

Greenhouse Gas Emission from NAP-Covered Earthen Manure Storage Basin

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Summary

The objective of this project was to examine the effectiveness of a negative air pressure (NAP) cover in reducing greenhouse gas (GHG) emissions from an earthen manure storage basin (EMB). GHG emissions were measured from the same EMB when it was uncovered and covered with chopped straw in 2001, 2002 and 2003, and compared with the emissions from the NAP-covered EMB in 2004. The 2-cell EMB was located at the 600-sow farrow-to-finish operation of PSC Elstow research Farm Inc. near Elstow, Saskatchewan.

Introduction

As part of the Kyoto Protocol agreement, Canada committed itself to reduce its greenhouse gas (GHG) emissions during the 2008 – 2012 period at a level corresponding to 94% of the 1990 emissions (AAFC 2000). Agriculture, in general, accounts for 9.5% of the total (GHG) emissions in Canada, with N₂O and CH₄ contributing 61 and 38% respectively (AAFC 2000). It is also estimated that 42% of the agricultural GHG emissions originate from livestock operations and one third of these emissions are associated with manure management (Laguë et al. 2002).

Results and Discussion

The concentrations of the gases in the samples collected from the surface of the cover were very near ambient conditions, so the emissions through the cover were deemed negligible. Additionally, the nitrous oxide

Table 1. Comparison of GHG emissions from NAP-covered primary and secondary cells of an EMB

	g of CO ₂ -eq/m ² -day	
	CO ₂ emissions	CH ₄ emissions
Primary cell	131	129
Secondary cell	54	49

concentration of the exhaust samples was also negligible. The average emissions from the exhaust fans (average of primary and secondary cells) were 93 and 89 g of CO₂-eq/m²-day for carbon dioxide and methane respectively.

The NAP cover resulted in a 72 and 93% reduction in carbon dioxide and methane emissions respectively, compared to the uncovered surface (Figure 6). While

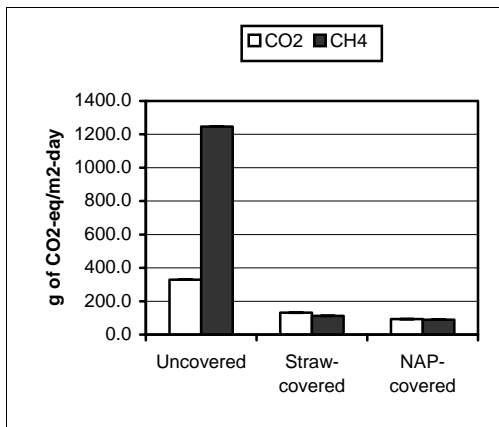


Figure 1. Overall GHG emission comparison among uncovered, straw-covered EMB in Saskatchewan.

these results show a significant reduction compared to the uncovered surface, the emissions from the NAP cover are not significantly lower than the emissions from the straw-covered surface.

Conclusions

Greenhouse gas emissions through the surface of the NAP cover were negligible, while the emissions from the exhaust fans were significantly lower than emissions from an open storage when expressed as g of CO₂-eq/m²-day (72 and 93% reductions in carbon dioxide and methane, respectively). However, GHG emissions from the exhaust fans of the NAP cover were not significantly different than those from the straw-covered surface when expressed as g of CO₂-eq/m²-day.

Nitrous oxide emissions from the exhaust fans were negligible. While the NAP cover showed only a minor improvement in greenhouse gas emission abatement compared to the straw-covered surface, the effectiveness of the cover at reducing odour emissions has been estimated to be as high as 99%. Additional benefits of the NAP-cover, such as the increased nutrient value and the ability to add biofilters at the exhaust fans to potentially further reduce emissions, should also be considered when assessing its overall performance.

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