cafre
College of Agriculture,
Food & Rural Enterprise

The Carbon Challenge – Understanding carbon on your dairy farm

DAERA
Department of Agriculture,
Environment and Rural Affairs
www.daera-ni.gov.uk

Climate Change Regulation and Policy

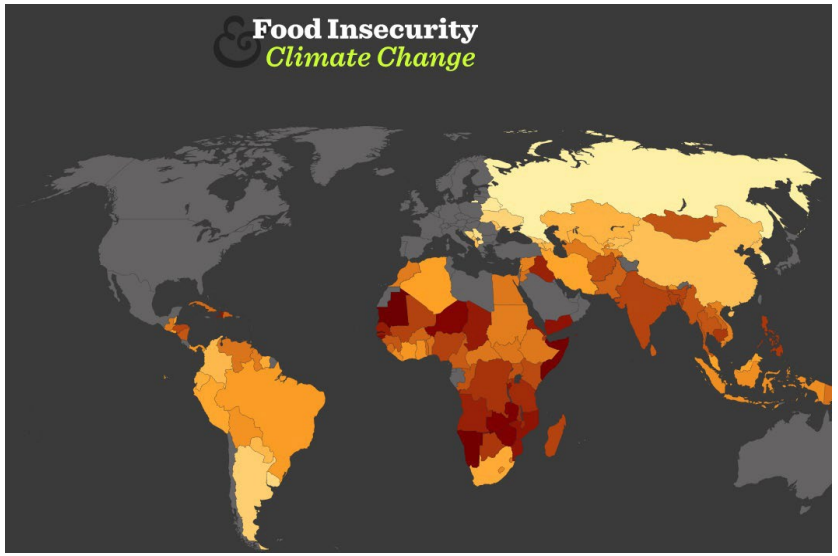
Claire Cockerill

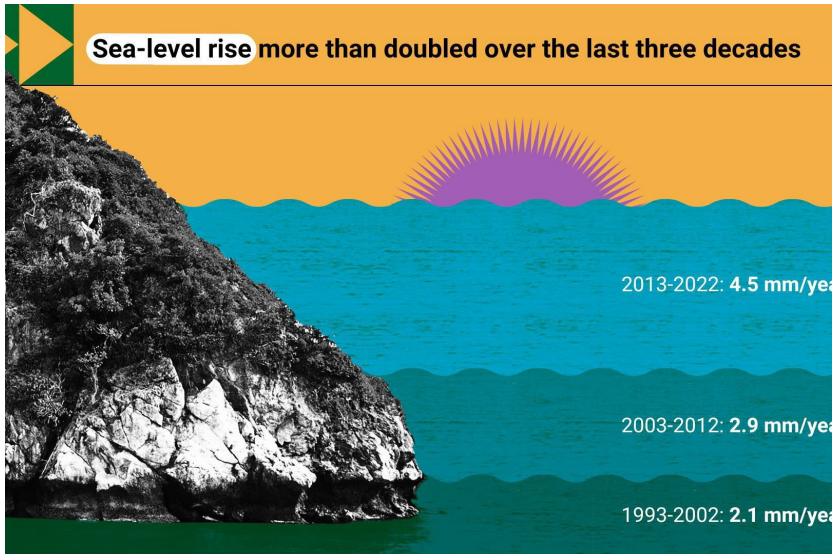
Director, Green Growth & Climate Action Delivery, DAERA

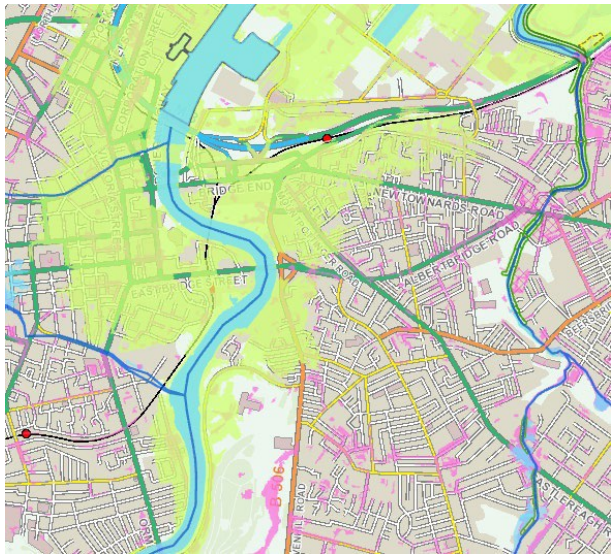
29th February 2024

Today we act.
Tomorrow we thrive.

Northern Ireland Executive



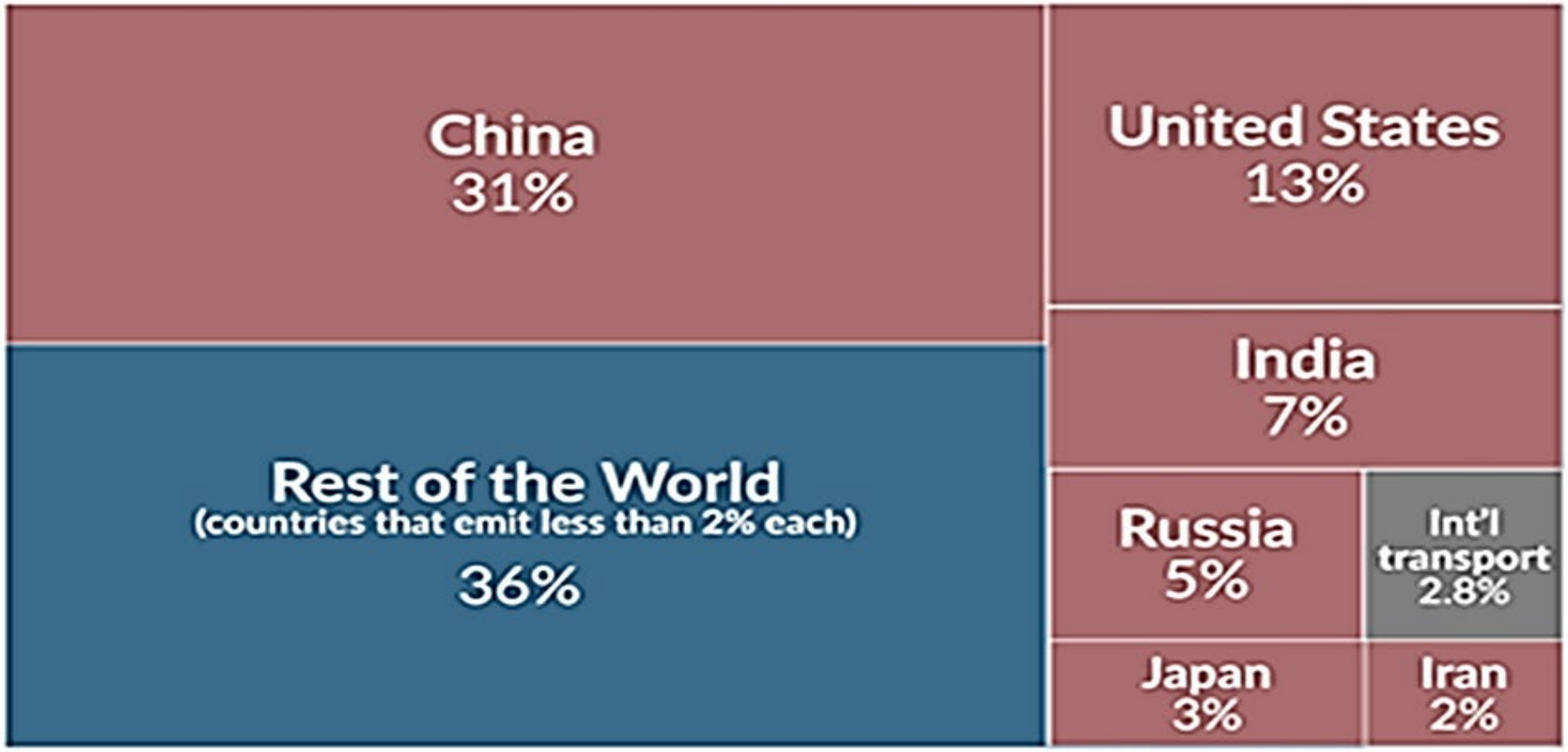




Impacts of climate change now

We can't solve climate change without countries with 'negligible' emissions taking action

Countries with national emissions that are less than 2% of the global total (those that might claim their emissions are 'negligible') account for more than one-third of global emissions combined.



Climate Change Act NI 2022

Act

Passed Final Stage in the Assembly on 9th March 2022.

Received Royal Assent on 6th June 2022.

Net Zero 2050

Sets a target of net zero greenhouse gas emissions by 2050.

Public Body Reporting

Carbon Budget

5 years

Climate Action Plan

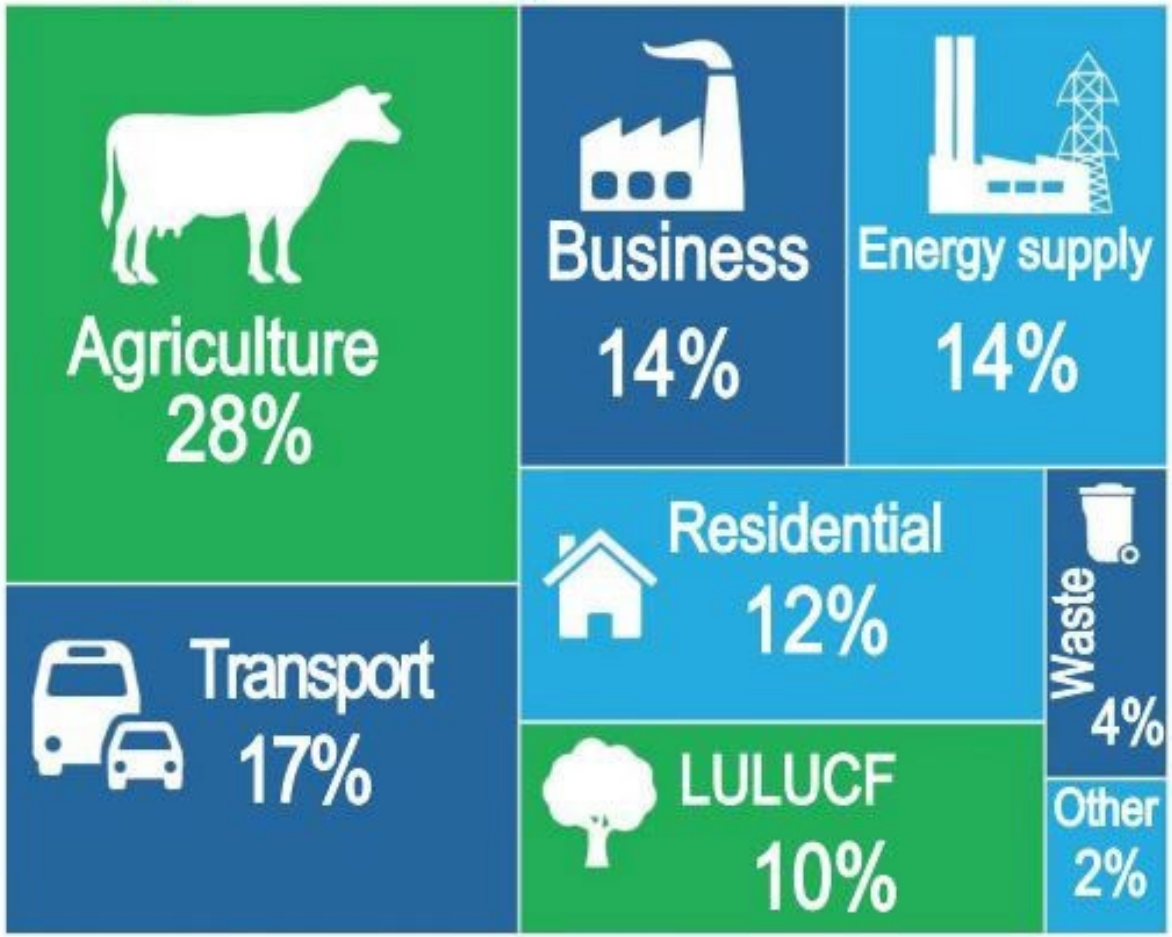
Northern Ireland Climate Commissioner

Sectoral Plans

Just Transition Commission

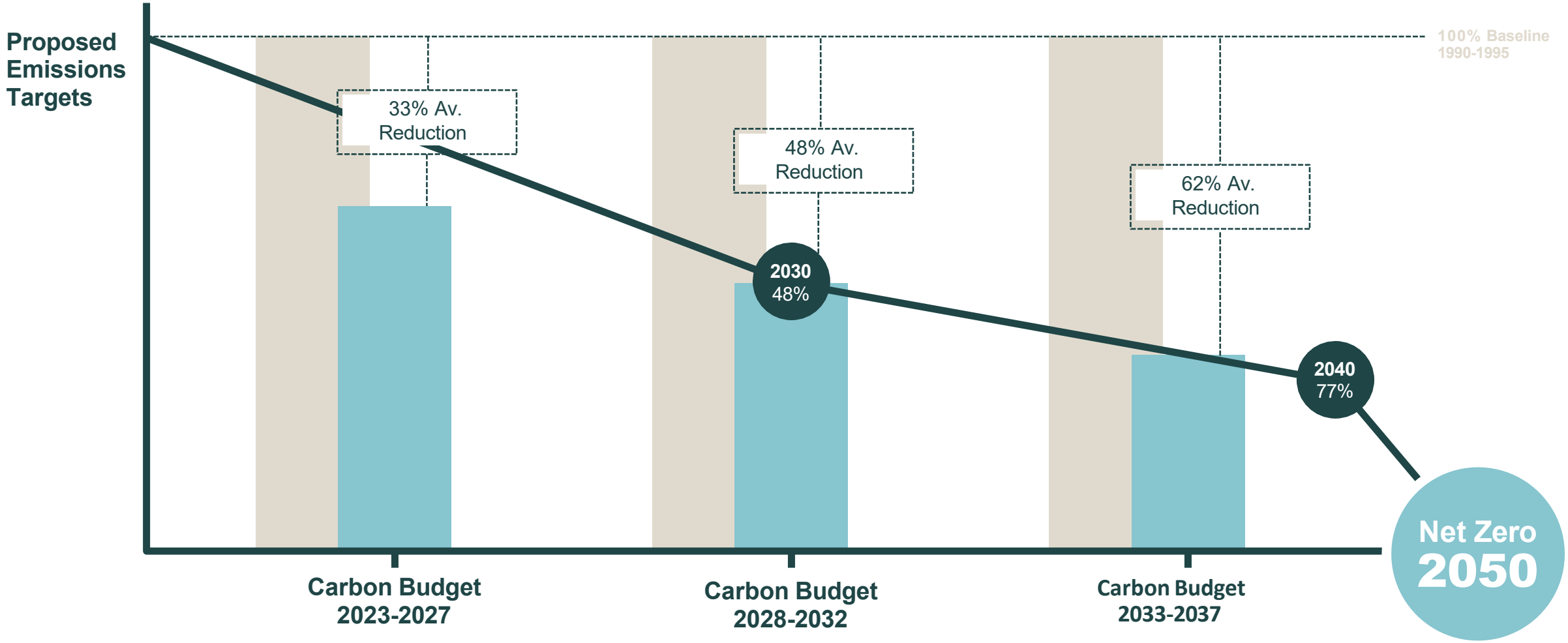
Just Transition Fund for Agriculture

Agriculture was the largest emitting sector of NI greenhouse gas emissions in 2021



*Other consists of Public and Industrial processes

The Journey - Budgets & Targets

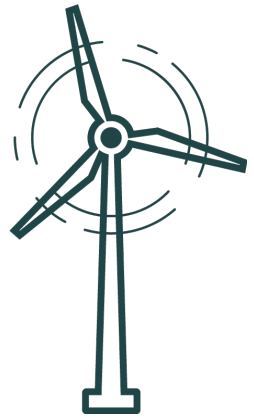


First Carbon Budget (2023-2027)

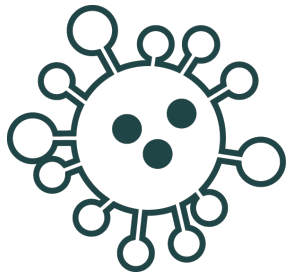
The maximum total greenhouse gas emissions for this five-year period is 98.6MtCO2e

1MtCO2e = 1 million tonnes of CO2e

1 million tonnes of CO2e =



≈80%
Renewables



2020

Climate Action Plan

- DAERA, on behalf of NI Executive, is leading development of NI's first Climate Action Plan (CAP).
- The CAP will set out how the first NI Carbon Budget (2023-202**7),** how interim targets (for 2030 and 2040) and the overall target for net zero by 2050 will be achieved.
- It is a detailed and strategic framework for measuring, planning, and reducing greenhouse gas (GHG) emissions.
- The CAP must also meet other requirements in relation to air, soil and biodiversity targets; nature based solutions; the special economic/social role of agriculture; the just transition principle, etc.
- Significant work has taken place within DAERA and with other Departmental representatives to scope and set the direction for the Climate Action Plan, in the context of our climate change legislation.

NI Climate Adaptation

Consultation on:

Northern Ireland's 2030 & 2040 Emissions Reduction Targets & First Three Carbon Budgets

&

Seeking views on Climate Change Committee (CCC) Advice Report: The path to a Net Zero Northern Ireland

Have your say!

Northern Ireland Executive | GREEN GROWTH

CCC Near Term Actions (by 2030)

Agriculture

Emissions to fall 21%

Reduction in livestock by 2030, 22% dairy cattle, 17% beef cattle 18% sheep, pigs and poultry.

LULUCF

Emissions to fall 22%

Afforestation to increase from 540h/yr to 2,000 h/yr by 2030.

All peatland extraction sites restored by 2035.

Transport

Emissions to fall 43%

Scale-up of plug-in vehicles new car sales from 10% to 100% within the next decade.

Increased journeys made by walking, cycling and public transport.

Buildings

Emissions to fall 33%

Improving efficiency of existing residential and public buildings.

The public sector should lead by example.

Energy

Emissions to fall 51%

Deployment of new renewable electricity generation required at scale with appropriate energy storage and decarbonised back-up solutions.

Business & Ind

Emissions to fall 46%

Industry to reduce fossil fuel use by 45% by 2030.

Necessary to develop carbon capture policy to identify the best approaches.

Waste Management

Emissions to fall 43%

Reducing landfill emissions by proposing options to reduce or eliminate biodegradable waste from entering landfill sites.

