



# Greenhouse gas emissions and crediting – what is it?

There is increasing scrutiny by governments, companies and the public on the impact of the industry's actions on the environment. In recent years, this has focused primarily on the effects of releasing greenhouse gases into the atmosphere at high levels and the impact this is having on our climate.

Terms like 'carbon footprints' were born out of this emphasis as a means to explain the impact of a product or industry, but in many cases it can be confusing due to the overlapping jargon and oversimplification of complex processes.

This guide is your playbook on the various terms in this space, as well as providing information on how to measure the impact of your farming business.

The most important thing to remember is that the tracking of product emissions is a process. It is not enough to isolate carbon emissions at a single point in time – it's about tracking against benchmarks and seeking continuous improvement.

This guide will help you with the first step - understanding emissions and where they are likely to arise from in your piggery, which will hopefully help to kickstart your journey to tracking, reporting and reducing your emissions.

For more detail about specific ways to reduce emissions, see the [Low Carbon Pork Roadmap](#).

## Nitrous oxide ( $N_2O$ )

Nitrous oxide is released directly from manure, manure stockpiles, composting and manure applied to land, as well as indirectly from atmospheric deposition to land and water, and leaching and runoff. The global warming potential of  $N_2O$  is approximately 265 times that of  $CO_2$  over a 100-year period.

## Methane ( $CH_4$ )

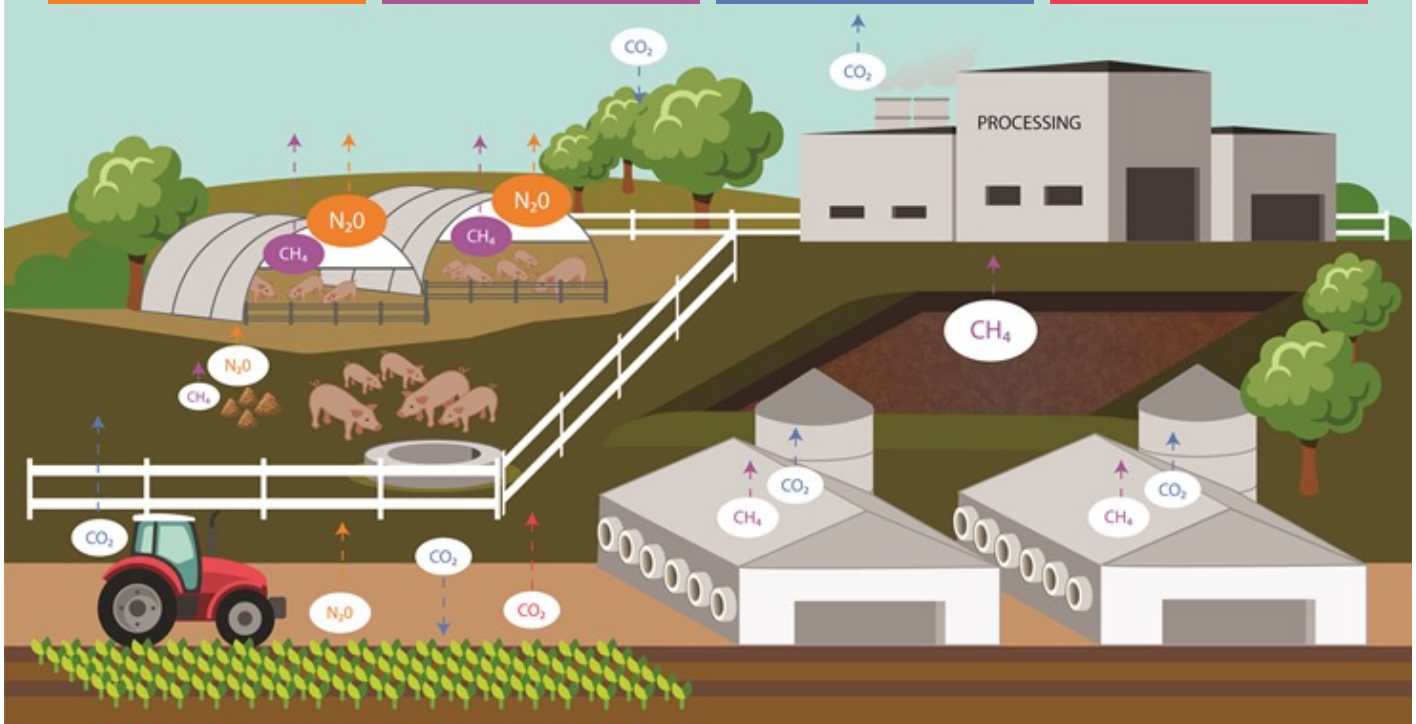
Methane is released from piggery manure with high levels derived from anaerobic ponds. Direct methane emissions also result from manure stockpiles, sheds (deep litter), as well as enteric emissions directly from pigs. The global warming potential of  $CH_4$  is approximately 28 times that of  $CO_2$  over a 100-year period.

