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Lower greenhouse gas flux and better economy with wetter peat soil use

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We have used the CoupModel to investigate effects of 80 years of peatland use on greenhouse gas (GHG) emissions for four scenarios (1) business as usual - Norway spruce with average soil water table depth (WTD) of -40 cm; (2) willow plantation with WTD at -20 cm; (3) reed canary grass production with WTD at -10 cm; and (4) a fully rewetted peatland with no harvested product. Total soil GHG emissions for the scenarios were (including litter and peat respiration CO_2 emissions as well as N2O and CH4) on average 33, 19, 15, and 11 Mg CO_2eq ha-1 year-1. No peat was lost for the wet peatland. At WTD -10 cm GHG emissions were at a minimum. Economy was analyzed by a cost–benefit analysis (CBA) where scenario (1) with spruce included gain from sold products like timber, pulpwood and energy biomass, and scenarios (2) and (3) harvests were for bioenergy purpose. Stored C in biomass and litter was included as gains, as well as biodiversity gains for the rewetted scenario. Costs included management and soil emissions. The CBA showed on average the best result for the rewetted peatland (4) and next were willow (2) together with reed canary grass (3), while spruce (1) production economic benefit was the lowest. This showed wetter condition to be a gain for the climate as well as for the economy. Questions to resolve are influences of fluctuating water tables and vegetation types on CH4 and N2O emission as well as DOC/DON loss etc.

Continuation

Clear-cut of forest followed by either continued forest or wetland restoration. We are now to clear-cut the mature spruce forest at Skogaryd research station, on which the model was calibrated. Half the area will then still be drained and planted with spruce and the other half rewetted to a wet meadow by building a dam. Collection of ecosystem and flux data will continue. We will now use the model to investigate the two scenarios, where we are most interested in effects on GHG and water DOC/DON losses, results presented here.
We will also gain further knowledge on GHG and other losses from agricultural peat soils in the project Climate Smart Use of Norwegian organic soils (MYR). We will calibrate the CoupModel on data generated from the project and use it for investigating alternative land use options (wetter soil and lower management intensity at cultivated peatlands). In this later step, we want co-operate with research groups using other models.

Kasimir Å., He H., Coria J. and A. Nordén. 2018. Land use of drained peatlands: Greenhouse gas fluxes, plant production, and economics. Global Change Bioloy 24, DOI: 10.1111/gcb.13931