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# Quantifying effects of land use change on soil organic matter at the landscape scale

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Soil organic matter (SOM) is an essential natural resource in land-based agro-ecosystems and is said to be the most important indicator of soil quality. Quantification of the impacts of land use (change) on SOM contents and stocks is vital in understanding the present and future relationships with agronomic sustainability but needs to consider relevant drivers at the landscape scale. Routine agricultural soil analyses (RSA) are potentially an attractive source of information for SOM and Soil Organic Carbon (SOC) inventories because of the large number of analyses and large temporal coverage (decades). However, the use of RSA's in this context has some drawbacks concerning for example sampling depth, sampling procedure and geo-referencing.
In this study, SOM inventories based on routine soil agricultural soil analyses are investigated and validated using field surveys. This is done for a selection of Dutch agricultural landscapes.
Analysis of land-use history of fields reveals that current SOM contents are strongly related to the temporal variability in land use. Grassland age and rotational schemes appear as key variables in understanding current SOM patterns. Furthermore data reveal that current SOM contents are related to the spatial variability in groundwater hydrology and soil texture. For the translation of these routinely determined SOM contents to soil organic carbon (SOC) stocks, pedotransfer functions (PTFs) are needed. Such PTFs can very well be based on significant non-linear relationships between gravimetric SOC contents and bulk density (R2=0•80). However, validating derived SOC stocks for the upper 10 cm using PTFs with a field survey reveals that SOC stocks based on RSA's and PTFs are substantially lower. The observed differences are much higher than reported annual rates in SOC changes. SOC stock inventories that make use of RSA's should be aware of the limitations involved.

References

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