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ABSTRACT BOOK

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4. Soil health in achieving the Sustainable Development Goals 4.30 133622 - Soil Organic Matter Stability as Key Driver to Soil Carbon Sequestration

EFFECTS OF LONG-TERM SOIL ORGANIC MATTER DECLINE ON SOIL NUTRIENT STATUS AND ORGANIC MATTER COMPOSITION IN ORGANICALLY MANAGED GRASS-CLOVER LEY AND PERMANENT PASTURE IN NORWAY

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Grasslands are often seen as a beneficial measure to increase soil organic matter (SOM) content in croplands and reduce GHG emissions. In permanent grassland continuous ground cover and high root density protect the soil against erosion, leading to an accumulation of SOM. In cultivated grasslands, such as grass-clover leys, the nutrient cycle encompasses an accumulation phase during the ley period, followed by a rapid decomposition after ley termination. Upon ploughing the grass-clover ley, there is an increased mineralization of nutrients, contributing to soil fertility buildup. As part of the global C-arouNd project, which aims to investigate how short and long-term agricultural management practices affect SOM persistence, we want to investigate how long-term SOM decline affect the soil nutrient status and organic matter composition in a permanent and cultivated grassland in West Norway.

At Tingvoll experimental farm, organic milk production was established in 1986, replacing the previous conventional sheep farming. Since 1990, soil samples (0-20cm) have been taken every 5–7-year for determination of SOM and soil fertility status. Grass-clover yields have been annually measured since 1991. Preliminary analyses show a decline of SOM (ignition loss) in the 0-20cm toplayer. On average in the cultivated grassland, SOM concentration declined from 14.0% and 7.9% in 1990 to 7.4% and 6.4% in 2021. In the permanent pasture the losses of SOM content were smaller: on average SOM decreased from 10.2% to 8.0%.

We hypothesize that fields with the largest decline in SOM over the past decades will contain relative more stable carbon components while also being richer for most macronutrients. Nutrient imbalances can lead to stronger SOM turnover, meaning that there have not been reached a steady state yet and a further decrease in SOM content can be expected. To test these hypotheses, soil samples will be taken in 2024 to study macronutrients and SOM composition in more detail. SOM composition will be examined using a thermal fractionation method on the different size fractions of the soil.

Keywords: Grasslands, SOM decline, Nutrients