NET ZERO & LIVESTOCK

How farmers can reduce emissions:
Meat 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

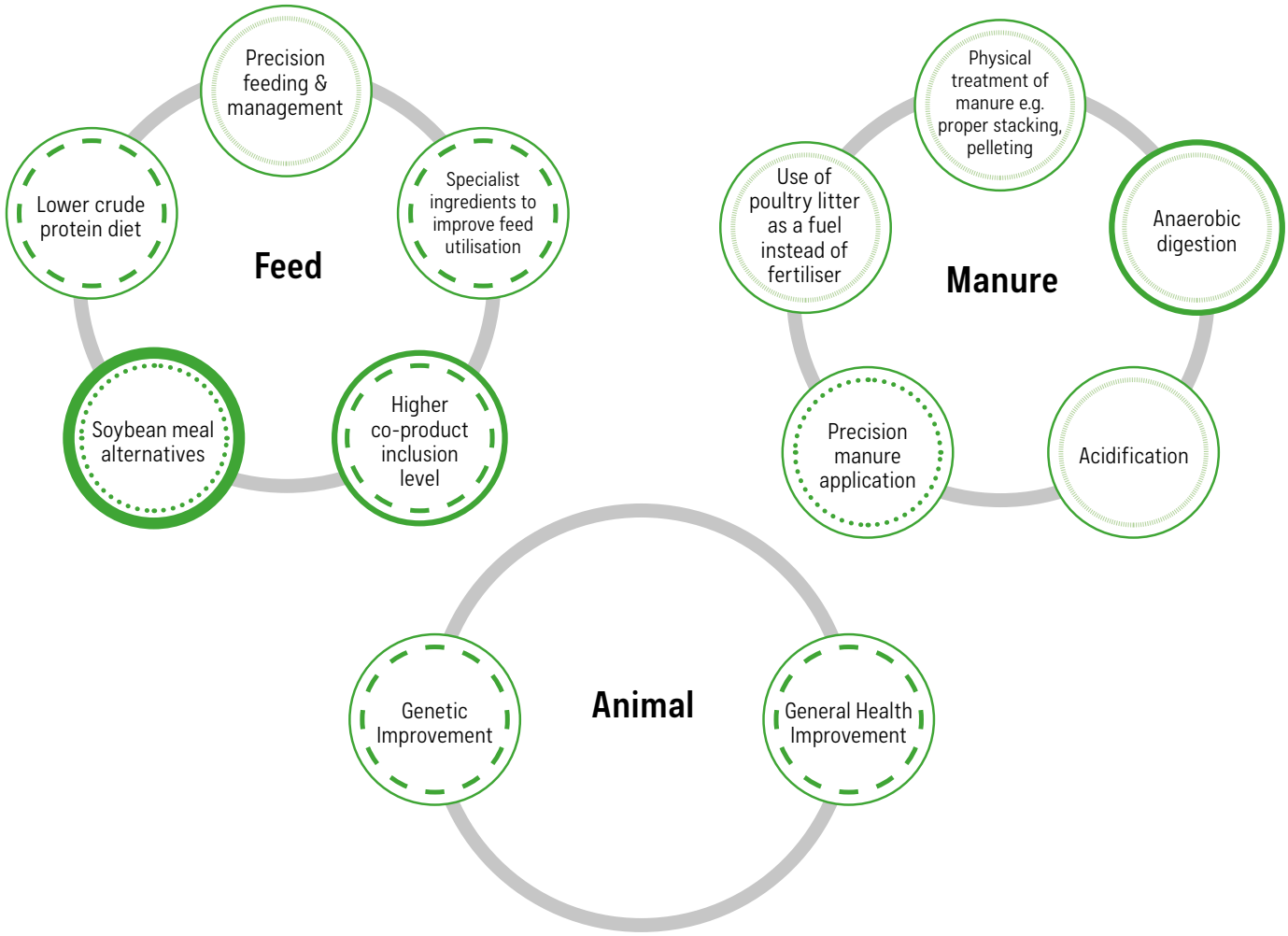
Relatively low carbon footprint vs dairy, beef and sheep sectors

