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Carbon balance and greenhouse gas fluxes in intensive and extensive managed grasslands on peat.

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Eutrophic drained peat meadow areas under agricultural exploitation constitute a significant source of CO_2 and water level manipulation is being considered to counteract this. This however may have a major effect on the emission of other greenhouse gases such as CH_4. We present current findings of a number of research groups from a landscape scale water manipulation experiment involving eddy covariance (EC) measurements and photo-acoustic chamber measurements of CO_2, CH_4, and N_2O. Measurements were made in three areas on peat soils differing in land management in the western part of the Netherlands. One site (Oukoop) is an intensively managed dairy farm; the second (Stein) has recently become a meadow bird reserve and is managed predominantly through mowing in June and August. Since September 2005 a water level increase to near the land surface is periodically being implemented. The third site, (Horstermeer) is a restoration site where the water level was increased 13 years ago. All sites were a source of carbon in winter and a sink during summer, with net ecosystem exchange varying between 10–60 mmol $CO_2.m^2.d^{-1}$ in winter to below -400 mmol $CO_2.m^2.d^{-1}$ in summer. NEE was closely correlated with LAI and management. Annual Net Ecosystem Exchange showed thet Oukoop was source for carbon with a net release of 112 $gC.m^{-2}.a^{-1}$and Stein carbon neutral +0 $gC.m^{-2}.a^{-1}$ while Horstermeer was a sink at -300 $gC.m^{-2}.a^{-1}$. However the emission of CH_4

was highest in Horstemeer. We explore the consequences of the different management regimes and the water level manipulation for the GHG balance and global warming potential of the three sites.