Soil Carbon Sequestration Potential of Dry-Zone Home Gardens in Anuradhapura District, Sri Lanka

Premalal[1], H.M.N.D., *Perera[1], G.A.D. and Ratnayake[2], R.R.
[1]Department of Botany, University of Peradeniya, Peradeniya, Sri Lanka.
[2]National Institute of Fundamental Studies, Hanthana Road, Kandy, Sri Lanka.
*Corresponding E-mail: anomap@sci.pdn.ac.lk

Home gardens are an integral component of dry zone agroecosystems of Sri Lanka. These sequester atmospheric CO_2 and thereby contribute to mitigate global warming, but agricultural practices performed in these are believed to be disturbing the soil, resulting the release of stored soil carbon to the atmosphere. Further, soil organic matter affects the retention of soil nutrients. Thus, the amount of soil carbon, and the available nitrogen and phosphorous contents in the soils of home gardens could vary with the management inputs. Therefore, the C sequestration capacity in the soils (0–15 and 15–30 cm depths) from three types of dry zone home gardens (intensely managed over a long period of time, poorly managed over a long time and intensely managed but recently established) in Anuradhapura District in the North Central province of Sri Lanka were studied in relation to major management interventions operated in these. The total organic carbon (TOC), Labile soil organic carbon (LC), Microbial Biomass carbon (MBC) Water soluble carbon (WSC), available phosphorus, NH_4^+ nitrogen and NO_3^- nitrogen contents in 108 randomly selected pooled soil samples (a composite of three) were detected by performing standard protocols, and the soil carbon stocks (SCS) in these three home gardens were estimated. TOC, LC, WSC and MBC contents in upper soil layers of more intensely and less intensely managed home gardens did not vary significantly (p >0.05). Also, the SCSs do not vary significantly with the intensity of agricultural practices in these home gardens. However, the examined home gardens appear to be sequestering carbon at a substantial level, ranging from 21.17–23.81 Mg ha^{-1} in the top-soil, but compared with this, the carbon stock is lower at the 15-30 cm soil depth (14.27–18.82 Mg ha^{-1}). The available phosphorous content at 0–15 cm soil depth, and the available phosphorous, NH_4^+ nitrogen and NO_3^- nitrogen contents at 15–30 cm soil depth in intensely managed home gardens were higher (p <0.05) than that in less intensively managed home garden, and this can be attributed to the addition of chemical and organic fertilizers to the top-soil and subsequent leaching of nutrients to the subsoil.

Keywords: Agroecosystems, Carbon stock, Microbial biomass carbon, Management intensity.