Fact sheet
March 2024

Emissions impact of anaerobic digestion for food waste processing

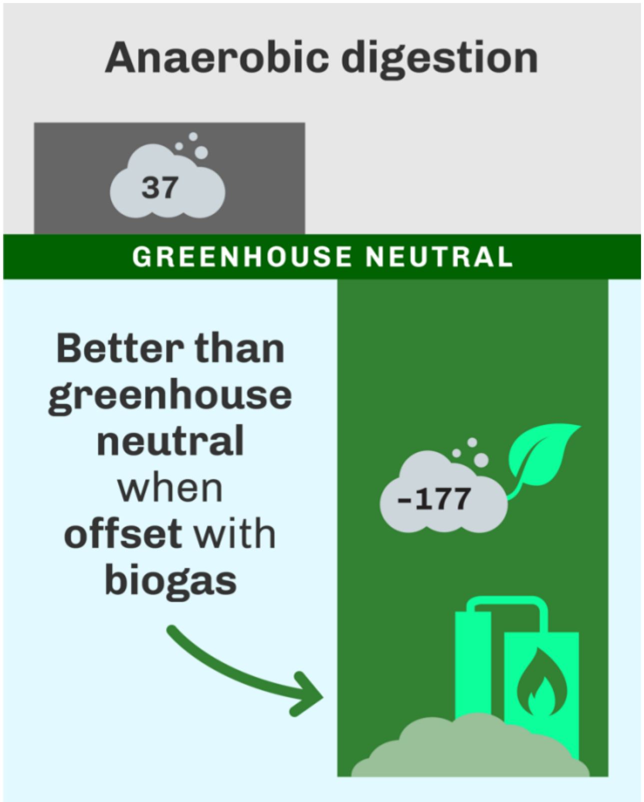
Anaerobic digestion (AD) of food waste avoids landfill emissions and produces biogas renewable energy and potential fertiliser. There will be increasing opportunities to divert food waste to AD facilities in NSW.

Introduction

This fact sheet is one of a series analysing the emissions impacts of different processing technologies for food waste in NSW. It draws on modelling of the greenhouse gas (GHG) emissions generated from the collection and transporting of source separated food waste, processing it in an anaerobic digestor, applying the digestate to land and utilising the biogas to generate electricity.

About Anaerobic Digestion (AD)

AD uses anaerobic bacteria to convert the degradable organic carbon in food waste into methane (or 'biogas'). Biogas can be used as a substitute for natural gas to generate renewable energy. The AD process also produces digestate, this contains nutrients that could substitute for synthetic fertilisers and improve plant growth.



Organic carbon in the digestate could add to soil carbon, which could reduce net emissions. As it is difficult to fully quantify these benefits, they have not been included in this modelling. This means that estimates of the GHG benefits of diverting food waste to AD facilities are conservatively low.

AD facilities are fully contained which reduces odour risks compared to landfill. This means AD facilities can be located closer to urban sources of organics, therefore reducing transport costs, traffic, and emissions.

Greenhouse impact of AD processing

Figure 1 shows the emissions of AD systems located 50 kilometres from the source of food waste, with and without emission offsets from the generation of renewable energy. This shows AD systems can be better than GHG neutral when biogas energy substitutes for fossil fuel electricity in NSW.

Figure 2 compares the net emissions of AD with composting 200 kilometres from the source of food waste, a high gas capture landfill 225 kilometres by train, and an average gas capture landfill 200 kilometres by truck. It shows very significant reductions in GHG emissions by diverting food from landfill. AD also outperforms aerobic composting due to the generation of renewable energy.

Modelling demonstrated that AD collection and transport emissions are relatively minor, even when waste is transported by truck 100km from the source.

