YEN Zero 23/24 Results Meeting

March 2024

Housekeeping before we begin …

- Today's meeting will be recorded for those who cannot attend

- Please stay on mute when you are not speaking

- We have a Q&A slot in today's meeting, but you can also post Q's in the chat box throughout the meeting

YEN Zero Results Meeting Agenda

11.00-11.20	**Introduction**	*Megan Tresise*
	Summary of YEN Zero 2023/24	
11.20-11.50	**Updates to the methods used to analyse YEN Zero data**	*Toby Townsend*
11.50-12.10	**Reports overview and summary of changes**	*Pete Berry*
12.10-12.30	**YEN Zero feedback and future**	*Megan Tresise, Laurie Abel*

Thank you to our sponsors

…and to all of you for your participation

Agrii AngloAmerican BAYER Department for Environment Food & Rural Affairs GLENMORANGIE SINGLE MALT SCOTCH WHISKY

INCHDAIRNIE DISTILLERY NFU Origin FERTILISERS UK FLOUR MILLERS

Introduction and summary of YEN Zero 2023/24

Megan Tresise

YEN Zero, a network for the net zero community

Gaps in the industry YEN Zero aims to address:

- **Better consensus on methodology** used for C footprint accounting
- **Space to share knowledge** and discuss issues within net zero
- **Ability to benchmark your C footprint** against others
- **Connecting the industry**: researchers, organisations across the food supply chain, growers
- **Support testing** of mitigation strategies on farm

YEN Zero 23-24 timeline of activities

July 2023

Aug 2023
Data entry open
Online platform made live for growers to enter field data.

Nov 2023
1st Discussion Workshop

Jan 2024
2nd Discussion Workshop

Mid Mar 24
Data entry closed
Growers no longer able to provide data, to allow time for data analysis.

March 2024
Interim reports delivered

March 2024
Results meeting and 3rd Discussion Workshop
Presentations of results, growers' forums, recognising trailblazers.

Early April 2024
Benchmarking reports delivered
Individual reports sent to growers and their sponsors.

May 2024

1st Discussion Workshop, November 2023

1. Topic: From data to agronomic decisions: mitigating carbon emissions associated with crop production
2. Presented as part of Countryside COP
3. Key takeaways:
   - Optimising nitrogen use is one of the main levers for reducing arable emissions
   - Reduce manufactured N emissions by selecting abated fertilisers, use organics/legumes or novel fertilisers
   - Reduce applied N emissions by optimising application rate, timing and method of application, inhibitors

2nd Discussion workshop, January 2024

1. Topic: Learning from YEN Zero: What is driving crop production emissions?

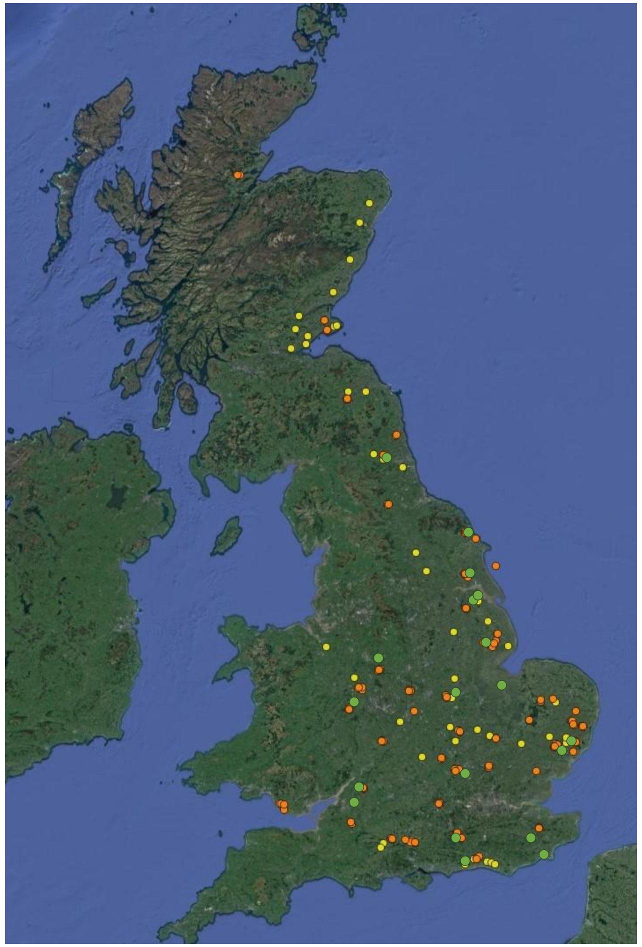
2. Presented at YEN Conference

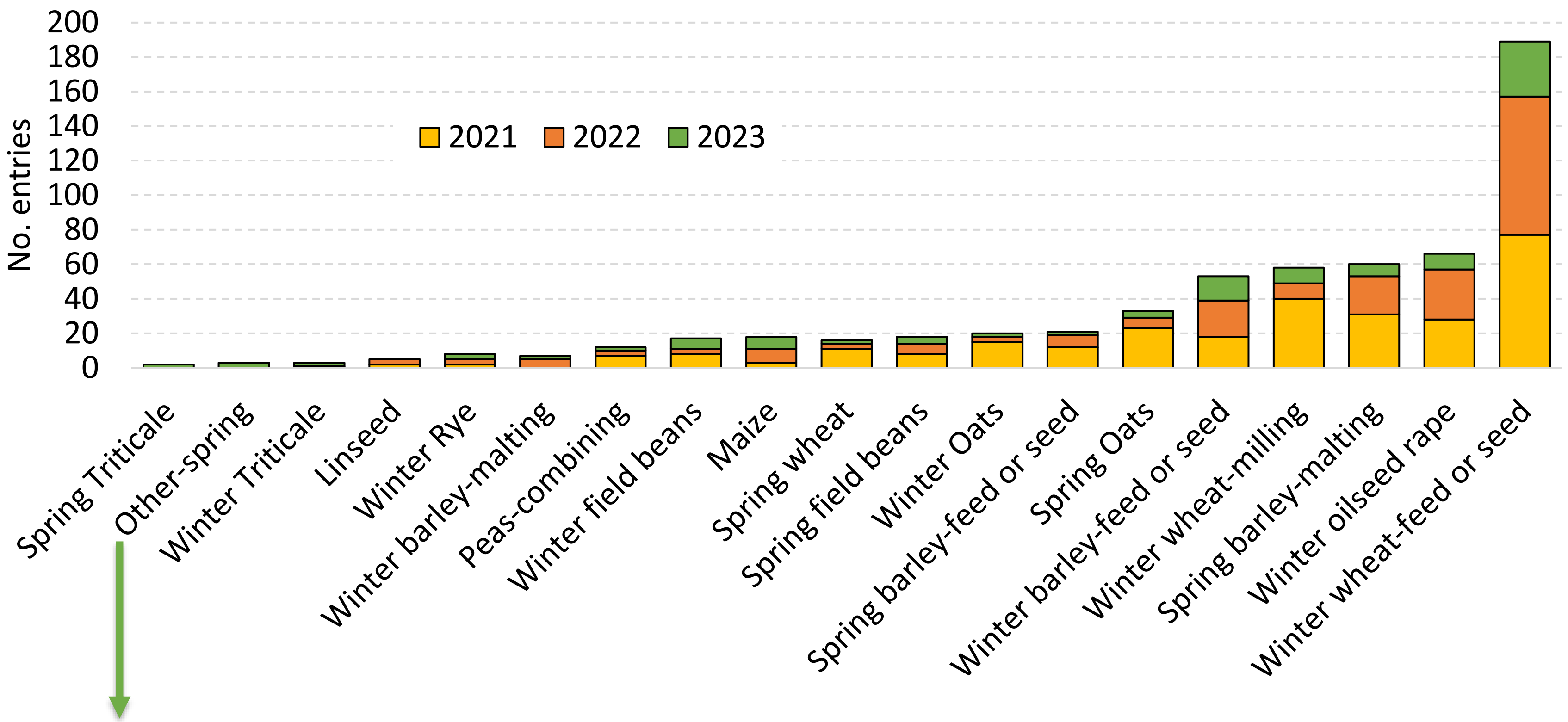
3. Summary of YEN Zero data from 2021 and 2022

4. Key takeaways:
   - Optimising yield reduces emissions per tonne of crop
   - Optimising nitrogen applications reduces emissions overall
   - Balance of crop rotation can reduce farm-level emissions

YEN Zero – 2021-23

- 88 growers & 609 crops entered into YEN Zero





Sugar beet and Flax → looking into getting data for these crops going forwards

Sponsorship, registrations and reports

- 8 sponsors → 80 potential sponsored entry places for 2023

- 47 registered entries with the data portal

- 19 results reports sent out yesterday – 109 crops with a carbon footprint in total
  - 15 full reports
  - 2 without mitigation tree details
  - 2 reports based on what had been entered up to Mitigations in the data portal

YEN Zero - 2021-2023

- YEN Zero crop management summary:

Cultivation strategy	Proportion of crops
Plough based	15%
Deep non-inversion (>6 cm depth)	23%
Strip tillage	11%
Minimum shallow tillage (<6cm depth)	20%
Direct drill	32%

Use of manure	Proportion of crops
Yes	33%
No	67%

Use of inhibitors	Proportion of crops
Yes	9%
No	91%

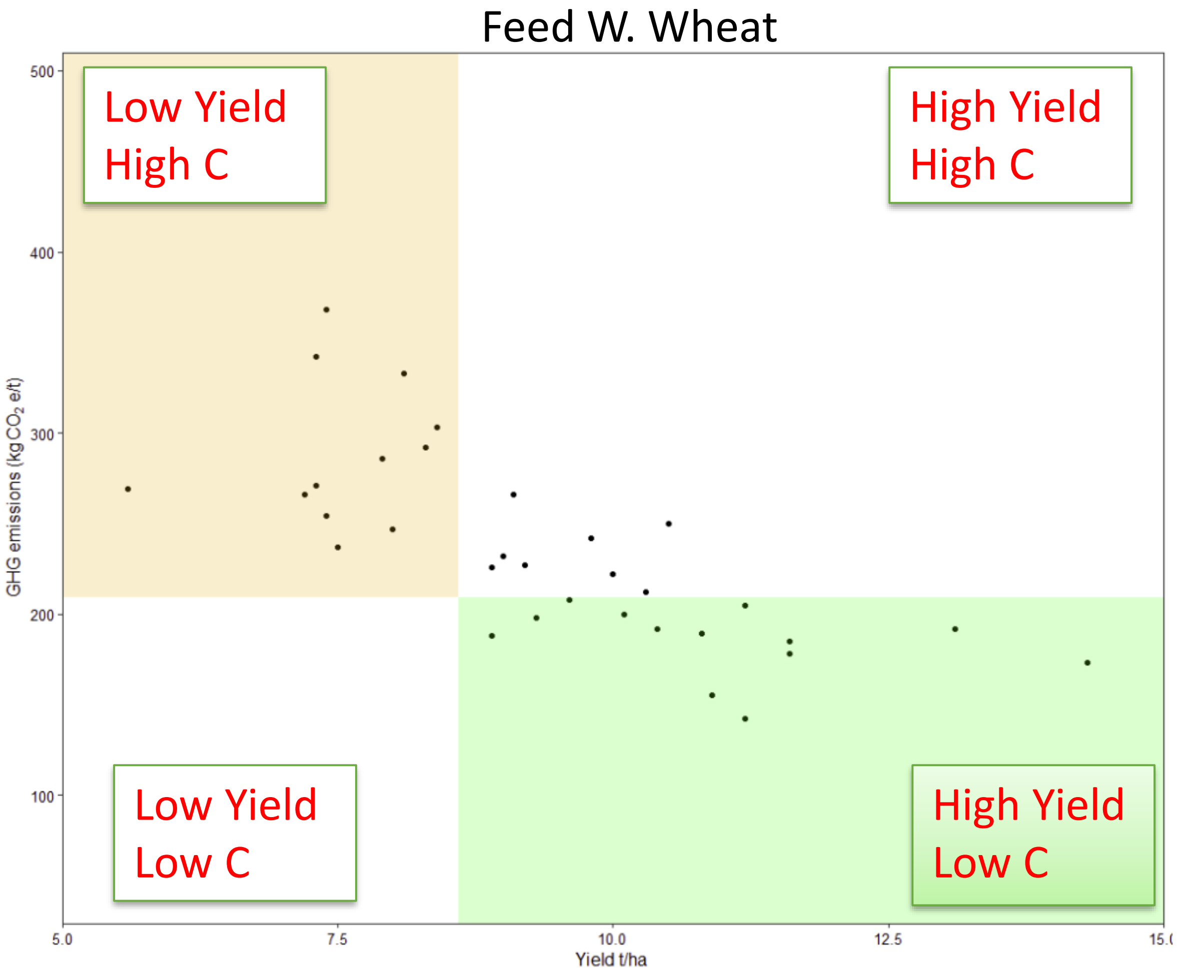
Use of cover crops after this crop	Proportion of crops
Yes	28%
No	72%

