



*Feed Industry Solutions to contribute to reaching zero-net GHG emission targets in animal production*

19 October 2021



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 Centre for Innovation Excellence in Livestock

[www.CIELivestock.co.uk](http://www.CIELivestock.co.uk)



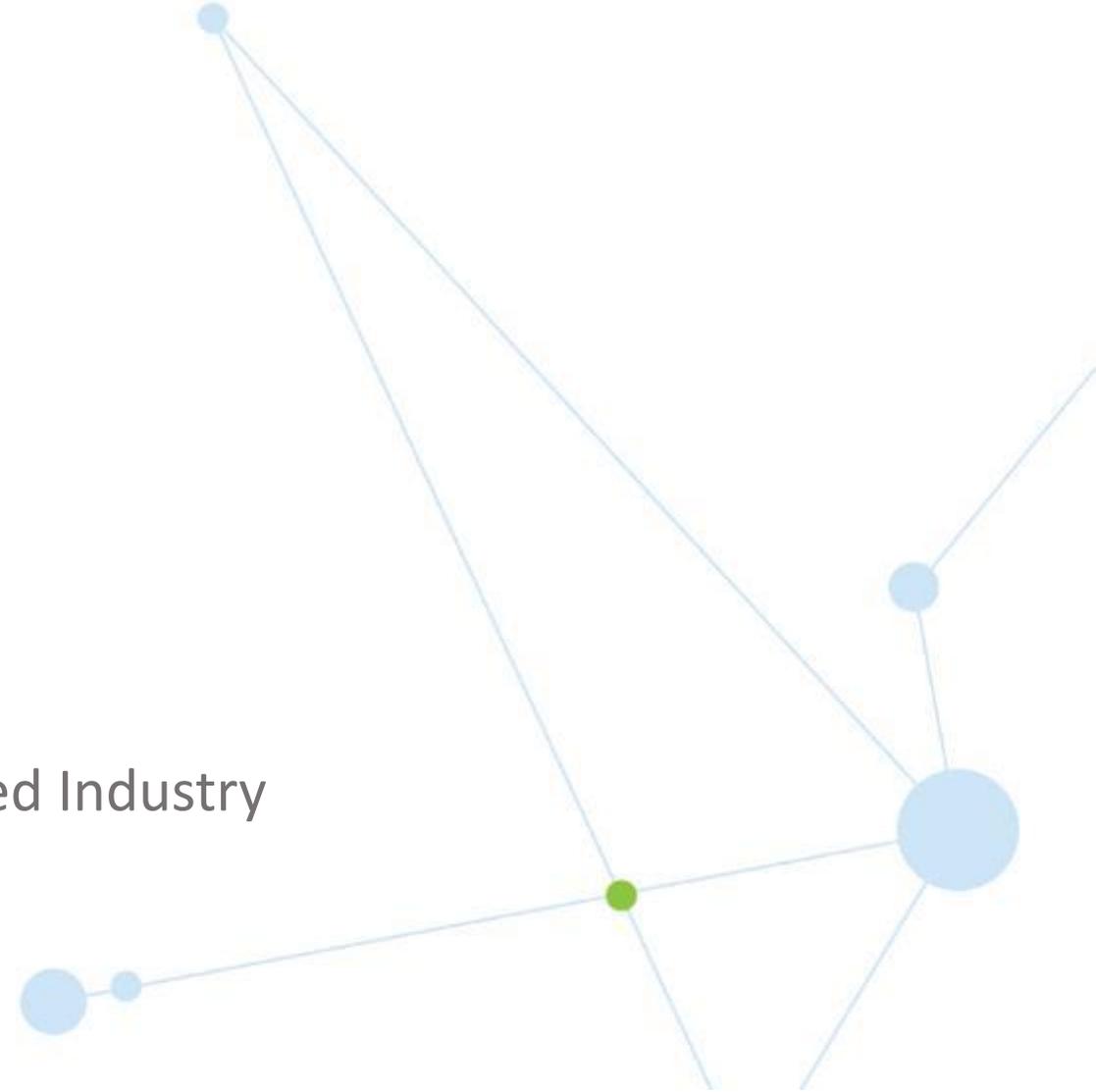


**NET ZERO**  
**& LIVESTOCK**



## Outline:

- ▶ Introduction
- ▶ CIEL Overview
- ▶ Net Zero & Livestock
  - ▶ Work to-date
  - ▶ Future Plans
- ▶ Observations and Challenges for Feed Industry





# CIEL Overview





Inspiring Innovation across  
the agrifood sector

The 4 UK Agri-Tech Centres are a collaboration between Government,  
academia and industry - established to drive greater efficiency, resilience and  
wealth across the sector