Fisheries

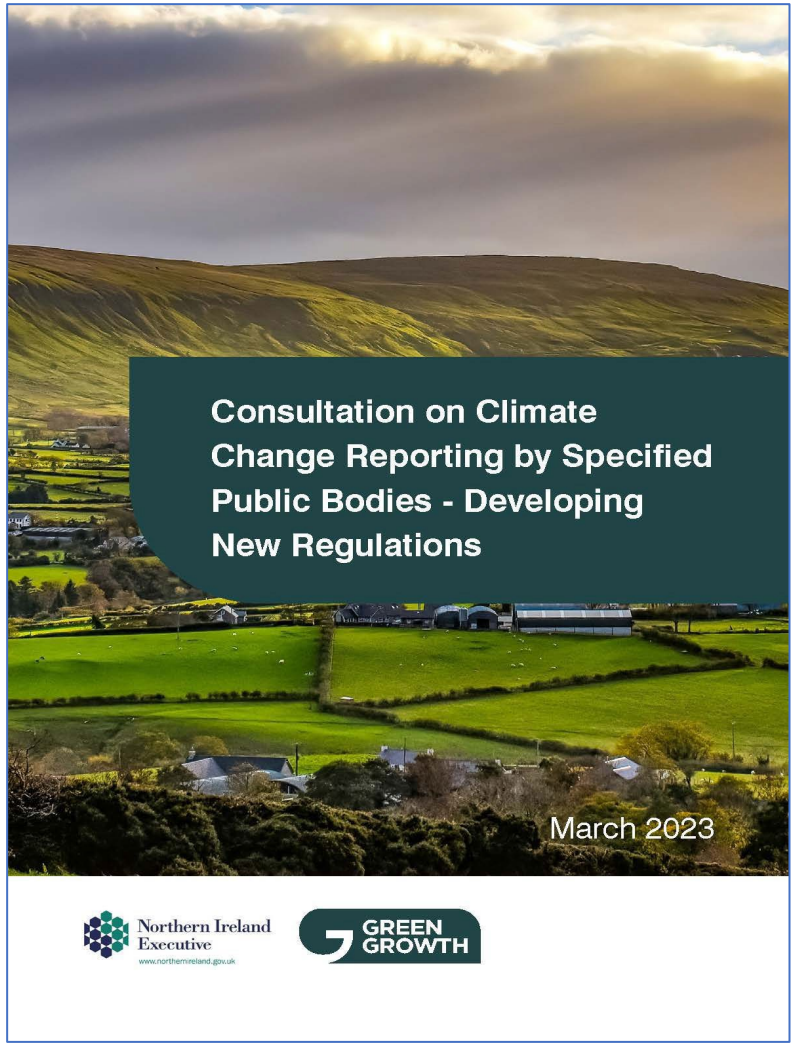
Emissions to fall 33%

CCC has provided advice for the UK shipping sector. This includes developing a clear timeline and roll-out plan to achieve zero-carbon shipping clusters by 2030.

Public Body Reporting:

The duties could include preparing reports containing:

1. an **assessment** of the **current and predicted impact of climate change** in relation to the body's functions;
2. a **statement** of the body's **proposals and policies** for **adapting** to, or **mitigating** the effects of, climate change in the exercise of its functions;
3. a **statement** of the **time-scales** for **implementing** those proposals **and** policies along with **progress made** in comparison to any previous reports prepared under the regulations.



Just Transition: What is required?

- Each NI department must have regard to the just transition principle and objectives when deciding its policies and proposals
- Each CAP must explain how the proposals and polices in the CAP take account of the just transition principle
- DAERA required to establish a **Just Transition Commission**
- The Commission will provide advice to NI departments

The Just Transition Principle:

- Seeks to ensure that the substantial benefits of a green economy are shared widely across all sectors
- While also supporting those who may stand to lose out the most

Enablers - Turning the Curve:

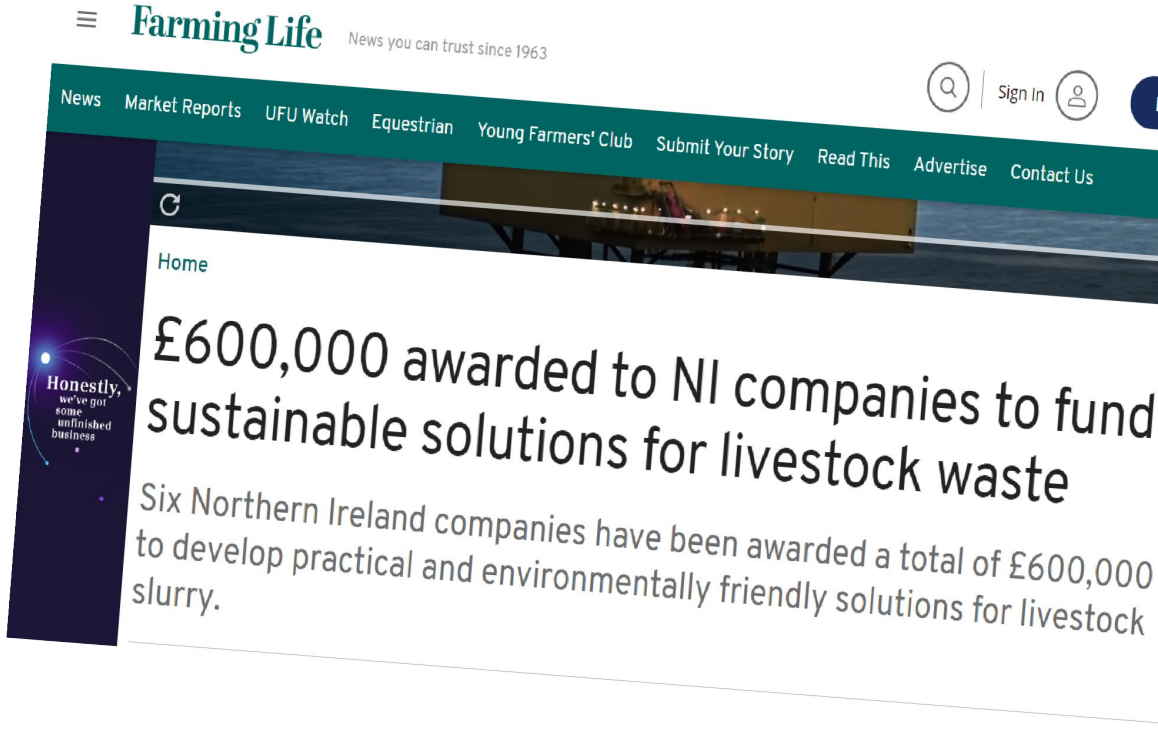
- Behaviour Change
- Communication and Education
- Adaptation
- Evidence and analyses

SBRI Challenge – Sustainable Use of Livestock Slurry

- SBRI - use innovation to address nutrient management challenge and produce low carbon energy source
- Proof of concept models to separate nutrients / process livestock slurry to reduce surplus phosphorus within NI agriculture and ensure efficient recycling of organic nutrients.

Phase 1

- 6 suppliers - Budget: £600,000 (ex VAT).
- Project length was 6 months (extended by a further month).
- Suppliers are using a variety of technologies.
- Policy barriers have been identified
- Successful outcomes – Consideration of Phase 2



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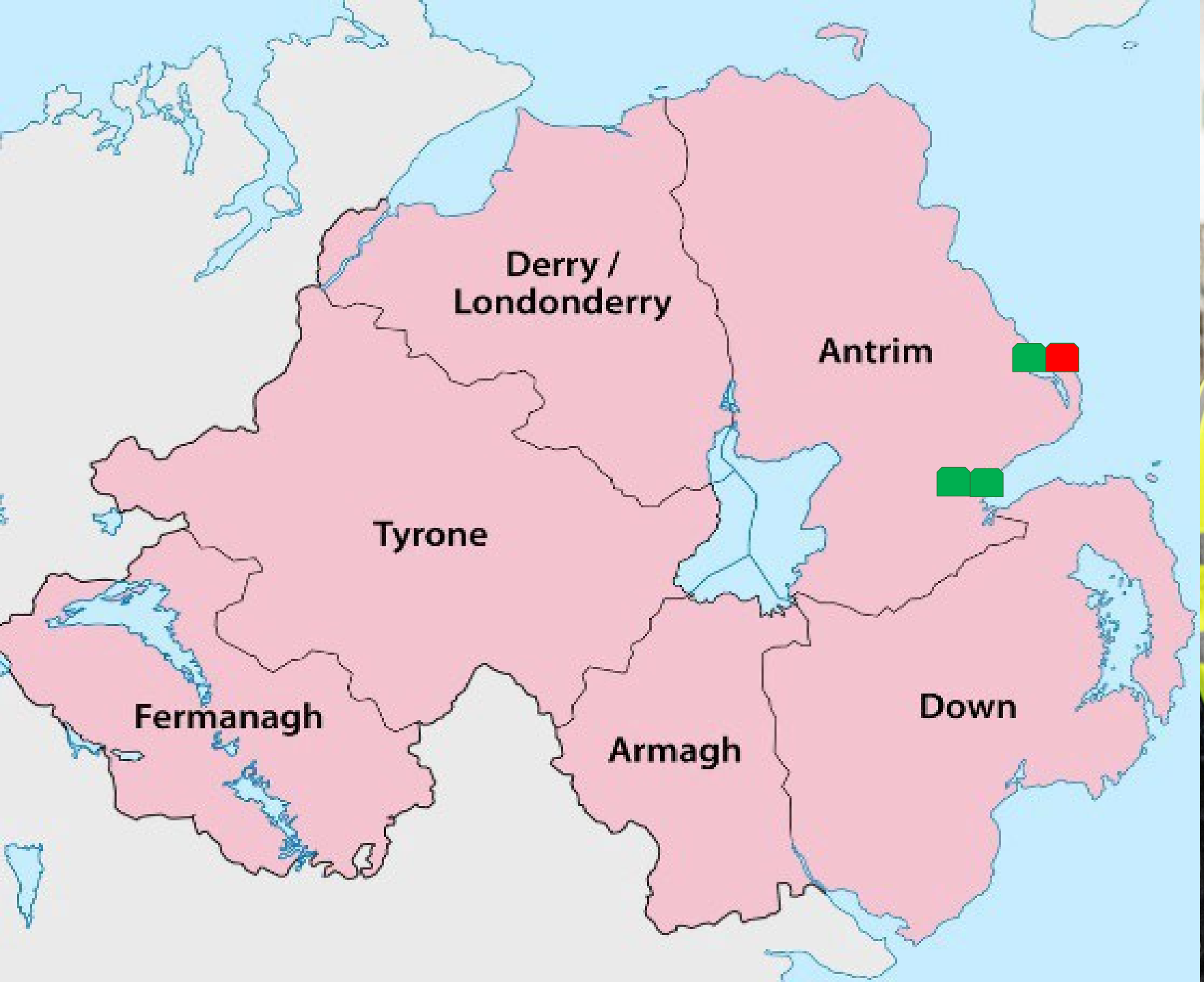
Act today.
Protect
tomorrow.
GREEN GROWTH
Today we act.
Tomorrow
we thrive.
Northern Ireland
Executive

A Retailer and Consumer Perspective of Carbon

Joe McDonald, Head of Corporate Affairs, ASDA NI


Derry /
Londonderry
Antrim
Tyrone
Fermanagh
Armagh
Down


ASDA
ASDA

NI Supply Chain

DALE FARM

CAVANAGH
free range eggs

MASH DIRECT
Cooked fresh on our Farm

abp

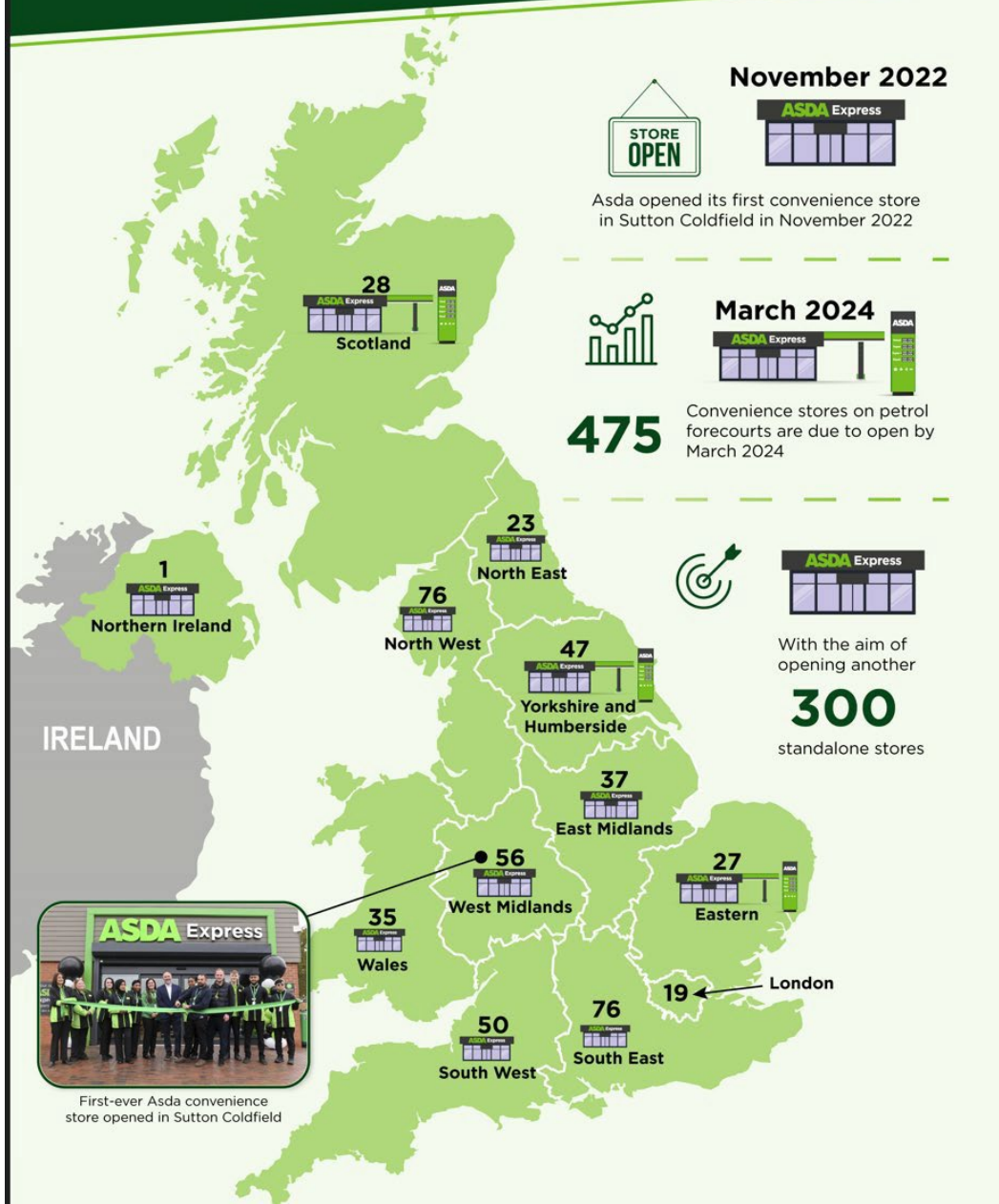
Artisan Finnebrogue

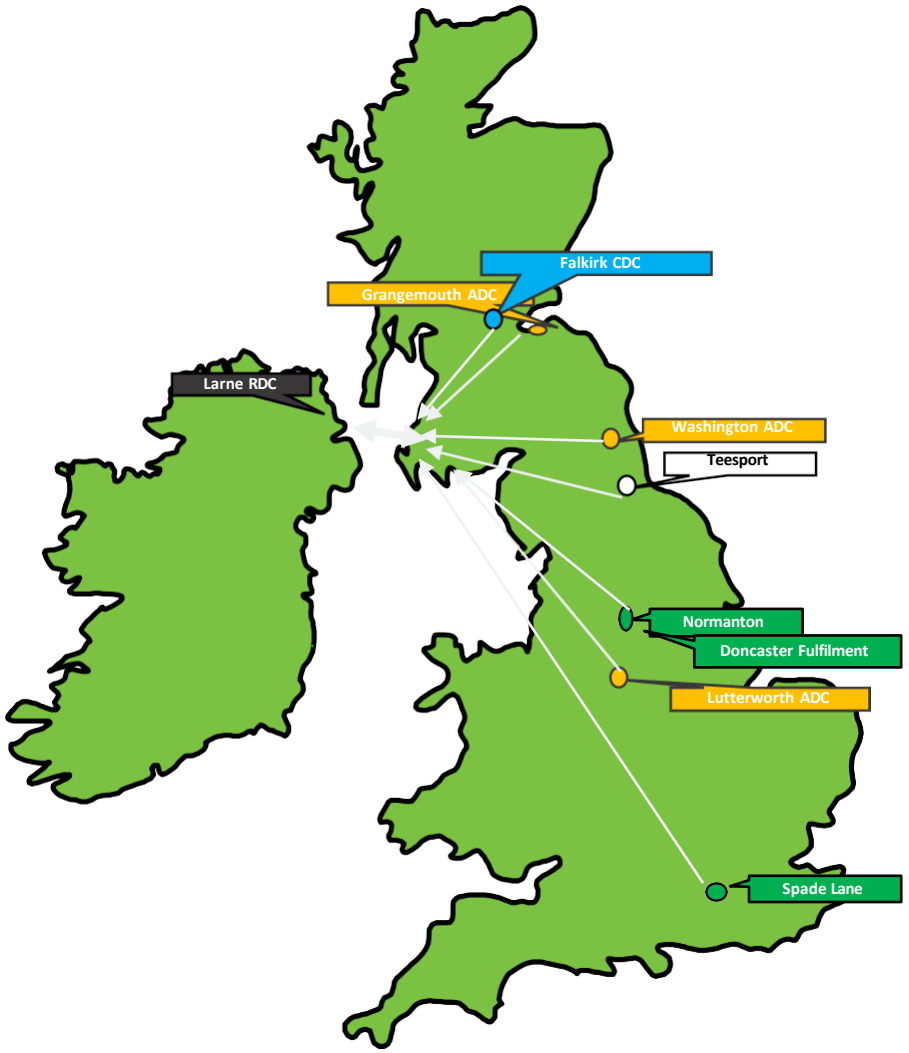
Gilfresh
FAMILY GROWN

GLENS of ANTRIM POTATOES

Growth

Asda Express Rollout



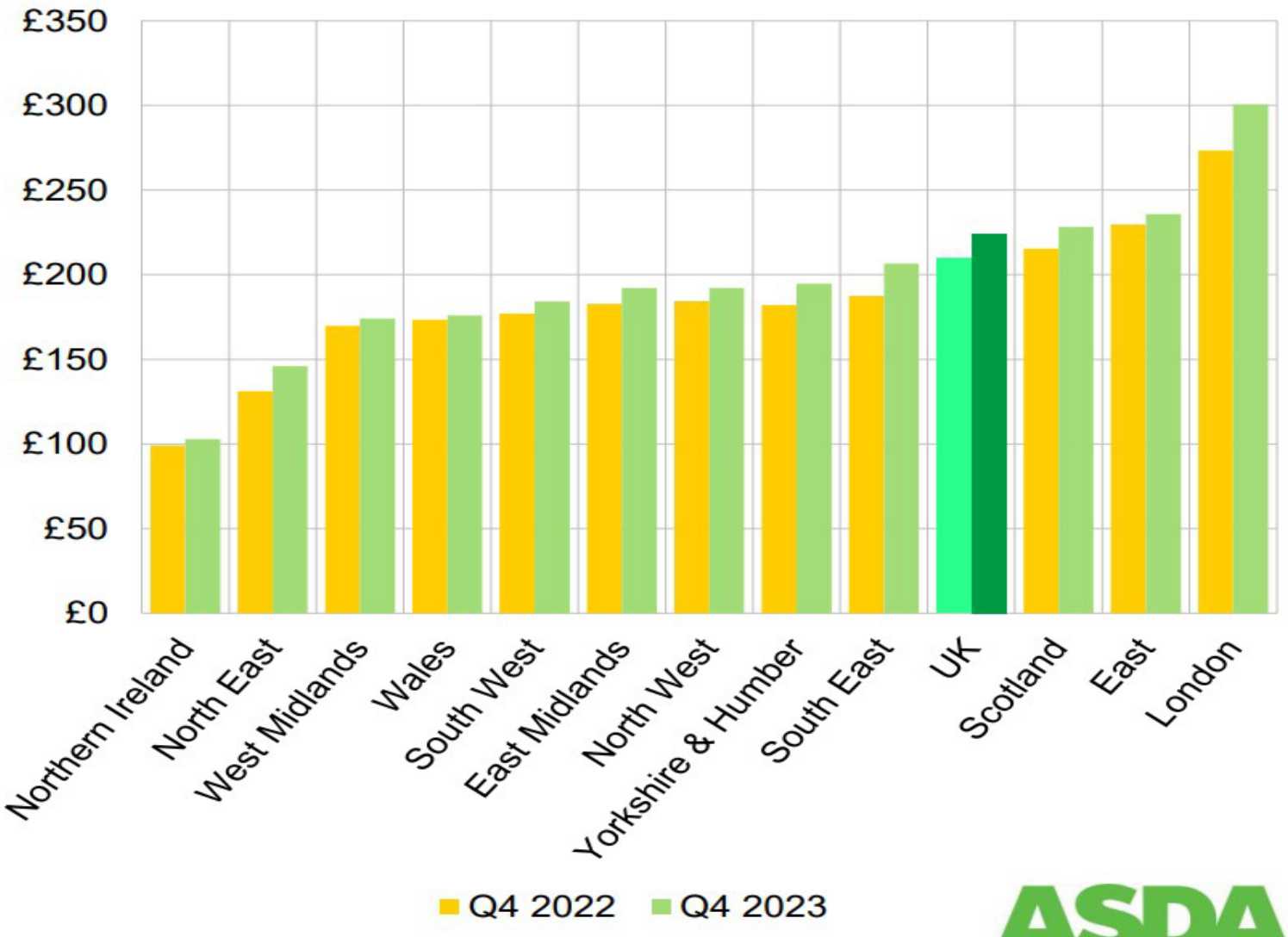

Falkirk CDC
Grangemouth ADC
Larne RDC
Washington ADC
Teesport
Normanton
Doncaster Fulfilment
Lutterworth ADC
Spade Lane