YEN Zero 2023 summary data

Crop type	Avg. Yield (t/ha)	Avg. GHG/t	Avg. GHG/ha
W. Wheat (feed)	9.3	236	2,124
W. Wheat (milling)	9.9	295	2,830
W. Barley (feed)	8.3	250	1,932
W. Barley (malting)	7.6	254	1,915
S. Barley (feed)	5.4	307	1,626
S. Barley (malting)	6.5	295	1,809
W. Oilseed rape	3.3	865	2,431
W. Oats	6.6	211	1,352
S. Oats	6.2	188	1,133
S. Field beans	3.0	225	677
W. Field beans	4.8	134	635

Productivity overview for 2023 – Feed wheat

- 32 feed Winter Wheat crops in 2023
- Yields: 5.6 – 14.3 t/ha, mean: 9.3 t/ha
- GHG/t: 142 – 368 kg CO_2e/t, mean: 236 kg CO_2e/t

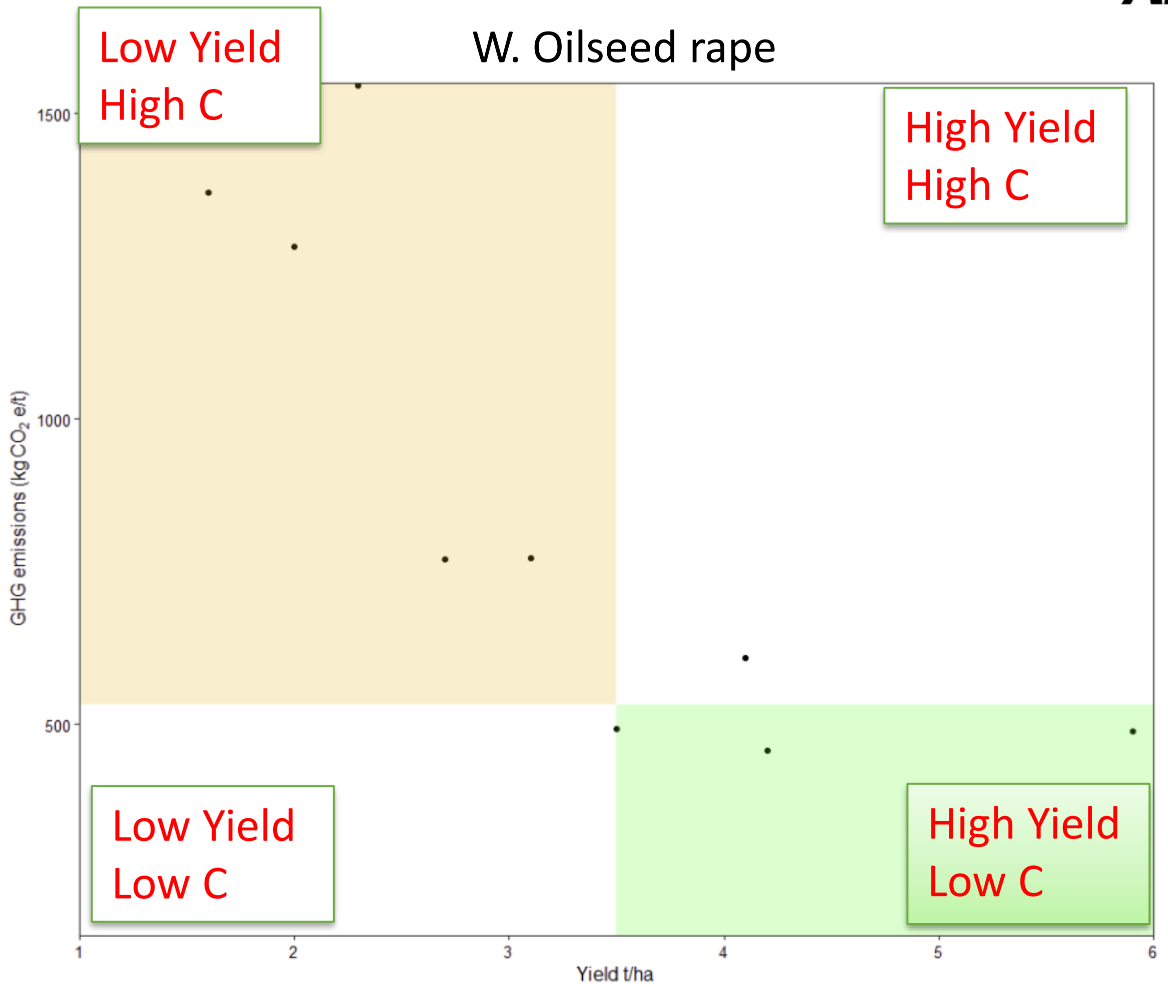


Productivity overview for 2023 – Feed wheat

Input	Information
Yield	5.6 – 14.3 t/ha
Fertiliser N applied	90 kg N/ha – 246 kg N/ha
Inhibitors used?	5 out of 32 crops
Organic manure applied	Only 1 crop – cattle slurry

Productivity overview for 2023 – Winter OSR

- 9 Winter Oilseed rape crops in 2023
- Yields: 1.6 – 5.9 t/ha, mean: 3.3 t/ha
- GHG/t: 458 – 1,545 kg CO_2e/t, mean: 865 kg CO_2e/t

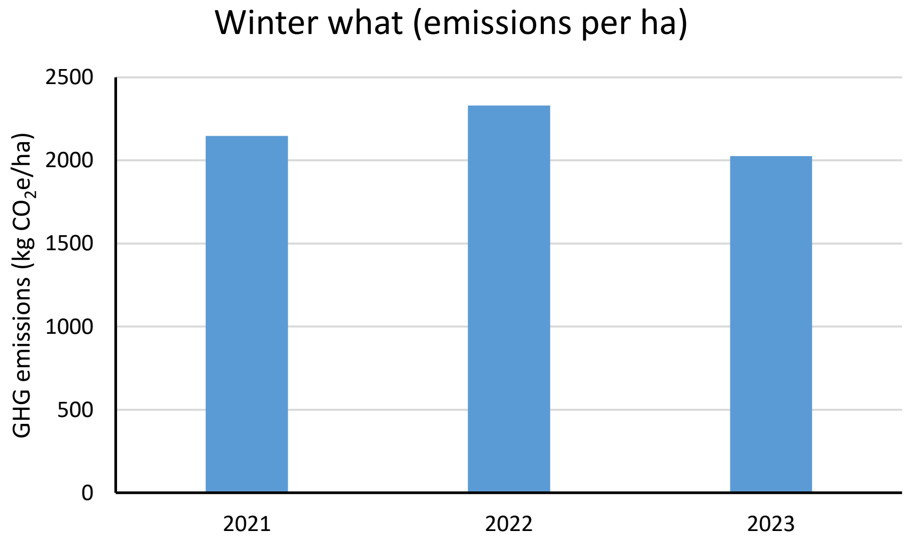


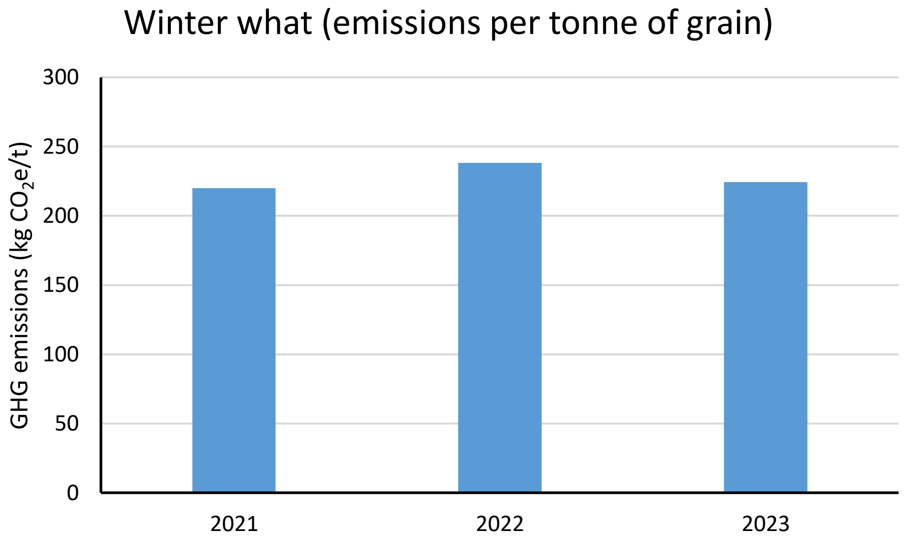
Productivity overview for 2023 – Winter OSR

Input	Information
Yield	1.6 – 5.9 t/ha
Fertiliser N applied	178 kg N/ha – 217 kg N/ha
Inhibitors used?	None
Organic manure applied	3 crops – all biosolid digested cake

Comparison to previous years

- Winter wheat – average emissions per ha and per tonne





Any feedback, comments or questions?

