



Carbon Footprint

Opportunities for the U.S. pork production industry



This document presents information that explains how the trend toward a carbon-conscious economy may impact the pork industry, and how addressing an operation's carbon footprint can lead to greater efficiencies, reduced costs of operation and an improved bottom line.

This effort is consistent with the pork industry's on-going commitment to issues of environmental stewardship and social responsibility.

Why Should Pork Producers Care About Their Carbon Footprint?

- To improve their efficiency, reduce costs and improve their bottom-line performance.
Determining a carbon footprint involves an in-depth analysis of the production process. Since carbon is closely associated with energy use, this in-depth analysis can help producers identify strategies to reduce their energy consumption throughout the entire production process; improve production efficiency; reduce the cost of production and save money. Implementing carbon emission reductions and offsets also may offer opportunities for added income for producers.

- To further demonstrate the on-going commitment of pork producers to being good environmental stewards and align the industry with a growing base of customers who are interested in environmental issues. In response to consumer demand, product life-cycle assessments are becoming popular and may be asked for by some retailers that are seeking to provide customers with "green" products.
- To be able to respond to the increasing interest on the part of society and government for commodity producers, such as the pork industry, to understand and manage their carbon emissions. National governments are taking or planning a variety of steps to reduce carbon emissions including: carbon emissions trading programs; voluntary or mandatory reduction and reporting programs; taxes on carbon emissions or energy use; and, regulations and standards on energy efficiency and carbon emissions.

Quantifying carbon emissions enables an operation to get a clear picture of where its emissions are originating from; establish a baseline for their emissions; develop an appropriate plan to address emissions; and, measure the effectiveness of those efforts.

What is a Carbon Footprint?

A carbon footprint is a technical assessment which determines the amount of emissions of certain gasses resulting from a process, an activity, a business or even a person's life-style. There are six primary gasses of interest: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆), per-fluorocarbons (PFCs) and hydrofluorocarbons (HFCs). These are often referred to as greenhouse gasses or GHGs as they are believed to contribute to a "greenhouse effect" which traps heat in our atmosphere. This greenhouse effect has the potential for global warming resulting in climate change on earth.

The global warming potential, or GWP, of each of these gasses is different and to be quantified needs to be adjusted to a common unit of measure. That common unit is carbon dioxide and is expressed as a carbon dioxide equivalent (CO₂e).

These emissions are generally measured in metric tons (2,204 pounds), the international standard.

Carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) are the primary GHGs that result from agricultural and livestock operations. The other three gasses are not generally

associated with agricultural operations. As the following table reflects, these gasses have different global warming potential when converted to carbon dioxide equivalents. Each ton of methane (CH₄) and nitrous oxide (N₂O) released to the atmosphere is equivalent to 21 tons and 310 tons of carbon dioxide, respectively.

Gas	Carbon dioxide (CO ₂)	Methane (CH ₄)	Nitrous oxide (N ₂ O)
Global Warming Potential, metric tons	1	21	310

A carbon footprint estimates the size and breakdown of GHG emissions; identifies areas where emissions may be positively impacted by improved efficiencies; and, provides a mechanism to track performance in improving efficiencies and reducing emissions. There are two options: an operational assessment and a product life-cycle assessment.

Operational Assessment

An operational assessment looks at the overall GHG emissions associated with a business (activity, process or person) on an annual basis.

An operational assessment at a pork production operation would analyze the GHG emissions arising directly from the production of live pigs including emissions from the treatment and storage of manure, energy consumption for all buildings and the fuel used by farm vehicles and machinery. Periodic reviews can help determine future opportunities for reductions.

The operational carbon footprint of a pork production facility would measure the GHG emissions from these sources based on utility bills, fuel consumption and established standards for determining GHG emissions from manure, based on production level, type of manure treatment and storage used and based on the location of the farm.

Product Life-cycle Assessment

A product life-cycle assessment examines the carbon footprint of one product from cradle to grave. This type of assessment traces a product back to its earliest beginning and tracks its emissions forward through production, consumption, and



until it, or the packaging it was sold in, has been broken down and returned to the natural environment or recycled.

In the case of pork, the assessment would start at the farm where the feed crops to feed the pigs are produced. The next step in a pork product life-cycle assessment would be to measure the GHG emissions resulting from operations (operational assessment), the vehicle emissions of vehicles used in the transport of pigs to the processing plant; the emissions from pork processing operations and their waste treatment facilities; Beyond the farm and processing plant, a life cycle-assessment would also account for the emissions related to the delivery of the retail product to a store; the energy used while storing and displaying the product at the store; the subsequent purchase and consumption of the product by the consumer; and the disposal of the packaging in a landfill.

There are nationally and internationally recognized protocols for the process of conducting carbon footprint assessments.

Where Do Carbon Emissions Come from on a Pork Operation?

Experience suggests that businesses that reduce GHG emissions improve their profitability primarily by improving energy efficiency. Reductions may translate into economic return for those efforts.