Falkirk CDC
Grangemouth ADC
Washington RDC
Washington CDC
Washington ADC
Larne RDC
Wynyard
Teesport
Wakefield CDC
Wakefield ADC
Yorkshire XDC
Warrington ADC
Doncaster GM
Skelmersdale CDC
Rochdale CDC
Doncaster Fulfilment
Lymedale RDC/Fulfilment
Lutterworth ADC
Lutterworth IDC
Lutterworth CDC
Bedford CDC
Brackmills RDC/Fulfilment
Erith XDC
Chepstow ADC
Erith CDC
Bristol CDC
Didcot ADC
Dartford ADC

Things on our mind

- Climate emergency
- Supply chain inflation
- Windsor Framework
- Geo-politics
- Obesity
- Alcohol

Average household discretionary income by region, £ per week in quarter indicated



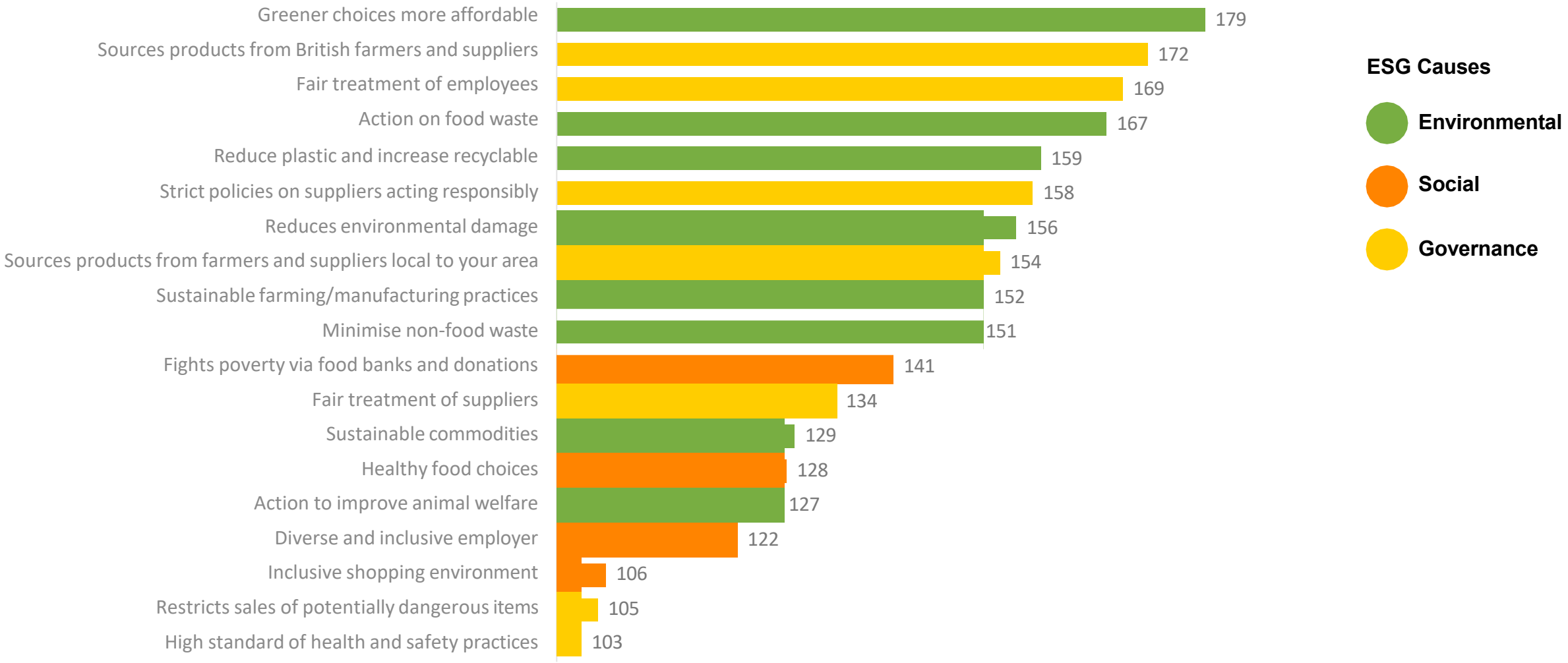
Walmart ⟶ new owners ⟶ ESG

- Increasingly important to our:
- Customers
- Investors
- Government
- Colleagues
- Boardroom

- Environmental, Social, Governance
- “The standards we set ourselves for the way we operate”

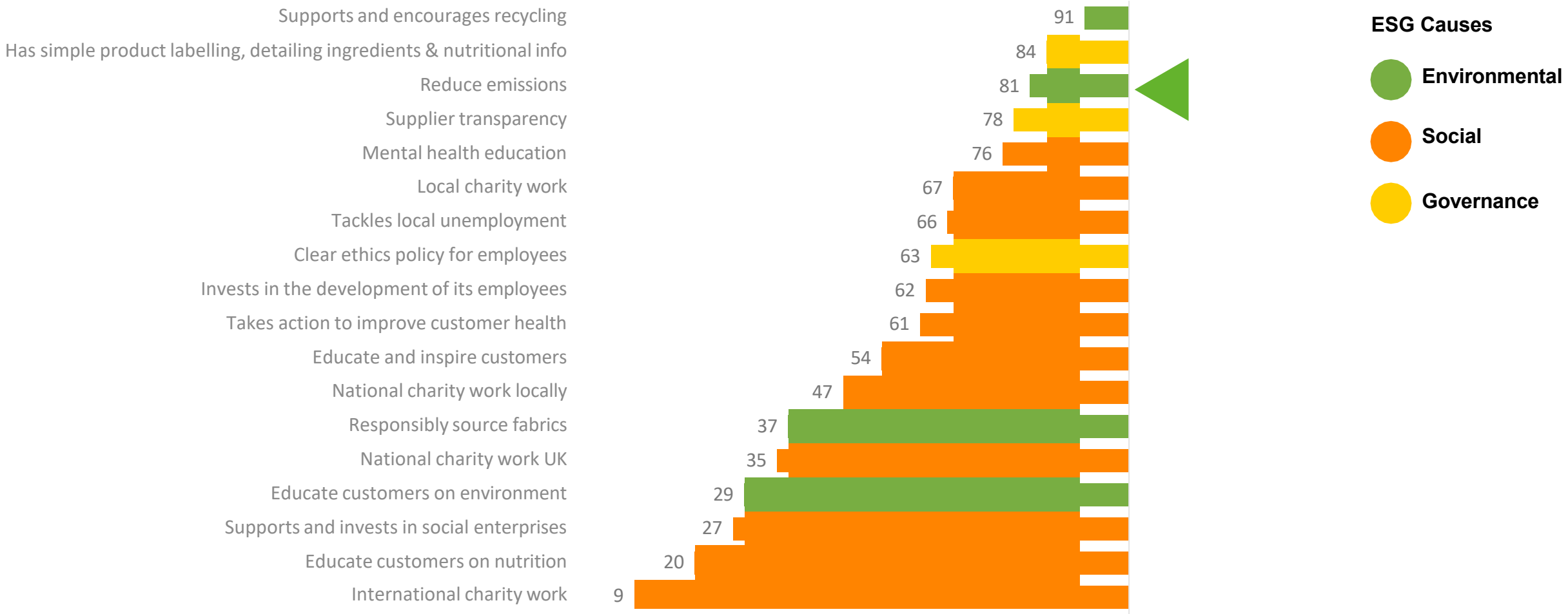
Environmental and governance score highest amongst ASDA customers

ESG stated importance amongst ASDA total customers – all drivers above an index of 100 = average



Social causes generally rank lower - local charity and mental health are seen as the most important of these

ESG stated importance amongst ASDA total customers – all drivers below 100 (average)



Better Planet

We aim to protect and conserve the world around us through sustainable practices and initiatives.

Find out more

Better Lives

We tackle the barriers to health and happiness that stand in the way of people getting the most out of life.

Find out more

Better Business

We hold ourselves to the highest standards of responsible business and ensure Asda is a fair, safe and transparent place to work and shop.

Find out more

Carbon

Our mission → Eliminating carbon emissions

Our vision for 2040 → An end to end net zero carbon emissions business

Our 2025 priorities →

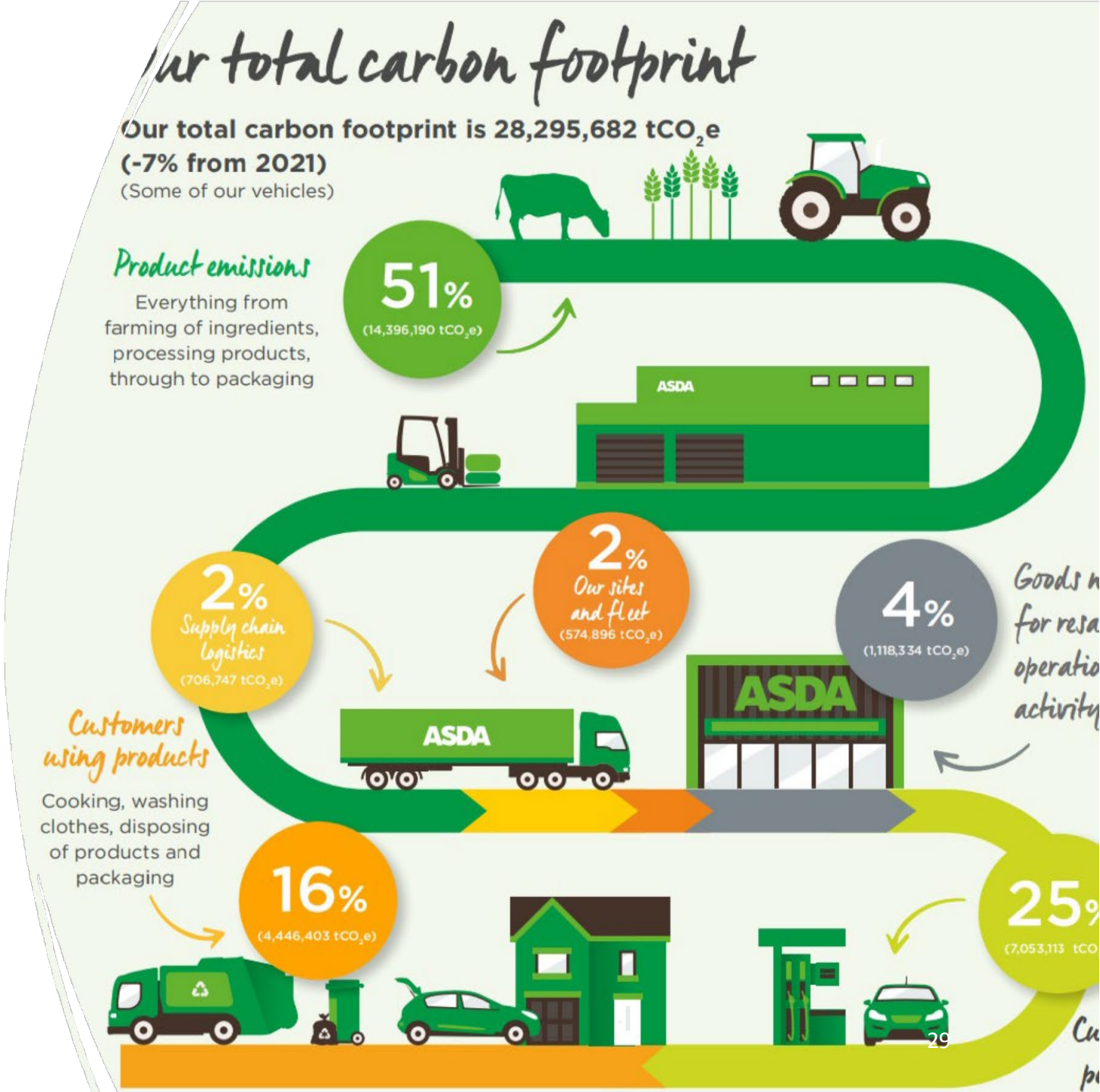
✓ Priority 1
50% lower direct GHG emissions

✓ Priority 2
Develop measurement of Scope 3 non-direct emissions

ESG 1 & 2

- **ESG 1:**
- Proud of the past, commitments for the future
- Carbon footprint down 44% 2007-2019

- **ESG 2:**
- Progress report & additional targets
- Publication of full carbon footprint for the first time
- Greener at Asda Price
- 50% lower direct GHG's by 2025
- Net Zero by 2040



ESG 3

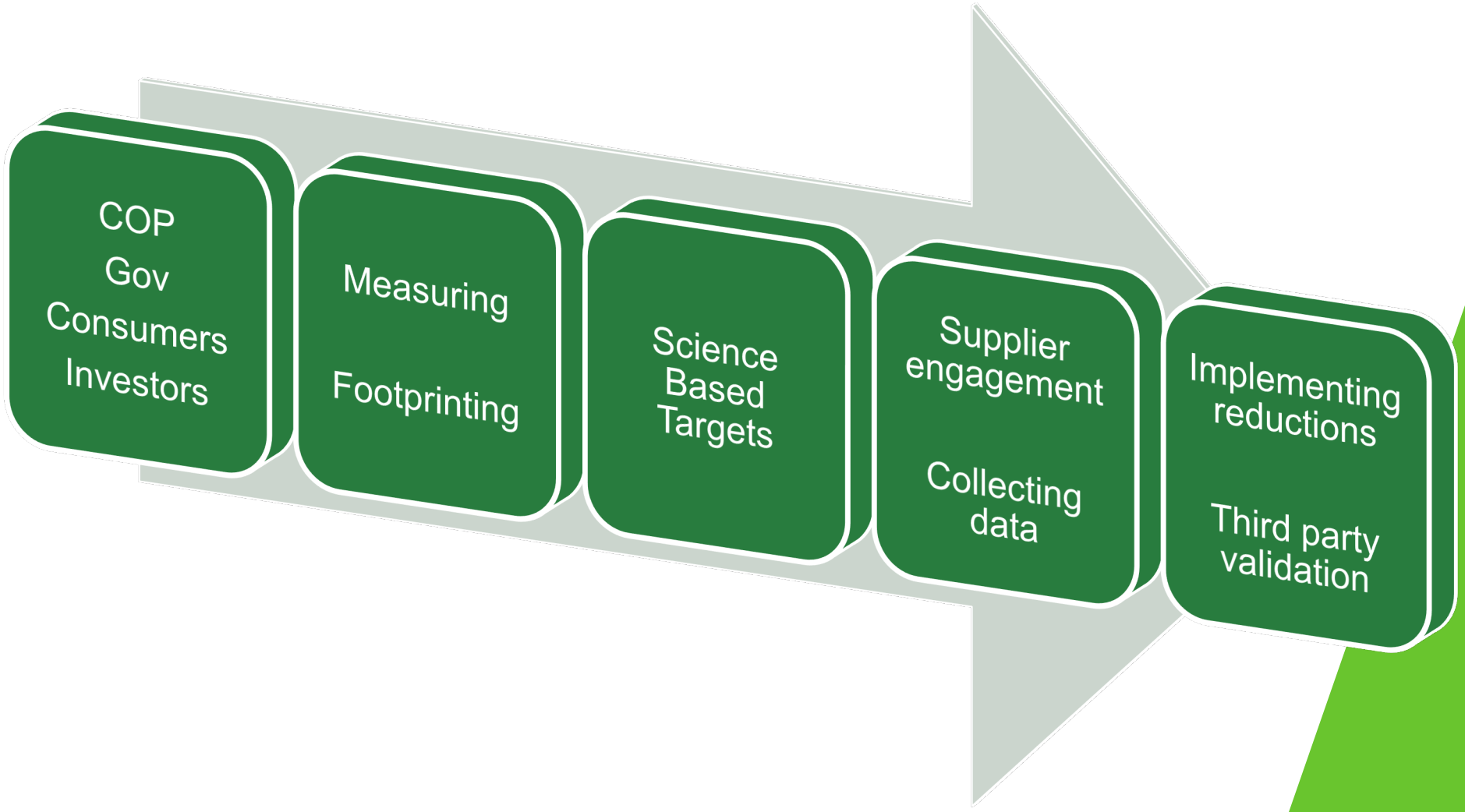

Priority areas
1 Energy and climate change mitigation
2 Food waste
3 Plastic & packaging
4 Healthy, sustainable choices
5 Supporting local communities

Sustainable Fitch

- Financial services ratings' agency
- 3/5 (54)
- "progressive effort to integrate ESG into business strategy".
- Decarbonisation since 2015 praised

- **To do:**
- Climate related scenario reporting
- Add water reduction roadmap
- Add green buildings roadmap

BRC Climate Roadmap 2040



Asda

2015

Today

2025

2030

2040

2015 baseline

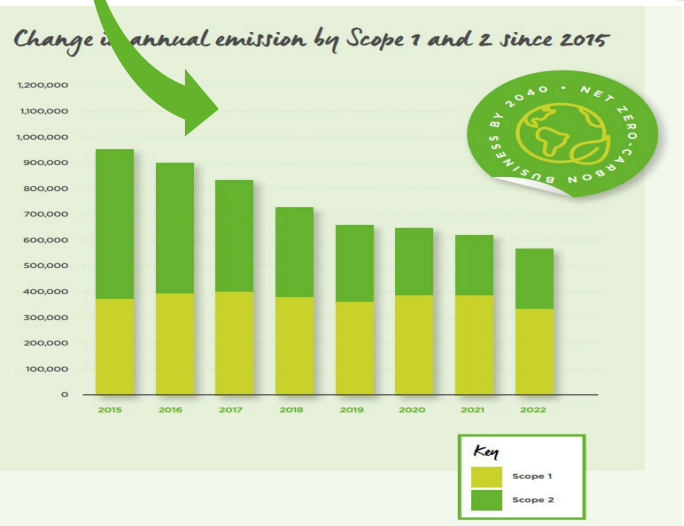
Footprint Roadmap 70% suppliers Validate SBTi