Updates to methodology

Toby Townsend

Emission sources

- Segregated the carbon footprint into 8 categories
- Emissions originate from three divisions:

Embedded emissions

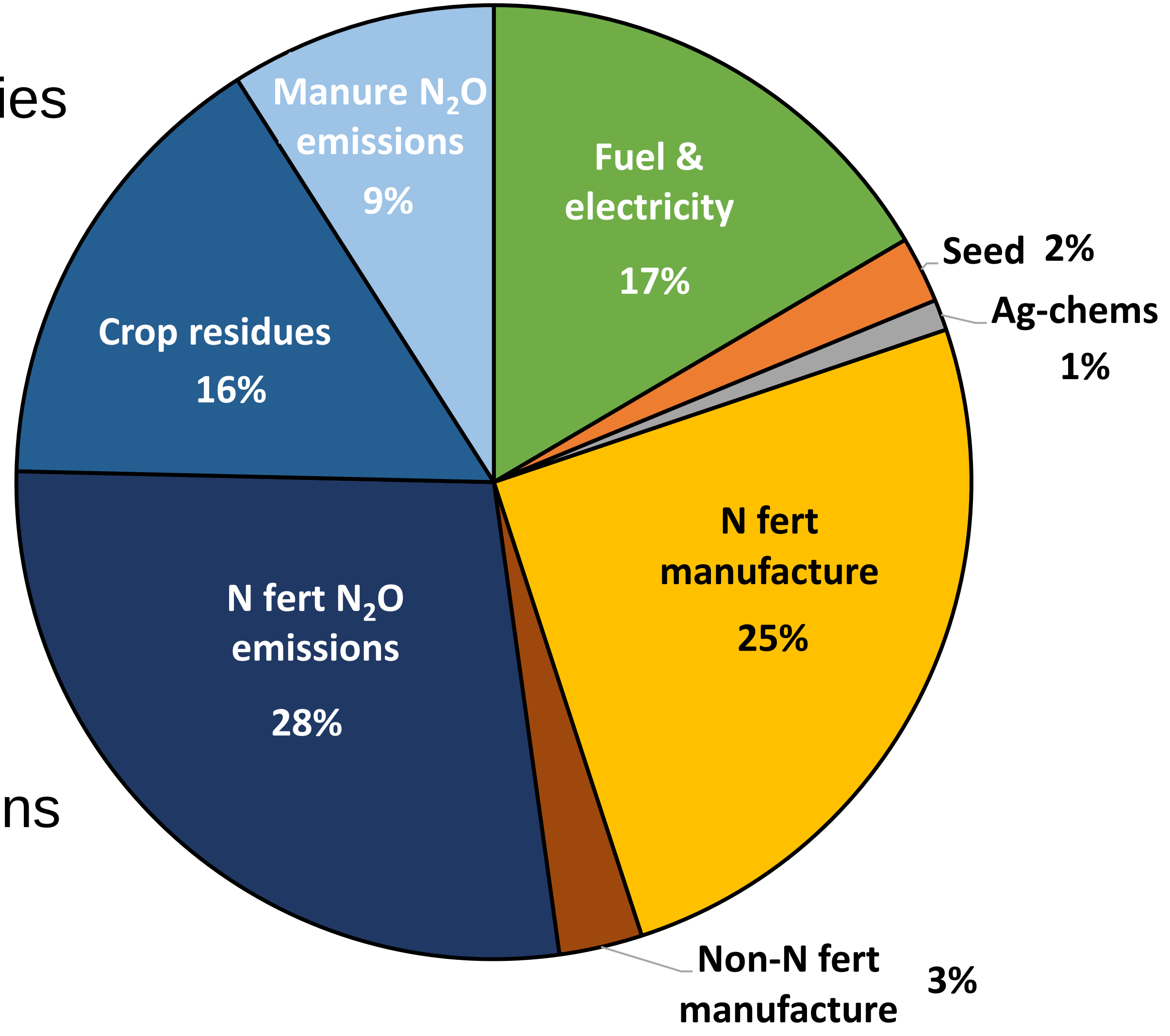
- Seed
- Ag-chemical manufacture
- Nitrogen fertiliser manufacture
- Non-N fertiliser manufacture

Energy

- Fuel & electricity

Direct and indirect nitrous oxide (N_2O) emissions

- Nitrogen fertiliser application
- Manure application
- Crop residue decay



Carbon footprint of YEN Zero 2021 and 2022 winter wheat (feed and seed) crops

Embedded emissions: seed, ag-chems, fertiliser, fuel

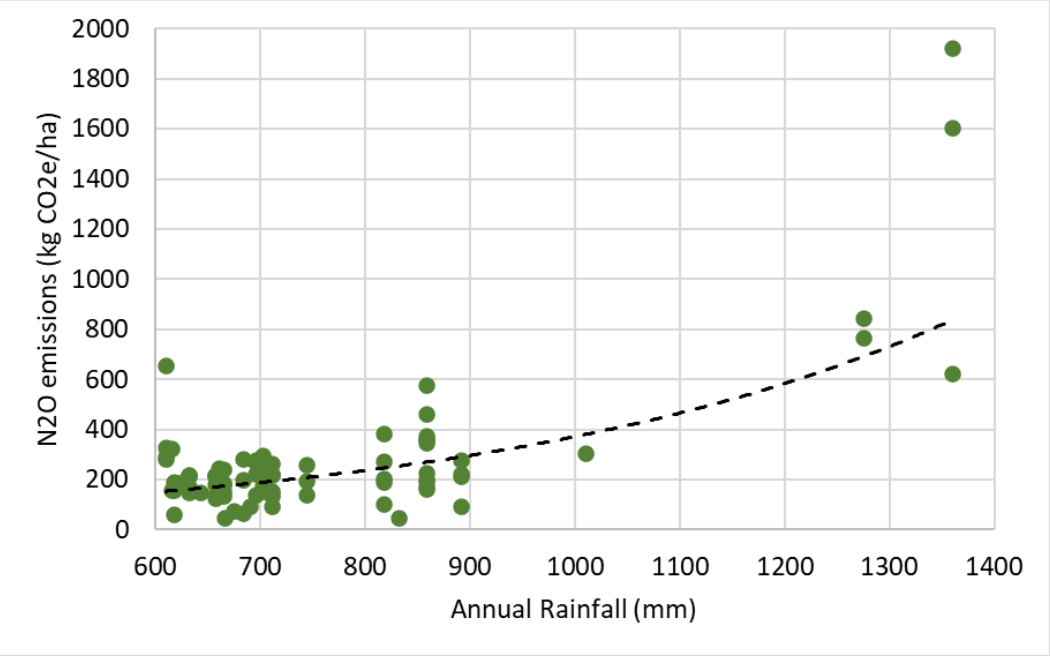
Activity x **Emission Factor** = **carbon footprint (kg CO_2e)**

Emission factors are used from the best available sources:

- **Seed – YEN Zero database**
- **Ag-chemicals – Based on kg ai/ha, Green et al. (1987)**
- **Fertiliser manufacture – Brentrup et al. (2018)**
- **Fuel use – DESNZ (2021, 2022, 2023)**

Modelled emissions: nitrous oxide emissions

- Direct emissions following N fertiliser application:
  - N_2O emissions from AN fertiliser modified by **annual rainfall**
    - … Long term annual rainfall at entrant's location used
  - Urea has lower direct emissions but higher indirect via volatilisation



- If an inhibitor used, reduction in emissions applied:
  - Nitrification inhibitor: 44% reduction in direct N_2O emissions
  - Urease inhibitor: 70% and 44% reduction in indirect volatilisation emissions for urea & UAN

Methodological updates

- Why update the methodology?
  - Changes in our understanding of emissions
  - Changes in emission factors

- What has been updated?
  - Nitrous oxide Global Warming Potential (GWP)
  - Seed embedded emissions
  - Energy emission factors

- What are the impacts of this?
  - Overall minor changes
  - But need to make sure comparisons with previous data are fair

Greenhouse Gas	100-Year Time Period			
	AR4 2007	AR5 2014		AR6 2021
	Feedback Not Included		Feedback Included	
CO_2	1	1	1	1
$CH_{4\ \text{fossil origin}}$	25	28	34	29.8
$CH_{4\ \text{non fossil origin}}$				27.2
N_2O	298	265	298	273

Largest reduction: -13%

Largest increase: +2%

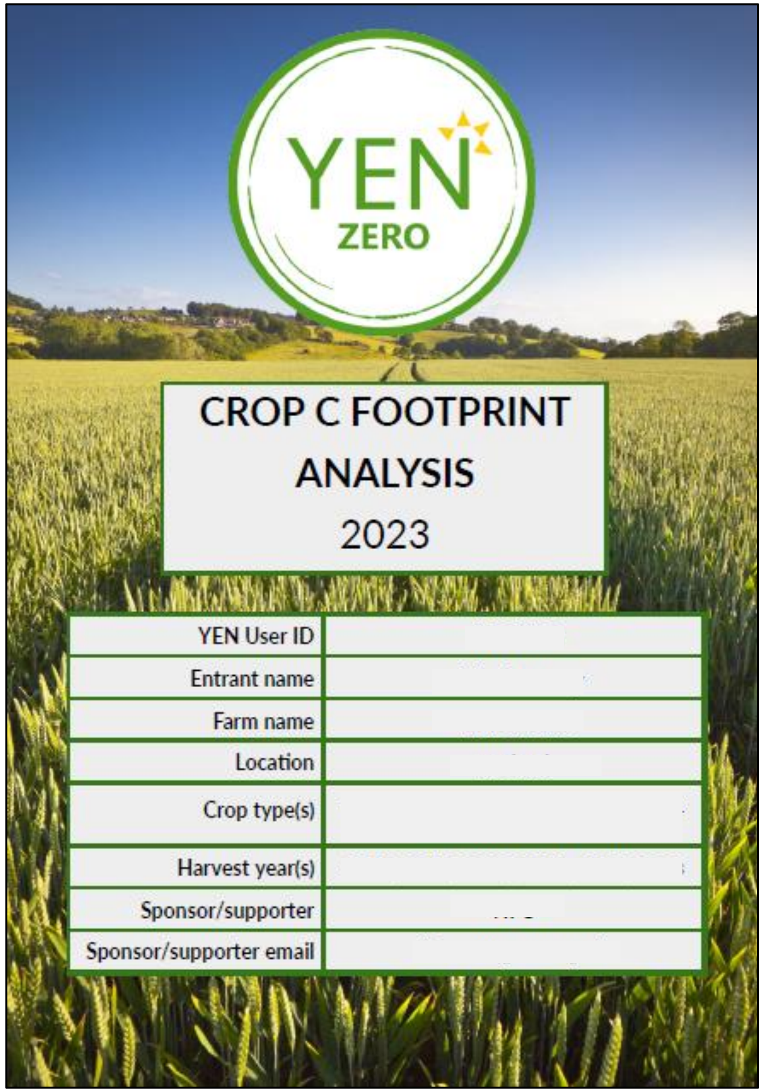
Average change: -4%

Any feedback, comments or questions?

