

**ESTIMATION OF SOIL CARBON STOCKS OF TROPICAL RICE
BASED CROPPING SYSTEMS: RICE-RICE, RICE-SOYA,
RICE-ONION AND RICE-TOBACCO IN SRI LANKA**

**B.M.A.C.A. Perera¹, R.P.S.K. Rajapaksha²,
E.M.H.G.S. Ekanayake² and R.R. Ratnayake²**

¹Faculty of Agriculture, Aquinas University College, Colombo 08, Sri Lanka.

²National Institute of Fundamental Studies, Hantana Road, Kandy, Sri Lanka.

renukar@ifs.ac.lk

Carbon sequestration increases soil fertility at the same time reduces global warming by storing atmospheric carbon in soils. This study aimed to investigate the variation of Soil Organic Carbon (SOC) fractions and carbon stocks as affected by crop rotation with upland crops in tropical rice based cropping systems in Sri Lanka. Total Organic Carbon (TOC), Microbial Biomass Carbon (MBC), Water Soluble Carbon (WSC), and KMnO₄ oxidizable Carbon were analyzed at 0-15 and 15-30 cm depths in Rice-Rice (RR), Rice-Soya (RS), Rice-Tobacco (RT) and Rice-Onion (RO) rotations. Soil pH and moisture were also analyzed. The data were analyzed as a completely randomized design (CRD) analysis of variance (ANOVA). Results showed that SOC fractions among the cropping systems varied significantly ($p < 0.05$) showing high contents of Carbon in 0-15 than 15-30 cm depth except only for water soluble Carbon which showed a higher content in 15-30 cm depth. The top soil layer had higher amount of MBC than the deeper layer. Although it was not quantified comparatively high amount of organic matter remaining in RR as paddy stubble accounted for highest amount of TOC. RS also maintained a higher TOC content probably due to the organic residues collected in soil via leaf litter as all dry leaves have fallen on to the soil at the time of harvesting of soya. However, in RO no residues were added to the system and significantly lower organic Carbon content was reported. After 10 years of cultivation cropping system changes from RR to other annual crops such as RT and RO reduced the soil Carbon sequestration to a significant level. However, crop rotation changes from RR to upland soya maintained same level of C (65.18 t/ha) as in RR (63.48 t/ha). This indicated that Carbon sequestration capacity is species specific and differences are mainly due to remaining crop residues and specific soil tillage practices used for upland crops. The study confirmed that tropical rice based cropping systems have a great potential in storing and maintaining Carbon in soils.