## Carbon dioxide ( $CO_2$ ) from fossil fuels

Carbon dioxide is released through production and consumption of fossil fuels used through the production of feed and bedding, transport and electricity.

## Carbon dioxide ( $CO_2$ )

Carbon dioxide can also be released if Land Use (LU) practices such as cultivation cause loss of soil carbon. Restoring this soil carbon can reduce net emissions. Similarly, land use change such as from pasture to cropping can result in soil carbon emissions.



# CARBON DEFINITIONS 101

**Greenhouse gases (GHG)** – are gases in the atmosphere that trap heat. Some of these gases include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), water vapour (H<sub>2</sub>O), nitrous oxide (N<sub>2</sub>O), ozone (O<sub>3</sub>) and some artificial chemicals like chlorofluorocarbons (CFCs). Not all gases have the same impact or long-term effect, as each survives in the atmosphere for different lengths of time. The most significant of these for pork producers is methane, produced when pig effluent is stored in ponds or when manure is stockpiled. Other gases of concern for pork production are nitrous oxide (also released when manure breaks down) and carbon

dioxide which is released from several processes including the burning of fossil fuels for power, respiration of mammals and the changing of vegetation on the land.

**Greenhouse effect** – is a naturally occurring process that traps heat within the Earth's atmosphere. Instead of the sun's energy bouncing off the Earth's surface and returning to space, the gases in our atmosphere trap it and keep a portion bouncing between them and the surface where it is absorbed. This warms the surface of the Earth and is the reason there is life on our planet.

**Anthropomorphic climate change** – this is the name given to the increasing shifts in global climate which is associated with the increased greenhouse effect linked to greenhouse gas emissions from human activity. A marked shift in average temperature can be seen since the Industrial Revolution, and this increasing temperature is linked to changing climate, increased frequency of natural disasters like fires and floods, decreased biodiversity, shifting wildlife habitat distribution and changing crop suitability for traditional cultivation areas.



**Emissions intensity** – emissions relative to output (i.e. CO<sub>2</sub>-e per kg of LW sold). Emission intensity values allow for comparison and benchmarking between farms of different sizes. They are the standard unit for a product carbon footprint. Emissions intensity for the pork industry was calculated as 3.3kg CO<sub>2</sub>-e/ kg LW pork in 2018. Each farm will have a different emissions intensity, depending on the housing type, manure management and feed inputs.

Total emissions/absolute emissions are expressed as the total amount of emissions (expressed as CO<sub>2</sub>-e) for an activity, process or product. This is what our national emissions are reported as and is preferred for business reporting in order to clearly identify reductions and avoid confusion when comparing different economic units between products (which can occur when using emissions intensity)

**Global warming potential (GWP) and carbon dioxide (CO<sub>2</sub>)** – different greenhouse gases have varying warming potential, which means the amount they contribute to the warming of the Earth's atmosphere varies. GWP (also known as GWP100 to reflect its 100 year timescale) is a measure of the global warming potential compared to one tonne for carbon dioxide and is measured in units of carbon dioxide equivalents (CO<sub>2</sub>-e). For example, one kilogram of methane (CH<sub>4</sub>) has a GWP100 25 times that of CO<sub>2</sub> while nitrous oxide has a GWP100 298 times that of CO<sub>2</sub>. GWP100 is the international standard for measuring the impact of greenhouse gas emissions.