Updates to the reports

Pete Berry

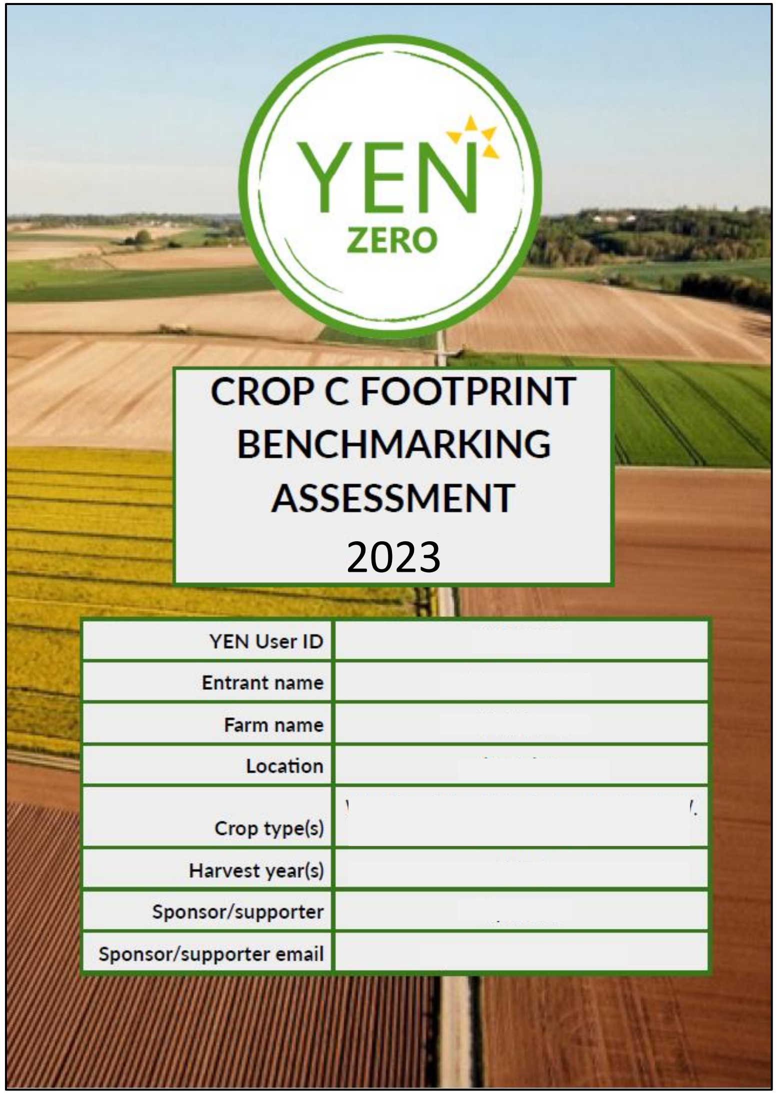
Reports overview


YEN ZERO

CROP C FOOTPRINT ANALYSIS

2023

YEN User ID	
Entrant name	
Farm name	
Location	
Crop type(s)	
Harvest year(s)	
Sponsor/supporter	
Sponsor/supporter email	


YEN ZERO

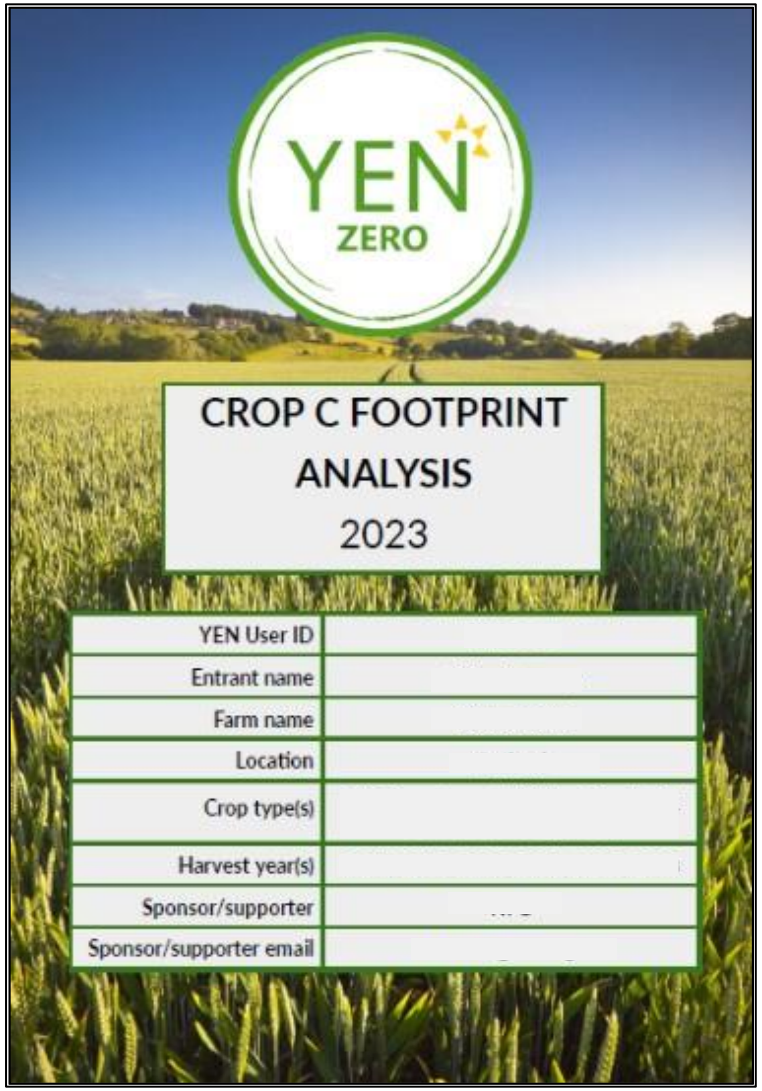
CROP C FOOTPRINT BENCHMARKING ASSESSMENT

2023

YEN User ID	
Entrant name	
Farm name	
Location	
Crop type(s)	
Harvest year(s)	
Sponsor/supporter	
Sponsor/supporter email	

Results Report

- Background to carbon footprinting
- Summary of emissions data
- Detailed breakdown per entry
- Overview of soil health
- Bespoke mitigation practice tree



INTRODUCTION

We would like to thank you for submitting your crop entries into YEN Zero.

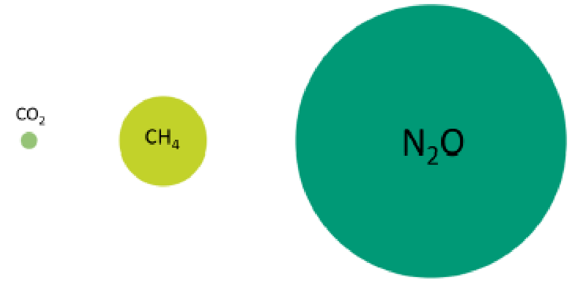
This report provides a detailed assessment of the greenhouse gas (GHG) emissions, and subsequent carbon footprint, associated with your farming operations. It aims to highlight where the emission hotspots lie in your system and provides an indication of which mitigation strategies may be suitable in reducing your crop GHG emissions. This report is the first of two YEN Zero provides with the second providing a benchmark analysis of your data alongside the range of figures submitted into the YEN Zero network, to allow for comparison.

GHG EMISSIONS ASSESSMENT

A GHG emissions assessment, or carbon footprint, is a way of estimating the total amount of GHGs emitted from a given activity; reported as the total emissions associated with the production of a product on a per unit area basis (emissions per hectare; kg CO_2e/ha), or on a per unit output basis (emissions per tonne; kg CO_2e/t).

To enable comparison between different greenhouse gases, all emissions are converted into carbon dioxide equivalents (CO_2e), the equivalent amount of CO_2 that would be required to achieve the same amount of global warming, as determined by the IPCC. The standard conversion factors used in this analysis are:

- 1 kg carbon dioxide (CO_2) = 1 kg CO_2e
- 1 kg methane (CH_4) = 27.2 kg CO_2e
- 1 kg nitrous oxide (N_2O) = 273 kg CO_2e



THE THREE MOST COMMON ON-FARM GHG EMISSIONS

CARBON DIOXIDE (CO_2)
Produced from combustion of fossil fuels e.g. fuel use

NITROUS OXIDE (N_2O)
Produced during the breakdown of nitrogen compounds e.g. fertiliser and organic residues

METHANE (CH_4)
Produced from livestock and manures

UNDERSTANDING YOUR GHG EMISSIONS

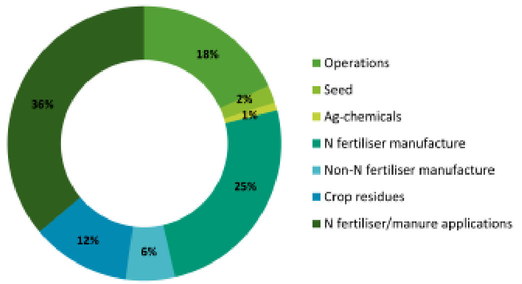
Greenhouse gas (GHG) emissions are generated from on-farm activities.

GHG emissions in this report are separated into seven main categories associated with crop production: embedded emissions of (1) seed, (2) operations, (3) non-N fertiliser manufacture, (4) ag-chemical manufacture, and (5) N fertiliser manufacture, and nitrous oxide (N_2O) emissions associated with (6) N fertiliser and manure application and (7) crop residue decomposition.

Farm operations include the combustion of fossil fuels and electricity used in crop production, e.g., for cultivations and grain drying. The manufacture of inputs i.e., embedded emissions such as ag-chemicals and non-N fertilisers uses energy and produces carbon dioxide. The manufacture of N fertilisers produces nitrous oxide (N_2O) through the conversion of ammonia to nitric acid. The application of N fertiliser sources (either organic or synthetic), and crop residues left in the field, produce nitrous oxide (N_2O) emissions as bacteria in the soil mineralise the nitrogen, which is exacerbated in wet conditions.

The crop management strategies will determine the extent of emissions per hectare. The emissions per tonne will be further determined by the crop yield. Examples of the impacts of management strategies include: 1) if more intensive soil cultivation strategies were used, then this proportion will be greater in the carbon footprint; 2) if the crop was harvested at a high moisture, grain drying can contribute a significant amount to the carbon footprint; 3) manure can account for a large proportion of a crop carbon footprint due to high total N contents in the material, but these emissions can be reduced by incorporating the manure quickly to reduce volatilisation (although ammonia is not a GHG, it can be converted to N2O after deposition) and improve the quantity of nutrients reaching the crop.

Typical breakdown of GHG emissions by source for a winter wheat feed crop, derived from YEN Zero data.

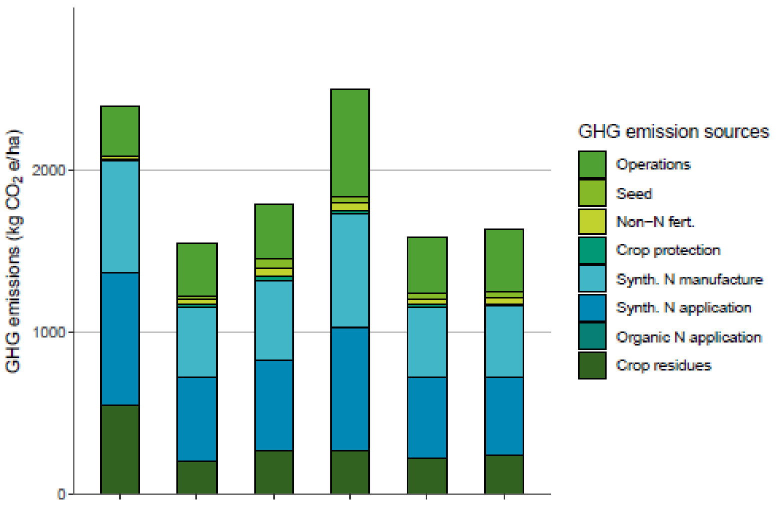


YOUR GHG EMISSIONS

This section provides detailed analysis of the GHG emissions from your farming operations. The table below shows the overall GHG emissions associated with each of your entries.

