NET ZERO & LIVESTOCK

How farmers can reduce emissions:
Egg Producing Poultry

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Current sector snapshot

£3.5bn – Value of UK poultry meat and egg production (2020)
≈13% of the UK's gross agricultural output

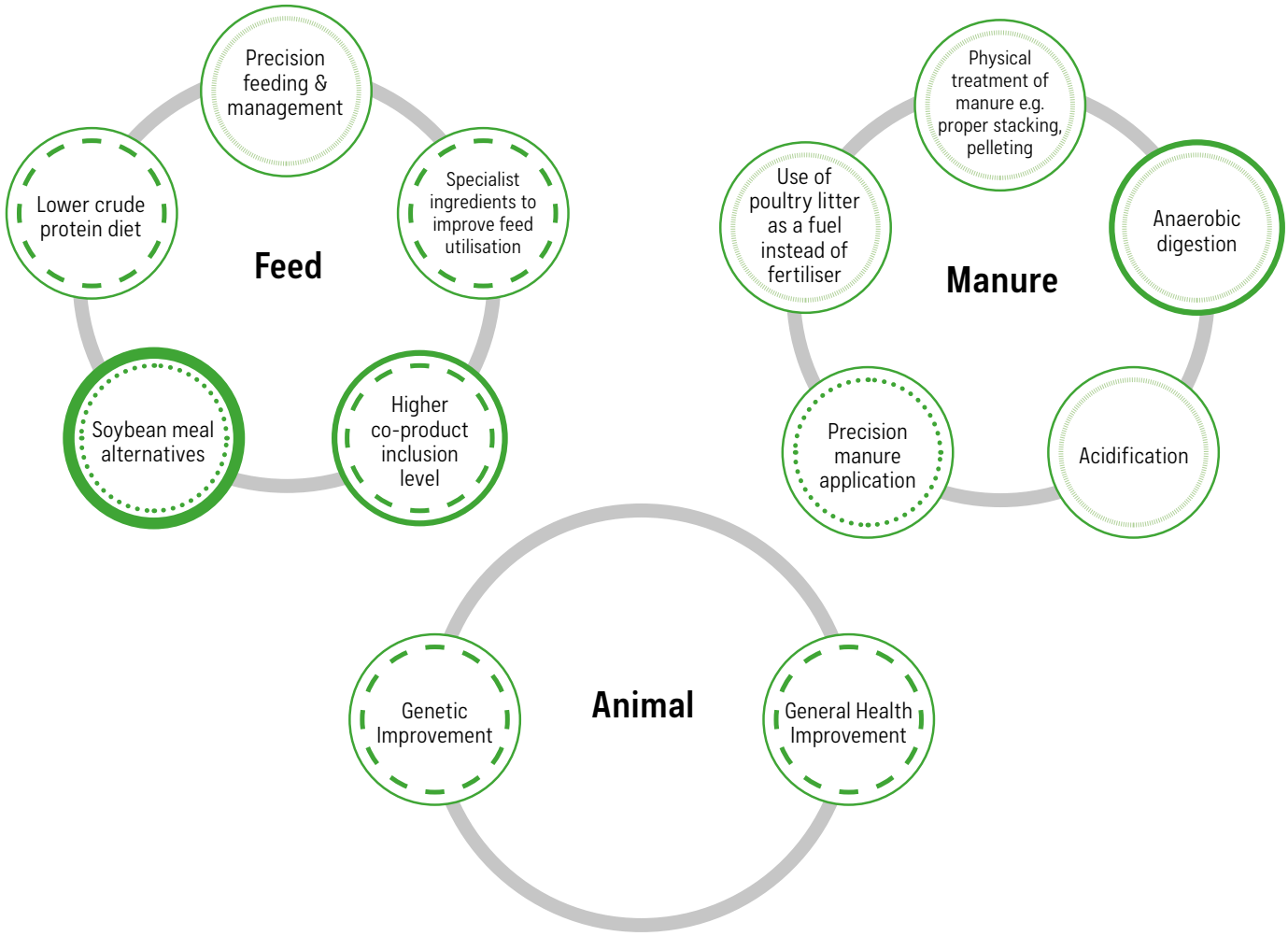
Relatively low carbon footprint vs dairy, beef and sheep sectors

Key sustainability challenge is with regard to air and water quality resulting from N, NH_3 and P emissions

Focus should be the reduction of N and P excretion from animals and use of technologies to reduce the release of these nutrients

Main contributors (≈ 70%) to carbon footprint of both poultry egg and meat production systems = Feed production, processing and transport

Potential for mitigating GHG emissions in egg production



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

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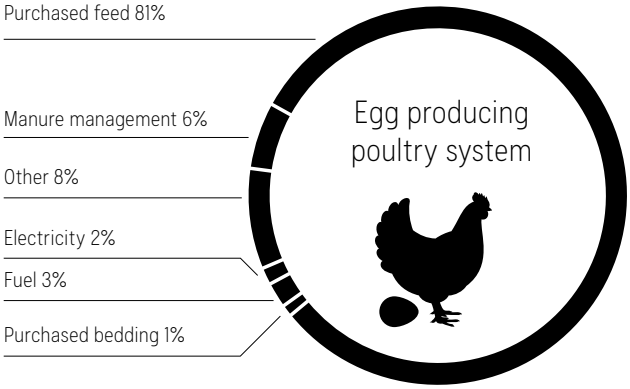
Putting it to the test: Egg producing poultry

Using real farms to calculate emissions generated by specific scenarios that are indicative of the potential savings available in the sector.

