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# Peat formation under pressure? Effects of machine mowing on soil and below-ground plant properties in temperate fens

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Peatlands contain 20-30 percent of the world's soil carbon stock. Because of drainage for agriculture and forestry resulting in peat oxidation, they currently emit large amounts of $CO_2$. A promising alternative to drainage-based land use is paludiculture, i.e. agriculture and forestry on wet and rewetted peatlands with simultaneous peat formation or at least preservation of the peat body. Such new management practices involve using site-adapted (low ground pressure) machinery. The effects of machine mowing on the wet peatland ecosystem (biogeochemistry, carbon stocks) are poorly understood. Within the EU BiodivERsA project REPEAT (REstoration and prognosis of PEAT formation in fens - linking diversity in plant functional traits to soil biological and biogeochemical processes, 2017-2020), we have studied machine mown and unmown near-natural and restored wet percolation fens in the Netherlands, Germany, and Poland. We hypothesize that machine mowing in wet fens leads a) to a lower cover of potentially peat-forming plants, b) to a relocation (but no change) in overall below-ground biomass stocks, c) to higher bulk density and penetration resistance, and d) to a smaller decomposition rate of below-ground biomass. The hypotheses are largely based on knowledge from mineral soils and drained peat soils. Species composition has been studied by comparing vegetation relevés with regard to the occurrence of peat-forming species and functional groups. Below-ground biomass production in different depths has been assessed in ingrowth cores. Penetration resistance has been measured using a penetrologger. Decomposition rates have been assessed using litter bags with local root material and standard materials at different depths over 3 and 12 months. In a subset of sites, the long-term (>5 years) impact of a light tractor with wide tyres compared to a heavy tracked machine has been assessed, and additional properties (e.g. root porosity) were included. Here, also a before-after passage experiment was performed with the tracked machine. Knowledge about alterations of peat and vegetation due to machine mowing is crucial from a conservation point of view as well as for understanding peat formation and assessing restoration effects. The results have implications for the emerging field of paludiculture, where traffic for harvesting is a critical issue.