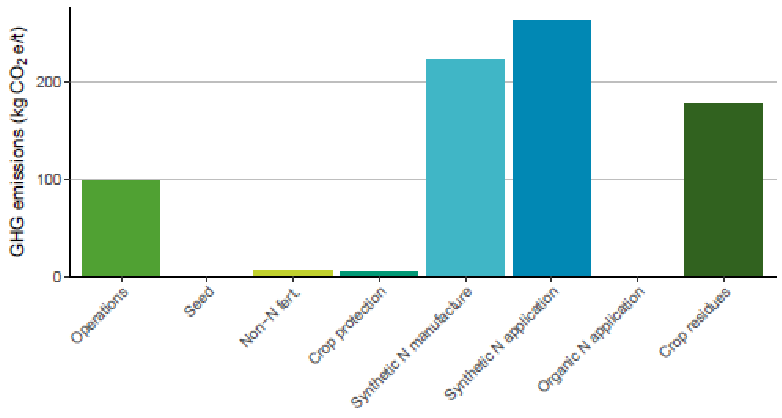
Entry	Field name	Year	Crop type	Variety	Yield	GHG emissions	
					t/ha	kg CO2e/t	kg CO2e/ha
1		2023	W. Oilseed rape	Acacia	3.1	772	2393
2		2023	W. Oats	Mascani	5.8	263	1546
3		2023	W. Barley (malting)	Craft	6.5	276	1787
4		2023	W. Wheat (feed)	KWS Dawsum	8.4	303	2496
5		2023	S. Barley (malting)	Laureate	5.3	301	1587
6		2023	S. Barley (malting)	Laureate	6	276	1635

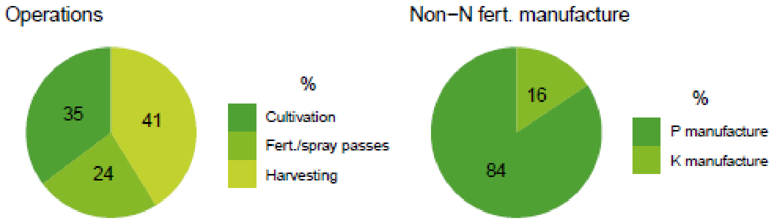
The graph below shows the total GHG emissions, on a per ha area basis, for each of your entries, broken down into the main emission sources.



The following charts describe the emission sources within your crop production system, on a per tonne of output basis, for each field entered into YEN Zero.

W. Oilseed rape

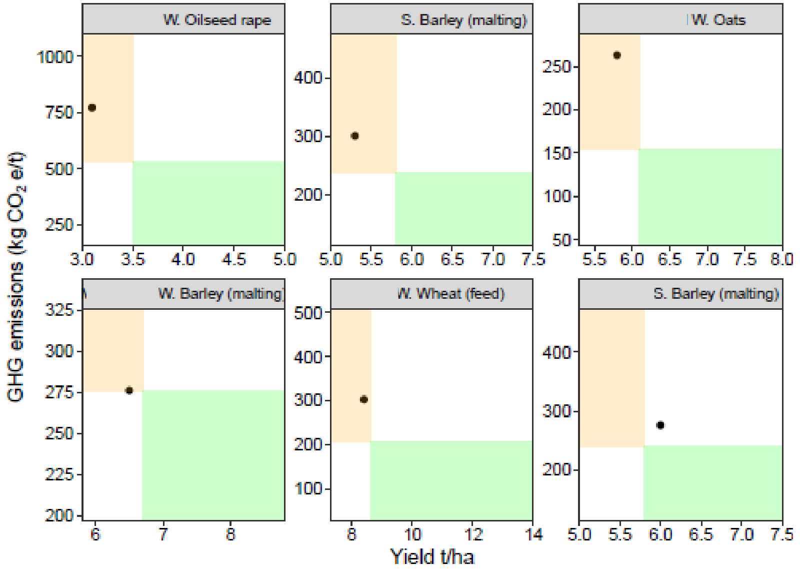




Cultivation type	Synth. N applied (kg/ha)	P applied (kg/ha)	K applied (kg/ha)	Lime applied (kg/ha)	Manure applied (t/ha)	Main manure type	Number ag-chem applications	Grain drying (%)	Straw fate
Deep non-inversion	200	42	7	NULL	NULL		4	0	Chopped

PRODUCTIVITY

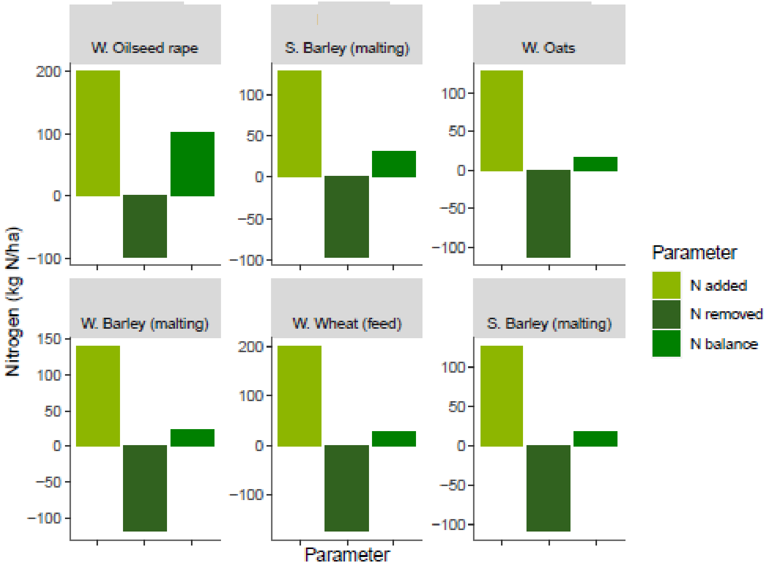
To minimise GHG emissions and maximise profitability, it is key to improve productivity on-farm by producing more output with fewer inputs. The graph below shows the yield of each of your crops against its GHG emissions per unit of productive output (the Carbon Intensity). This is the carbon emissions footprint of your crop per hectare divided by the yield, giving a Carbon Intensity value per tonne of yield. More efficient systems fall into the green shaded box, where yield is high and carbon is low.



NITROGEN BALANCE

In a typical crop carbon footprint, more than two thirds of the emissions are associated with the use of N fertiliser. Therefore, understanding the nitrogen (N) use efficiency of the field (i.e., how much N is added against how much is removed from the field) can help identify where there are opportunities to improve N efficiency and reduce GHGs. Large positive N balances generally indicate areas where N efficiency can be improved. A N balance has been calculated using the yield corrected amount of N in the crop grain removed from the field (Nitrogen Removed) subtracted by the amount of N in the manufactured N fertiliser applied and the amount of N in any organic manures, slurries or other organic materials (Nitrogen Added). Default grain N proportions have been taken from YEN Nutrition data. The calculation for estimating the N balance is as follows:

$$\text{Manufactured fertiliser N (kg N/ha)} + \text{Organic N (kg N/ha)} - \text{Yield (t/ha)} \times \text{Grain N (\%)}$$



Peas and Beans will biologically fix N at a rate of between 150 and 250 kg N/ha. No data for maize is currently available to estimate N removal, but we hope to be able to provide this in future reports.

ROTATIONAL EMISSIONS

If you have selected a single field and provided historical rotational data then this information is presented here.

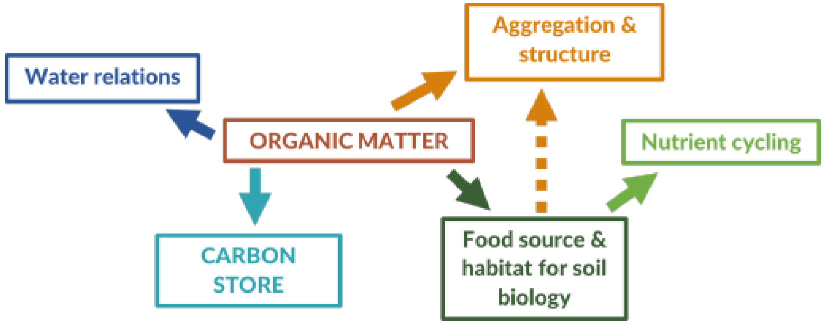
To calculate the rotational footprint, the emissions from lime and manure inputs are expressed on an annual basis across the whole period of the rotation as they are less likely to be applied every year.

Parameter	2018	2019	2020	2021	2022	2023	Mean
Rotation	W. Wheat (feed)	S. Barley (malting)	W. Oilseed rape	W. Wheat (feed)	S. Barley (malting)	Maize (forage)	
Yield (t/ha)	7	8	2	8	8	44	
Lime manufacuture and organic amendments (kg CO2e/t)	41	41	136	39	39	7	50
Other crop emissions (kg CO2e/t)	368	342	951	333	205	30	372
Rotational GHG emissions/t (kg CO2e/t)	409	383	1087	372	245	37	422

SOIL ORGANIC MATTER

In YEN Zero crop carbon footprint analysis, carbon sequestration in soils is not considered because our current understanding does not allow for accurate quantification of soil carbon sequestration, without measurement of soil carbon stocks, which is time intensive and costly. The Sustainable Soils Alliance is currently working to establish a set of scientifically valid minimum standards for soil carbon sequestration in our agricultural soils. The British Standards Institute (BSI) are developing a UK-wide standards framework for nature with 'high integrity markets' to guide private investment in commodities such as soil carbon.

YEN Zero is using soil organic matter (SOM) as a proxy to understand the amount of soil carbon in a YEN Zero field. SOM is an easier characteristic to measure in soils, and an increasingly common assessment undertaken by growers in the determination of soil health. Carbon is a major component of SOM, comprising approximately 58%, and therefore a good indication of soil carbon levels. It is also an important characteristic to monitor and endeavour to improve, as it provides important benefits such as increased water holding capacity, improved soil structure and workability, and nutrient retention, which can all contribute to more efficient crop management and nutrient use that is associated with lower GHG emissions.



Organic matter does not accumulate in soils indefinitely, and if management remains unchanged, it reaches an equilibrium where carbon inputs in the form of crop roots and residues equal carbon outputs such as CO_2 produced during the breakdown of these materials by soil microbes. The final equilibrium will differ depending on soil type (particularly clay content), climate conditions (particularly rainfall) and land use (e.g., grass vs arable). Therefore, it is important to know what the potential is for our soils to build up levels of SOM, to understand where the ceiling is. Soils with a high proportion of clay in wet regions of the UK can store higher amounts of soil carbon.

YOUR SOIL ORGANIC MATTER

YEN Zero has determined the potential level of SOM your soil can achieve using the AHDB/BBRO Soil Health Scorecard benchmarking guidance (2022), which gives a range of 'typical' SOM contents according to clay content, rainfall, and cropping (grass vs. arable). Soils with a large percentage of clay in areas with high rainfall can store more SOM than lighter soils in dry regions. The upper values in the table below are what is at least potentially achievable on your soil type, and anything you achieve higher than these typical SOM values is considered excellent for arable soils. However, factors such as land use/management history, drainage class, soil pH and position in the landscape will also affect the final equilibrium value. It is important to note that any achieved increases in organic matter can be rapidly reversed unless the change in practice is maintained.

We assume that the current SOM values you entered have been calculated through robust soil sampling and analysis methods. If you haven't entered current SOM data, then you will only see the potential SOM for your climate and soil type.

