The impact of harvest on the spatio-temporal variability in soil GHG fluxes in a short-rotation poplar plantation (POPFULL)

C.-M. Görres, G. Berhongaray, M. Camino Serrano, R. Ceulemans
Research Group of Plant and Vegetation Ecology, University of Antwerp, Belgium

Background

- Bioenergy crops can release substantial amounts of soil GHG depending on crop type and management intensity.
- The present knowledge about soil GHG fluxes from bioenergy crops is not sufficient to accurately quantify them, but quantitative data is urgently needed for decision making.
- This is especially true for woody crops like poplar which might become more important in the future because of their relatively high GHG mitigation potential.

Objectives

- Simultaneous quantification of the changes in soil gas concentration profiles and soil fluxes of CO₂, CH₄, and N₂O caused by a harvest event in a 4 yr. old poplar bioenergy plantation.
- Studying the influence of the spatial factors ‘former land-use type’ and ‘inter-row spacing’ on these changes.
- Identification of underlying interactions between soil carbon and nitrogen dynamics driving these influences.

Study site and methods

- 4 yr. old poplar bioenergy plantation with double-row planting system located in Lochristi (Belgium)
- 1st harvest in February 2012, 2nd (targeted) harvest in February 2014
- 4 experimental blocks spaced about 10 m apart (1 shows an example of a block setup)
- 2 blocks are located on former pasture, 2 on former cropland

First results

- Diurnal variability in ambient CH₄ concentration, but no fluxes detected with chambers (2).
- Low nitrogen content in groundwater (NOₓ < 0.01 mg l⁻¹, NO₂ < 0.1 mg l⁻¹, other nitrogen < 2 mg l⁻¹), but N₂O fluxes still observable (3).
- Former land-use type affects root biomass (3).
- Former land-use type as well as inter-row spacing seem to affect soil CO₂ and O₂ concentrations (6 and 7).

Acknowledgements: We would like to thank Simon O. Petersen (Aarhus University, Denmark) who has designed the soil gas samplers. Christian Jörres, Carolina Kampia and Hans Hermann Klein (University of Applied Sciences, Frankfurt am Main, Germany) have been responsible for the soil gas analysis. Funding from ERC grant agreement (nr. 233346) POPFULL, Marie Curie International Re-Inegration Grant (agreement nr. 288287) under the EC 7th Framework Programme (FP7-2007-2013), Flemish government through the Hercules Foundation and the Methusalem Program, and Erasmus Mundus External Cooperation Window (EADIC L07.16).