Scope 1&2 down 50%

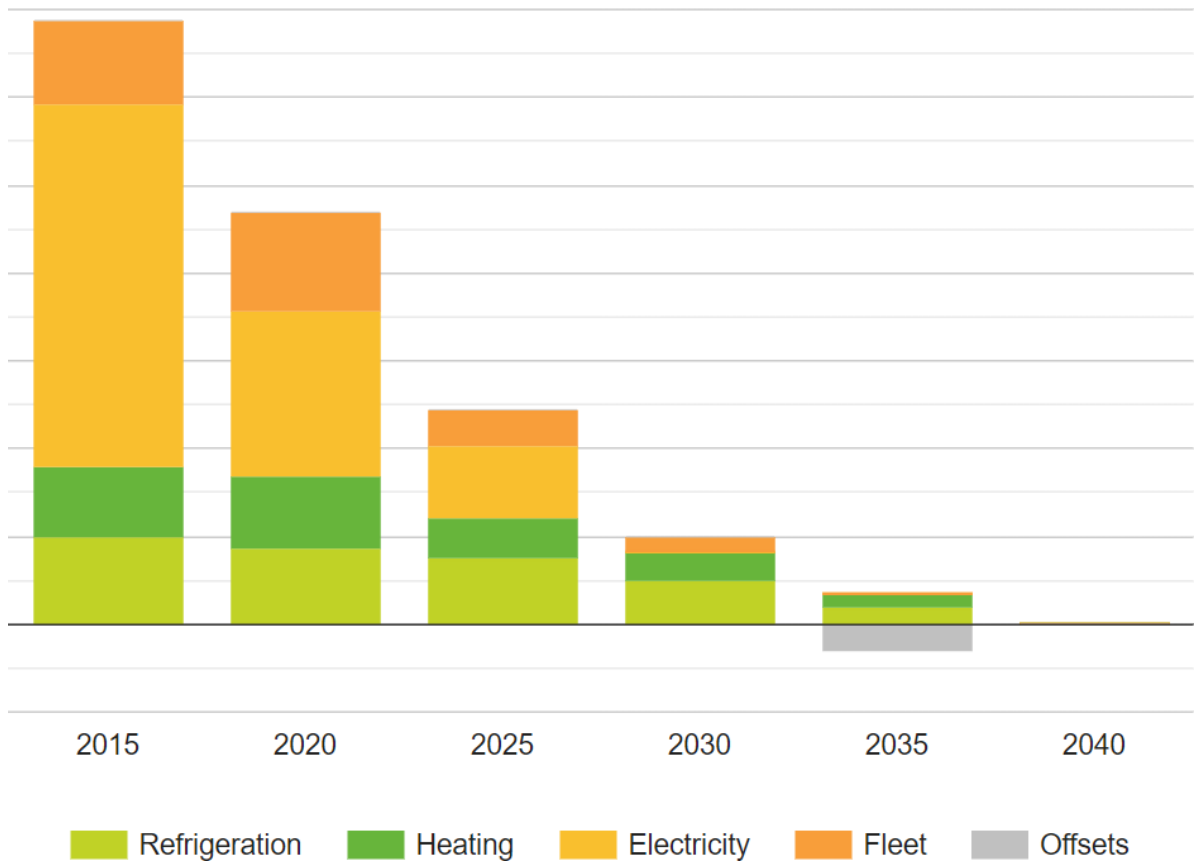
Measurement of scope 3

SBTi targets 1,2,3 & FLAG

End to end Net Zero



Roadmap for scope 1 & 2



Scope	2020 (tCO2e)	2021 (tCO2e)	Change
Scope 1 (Fuel combustion)	393,810	390,131	-1%
Scope 2 (Electricity use)	261,548	234,548	-10%
Total Scope 1 & 2 (Direct emissions)	655,358	624,679	-5%
Scope 3 (Indirect emissions)	30,298,632	29,748,151	-2%
Total Carbon Footprint	30,953,990	30,372,830	-2%

- Sustain and Save Exchange - Two Degrees
- Arla Dairy Group
- ABP Group
- LEAF
- Supplier conference 20th March

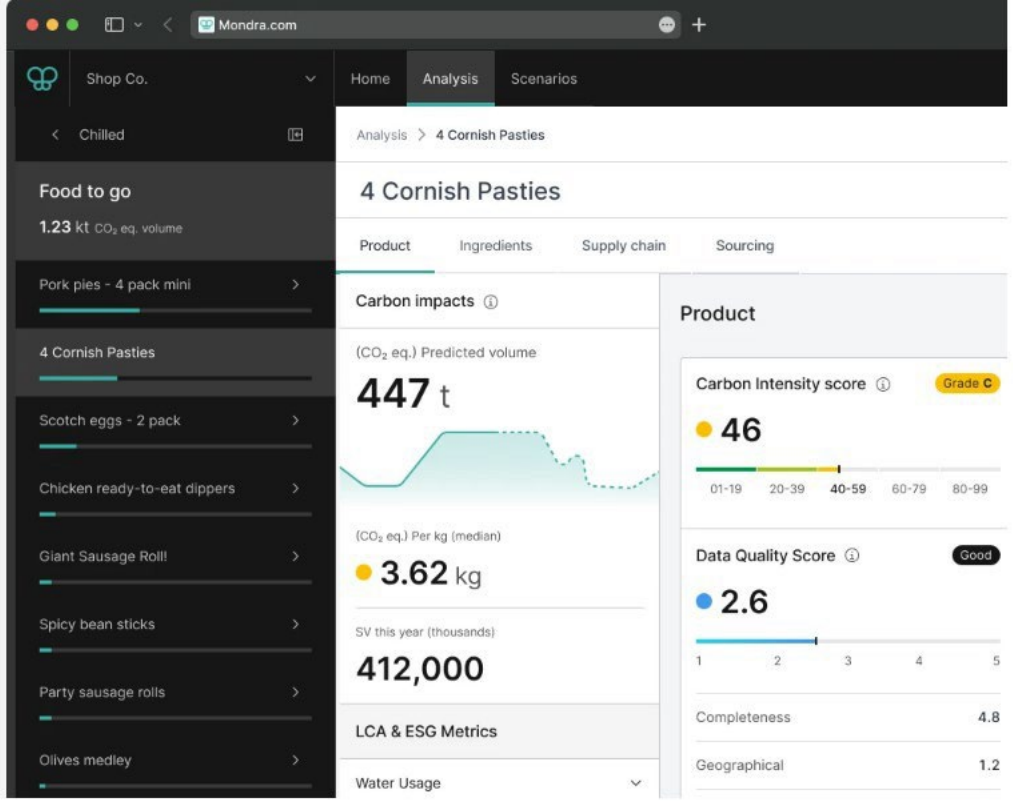
Scope 3

2025 reduction targets

BRC Mondra Coalition

Food Data Transparency Partnership

mondra



Take home message

- Pledges have been made
- Scope 3 a big part of the jigsaw
- Measurement methodology needs to be agreed
- Supply chain partners
- It’s a journey

DAIRY COUNCIL NORTHERN IRELAND

Meeting the carbon challenge in the supply chain

Ian Stevenson

29 February 2024

What's driving the carbon challenge?

- Legislation – Climate Change Act (NI) 2022
- Customers of Industry – Specifications, public commitments
- Competition – Need to work hard for position in marketplace
- Business reporting requirements
- Financing business development and sustainable growth
- Improving business efficiency and profitability

What has the supply chain been doing?

Strategy and Action Plan published 2011

- Sectors' committed to playing their part in carbon reduction and meeting targets
- Promoted awareness of agricultural GHG's along supply chains
- Identified practical measures to implement at farm level
- Focus on productivity improvement and reducing waste
- Scientific research to underpin recommendations
- Partnership approach between government and industry
- Honed-in on decreasing carbon intensity per unit of output
- Growing production in a sustainable way

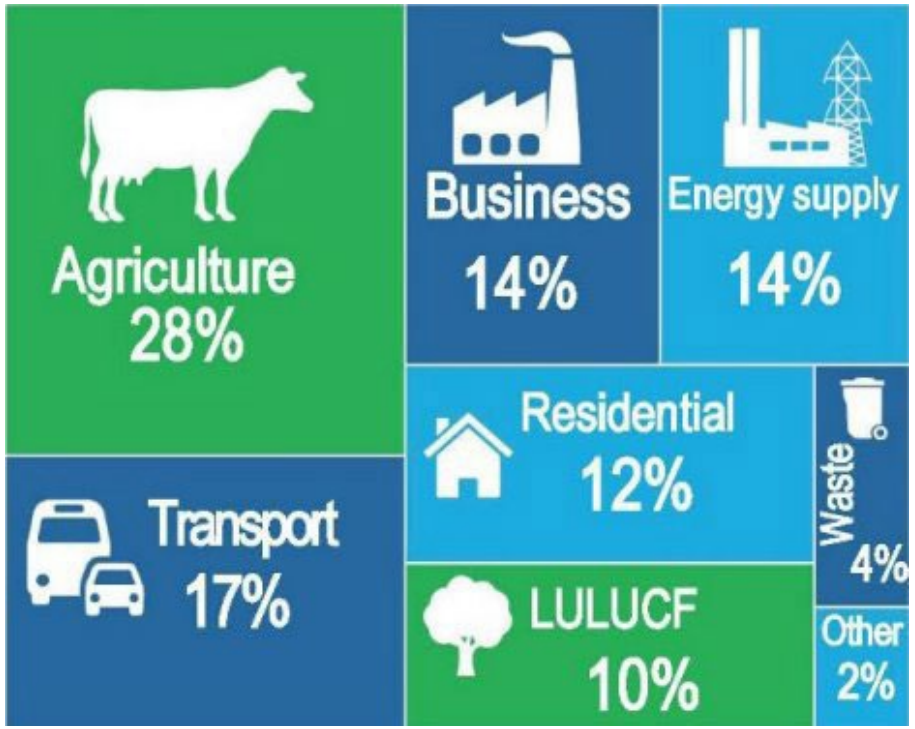
Was it impactful?

- Official statistics published by DAERA on Northern Ireland (NI) carbon intensity indicators 2022

- Total emissions (excluding sequestration) related to milk production decreased by 37% from an average of 1,927 grams of CO2 equivalent per kilogram of Energy Corrected Milk (ECM) in 1990 to 1,215 grams in 2020.

- Whilst milk production in the dairy sector has expanded by 85% since 1990, the total number of dairy cows over this period has increased by only 13%, meaning this improvement in carbon footprint has been driven by substantial increases in milk yield per cow.

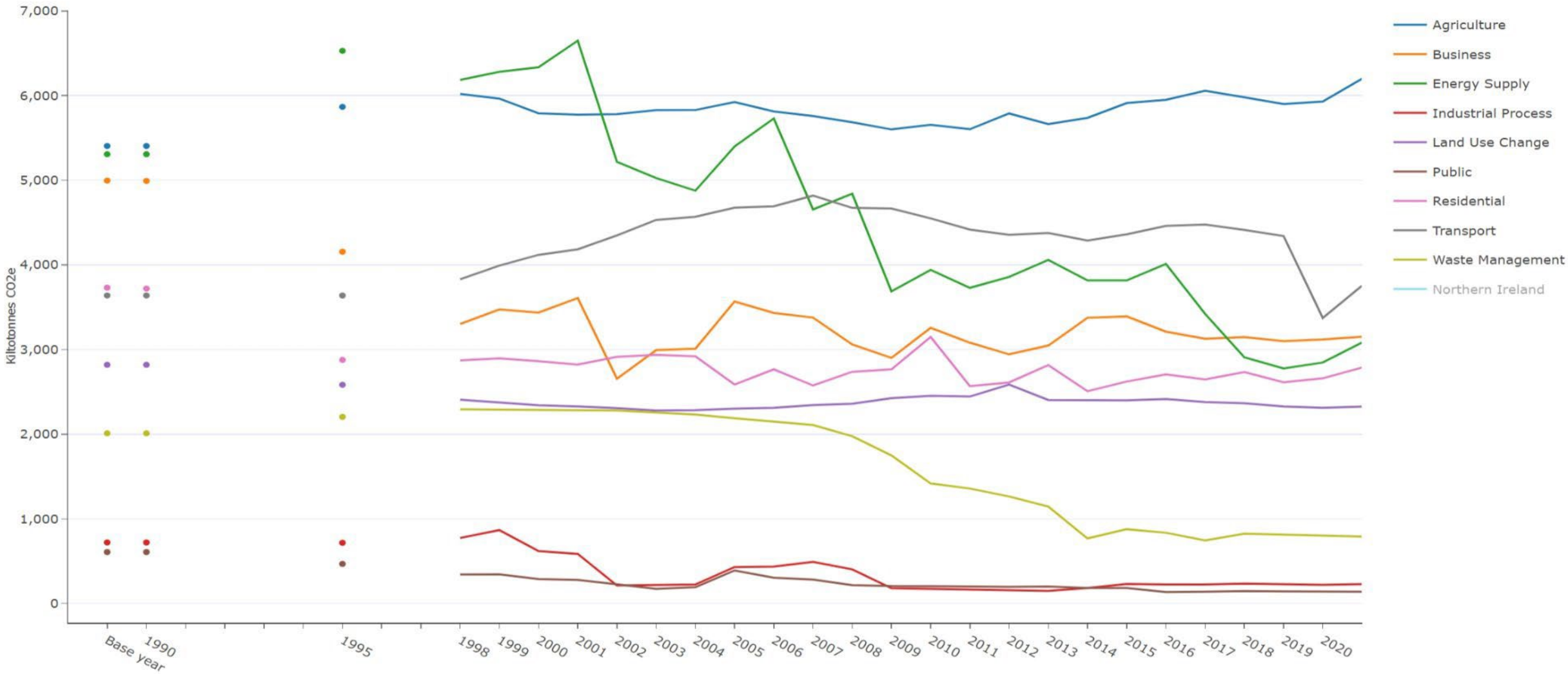
But…Current GHG emissions per sector in Northern Ireland:



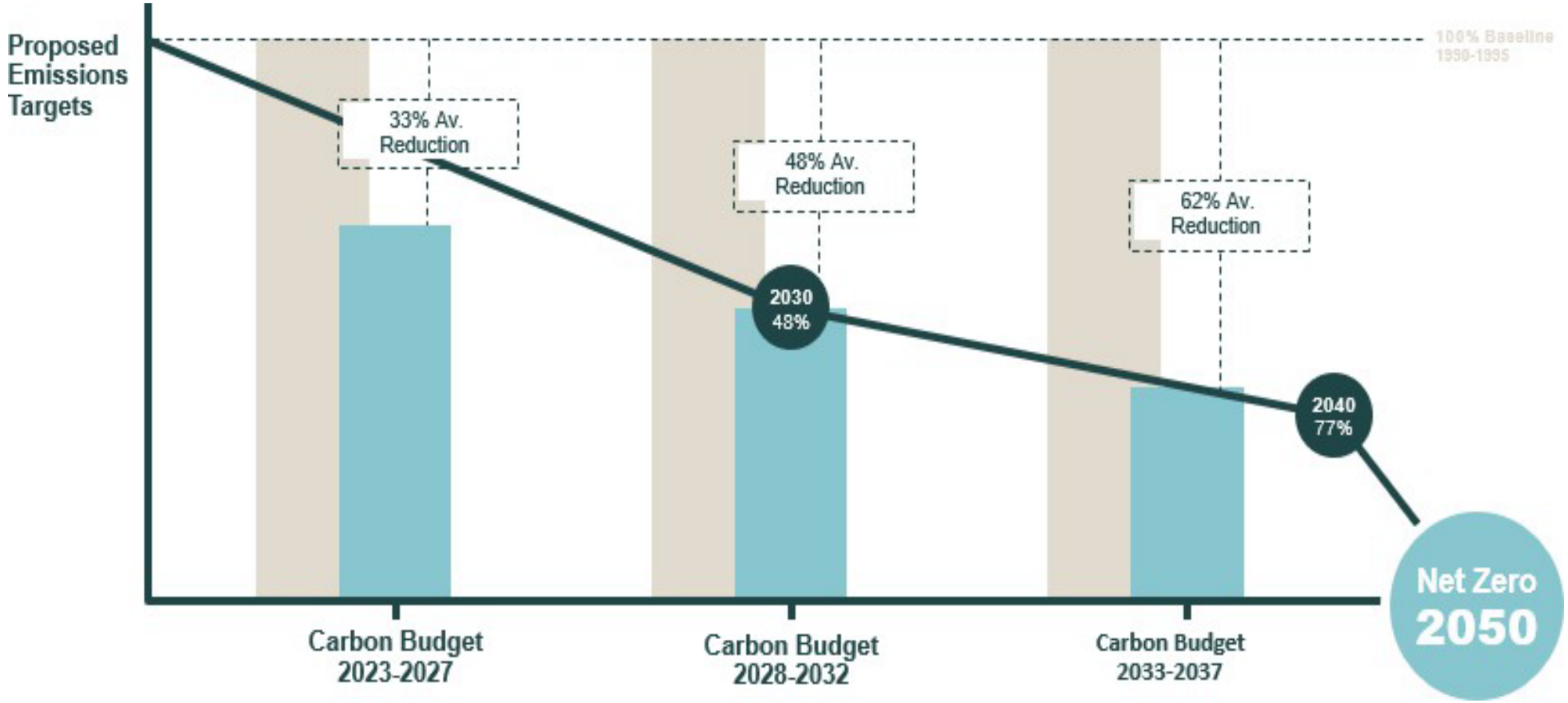
Greenhouse gas emissions for Northern Ireland by source sector for the years 1990 to 2021. Further information available from

https://www.daera-ni.gov.uk/articles/northern-ireland-greenhouse-gas-inventory

Northern Ireland | Agriculture | Business | Energy Supply | Industrial processes | Land use change | Public | Residential | Transport | Waste Management



The Challenge Ahead for NI is Huge



How does agri-food approach this challenge? Carbon Steering Group Alliance 2023

Purpose of CSG Alliance

- To progress carbon element of sustainability agenda
- To prepare for publication of first NI climate action plan
- To mould an industry wide coordinated approach that can measure and manage carbon emissions
- To achieve consistency in direction towards legislative targets
- To lead from the front to develop a market strategy and support farmers to intercept potential livestock reductions
- Develop a workable system that can deliver the information required and enable the agri-food sector to remain competitive & compliant

Carbon Footprinting Programme

- Carbon Farming Partnership now established combining the expertise of CSG and DAERA
- Programme forms a key part of DAERA's future farm support and development programme
- Industry (CSG) has led the way on developing and piloting a secure and efficient carbon footprinting data collection system
- Robust governance structures in place to ensure all workstreams underpinning the programme work in harmony and that data collected is safeguarded for its intended purpose

What's Unique about the NI Approach

- Single carbon calculator to be used across all farms
- Businesses and business sectors working pre-competitively
- Technical Working Group forensically working through the science and detail behind the carbon footprint calculation
- Harmonised and accurate data collection
- Focussed on minimising time on farms (first stage will be data collection at the same farm visit as FQAS / RT inspection)
- Joined up approach to knowledge transfer and business advice

Sustainability Leadership

The three CEOs of Northern Ireland's largest dairy processors Lakeland Dairies, Dale Farm and Leprino Foods came together on a panel at a recent DCNI dairy symposium to discuss the importance of sustainability to their own businesses and how they are working with farmers to tackle climate change

Processors are committed to addressing emissions across the supply chain including those from milk supply, energy, transport and processing operations

Processors are now starting to roll-out sustainability payments to help incentivise and engage their milk suppliers in taking practical and cost-effective measurement and mitigation actions at farm level

The Importance of Communication

For decades, the sector has been driving forward efficiencies and investing in new technologies to lower emissions and preserve the environment.