# Innovation to feed the world sustainably with One Health & One Nutrition solutions – animals, people, planet



- ▶ **The front door** for research & innovation in livestock food production
- ▶ **Providing leadership** by joining up pockets of excellence to form world-class hub of expertise
- ▶ **Creating valuable collaborations** between UK's livestock research institutions and industry
- ▶ **Facilitating access** to major capital investment in commercially relevant research capability
- ▶ **Areas of focus & investment**
  - ▶ Feed & Nutrition
  - ▶ Environmental Impact
  - ▶ Animal Health, Behaviour & Welfare
  - ▶ Genetic technologies



# CIEL Industry Members



**WAITROSE & PARTNERS**

**WYNNSTAY**

Retail / Suppliers

**TESCO**

**Morrisons**  
Since 1899

**Mole Valley FARMERS**

**Germinal**  
Sowing future seeds

**DEVENISH**  
Beyond Nutrition

**volac**

**Livestock Feed & Nutrition**

**Cargill**

**ab agri**

**DAVIDSON'S**  
Animal Feeds

**ED&F MAN**  
EST. 1789  
Liquid Products

**Cloudagri**

**for farmers**  
the total food business

**Anpario**  
Nature's Answer

**ufac-uk**

**zoetis**

**XL Vets**

**Greengage**  
Enlightened Farming

**NEMESIS BIOSCIENCE**

**Biotangents**

aga nanotech

**PROSLIN Technologies**

**Chordata**

**Livestock Health & Welfare**

**MSD**

**Quantech Solutions**  
Food Chain and Bioscience

**Mileutis**

**CHEMITEQ LIMITED**

**SEMEX**  
Genetics for Life®

**FOLIUM Science**

**WOLF-HOUND**

**anifera**

**Boehringer Ingelheim**

**Antler bio**

**RAFT**

**FARM**

**070 innovations**

**BioSS**

**@breedr**

**Eggbase**  
Share the power of eggs

**glas data**

**On Farm Solutions**

**MAP OF AG**

**ISOMETRICA**  
51.43895°N - 2.07992°W

**MIRICO**  
Transformational Gas Measurement

**Shearwell Data**  
Animal Identification & Management Systems

**ICEROBOTICS**

**SCI**

**N2 — Applied**

PigRegen Ltd

**bmpa**  
British Meat Producers Association

**AHDB**

**bsas**  
British Society of Animal Science

**RABDF**  
Working for British Dairy Farmers

**Associations & Societies**

**aic**  
Agricultural Industries Confederation

**AgriSearch**  
Driving Excellence & Innovation

