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GREENHOUSE GAS (GHG) BALANCE OF BIOMASS GROWN FOR BIOGAS PRODUCTION ON REWETTED AGRICULTURAL FEN PEATLAND

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Rewetting has been recommended to reduce CO_2 emission and to restore the carbon sink function of drained peatland. Paludiculture, the combination of peatland rewetting and biomass production, has gained interest as a possible land use option without losing agricultural land. Biogas production is one possible option if grass biomass is produced in paludiculture. However, more knowledge on suitable crops and their effects on the GHG balance is needed. With intact soil cores (mesocosms) we have shown that the GHG emission from cultivation of reed canary grass (RCG) under controlled conditions can offset the GHG emission from a drained peat soil if the water table is raised close to the soil surface and at the same time produce 12 Mg ha^{-1} DM per year in two cuts. To support these findings, a new field experiment was initiated in 2015. The water levels of four plots established with RCG in 2013 on a fen peat soil were raised to soil surface by pumping water back from the ditch. Emissions of CO_2, CH_4 and N_2O were measured bi-weekly with opaque chambers and NEE of CO_2 was assessed with temperature controlled transparent chambers. Two cuts of the biomass in 2015 yielded 13.8 Mg ha^{-1} DM and the NEE from March to October 2015 showed that more than 20 Mg ha^{-1} CO_2 was taken up by the ecosystem. However, in the same period 18.8 Mg ha^{-1} CO_2 eq of CH_4 and 2.7 Mg ha^{-1} CO_2 eq of N_2O were emitted. Based on these preliminary results from the first year of rewetting we can conclude that peat degradation at this agricultural field was reversed but high emission of the stronger GHG CH_4 maintained the field as a GHG source.

Keywords: *paludiculture, wetland, methane, nitrous oxide, carbon dioxide*