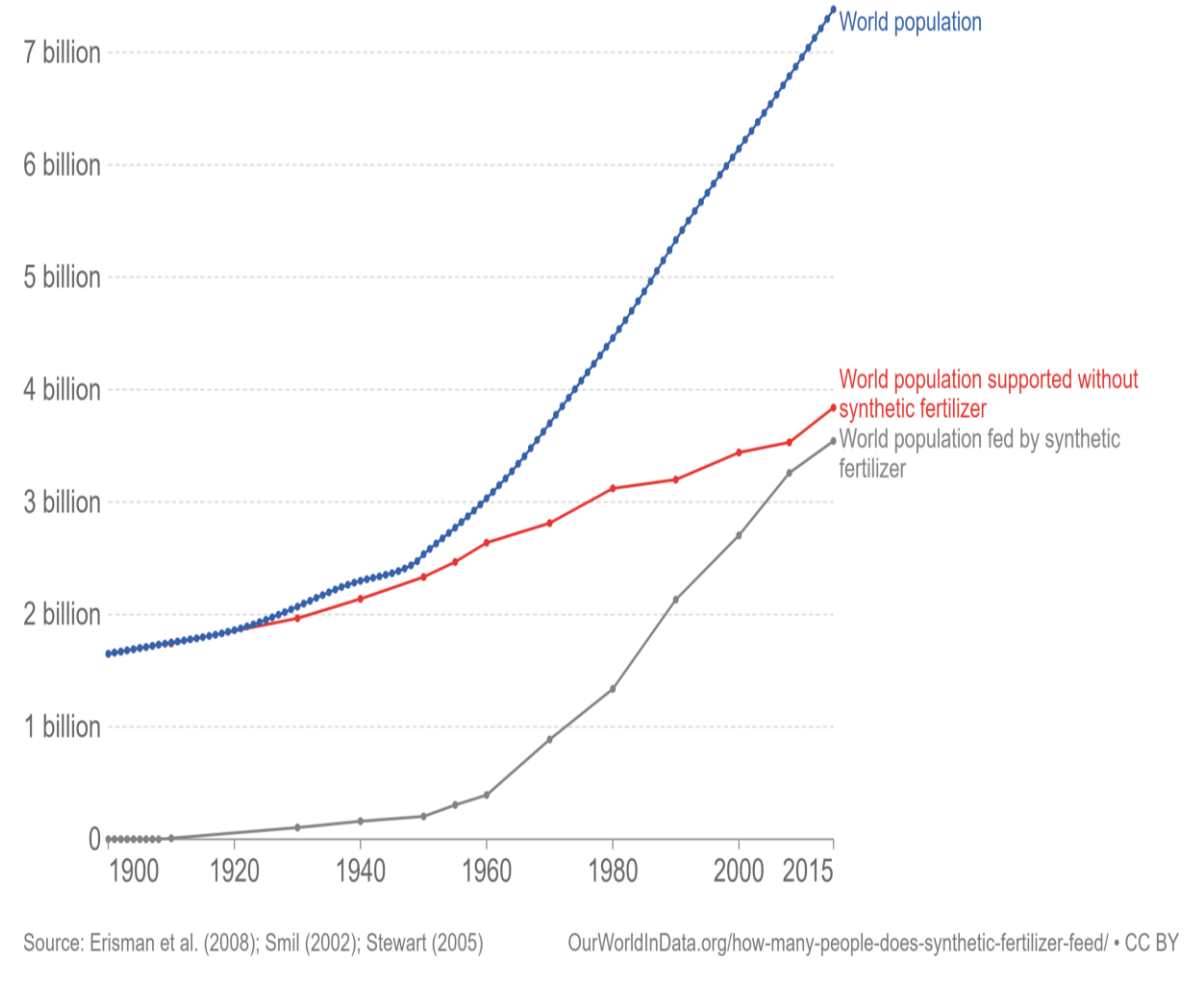
An insight from CF Nitrogen fertiliser Use Efficiency trials



