Pigs & Poultry
Towards net zero

The greenhouse gases arising from pig and poultry production are: methane, nitrous oxide and carbon dioxide. Whilst ammonia is not a key greenhouse gas, it can impact the environment negatively through nitrogen deposition and soil acidification.

Emission challenges

Feed

The main challenge to achieving net zero in the pig and poultry supply chain is feed (Figure 1). Feed contributes 78% of total emission during broiler production, 69% of emission during layer production and 64% for pork[1]. Feed conversion efficiency and growth rate dictate feed requirement and are also critical influencers of emissions from housing, manure storage and spreading.

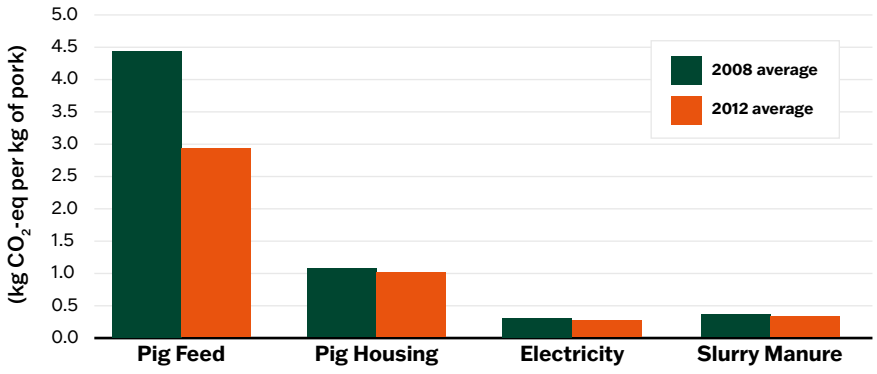
Energy demand

Pig and poultry systems require extensive amounts of energy to provide automatic feeders, drinkers, weigh scales, ventilation, heating, egg collection belt, automatic muck belt and cooling systems. This requirement equates to 37% of emissions from production of eggs and 41% of the emissions from chicken meat[1]. Climate change is anticipated to result in a greater need for energy to cool, heat or modify the relative humidity of housing and is expected to make reliance on energy more critical.

Manure management

Manure management is also a challenge to both pig and poultry systems. The way manure is contained and managed within the housing impacts the levels of emissions.

Figure 1 Emissions from British Pork[5]



Emissions from manure continue during storage and spreading to land. Inadequate storage or unsuitable equipment can force spreading to occur at times of high pollution risk and lower utilisation of nutrient value thereby increasing emissions.

Future climate impacts

Higher temperatures caused by climate change, coupled with increased UV levels will make housing conditions harder to control. Pigs and poultry are susceptible to heat stress with negative consequences for production and welfare. The types of crops grown for feed and security of supply are expected to also change in a future climate. This may mean new feeding techniques, or genetic adaptation of livestock may be necessary.

The total number of poultry birds in the UK has increased by 3.6% to 188 million birds in 2018[1].

Globally, chickens are estimated to emit approximately 8% of total emissions from the livestock sector[2].

In June 2018 the UK pig herd stood at 5.01 million pigs, of which 409,000 were breeding sows[3].

Farm performance has been increasing, in 2005, 8.97 million pigs were slaughtered at an average deadweight of 72.5kg. In 2018 this had increased to an average dead weight of 83.3kg[4].

Short term solutions to reduce emissions

Precision feeding

Precision feeding systems are capable of feeding each pen or area individually. Dietary changes can be made very quickly in response to growth rate, health status, or need for diet adaptation if any ingredient becomes scarce or unavailable. Such systems, especially when combined with real time growth weight monitoring such as weighing or visual image analysis can deliver very high levels of performance and efficiency, potentially offering big gains in emission reduction.

Carbon offsetting

Carbon offsetting can be achieved in pig and poultry systems. Planting buffer strips with trees around poultry and pig houses will sequester carbon dioxide, absorb ammonia and help aid water quality improvements. 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. This system must be treated with caution, however, as incorporating more trees in a range could potentially increase the chance of migrating birds in the range and subsequently avian influenza.

Case study

Xergi, is a Danish company which specialises in biogas and has over 20 years' experience developing green technologies. Xergi built an anaerobic digestor which runs 100% poultry manure in Northern Ireland. The plant generates three megawatt (mW) of renewable electricity from up to 40,000 tonnes of chicken litter each year[6]. The electricity will be sold through the electricity network and is enough energy to power 4,000 homes. The capital cost of the plant was approximately 20 million GBP[6].

Longer term investments

Housing and manure management

Low emissions housing provides good quality air and lying surfaces for livestock, giving health and behaviour benefits. Underfloor heating is an industry standard aimed at distributing heat in poultry houses evenly and managing litter. There is now the ability to use ground source heating to provide the energy requirement. Frequent removal of slurry or manure from pig housing also helps lower emissions and creates better air quality and hygiene for animals.

Other infrastructure upgrades that will assist lower emissions from manure include:

- **Covering slurry stores with either a floating or hard cover or using slurry bags.**
- **Using low emission slurry spreading equipment such as trailing hose, trailing shoe or injection systems (30 - 60% emission reduction).**
- **On-farm and on-tanker slurry analysis equipment combined with GPS that will allow slurries and manures to be applied with precision.**
- **Slurry separation systems to enable the essential plant nutrients to be partitioned.**
- **Slurry acidification systems to reduce pH through the controlled application of industrial grade acids to reduce methane emissions by up to 90% and ammonia by 65%.**

Energy

Renewable energy is a great way to reduce emissions from fossil fuel use in pig and poultry units. Established renewable energy sources include solar panels, biomass boilers, small scale anaerobic digestion plants and ground source heating. Air and ground source heat pumps can be used to cool air entering a building to help optimise internal temperature and humidity and also reduce the required ventilation rate saving energy needed to drive fans.

Pigs and poultry units produce considerable quantities of heat. This heat can be captured and used in hot water heating systems elsewhere either on or off the farm. Exhaust air heat recovery can now be incorporated into air cleaning (scrubber) systems which reduce odour or ammonia, or both. The energy recovered can offset the cost of the air cleaning in the correct situation.

Slurry within a pig house is a significant heat reservoir. Ground source heat pump technology can be applied to harvest this energy. Slurry cooling will also aid with reducing ammonia emissions from pig housing of up to 55%.

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