Much of the hard work and investment by farmers and dairy processing companies alike has gone unseen.

The differing approaches to sustainable farming practices by farmers like Robert Bryson of Carrick House Farm in Loughbrickland and Thomas Steele of Rowreagh Farm in Kircubbin are excellent examples of improving on-farm environmental sustainability.

Safeguarding Our Resources

- Our grasslands play a key role in sequestering carbon and good grassland management practices such as liming, reseeding and targeted nutrient use help achieve this.

- Initiatives such as GrassCheck NI, which monitors grass growth throughout the growing season, and the AFBI Precision Grassland Platform which integrates soil, plant, animal, and climate data to improve understanding and management of grasslands

- Hugh Harbison's farm in Aghadowey is a shining example of farming with nature. The farm has won various conservation awards over the years.

- In the case of Strabane farmer Hall Donnell, investing in renewables and implementing energy efficiencies has significantly lowered his farm's carbon footprint.

From Research to Practice

Northern Ireland farmers benefit from leading research carried out by scientists at the Agri-Food and Biosciences Institute (AFBI) and with the support of advisers from the College of Agriculture Food & Rural Enterprise (CAFRE) this research is being put into practice on local dairy farms.

Omagh farmer Drew McConnell took part in a two-year research trial with AFBI investigating the impact of feeding a lower protein diet to dairy cows.

Although milk volume was reduced in the early days, the farm recorded no negative impact on overall milk performance and improvements in animal health and fertility were also seen.

From Research to Practice

Ballywalter farmer James Brown saw substantial benefits from taking part in an AFBI Youngstock research programme which helped him achieve a first calving age of 24 months.

Earlier calving means James can keep 30 less animals on the farm, thus lowering emissions as well as improving animal health.

Commenting on his involvement in the research project, James remarked, *"The feedback was terrific, I got a report on how well my calves were performing compared to other farms and being involved in the research project helps you keep your eye better on the ball."*

Informed Nutrient Application

Ian McClelland's farm in Loughbrickland took part in AFBI's Soil and Catchment modelling study which has given a better understanding of nutrient management on dairy farms.

Ian received soil and LiDAR analysis of his farm and surrounding areas which detailed where the most likely nutrient run-off areas are.

Ian said: "*We have greatly benefited from the analysis and recommendations the programme produced and it has helped inform my fertiliser application and is enabling me to make the most of my soil testing, grass measurement and nutrient management.*"

Energy Efficiencies and the Circular Economy

Anaerobic digestion is used throughout the sector, from the farm to factory.

It demonstrates how reducing waste throughout the entire dairy supply chain, and repurposing suitable waste as a feedstock for AD, is helping to decarbonise the dairy sector further.

Three AD plants within the dairy supply chain were showcased in DCNI's Sustainable Dairy Programme in 2021: on Alastair Taylor's farm outside Ballymoney, at the dairy processing site in Ballyrashane and at a third-party service provider Bio Capital at Granville Eco Park in Dungannon which is creating renewable electricity, biofertiliser and biomethane fuel from food waste and dairy by products.

Bio Capital is now injecting renewable biomethane directly into the natural gas network showing how creative problem solving can also create value for other sectors.

Data in Action

As a sector we want to show that we are working towards the NI Climate Act targets, but we need to ensure we have the data and factual evidence to stand over the sector's progress

The new DAERA farm support and development programme includes important cross cutting data packages on carbon footprinting, ruminant genetics and soil nutrient health

These initiatives are game changers for Northern Ireland and have a strong co-design and partnership ethos

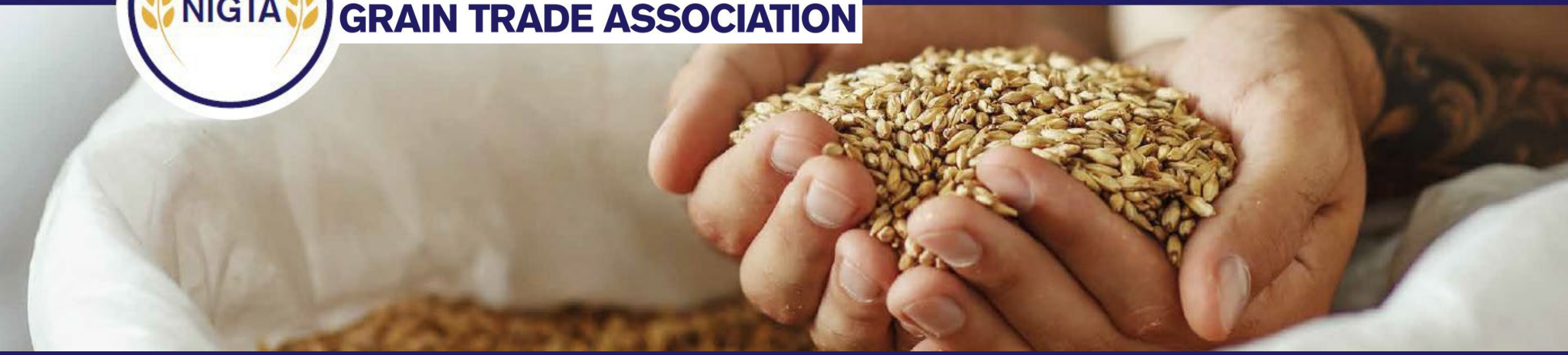
Concluding Remarks

DAERA and other Departments are working through the implications of the NI legislation, carbon budgets, sector plans and a climate action plan for the whole of NI

Within our own dairy sector, gathering the data from Carbon Footprints is a key priority to help inform our sustainability improvement journey and champion our credentials – standing still is not an option

The most important data point on the farm remains the bottom-line and we want to see profitable progressive businesses that provide nutritious, quality food whilst playing an active role in improving the environment

NORTHERN IRELAND
GRAIN TRADE ASSOCIATION



Feed and carbon - issues and solutions

Jim Uprichard, Trouw Sales and Technical Manager for Sustainability, NIGTA

Compound Feed

Compound Feed Usage

By Species

Feed Production in Northern Ireland

Total Compound Feed 2022 – 2,600,000 metric tons

NIGTA

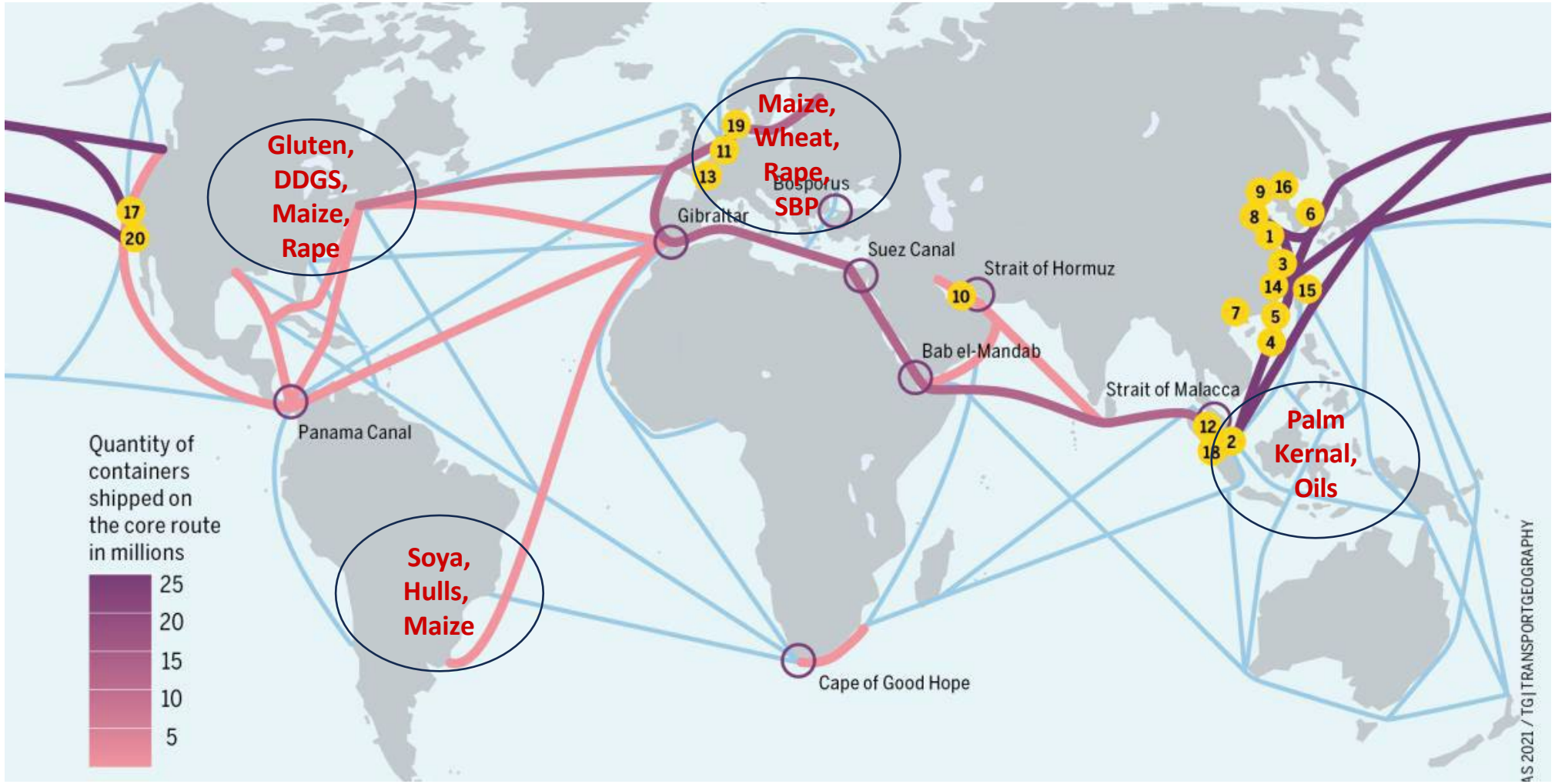
Raw Materials

Carbon and Land Use Change

- Maize
  - EU: 533kg CO2e/mt
  - Canada: 486kg CO2e/mt
  - Brazil: 1521kg CO2e/mt (LUC – 1012kg)
- Soyabean Meal Carbon Footprint:
  - Argentina: 4417kg CO2e/mt
    - Of which Land Use Change; 3741kg CO2e/mt
  - USA: 662kg CO2e/mt
    - Of which LUC; 10.2kg CO2e/mt
  - By 2025 all Soya in Europe will be vDCF
- Wheat
  - EU: 533kg CO2e/mt
  - Irish: 335kg CO2e/mt (GFLI)
  - : 242kg CO2e/mt (Tirlan)
- Beans
  - Local: 510kg CO2e/mt

Raw Material Footprint

Country of Origin is Important



Raw Material Footprint

Why not use Local Ingredients

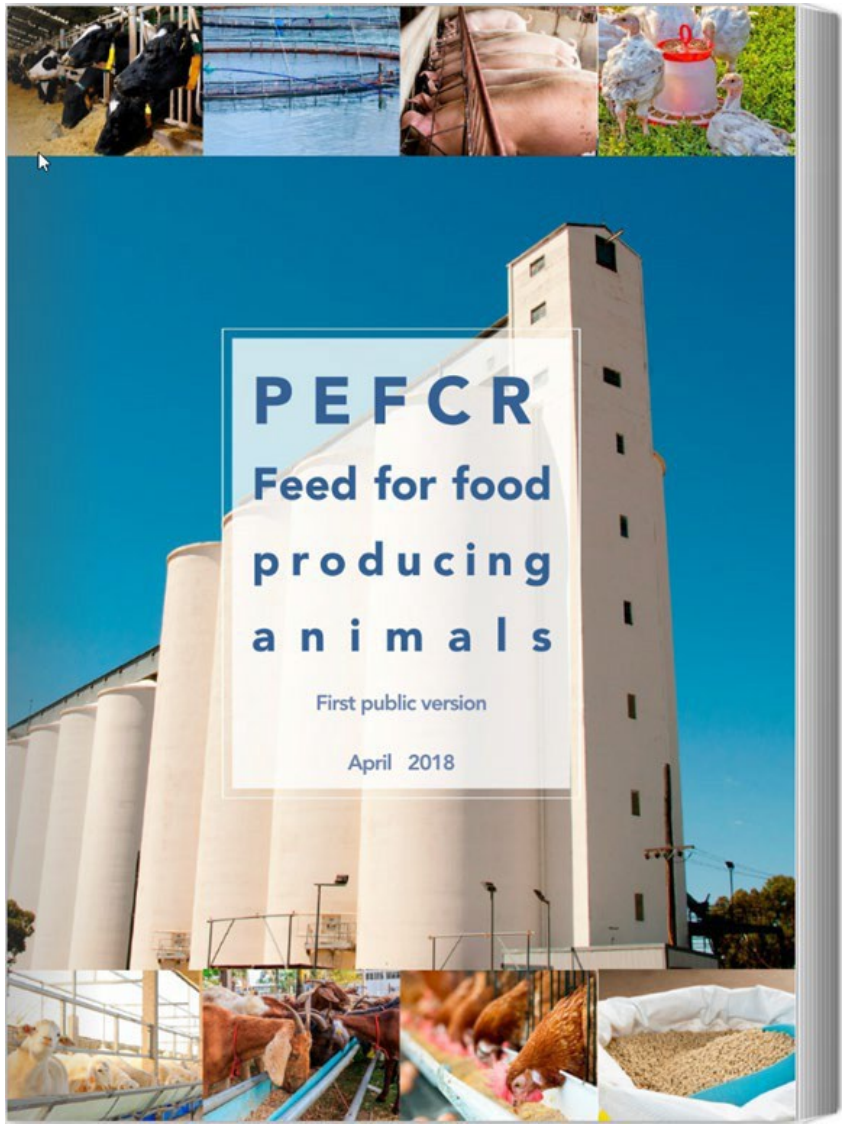
- Wheat and Barley — Acreage required
  - Locally Grown: 200,000mt — 80,000
  - Needed: 700,000mt — 280,000
- Soya - Replace with Beans!
  - Beans are 50% of Crude Protein of Soya
  - Locally Grown: ??? — ???
  - Needed: 700,000mt — 350,000
- Do we have enough Arable land?

Carbon Footprinting of Feed

Carbon Footprinting Rules

Product Environmental Footprint Category Rules

- NIGTA follows international LCA standards, based on the calculation principles given by the PEFCR Feed Standard and ISO 14040/44
- Product environmental Footprint category rules (PEFCR) is the recommended LCA standard from the European commission to create a single market for green products. It is endorsed by our sectors trade organizations.
- Feed trade organizations have been actively involved in developing the PEFCR for feed
- This means all feed calculations are accurate, common across all species and updated regularly.



What is in the Feed Environmental Footprint?

Feed Ingredient

The environmental impacts of cultivating, harvesting (or extracting), and processing the ingredient.

Inbound Transport

The environmental impacts of the distance traveled and the modes of transportation used to bring the feed ingredient to the feed mill.

Feed Mill

The environmental impacts of the ingredients used in the feed formula along with the source and amount of energy used by the feed mill.

Global Feed Lifecycle Assessment Institute

Secondary data from accredited databases	Company specific data or data from accredited databases	Company specific data
83%	≈15%	2%

Dairy Feed Carbon Footprints

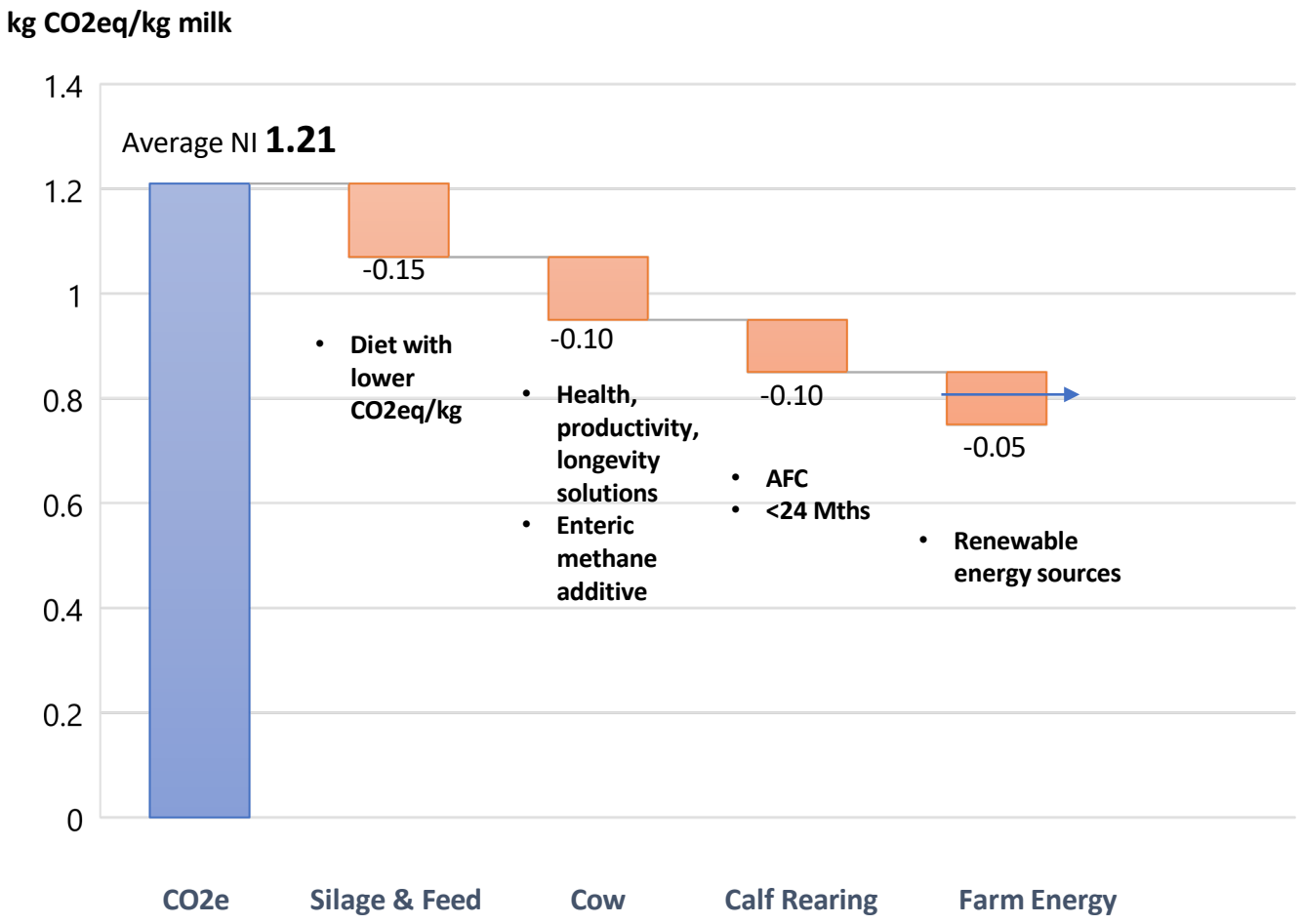
What can reduce the Feed Footprint?

