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Carbon sequestration in soils, biomass and their relationships in dry environments: a case of central Botswana

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The study was conducted around Serowe village (26002'-26058' East and 22012'-22036' South), Botswana. Carbon is considered as a building block of life. Soil carbon for instance has been considered as a good indicator of ecosystem health. Moreover, understanding the carbon stock is becoming important in carbon sequestration as a response to climate change. Thus, this study aims at: (1) Assessing the Carbon stock in woody biomass; (2) Assessing Soil carbon stock (SOC) of the upper 30cm; and (3) Assessing the applicability of above ground biomass in estimating soil carbon stock. The area was stratified into three main landscape units: Sandveld (Upper slope), Escarpment (Middle slope) and Hardveld (Lower slope), and sampled, using 75 plots. Ankle height tree basal area was measured in the field and converted to fresh weight biomass using existing regression equations. The fresh weight biomass was converted to dry biomass using fresh to dry biomass conversation factors. Finally, the dry biomass was converted to carbon stock the Biomass to Carbon stock using existing conversion factors. Bulk density (using core sampler), course fragments % (using visual estimation) and Carbon content (using Walkley-Black method) were determined to SOC stock. The result indicated that the 95% confidence interval for Carbon stock in biomass and soils were 4.51$\pm$0.55 ton/ha and 20.6$\pm$1.82 ton/ha, respectively. The results indicate that, biomass poorly explains the variation in SOC, R2 = 17% and 0%, in the Sandveld and Escarpment, respectively. However, SOC was better explained by biomass in the Hardveld (R2 = 49%). By taking the Arenosols, which covers 78 % of the study area, biomass explained 13 % of the SOC variability. Based on this study it can be concluded that biomass is not a good estimator of SOC stock in the dry environment of central Botswana.

Key words: biomass, Botswana, carbon sequestration, dry environments, soil organic carbon