Geophysical Research Abstracts
Vol. 18, EGU2016-863-2, 2016
EGU General Assembly 2016

Soil organic carbon accumulation in afforested/abandoned arable fields in Taiwan

Yi-Han Lin, Chih-Hsin Cheng, and Yu-Hsuan Huang
School of Forestry and Resource Conservation, National Taiwan University, Taipei, Taiwan (r03625003@ntu.edu.tw)

Afforestation or abandonment of arable fields has been proposed as a way to increase terrestrial carbon storage and mitigate anthropogenic carbon emissions. When the arable fields are afforested or abandoned, the accumulation in soil organic carbon (SOC) is a key pool to sequestrate carbon. However, high uncertainties still exist in the tropics and subtropics because of fast SOC turnover rates and variable land use managements in these areas. In this study, a total of eleven sites with afforested/abandoned age over 15 years and elevation ranging from 16 to 2,056 m were investigated. We examined the increments of SOC by comparing with the adjacent tilled (e.g. croplands) and non-tilled (e.g. tea plantation or orchards) fields in two sampling layers, 0 - 10 and 10 - 20 cm in depth. In addition, density fractionation of SOC was also conducted in order to differentiate SOC into light fraction, intra-aggregate fraction, and heavy fraction to gain more information about the mechanism of SOC sequestration. Our results indicated that the increments of SOC concentration and stock varied with elevation, land use management, and soil depth. For the sites with elevation below 500 m, the SOC concentration and stock in the abandoned fields were 14.3 $\pm$ 0.9 mg C g^{-1} and 14.6 $\pm$ 4.6 Mg C ha^{-1} higher than the adjacent tilled fields, and 10.2 $\pm$ 6.3 mg C $g^{-1}$and 6.4 $\pm$ 6.2 Mg C ha^{-1} higher than the adjacent non-tilled fields for surface 0-10 cm. For the sites with elevation above 500 m, the SOC concentration in the abandoned arable fields were 22.8 $\pm$ 12.8 mg C g^{-1} higher than the adjacent tilled fields, but the SOC stock might not be different due to high stone content in abandoned field. Moreover, the SOC concentration and stock in abandoned field were not different or even less than non-tilled fields where organic amendments were frequently applied. The increments of SOC for 10-20 cm soils were less evident than those for surface 0-10 cm soils, and the differences were only observed in the SOC concentration in some sites. The preliminary results from SOC fractions further indicated that the increment of SOC in the low elevation afforested/abandoned fields were from all three fractions, but only one or two fractions (e.g. light fraction or intra-aggregate) increments were observed in the high elevation ($>$ 500 m) afforested/abandoned field. More studies about SOC fraction are still underway and will present in the General Assembly 2016.