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Nitrous oxide emissions after sewage sludge fertilization of a bio-energy plantation

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The use of sewage sludge as fertilizer after harvest of bio-energy plantations gives rise to high emissions of the greenhouse gas nitrous oxide (N_2O). N_2O is a powerful greenhouse gas with a global warming potential almost 300 times larger than that of carbon dioxide and an atmospheric life-span of over 100 years. Plantations of e.g. willow (*Salix)* and poplar (*Populus)* species are today grown and used for bio-energy purposes. They could serve as carbon and nitrogen sinks, thus lowering greenhouse gas emissions and helping to mitigate a change in climate. However, since N_2O is such a powerful greenhouse gas it can have a large impact on the total emission of greenhouse gases from a bio-energy plantation. The magnitude of N_2O emissions after fertilization using sludge from sewage treatment plants is therefore important to investigate.

This study concerns N_2O emissions from a conventionally grown bio-energy plantation of *Salix*. The aim of the study was to investigate the use of sewage sludge as fertilizer after harvest, and its effect on emissions of N_2O from the soil ecosystem. The field site is a *Salix* plantation in south-western Sweden, a representative site in management practices and abiotic conditions. Emissions of N_2O were monitored using automatic chambers (height 1.05 m, volume 0.2625 m^3) and a trace gas analyzer (TGA100, Campbell Scientific, USA) during approximately one (1) year. After harvest, N_2O emissions from control plots without application of sewage sludge (non-fertilized plots) were compared to plots with sewage sludge application (fertilized plots).

Preliminary results show that emissions of N_2O were continuously very low throughout the measurement period, except for peak emissions after harvest and fertilization. These peak emissions of N_2O were observed at both fertilized and non-fertilized plots in connection to the fertilization events. The results indicate that heavy precipitation could be the cause of induced emissions of N_2O at non-fertilized plots. Some fertilized plots also showed smaller emission peaks several weeks after fertilization, whereas none of the non-fertilized plots showed this emission pattern. Annual emissions have also been calculated for fertilized and non-fertilized plots, and the results will be presented at the conference. Preliminary results indicate higher annual emissions from fertilized plots.