

## THE AREA OF CULTIVATED ORGANIC SOILS IN FINLAND ACCORDING TO GIS DATASETS

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### SUMMARY

The recently published Finnish Soil Database consists of a digital soil map over the entire country. Location of all field plots on active farms is available on a field plot database owned by the Agency for Rural Affairs. By combining these two sources of information by geographical information systems (GIS), the area of cultivated organic soils could be calculated with a good accuracy for the first time. Histosols, and soils with a histic horizon were treated as organic. Organic soils cover 252 000 hectares, i.e. 10.4% of the cultivated area.

**KEYWORDS:** organic soil, Histosol, histic horizon, soil map, field plot database

### INTRODUCTION

The area of cultivated organic soils is important data needed for assessing the environmental impacts of agriculture. Due to the large carbon and nitrogen stocks in organic material the potential for nutrient leaching and greenhouse gas emissions is high. The aim of this study was to provide an updated estimation on the area of cultivated organic soils in Finland to be used in estimating the environmental effects of these soils.

### MATERIAL AND METHODS

The area of cultivated organic soils was determined by using two datasets that have recently become available. The first one is the Finnish soil database (Lilja *et al.* 2006, Lilja and Nevalainen 2007, Lilja *et al.* 2009). It consists of a digital soil map over the entire country, and information about properties of soils. Soil types are named in agreement with the World reference base for soil resources (FAO 2006). In this study, Histosols, and soils with a histic horizon are considered organic. The database distinguishes three classes of Histosols:

Histosol 1, organic layer >60 cm  
Histosol 2, organic layer 30-60 cm  
Histosol 3, organic layer < 30 cm

The second dataset is the field plot database owned by the Agency for Rural Affairs. The database includes the location of all field plots that have received areal based farming subsidy during Finland's membership in the European Union, i.e. since 1995. A very high percentage

of the farms have received the subsidy, like 95% in 2008 (Niemi and Ahlstedt 2008). In this study, cultivated area means all agricultural and horticultural area used for the production of annual and perennial crops including grasslands. Field plot data from 2008 was used in this study.

By combining the two sources of information by geographical information systems (GIS), the area of cultivated organic soils could be calculated.

## RESULTS AND DISCUSSION

Organic soils covered 252 000 hectares, i.e. 10.4% of the cultivated area. The proportion of organic soils to the cultivated area was low in the Southern Finland but increased to the north (Fig. 1).

In this study, the amount of cultivated organic soils in Finland was less than in the latest estimation made by Mylly and Sinkkonen (2004). They used another, indirect method, and estimated that 13.6% of the total cultivated area was organic soils. It is unlikely that the area has decreased to that extent in less than ten years but it is likely that the former estimation gave an overestimated area.

Combining the Finnish soil database and the field plot database by GIS is a good prerequisite for the determination of the accurate area of cultivated organic soils. However, the field plot database does not exactly match to the present cultivated area as there are plots that have never got farming subsidy and thus, are not recorded on the database. In addition, abandoned plots are not removed from the database. Therefore, the field plot database covers the present cultivated area *minus* area that has never received farming subsidy *plus* area that has been abandoned after once digitized.

The Finnish soil database is collected from information from several sources. There may be different definitions for organic soils among them. However, the database is the best available source of soil data in Finland.

This study also gave information about the thickness of the organic layer in cultivated soils. Most organic soils were Histosols with a thick layer of organic material (Table 1). The proportion of Histosols with an organic layer thicker than 30 cm to all organic soils was over 90% on most of the country (Fig 2). The proportion was less only on the coastal regions, where the organic deposits are younger, and therefore less developed, and where the cultivation practices are intensive due to the growing of annual crops instead of grasses. Therefore, organic material may have been decomposed faster than elsewhere in the country.