**TEXEL SHEEP SOCIETY**

**HYBU CIG CYMRU**  
MEAT PROMOTION WALES

**QMS**  
Quality Meat Scotland

**Saputo**  
Dairy UK

**Arla**

**CRANSWICK COUNTRY FOODS**

**WINTERBOTHAM/DARBY**

**Stonegate**

**Food Processors**

**dunbia**

**BUITELAAR GROUP**

**abp Food Group**

**HILTON Food Group plc**

**DOVECOTE PARK**

**KARRO FOOD GROUP**

**WAGYU**

**Moy park**

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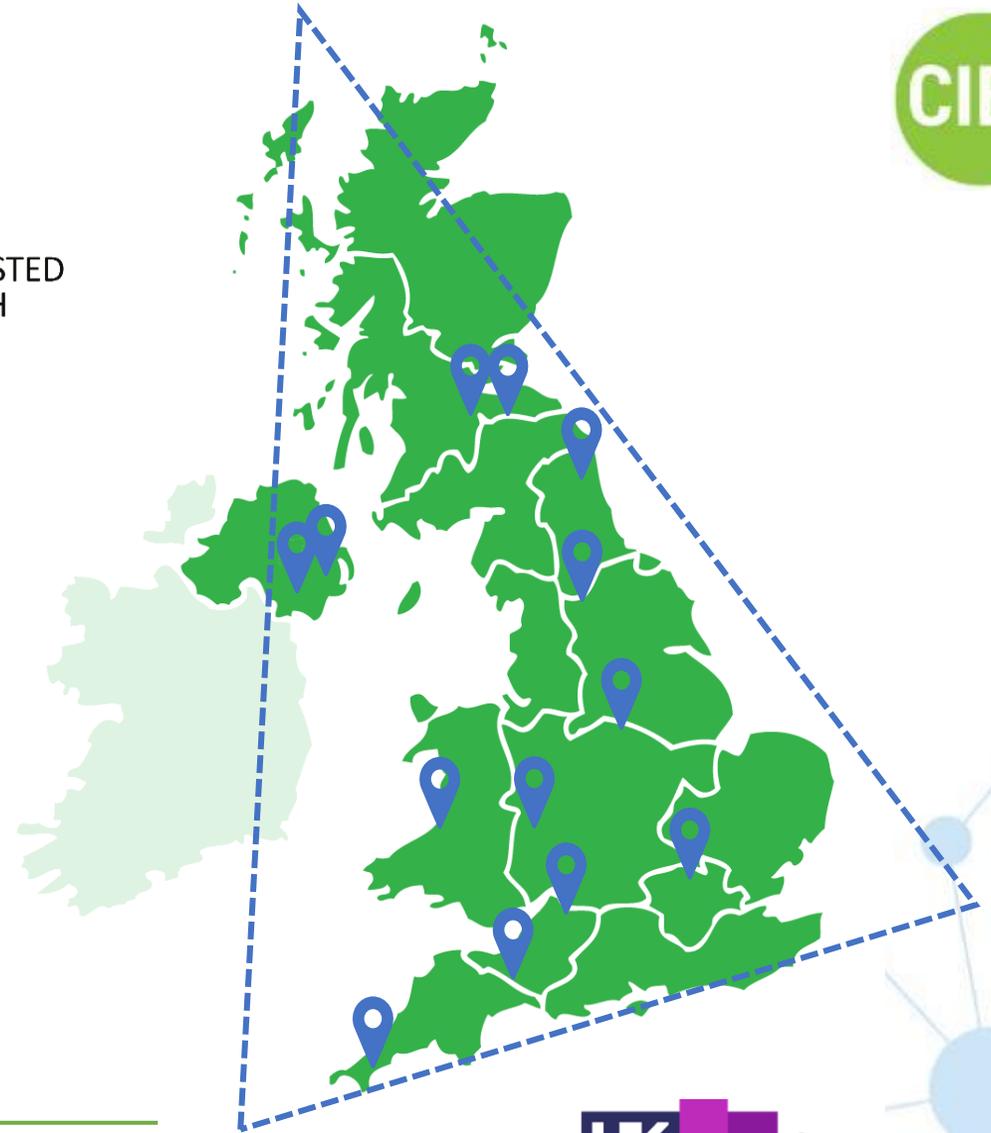
Moy park

# Tackling grand challenges for livestock food production

- ▶ Climate Smart Food Systems
- ▶ Resource Efficiency & Precision Nutrition
- ▶ Endemic Disease Reduction
- ▶ Antimicrobial Resistance
- ▶ Health & Welfare Management
- ▶ Food Safety, Quality & Integrity



# Research partners across the UK



Joint investments Collaborative working Open access New research partnerships welcome



# Snapshot of key capability

Network of National Livestock Research Centres Dairy, Beef and Sheep



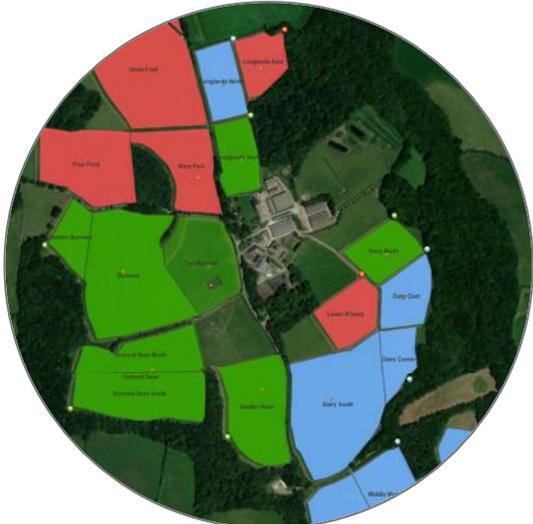
## Centre for Dairy Science Innovation (CDSI)



## AFBI Research Farm and Precision Grassland Platform



## North Wyke Farm Platform



# Snapshot of key capability



## Network of National Livestock Research Centres

Pig 

National Pig Centre



UNIVERSITY OF LEEDS



Poultry 

Allermuir Avian Innovation  
and Skills Centre





# Net Zero & Livestock



**NET ZERO**  
**& LIVESTOCK**

# Net Zero Carbon & UK Livestock - 2020 work



**CIEL**  
Centre for Innovation  
Excellence in Livestock

NET ZERO CARBON  
& UK LIVESTOCK

WWW



d roles of livestock  
d **summary** of current

ading Universities  
stock, **identifying:**

missions

bility)

stock

# Net Zero Carbon target



- ▶ Agriculture's ambition to contribute to Net Zero Carbon for UK is through delivery of **a 64% reduction in carbon emissions**
  - ▶ Assume same target for livestock
- ▶ CIEL report **Net Zero Carbon & UK Livestock** calculates that livestock can only deliver **38% of that goal** by 2050 (*i.e.* a **24%** reduction) using technologies available now  
*.... and even that requires high uptake of all known technologies*

