

Soil carbon pool and carbon fluxes estimation in 26 years after selective logging tropical forest at Sabah, Malaysia

ABSTRACT

The soil carbon pool holds an enormous amount of carbon, making it the largest reservoir in the terrestrial ecosystem. However, there is growing concern that unsustainable logging methods damage the soil ecosystem, thus triggering the release of soil carbon into the atmosphere hence contributing to ongoing climate change. This study uses a replicated ($n = 4$) logging experiment to examine the impact of supervised logging with climber cutting (SLCC) and conventional logging (CL) on basic soil characteristics, litter input to soils, soil carbon pools, and soil respiration in a mixed dipterocarp forest 26 years after logging. This study found that there was no significant difference observed in the soil physicochemical properties and total carbon pools between the logging treatments and the virgin forest. Soil carbon pools dominated the total carbon pools, and the highest mean value was recorded in SLCC ($87.95 \pm 13.67 \text{ Mg C ha}^{-1}$). Conventional logging had a lower mean value ($71.17 \pm 12.09 \text{ Mg C ha}^{-1}$) than virgin forest ($83.20 \pm 11.97 \text{ Mg C ha}^{-1}$). SLCC also shows a higher value of soil respiration rate ($161.75 \pm 21.67 \text{ mg C m}^{-2} \text{ h}^{-1}$) than CL ($140.54 \pm 12.54 \text{ mg C m}^{-2} \text{ h}^{-1}$). These findings highlight the importance of accurate quantification of the effect of different logging methods on the forest's carbon pools.