The changes of soil carbon stock following forest degradation in tropical monsoon forest in Southeast Asia

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Abstract

The soil carbon stock (SCS) in each forest type and their changes following forest degradation were investigated in Mae Klong Watershed Research Station, western Thailand. SCS was highest in Dry evergreen forest (DEF) and lowest in Dry dipterocrp forest (DDF). Amounts of SCS (kg C m^{-2}) were 11.5 in DEF and 4.6 in DDF, those of Mixed deciduous forest (MDF) were 6.8 in the depth of 30cm. Amounts of SOC in the depth of 30cm in primary forest (PF) and secondary forest (SF) were calculated for MDF to discuss the effect of forest degradation. There were 7.3 in PF and 5.9 in SF. These results shows that forest degradation introduce SCS and key factor for SCS conservation is to maintain the clay contest is of soils in the tropical monsoon forest.

Key Word: Clay contents, Forest degradation, Soil carbon stock, REDD+

Introduction

To promote REDD+ activity in tropical countries, evaluation of the soil carbon stock (SCS) in each forest type and their changes following forest degradation were required. We investigated the SCS of mixed deciduous forest (MDF), dry dipterocarp forest (DDF), teak (*Tectona grandis*) plantation (TK) and, grassland (GL) in the tropical monsoon forest at Mae Klong Watershed Research Station (MWRS), western Thailand. MDF was dominant in this region. SCS in 0-30 cm depth following Tier 1 of IPCC-GPG and in 0-100 cm depth were estimated.

Methodology

The soil survey was conducted in mixed deciduous forest (MDF), dry dipterocarp forest (DDF), teak (*Tectona grandis*) plantation (TK) and, grassland (GL) at Mae Klong Watershed Research Station (MWRS), western Thailand. MDF was dominant in this region. Collected soil samples were sieved after air drying. The carbon content of fine soil was determined dry combustion method (NC-900, Sumica, Japan). The soil carbon stock (SCS) in each forest was calculated from carbon content and bulk density of fine soil. SCS in 0-30 cm depth following Tier 1 of IPCC-GPG and in 0-100 cm depth were estimated. Ratio of soil carbon stock in 0-30 cm to 0-100 cm was also calculated. Their changes following forest degradation were also investigated.

Results and Discussion

Soil carbon stock in Mae Klong Watershed Research Station, Kanchanaburi, western Thailand

SCS was highest in DEF and lowest in DDF. Amounts of SCS (kg C m^{-2}) were 11.5 in DEF and 4.6 in DDF, those of MDF were 6.8 in the depth of 30cm, and were 20.5 in DEF, 7.1 in DDF, 13.4 in MDF in the depth of 100 cm. Ratio of SOC in 0-30 cm to 0-100 cm was 0.5-0.6 and not different among forest type (Figure 1).

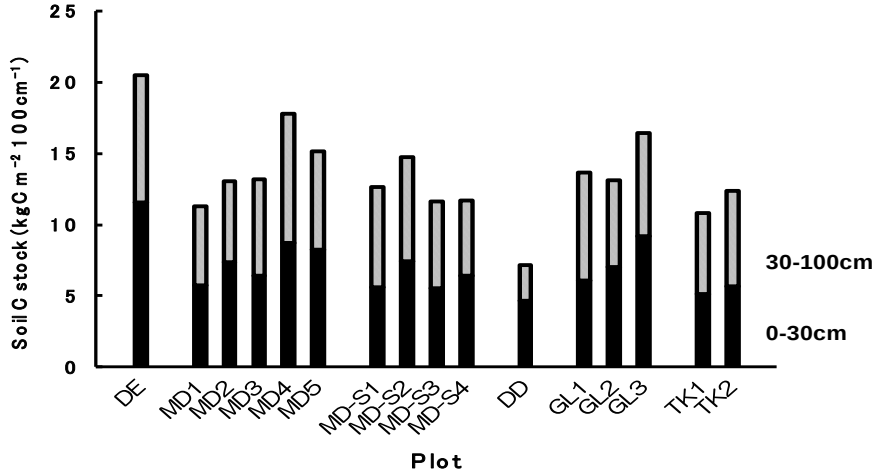

Figure 1 Soil carbon stock under different forest types in Mae Klong Watershed Research Station, western Thailand.
DE: dry evergreen forest, MD: mixed deciduous forest, MD-S: mixed deciduous forest (secondary forest), DD: dry dipterocarp forest, GL: gassland, TK: Teak planatation forest

Controlling factors of soil carbon stock

To discuss the effect of forest degradation, amounts of SOC in the depth of 30cm in primary forest (PF) and secondary forest (SF) were calculated for MDF. There were 7.3 in PF and 5.9 in SF. SCS was close in MDF but lower than Thai in DEF, in the Cambodian forest (Toriyama *et al.* 2007; 2010). It was considered that controlling factor for SCS was different between in the Thai and Cambodian forests. When amounts of clay contents were close, SCS was higher in the Thai than the Cambodian forest soils. These results shows that forest degradation introduce SCS and key factor for SCS conservation is to maintain the clay contest is of soils at the Thai and Cambodia in the tropical monsoon forest.

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