**Carbon footprint** – is the net impact an activity, industry or process has relative to global warming potential emissions. It is a measure of emissions intensity and is expressed as kg of CO<sub>2</sub>-e per unit (eg kilogram

of product and is typically assessed through a life cycle assessment (LCA). It must include Scope 1,2 and 3 emissions (see [Life Cycle Assessment](#) for more detail).

**Carbon accounting** – is the name given to the process of determining carbon emissions and reduction activities for a product, process or industry. It is typically focused on business emissions and carbon storage for a particular site or business. It often focuses on Scope 1 and 2 emissions, with the inclusion of Scope 3 emissions being optional.

**Carbon neutral** – any carbon dioxide released into the atmosphere by an activity or action is balanced by an equivalent amount being removed. Carbon neutral can be achieved by changing an activity so it no longer emits greenhouse gases or offsetting the greenhouse gases produced.



**Carbon offsets** – is a way GHG emitters can neutralise the impact of their emissions. In carbon accounting terms carbon offsets cancel out carbon emissions. GHGs emitted by a process, industry or country can be offset by carbon sequestration or avoided emissions. For example, a business may buy carbon offsets in the form of tree plantations that absorb the same amount of carbon the business releases or by buying carbon credits from a business that has undertaken emissions reduction activities (e.g. renewable energy projects or emissions avoidance activities like methane flaring).

**Carbon sequestration** – is the long-term storage of carbon in plants, soil, oceans and other geological matter. Carbon can be stored either naturally or through artificial processes. There are programs available that can reward carbon sequestration with the generation of carbon credits, however there are usually very strict requirements around permanence that need to be considered.

**Carbon sink** – any process, activity or mechanism which removes GHG, or a precursor of a GHG from the atmosphere is termed a sink. Trees and other vegetation are considered sinks because they remove carbon

dioxide through photosynthesis, as well as soil which can store organic carbon through cultivation of certain crops or the addition of soil amendments, such as manure or compost.

**Carbon capture and storage** – is a process that is currently used by big polluters such as coal fired power plants whereby CO<sub>2</sub> emissions are captured and then injected below ground to be stored as a means of preventing atmospheric emissions. While not currently used in Australia, it is a key technology identified in the Australian Government's Low Emissions Roadmap and is a key part of Australia's net zero strategy.

**Carbon credits** – Australian Carbon Credit Units (ACCUs) are created when approved activities are undertaken to reduce green house gas emissions, such as capturing and destroying methane from a piggery effluent pond. One ACCU is equivalent to 1 tonne of carbon dioxide. ACCUs are the only official way of generating credits available for government contracts in Australia, and while private and international schemes do offer opportunities, these are largely focused on carbon sequestration and biodiversity management schemes.

**Carbon markets** – are the trading mechanism for carbon credits. In Australia, carbon credits are traded by the Australian Government through the Emissions Reduction Fund or sold to private buyers on the open market. Most registered projects choose to sell to the government for a fixed price on a contract that is set every year. With prices on the open market going up, there may be more opportunity to increase profits through the auctioning of credits. Note that if credits are sold in a carbon market, they cannot be used to claim carbon neutral or offset against a business's emissions so if carbon neutral marketing becomes a driver of higher prices it may be more advantageous to not sell credits generated on the markets.

**Emissions Reduction Fund (ERF)** – supplies Australian carbon credit units (ACCUs) and is a voluntary program that provides financial incentives for companies to adopt approved methodologies to reduce emissions, or by removing carbon dioxide from the atmosphere and sequestering carbon in soil or vegetation.



# LIFE CYCLE ASSESSMENT (LCA)

An LCA is a way to measure the environmental impact of your farm or products. It is a standardised way to model and compare impacts of interest across different production systems and industries, much like a financial account. While it produces information on more than just GHG emissions, an LCA does produce a measure of emissions which is considered highly when aligned with national and international standards. It is both difficult and expensive to measure the quantity of GHG emissions or the carbon storage on a piggery. For this reason, carbon accounting is done through calculations and modelling as part of an LCA, to produce an estimate of emissions and carbon storage.

LCAs can cover a wider range of impacts. The most common ones included are:

- Greenhouse Gas (GHG) emissions (reported as carbon equivalents)
- land use and land use change
- energy use and water use
- nutrients to land
- feed ingredients and by-products
- biodiversity

You can also have different boundaries for an LCA, focused just on farm, to processing or all the way from feed creation through to final product consumption.

