



## Assessing Impacts of 20 yr Old Miscanthus on Soil Organic Carbon Quality

Yaxian Hu (1), Gerhard Schäfer (2), and Nikolaus Kuhn (1)

(1) Basel University, Basel, Switzerland (yaxian.hu@unibas.ch), (2) Laboratoire d'HYdrologie et de GEochimie de Strasbourg (LHyGes), Strasbourg University

The use of biomass as a renewable energy source has become increasingly popular in Upper Rhine Region to meet the demand for renewable energy. Miscanthus is one of the most favorite biofuel crops, due to its long life and large yields, as well as low energy and fertilizer inputs. However, current research on Miscanthus is mostly focused on the techniques and economics to produce biofuel or the impacts of side products such as ash and sulfur emissions to human health. Research on the potential impacts of Miscanthus onto soil quality, especially carbon quality after long-term adoption, is very limited. Some positive benefits, such as sequestering organic carbon, have been repeatedly reported in previous research. Yet the quality of newly sequestered organic carbon and its potential impacts onto global carbon cycling remain unclear. To fully account for the risks and benefits of Miscanthus, it is required to investigate the quality as well as the potential CO<sub>2</sub> emissions of soil organic carbon on Miscanthus fields.

As a part of the Interreg Project to assess the environmental impacts of biomass production in the Upper Rhine Region, this study aims to evaluate the carbon quality and the potential CO<sub>2</sub> emissions after long-term Miscanthus adoption. Soils were sampled at 0-10, 10-40, 40-70, and 70-100 cm depths on three Miscanthus fields with up to 20 years of cultivation in Ammerzwiler France, Münchenstein Switzerland, and Farnsburg Switzerland. Soil texture, pH, organic carbon and nitrogen content were measured for each sampled layer. Topsoils of 0-10 cm and subsoils of 10-40 cm were also incubated for 40 days to determine the mineralization potential of the soil organic matter. Our results show that: 1) only in top soils of 0-10 cm, the 20 year old Miscanthus field has significantly higher soil organic carbon concentrations, than the control site. No significant differences were observed in deeper soil layers. Similar tendencies were also observed for organic nitrogen content as well C/N ratios. This indicates that the positive benefits of Miscanthus in sequestering organic carbon and improving soil quality are probably only effective in top soils. 2) Soils from the 20 years old Miscanthus fields produced significantly more CO<sub>2</sub> than the control site, suggesting the great susceptibility of organic carbon on Miscanthus fields to mineralization. Overall, our results indicate a potentially additional contribution of Miscanthus fields to atmospheric CO<sub>2</sub> compared to reference soils, cautioning the widespread adoption of Miscanthus. Consequently, further studies aiming at a full emission balance are required to assess the overall environmental impacts of biomass production in the Upper Rhine Region.