



Soil carbon sequestration via cover crops- A meta-analysis

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Agricultural soils are depleted in soil organic carbon (SOC) and have thus a huge potential to sequester SOC. This can primarily be achieved by increasing carbon inputs into the soil. Replacing winter fallows by cover crop cultivation for green manure has many benefits for the soil and forms an additional carbon input. An increase in carbon concentration has been reported in several studies worldwide. However, the effect on SOC stocks, as well as the influence of environmental parameters and management on SOC dynamics is not known. We therefore conducted a meta-analysis to investigate those issues. A total of 33 studies, comprising 47 sites and 147 plots were compiled. A pedotransfer function was used to estimate bulk densities and calculate SOC stocks. SOC stock change was found to be a linear function of time since introduction, with an annual sequestration rate of 0.32 Mg C ha⁻¹ yr⁻¹. Since no saturation was visible in the observations, we used the model RothC to estimate a new steady state level and the resulting total SOC stock change for an artificial “average cropland”. The total average SOC stock change with an annual input of 1.87 Mg C ha⁻¹ yr⁻¹ was 16.76 Mg C ha⁻¹ for the average soil depth of 22 cm. We estimated a potential global SOC sequestration of 0.12±0.03 Pg C yr⁻¹, which would compensate for 8 % of the direct annual greenhouse gas emissions from agriculture.