# THE POTENTIAL FOR SOIL CARBON SEQUESTRATION UNDER TEA AND *EUCALYPTUS* IN THE UPCOUNTRY INTERMEDIATE ZONE OF SRI LANKA

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Soil carbon sequestration is a process that transforms $CO_2$ from the atmosphere into the soil through plant residues and other organic solids, in a form that is not immediately reemitted. Globally, soils are estimated to contain 1500 Pg of soil C to a depth of 1 m, approximately double the amount of C in the atmosphere. Around 160 Pg of organic C are stored in soils of agricultural croplands in the world. Limited data are available on soil C sequestration capacity of agricultural plantations in Sri Lanka. Tea is the major export agricultural crop in Sri Lanka. However, no data are available on the soil C sequestration capacity of tea plantations in Sri Lanka. Therefore, the main objective of this research was to study the C sequestration capacity of soils and to estimate the C stocks with respect to soil depth in tea plantations of Sri Lanka. The different fractions of soil C were also studied with a long term objective of improving the stable pool of C in soils. The establishment of *Eucalyptus* plantations in degraded areas of tea plantations is a common practice carried out for rehabilitation. C sequestration capacity will be an additional benefit over rehabilitation. Therefore, C sequestration capacity of an adjacent *Eucalyptus* plantation was also evaluated. The sites were located in Badulla district in the up country intermediate zone of Sri Lanka. Soil moisture content, soil pH, microbial biomass carbon (MBC) and microbial biomass nitrogen (MBN), soil active C and total organic carbon (TOC) in soil were determined. C stocks were estimated. Accumulation of plant litter, water soluble C and N in plant litter and TOC in plant litter were also determined. Soil pH decreased in both plantations with the soil depth without a statistically difference. It was not significantly different between the two plantations at 0-15 cm soil depth. MBC and MBN of tea plantation were not significant with the soil depth. MBC decreased statistically with the soil depth, but MBN decreased with the depth without a statistical difference in the *Eucalyptus* plantation. The soil TOC level was 2.88 g $kg^{-1}$ in tea and 1.98 g $kg^{-1}$ for soil of the *Eucalyptus* plantation at 0-15 cm depth. Total organic C decreased statistically with the soil depth in *Eucalyptus* plantation. However, there was no significant difference of TOC between the two soil depths in tea soil. Active C in 0- 15 cm layer of tea soil was 469.00 mg $kg^{-1}$ and 367.60 mg $kg^{-1}$ for soil of *the Eucalyptus* plantation. Active carbon decreased significantly in the soil of both plantations when the soil depth increased. Litter accumulation of *Eucalyptus* plantation was significantly higher than the litter accumulation of tea plantation. The TOC content and the water soluble organic C of the *Eucalyptus* litter were significantly higher than that of litter of tea, but water soluble nitrogen was significantly lower in litter of *Eucalyptus* than that of litter of tea plantation. TOC stocks calculated were 5.61 kg $ha^{-1}$ in tea plantation and 4.21 kg $ha^{-1}$ for the *Eucalyptus* plantation for 0-15 cm depth. This clearly shows that a monoculture agricultural plantation also has a great potential for soil C sequestration and also for future C trading arrangements.