Soil carbon sequestration in Swedish grasslands

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Soil carbon (SOC) sequestration estimations for Swedish grasslands under grazing are considerably lower than figures reported in the recent international literature (Soussana et al. 2007). In this study we analyzed variation in SOC stocks in grassland with respect to region, previous land-use, site moisture class, tree biomass and biodiversity. We also determined soil carbon sequestration rate in grasslands by using two independent methods.

The primary source of data for this study is the Swedish National Forest Soil Inventory which also includes grasslands. The inventory is based on an objective sample grid of the total Swedish land area. Soil carbon stocks are determined by measurement of C concentration and bulk density measurements in the upper part of the soil profile and extrapolation to deeper soil layers based on soil type characteristics and soil depth. The inventory was made 1993 to 2002 and 2003 a re-inventory started which allows studies of change over a 10-year period. As an independent comparison we used a mass balance approach that estimates carbon sequestration indirectly through an input-output budget for N (de Vries et al. 2006). Assuming that C/N ratio is constant any surplus N is converted to C by multiplying with the C/N ratio. The N budget accounted for N deposition, N leaching and N uptake in biomass. Data for the calculations were taken from several Swedish environmental monitoring databases.

Previous cultivation and wetter soil conditions were the two factors that contributed to significantly higher C stocks while region, tree biomass and biodiversity had no effect on the C stock. The average SOC sequestration rate based on the inventory was 61 kg C ha^{-1} yr^{-1} while the N balance method estimated the SOC sequestration rate to 30 kg C ha^{-1} yr^{-1}. The low SOC sequestration rate can be explained by the low-intensity management of the permanent grazing land with practically no fertilization.

References

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