RRR Conference, 9th – 11th March 2021

Effects of topsoil removal on greenhouse gas exchange and water quality of fen paludicultures

Philipp-Fernando Köwitsch[1] · Bärbel Tiemeyer[1] · Malte Ortner[2] · Sören Thiele-Bruhn[2]

[1] Thünen Institute of Climate-Smart Agriculture, 38116 Braunschweig, Germany
[2] Department of Soil Science, Trier University, 54296 Trier, Germany

Background and objectives

- Drainage is necessary for conventional agriculture on peatlands, but this practice causes high emissions of the greenhouse gases (GHG) carbon dioxide (CO_2) and nitrous oxide (N_2O) as well as the release of nutrients.
- Paludiculture on rewetted fen peat is an option to mitigate these adverse environmental effects while maintaining productive land use. However, data on GHG emissions from fen paludicultures is however still very scarce.
- ➢ How do aerenchymous fen paludiculture species influence the release of methane (CH_4)?
- ➢ Does the removal of topsoil reduce both, methane emissions and phosphorous release and will it hamper the plant growth?
- ➢ How does the establishment of a paludiculture effect the water quality?

Study site Hohenbökener Moor

- Location: North-West Germany (53°6'38'' N, 8°30'37'' E)
- Fen peatland, with a peat thickness of approx. 60 cm, formerly used as grassland

Study site layout

- Rewetting and installation of sub-polders to investigate the effect of topsoil removal
- *Typha angustifolia*, *Typha latifolia* and *Phragmites australis* are grown in different planting densities
- Part of the original grassland serves as a reference site

FIG 1: Profile on reference site
© Tiemeyer

FIG 2: Model of the study area
© Flemke (NLWKN)

Measurement of GHG Fluxes

- Measurement campaigns are realised every three weeks
- Quantification of CO_2 and CH_4 fluxes in opaque and transparent manual chambers with a laser spectrometer ('GasScouter', Picarro)
- Fluxes of N_2O are analysed by gas chromatography

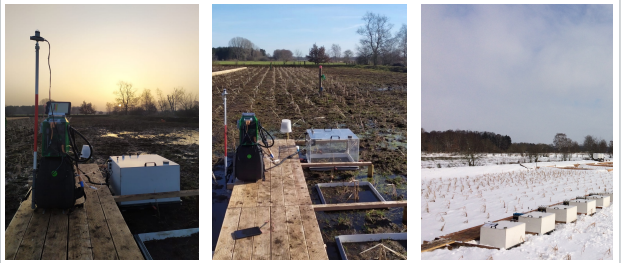

FIG 3-5: Manual closed chamber measurements with opaque and transparent chambers
© Antonazzo, Köwitsch

Study site layout

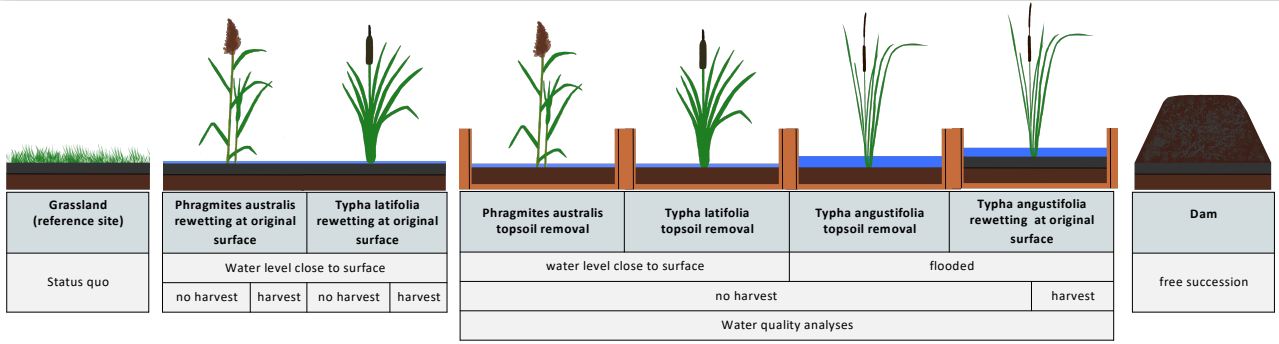

FIG 6: Study site layout of reference site, polder, sub-polders and dam site

Water quality

- Collection of (soil) water samples to examine the retention or release of solutes
- Samples are analysed for electric conductivity, pH-value, DOC, nitrogen and phosphorus compounds
- Investigation of the presence and fate of antibiotics

Funded by the European Regional Development Fund, Stronger Region Programme and the State of Lower Saxony.

THANKS
We would like to thank Sonia Antonazzo, Frank Hegewald and Sebastian Willi Oehmke for their enthusiastic support during the site setups

Contact
Philipp-Fernando Köwitsch
Thünen Institute of Climate-Smart Agriculture
Bundesallee 65a 38116 Braunschweig
philipp-fernando.koewitsch@thuenen.de