5th September 2022

73rd Annual Meeting of EAAP - Joint Session: the EAAP Livestock Farming Systems Study Commission and the ATF Special Session

Session 13. Livestock emissions and the COP26 targets

Considerations from modelling UK livestock farming: How farmers can reduce emissions

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UK Agri-Tech Centres

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Agrimetrics
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UKRI Innovate UK

Our collective journey to Net Zero

2020

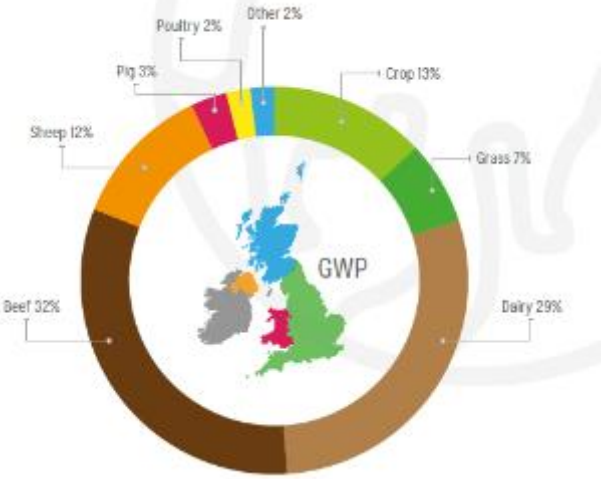
Net Zero Carbon & UK Livestock

2022

Net Zero & Livestock: How farmers can reduce emissions

2050

Reach UK ambition for Net Zero



Jan22

Sector Surgeries

Pig & Poultry + Ruminants

2021

The 2021 United Nations Climate Change Conference

COP26

2023 - onwards

Next steps

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Net Zero & Livestock: How farmers can reduce emissions

An independent summary of currently known science & evidence

- **Outline key GHG mitigations**
  - For the five main livestock types in the UK
- **Assess Strategies**
  - Cost
  - Relative impact (& certainty)
  - Ease of implementation
  - State of readiness
  - Other impacts
- **Model their impact using different approaches**
  - Life Cycle Analysis tools i.e. Carbon Calculators on case study farms
  - The national inventory (UK GHG Emission Inventory)