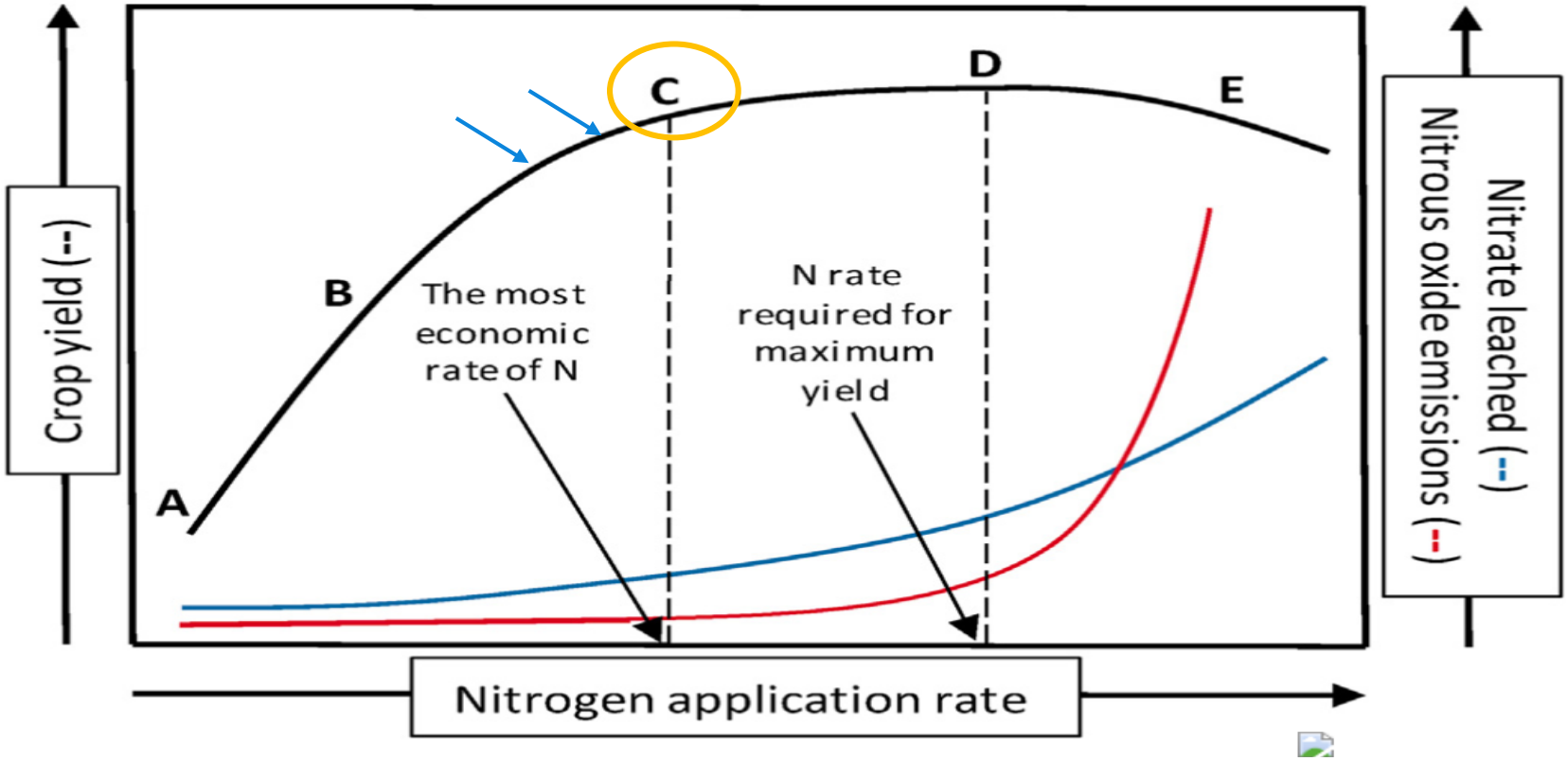
Dr.Sajjad Awan
Company Agronomist
CF Fertilisers

Significance of Nitrogen as a Fertiliser

- Nitrogen is often the limiting nutrient for crop production
- Currently, it supports approximately half of the global population
- Optimum applications are required to improve profits and reduce environmental losses
- How do we know what is ‘optimum’



Maximum benefit from N is just below the rate for the highest yield



Economic optimum changes with the **commodity** and **fertiliser** prices

Environmental and Sustainability Indicators 10 (2021) 100099

Increasing our Understanding of Science: Large Scale UK Farm Trials to Optimise N Use

Trials' detail

- Extensive tramline trials conducted across the country during 2020/21
- Conducted on research/commercial farms and farmers' fields
- Trials with 'zero' N included for accurate determination of NfUE
- Optimum N rate: Calculated measuring SNS through CF N-Min
- Crop N recommendations based on N-Calc programme

