Reduced nitrogen losses from drained temperate agricultural peatland after mineral soil coverage

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Draining peatlands for agriculture induces peat decomposition, subsidence, and carbon (C) and nitrogen (N) losses, thereby contributing to soil degradation and climate change. To sustain the agricultural productivity of these organic soils, coverage with mineral soil material has increasingly been used. To evaluate the effect of this practice on the N flows within the plant-soil system, we conducted a N-15 tracer experiment on a drained peatland that was managed as an intensive meadow. This peatland was divided into two parts, either without (reference ”Ref”) or with similar to 40 cm mineral soil cover (coverage ”Cov”). We applied (NH4NO3)-N-15-N-15 on field plots to follow the fate of N-15 in plant-soil system over 11 months. In addition, N mineralization was determined by laboratory incubation. The field experiment showed that Cov lost less N-15 ($p < 0.05$) than Ref, even though plant N-15 uptake was similar at both sites. The lower net N loss from the Cov site was accompanied by higher soil N-15 retention. The laboratory incubation revealed a similar to 3 times lower N mineralization at Cov than at Ref, whereas the N release per unit soil N was around two times higher at Cov than at Ref, suggesting a faster SOM turnover rate at Cov. Overall, the mineral soil cover increased the retention of fertilizer-N in the soil, thus reducing the system N losses. Our result indicates that agricultural production on drained peatland is less harmful to the environment with mineral soil coverage than using drained peatland directly.
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