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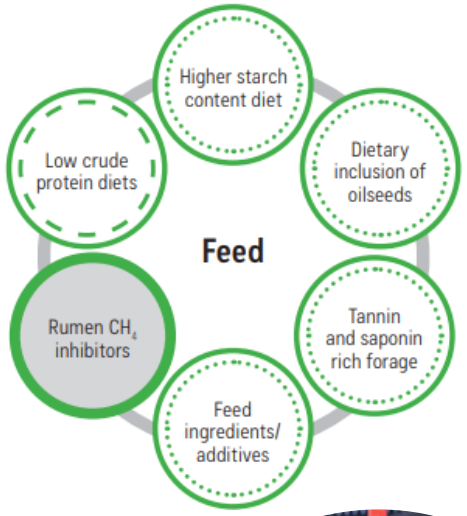
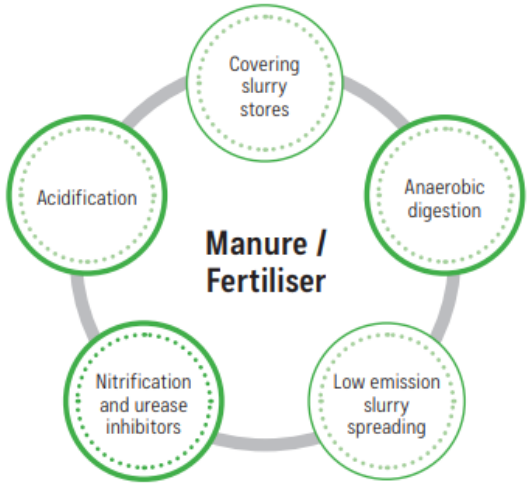
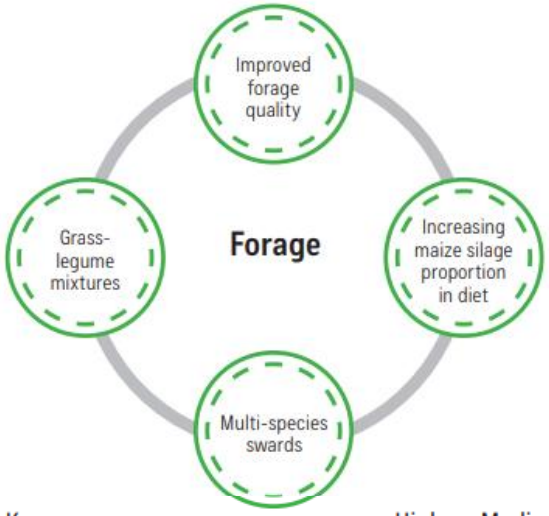
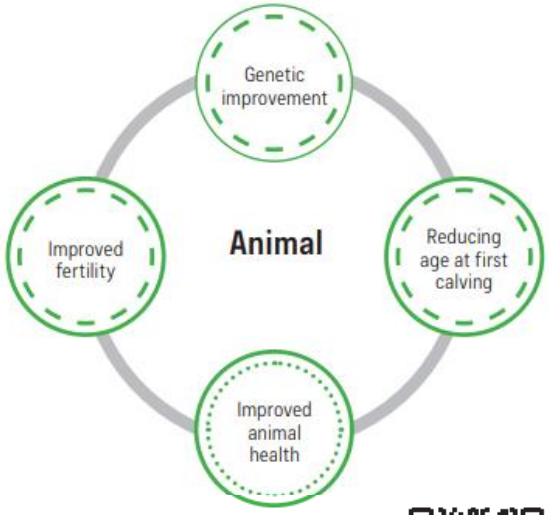
Livestock Systems: Ruminants (example: Dairy) I

Potential for mitigating GHG emissions in dairy cattle









Key	High	Medium	Low
Impact on Carbon Footprint	●	○	○
Cost	◌	◌	◌
Mitigation not yet widely available	●		

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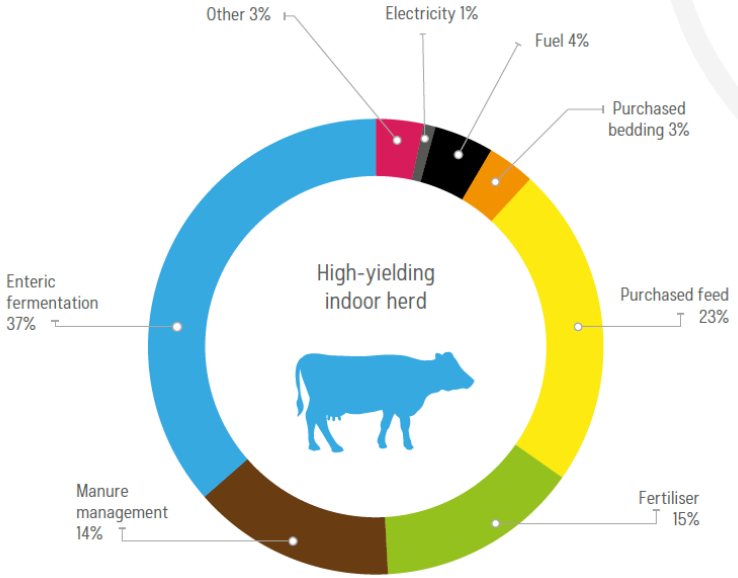
Livestock Systems: Ruminants (example: Dairy) II

Case study farms Baseline Emissions

Farm facts

- 251.6ha grazing platform
- 410 Holstein cows
- Yielding 10377 l/cow at 3.49% butterfat and 3.24% protein
- Age at first calving: 25 months
- Stocking rate: 2.27LU/ha
- 159kg N/ha fertiliser