Farm facts:

- 4251 laying hens
- 279 eggs/hen/year
- Feeds wheat-based and formulated to be iso-energetic and iso-nitrogenous
- Animal performance similar for diets modelled
- 1.186m eggs/year
- 56kg feed/hen/year

Baseline emissions



Mitigation modelled

Impacts on emissions and carbon footprint of dietary protein source, including the effect of land use change (LUC).

What is Land Use Change? A process by which human activities transform the natural landscape (e.g. conversion of forest into agricultural land).

Diet* Base = Soya and rapeseed Alternate = Beans replaced ≈ 50% of soya	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	1.54	
Alternate diet	1.61	↑ +4%

When the soy, rapeseed or beans were not associated with land use change, there was a small change in the GHG emissions from layer systems between the different diets.

2. Comparing TWO Diets – With LUC		
Base diet	3.08	
Alternate diet	2.33	↓ -22%

When the soy, rapeseed or beans were associated with land use change, replacing soybean meal with beans resulted in reductions of 22% of the GHG emissions from layer systems.

3. Comparing Base Diet – With and without LUC		
No LUC	1.54	
With LUC	3.08	↑ +80%

4. Comparing Alternate Diet – With and without LUC		
No LUC	1.61	
With LUC	2.33	↑ +36%

The greatest impact on the carbon footprint arose from when the feed was associated with land use change.

*Assumptions about emissions associated with LUC based on values reported in the Global Feed LCA Institute (GFLI) Inventory

Putting it to the test: Diets used for modelling

Key ingredients (protein sources) and dietary characteristics of the diets modelled.

Soya-based diet	Starter Crumb	Rearer	Developer	Early Lay	Late Lay
Age offered (weeks)	0–6	6–15	15–20	20–35	35–60
Dietary characteristics (% unless otherwise stated).					
Wheat	63.52	67.11	67.53	64.06	68.53
Wheatfeed	7.35	9.26	12.18	3.34	-
Soya	20.09	9.69	6.67	14.51	11.95
Sunflower	4	10	10	6	7
Whole rapeseed	-	-	-	-	-
Energy (MJ/kg)	12.0	11.6	11.6	11.4	11.3
Protein (%)	19.0	16.5	15.4	16.3	15.4
Total Lysine (%)	0.98	0.78	0.68	0.79	0.74
Alternative protein diet					
Wheat	54.68	52.89	55.91	52.13	52.01
Wheatfeed	10	15	15	10	13
Soya	15	4	-	10	6
Sunflower	7	15	16	7.5	8
Whole rapeseed	10	10	10	10	10
Energy (MJ/kg)	12.1	11.7	11.7	11.4	11.3
Protein (%)	18.9	16.5	15.1	16.2	15.1
Total Lysine (%)	1.00	0.80	0.69	0.80	0.75

Take home messages

- The greatest impact on the carbon footprint arose from when the protein was associated with land use change (LUC).
- There was essentially no change in the greenhouse gas (GHG) emissions from layer systems when almost all soybean meal in the diet was replaced with rapeseed. These ingredients were not associated with LUC. Under this scenario, the GHG emissions associated with the production of soya and rapeseed were relatively similar.
- However, when the ingredients were associated with LUC, replacing the soybean meal with rapeseed resulted in reductions of 22% of GHG emissions from layer systems.
- UK grown ingredients will likely be of greatest benefit in terms of their climate change impact if sourced from non- LUC practices. Soya from non-LUC practices grown in other countries should not be considered negatively.

Replacing the soybean meal with rapeseed resulted in reductions of **22%** of the GHG emissions from layer systems, when the ingredients were associated with LUC.

Taking practical steps towards net zero:
EGG PRODUCING POULTRY

Adjust diet and consider carbon footprint of feed components

- Replace soybean meal with protein not associated with land use change
- Home-grown protein not associated with land use change (e.g. rapeseed meal and legumes) has the greatest impact in reducing the carbon footprint of egg production
- Dietary manipulation, such as reducing the crude protein content of feed, improvements in feed processing technologies and inclusion of specialist ingredients e.g. synthetic amino acids, enzymes and probiotics can offer some reductions in carbon footprint.

Enhance bird health

- For egg producing poultry, past genetic improvement in feed efficiency, animal health and productivity, at the level of pullet and eggs, have already reduced the carbon footprint of poultry egg production systems. Further improvements are more likely to come from enhancements in bird health leading to hen longevity.

Consider precision feeding and management strategies

- Potential to reduce emissions but currently high cost
- Technological advances could make such strategies cheaper and more readily available in the longer term.

Adapt approach to storing and utilising manure

- Physical treatment of manure, such as improved stacking, pelleting reduces GHG emissions
- Emissions may be reduced further by chemical and biological means, but information about optimal design and economic feasibility is currently lacking for these mitigations
- Alternative manure management systems, e.g. using litter as fuel or as a substrate for AD, instead of spreading on fields can reduce GHG emissions
- Such alternative systems can also deliver wider environmental benefits through reduction of emissions of NH_3 and other odours.

CIEL

CIEL (Centre for Innovation Excellence in Livestock)
Innovation Centre, York Science Park, Heslington, York YO10 5DG
T: 01904 567716 **E:** enquiries@cielivestock.co.uk **www.**CIELivestock.co.uk

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