Comparing N2O Concentrations with Surface Fluxes under Different Farming Practices during Spring Thaw

Faezeh Parastesh[1*], Xiaopeng Gao[1] and Mario Tenuta[1]
[1]Department of Soil Science, University of Manitoba, Winnipeg, Manitoba, R3T 2N2, Canada
Email: Faezeh.parastesh@umanitoba.ca

A field study in the Red River Valley, Manitoba, Canada, investigated the impact of farming management practices, including fertilizer best management practices (BMPs) and 4R principles, on soil nitrous oxide (N_2O) concentrations and flux emissions. Conducted over the spring-thaw period and growing season, the study used four fields on clay soil and measured N_2O concentrations and surface fluxes with a micro-meteorological tower. It found significant variability in N_2O levels, with the highest concentrations at deeper soil depths. For instance, Field One recorded up to 4 µLN_2O/L at 30 cm depth post-harvest in 2021, while the spring thaw of 2022 and 2023 saw even higher levels, particularly in Field Two with 37 µLN2O/L at 30 cm. The study also noted that enhanced efficiency nitrogen fertilizer (EENF) generally led to higher N_2O concentrations compared to conventional fertilization, especially at 5 cm and 60 cm depths during the initial growing season. Significant effects of cover crops on N_2O concentration were observed at all depths. However, these effects were not significant during the spring thaw. A notable correlation between N_2O concentration and precipitation at 15 cm depth was observed, but no correlation was found between N_2O concentration and flux emission. This research provides insights into the effects of different farming practices and environmental factors on N_2O emissions in agricultural soils, contributing to the understanding of greenhouse gas emissions in agricultural settings.