Modelling Mitigation Options

Mitigation options– higher-yielding, indoor herd	
Baseline	
1. Reducing age at first calving from 25 to 24 months	-0.8%
If released land used for forestry	-5.1%
2. Application of fertiliser amendments protected urea and N_2O inhibitors	-2.5%
3. Inclusion of legumes in grassland	-3.4%
4. Employing methane inhibitor:	
at 15% effectiveness	-6.8%
at 30% effectiveness	-14.4%
5. Combined effect:	
Reducing age cows first calf plus dietary methane inhibitor (30% effective)	-15.3%
If released land used for forestry	-16.9%

Combined Effect Emissions

Carbon footprint (kg CO2-eq/kg milk)

Livestock Systems: Ruminants (example: Dairy) III

Dairy - Application of mitigations to National Inventory

Mitigation options
Methane inhibitor used in all dairy animals
Methane inhibitor used only in cows
Increased productivity
Reduce age at first calving from 29 to 24 months
Use of nitrification inhibitor with dairy slurry application
Dairy slurry processed by AD
Use of nitrification inhibitor with all N fertiliser applied to all UK grassland
Combined effect of mitigations 1,3,4,5,6

Combined effect of mitigations

GHG reduction for UK dairy sector

45%

GHG reduction for whole of UK agriculture

12%

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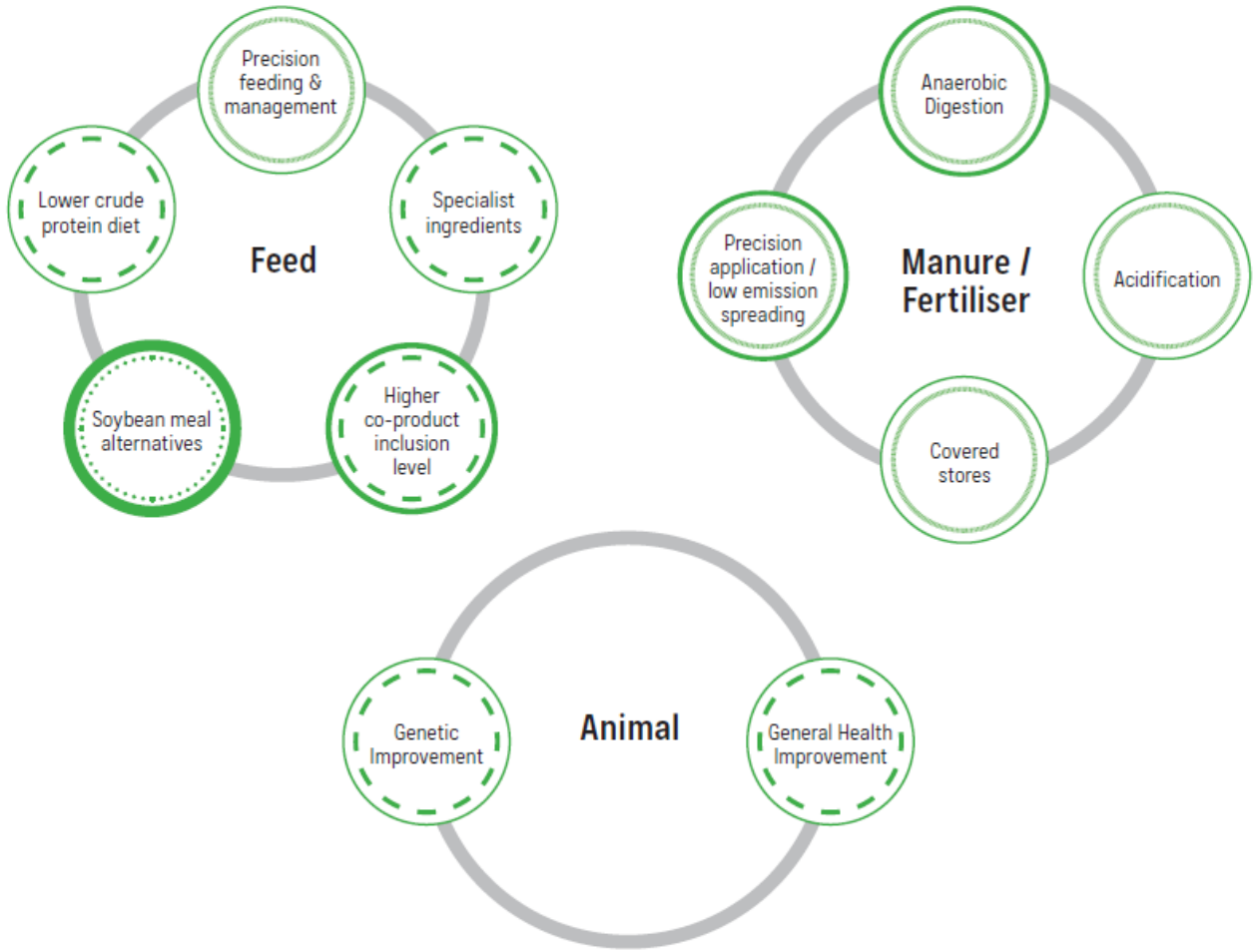
Livestock Systems: Monogastrics (example: Pork) I

