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The German Agricultural Soil Inventory - Soil sampling for climate change abatement

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Due to several international agreements on climate change abatement (UN Framework Convention on Climate Change, Decision 529/2013/EU of European Parliament and of the Council) Germany is in duty to report greenhouse gas emissions from agricultural soils. Moreover, enhanced carbon storage in soils can be accounted for as greenhouse gas mitigation strategies. For such reports and policy decision making, a harmonized, representative, and reliable database of soil carbon stocks was missing so far. Thus, the German Agricultural Soil Inventory started over in 2011 assessing soil carbon contents and stocks in a nation-wide harmonized sampling system. A 8*8 km grid defined the 3100 sampling points under arable land, grassland and plantation crops. Landscape and soil type were described for each point and disturbed and undisturbed soil samples were taken from a 1 m3 pit. Sampling depths were 0-10, 10-30, 30-50, 50-70, and 70-100 cm. Further, from soils rich of carbon, an additional sampling of the subsoil was conducted at 100-150 and 150-200 cm. In order to evaluate the spatial heterogeneity on the field scale, eight additional soil cores were taken in a distance of 10 m around the pit. All samples were analyzed in the same lab following standardized protocols. In order to evaluate effects of arable management on soil carbon contents, farmers managing the field of a sampling point filled in a questionnaire covering the last ten years before sampling. Thus, we are able to link land use and arable management (tillage, fertilization...) information with the carbon stock measured.
This enormous database of harmonized soil carbon data is a valid basis of several ongoing and future subprojects. Currently, the team is working on (i) site specific and anthropogenic drivers of arable soil's carbon stocks via machine learning, (ii) vulnerability of carbon in organic and mineral soils via density fractionation and incubation, (iii) predictability of soil carbon fractions via near infrared spectroscopy, (iv) models which predict an arable site as a sink or a source for soil carbon, (v) stratification of the sampling area (Germany) in order to enhance the predictability of soil carbon stocks, and (vi) regionalization of soil carbon data for the generation of maps via machine learning. The poster will present the design of the project and selected results.