

A Sustainable Form of Land Use under *Borassus flabellifer*: A Case Study in Jaffna District of Sri Lanka

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Abstract

Perennial plantations play a significant role in mitigating climate change and improve the plant diversity. This study was carried out to estimate the carbon sequestration potential of Palmyrah (*Borassus flabellifer*) land use in twelve different soil series in Jaffna district and to estimate the plant diversity of the same. Samples were collected from sampling quadrates of 10 mx10 m. A total of 75 quadrates were sampled. Numbers of quadrates in each soil series were selected based on the extent of Palmyrah plants and soil series. From each quadrate following data was collected: number of Palmyrah trees and other trees and their height and diameter at breast height. Soil samples were also collected within each quadrate at three depths, up to a depth of 30 cm. For the estimation of biomass carbon stock Palmyrah wood density was determined using 15 wood samples. Biomass carbon was estimated using the standard equations. Soil organic carbon percentage was determined by loss on ignition method. The total carbon stock was determined by the summation of carbon in palm biomass and soil carbon. Plant diversity was estimated in terms of number of species, Shannan Weiver index (SWI) and evenness. Soil organic carbon percentage of Palmyrah land use in different soil series ranged between 1.1-4.5%. Soil organic carbon stock in different soil series ranged 51-190 Mg/ha. There was no significance difference among soil organic carbon percentage of Palmyra land use in different soil series. Top most layer (0-10 cm) had significantly higher amount of soil organic carbon than sub surface layers (10-20 cm, 20-30 cm). Palm density of Palmyrah land uses in different soil series ranged 5-13/100 m². Biomass carbon stock ranged between 2.83-6.80 Mg/100 m². Biomass carbon stock in different soil series was significantly differed. Total carbon stock ranged 4.06-7.97 Mg/100 m². A total of 22 plant species belonging to 13 families were identified in the Palmyrah land uses in the study area. Arecaceae family was vastly distributed in the palmyrah land use while Poaceae and Malvaceae were the poorly distributed ones. The mean value of Shannan Weiver Index (SWI) was 1.2 while evenness was 0.74. This study therefore concludes that the Palmyrah land use in the study area has great potential to sequester carbon in long term, while maintaining a reasonable tree species diversity.

Keywords: Soil carbon, Biomass carbon, Plant diversity, Carbon stock