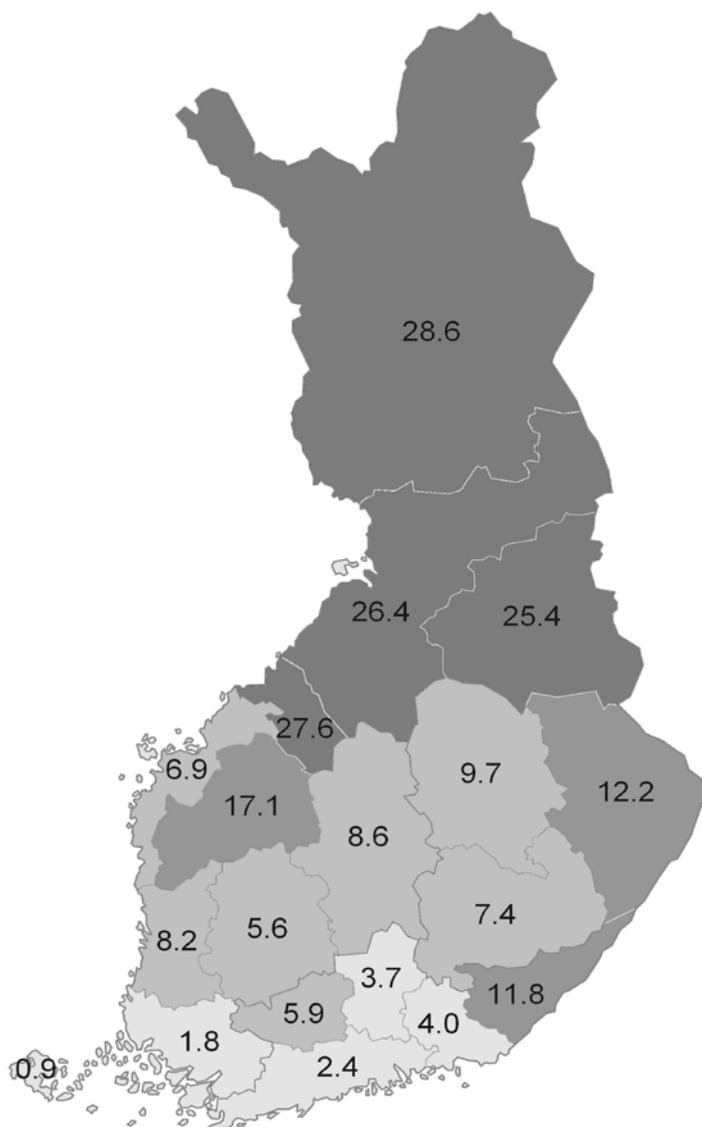


Fig. 1. Proportion of cultivated organic soils to the cultivated area in the regions of Finland (%). Darkening shade indicates increasing proportion.

Table 1. Proportions of the area of each organic soil type to the area of all organic soils (%)

Histosol 1 (organic material >60 cm)	Histosol 2 (organic material 30- 60 cm)	Histosol 3 (organic material <30 cm)	soil with a histic horizon
62.0	30.0	3.7	4.4

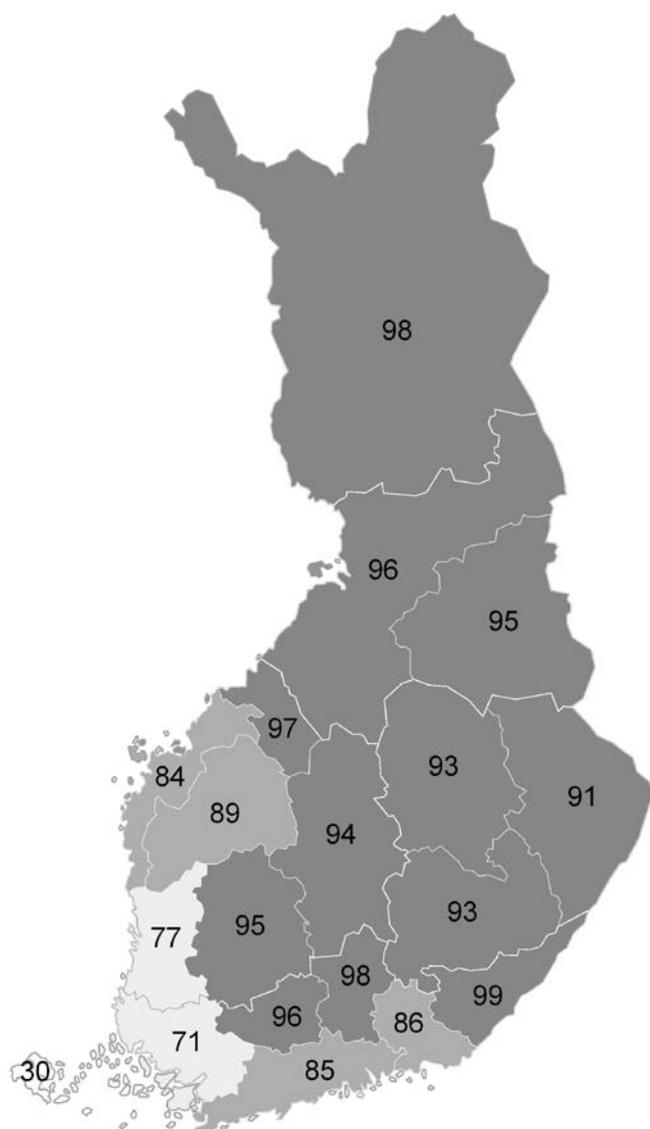


Fig. 2. Proportion of Histosols 1 and 2 (organic material layer over 30 cm) to all organic soils (%). Darkening shade indicates increasing proportion.

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