*So, what can we do now?*



# Hot spots for emissions Using Life Cycle Assessments, so full carbon cost estimated

Dairy



## Carbon footprints of 3 conventional dairy systems

	Unit	C1	C2	C3
Grazing access	days/year	270	180	0
Milk yield (energy corrected)	kg/cow/year	5,500	7,800	9,200
Feed carbon footprint (minus N application)	kg CO <sub>2</sub> -eq/kg milk	0.30	0.37	0.35
Enteric methane	kg CO <sub>2</sub> -eq/kg milk	0.69	0.47	0.44
Manure management methane	kg CO <sub>2</sub> -eq/kg milk	0.08	0.10	0.13
Nitrous oxide	kg CO <sub>2</sub> -eq/kg milk	0.17	0.12	0.09
<b>Total carbon footprint (beef + dairy)</b>	kg CO <sub>2</sub> -eq/kg milk	<b>1.24</b>	<b>1.06</b>	<b>1.01</b>

C1 = grazing most of year  
 C2 = grazing half of year  
 C3 = fully housed



# Hot spots for emissions

## Beef cattle



Major hotspots for a pasture-based beef finishing system.  
Values = kg CO<sub>2</sub>-eq/kg LW

	Permanent pasture
Enteric fermentation (CH <sub>4</sub> )	7.09
Manure management (CH <sub>4</sub> + N <sub>2</sub> O)	2.51
Ammonium nitrate fertiliser production	3.56
Fertiliser application (N <sub>2</sub> O)	2.03
Others	3.28
<b>Total</b>	<b>18.47</b>

CH<sub>4</sub> = Methane & N<sub>2</sub>O = nitrous oxide

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# Hot spots for emissions

## Poultry (chicken meat)



Carbon footprints of UK's major chicken meat supply-chains.  
Values reported as kg CO<sub>2</sub>-eq/kg meat

Material or activity	Standard	Free range	Organic
Feed & water	3.14	3.69	4.08
Electricity	0.16	0.15	0.17
Gas & oil	0.43	0.34	0.31
Housing & land	0.53	0.78	1.03
Manure & bedding	0.14	0.16	0.08
<b>Total</b>	<b>4.41</b>	<b>5.13</b>	<b>5.66</b>

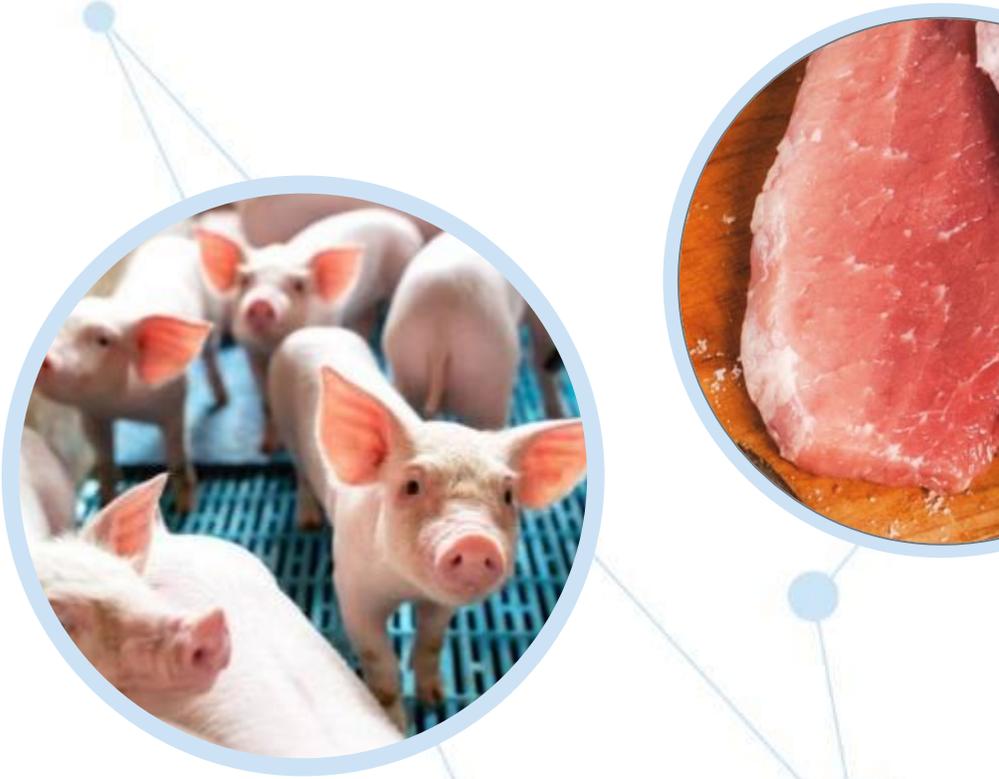


# Hot spots for emissions



Simple breakdown of the UK's two major supply chains' hotspots.  
Values reported as kg CO<sub>2</sub>-eq/kg LW