Winter Wheat NfUE Trial

Wiltshire

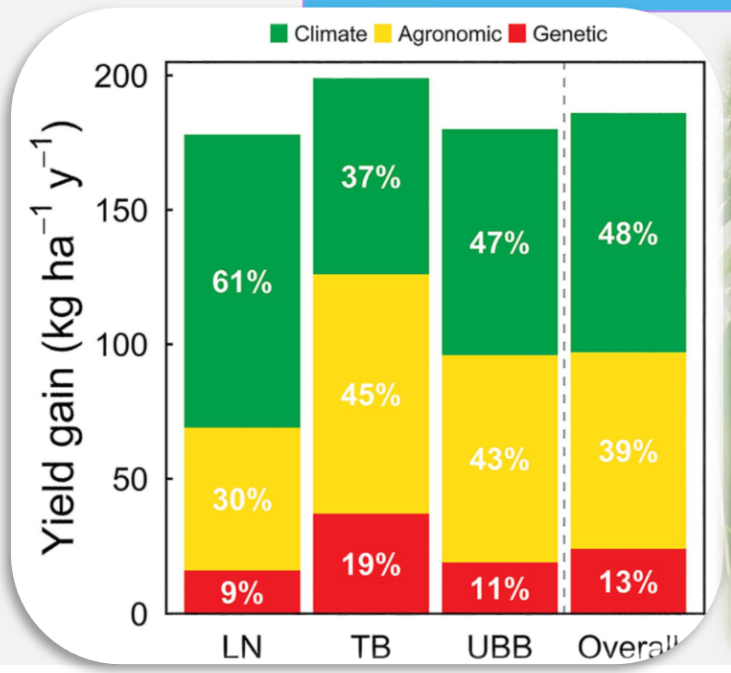
Trial conducted on farmer's field in Oxfordshire, 2020/21

Significance of NfUE?

Low NfUE could result in high monetary & environmental losses

Reasons for low NfUE in Cereals and Oilseeds

- Poor synchronisation between crop N demand and application (Farm Factor)
- **Risk aversion……**
- Weather/Climate
- Varietal choice (genetics)
- Fertiliser products



High NfUE

Higher N fertiliser uptake and crop utilisation

=

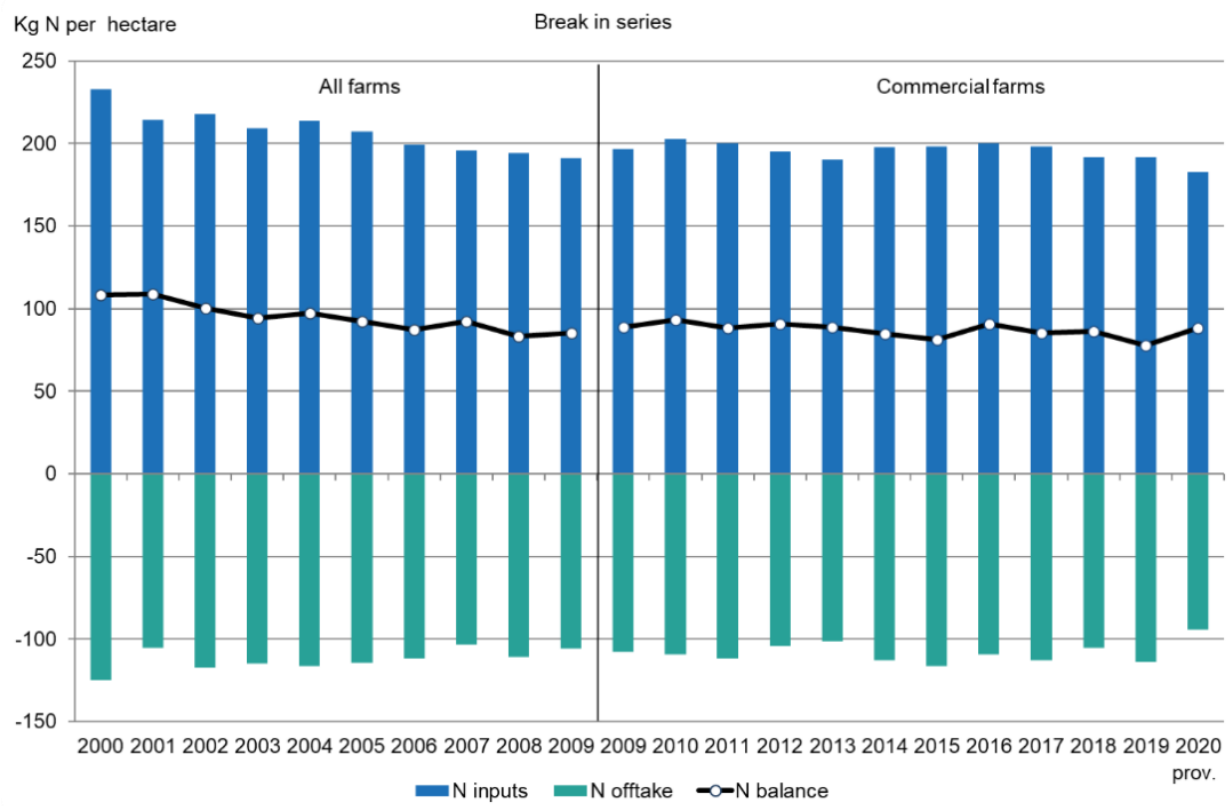
Bigger profit margins + better environment

How well have we done so far?