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 meat production



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

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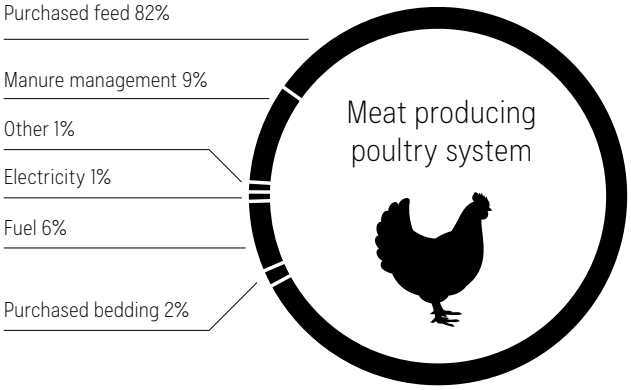
Putting it to the test: Meat producing poultry

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

Farm facts:

- 20,785 birds
- 3.54kg feed per bird
- 294t broiler meat/year
- 2.2kg liveweight-endpoint
- Feeds wheat-based and formulated to be iso-energetic and iso-nitrogenous
- Animal performance similar for diets modelled

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	1.27	
Alternate diet	1.32	↑ +5%

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

2. Comparing TWO Diets – With LUC		
Base diet	2.75	
Alternate diet	2.21	↓ -20%

When the soy, rapeseed or beans were associated with land use change, replacing nearly 50% of soybean meal with beans resulted in reductions of 20% of the GHG emissions from poultry systems.

3. Comparing Base Diet – With and without LUC		
No LUC	1.27	
With LUC	2.75	↑ +117%

4. Comparing Alternate Diet – With and without LUC		
No LUC	1.32	
With LUC	2.21	↑ +67%

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	Grower	Finisher	Withdrawal
Age offered (days)	0–10	11–24	25–32	33+
Key ingredients (protein sources) and dietary characteristics of the diets modelled.				
Whole rapeseed	5.0	7.5	10.0	10.0
Soya	33.5	25.5	18.0	17.0
Beans	-	-	-	-
Energy (MJ/kg)	12.7	13.1	13.4	13.4
Protein (%)	22.8	20.0	18.5	18.0
Total Lysine (%)	1.44	1.20	1.08	1.04
Alternative protein diet				
Whole rapeseed	5.0	7.5	10.0	10.0
Soya	25.5	16.0	9.0	7.5
Beans	10.0	15.0	20.0	20.0
Energy (MJ/kg)	12.7	13.1	13.4	13.4
Protein (%)	21.5	18.7	17.0	16.5
Total Lysine (%)	1.42	1.21	1.09	1.06

Take home messages

- The greatest impact on the carbon footprint arose from when the protein was associated with land use change (LUC).
- However, there was essentially no change in the GHG emissions from broiler systems when approximately 50% of soybean meal in the diet was replaced by beans (when these ingredients were not associated with land use change). Under this scenario, the GHG emissions were relatively similar whether soya or beans were used.
- However, when ingredients were associated with land use change, replacing soybean meal with beans resulted in a reduction of 20% of the GHG emissions from the broiler system.
- The source of raw materials and the assumptions aligned with LUC or not are critical when calculating the carbon footprint of broiler systems. Therefore, further investigation into these assumptions is warranted within carbon calculators.
- UK grown ingredients will likely be of greatest benefit in terms of their climate change impact if sourced from 'non land use change' practices. Soya from 'non land use change' practices grown in other countries should not be considered negatively.

Replacing the soybean meal with beans resulted in reductions of **20%** of the GHG emissions from broiler systems, when the ingredients were associated with LUC.

Taking practical steps towards net zero:

MEAT 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. beans) has the greatest impact in reducing the carbon footprint of poultry meat production
- 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.

Explore potential of alternative protein sources

- Within poultry meat production, a number of alternative protein sources, such as insect meal, algae and microbial protein, may have the potential to reduce the carbon footprint of the sector and are being considered for use in the UK.

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.

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