



Greenhouse gas exchange and global warming potential of a peat bog restoration sequence in NW Germany

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About 13,000 km² (3.6%) of the land area in Germany is covered by peat. Due to multiple land use patterns and a wide variety of peatland types, the assessment of emission factors for many peat land use combinations has been difficult and reliable data on the exchange of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), between soil and atmosphere of these areas is particularly scarce. The project investigates the greenhouse gas exchange of a peat bog restoration sequence over a period of 2 years (July 2007 – June 2009).

The sites were set up at a raised bog, situated in the “Ahlen-Falkenberger Moor”, 50 km NW of Hamburg (precipitation 926mm/a, annual average temperature 8.5°C 1961-1990). We set up three replicate plots on each agricultural use:

- Intensive Grassland (GI, mineral fertilizer, cattle manure and 4-5 cuts/a)
- Extensive Grassland (GE, no fertilizer or manure, 1 pruning/a)
- Near-Natural peat bog

Based on biweekly CH₄ N₂O flux and CO₂ NEE determinations every 3 – 4 weeks using closed chamber techniques, we obtained seasonal and annual estimates of GHG exchange.

Our analysis resulted in an emission rate of 664 ± 169 g CO₂-C/(m²*a) in the first (dry) and 828 ± 140 g CO₂-C/(m²*a) in the second (wet) year emitted from the intensive used grassland site. The extensive used site showed a slight CO₂-C uptake in the first year (-137 ± 143 g CO₂-C/(m²*a)), and a small emission rate of 90 ± 146 g CO₂-C/(m²*a) in the second year. In contrast to these sites, the near-natural area showed a CO₂-C-uptake in both years of -10 ± 66 g CO₂-C/(m²*a) and -125 ± 51 g CO₂-C/(m²*a). Considering the N₂O and CH₄ exchange, this leads to a total GWP of 771 g C – equivalents/a for GI, -16 g C – equivalent/a for GE and -64 g C – equivalent/a for the Near Natural site.

The results show that, despite considerable interannual variability, restoration measures quickly contribute to mitigating large GHG emission rates and approach the carbon sequestration potential of near natural sites.