

## The methodology used in year 2005 for greenhouse gas inventory of Finnish forest soils

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### Introduction

The greenhouse gas inventory of Finnish forest soils is part of national inventory LULUCF (Land Use, Land Use Change and Forest). The methodology is consistent with the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories and IPCC Good Practice Guidance for Land Use, Land Use Change and Forestry. LULUCF is one of the key categories in Finnish inventory and the methodology is based on Tier 2 analysis.

### Method

The calculation routine used in year 2005 inventory (covering years 1990-2004) is shown in *fig. 1*. First, the annual litter production was estimated and added to the litter stock and then the decomposition of all the organic matter stocks were calculated. The change in organic matter stocks caused by land use changes could not yet be estimated. The inventory was made separately for mineral and organic soils. Only drained peatlands soils were considered

as organic soils, undrained peatlands were assumed to be in stable state and not affecting the GHG balance. Stock changes of litter, dead wood and SOM pools were estimated with Yasso model (Liski et al., 2005, *fig. 2*), except in the case of peat decomposition, which was assessed using site specific emission factors and estimates of the annual below ground litter inputs.

Reported litter, dead wood and SOM stocks were determined according to the state variables of Yasso (*fig. 2*). State variables fine woody litter, coarse woody litter, extractives, celluloses and lignin-like compounds were considered as litter. Correspondingly humus 1 and humus 2 were considered as SOM. Dead wood was determined as litter originating from stems and stumps thicker than 10 cm.

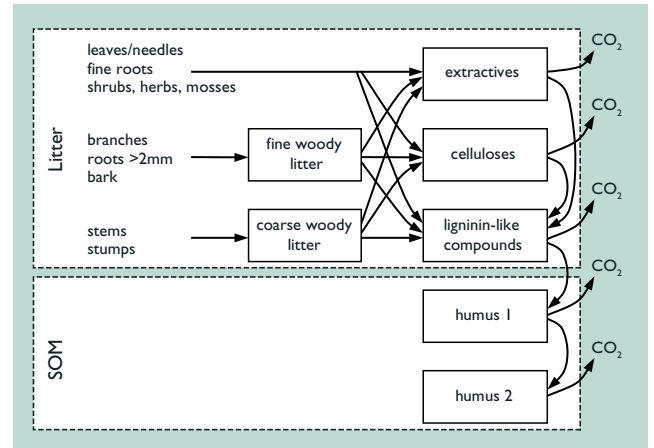


Figure 2. Schematic presentation of the Yasso model (Liski ym. 2005).

soils and years 1990-2004 for peatlands, was estimated from forest data provided by National Forest Inventories (NFIs). Natural mortality was estimated on the basis of the follow-up of some 3000 permanent sample plots from 1985 to 1995. Fellings in years 1990-2004 were reported by roundwood purchasers and Metsähallitus.

Annual litter production consisted of litter production from living biomass (trees, ground vegetation), natural mortality of trees and harvesting residues. In mineral soils the litter production of the ground vegetation was not yet included, since reliable estimates were lacking.

The parameterisation of Yasso included assessment of the decomposing properties of different biomass compartments and also the temperature effect on decomposition rate in south and north. Initial state of the model was estimated with a long initiating period, starting from the year 1000. In mineral soils the inventory simulation with actual estimated litter input started from 1940 and in drained peatlands from 1990.

GHG balances were reported as 5 years moving averages, emphasis being in the long-term trends of changes.

### Results

Mineral soils seem to be minor sinks of carbon whereas drained peatlands seem to be minor sources (*fig. 3*). When also carbon fixation by net growth of trees is included, Finnish forestlands become clear sinks of carbon (7,1 Tg C in year 2004).

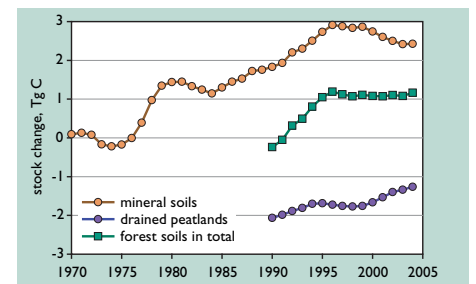


Figure 3. Results of Finnish inventory of carbon stock changes in forest soils.

### References

Liski, J., Palosuo, T., Peltoniemi, M. & Sievänen, R. 2005. Carbon and decomposition model Yasso for forest soils. *Ecol. Model.* 2005 (in press).

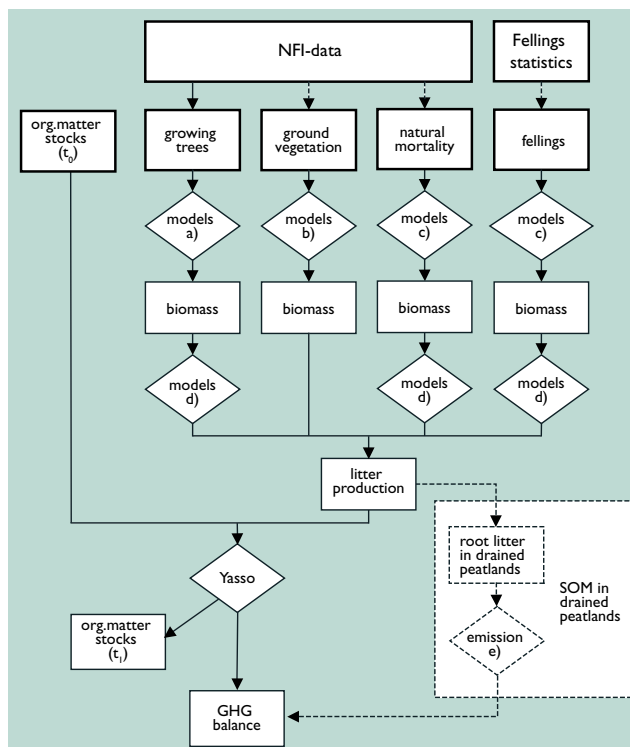


Figure 1. Schematic presentation of calculation routine used in Finnish GHG inventory. Classification of organic matter is presented in *fig. 2*. **Models a)** tree level functions for biomass compartments, **models b)** functions for biomass of shrubs, herbs, grasses and mosses, **models c)** area level functions for biomass compartments (BEFs), **models d)** litter production of each biomass compartment, **emission e)** functions using emission factors.

### Data

Litter production, covering years 1922-2004 for mineral

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