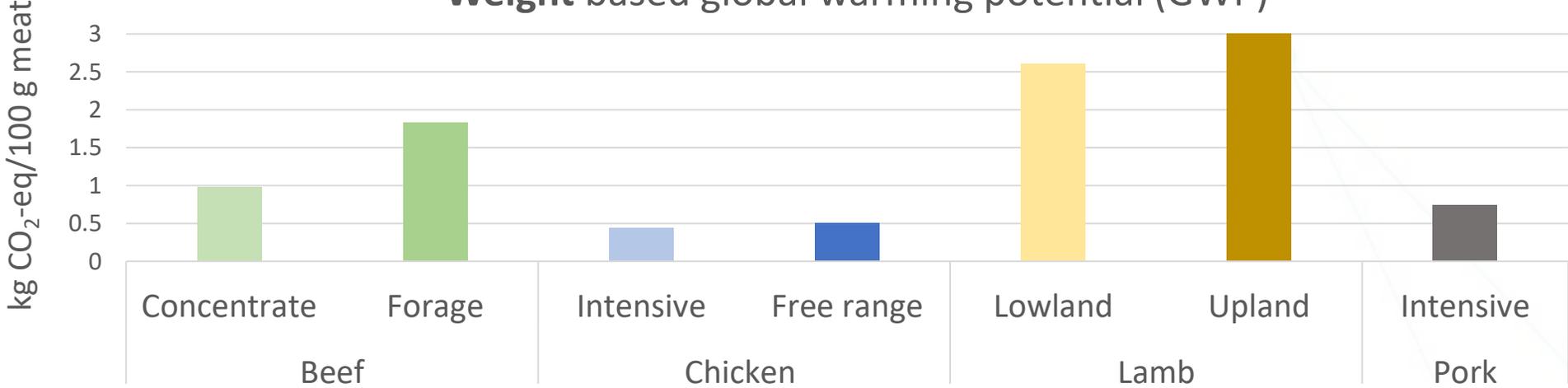
	Indoor (I)	Outdoor (O)
Feed	2.06	2.08
Manure management & enteric methane	0.08	0.09
Electricity	0.28	0.32
<b>Total</b>	<b>2.42</b>	<b>2.49</b>



