Pigs
Towards Net Zero

What are the key emission challenges influencing the pig sector?

Feed

Feed and feed production are the main challenges in achieving net zero in the pig sector, contributing up to 75–80% of emissions from pork[1]. Improving feed conversion efficiency and growth rates, alongside reducing feed waste, impacts on feed requirements and are significant influencers of emissions from housing, slurry and manure storage, and spreading[2].

Slurry and manure management

Slurry and manure management impacts on direct emissions from pig systems, mainly of methane from enteric fermentation, and slurry and manure storage and application, and nitrous oxide from manure application[2]. In housing and yard areas, slurry and manure removal methods, frequency and containment impact on emission levels. Storage and application also play a significant role on emission levels. Inadequate storage or unsuitable equipment can force spreading to occur at times of high pollution risk and lower utilisation of nutrient value, therefore increasing emissions.

Energy

Pig systems require extensive amounts of energy to provide automatic feeders, drinkers, weigh scales, ventilation, heating and cooling systems. This requirement equates to 37% of emissions from production of pig 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.

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

The main greenhouse gases arising from pig production are methane, nitrous oxide and carbon dioxide[3]. Whilst ammonia is not a greenhouse gas, it can impact the environment negatively through nitrogen deposition and soil acidification.

Quantifying the impact of existing practices, using annual carbon footprinting, will help your farm understand emission hotspots and prioritise actions. Managing feed is a key priority to reducing greenhouse gas emissions. Combined with identifying alternative protein sources to reduce soya and crude protein content in diets.

Priorities you should identify for your farm include increasing feed efficiency whilst incorporating alternative feeds alongside improving slurry and manure management. Focus should also centre on reducing reliance on fossil fuels and preparing for future practices in livestock management such as adapting housing environments to improve health and welfare conditions whilst reducing emissions.

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There are eight practices listed below which could support your farm in reducing emissions immediately which include:

1. Precision feeding, improve feed efficiency and reduce feed waste
2. Alternative feeds and additives – improve availability of feed sources and utilisation efficiencies
3. Crude protein reduction and improved feed efficiency
4. Cover slurry and manure stores, and use slurry separation
5. Slurry and manure application using low emission equipment with GPS guidance – improve nutrient use[9]
6. Genetic traits enhancement – reduce maintenance requirements and improve growth rates and ratio of protein to fat in the body
7. Low emission housing – improve air quality, lying surfaces, health and welfare, and animal behaviour
8. Renewable energy and energy efficiency – reduce reliance on fossil fuels and purchased energy

What practical steps could you take?

These steps can be applied immediately on most organic or conventional farms and revolve around three simple principles to combat on-farm emissions:

1. Utilise feed management systems and techniques to reduce waste and improve feed efficiency
2. Manage slurry and manure more effectively to maximise use of nutrient benefits and reduce emissions
3. Improve genetic traits to improve outputs and reducing emissions

To assist in the integration of these principles, the following steps are suggested:

What is the practise?	Why would this be of benefit to your farm?	How can I do this well?
Alternative feeds – improve diversity of feed sources	Feed management is a vital element of pig efficiency as it provides essential nutrients and energy, but soya is often a key component of feed rations and, although it is well-suited to pig diets, it creates significant greenhouse gases[4]. Using farm-grown and domestically produced protein feeds increase sustainability and security in your supply chain[3]. Recent modelling indicates replacing soyabean meal with rapeseed meal resulted in a reduction of 7% of greenhouse gas emissions, when both products were associated with land use change[2]. Using synthetic amino acids and enzymes work effectively to reduce the need for soya inclusion rates in rations whilst reducing nutrient excretion and increasing productivity by up to 30%[5]. Animal feed supplements lower phosphorus levels in run-off from manure by at least 20%[6].	Review and monitor feed rations on an ongoing basis to ensure dietary requirements are met. Focus on whether crude protein levels within the ration meet or exceed dietary requirements. Trials have reduced crude protein in rations, potentially incorporating alternative crops to reduce or replace imported soya such as rapeseed and sunflower meal[2]. Include, if required, synthetic amino acids (not suitable for organic farms), enzymes, probiotics and authorised feed additives to increase nutrient availability and improve feed balance, and reduce total nitrogen excreted[5]. Consult with your feed advisor when making significant changes to ration contents.
Precision feeding systems – improve feed efficiency	Using precision systems enable targeted feeding to individual pens or areas, allowing rapid changes to rations in response to growth rates, health status or diet adaptation. Precision feeding techniques increase individual nutrient efficiency in growing pig systems and can reduce protein and phosphorus intake by 25%, excretion by 40% and greenhouse gas emissions by 6%[7]. Reducing crude protein levels as well as reducing feed waste and nutrient excretion by adjusted nutrient supply at different points in time.	Monitor any dietary changes to ensure productivity levels are maintained or increased including feed digestibility, dry matter, crude protein, nitrogen and liveweight gain[6]. Monitor growth rate using weighing or visual image analysis and when calculating rations, take account of factors impacting on feed conversion ratio such as spillage, feed digestibility, composition of weight gain, feed intake and nutrient utilisation[5].

What is the practise?	Why would this be of benefit to your farm?	How can I do this well?
Slurry acidification systems – reduce pH and emissions	Acidification reduces pH, limiting ammonia levels and odour, and improving environmental conditions in housing. Acidification also retains a greater nutrient value within the slurry[3].	Apply industrial grade acids – nitric or sulphuric – using specialist commercial equipment[8]. Acidification can be carried out in housing, slurry storage or at the time of application. Ensure compliance with all relevant health and safety requirements regarding the storage and use of acids[8].
Genetic traits enhancement – reduce maintenance requirements and improve growth rates	Breeding to enhance positive genetic traits such as leaner and faster growing pigs, increasing piglet numbers per sow per litter and overall mortality reductions improves health, welfare and productivity[2]. Genetic improvements could reduce maintenance requirements and improve growth rates and ratio of protein to fat in the body[6].	Identify traits that would improve production efficiency in your herd and work with breed / genetics advisors to increase the rate of genetic progress within the farm.

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

Looking ahead, further actions which seek to reduce the impact of feed, housing management, and manure and slurry management as well as reducing emissions will prove critical. Examples of actions you could consider investigating and incorporating into your farm include:

- Anaerobic digestion, which generally requires other feedstocks such as grass silage, rye or maize to work successfully, could be used to provide energy for feed processing, heating, lighting, cleaning and ventilation, reducing costs[3].
- Alternative feeds such as insects, seaweed, maize gluten meal, distillers' grains and other co-products as well as bacterial protein growth on substrate may offer opportunities to diversify the range of feeds used, reducing emissions and improving food security[5,9]. Initial research indicates that peas, beans and lupins are less palatable for pigs and have lower protein levels than some alternatives, but further research, trials and technology may alter these findings[3].
- Technologies such as sensors, surveillance and feeders allowing group-housed pigs to be fed based on individual needs as well as specialist systems to generate energy such as hydrogen electrolysis to fuel machinery will improve efficiency, reducing production costs and emissions[3].
- Low emissions housing to improve environmental conditions, providing better working conditions and improvements for pig health and welfare as well as reducing ammonia emissions. Potential options include reducing ammonia emitting surfaces, increasing the frequency of manure and slurry removal, and separation of urine from faeces as well as improved ventilation, insulation, air scrubbers and biofilters[8].

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