Soil nitrogen balance is a good indicator of how well crops utilised applied nitrogen!

In spite of using modern technology, several government initiatives and campaigns, there is no reduction in soil Nitrogen balance.

Reasons for a status quo?



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Assessment of Soil Nitrogen Supply (SNS)

- Field Assessment Method (RB209)- accuracy 33%

- Measurement Method (Soil Mineral Nitrogen)- accuracy 45%

- Cf N-Min Test- accuracy 75%

Table 4.2. SNS Indices for low rainfall (500–600 mm annual rainfall, up to 150 mm excess winter rainfall) – based on the last crop grown

Previous crop	Soil category					
	Light sand soils or shallow soils over sandstone	Medium soils or shallow soils not over sandstone	Deep clayey soils	Deep silty soils	Organic soils	Peat soils
Beans	1	2	3	3	All crops in SNS Index 3, 4, 5 or 6. Consult a FACTS Qualified Adviser.	All crops in SNS Index 4, 5 or 6. Consult a FACTS Qualified Adviser.
Cereals	0	1	2	2		
Forage crops (cut)	0	1	2	2		
Oilseed rape	1	2	3	3		
Peas	1	2	3	3		
Potatoes	1	2	3	3		
Sugar beet	1	1	2	2		
Uncropped land	1	2	3	3		
Vegetables (low N)[a]	0	1	2	2		
Vegetables (medium N)[a]	1	3	3[b]	3[b]		
Vegetables (high N)[a]	2	4[b]	4[b]	4[b]		

CF N-Min

Soil Mineral Nitrogen (SMN) + **Additional Available Nitrogen (AAN)** = **Soil Nitrogen Reservoir**

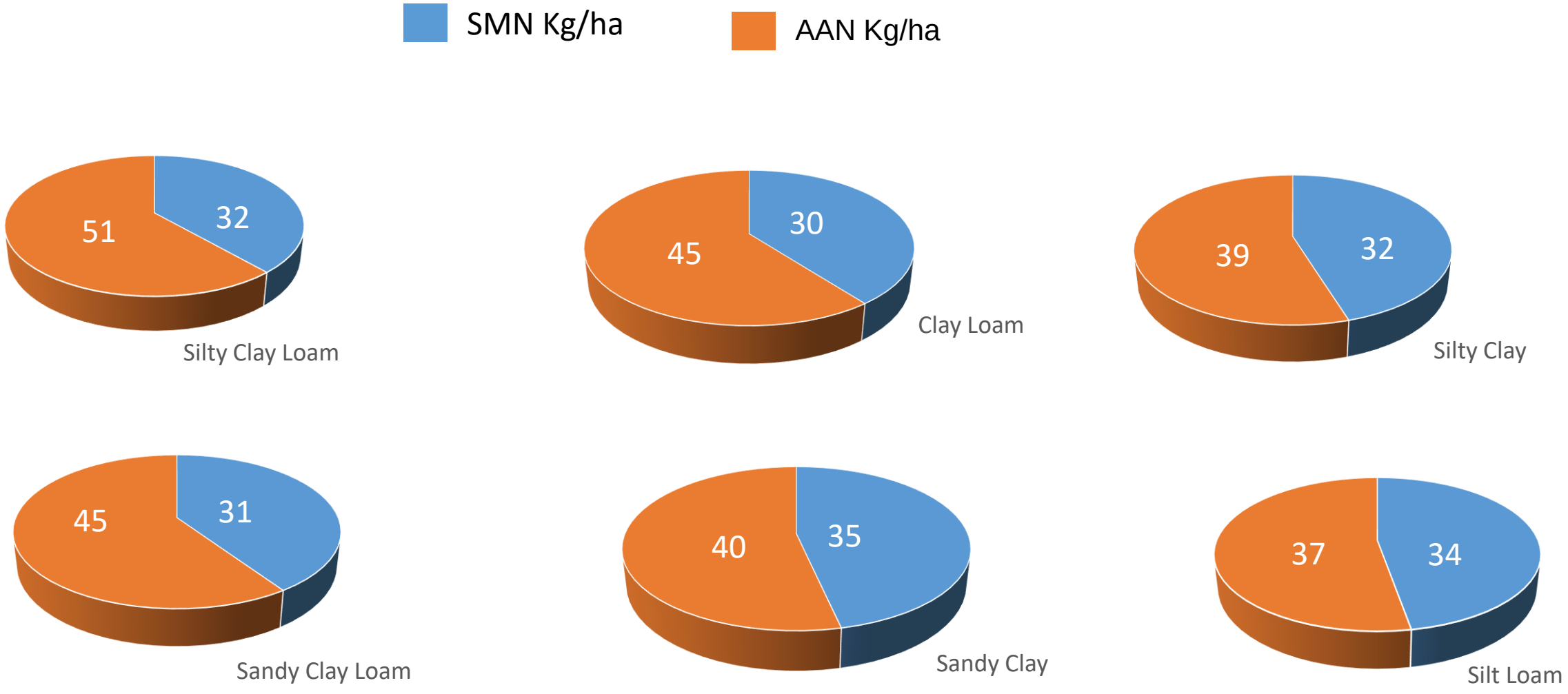
Soil Nitrogen Reservoir + The Crop Nitrogen = **Seasonal Soil Nitrogen Supply (SNS)**

