Canadian AgriSafety Applied Science Program

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Testing a New Technology for Solid Manure Injection

Manure spreading on agricultural land is beneficial for crop production, but it can have adverse consequences for the environment and for human health. Researchers leading the *Fugitive Emissions Following Manure Spreading - Risk Assessment and Engineering Controls* project have quantified airborne emissions from manure spreading both in a controlled environment and in the field. Following this study, the research team wanted to test mitigation strategies in order to reduce the airborne emissions. A new manure spreading equipment (Figure 1) developed by Prairie Agricultural Machinery Institute (PAMI) was refurbished and shipped to the IRDA's research facility in St-Lambert-de-Lauzon, Québec for this very purpose. Instead of spreading solid manure over land as with conventional equipment, the PAMI spreader uses screw augers to deposit the manure on the surface and then incorporate it into the soil. By directly mixing the manure into the soil, it will hopefully be possible to avoid the release of fugitive air contaminants.

Methodology

The PAMI spreader was compared to conventional horizontal and vertical beater spreaders (Figure 2). Three spreading tests using poultry manure with bedding were conducted for each type of equipment. Gases (ammonia – NH3 and carbon dioxide – CO2) were measured with an FTIR gas analyser at a fixed point in the field. Odour intensity was measured by collecting samples in gas bags 30 minutes before, during and 30 minutes after spreading. Odour samples were then compared to standard concentrations of a reference odorant (n-butanol) by a team of qualified panelists.

Figure 1: New PAMI spreader

Figure 2: Horizontal and vertical beater spreaders

Results

Concentrations of CO2, presented in Figure 3, were similar for all the spreading tests, varying between 380 and 430 ppmv. Small variations can be observed during manure spreading, but no clear tendencies were detected. Furthermore, all measurements were near normal atmospheric CO2 concentrations, indicating little influence of the spreading tests.