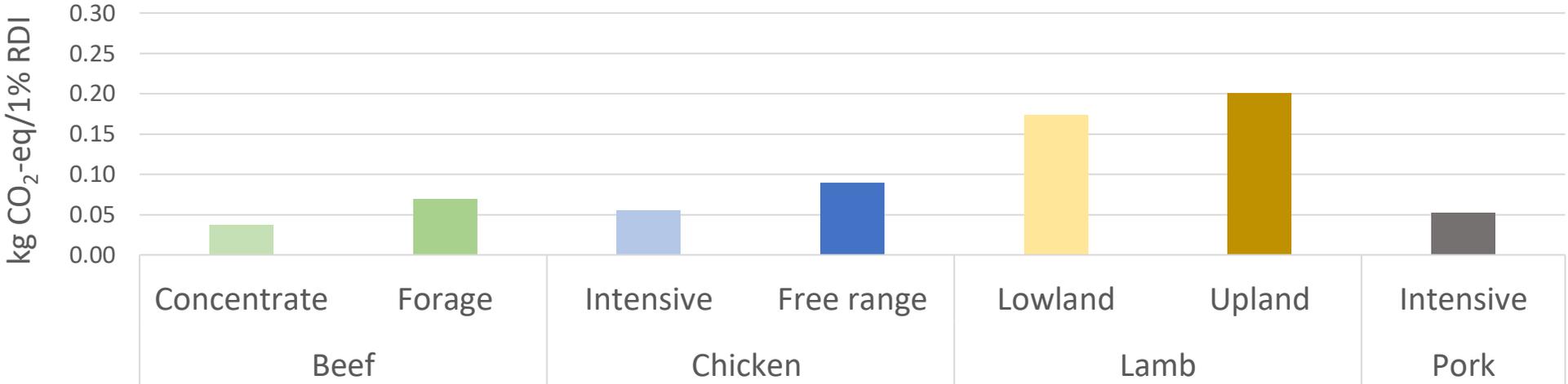


# Weight does not describe nutritional value

### Weight based global warming potential (GWP)



### Nutrient based global warming potential (GWP)



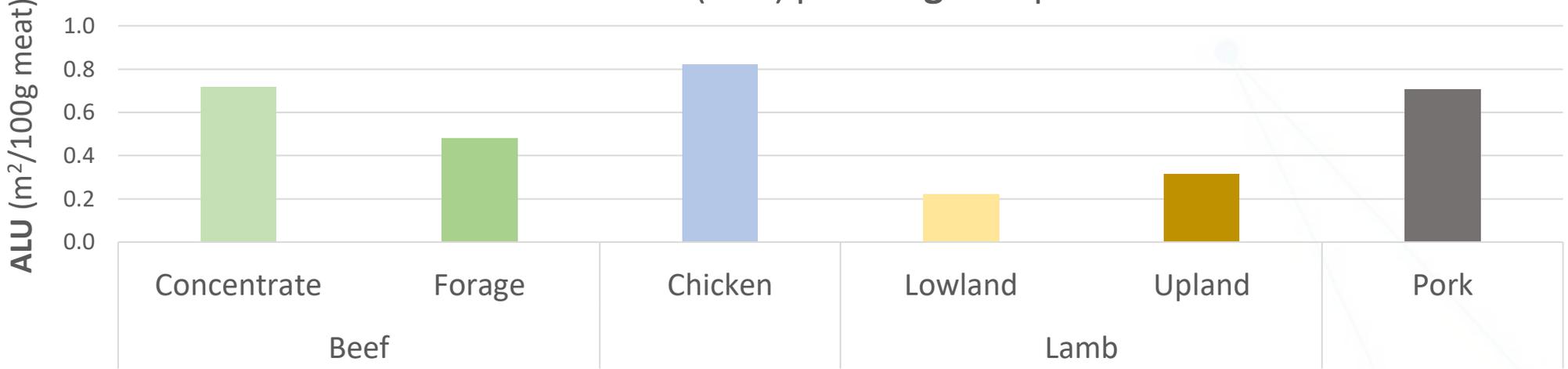
Source: McAuliffe, Takahasi, Lee 2018  
Rothamsted Research UK



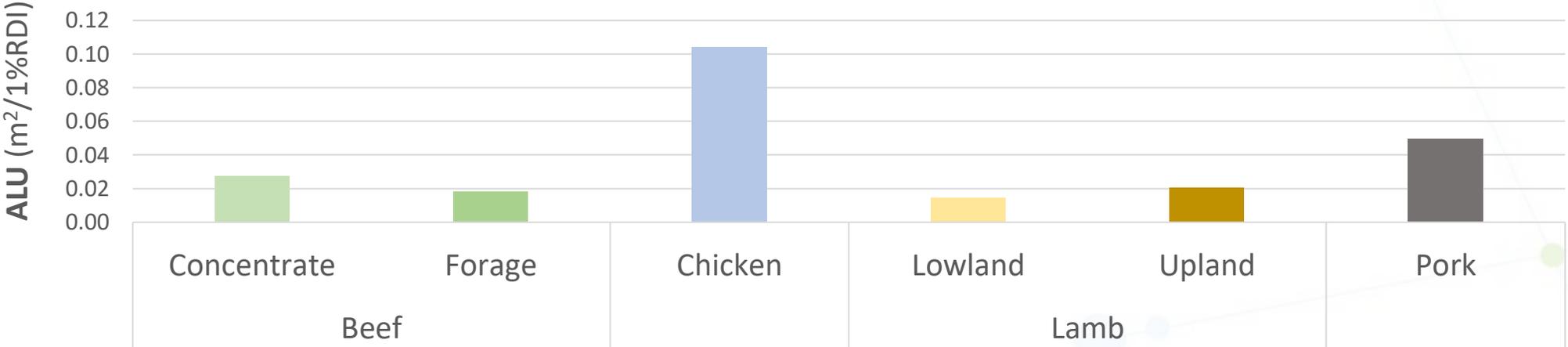


# Sustainability is Not Just Carbon

### Arable land use (ALU) per weight of product



### Arable land use (ALU) per unit of nutrient density



# On farm strategies for reducing emissions

1. Improved efficiency
  - ▶ genetics, growth rate, animal health
2. Novel & alternative feeds
3. Addressing nitrogen fertiliser use
4. Smart technology & precision livestock farming
5. Carbon sequestration, optimising soil health & accounting for this
6. Better carbon accounting tools to inform farm managers

