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Effects of mechanical site preparation techniques in forest plantation context on the soil organic carbon stocks and on the priming effect process.

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For the forest stand renewal phase, Mechanical Site Preparation (MSP) can be applied to promote the forest plantations establishment (Collet et al., 2014). Nevertheless, MSP results in soil disturbance and interferes with soil organic carbon (SOC) stocks (Mayer et al., 2020). Alternative MSP techniques are now being proposed to reduce the impact on soil properties and thus preserve the carbon sequestration function of forest soils (Pellerin et al., 2020). This thesis project aims to (i) test different MSP techniques of variable tilled area on SOC destorage, (ii) identify a short-term response of SOC stocks to MSP over a textural gradient, (iii) measure how the SOC redistribution following MSP influences the SOC mineralization process. In the short term, we assume (i) that MSP localized to a reduced surface area does not significantly impact SOC stocks at the forest stand scale, (ii) that SOC destorage in tilled area is greater in clay-rich soils and (iii) that SOC redistribution following MSP causes overmineralization through the priming effect process. Three complementary approaches are used: (i) an *in situ* block experiment testing five MSP modalities of gradual intensity in terms of tilled surface (initial state before MSP then monitoring over 2 years during the thesis), (ii) a sampling before and after MSP on a panel of twelve sites being renewed constituting a textural gradient of clay content to gain in genericity compared with the *in situ* experiment, (iii) a controlled laboratory experiment on soil cores from the modalities of the *in situ* experiment, on which a C4 plant will be grown in order to monitor the mineralization process using the natural isotopic signature (13C) of C4 plants. From these approaches, we expect our results will show a significant effect on SOC stocks proportional to MSP intensity, a more significant decrease in top soil layer in sites with high clay content, and a priming effect proportional to MSP intensity.

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