

# **Book of Abstracts**

## **Wageningen Soil Conference 2017**

**'Soil Science in a Changing World'**

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**27 - 31 August 2017**

**Wageningen**

**The Netherlands**

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## TOWARDS A SAMPLING DESIGN FOR MONITORING GLOBAL SOIL ORGANIC CARBON STOCKS

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Accurate estimation of the global soil organic carbon (SOC) stock and temporal changes therein are of vital importance for climate-change studies. Most current assessments take a model-based approach to predict SOC spatially and aggregate point predictions to a global SOC stock estimate. Estimates of SOC stock dynamics are derived by repeating this procedure over time. Uncertainties associated with such estimates are rarely quantified, while they may be large compared to the estimate itself, especially for estimation of SOC stock change. Moreover, if uncertainties are quantified, they depend strongly on the model assumptions. Alternatively, estimates of global SOC stocks and changes therein may be obtained with design-based approaches, using statistical sampling theory. These methods have the important advantage that the estimates are model-free and accompanied by model-free accuracy measures. The main requirement is that the sampling locations are obtained using probability sampling and that all soil analyses are made in a standardised way. The aim of this study was to analyse whether design-based methods could produce sufficiently accurate estimates of SOC stock dynamics for realistic budgets. First, we derived the variance of global SOC stock (0-30 cm) point observations using global data from the ISRIC WoSIS database. Next we set the maximum acceptable standard error at 1.75 Gt C, which is 10% of the 5-year cumulative SOC stock increase targeted by the quatre pour mille initiative. We then computed the required sample size assuming simple random sampling. It turned out that 3000 soil observations are required to reach the accuracy threshold. Calculations for France and New South Wales further showed that this number can be more than halved if simple random sampling is replaced by a particular new kind of stratified random sampling. We conclude that from a technical point of view design-based estimation of global SOC stock dynamics is feasible. However, it is a considerable challenge to convince policy makers across the world to support and facilitate such project and to address all practical implementation issues.