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Assessment of short-term effect of CNPS stoichiometry on SOC and soil properties using Vis-NIR spectra

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Soil organic carbon (SOC) is known to play a crucial role in soil quality. The general approach to enhance SOC is to minimise soil disturbance and ensure fresh C-inputs to the soil. However, current sustainable land management practices do not always result in an increase in SOC and are not precise enough to prescribe C-inputs to achieve a target soil C stock and management of soil quality. Recently, CNPS stoichiometry has been shown to limit the stabilised SOC pool. The aim of this study was to test CNPS stoichiometry to increase organic matter (OM) mineralization and examine the effect on soil properties following straw incorporated with supplementary nutrients in a soil incubation experiment. The objectives were to (i) quantify the dynamic change in SOC and particulate organic matter (POM) in response to straw incorporation with and without supplementary nutrients based on CNPS stoichiometry and (ii) determine if the limits of detection for visible near-infrared spectroscopy (vis-NIR) can capture short-term change in SOC and POM. Five soils (40g) varying in clay content were incubated for 12 weeks at 25°C and 70 % field capacity. Soils received straw at a rate of 8 t/ha with and without supplementary nutrients (N, P and S) based on stoichiometric inputs. Vis-NIR measurements were collected for the soil samples post incubation with soil structure intact and removed (sieved to <2 mm). Laboratory analysis of soil properties is underway. Preliminary exploratory analysis of the spectra was performed by Principal Component Analysis (PCA). Preliminary results of the PCA show that the first two principal components captured the soil variability (PC1 56.09%, PC2 36.0%) however no obvious treatment effect was observed. Further modelling work will investigate if the straw treatments with and without nutrient supplementation produced a measurable change in SOC and POM and if the dynamic change in soil carbon can be detected in the spectra using regression analysis.