LCAs are a lag measure of environmental impact: they rely on data typically falling about 18 months in the past. This means that they will not capture any recent changes to practices. For more information, see the [Low GHG Emissions Roadmap](#).

A LCA can focus on any of three scopes, where as a carbon footprint must include all three. There are three scopes which are outlined below which are used to classify GHG emissions based on where they are generated and their relationship to the business being assessed:

- Scope 1: Direct GHG emissions occur from sources that are owned or controlled by the company. For a piggery the biggest source is likely to be from manure management.
- Scope 2: Accounts for GHG emissions from the generation of purchased electricity consumed by the company.
- Scope 3: Are a consequence of the activities of the company but occur from sources not owned or controlled by the company:
  - Upstream emissions: from sources such as the production of purchased feed, and manufacture of chemicals.
  - Downstream emissions: from sources such as those associated with the transportation and processing of pigs, through to preparation and consumption by consumer.

## Upstream

(Pre-farm emissions)



### Scope 3 emissions

- Emissions from purchased pigs
- Emissions from the production of feed, including grain and supplements
- Emissions from the production of straw bedding

## On-farm

(Piggery)



### Scope 1 emissions

- Piggery emissions
- Enteric methane
- Manure management emissions including nitrous oxide and methane
- Piggery services including diesel, petrol, gas

### Scope 2 emissions

- Grid-supplied electricity emissions

## Downstream

(Post-farm emissions)



### Scope 3 emissions

- Emissions from transport of pigs to meat processing
- Meat processing
- Retail
- Emissions from manure/sludge exported offsite

## Emissions and Benchmarking



LCA benchmarking over time is important if you are considering how to lower your footprint. As the accepted way to track figures like GHG emissions, there is a need to understand your baseline through an LCA before you can make changes and then undertake another LCA to determine if there are any improvements. We need current baselines and ongoing benchmarking to help the industry demonstrate our good environmental credentials. As the interest in reducing emissions continues to gain focus at a business level but also to consumers, it is likely that this will become a requirement of some supply chains and customers who might have their own pledges around reducing emissions across their operations.

Many of the items that you would be required to monitor as part of an LCA benchmarking process are standard production measures such as feed conversion, finished pig weight and herd composition.

Operational factor	Comment
Herd composition	Breakdown of pig numbers and housing
Pigs weaned /sow/year	Annual average
Finisher pig weight	Average weight at delivery to processing
Electricity/diesel/LPG usage	Usage in piggery operations
Feed composition	Key feed ingredients
FCR	Whole herd FCR (kg feed per kg LW)
Soymeal content in feed	% content in feed and origin
Distance to services (feed, fuel, processing)	Distance for delivery
Feed substitutions	Use of material other than manufactured pig rations
Manure management	Details of how manure is managed across site

## FACT OR FICTION

**Anyone can undertake an LCA – False.** For it to be meaningful under any certification scheme, a LCA or carbon footprint assessment must be undertaken by an accredited professional in line with a national or international standard.

**Carbon credits can be a reliable source of alternative income – True.**

Although like any financial product they need to be managed correctly to generate a benefit and specialist financial advice is advised before engaging in the carbon market.

**I can sell my carbon credits and be carbon neutral – False.** Under current schemes if you abate emissions on your farm but then sell the credits you generate, these activities cannot be used for you to claim that your business or product is low carbon. This is to avoid double counting of reduction activities.

**It is quick and easy to generate carbon credits – False.** Carbon abatement or sequestration projects, like any major project take significant amounts of time and investment in order to be successful. It can easily take up to two years to start

generating income from a project. Remember that all projects must be registered before any finance is organised or ground broken.

**Interest in sustainability and greenhouse gas reduction is related to company growth – True.** Figures show that the companies showing the most growth are those that have strong positions on sustainability in general, including reducing greenhouse gas emissions, ethical sourcing and waste reduction are seeing sustainably more growth in profits compared to those that don't have strong positions.