Entry	Field name	Year	Clay classification	Long term annual rainfall (mm)	Current SOM level (%)	Typical upper SOM range (%)	Soil health status
1		2023	Heavy	817.0	5.9	6.3 - 8.9	Review
2		2023	Heavy	817.0	4.6	6.3 - 8.9	Review
3		2023	Heavy	817.0	5.3	6.3 - 8.9	Review
4		2023	Heavy	817.0	5.6	6.3 - 8.9	Review
5		2023	Heavy	817.0	6.1	6.3 - 8.9	Review
6		2023	Heavy	817.0	6.6	6.3 - 8.9	Typical

Potential SOM levels based on the AHDB/BBRO (2022) Soil Health Scorecard 'typical' benchmarks for cropped soils, these should be what is at least possible for your soil type but can be higher. Light soils are defined as <18% clay, medium 18-35%, and heavy >35% clay. Low rainfall is defined as <650 mm/year, medium 650-800 mm/year, and high 800-1100 mm/year of rainfall.

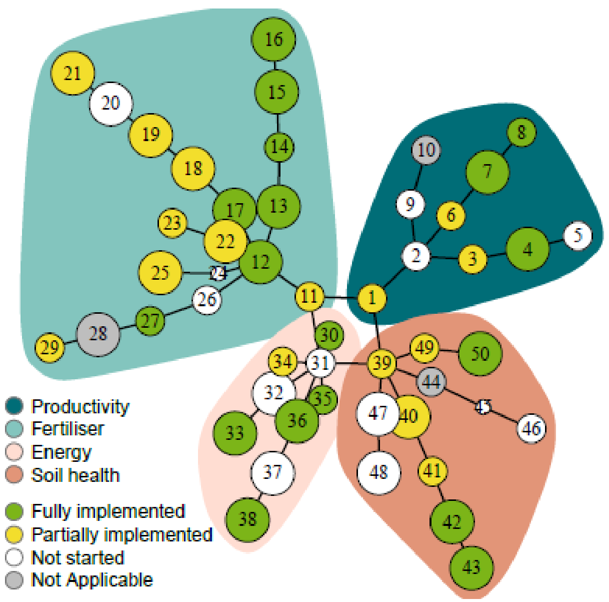
Traffic light	Meaning
Investigate	SOM is very low for the climate and soil type. Add more organic materials to improve SOM.
Review	Lower than the average SOM for the climate and soil type. Add more organic materials to improve SOM.
Monitor - typical	Typical SOM for the climate and soil type. Maintain practices that are building SOM.
Monitor - high	Above average SOM for the climate and soil type. Maintain practices that are building SOM.

REDUCING GHG EMISSIONS

The schematic below provides a summary of some of the main strategies which can be implemented on your farm to reduce GHG emissions.

Each circle represents a GHG mitigation practice (there is a full list on the next page). The size of the circle indicates the relative impact on reducing GHG emissions (larger = greater impact). Practices are grouped into four main categories, although some have benefits across multiple categories. Each category has a "core" practice at the centre, which is foundational to the others and should be implemented first. In general, as practices radiate outwards, they become more difficult and/or costly to implement - although they often have greater emission reduction potential. If you provided information on what practices you have implemented already, then this will be shown with green (fully implemented) and yellow (partially) bubbles, with white showing those that are not yet implemented.

This diagram can help you identify and prioritise practices that will have the greatest impact for the least cost. To use it, follow each branch of the tree from the centre to the outside until you find practices that you haven't already implemented. Note down all of these potential practices and then refer to the key on the next page. Of these, consider what is most practical within your production system and seek further information on how best to implement them.

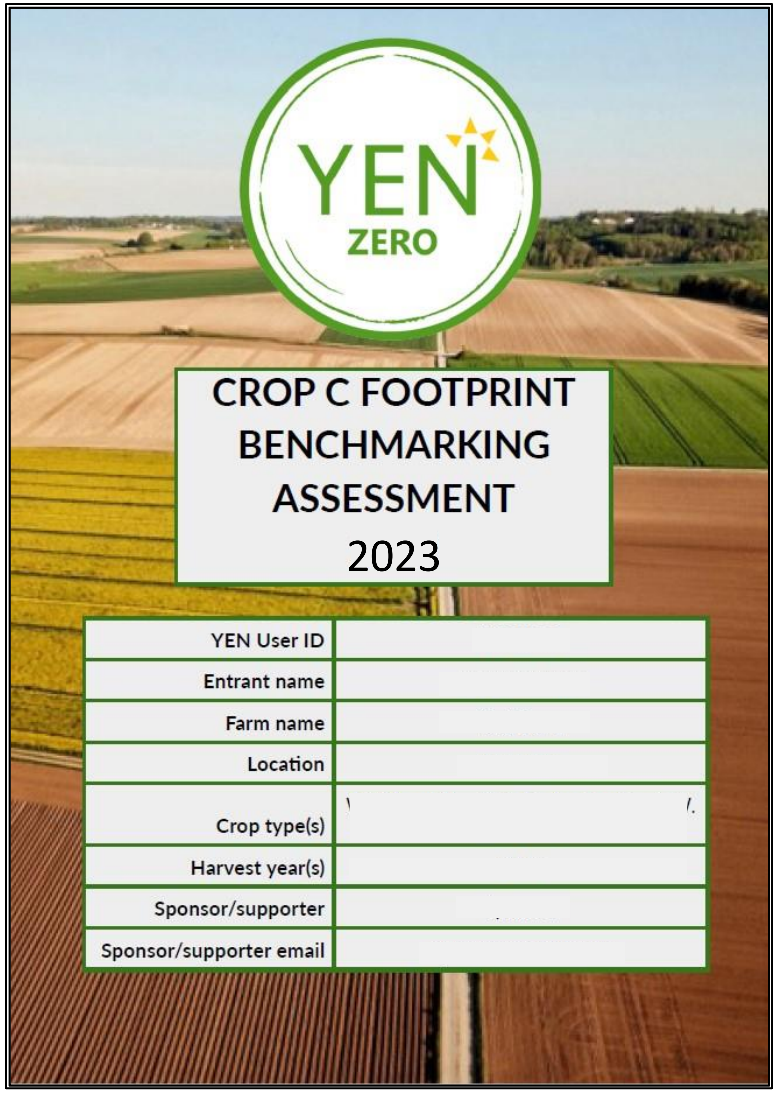


ID	Practice	Link
1	Soil nutrient and pH sampling (ensure nutrients are not limiting	Click here for more information
2	Optimise soil pH	Click here for more information
3	Create crop health plan	Click here for more information
4	Choose disease-resistant varieties	Click here for more information
5	Use integrated pest management	Click here for more information
6	Optimise seed rate	Click here for more information
7	Review crop rotation, consider crops and varieties with a low N requirement	Click here for more information
8	Measure yield and protein to assess offtake success	Click here for more information
9	Improve soil conditions to encourage root growth	Click here for more information
10	Monitor crop nutrition to prevent deficiencies	Click here for more information
11	Measure soil mineral N (plus crop N). Base N rate on realistic yield and quality expectations	Click here for more information
12	Use nutrient management planning	Click here for more information
13	Purchased fertiliser from abated sources	Click here for more information
14	Use variable rate fertiliser application	Click here for more information
15	Use urease inhibitors	Click here for more information
16	Use nitrification inhibitors	Click here for more information
17	Calibrate fertiliser spreader	Click here for more information
18	Consider method and timing of organic material applications to minimise NH3 losses & leaching (rapidly incorporate)	Click here for more information
19	Measure nutrient content of manures to fully account for inputs	Click here for more information
20	Don't apply in warm, wet conditions	Click here for more information
21	Ensure good field drainage	Click here for more information
22	Use legumes in the rotation	Click here for more information
23	Grow cover crops before spring crops and catch crops after high N crops such as vining peas to minimise N losses	Click here for more information
24	Use N-efficient varieties	Click here for more information
25	Adjust N rate according to SMN and fertiliser recovery (consider soil type and N form)	Click here for more information
26	Adjust N rate based on break-even ratio	Click here for more information
27	Adjust N rate based on crop growth across season	Click here for more information
28	Conduct an on-farm trial to optimise N rate for crop and field	Click here for more information
29	Record success of fertiliser strategy by analysing the grain and calculating offtake	Click here for more information
30	Create vehicle maintenance plan	Click here for more information
31	Plan on-farm operations	Click here for more information
32	Harvest grain at correct moisture to reduce drying	Click here for more information
33	Reduce tillage frequency/intensity	Click here for more information
34	Minimise number of passes by combining sprays	Click here for more information
35	Record fuel use	Click here for more information
36	Install Ground Source Heat Pumps for grain drying	Click here for more information
37	Install renewable energy sources such as solar and wind	Click here for more information
38	Switch to EV/alternative fuel vehicles	Click here for more information
39	SOM sampling and monitoring	Click here for more information
40	Reduce tillage frequency/intensity	Click here for more information
41	Use cover crops	Click here for more information
42	Ensure adequate drainage with drainage systems & ditches properly maintained	Click here for more information
43	Avoid compaction in the soil profile	Click here for more information
44	Apply organic materials	Click here for more information
45	Incorporate straw	Click here for more information
46	Store organic materials on concrete pads to reduce leaching	Click here for more information
47	Extend field margins	Click here for more information
48	Expand hedgerows (or fill gaps in existing)	Click here for more information
49	Introduce/extend grass/herbal leys in rotation	Click here for more information
50	Plant agroforestry	Click here for more information

Benchmarking report

- Dataset summary
- Average crop carbon footprints
- Detailed benchmarking of GHG emissions for each entry
- Colour-coded KPI table

- Aiming to do in the next 2 weeks



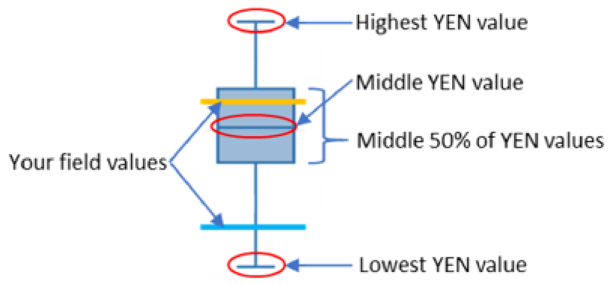
INTRODUCTION

We would like to thank you for submitting your entries into the YEN Zero network. You are one of 39 growers who submitted data from a range of arable crops including wheat (91 entries), barley (55), OSR (29), oats (9), beans (9), peas (3) and others (20).

This report is the second report provided by YEN Zero in which your crop C footprint analysis is presented alongside the range of figures within the YEN Zero database for each crop type, to allow for comparison. Benchmarking your data in this way can indicate where you are performing higher or lower than other growers in the network, in terms of GHG emissions associated with different aspects of crop management.

UNDERSTANDING YEN BENCHMARKING

Benchmarking within the YEN Zero network allows you to gauge the performance of your crops against other crops in the network. This has provided the principal value of YEN to participants throughout other YEN networks. We do this with benchmark charts, which compare your values with everyone else's as per the following key:



The 'whiskers' show the range of YEN Zero values whilst the box shows the middle half of values, with a line for the mid-value. The coloured lines show the values for your entries.