- **Nutrition always Trumps Carbon!!!**
- Feed Formulation
  - Using less of high footprint ingredients
  - Use home-grown cereals
  - Wheat vs Maize?
    - Manage rumen health to avoid acidosis
- Crude Protein
  - Requirements: 16% lower than 20%
- Nuts vs Blends?
  - No Difference!

Carbon Reduction Strategies

CO2eq Reduction Programs

Example Farm



Potential incentives farmers to reduce CO2eq

- efficiency improves profitability
- License to supply
- Premium payments milk
- Use of Feed Additives
- Eligibility for subsidies, grants, loans
- Contributes to positive image

Where to start?

Low hanging fruit

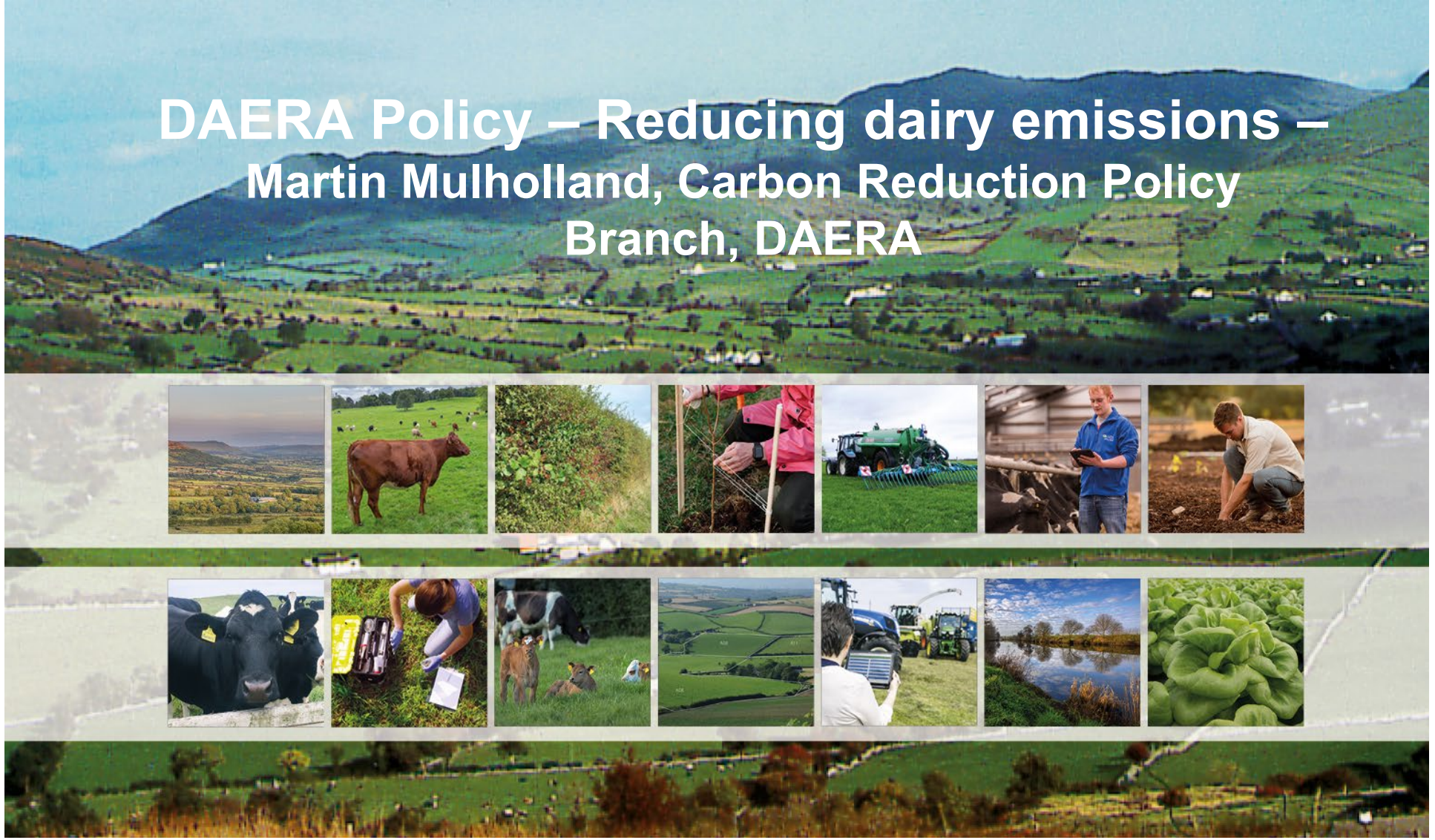
- Forage Analysis
  - **Digestibility (D value) is king!**
- Precision nutrition
  - Balance the diet
  - Methane Inhibitors?
- Early life – target 23mth calving
  - **Feed more milk**
- Herd Health; Manage for longevity
  - Infertility, lameness, metabolic disease
- Calculate **Lifetime Daily Yield**
  - Total lifetime production/Total days alive

Take Home Messages

- **Nutrition and Health always Trump Carbon**
- Northern Ireland Imports 90% of it's feed ingredients.
- Very limited potential to reduce this.
- When needed ask your feed rep for Feed Footprints.
- Precision Nutrition – only feed what you need.
- Target 16 litres Lifetime Daily Yield
- **Efficient farming reduces Carbon and makes money!**

DAERA Policy – Reducing dairy emissions –

Martin Mulholland, Carbon Reduction Policy Branch, DAERA



Department of Agriculture, Environment and Rural Affairs

www.daera-ni.gov.uk

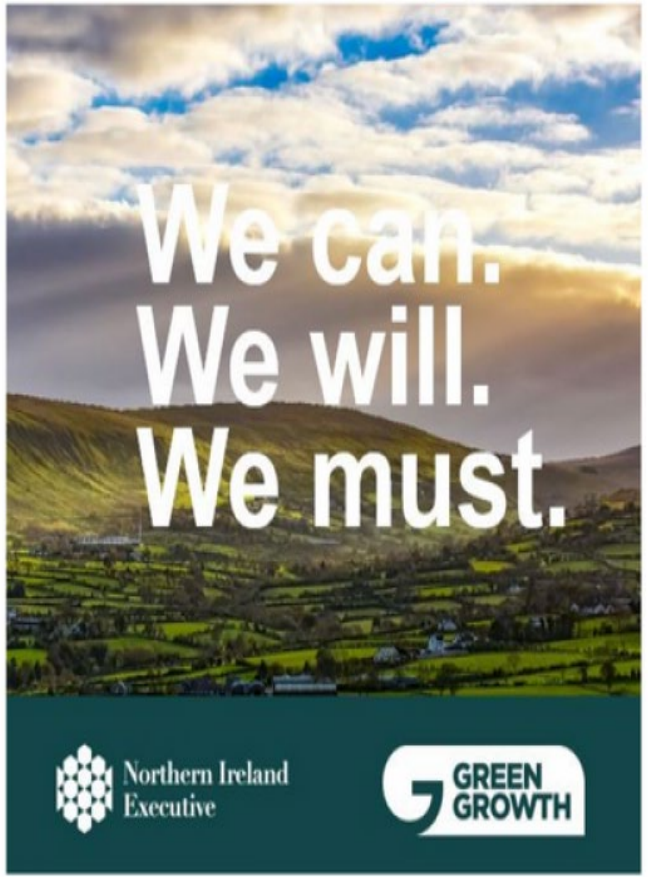
***Sustainability** at the heart of a living, working, active landscape valued by everyone.*

Presentation Outline

- Climate Change Act
- Carbon Budgets Consultation
- GHG Emissions in Northern Ireland
- Farm Support and Development Programme Schemes
- Potential to reduce dairy farm emissions through Low Carbon Farming Practices

Delivering for Climate Change

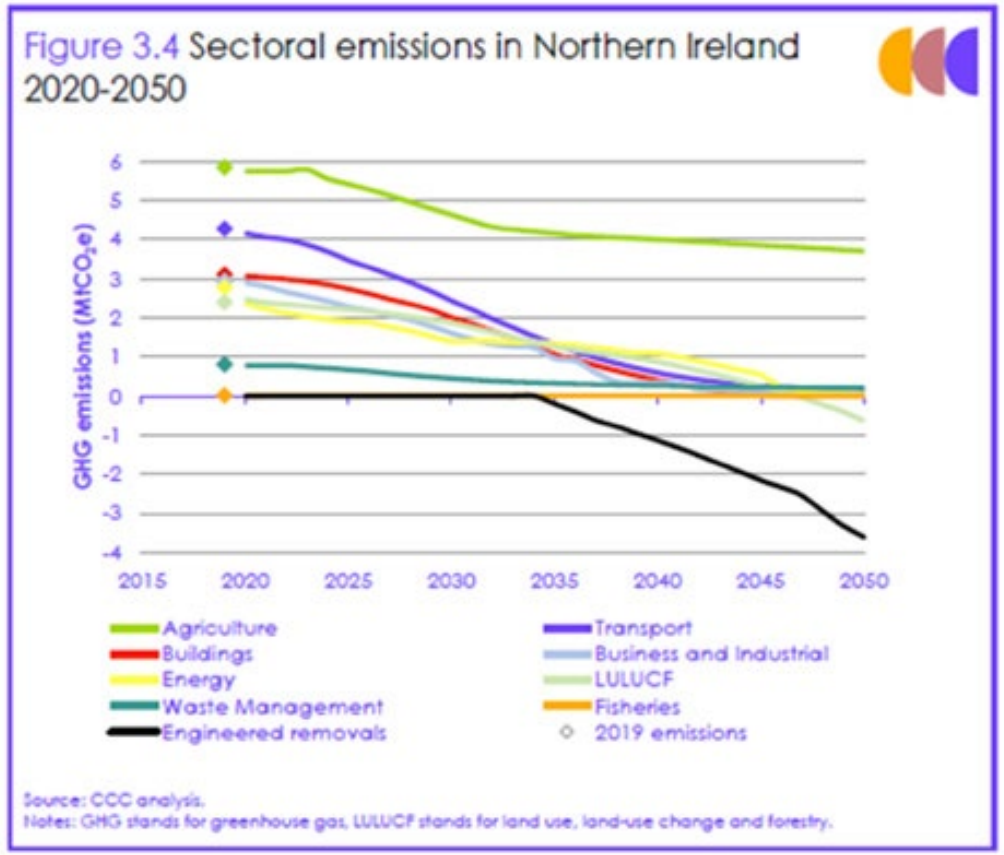
The Farm Support and Development Programme will help the industry to reduce GHG emissions and meet its targets.



Climate Change Act (NI) 2022

- 2030 – net NI emissions are 48% lower than the baseline year of 1990
- 2050 – NI GHG emissions is at least 100% lower than the baseline year of 1990
- Climate Action Plans to be developed and published every 5 years
- Climate Action Plans will set out policies and proposals to achieve the carbon budget for the CAP period and reduce emissions in line with the reduction targets as stated in the Climate Change Act (NI) 2022
- Climate Action Plans will build on the Climate Change Committee's (CCC) and other organisations' relevant evidence and advice to inform trajectories and measurable pathways for each sector

Carbon Budgets Consultation (June 2023)



	1990 ($MtCO_2$)	2019 ($MtCO_2$)	2030 ($MtCO_2$)	2050 ($MtCO_2$)
GHGs	5.5	5.9	4.6	3.7
% change from 1990		+6%	-16%	-33%

CCC Advice and Farm Support and Development Programme

CCC Advice

Emissions reductions are to be achieved by:

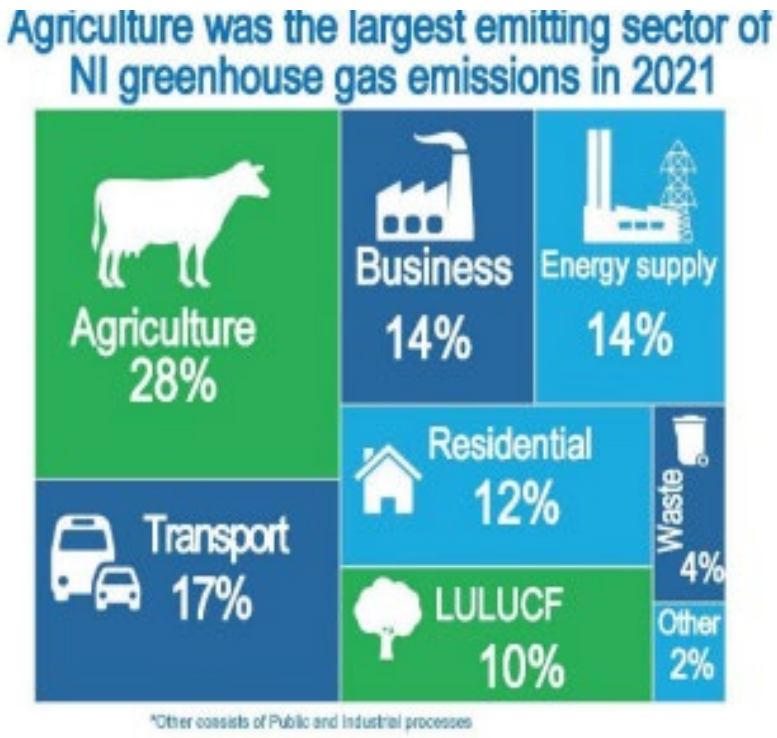
- Improved farm productivity;
- Widespread adoption of low-carbon farming practices;
- Widespread adoption of new and improved breeding, feeding and management practices to reduce GHG emissions;
- Reduction in livestock numbers by 2030:
  - 22% reduction in dairy cattle,
  - 17% reduction in beef cattle
  - 18% reduction in sheep, pigs and poultry.

DAERA Farm Support and Development Programme

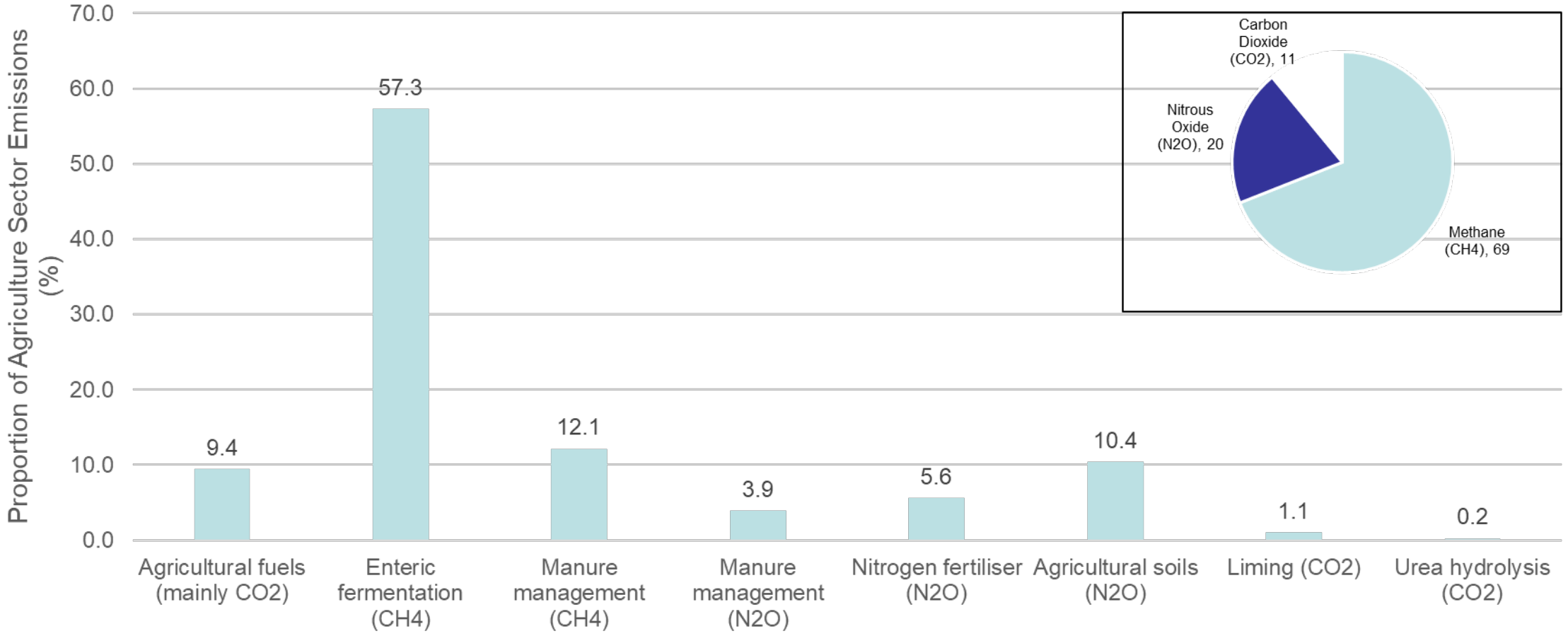
Emissions reductions are to be achieved by:

- Improved farm livestock productivity;
  - Age at slaughter, age at calving, calving interval;
- Widespread adoption of low-carbon farming practices;
  - Reductions in N fertiliser use through legumes & herbs;
  - Switch from CAN to Protected Urea;
- Widespread adoption of new and improved breeding, feeding and management practices to reduce emissions;
  - Breeding to improve cattle productivity;
  - Methane suppressing feed products;
  - Reductions in dietary crude protein and phosphorus;
- Reductions in the numbers of older non-breeding cattle;
- Increased AD/Biomethane using separated manure solids.

