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## Investigating the potential of vineyard soils for carbon sequestration and greenhouse gas emission mitigation after incorporation of organic matter into the subsoil

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Soils in perennial cropping systems, such as vineyards, have good prospects for storing carbon since less management is required with minimum disturbance to the soil that might prevent rapid turnover of organic matter. In addition, incorporation of organic matter into the subsoil instead of conventional topsoil application might increase its resistance to decomposition through physical isolation and the buildup of organo-mineral complexes. However, the stability of organic matter in agricultural land could also be highly dependent on individual systems, soil properties and climatic conditions.

In our study, the stability of high carbon organic materials (i.e., compost and a Terra Preta-like material) after deep (30-60 cm) incorporation into the soil of a vineyard in western Germany was investigated with respect to greenhouse gas emissions. Portable gas analyzers were used for long-term in-situ monitoring of greenhouse gas emissions. Additional parameters quantified were soil redox potential using Pt electrodes and the concentration of greenhouse gases in the pore space of the soil using air samplers.

The deeply incorporated soil organic amendments showed good stability with respect to N<sub>2</sub>O and CH<sub>4</sub> emission, whereas 30.4% and 51.7% of the compost and the Terra Preta-like material, respectively, was decomposed and released as atmospheric CO<sub>2</sub> after two years of observation. Oxygen availability at different soil depths throughout the sampling period, indicated by redox potential values of 300 to 700 mV, played a role in the turnover of organic matter in the treatments. Higher CO<sub>2</sub> concentration in the treatments in the deeper soil layer (30-50 cm) compared to the control was also consistent with higher CO<sub>2</sub> emission at the soil surface.

To investigate the site-specific influence on the stability of organic matter, the emission of greenhouse gases will also be quantified in different vineyards at different locations with similar management.