# FACT SHEET

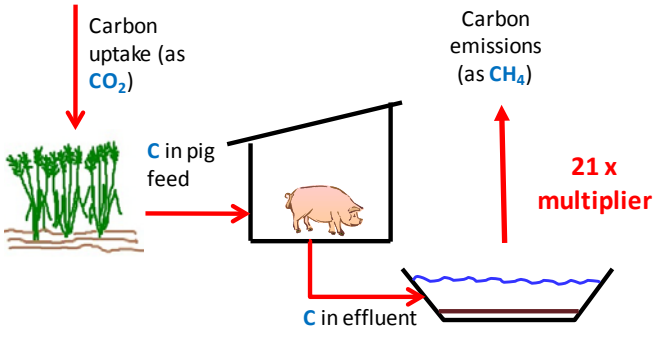
August 2011

## REDUCING GREENHOUSE GAS EMISSIONS FROM PIGGERIES

Greenhouse gas (GHG) emissions from pork production are seen as a major priority for the industry. Although only contributing 0.4% to Australia's overall GHG emissions, the pork industry sees mitigation and utilisation as a significant opportunity to reduce resource inputs and minimise its environmental footprint. Emissions arise from a range of sources, including energy use and 'upstream' emissions from feed production. The largest emission source at a conventional piggery comes from the effluent treatment system. Recent APL funded life cycle assessment (LCA) research showed that 66% of emissions from a conventional piggery came from effluent treatment in anaerobic ponds[1].

The main GHG arising from effluent treatment is methane ($CH_4$). Methane is generated in the pond from the undigested material within the effluent, and from spilled feed that enters the by-product stream. After entering the pond, bacteria breakdown this material, but because of the lack of oxygen, the process is incomplete and a mixture of methane and carbon dioxide is released from the pond. These gases can often be seen bubbling to the surface in an effluent pond.

The carbon that is emitted (as methane) in the pond originally came from crops that absorbed carbon dioxide from the atmosphere. However, when this carbon material in the manure enters the pond and is converted to methane, it becomes a much more potent GHG. This means that the whole process multiplies the amount of GHG emitted. When pig manure is not treated in anaerobic ponds, these methane emissions do not occur at the same rate.




### Reducing Emissions

Fortunately for the pork industry, the biggest emission source can be managed. There are a number of options that pig farmers can investigate to help reduce emissions from ponds. The mixture of methane and carbon dioxide emitted from ponds (known as biogas) has a moderate energy content, which can be used to generate heat or electricity. At the simplest level, the biogas from effluent ponds can be captured and burned, to destroy the methane and eliminate the global warming contribution.

A recent APL funded project [2] that analysed these options showed that emissions from effluent treatment may be reduced by 62-80%. The treatment systems investigated included capturing and destroying methane from covered anaerobic ponds (CAPs) with flaring (CAP-F), using methane for heat to offset farm gas usage (CAP-G), and for combined heat and power generation on-farm (CAP-CHP). A fourth option looked at transporting effluent off site for processing at a centralised anaerobic digestion plant (CAD). Results are shown in Figure 1.

### Figure 1: Greenhouse gas emissions from four alternative effluent treatment systems for a simplified piggery system 1

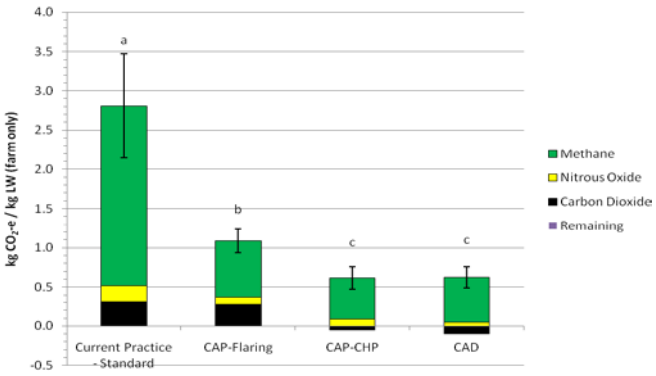



Figure 1 shows that even for the covered pond systems, residual emissions of methane are likely to be the biggest source of GHG.

[1] Error bars and labels reflect differences at the 95% CI. Uncertainty mainly relates to estimation of volatile solids entering the effluent stream and methane emission predictions.

This is because most farms have multiple ponds, and the cost of covering all ponds within the system will most likely be too high. This means that an amount of methane will still be emitted from most effluent treatment systems.

Using biogas in a combined heat and power unit provided the largest reduction in GHG for the on-farm systems. While this is the most expensive system to install, it offers the best utilisation of the energy in biogas and may provide reasonable payback periods for investment. The CAD scenario resulted in similar reductions in GHG to the farm CHP scenario. The main limitation to the CAD scenario isthe need to pre-treat effluent on-farm to reduce transportation costs.

These options offer exciting possibilities for the pork industry. The pork industry was the first in Australia to develop and have approved a methodology by the Department of Climate Change and Energy Efficiency (DCCEE) for the Carbon Farming Initiative (CFI). The methodology titled "Destruction of methane generated from manure in piggeries" allows producers to generate and sell carbon credits for installing the systems described in this fact sheet.

## Managing Nutrients

Piggery effluent contains nutrients as well as carbon. Managing these nutrients is the other key to improving environmental performance of piggeries. Because nutrients are valuable crop and pasture inputs, beneficial utilisation will help improve sustainability of both piggery and cropping or pasture systems. Additionally, using nutrients from effluent (particularly nitrogen) in an efficient and sustainable way will further lower GHG emissions, because it can offset the use of energy intensive synthetic fertilisers like urea.

Best practice utilisation of effluent nutrients resulted in up to 18% lower GHG emissions for combined heat and power treatment systems.

## Where to Next?

Several commercial pig farms have operational biogas capture systems in Australia, and many more projects are 'in the pipeline'. APL is currently funding projects to study the practical and economic feasibility of installing covered ponds across the industry. There is also research underway to investigate the value of carbon credits to the industry. Stay tuned!

## Further Reading

[1] Wiedemann, S.G., McGahan, E.J., Grist, S. and Grant, T. 2009. *Environmental Assessment of Two Pork Supply Chains using LCA*. Report prepared for Australian Pork Limited and RIRDC.

[2] Wiedemann, S.G. and McGahan, E.J. 2011. *Environmental impacts of alternative waste treatment systems for Australian piggeries using LCA*. Report prepared for Australian Pork Limited. APL Project No. 2009/1011.336.

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