The influence of land-use and land-management on Soil Organic Carbon concentrations: Limitations of making predictions using only soil order data

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In light of recent concern over the extent of global warming and the role of soil carbon as a potential store of atmospheric carbon, there is increasing demand for regions to estimate their current soil organic carbon (SOC) stocks with the greatest possible accuracy. Several previous attempts at calculating SOC baselines at global, national or regional scale have used mean values for soil orders and multiplied these values by the mapped areas of the soils they represent. Other methods have approached the task from a land cover point of view, making estimates using only land-use, or soil order/land-use combinations and others have included variables such as altitude, climate and soil texture. This study aimed to assess the major controls on SOC concentrations (%SOC) at the National Trust Wallington estate in Northumberland, NE England (area = 55km^2) where an extensive soil sampling campaign was used to test what level of accuracy could be achieved in modelling the %SOC values on the Estate. Mapped %SOC values were compared to the values predicted from The National Soils Resources Institute (NSRI) representative soil profile data for major soil group, soil series and land-use corrected soil series values, as well as land-use/major soil group combinations from the Countryside Survey database.

The results of this study can be summarised as follows:

- When only soil series or land-use were used as predictors only 48% and 44% of the variation in the dataset were explained.

- When soil series/land-use combinations were used explanatory power increased to 57%

- both altitude and soil pH are major controls on %SOC and including these variables gave an improvement to 59%

- A further improvement from 59% to 66% in the ability to predict %SOC levels at point locations when farm tenancy was included indicates that differences in land-management practices between farm tenancies explained more of the variation than either soil series or land-use in %SOC.

Further work will involve a verification site in another area of the UK where the results of this sampling campaign will be used to confirm the greater predictive value of using land-use and management information in combination with soil series in correctly identifying %SOC at specific locations.