

Selected Papers of the Workshop on “Development of Models and Forest Soil Surveys for Monitoring of Soil Carbon

**Koli, Finland, April 5–9 2006, Organized by the Finnish Forest Research Institute (Metla) and
Sponsored by the European Science Foundation (ESF)**

The selected papers have been peer-reviewed in accordance with Silva Fennica’s normal review procedure

All presentations and posters at the meeting, as well as abstracts, are available
at www.metla.fi/tapahtumat/2006/soil2006

Workshop on Soil Carbon

The objective of this workshop was to assess potential methodologies of soil carbon monitoring, and to evaluate applicability of the methods for large-scale inventories. The workshop discussed possibilities for using existing soil carbon models and soil surveys to monitor changes in soil carbon.

The workshop agreed that repeated sampling of representative sample plots would be the most transparent method to assess changes in forest soil. However, presently, few European countries (UK and Sweden) run soil surveys that are, or may be, able to provide nationwide estimates of soil carbon stock changes. Establishing such surveys in all European countries seems unrealistic due to high costs, though there are plans in the US to establish such an inventory. Repeated soil carbon measurements from a limited number of sample plots can be used for preliminary estimation of trends in soil carbon. At the European scale, the ICP/Forest Focus sample plots give such data.

A major outcome of the workshop was the increased common understanding of the possible role of soil carbon models in large-scale carbon inventories. The meeting discussed reliability of the current soil models in estimating decomposition and the soil carbon balance. The reliability depends on, first, how realistically and comprehensively the models describe the processes controlling the carbon balance and, second, how accurately the effects of processes are quantified in the models. The first requirement calls for complex models whereas the second limits their usefulness, as the data available may be inadequate to estimate their numerous parameters.

Several models have already been tested and have been applied for nationwide soil carbon assessments on mineral soils, but further development is needed to provide methods for carbon assessment of peatland soils. The soil models differ in details, in needs for input data, in the soil layers accounted for, and in the soil processes included. In general, the selection of the model for a large scale inventory is guided by availability of the input data.

The workshop discussed how models and soil surveys can be combined and what advance can be achieved by model-based approaches in soil carbon monitoring. Many countries have already selected either fully or partly model-based approaches for nationwide reporting of changes of carbon in forest soils. Development of a robust model-based monitoring system includes several steps i.e.

- 1) select and develop an appropriate model,
- 2) verify the adequacy of the model by comparing to measurement data,
- 3) identify sources of model input data such as soil surveys, land use and management activity records, and climatic data,
- 4) assess uncertainties
- 5) implement the model, and
- 6) evaluate results with an independent set of measurements.

According to this workshop, model-based methods can provide first estimates of the carbon stock changes of forest soils at national and European scale. In addition, model-based approaches help in verification and harmonization of the carbon assessments of different countries, since inventory can be repeated with different models. This workshop also agreed that the scenarios of soil carbon sequestration in current and changing climatic conditions with different management practices can be derived with currently existing models. In addition, these models and predictions can be used in the design of stratified soil sampling.

Scientific advisory board of the workshop:

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