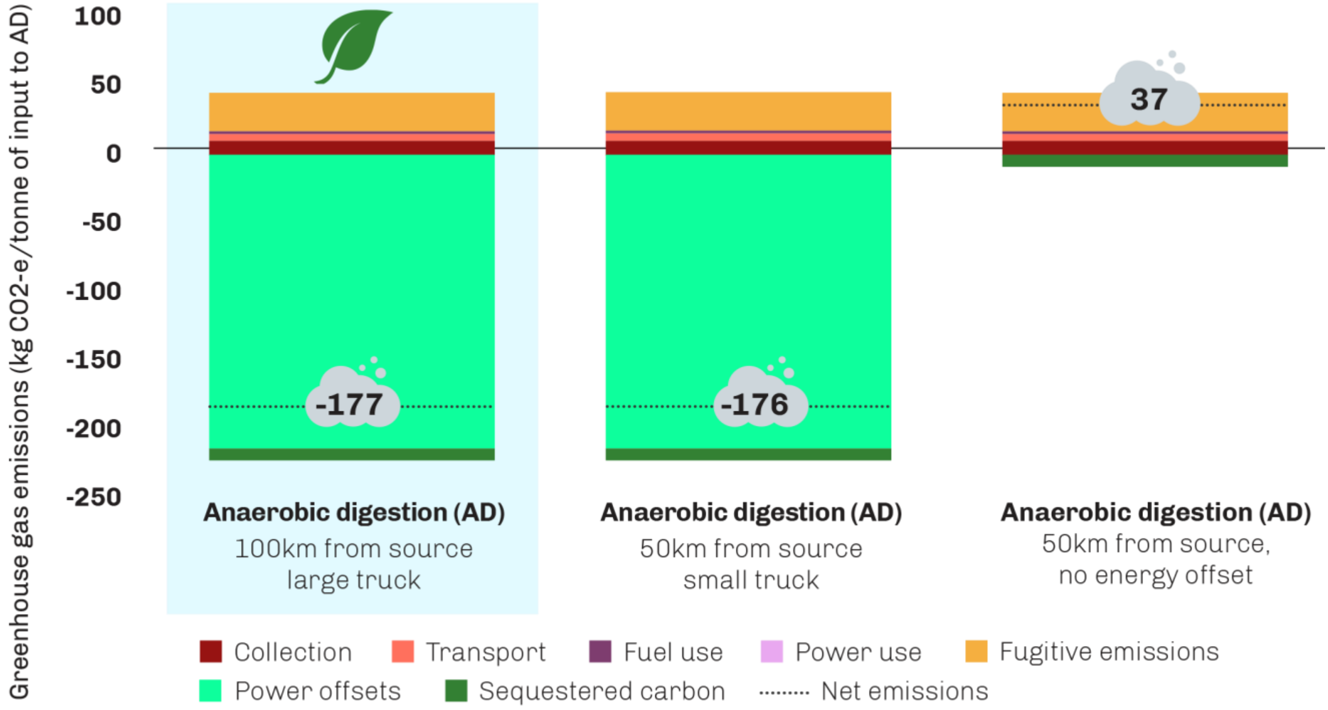


Figure 1 Emissions and offsets of three off-site anaerobic digestion scenarios

If AD bioenergy is used, net GHG emissions reduce by 176 kg CO_2-equivalents per tonne of food collected, transported, and processed. If not used, net GHG emissions of AD are around 40 kg CO_2-e/tonne of food.

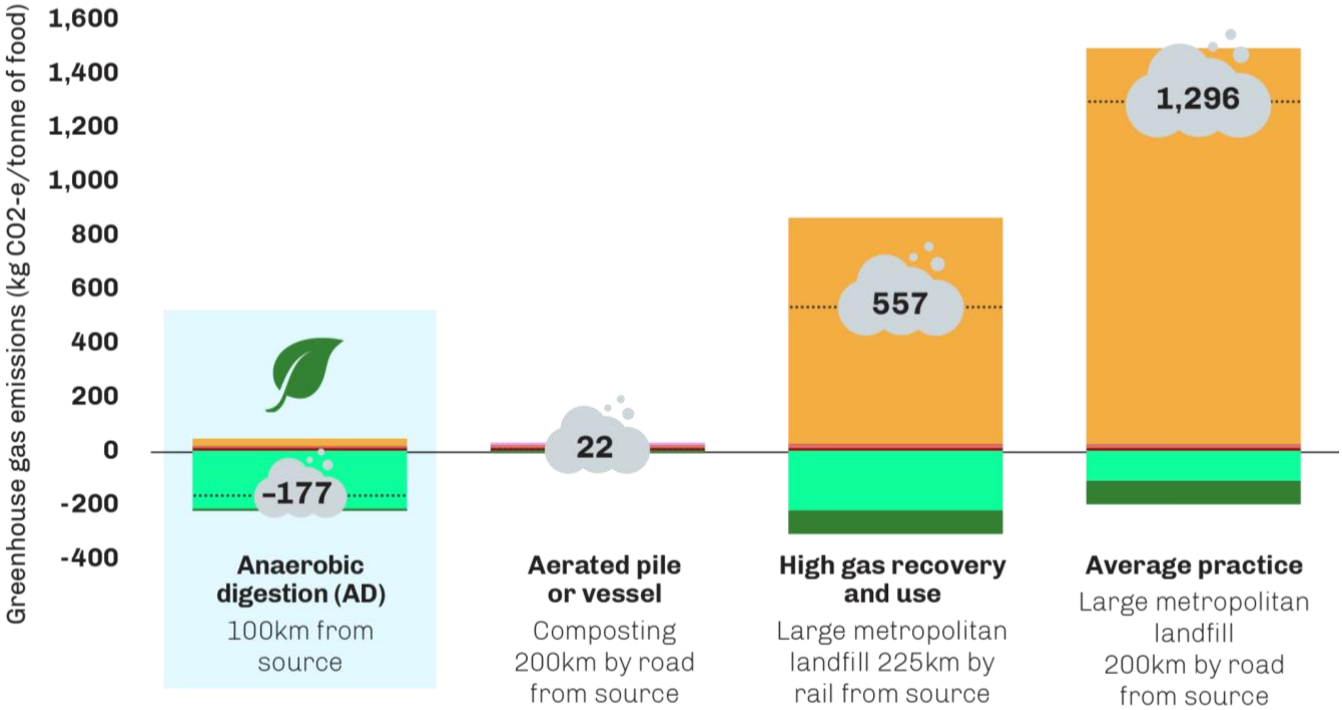


Figure 2 Emissions and offsets of AD compared to composting and landfill.

If AD bioenergy is used, AD has better GHG outcomes than composting, and far greater benefits than landfill due to avoided methane emissions that are not collected by landfill gas capture systems.

References

Blue Environment, 2023, Organics processing technology assessment.

NSW Environment Protection Authority
Email: info@epa.nsw.gov.au | Website: www.epa.nsw.gov.au

ISBN 978 1 922778 82 6 | EPA 2024P4524 | March 2023