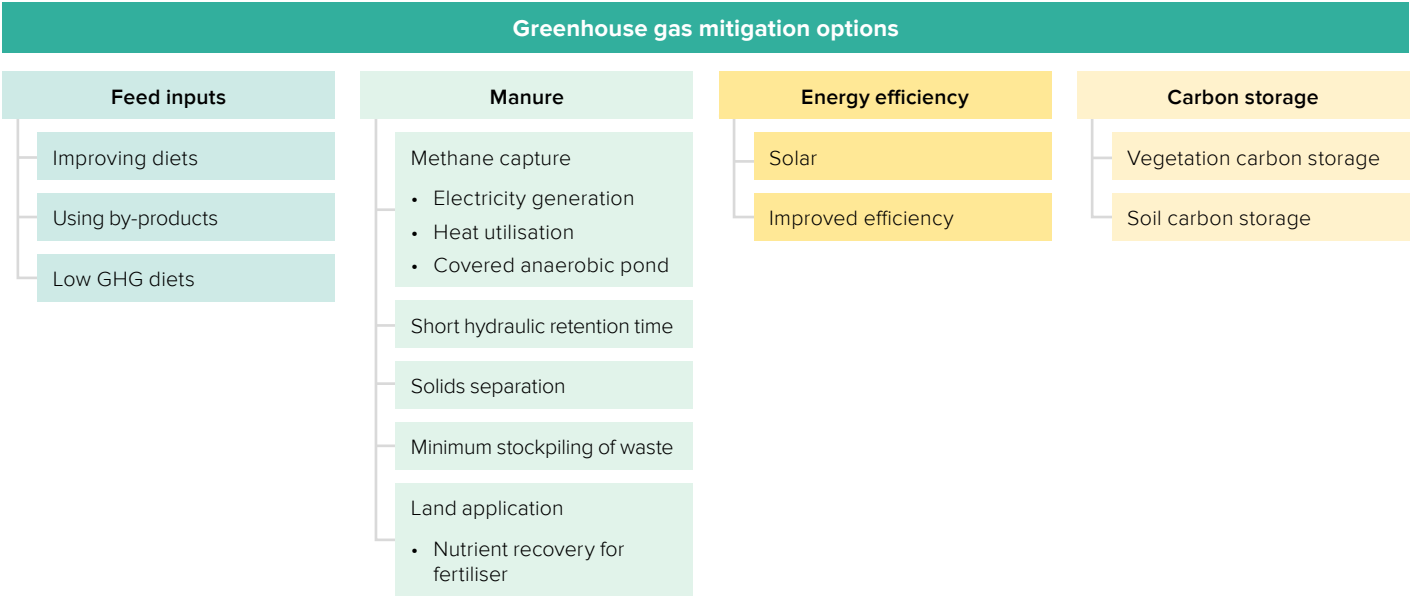
# CARBON & FARMING PRACTICES

When considering pig farming there are several areas where improvements can be made to reduce GHG emissions. The best place to start is to consider farm inputs – energy and feed. Energy can be a simple place to make improvements from simple switch of providers to one who uses a greater mix of renewables, to making efficiency improvements on farms (updating lighting, pumps, augers) to investing in renewables like biogas or solar on farm.

A lot of emissions for pork production are also tied up in feed, looking at where your feed comes from and choosing suppliers carefully can further reduce your footprint. For example, imported soy products have high footprints due to land clearing practices, consider replacing soy with alternative ingredients or looking for local sources. The biggest source of on farm emissions is manure management systems. For liquid effluent systems, the best way to mitigate is to cover ponds and flare the captured methane or use it to generate power but there are other management options such as reducing the time the effluent is held in ponds which can improve outcomes.

There are also many funding opportunities available to assist producers to reduce their emissions. Most state governments have an energy efficiency project funding available.

APL are continuing to invest in understanding new opportunities in this space. The first step was the development of the low carbon roadmap and new research on soy alternatives, effluent spraying and soil carbon, biogas optimisation and energy resources are being investigated. Support is also available for working with the clean energy regulator to register projects to generate carbon credits.



Take some time today and consider how you can reduce emissions on your farm.

## MORE INFORMATION

For a copy of the Sustainability Framework have a look on [APL's website](#) or contact Rowena Davis at [rowena.davis@australianpork.com.au](mailto:rowena.davis@australianpork.com.au)

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