YEN ZERO DATA SUMMARY

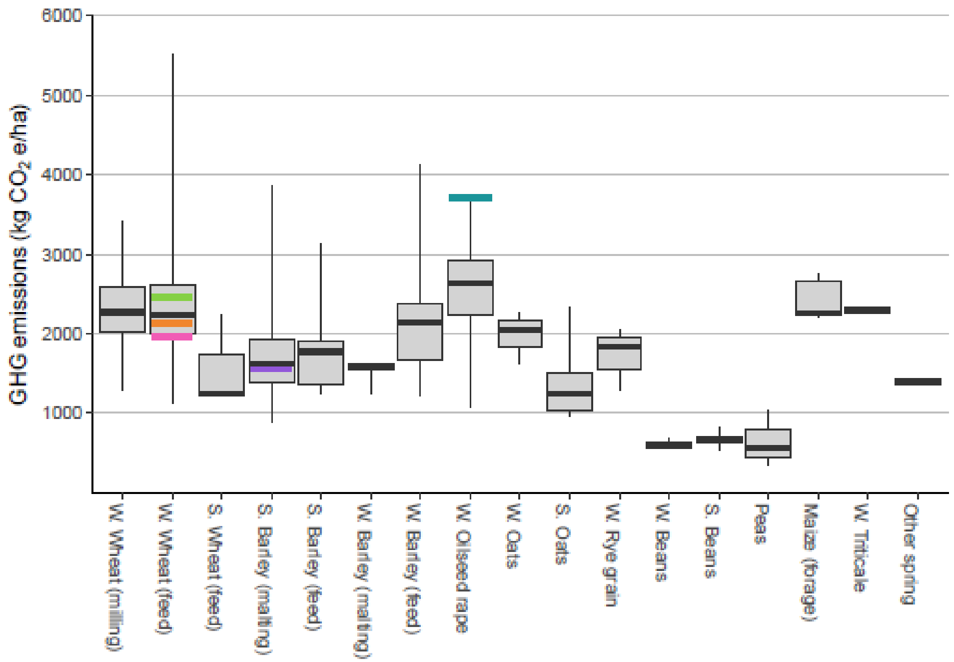
Below is a summary of the proportion of crops entered into the network which used particular crop management strategies such as cover cropping, manures, nitrification/urease inhibitors, and different cultivation strategies, to demonstrate the types of crops your data is benchmarked against.

Also summarised is the proportion each crop management category contributes to the C footprint of the main crops entered into the network, averaged from this year's dataset. These pie charts demonstrate how emission hotspots differ between crop types and where the opportunities lie to reduce the C footprint associated with different crops.

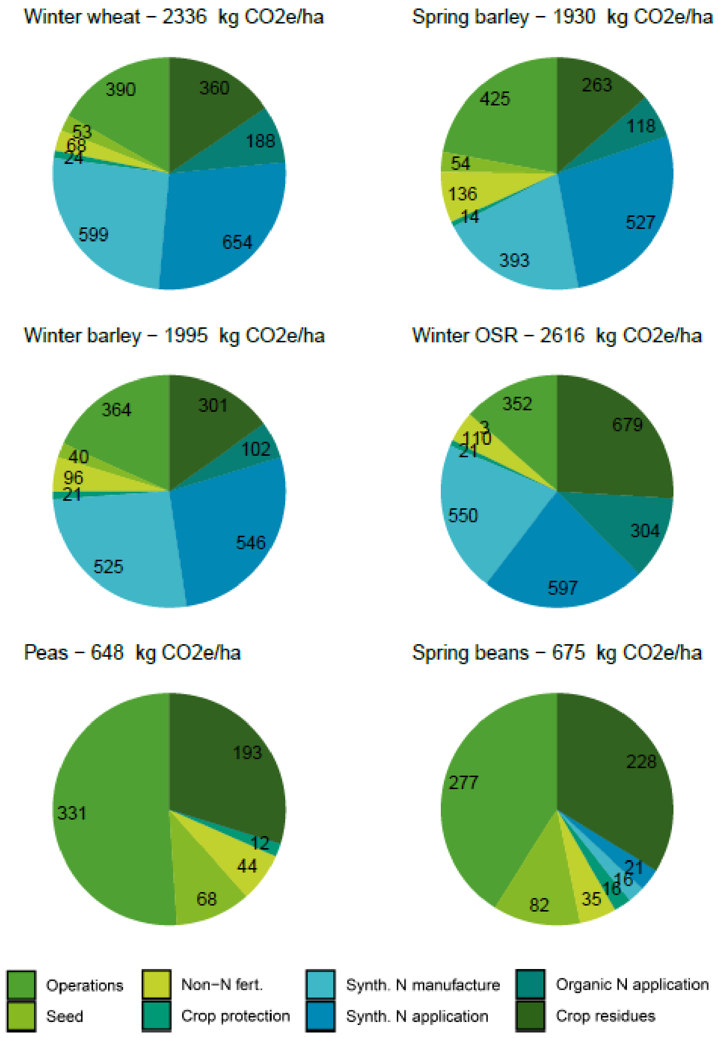
	Crop management	Proportion of crops
Cover crop after this crop	Yes	18%
	No	82%
Cultivation strategy	Plough-based	18%
	Deep non-inversion (>6cm depth)	16%
	Strip tillage	9%
	Minimum shallow tillage (<6cm depth)	23%
	Direct drill	34%
Manure use	Yes	23%
	No	77%
Inhibitor use	Yes	12%
	No	88%

YEN ZERO DATA SUMMARY

Presented below is the range of GHG emission intensities (GHG emissions per ha) for each crop within the YEN Zero network. The coloured lines show how your entries compared.



The pie charts below show the average C footprint for a range of arable crops on a per hectare basis.

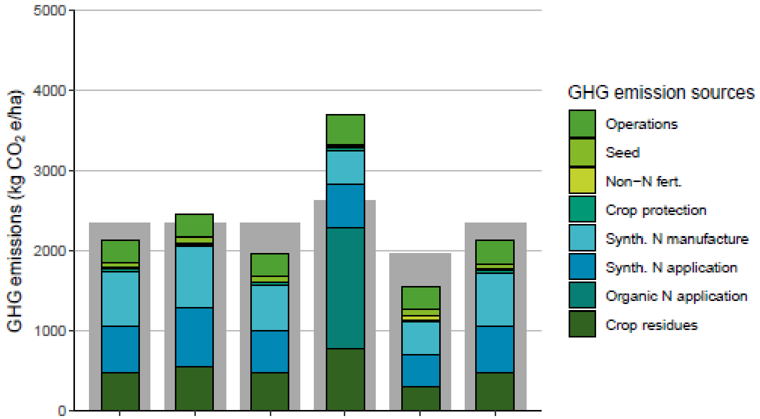


YOUR GHG EMISSIONS

This section provides detailed analysis of how the GHG emissions from your farming operations compare against others in the YEN Zero network.

Entry	Field name	Crop type	Variety	Yield	GHG emissions	
				t/ha	kg CO2e/t	kg CO2e/ha
1		W. Wheat (feed)	Graham	11.6	185	2137
2		W. Wheat (feed)	Graham	13.1	187	2451
3		W. Wheat (feed)	Graham	11.6	170	1964
4		W. Oilseed rape	Matrix CL	5.0	743	3705
5		S. Barley (malting)	RGT Planet	6.2	249	1553
6		W. Wheat (feed)	Graham	11.3	188	2126

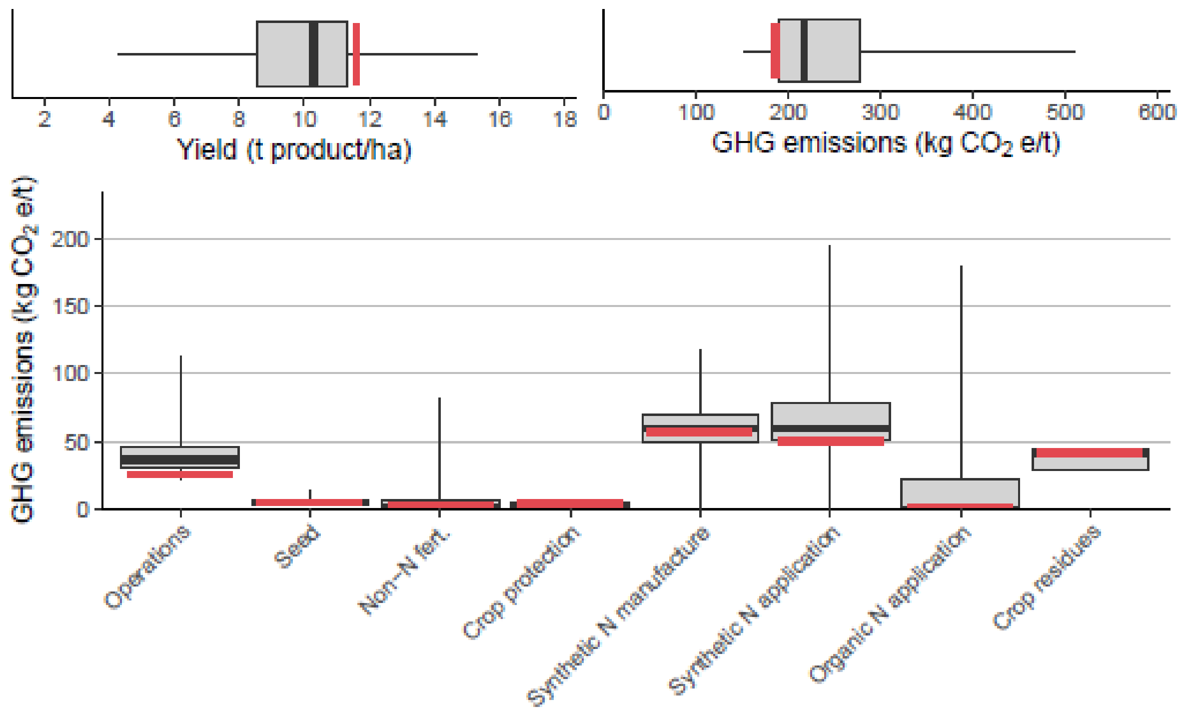
The graph below shows the total GHG emissions (per ha) for each of your entries, broken down into the main emission sources. The grey bars in the background show the average total GHG emissions for that crop type within the YEN Zero database.



BENCHMARK ASSESSMENT

This benchmark assessment shows boxplots comparing your yield, GHG emissions intensity (kg CO_2e/t product), and GHG emissions by source, with the rest of the YEN Zero network.

W. Wheat (feed)



		W. Wheat (feed)	W. Wheat (feed)	W. Wheat (feed)	W. Oilseed rape	S. Barley (malting)	W. Wheat (feed)
Yield	t/ha	11.6	13.1	11.6	5.0	6.2	11.3
GHG/t	kg CO2e/t	185	187	170	743	249	188
GHG/ha	kg CO2e/ha	2137	2451	1964	3705	1553	2126
N application rate, synthetic	kg N/ha	189	227	159	159	122	189
N application rate, organic	kg N/ha	0	0	0	36	0	0
N efficiency	kg N applied/t yield	16	17	14	39	20	17
Fuel use	L/ha						
Total no. of passes	no.	13	12	12	12	10	13
Ag-chem spend	£/ha	225	258	258	250	126	205
SOM	%	3.2	3.3	3.3	3.0	3.5	3.2
Gross margin	£/ha						

Performance versus YEN average for relevant crop type:

Lower 20%		Middle 20%		Upper 20%

More green = more favourable result, e.g. higher Yield or lower N use.