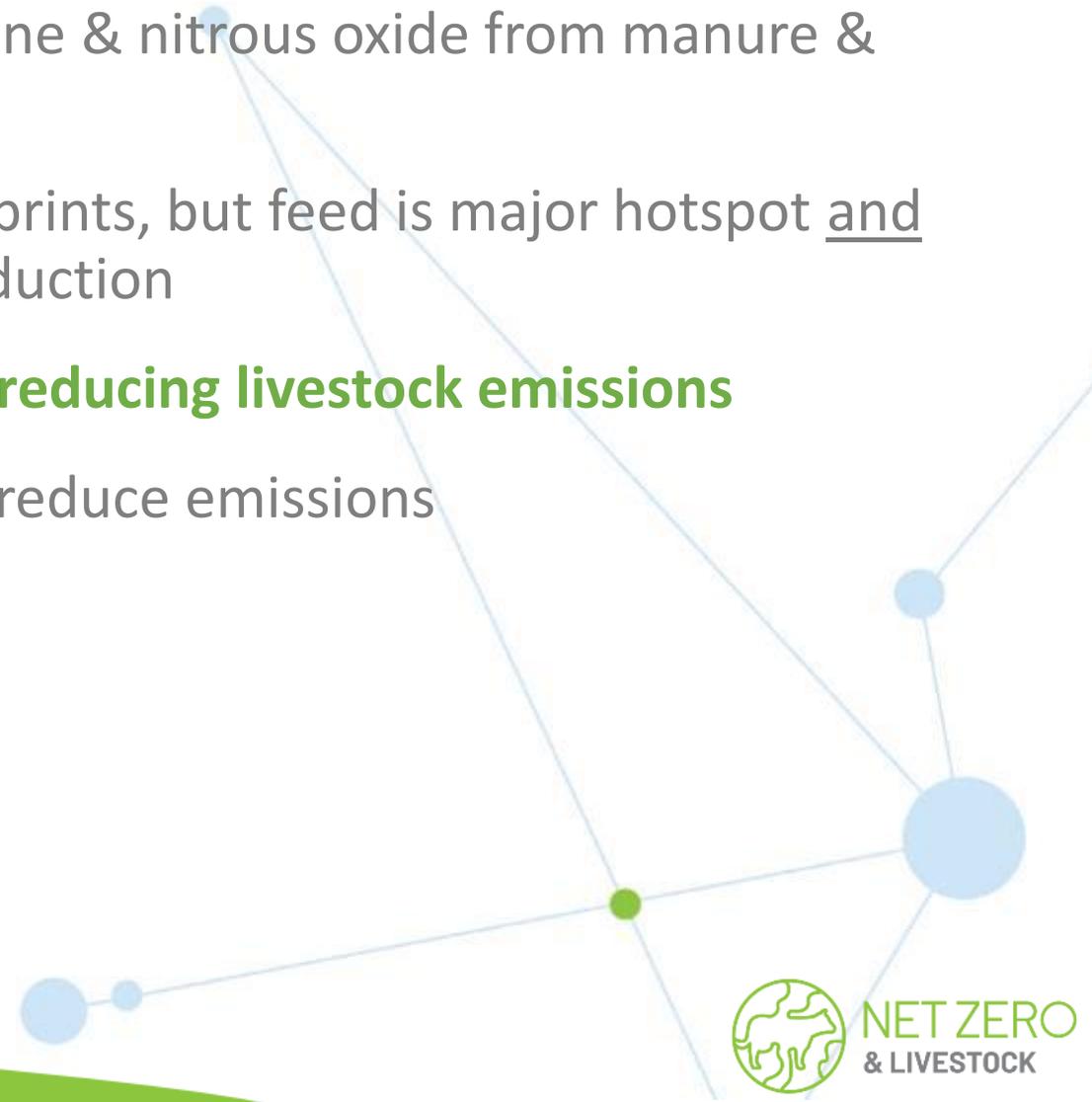
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# Summary of livestock emission hotspots



- ▶ For ruminants, major hotspots are rumen methane & nitrous oxide from manure & fertilizer
- ▶ Poultry & pigs appear to have lower carbon footprints, but feed is major hotspot and they compete for land used for human food production
- ▶ **Animal feeds and feeding offer much scope for reducing livestock emissions**
- ▶ All livestock systems can increase efficiency and reduce emissions