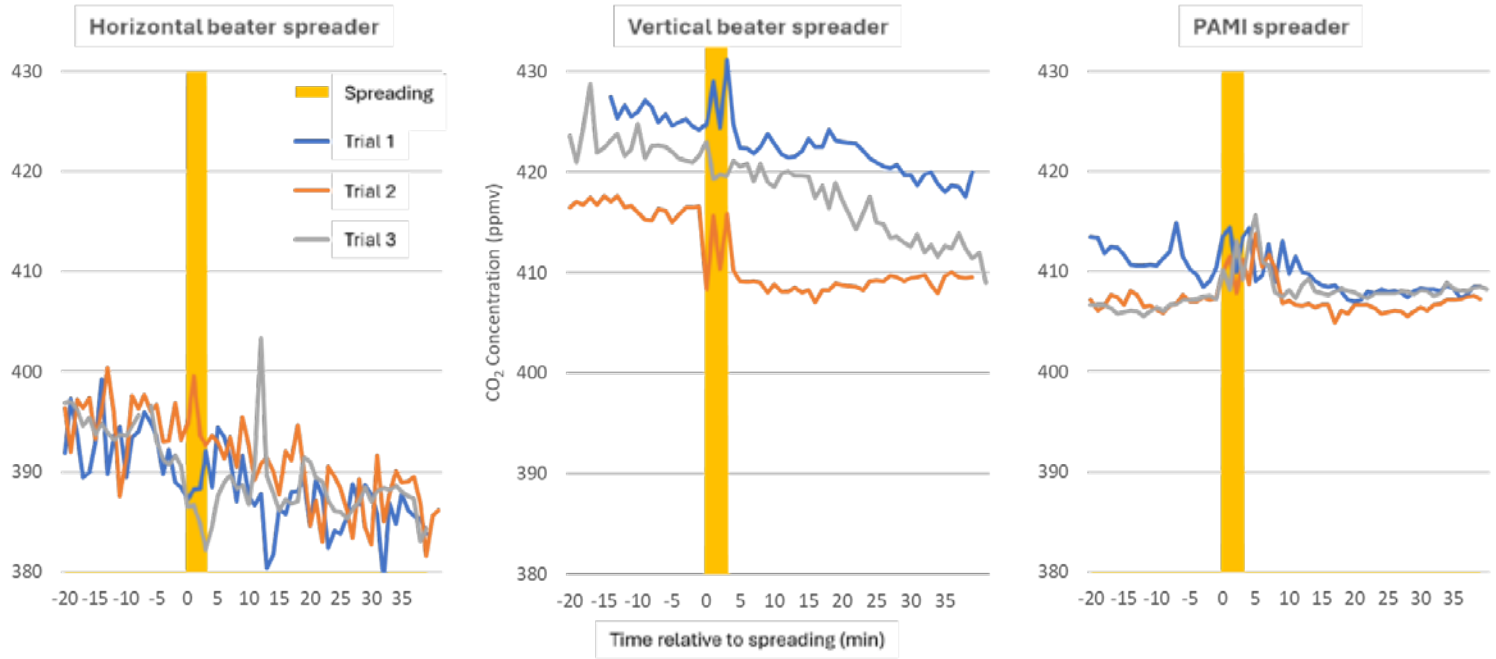

Figure 3: CO2 concentrations (ppmv)

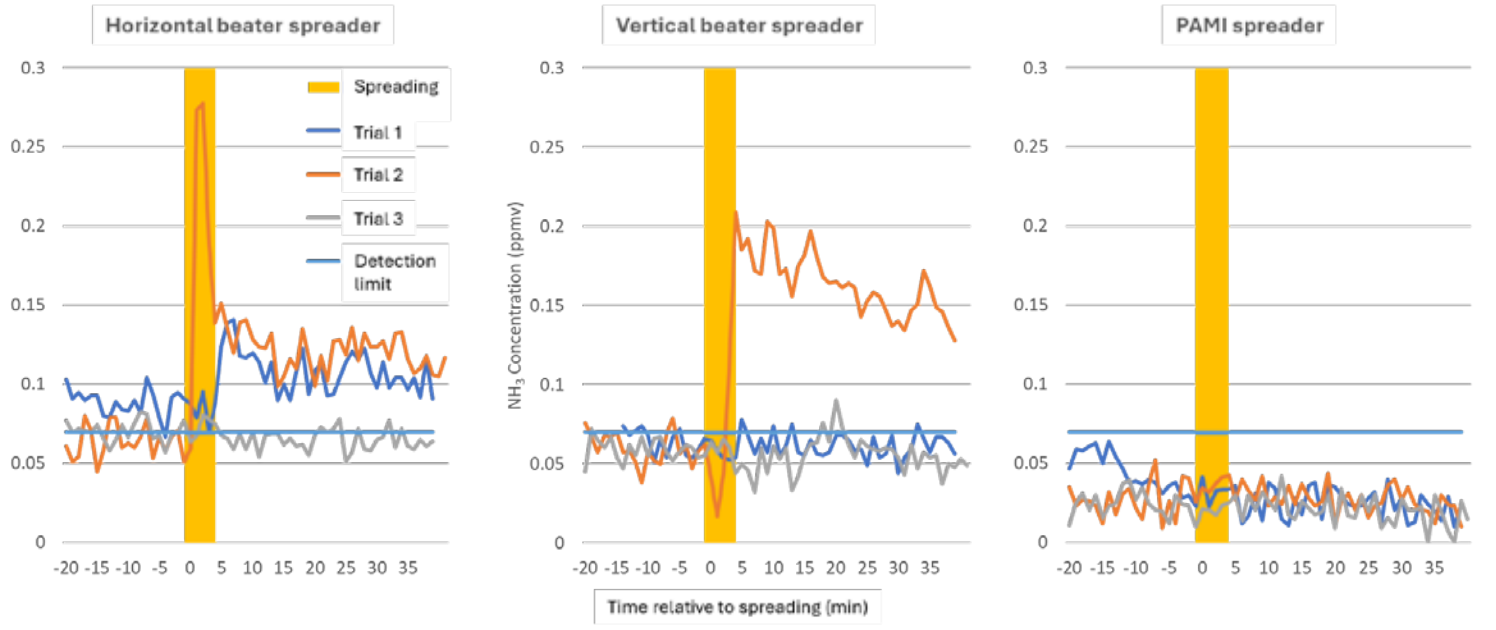

Figure 4: NH3 concentrations (ppmv)

NH3 concentrations were also relatively low for all the spreading tests, ranging from below the detection limit of the FTIR analyser (around 0.07 ppmv) to 0.3 ppmv (Figure 4). For part of the tests, both the horizontal and vertical beater spreaders produced higher concentrations of NH3 during and after spreading. However, the NH3 concentrations for the PAMI spreader were consistently below the detection limit.