The CF N-min Test

Consists of two components:

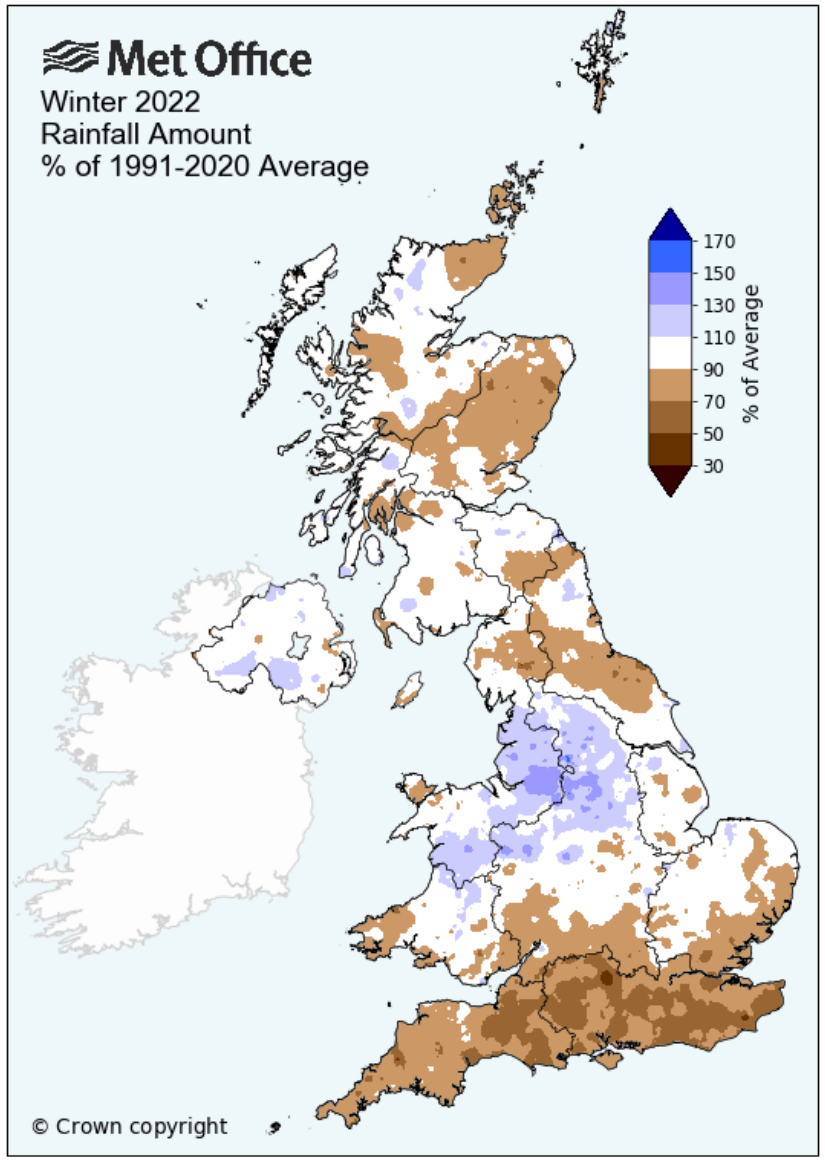
1. The measurement of Soil Mineral N (SMN). This is the N immediately available to the crop for plant uptake. It is also liable to leaching.
2. The measurement of Additionally Available N (AAN). This is the N which becomes available for crop uptake between the time of sampling and the time of harvest through mineralisation.
3. The latter is measured by a laboratory incubation method developed by CF and Hill Court Farm Research.