Potential for mitigating GHG emissions in pork production



Key	High	Medium	Low
Impact on Carbon Footprint	●	○	○
Cost	○	◌	◌
Mitigation not yet widely available	●		

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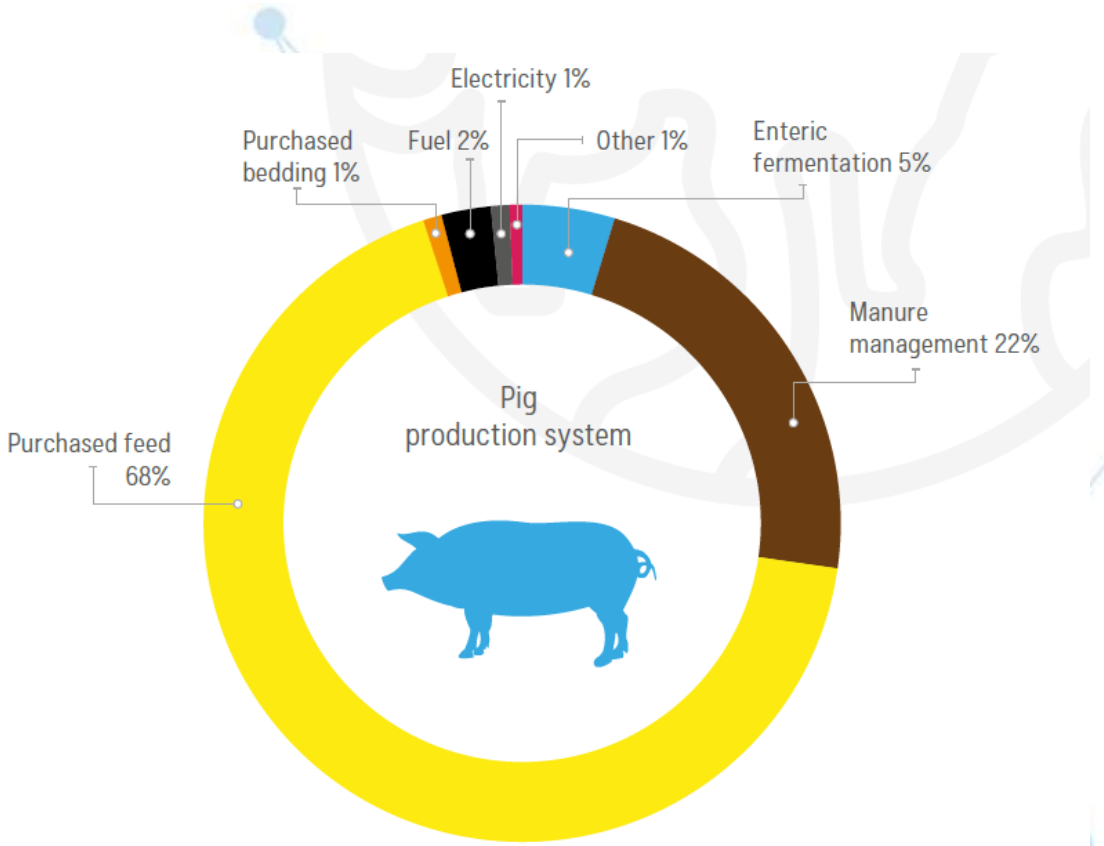
Case study farm: Baseline Emissions



