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Can restoration convert a degraded bog in southern Bavaria to a carbon sink and climate cooler?

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Abstract

The peatland area of Germany is about 14.000 km^2 (Succow & Joosten 2001) with 8% natural like bogs and 4% natural like fens (Höper 2006). All other peatland areas are more or less intensively used and thus, lost their sink function for carbon. If, theoretically, all German peatlands would be rewetted, this restoration would lead to a carbon mitigation of 9.5 Mio. t CO_2-C equivalents (Freibauer et al. 2009). In test areas like the studied bog, the viability and potential of peatland restoration for climate mitigation can be proofed.
The investigated bog is situated close to the Bavarian Alps; one part of this bog is extensively used and had been rewetted in 1993 except of a small stripe; management was stopped totally at another stripe. The second part of this bog had been drained without any further use. Here a Calluna heath established, accompanied by Pine trees. The restoration of this bog heath was done in two time steps; here a chronosequence of succession after restoration at different water table levels was investigated.
To get to the greenhouse gas (GHG) balances of CO_2 CH4 and N2O, gas flux measurements were done for two years using the chamber technique of Drösler (2005). At both areas, the degraded sites were sources for GHG (+203 to +736 g CO_2-C-equiv m-2 a-1). Restoration reduced these emissions depending on water table and succession of bog species (-51 to +557 g CO_2-C-equiv m-2 a-1). Depending on the vegetation's vitality GHG balances of already established natural like sites varied in between the years (-189 to +264 g CO_2-C-equiv m-2 a-1) mainly driven by the oscillation of their water table.
Stop of management and development of Sphagnum communities turned most of the sites into sinks for GHG (-216 to +7 g CO_2-C-equiv m-2 a-1).
Thus restoration turned degraded bogs efficiently to carbon sinks and climate coolers in dependence of a proper water table management, withdrawal of land use and vegetation succession.

Key words: bog, greenhouse gases, restoration, water table