SMN (Soil Mineral Nitrogen) and AAN (Additionally Available Nitrogen)- 2021 data- Soil type

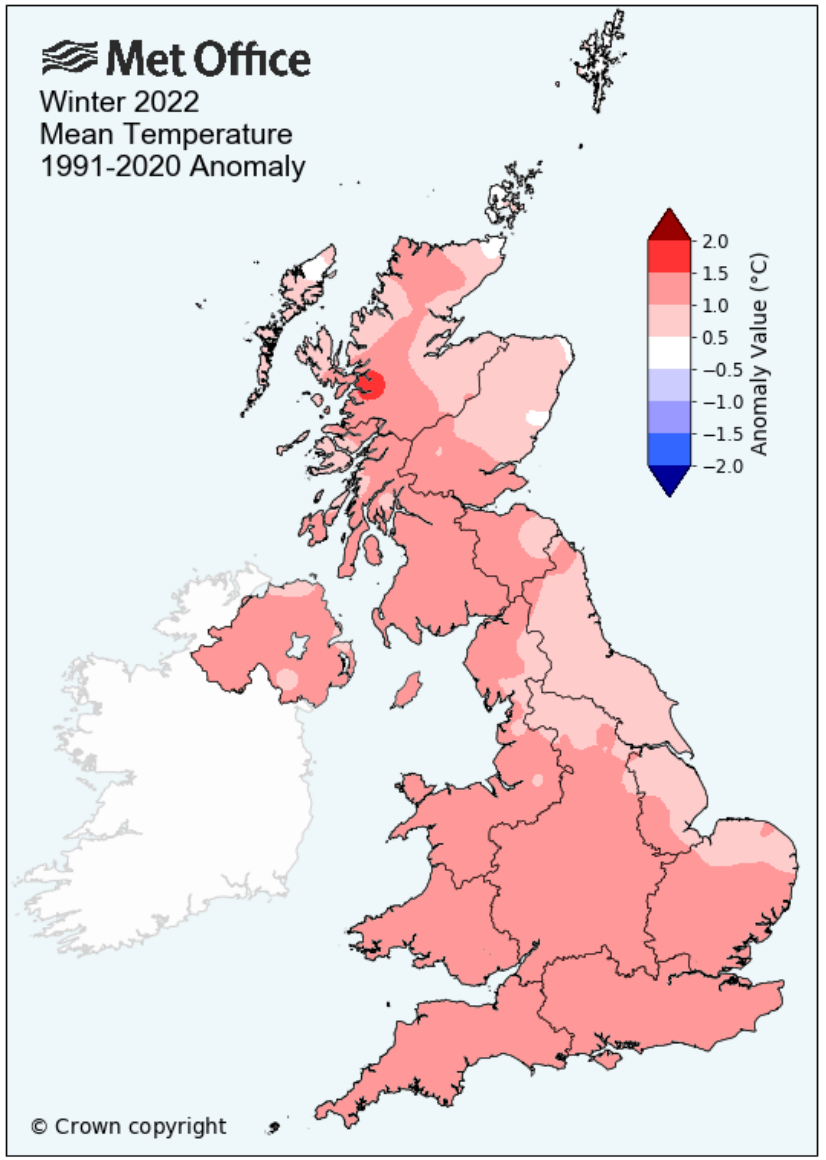


SNS Prediction for Spring 2022