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Livestock Systems: Monogastrics (example: Pork) II

Carbon Footprint – Using Farm Carbon Calculator

Diet Base = Soya 19.2% Alternate = Soya 11%, Rapeseed meal 14%	Carbon footprint from feed (kg CO_2 - eq/kg deadweight)	% Difference for emissions and for carbon footprint from feed
1. Comparing TWO Diets – No LUC		
Base diet	2.16	
Alternate diet	2.15	↓ -0.5%

When the soy or rapeseed was not associated with land use change there was essentially no change in the GHG emissions from pig systems between the different diets.

2. Comparing TWO Diets – With LUC		
Base diet	4.39	
Alternate diet	4.05	↓ -8.8%

When the soy or rapeseed was associated with land use change, replacing soybean meal with rapeseed meal resulted in reductions of 8.8% of the GHG emissions from pig systems.

3. Comparing Base Diet – With and without LUC		
No LUC	2.16	
With LUC	4.39	↑ +103%

4. Comparing Alternate Diet – With and without LUC		
No LUC	2.15	
With LUC	4.05	↑ +88%

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Application of mitigations to the National Inventory

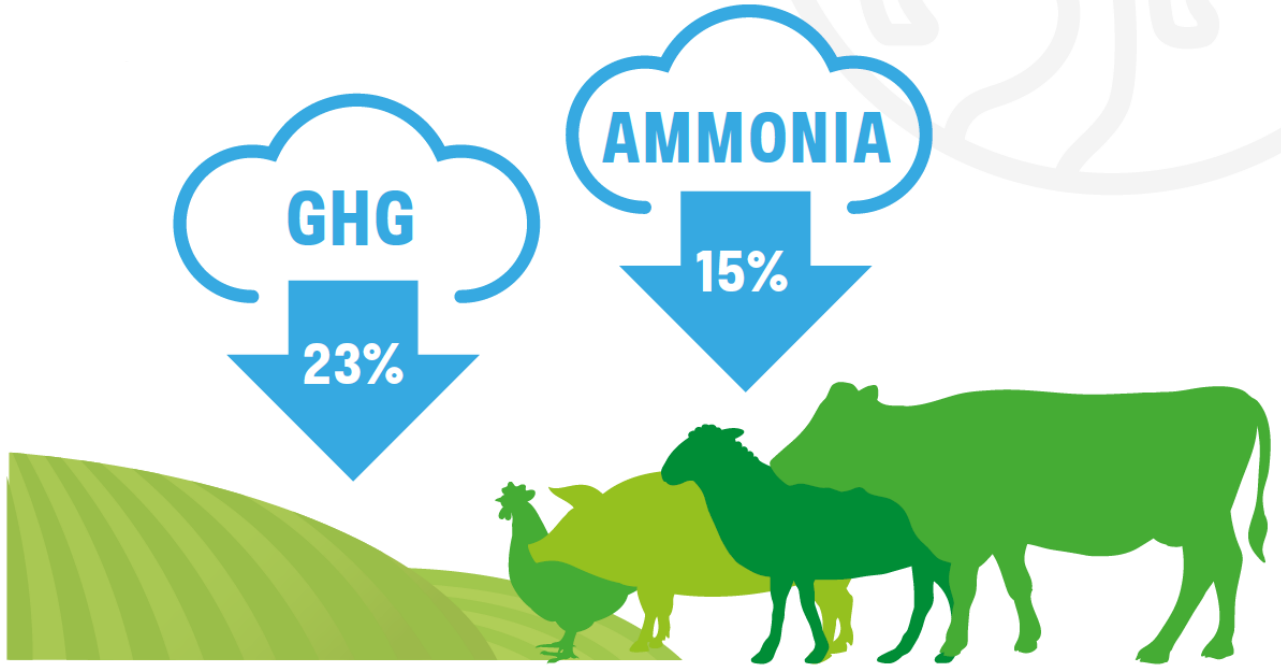
The GHG and ammonia reductions achieved within the UK pig herd by reducing the Crude Protein (CP) content of diets, application of Anaerobic Digestate (AD) and use of a Nitrification Inhibitor.

