Poultry
Towards Net Zero

What are the key emission challenges influencing the poultry sector?

Feed

Feed continues to be the largest challenge facing emissions coming from the poultry sector, contributing 78% of total emissions within broiler production and 69% of emissions within layer production systems[1]. The embedded emissions from feed are largely due to the land use change associated with sourcing certain proteins, such as soybean, for the diet. The production, processing and transport of these primary feeds are the drivers of those emissions, mainly carbon dioxide. Diet plays an important role to nitrogen excretion in poultry. Unused protein lost in hen manure increases the risk of nitrous oxide emissions from manure storage and application[2].

Manure

Many chickens in the UK are produced and reared intensively in indoor units which produce large volumes of concentrated manure. Manure management from the poultry sector is also a significant contribution to nitrous oxide and ammonia emissions within poultry, contributing 15% of the total ammonia from agriculture in the UK. The storage, management and application of manure within housing impacts the level of emissions on-farm due to its nitrogenous compounds[3].

Energy

Poultry systems require extensive amounts of energy to power automatic feeders, drinkers, weigh scales, ventilation, heating, egg collection belt, automatic muck belt and cooling systems. Greater need for energy to cool, heat or modify the relative humidity of housing and is expected to make reliance on energy more critical as a result of climate change. Free range egg producers can also use up to 15% more energy than caged systems[4].

Where should you start to prioritise reducing emissions on your farm?

Poultry systems have a low carbon footprint but emission intensity on broiler and layer farms is primarily associated with purchased feed emissions, accounting for c.70–80% of total emissions. This also presents risks for using feed products which are connected to deforestation in South America and Southeast Asia. Additional challenges are generated by poultry systems which can affect air and water quality from excess nitrogen (N), ammonia (NH_3) and phosphate (P).

Priorities the farm should identify include improving the efficiency of feed, manure and nutrient, and land management. Effective utilisation of these key areas will promote productivity of livestock, boost soil health and carbon uptake, whilst reducing expense and emissions associated with purchase feed and artificial fertiliser. Completing an **annual carbon footprinting report** is an important action to help you establishing a baseline, identify and monitor hotspots, and to target key areas that will have the greatest improvement on your farm.

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There are a number of practices for both layers and broilers which can be implemented on-farm to support emissions reduction immediately, including:

1. Calculating energy consumption – a starting point to implement a number of strategies for energy efficiency
   i.e. LED bulbs, timed lighting systems, motion sensors in the shed, solar energy
2. Feed management – alternative proteins in the diet e.g. algae, microbial proteins
3. General health improvement of the birds
4. Genetic improvement to increase feed efficiency and animal health
5. Homegrown feed as protein source for pullets (contributing 20–25% emissions from egg production)
6. Exhaust air heat recovery systems incorporated into air cleaning (scrubber) systems

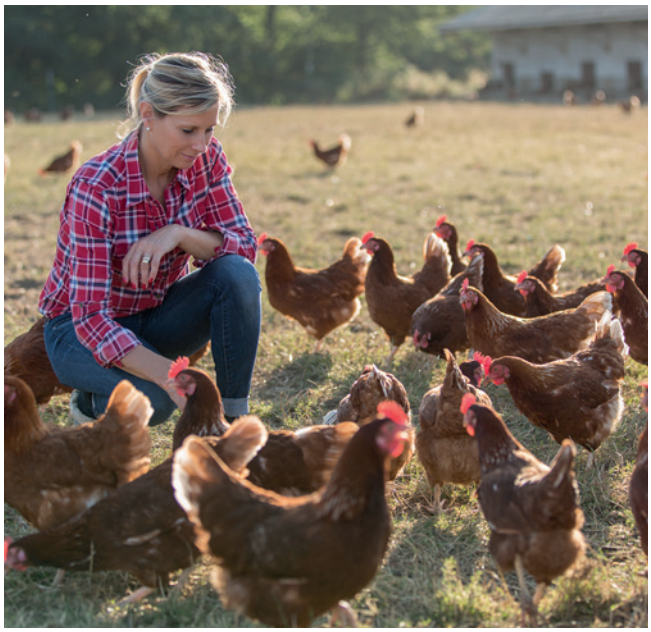
What practical steps could you take?