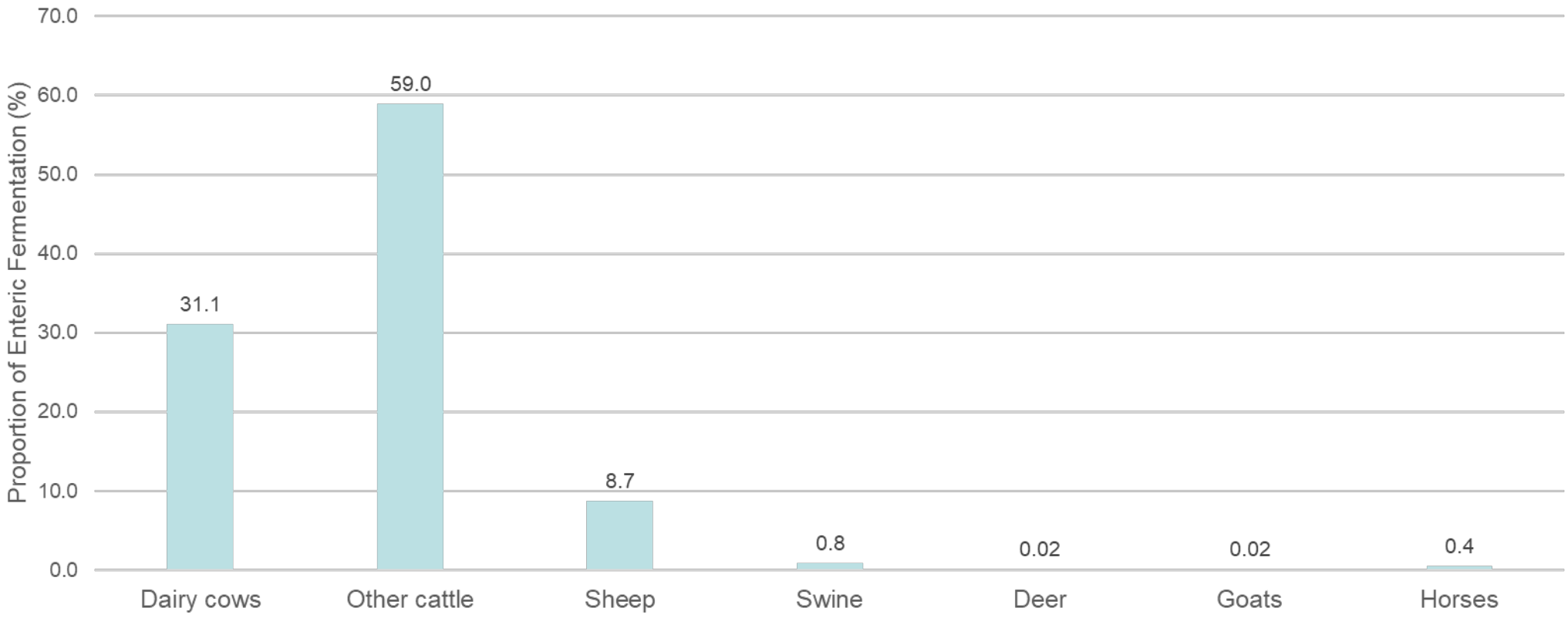
Agriculture Sector – Current Emissions



GHG Inventory - Emissions Breakdown by Source and Gas



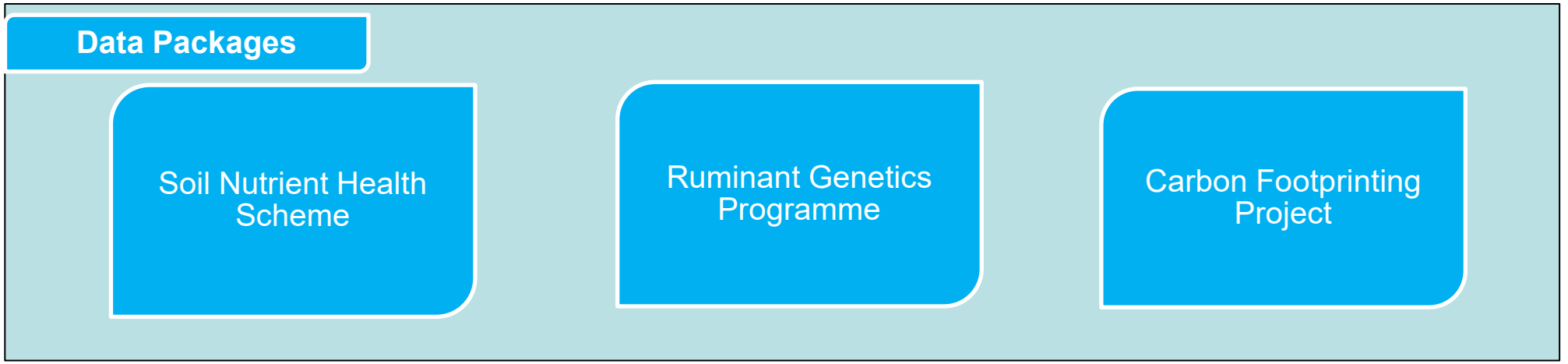
GHG Inventory - Enteric Fermentation - Breakdown by Species



Farm Support and Development Programme - Main Schemes

- Farm Sustainability Payment
- Beef Sustainability Package
- Farming with Nature Package
- Farming for Carbon Package
- Investment Measure
- Knowledge and Innovation Package
- Farming for the Generations
- Supply Chain Package

Cross-cutting Measures



Controls and Assurance

Monitoring and Evaluation

Horticulture

Farming for Carbon Actions

- Assist and incentivise farmers to adopt carbon reduction actions into their management will also be central to this future policy

- Seek to ensure that as many of the policy interventions as possible help drive down the carbon footprint of the agricultural industry

- Will evolve over time as baselines and reduction targets are established – starting with relatively simple measures that can assist all farm businesses now to begin to reduce their carbon footprint

Carbon Reduction Measures

Agriculture Measures	LULUCF Measures
Reductions in numbers of older non-breeding beef cattle (age at calving, replacement rate, age at slaughter)	Afforestation
	Agroforestry
Reductions in numbers of older dairy cattle (age at calving, calving interval, replacement rate)	Peatland rewetting
Feed additives (e.g. 3-NOP) and feed formulation	Soil carbon
Legumes and herbs/reduced fertilisers	Hedgerows
Breeding and genomics	
Urease inhibitor fertilisers	
Biomethane from waste	

Defra Dairy Demonstrator (1)

Northern Ireland specific requirements incorporated within Dairy Demonstrator:

- Minimum of 12 commercial dairy farms involved in Northern Ireland;
- Innovative diets to include methane inhibitors, crude protein reduction and phosphorus reduction;
- Target complete dairy cow diet crude protein level across the year – 16% by dry matter;
- Target phosphorus content of concentrates 5.0 g/kg DM or less;
- Knowledge transfer initiative in Northern Ireland from October 2024 onwards;
- MRV case for first methane inhibitors (e.g. 3-NOP) to be finalised by June 2025;
- Living Labs approach to provide evidence for policy development;
- Northern Ireland Living Lab with strong industry representation (Dairy Co-operatives, Feed Companies, Farmer representatives).

Defra Dairy Demonstrator (2)

Examples of what's in scope:

- Trialling multiple GHG measures in synchrony
- Trialling proven mitigation measures
- Methane suppressing feed products
- Precision formulated diets
- Tech to improve animal health and increase productivity
- Genetic testing of individual animal variability
- Tech to estimate or measure animal's GHG emissions
- Tech and mitigations to reduce nitrogen excretion impacts (should be directly applicable)

Defra Dairy Demonstrator (3)

- Launched 29 Nov 2023
- Call for bids from research led consortia
- Defra/DAERA hosted supplier event - Tue 12 Dec 2023
- Closing date for applications - 5 Feb 2024
- Anticipated to be a 3-year project delivered by one successful UK consortium

Methane Suppressing Feed Products (MSFP)

3-NOP being progressed through Defra Dairy Demonstrator project

- 3-NOP current formulation – needs fed 6-8 times/day
- 50% to 55% dairy cows fed by TMR
- Slow-release formulation by 2025?
- Kebreab et al meta-analysis: JDS 2023

NI example diets	Avg GS	Good GS+WC	Good GS+FM
3-NOP (mg/kg DM)	60	60	60
NDF (% DM)	36.3	36.8	37.0
Fat (% DM)	6.0	5.7	5.5
Starch (% DM)	10.5	12.6	14.2
CH4 change (% g/day)	-20.8	-21.3	-21.7

- % Change CH4 = -32.4 - 0.282*(3NOP (mg/kg) - 70.5) + 0.915*(NDF (% DM) - 32.9) + 3.080*(Fat (%DM) - 4.2)

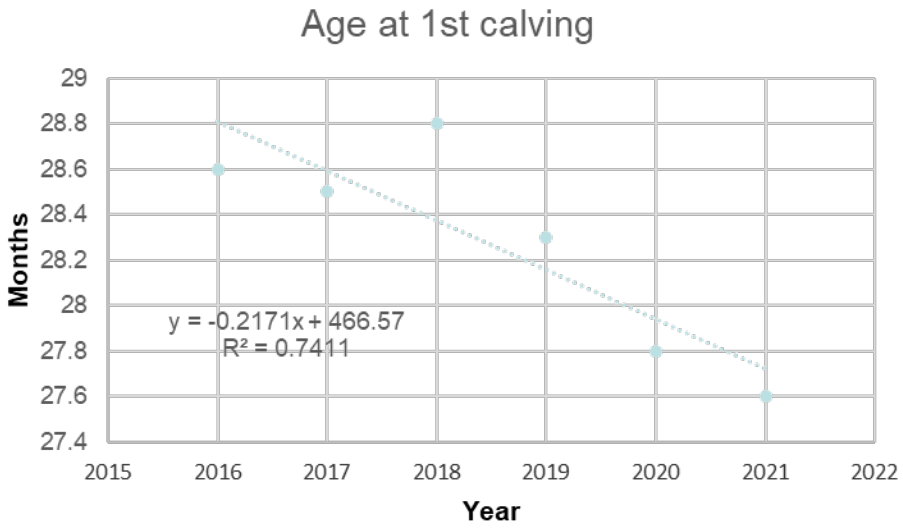
- Additional methane suppressing feed products available e.g. nitrates and essential oil products
- Other products being researched include: Rumenglas (Calcium peroxide) and seaweed products

Reducing age at 1st Calving - Dairy Replacements

- APHIS average age at first calving 30.9 months in 2020
- Dale Farm & NMR milk recording suggests latest (2022) calving age is 24.6 months
- Reduced age at 1st calving delivers a quantifiable reduction in emissions without impacting milk output

Year	'Filtered' Age 1st Calving (months)
2016	28.6
2017	28.5
2018	28.8
2019	28.3
2020	27.8
2021	27.6

C. Hamill 2023 - Analysis excludes: 1st Calving ages <18 months & >39 months



Reducing replacement rate in Dairy Herds

- Ideal economic and environmental replacement rate – 20% (Dallago et al Canada 2021)
- Options to reduce replacement rate:
    - Genetics – enviro-cow PTA
    - Management
    - Crossbreeding – Hansen et al Minnesota (2020)
- Quantifiable reduction in dairy farm emissions through fewer replacement heifers on dairy farms
- **Impact on overall cattle emissions across dairy and beef?**
    - Reduced cull dairy cow beef
    - Increased dairy bred beef animals for slaughter

	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Dairy herd replacement rate	31%	29%	27%	29%	30%	30%

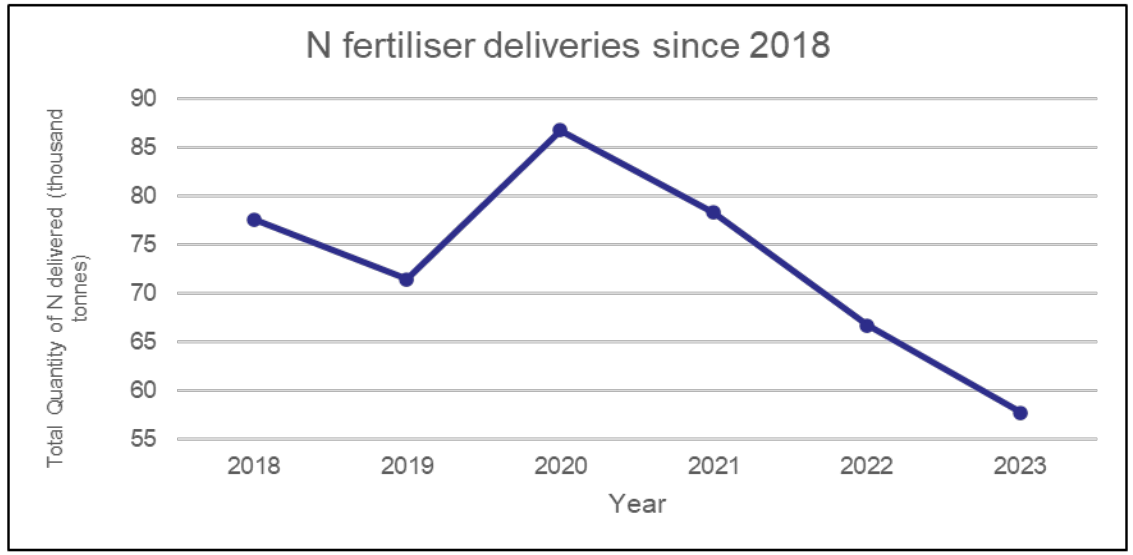
Reducing Calving Interval in Dairy Herds

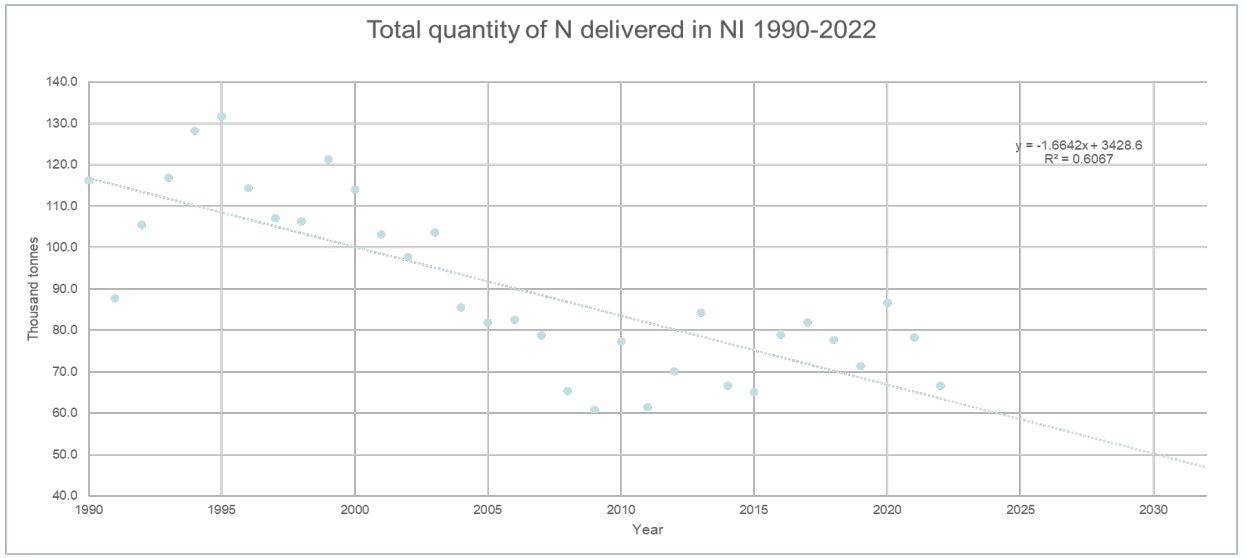
- Ideal economic and environmental replacement rate – 365 (days)? – 380 (days) more realistic target
- Options to reduce replacement rate:
    - Genetics – Fertility Index PTA
    - Management
    - Crossbreeding – Hansen et al Minnesota (2020)
- **Impact on overall emissions across dairy and beef?**
- Reduced calving interval:-
    - Increase in milk yield per cow per year
    - Increase in dairy herd margins
    - Increase in dairy bred beef calves
- Potential to maintain beef and milk output with fewer cows while increasing margins?

Year	Calving Interval Milk Recording (days)	Calving Interval APHIS Analysis (days)
2019	405	402
2020	407	401
2021	405	400
2022	404	
2023	403	

Source: Dale Farm Milk Recording & C. Hamill CAFRE

Reducing N Fertiliser Use and Switch to Protected Urea





- Total N fertiliser deliveries in 2023 down by 33% compared to 2020
- Switching from CAN to Protected Urea significantly reduces N2O emissions
- Current fertiliser use considerably lower than 1995 peak
- But – impact on feed use and Nitrogen and Phosphorus balances?
- Necessity to maintain forage output

Legumes and herbs

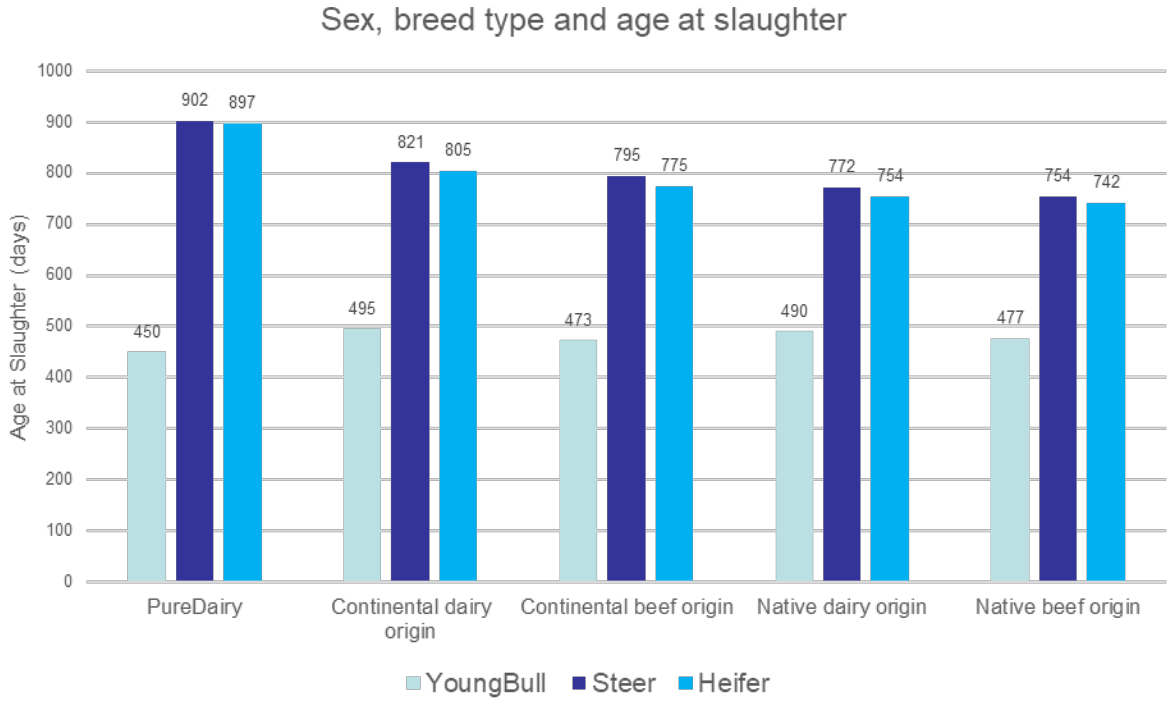
- Past research and experience of clover - CAFRE Beef and Sheep Centre
- Clover incorporation programme ongoing - CAFRE Dairy Centre
- Appropriate soil pH and fertility – SNHS
- Agrisearch ZeroNsile project on red clover
- Defra funded, Germinal led NEU-Leg project
- Teagasc Solohead into 4th year of a 'Clover-Zero' dairy system study
- Growing same forage yields (15 t DM/ha) as 275 kg N control

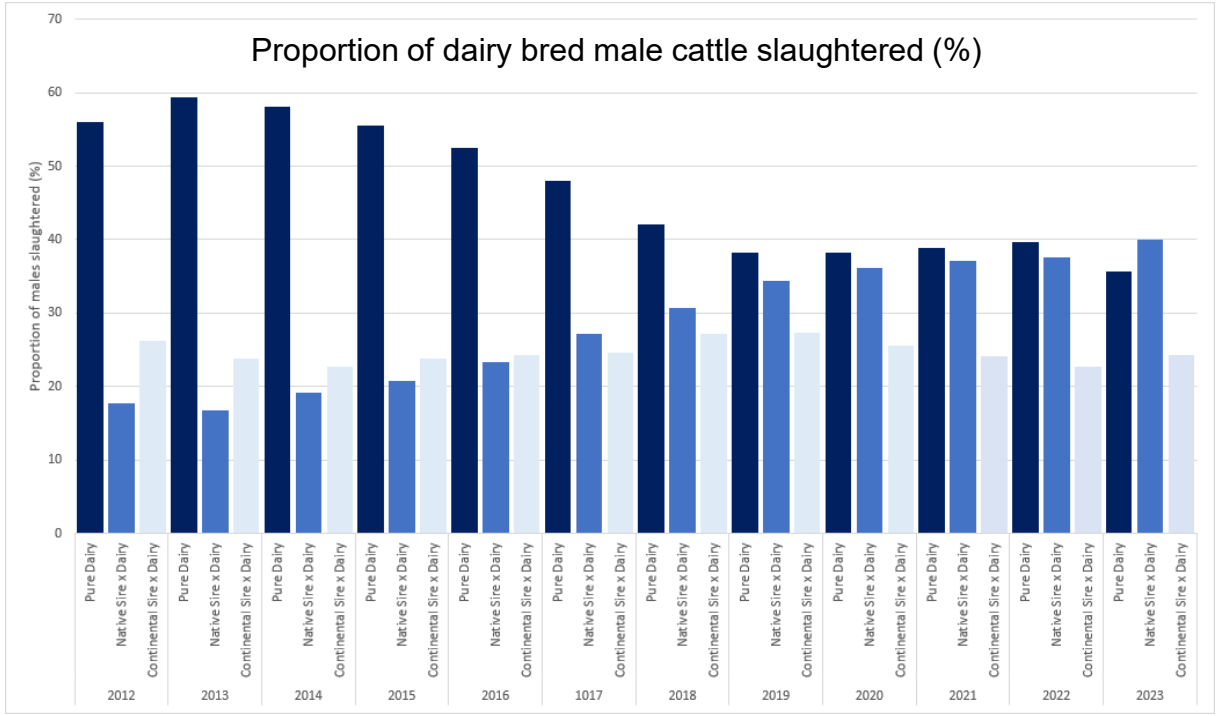
Solohead Dairy Systems (t DM/ha)