This section identifies areas in which GHG emissions can be addressed in a pork production operation. The areas of the pork production operation that may have the greatest opportunities for carbon emission reductions are the manure storage and handling facilities, fuel use and hog building energy consumption.

Manure Storage and Handling

Manure lagoons represent one of the biggest opportunities to reduce GHG emissions. The reason anaerobic lagoons are a good reduction source is that they can be a source of significant amounts of methane (CH_4). Methane has an impact potential 21 times higher than carbon dioxide (CO_2).



There may be various options for controlling emissions from manure storage and handling. One option is to cover manure storage structures and capture the emissions. The gasses can then be flared or used as a fuel source to drive power generators or equipment.

Fuel Use by Facility Vehicles

Depending on the size of the facility and complexity of the facility processes, a facility's tractor and vehicle fleet can make up a sizeable portion of a pork operation's GHG emissions. Measures to reduce GHG emissions from vehicles can be as simple as putting in place rules against idling, more efficient routing or multi-purpose single trips. Focusing on tractor and vehicle efficiency also may result in significant savings.



Hog Building Energy Consumption

GHG emissions from hog facilities can be achieved in different ways. These reductions arise from energy efficiency measures such as lighting upgrades, improved temperature regulation (heating and cooling) in buildings, upgrades on fan

motors, the use of natural light and onsite fuel for power production. An additional benefit from these emission reductions is money saved from lower electricity and fuel bills.

Feed Production and Delivery

GHG emissions from feed crop production generally are the result of nitrous oxide emitted from fertilizer application and from nitrogen volatilization after application. Emissions savings in this area can be achieved primarily by increasing the use of natural fertilizer such as pig manure and through precision application of fertilizer.

These general categories can begin to give ideas for reducing GHG emissions on pork production operations. The next section will look at carbon markets and opportunities to sell these reductions to buyers.

What is a Carbon Market?

Carbon markets and the trading of carbon credits that occurs within them are complex topics. This section gives a brief overview of carbon markets and their potential impacts on pork producers.

In addition to resulting in potential savings in the cost of production, carbon emission reductions and offsets may offer opportunities for added income for pork producers. GHG reductions, if properly verified, can be given a monetary value and traded in carbon markets as carbon offsets or carbon credits to help pay for technology improvements that further reduce GHG emissions.

The common elements of a high quality carbon credit are that the credit meets three conditions: additionality, leakage and permanence.

Additionality ensures that GHG emission reductions have an additive effect. In other words, the reductions are in addition to those resulting from “business as usual” and result from a reduction project. Leakage focuses on insuring that the reduction in one area does not lead to an increase of GHG emissions in another. Permanence deals with the long-term reduction of the GHG emissions. Ultimately, the overall quality of a carbon credit offset leads directly to its value (price) and its acceptance in the national or international voluntary carbon markets.

A carbon market is a market in which carbon emission credits or carbon credits are sold as a commodity. The key concept underlying these transactions is that a ton of carbon dioxide

equivalent (CO₂e) emitted, regardless of where it is emitted, has the same impact on the climate as another. Likewise, a reduction of a ton of CO₂e emitted has the same climate benefit and because of that, it can be given a monetary value and transferred or sold in a voluntary market anywhere in the world.

There are two basic types of carbon markets: compliance (or regulated) markets and voluntary markets. Compliance markets are markets that have been established through national or state legislation, or by international treaty, and establish binding emission limits with penalties for non-compliance. The total emission limit, or cap, is usually set by government and divided among the regulated parties (usually large industrial companies) by assigning or selling tradable emission allowances. Regulated firms can then trade these allowances, depending on whether they have a surplus or deficit, forming an emission “cap-and-trade” system that puts a market price on emissions.

Voluntary markets have been established by non-governmental entities that are seeking to reduce GHG emissions in areas that do not yet have compliance markets. There are important differences between the regulated compliance markets and the more dynamic, less bureaucratic voluntary markets. There is also overlap between the voluntary and compliance sectors:

voluntary markets often use similar methodologies for developing mission reductions as the compliance markets.

What is the Next Step?

The Pork Checkoff convened a meeting of stakeholders from across the pork chain to discuss addressing GHG emissions of the pork chain and outlining a process for conducting a life-cycle assessment of GHG emissions for the U.S. pork industry.

This life-cycle assessment will be a collaborative effort involving all portions of the pork chain and will account for the GHG emissions arising in pork production from feed crops to retailers. The assessment also may include packaging and disposal. The Pork Checkoff will concentrate its efforts on the in-depth assessment of the live hog production portion of the pork chain with the other segments being responsible for in-depth assessments of their portion.

It is important to remember that the reduction of GHG emissions at pork production facilities can result in improved energy efficiency, lower costs of production and improved profitability. Overall, these actions will focus on increasing pork producers’ efficiency and economic competitiveness.



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