Rainfall amount -Winter 2022

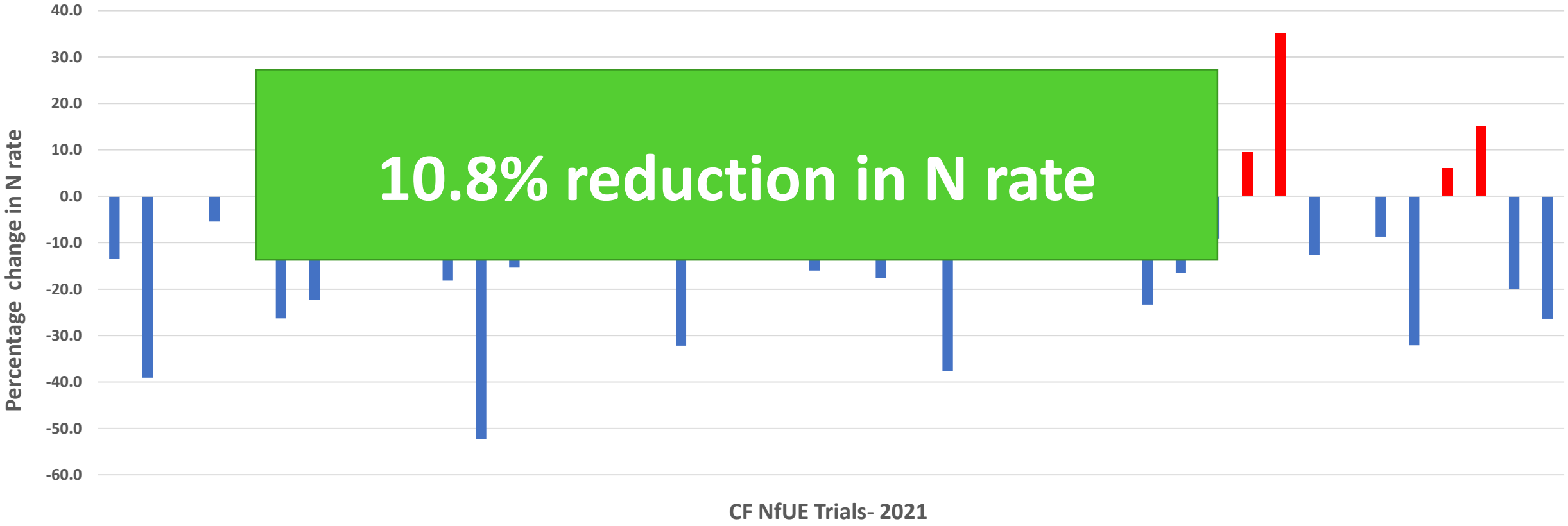


Mean Temperature-Winter 2022



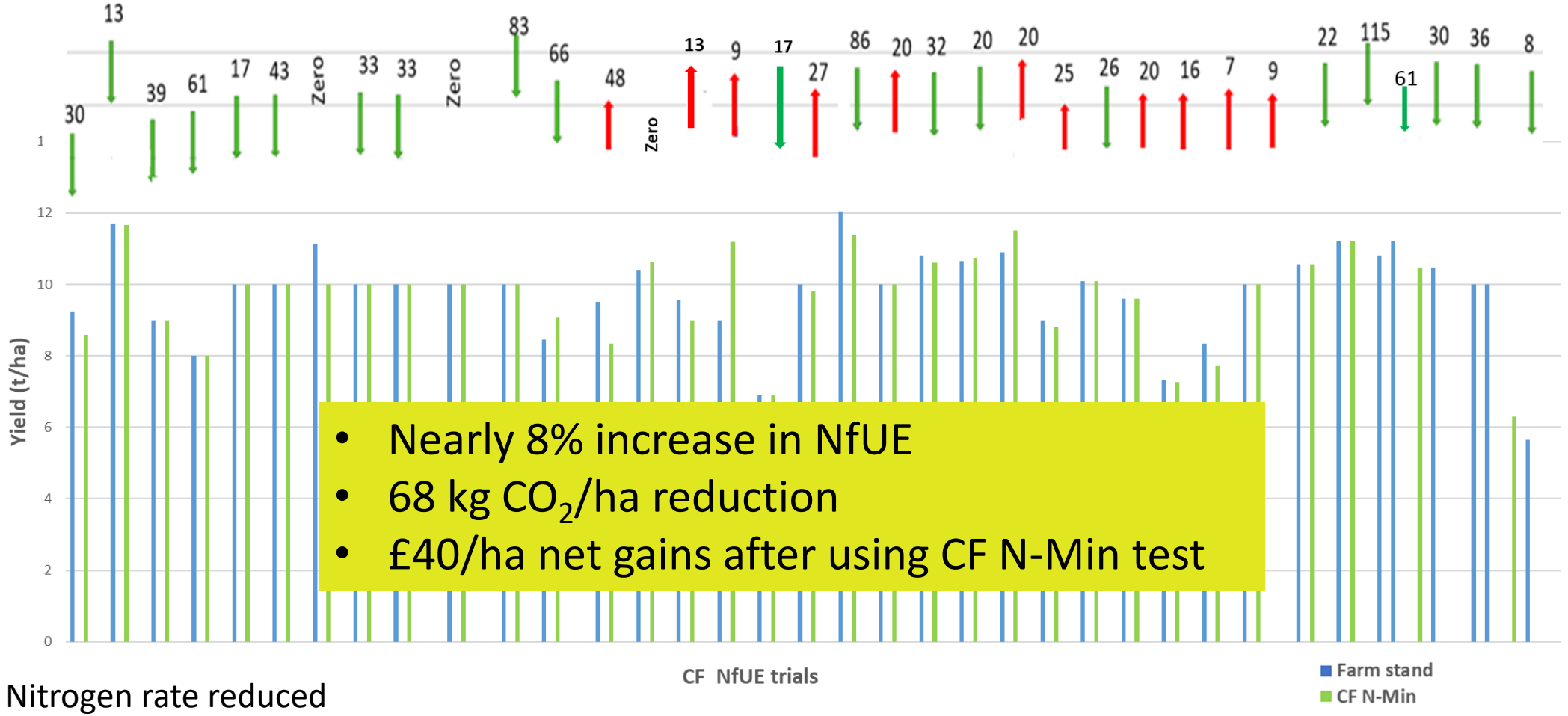
Results- CF NfUE Trials (2021)

