Preface

Soil carbon stocks at regional scales

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The appropriate management of soil organic carbon (SOC) is important at a range of scales. At the local scale, good management of SOC determines ecosystem and agro-ecosystem function, influencing (amongst other things) soil fertility and soil physical properties such as aggregate stability and water holding capacity. At the global scale, SOC management is important because of its role in the global carbon cycle and therefore, the part it plays in the mitigation or exacerbation of atmospheric levels of greenhouse gases (GHGs). Soil organic C is highly sensitive to changes in land use, with changes from native ecosystems such as forest or grassland to agricultural systems almost always resulting in a loss of SOC. Likewise, the way in which land is managed following land use change has also been shown to affect SOC stocks. We therefore have the opportunity in the future to adopt land use and land management strategies that lead to greater C storage in the soil, thereby improving soil fertility, minimising loss of C from soils to the atmosphere and potentially mitigating the effects of GHGs. Maximising this opportunity will require the formulation of policy at the national and sub-national scale.

The biggest changes in land use and SOC are likely to occur in tropical areas, which, along side arid regions, are the areas for which we have the least data and the least understanding of the processes determining soil organic carbon. In general, our present understanding of SOC stocks and changes is severely skewed in favour of temperate areas. With this in mind, a need was identified for a model-based system that is generically applicable, encompassing as wide a range of soil types, climates and land uses as possible, that can estimate current soil organic carbon stocks and likely changes under future land use change scenarios, at the national and sub-national scale. The global environment facility soil organic carbon (GEFSOC) modelling system was developed to meet this need.

The GEFSOC system was the main output of the global environment facility co-financed project ‘Assessment of soil organic carbon stocks and change at national scale’ (Project no. GFL-2740-02-4381). The project was carried out between June 2002 and July 2005. Other project outputs include soil organic carbon stocks and stock change estimates for The Brazilian Amazon, The Indian part of the Indo-Gangetic Plains, Jordan and Kenya. The papers in this special issue present findings of the GEFSOC project, with many papers being based on talks given at ‘The GEFSOC Final Project Presentation’ held at The United Nations Environment Programme (UNEP), Nairobi Kenya on 23 and 24 May 2005.

The first two papers (Milne et al. and Easter et al.) give the rationale behind the development of the GEFSOC system and a technical account of how the system works. The third paper (Batjes et al.) presents a uniform approach that was used to develop consistent soil datasets during the project and illustrates how these can be used to estimate SOC stocks using an empirical method. Papers 4–10 present soil C stocks and stock changes estimated using the GEFSOC modelling system for the four GEFSOC project case study areas in addition to discussing model evaluation and parameterisation used during the project. Finally, the last two papers look at the possible impact of climate change on carbon storage in both soil and vegetation and consider national and global implications of the project findings.

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