CO_2 emission from two cultivated organic soils in Sweden

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Conclusions

- **CO_2 emissions were higher from treatments with 40 cm groundwater level (GWL) compared to 80 cm GWL**
- **Ryegrass yield was higher with 40 cm GWL compared to 80 cm GWL**
- **CO_2 emissions were significantly different between the two soil types due to soil quality differences**

Introduction

Organic soils dominate the emission of CO_2 from agricultural soils in Sweden (Kasimir-Klemedtsson et al., 1997). The purpose of this project was to investigate if the farmer, by controlling the drainage intensity, can mitigate the emission of CO_2. This investigation was performed in lysimeters extracted from two cultivated and drained peat soils located in southern and central Sweden.

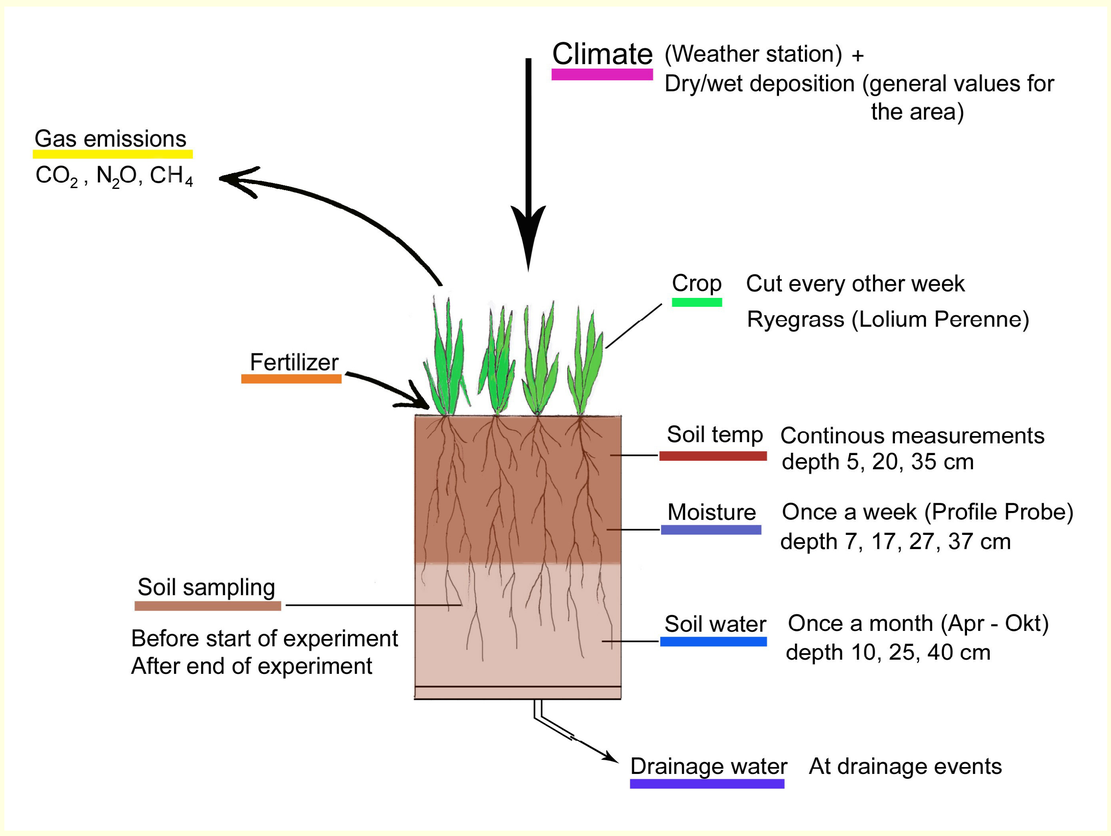


Figure 1. The lysimeter experiment was carried out at the lysimeter site in Uppsala. Climate, crop, soil water parameters and gas emissions were measured during the study.

Results

Plant growth was higher, but not significantly, with a high water table (40 cm) compared to a low (80 cm) at both sites. During the growing season in 2004 (Figure 2), CO_2 emissions were significantly greater from Örke (GWL 40 cm = 3.35 kg/m^2) then from Majnegården (GWL 40 cm = 2.51 kg/m^2) and higher at 40 cm drainage depth compared to 80 cm depth (Örke GWL 80 cm = 2.97 kg/m^2, Majnegården GWL 80 cm = 2.28 kg/m^2). CO_2 emission showed a strong dependence of soil temperature with a Q_{10} between 2.1 and 3.0.