Nearly 75% of the farmers saved through efficient use of N fertiliser



Note: Each bar represents an individual on-farm trial
Green bars show N rate reduction
Red bars show an increase in N rate

Nitrogen rate adjustment had little to no effect on crop yield

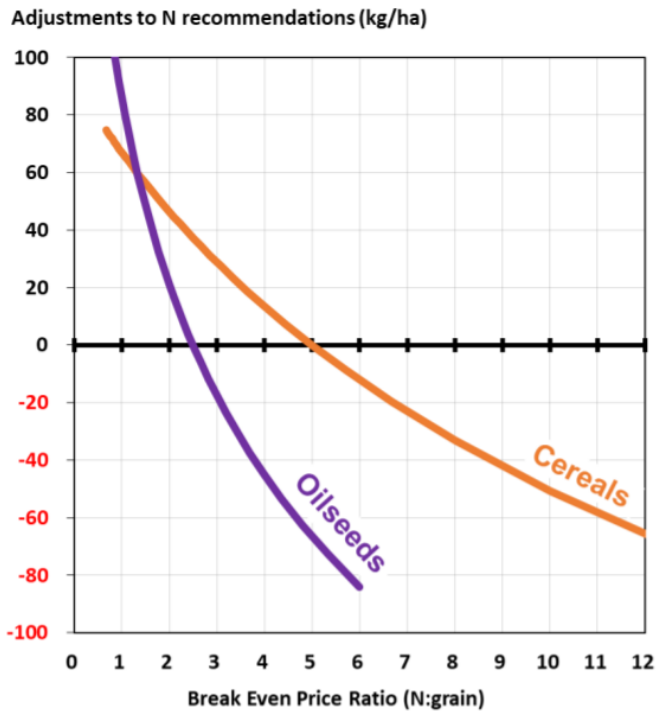


- Nearly 8% increase in NfUE
- 68 kg CO_2/ha reduction
- £40/ha net gains after using CF N-Min test

Nitrogen rate reduced

Nitrogen rate increased

High Fertiliser Prices- Should I cut my fertiliser rates?



AHDB Research Review No. 97: Review of how best to respond to expensive fertiliser nitrogen for use in 2022

Phosphorus and Potassium for Silage Maize

Silage Maize: P&K offtakes (RB209)

Crop material	Phosphate	Potash
	kg/t of fresh material	
Maize: Silage (30% DM)	1.4	4.4

At P index-2 (maintenance index) 40t maize crop will remove approximately;
40 X 1.4 = 56kg P_2O_5/ha

At K index 2- (maintenance index) , the same crop will remove approximately;
40 X 4.4 = 176 kg K_2O

Nutrient	SNS, P or K Index				
	0	1	2	3	4 and higher
	kg N/ha				
Nitrogen	150	100	50	20	0
Phosphate[a]	115	85	55	20	0
Potash[a]	235	205	175 (2-) 145 (2+)	110	0

* It's best to analyse forage from a lab for more accurate results

Summary

- These are extraordinary times hence we need to act accordingly
  - **Must measure Soil Nitrogen Supply**:
    - CF N-Min test is the best in the UK
    - Reduce excessive application, residual soil nitrogen and increase gross margins
    - Improve soil, air and water environment
  - **Select fertilisers with minimal losses to the environment (15-20% savings)**
  - **Have realistic yield and quality targets**
  - **Reassess your targets during early summer**
  - **Make use of manures/slurries or any other organic materials**

Questions?

If you would like to know more or get involved, please contact;

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