The results in Figure 5 show a clear influence of manure spreading on the odour intensity for the horizontal and vertical beater spreaders. Values before spreading were below 500 ppm n-butanol, but then the odour intensity jumped up to values close to 2500 ppm n-butanol. For the PAMI spreader, values were a little higher during spreading, but they remained low, under 500 ppm n-butanol.

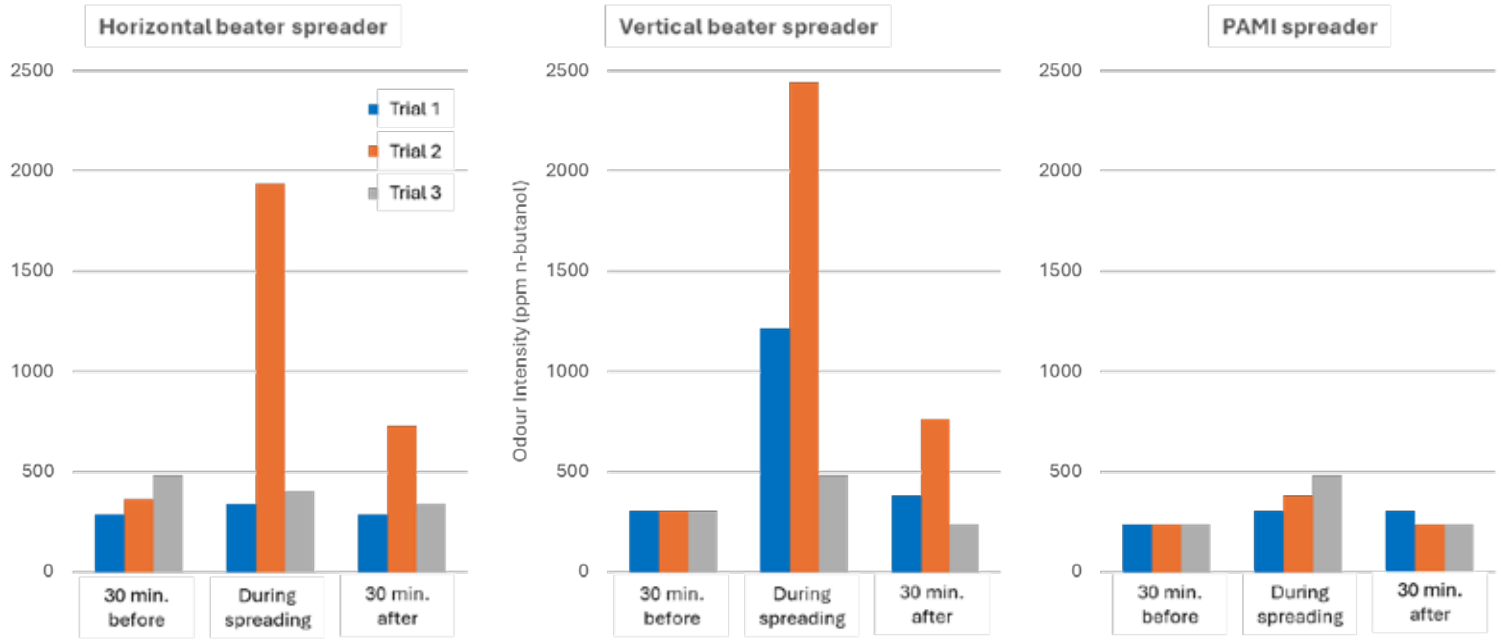

Figure 5: Odour intensity (ppm n-butanol)

This new technique for solid manure injection with the PAMI spreader showed promising results to mitigate the airborne emissions from manure spreading. In fact, the results presented here demonstrate that the PAMI spreader effectively eliminated odour and gas emissions from the spreading of poultry manure.

For contact information, please visit www.agrivita.ca

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