# How can CIEL help deliver the Net Zero ambition?



<b>1</b> NO POVERTY 	<b>2</b> ZERO HUNGER 	<b>3</b> GOOD HEALTH AND WELL-BEING 	<b>4</b> QUALITY EDUCATION 	<b>5</b> GENDER EQUALITY 
<b>6</b> CLEAN WATER AND SANITATION 	<b>7</b> AFFORDABLE AND CLEAN ENERGY 	<b>8</b> DECENT WORK AND ECONOMIC GROWTH 	<b>9</b> INDUSTRY, INNOVATION AND INFRASTRUCTURE 	<b>10</b> REDUCED INEQUALITIES 
<b>11</b> SUSTAINABLE CITIES AND COMMUNITIES 	 <b>THE GLOBAL GOALS</b> For Sustainable Development			<b>12</b> RESPONSIBLE CONSUMPTION AND PRODUCTION 
<b>13</b> CLIMATE ACTION 				<b>14</b> LIFE BELOW WATER 

31 OCT - 12 NOV 2021  
GLASGOW

# COP26

IN PARTNERSHIP WITH ITALY



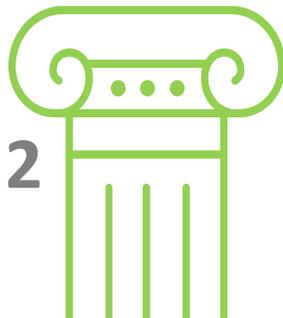
# How can CIEL help deliver the Net Zero ambition? 2021/22 activity plan



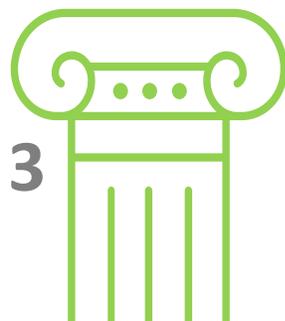
## 3 Central Pillars of Activity in Net Zero & Livestock



Independent Evidence



Open Innovation Space



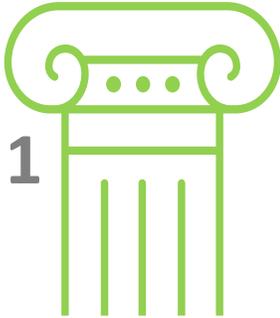
Hub for SME Innovation Support



# How can CIEL help deliver the Net Zero ambition? 2021 activity plan



## Central Pillars of Activity in Net Zero & Livestock



### Independent Evidence

- ▶ Unbiased information from research community, translating and quantifying activity across the supply chain





2020 – CIEL report





2020 – CIEL report



2021 – CIEL next steps



# 2021 – CIEL next steps report



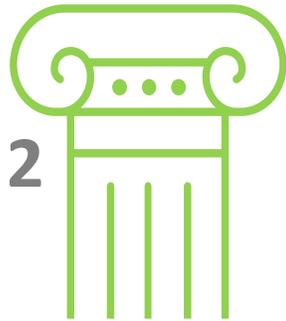
- ▶ Comprehensive description of all the ways farmers can reduce emissions on farm (Nov 2021)
- ▶ Characterisation of costs, benefits and impacts elsewhere, for most significant interventions
- ▶ Farmer friendly presentation as “score card” for each intervention using common criteria (Jan 2022)
- ▶ e-Publication of report (Feb 2022)



# How can CIEL help deliver the Net Zero ambition? 2021 activity plan



## Central Pillars of Activity in Net Zero & Livestock



### Open Innovation Space

- ▶ Recognising need to do things differently
- ▶ Convening work groups for collaboration on identified themes:
  1. Productive Grasslands
  2. Feed & Nutrition
  3. Health & Welfare
  4. Waste



# Key take-home message



- ▶ Current technology can only reduce GHG emissions by **38%** of on-farm goal by 2050 *with high rates of uptake*
- ▶ Great **need for innovation** to deliver further reductions
- ▶ Widespread & early **adoption** will need **support and incentives**
- ▶ Need to be on **front-foot with** messaging – for policymakers and consumers/customers



# Observations & challenges for animal feed industry



- ▶ Will less land be available in future to grow pure grain or pulse crops for feed?
- ▶ What homegrown feeds can replace imported feed to improve sustainability credentials?
- ▶ What are likely feed components in a resource efficient circular feed system?
- ▶ Can some feed components deliver value to animal health & welfare, reduce losses from rumen and manures, or help manure be incorporated into soils more easily?
- ▶ How should we think about feeding our farmed animals and aquaculture differently?

## ▶ One Nutrition approach

- ▶ Animals
- ▶ People
- ▶ Planet





**NET ZERO**  
**& LIVESTOCK**

**Thank you**

[www.cielivestock.co.uk/net-zero-carbon-and-uk-livestock](http://www.cielivestock.co.uk/net-zero-carbon-and-uk-livestock)





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# Questions?

[enquiries@cielivestock.co.uk](mailto:enquiries@cielivestock.co.uk)

