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Long term effects of ploughing and reseeding on soil chemical properties of grass swards

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Three long-term field experiments including permanent swards and swards ploughed and reseeded every 3 and 6 years were established in 1968 on a peat mixed with clay under sub arctic continental climatic conditions in the north (Svanhovd), and on a sandy loam of moraine origin under mild coastal climatic conditions in the south west (Særheim) of Norway. The permanent swards and the swards reseeded every 6 years were sown with a mixture of timothy (Phleum pratense), smooth meadowgrass (Poa pratensis), meadow fescue (Festuca pratensis) and perennial ryegrass (Lolium perenne). The swards reseeded every 3 years were sown with pure timothy or with perennial ryegrass. Soil analyses from both sites obtained in 1986 (0-20 cm soil layer) showed that ploughing and reseeding the swards had significant effects on loss on ignition (LOI), Kjeldahl-N and total-C at both sites. The LOI in the permanent sward was 14.7% at Særheim and 67.3% in the peat soil at Svanhovd. Ploughing and reseeding the swards every 6 years resulted in 15% less LOI and similarly about 15% less Kjeldahl-N and total carbon at both sites, while reseeding the swards every 3 years led to 30% less LOI, Kjeldahl-N and total carbon at Særheim or 42% less at Svanhovd. Soil analyses obtained in 2003 showed a decline of LOI in the permanent swards from 1986 to 2003 at both sites with a LOI of 12% at Særheim and 41% at Svanhovd. The differences between the swards in rotation and the permanent swards were significant, but smaller than in 1986. The content of Ca-AL was significantly higher in permanent swards than in the reseeded swards at both sites. These results indicate that the rotation of grass swards affect the accumulation of carbon, and also have impact on soil chemical properties. The results also show a general decline in carbon content of especially the peat soil of about 40% during the 17 years from 1986 to 2003.