What is the practise?	Why would this be of benefit to your farm?	How can I do this well?
Alternative feeding methods – reducing protein in the diet	Reducing the amount of excess crude protein given via feed will reduce the levels of nitrogen (N) in the manure. This reduces the incorporation into nitrous oxide (N_2O) and ammonia (NH_3) released through excretion. Reducing dietary protein by 2–5% can lead to a reduction of 60% or more of total nitrogen excretion from broilers and laying hens[6].	Reducing protein from soybean and other protein-rich grains. Looking at a lower protein diet supplemented with amino acids. The ratio of amino acids can be individual and also depends on the various growth stage of the chicken.
Manure treatment	Litter treatments, mainly aluminum sulfate (alum) have shown some success, in the short term, reducing NH_3 emissions by up to 57%, reducing to 20–30% after three weeks[7].	Incorporate dry alum into litter between flocks, added to used bedding prior to each subsequent flock, or certified professional applicator to treat with liquid alum[8]. The application rate depends on the size of the flock.
Bird/flock health and genetics	Development in the genetics of broilers is further along than layers, where advancements have already been made. Genetic improvement in laying hens can contribute to improved feed efficiency, animal health and productivity as well as hen longevity.	Today's broilers produce a 50% lower footprint than those in 1970[9]. Having discussions with nutritionists and other industry experts on genetic selection and breeding will help make decisions based on the most beneficial breeds for your farm. The largest influence is typically the feed conversion ratio (FCR) which is the rate at which birds convert feed into live weight.
Heating – air and ground source heat pumps	Cool air entering the poultry buildings can help optimise humidity and temperatures whilst reducing required ventilations. This saves energy required on fans in the sheds. Carbon dioxide emissions can be reduced up to 75% whilst also being 25–50% cheaper than conventional systems[10].	Initial investment costs may be high but come with long term benefits. Planning ahead of installation of ground source heat pumps is required as the greater the heat, the larger the area to fit pipeworks. Maintenance is lower than that of a conventional system.

What's next? What should I look at beyond two years?

Looking ahead, adopting practices that seek to limit the impact of feed and manure on your farm will lead to greater resource use efficiency and lower emissions. Examples of actions you could consider investigating include:

- The development of alternative proteins from insects or the reintroduction of processed animal protein (PAP) are growing within the feed industry and gaining the attention of more farmers, feed companies and manufacturers. The use of both PAPs and insect proteins could offer significant nutritional benefits with a good amino acid profile whilst lowering the carbon footprint associated with feed in poultry[11].
- Reviewing feeding practices will allow a number of options to be considered in order to reduce emissions from this area. Fibre nutrition, feed additives, phase feeding, and feed processing are all considerations for making changes within the feed.
- Farms can begin offsetting some of their emissions by increasing the amount of carbon stored and sequestered, through enhancing in-soil health to increase soil organic matter and carbon, and by increasing the quantity and quality of perennial woody biomass. Many free-range poultry systems and organic certification standards integrate egg production with agroforestry system, with up to 20% tree coverage in the ranges. The Soil Association has now updated their standard that a minimum of 5% tree cover in poultry ranges is required[12]. Trees can also have the multi-functional use of offering ammonia mitigation from poultry units.
- Composting manure with wood chippings, grass or biochar in order to give more consistent sources of both nitrogen and phosphorus whilst also providing a nutrient rich fertiliser. The additives reduce the risk of compaction and therefore greater aeration.
- Anaerobic digestion stands as another opportunity to process poultry manure, which must be co-digested, similar to composting. This process is effective in reducing solids and NH_3 concentration. Utilising manure as fuel is also growing in popularity within the industry.



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