System	Control	Clover - Zero
Kg N/ha	275	0
2021	15.5	15.4
2020	15.0	15.3
2019	15.5	14.9

Ruminant Genetics Programme and Dairy Bred Beef

- Considerable scope to select for improved longevity, fertility and feed efficiency
- Dairy bred beef – considerable scope for genetic improvement





Source: AFBI Bovine Information System (BOVIS)

Livestock Manures and Biomethane from Grass

Anaerobic Digestion of 2.5% of managed cattle and pig slurry (2021 GHG Inventory)

Biomethane proposals – KPMG + Action Renewables (2022):

- Proposed biomethane target of 1.4 TWh by 2030
- 70 No. 20 MW AD-Biomethane plants with feedstock:
    - 48,000 tonnes grass silage
    - 16,000 tonnes cattle slurry and 16,000 tonnes pig slurry
    - Equates to an additional 6% of managed cattle and pig slurry utilised for biomethane
- Sustainable Utilization of Livestock Slurry (SULS) SBRI projects – separated slurry solids
- Potential to reduce manure emissions through slurry aeration and slurry additives

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Understanding Carbon: CAFRE Dairy Farm

Michaela Tener
Sustainable Land Management Branch
CAFRE

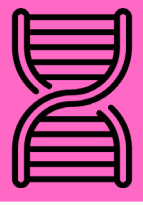
DAERA
Department of Agriculture, Environment and Rural Affairs
www.daera-ni.gov.uk

CAFRE Herd performance

Herd Size:
181

Nutrition:
- **Meal Fed per cow:** 2.47t
- **Feed Rate:** 0.28kg/ltr

Milk From Forage: 3,192 ltrs



Replacement Rate: 27%

Annual Production/cow:
- **Liquid milk:** 8,679 ltrs
- **Milk solids:** 680 kgs
- **P:** 3.48%
- **BF:**4.34%

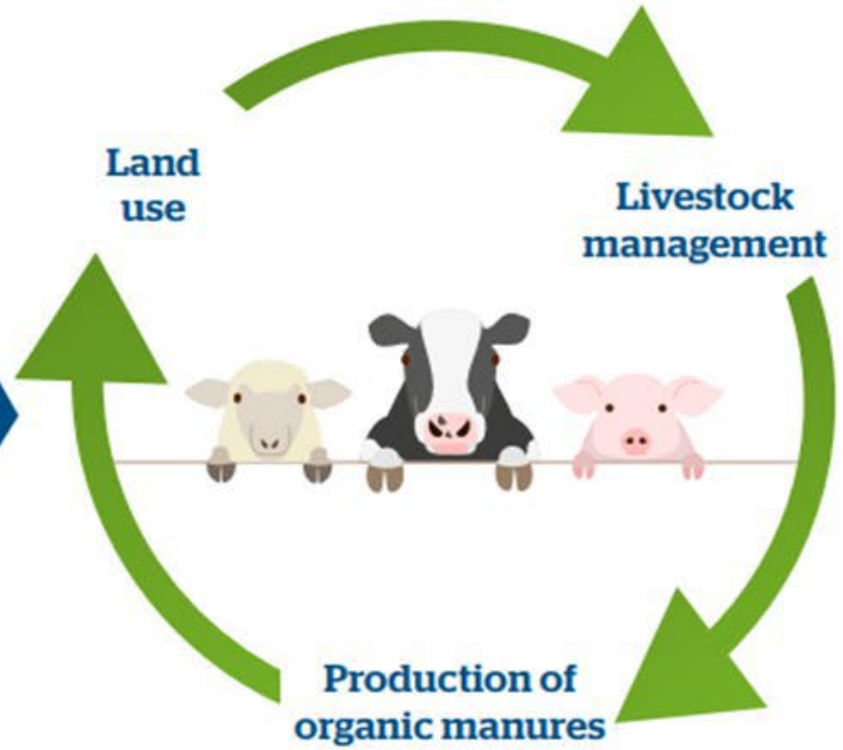
Breeding Performance:
- **Calving Interval:** 384 days
- **Age at 1st Calving:** 24.7 months

Carbon Management at CAFRE

- Measure to manage
- Understand sources of emission
- Tool to support business planning
- Farm business sustainability

Farm Inputs:

- Concentrate feed
- Purchased crops/silage
- Fertilisers (N, P & K)
- Lime
- Organic manures
- Crop protection products
- Fuel
- Electricity
- Bedding
- Purchased stock



Farm Outputs:

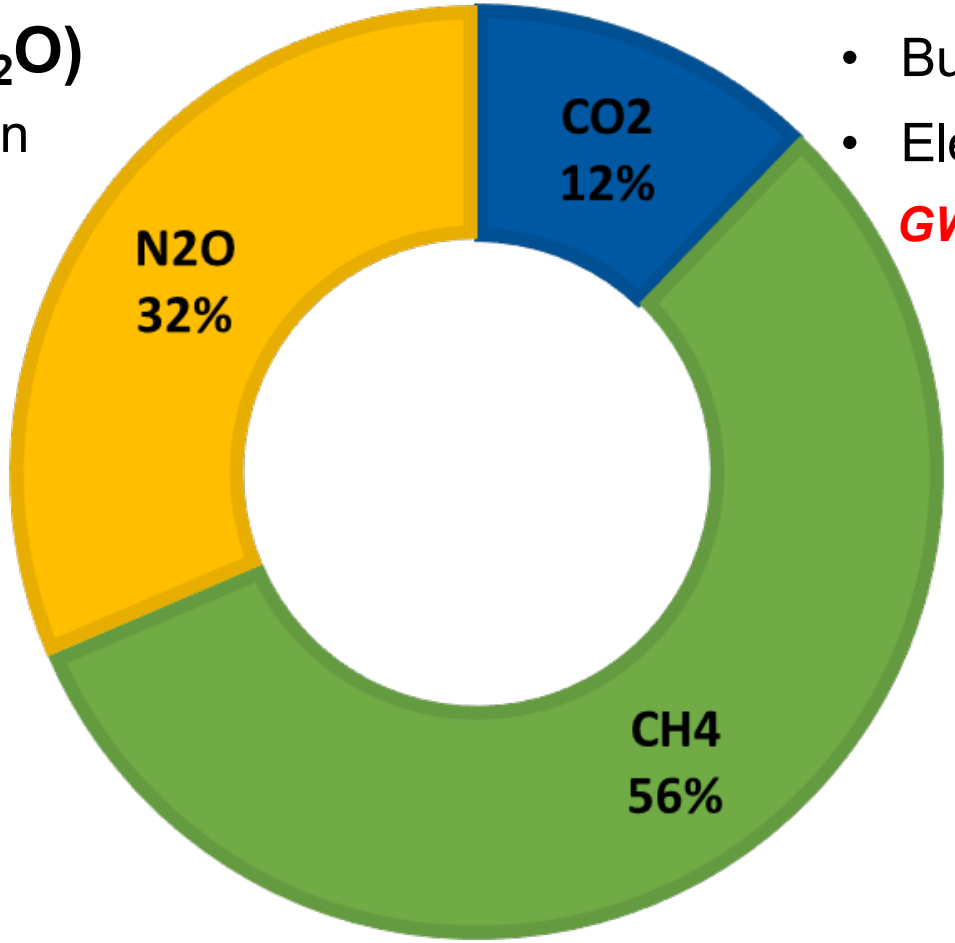
- Livestock sales - live and dead
- Crops / Silage sales
- Exported organic manures

Agricultural GHG Emissions

Nitrous oxide (N_2O)

- Fertiliser application
- Nitrogen cycling

GWP 273



Carbon dioxide (CO_2)

- Burning of fossil fuels - diesel
- Electricity

GWP 1

Methane (CH_4)

- Enteric Fermentation
- Manure Management

GWP 27.2

GWP=Global Warming Potential

GWP correct for AR6 report

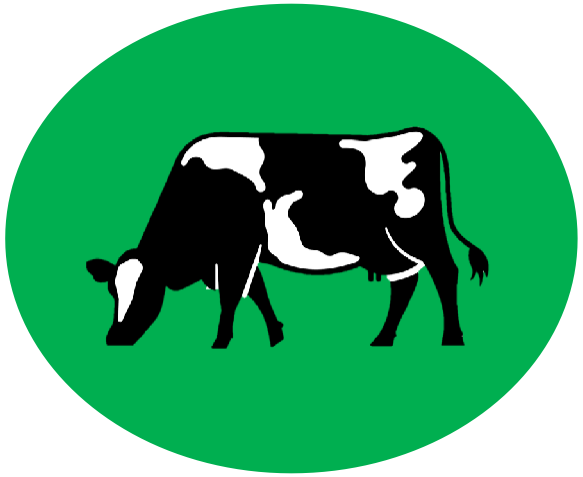
CAFRE Dairy Enterprise

Calculated Emissions: 2193 tCO2e

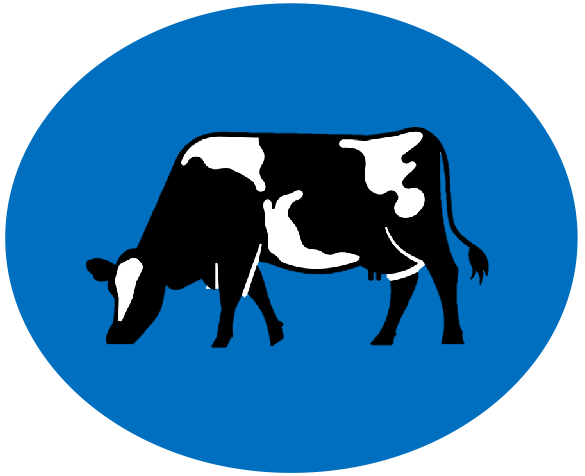
*2022

www.cafre.ac.uk

Carbon Intensity



CAFRE: 1.23



Top 25%: 1.18

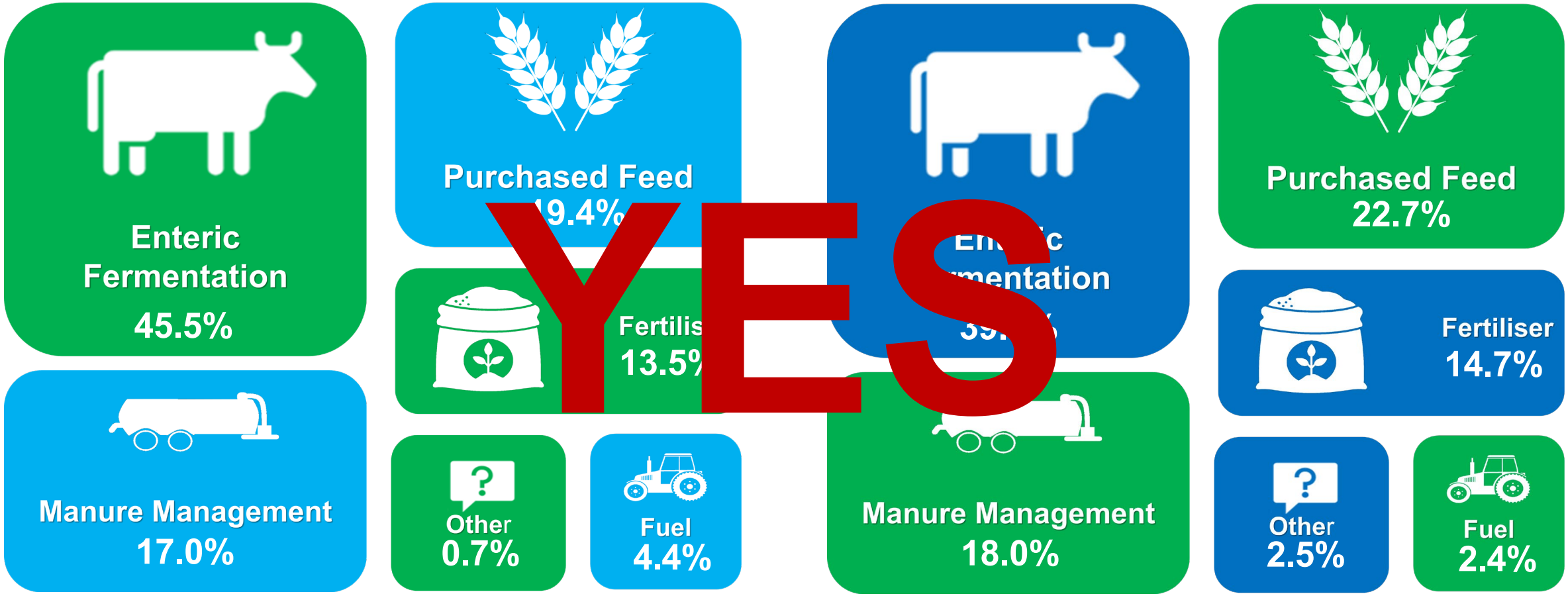
NI Average: 1.38

Bottom 25%: 1.61

*Figures quoted as kg CO2e/kg FPCM

www.cafre.ac.uk

Is CAFRE typical of NI dairy systems?



CAFRE

NI Average

CAFRE Journey to 2030

Potential GHG Reductions

- Enteric Fermentation -7%
- Purchased Feed
- Fertiliser -5%
- Manure Management
- Other
- Fuel

Dairy Enterprise

Key themes

- Measure to manage
- Understand sources of emission
- Tool to support business planning
- Farm business Sustainability

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Understanding Carbon: Mitigations and Adaptations

Alan Agnew

Senior Dairying Adviser, CAFRE

How can we reduce emissions at CAFRE, Greenmount?

Feed

Livestock

Forage

Manure/Fertiliser

Mitigating Emissions

Feed

- Low Crude Protein Diets
- Higher Starch Diets
- Including Lipids
- Feed additives/methane inhibitors
- Origin of feed ingredients

Mitigating Emissions

Livestock

- Genetic Improvement
- Reducing Age at first calving
- Improved fertility
- Improved animal health

Herd Genetic Report

Holstein Herd Standards

Excel Version

The table below shows your current herd averages bench marked (highlighted in yellow) against current UK breed percentiles. Each trait is evaluated individually; a herd in the top 1% for milk can equally be in top 10% for protein. All averages are calculated from live cows. Please note; all animals, including cross bred animals, are included in the benchmarking table, determined by their breed code.

Compare against national averages for Milking Herd

Percentile	£PLI	Healthy Cow	Enviro Cow	PTA Milk (kg)	PTA Fat (kg)	PTA Prot (kg)	change PTA Fat (%)	PTA Prot (%)	Lifespan	SCC	Fertility Index	Mastitis	Maintenance
1	310	114	1.4	429	17.1	13.7	0.15	0.10	66	-9.4	9.0	-1.3	-26.7
5	250	95	1.1	323	13.6	10.8	0.10	0.07	51	-7.5	6.3	-0.8	-18.2
10	218	85	1.0	268	11.6	9.1	0.08	0.05	44	-6.5	5.0	-0.6	-12.2
15	195	79	0.9	227	10.1	8.0	0.07	0.04	39	-5.8	4.2	-0.5	-8.6
20	174	73	0.8	192	8.9	7.0	0.06	0.04	35	-5.2	3.6	-0.4	-6.7
25	156	69	0.7	163	7.8	6.1	0.05	0.03	32	-4.6	3.0	-0.3	-5.2
30	142	64	0.6	134	6.8	5.3	0.04	0.03	29	-4.1	2.5	-0.3	-4.1
35	126	59	0.6	109	5.9	4.5	0.04	0.02	27	-3.6	2.2	-0.2	-3.3
40	110	55	0.5	82	4.9	3.6	0.03	0.02	24	-3.1	1.8	-0.2	-2.5
45	94	50	0.5	55	3.9	2.8	0.03	0.02	22	-2.6	1.4	-0.1	-1.9
50	79	46	0.4	22	2.8	2.0	0.02	0.01	19	-2.0	1.0	-0.1	-1.1
55	61	41	0.3	-9	1.7	1.1	0.02	0.01	16	-1.4	0.6	0.0	-0.5
60	45	35	0.3	-41	0.3	0.0	0.01	0.01	14	-0.8	0.2	0.0	0.1
65	24	29	0.2	-81	-1.2	-1.3	0.01	0.00	10	-0.2	-0.2	0.1	0.7
70	1	23	0.1	-129	-3.2	-2.9	0.00	0.00	7	0.8	-0.6	0.2	1.5
75	-22	15	0.0	-187	-5.1	-4.6	0.00	0.00	2	1.9	-1.2	0.3	2.2
80	-56	4	-0.1	-256	-7.7	-6.7	-0.01	-0.01	-5	3.4	-1.8	0.4	3.1
85	-106	-12	-0.4	-338	-10.1	-8.9	-0.02	-0.01	-16	5.0	-2.5	0.5	4.0
90	-193	-54	-0.7	-436	-13.4	-12.1	-0.03	-0.02	-42	7.3	-3.4	0.7	5.0
95	-301	-113	-1.2	-569	-18.6	-16.4	-0.04	-0.03	-74	9.7	-4.8	1.0	6.7

Mitigating Emissions

Forage

- Grass/Legume Mixes
- Improved forage quality
- Inclusion of maize silage (or wholecrop) in diet
- Multispecies Swards

Mitigating Emissions

Manure/Fertiliser

- Low Emission Slurry Spreading
- Use of inhibitors (protected Urea)
- Covering Slurry Stores
- Slurry additives/processing
- Nutrient Management Planning

Carbon Balance

Emission Reductions:	tCO2e
• Improve milk from forage	23.7
• Reduce replacement rate	41.7
• Reduce fertilizer use	14.4
• Improve animal health	21.9
• Improve genetics	21.9
• Feed Additive	153.5

Total reduction 277.1 tCO2e (13%)

Additional Sequestration:	tCO2e
• 4.5 ha to forestry	63.0
• *Bulking* of hedgerows	9.4
• Improved soil OM	115.5

Total add. sequestration 187.9 tCO2e

Net Emissions improved by 465.0 tCO2e (21%)

Adaptations

Forage

Increasing number of cow tracks and entry points

Sward species, drought resistant?

Livestock

Cooling fans in collecting yards / cattle housing

Further use of Breeding Indices

Manure/Fertiliser

Shallow injection to reduce run-off

Volume of slurry storage

Feed

Home-grown cereals & proteins

Acreage of maize/wholecrop

Key messages

- Improving farm efficiency generally improves carbon efficiency as well as profitability – Win Win
- The aim is to maintain output while reducing emissions – We’re still producing food.
- Carbon is only one part of the story – Sustainability.
- Start the journey – Measure and manage.