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# Estimation of Aboveground and Belowground Carbon Stocks in Homegardens of Low Country Wet Zone, Sri Lanka

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## Abstract

Homegardens are one of the most significant and oldest types of land use systems in Sri Lanka which have been recognized as an essential component in providing a variety of ecosystem services. In these systems, trees and shrubs are grown together with food crops under family labor, creating a multitude of biological interactions. Due to rich tree diversity and density, homegarden agroforestry systems are known to have a great capacity to capture and store carbon in their biomass and soils, and thus greatly contribute to mitigation of climate change. Even though the importance of homegardens with regard to the above is highlighted significantly, large knowledge gaps remain on their total carbon storage potential, particularly in low country wet zone homegardens of Sri Lanka. Therefore, the current study aims to estimate the total aboveground and belowground carbon stocks of homegardens in Kalutara district. The study was conducted in ten homegardens ranging from 0.15 Ha to 0.43 Ha. The study focused on all perennial woody trees present in the homegardens. Heights and diameters at breast height (DBH) were measured in a total of 966 woody trees. Aboveground biomass of each tree was calculated nondestructively, using allometric equations which incorporated wood density, DBH and tree height. Belowground biomass was calculated using root: shoot ratios of trees. Total biomass of each tree was converted to total carbon stocks using a conversion factor of 0.5 extracted from literature, considering that total carbon stock of a tree is equivalent to half of its biomass. In order to get the total carbon stock, soil organic carbon (SOC) content of each home garden was analyzed in the laboratory from collected soil samples using the Loss-on-ignition method. Belowground biomass carbon stock and the SOC stock together were taken as the total belowground carbon stock of each homegarden. Estimated mean aboveground carbon stock was 91.4±11.4 Mg $ha^{-1}$, while the mean belowground carbon stock was determined as 134.3±12.3 Mg $ha^{-1}$ in low country wet zone home gardens. Aboveground carbon stock, together with the belowground carbon stock, was taken as the total carbon stock of the homegardens. Calculated total carbon stock per unit area for low country wet zone homegardens ranged between 179.873 Mg $ha^{-1}$ and 286.606 Mg $ha^{-1}$ with a mean value of 225.7±11.9 Mg $ha^{-1}$. Above findings of the study present evidence for significant carbon storage capacity of low country wet zone homegardens.

***Keywords:*** Homegarden, Low country, Wet zone, Carbon stock, Climate change