Any feedback, comments or questions?

Reflections, feedback and the future

Megan Tresise & Laurie Abel

YEN Zero – Reflection from last year's feedback

- Updates to methodology needed to align with latest scientific evidence ✓
- Carbon footprint reports not sent out on a rolling basis – due to increased modelling effort needed for new features
  - Added in rotational emission footprint ✓
  - Added in N balance section ✓
  - Added in productivity section ✓
- Updating Soil Organic Matter section to help growers understand what health status their soil is ✓
- Provided mitigation practice links to useful resources ✓

Challenges from 2023/24

- Not as much data entry as hoped – only 19 reports out of a possible 47
  - Technical issues with different email addresses on the system
  - Portal downtime for updates
  - Data entry confusion/competing priorities
  - … anything else?

- Updating methodology and coding behind results report
  - Huge time investment needed, leading to delays
  - Issues with data entered – e.g., kg product rather than kg nutrient

YEN Zero - Future

- Host a training webinar prior to data entry portal opening in June
  - Including how to register, log in and view your data, data entry and troubleshooting
- Offering 1:1 or group grower calls by sponsor to aid with data entry
  - Between June and September
- Data collection
  - How to avoid duplication of effort
  - Already cut 33 questions from the data entry survey for this next year
  - Dynamic benchmarking
- Model updates
  - Updates in methodology

YEN Zero 24-25 proposed timeline of activities

April 2024

May/June 2024
Training webinar
How to register, log in and enter data

June 2024
Data entry open
Online platform made live for growers to enter field data.

Sep 2024
1st Discussion Workshop

Oct 2024
Interim reports delivered

Nov 24
Data entry closed
Growers no longer able to provide data, to allow time for data analysis.

Jan 2025
2nd Discussion Workshop
YEN Conference

Jan/Feb 2025
Remaining reports delivered

Feb/March 2025
Benchmark reports delivered
Individual reports sent to growers and their sponsors.

March/April 2025
Results meeting and 3rd Discussion Workshop
Presentations of results, feedback and future of YEN Zero.

April 2025

ADAS

YEN Yield Enhancement Network

YEN Yield Enhancement Network

YEN ZERO

YEN Zero communication

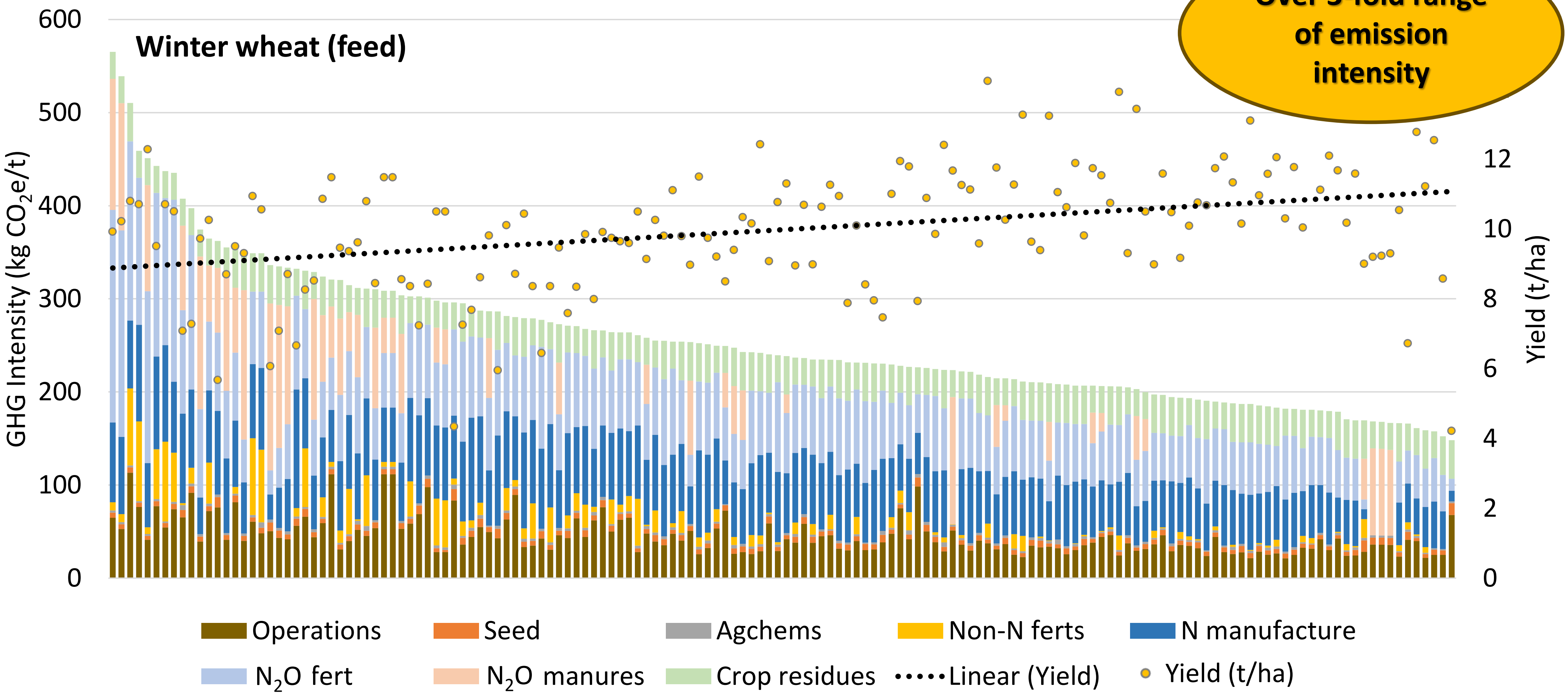
- Most effective communication with growers and sponsors – send to all or targeted emails?
- What topics would you like to be contacted about? E.g. deadlines, help links, reminders etc.
- How often would you like to be reminded about data entry/deadlines? E.g. Monthly, twice a month
- Closer to data entry deadlines, would a phone call be more effective in gathering data?

YEN Zero – Future Discussion Workshops

- Late September 2024 – Discussion Workshop 1
  - Is the timing right?
  - What would you like to see/hear about?
  - Would you prefer online or in-person?

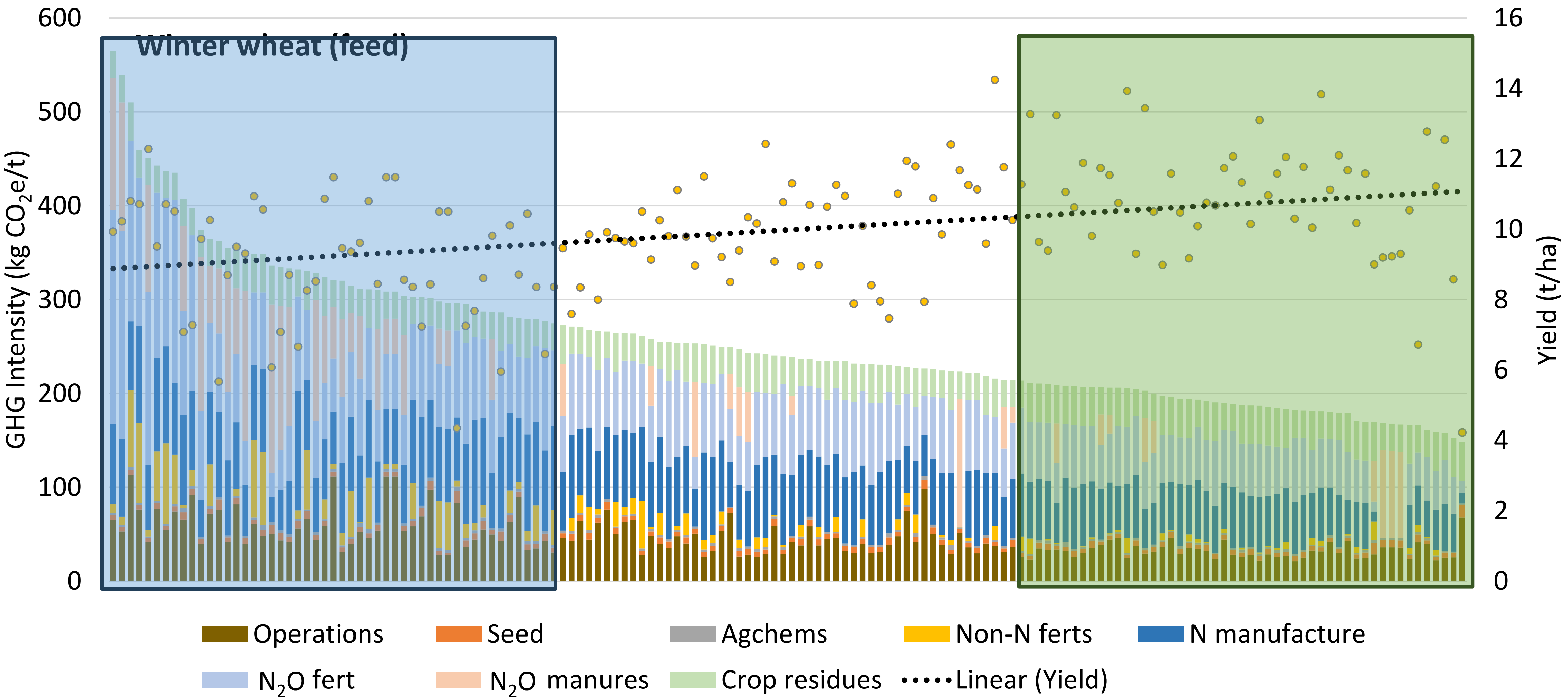
- January 2025 – Discussion Workshop 2 / YEN Conference
  - Did you manage to come along this year?
  - Would you be interested in coming again to learn more about YEN Zero?

Data analysis: Yield drivers of crop emissions



Over 3-fold range of emission intensity

Yield drivers of crop emissions



Yield drivers of crop emissions

Factor		Upper 1/3 for GHGs/t	Lower 1/3 for GHGs/t	P<0.05
Total C footprint	kg CO_2e/t	354	187	*
Yield @ 15% mc	t/ha	9.0	10.8	*
Total N applied (manufactured)	kg/ha	198	159	*
% crops using nitrification or urease inhibitor	%	6	31	*
% of crops with manure applied	%	51	21	*
GHGs from P K, Lime fertiliser	kg CO_2e/ha	209	37	*
% wheat following non-cereal crop	%	44	65	0.06
GHGs from residue decomposition	kg CO_2e/ha	301	398	*
% crops with straw chopped	%	38	58	*
GHGs from grain drying	kg CO_2e/ha	188	12	*
GHGs from cultivations	kg CO_2e/ha	115	84	0.06
% crop direct drilled	%	23	47	*

Messages

- Crops with low GHGs/t tend to have
  - High yields
  - Low rate of synthetic N fertiliser, greater use of fertiliser efficiency products
  - Less intensive cultivations, less grain drying (wheat)
  - Wheat more often following non-cereal break crops
  - Less manures and P, K fertiliser
    - … but these may be applied elsewhere in rotation

Any other feedback, comments or questions?

Thank you to our sponsors

…and to all of you for your participation