Estimation of the Above- ground, Below-ground, and Total Biomass and Carbon Stocks of tea plants in Organic and Conventional Tea Cultivation Systems in the Uva Region of Sri Lanka

Madhuranga, H.P.N., Rathnayaka, R.A.A.S.[1], Mohotti K.M.[2], Sivananthawerl, T.[1] and Mohotti A.J.[*]
Department of Crop Science,
Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka

This study was designed to develop an allometric equation to estimate the above-ground (AGB), below-ground (BGB), and total biomass (TB) of tea, and the carbon stocks of tea grown in organic and conventional systems in the Uva region of Sri Lanka. Measurements are collar circumference and diameter (CDSL) at soil level, collar circumference and diameter at 6 cm height from soil level (CDSH) to beginning of primary branch, number of primary branches, circumference and diameter of the beginning of primary branches, circumference and diameter of the end of the primary branches and length of primary branches. Allometric equations were developed with the AGB, BGB and TB and these parameters, and the best-fitted equation was selected by Pearson correlation coefficient and simple linear regression. Using this equation, the AGB, BGB and TB in each selected tea land was estimated. Carbon stock was considered to be 50% of the biomass. The significance of differences between the two systems were analyzed using two sample t test. CDSH had the best ($P < 0.05$) correlation coefficient in both fresh weight and dry weight basis with AGB BGB and TB in fresh weight basis. The determined allometric equations in fresh weight basis were; $AGB = 741.222 \times CDSH$($R^2$=0.972), $BGB = 351.600 \times CDSH$($R^2$=0.946) and $TBM = 822.822 \times CDSH$($R^2$=0.980). Determined allometric equations in dry weight basis were $AGB = 226.716 \times CDSH$ (R^2 = 0.955), $BGB = 153.675 \times CDSL$ (R^2 = 0.950) and $TB = 377.390 \times CDSH$ (R^2 = 0.950). There was no significant difference ($P>0.05$) in the AGB, BGB and TB, and the carbon stocks of tea plants between the organic and conventional systems. The results indicate that tea plants cultivated in both systems are equally capable of sequestering the atmospheric carbon.

Key words: Allometric equation, Biomass, Collar diameter, Conventional, Organic, Tea

[1]Department of Agricultural Engineering and Soil Science, Faculty of Agriculture, Rajarata University of Sri Lanka.
[2]Tea Research Institute of Sri Lanka
[*]mohottij@agri.pdn.ac.lk