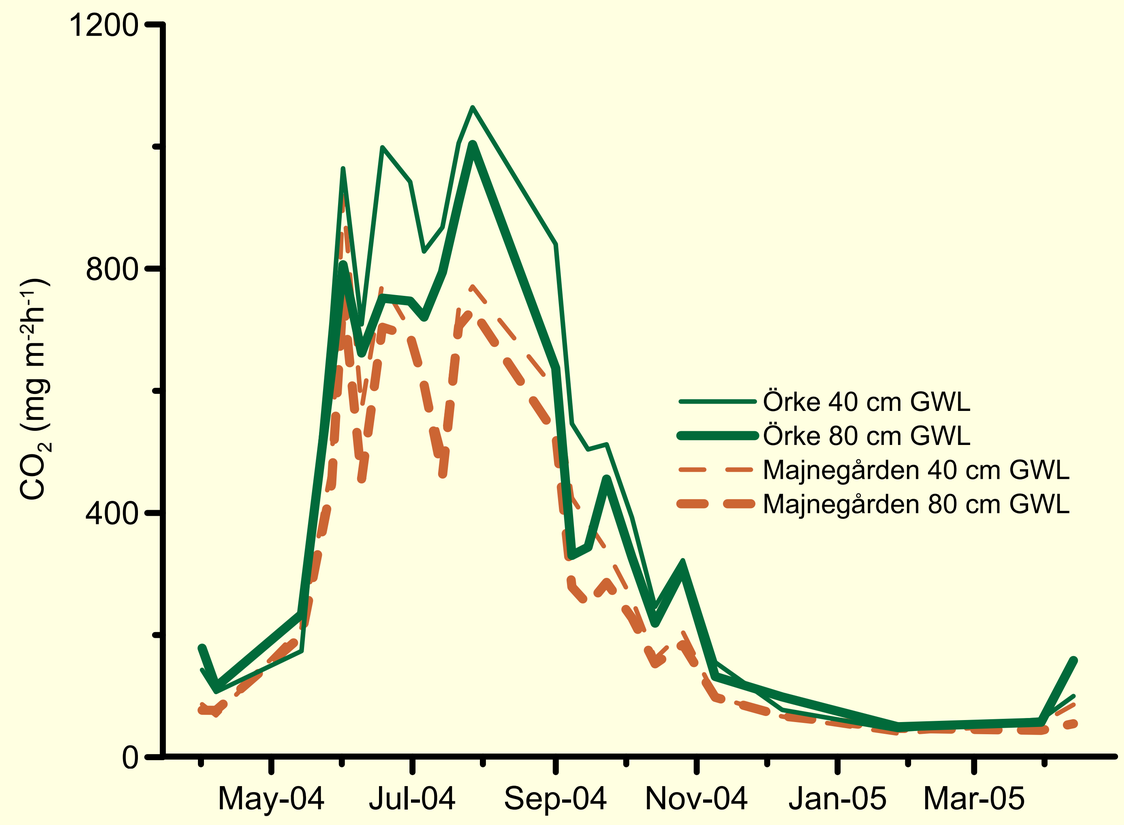
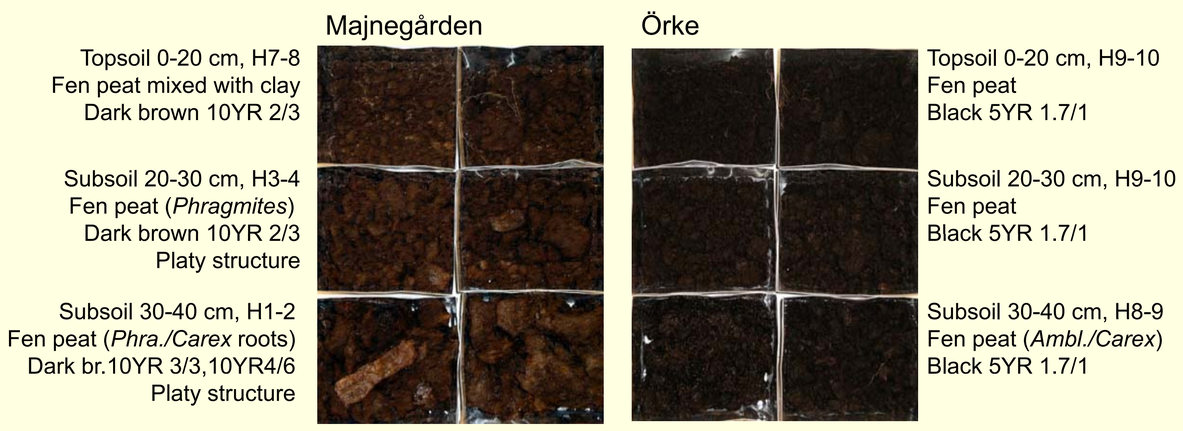


Figure 2. CO_2 emission rates (dark respiration) from Majnegården and Örke soils with drainage depth of 40 cm and 80 cm.

Materials and methods

A drilling method with minimal soil disturbance (Persson and Bergström, 1991) was used to collect 50 cm deep undisturbed soil monoliths from two sites, Örke in central Sweden and Majnegården in southern Sweden. The study was carried out at a lysimeter site at the Agricultural University in Uppsala. The lysimeters were sown with ryegrass (*Lolium perenne*) and water was supplied from below and kept constant at 40 cm and 80 cm depth. CO_2 emission was measured once a week during the growing season using the dark chamber method. Crop growth and nutrient uptake of plants was recorded. Soil moisture content and soil temperature was also monitored during the experiment. The construction and set-up of this system is described in detail in Berglund et al. (2007).



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