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Effects of different grazing intensities of sheep on accumulated particulate organic matter (POM) and organic matter mineralization in low-alpine grassland soils in Norway.

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Summer farming in mountain areas of Norway (e.g. livestock grazing and logging of fire wood) has reduced during the last century; however the number of sheep stayed relatively unchanged implying a translocation of grazing impact. Herbivores may affect both vegetation dynamics and nutrient cycling. Much information exists about the impact of cession of grazing, but little is known about the ecological effect of different grazing intensities. Using a controlled grazing experiment organized as total randomized block design (starting 2001), with three levels of grazing intensities by sheep (high, low and no sheep), effects of different grazing pressure on soil organic matter (SOM) mineralization and amount and quality of POM was studied in a low alpine region of Southern Norway. In a parallel study in situ measurements were conducted to determine biomass production rate and the quality of litter input. Soil samples from the O-horizon were incubated (determining C and N mineralization) and fractionated (free light POM fraction, density <1,8 g cm-3, size 20-2000 μm). It was hypothesized that high levels of grazing would induce (1) higher C and N mineralization rates and (2) less POM, due to physical (trampling) and chemical (input of faeces and urea) impact of sheep in addition to observed changes in vegetation cover.

Results indicate that the amount of POM was in the order low>no sheep>high, indicating that low grazing intensity build up a potential larger mineralizable fraction compared with high and no sheep. The C content of POM was in the order no sheep>low>high and the N content of POM in the order low>no sheep>high. The C content of POM at high grazing intensity was significantly lower than at low grazing intensity and no sheep (ns. different). The low C content of POM at high grazing intensities (but not the N content) was the main reason for the observed CN ratios of the POM fraction being lowest at high densities (no sheep>low>high).

Initial analysis of C and N mineralization suggest that the amount of CO2 evolved per g soil is highest in soil samples from low grazing pressure; however respiration rates expressed per g POM do not differ between treatments. Ammonium is the dominant form of inorganic N mineralized from SOM. By contrast, there is little or no accumulation of nitrate, suggesting low nitrification potentials in these soils. Differences between treatments in the amount and quality of POM and in mineralization rates indicate that there is a non linear response of grazing activity. Thus, change in management practice may have important consequences for feedback mechanisms controlling above and below ground productivity. At the conference more data on C and N mineralization in addition to a coupled stoichiometri of selected plants and SOM will be presented.