Mitigation options	
1% reduction in CP content	Applied to all growing and finisher pig feed in UK (100% adoption). Assumed reduction of 8% in N excretion from grower and finisher pigs.
+ **All pig slurry to AD** (not farm yard manure)	Methane conversion factor of 4% assumed to account for 'escaped' emissions.
+ **Nitrification inhibitor** used with pig slurry application*	Assumed to reduce N_2O emissions from soils after spreading by 40%.
Combined effect of above 3 mitigations	

Application of the mitigations across all livestock sectors to the National Inventory

Objective: Reducing emissions from agriculture by **64%** by 2050

But - Current technologies could only deliver a **23%** reduction



We need new innovations to deliver the **missing 40%.**

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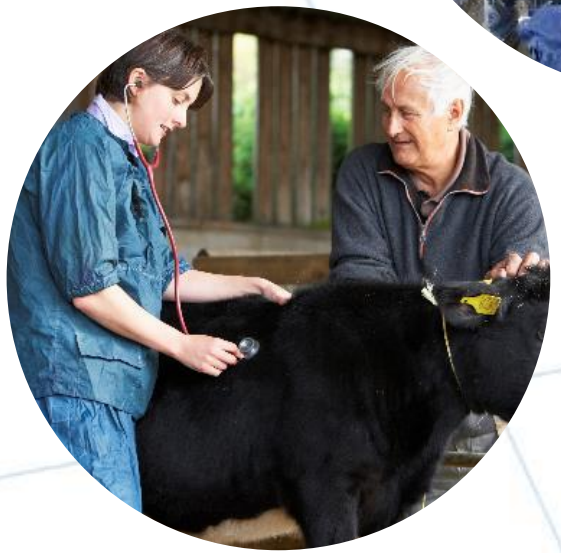
Main Findings – Way Forward

1. **Focus on Efficiency**: Adopt mitigations that also increase profit
2. **New technologies**: Exploit as they become available
3. **Farm carbon calculators**: **Essential** – Define standard features & reward good practice
4. **Collaboration across sector**: Delivering change requires a collective effort



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Find it here: |CIEL (www.cielivestock.co.uk)|

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Acknowledgements

This report was commissioned by CIEL and delivered by a consortium:

Lead authors

- Prof. Elizabeth Magowan (AFBI)
- Dr. Steven Morrison (AFBI)

Authors

- Prof. Ilias Kyriazakis (QUB)
- Prof. Bob Rees (SRUC)
- Dr. Taro Takahashi (Rothamsted Research)
- Prof. Tom Misselbrook (Rothamsted Research)
- Dr. Xianjiang Chen (AFBI)

Contributions:

- Julian Bell, Rachael Ramsey and Kaia Waxenberg (SAC Consulting)
- Louise McNicol (SRUC/Bangor University), with funding from Hybu Cig Cymru (HCC)

Research organisations writing report

afbi AGRI-FOOD & BIOSCIENCES INSTITUTE

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Thank you for your attention

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