

The Treatment of Uncertainty in Agricultural Odour Management in Canada



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EXECUTIVE SUMMARY

Odor is perceived to be an offensive environmental problem in many agricultural communities, particularly where residential and farming uses are adjacent. Intensive agricultural production facilities can result in odor problems to the neighboring population under certain weather conditions. Consequently, odors can become an environmental constraint to expanding the agriculture production, especially in areas that are good for livestock growing feed, water is available and transportation costs are reasonable. Thus, effective management must be made by the producer to reduce the Frequency, Intensity, Duration and the Offensiveness of the odors (FIDO). It is unrealistic to expect a commercial livestock operation to operate without any odor. However, the odor level can be significantly reduced when relevant management systems are properly designed and operated. The exposure of barn workers and the neighboring population to odours must be acceptable.

Odour management usually involves in odour dispersion modeling, risk assessment (or impact assessment), and mitigation-approach selection. In addition, odour management is normally complicated with a variety of uncertainties that were associated with both subjective (odour criteria) and objective processes (wind speed and emission rate). Addressing these uncertainties in the process of modeling and impact assessment is essentially important for selecting proper mitigation and/or adaptation alternatives for odour management.

Over the past decades, many studies were undertaken regarding odour management under uncertainty. However, few models have been widely used because all of them have their strength and inherent limitations when applied to address various uncertainties that associated with both objective and subjective processes. This leads to the difficulty for decision makers in choosing suitable practices for supporting odor management. Therefore, in view of comparisons of odour models and to reflect the uncertainties in simulating odor dispersion process and assessing potential risk, it is desired to integrate more than one tool for supporting odor management. This encouragement motivates this study with objective of scoping a suite of tools or models that could be used to reflect the uncertainty involved in mitigations of odor emissions per agricultural practice for a range of Canadian geographic and environmental conditions. This objective entails:

- Characterize and evaluate sources of uncertainty in the principal components of an odour management system, and the potential for propagation of error;
- Conduct a thorough literature review on methods/tools for treating or managing sources of uncertainty;
- Examine a number of models that currently used in odour modeling system;
- Propose and assess a variety of modeling tools for tackling uncertainty;

- Initiate a case study application to demonstrate the impact of uncertainty;
- Identify and examine practical considerations for incorporating results from this study into an operational odour management program.

This report consists of 8 chapters. Chapter 1 is an introduction. Chapter 2 provides literature review and background of this study. Chapter 3 gives a detailed analysis on the sources of uncertainty associated with odour management. Dispersion modeling under uncertainty for support agricultural odor management is given in Chapter 4. Chapter 5 provides an methodologies for conducting odour risk assessment. Chapter 6 examined available mitigation and adaptation approaches for odour management. Chapter 7 provides some practical considerations for incorporating results from this study into an operational odour management program. Chapter 8 is devoted to a summary of this project and some recommendations based on this study effort.

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