# CARBON STOCKS AND CARBON DIOXIDE REMOVAL CAPACITY OF MANGROVE VEGETATION; A CASE STUDY FROM SAHASTHAWELA ISOLATED MANGROVE ECOSYSTEM IN THE EAST COAST OF SRI LANKA

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## Abstract

Mangroves have been identified as one of the world's most productive ecosystems. Thus, they have been considered as an efficient carbon stock as well as a carbon sink. There are few reports on high carbon stock in the west coast mangrove of Sri Lanka. However, mangrove forests that are in the eastern coast have been poorly studied and especially the carbon stocks of these forests have not been estimated. Thus, the main objective of this study was to determine the carbon stock of one of the largest and isolated mangrove forest, Shahasthawela in the eastern coast of Sri Lanka. Further, net photosynthesis rate of the forest canopy was estimated as a measure of carbon sink. Seventeen 10 x 10 $m^2$ plots were located randomly in Shahasthawela mangrove forest. Trees > 10 cm dbh was identified and their height was measured. Shoot and root biomass and carbon stocks (plant above ground and below ground carbon) were estimated using standard allometric equations. Five locations were randomly selected from each plot and soil samples were collected from top 0.3 m layer of the soil using a soil auger. Samples were pooled together and five replicates from the pooled sample was used to determine total organic carbon (TOC) using loss on ignition method. Light intensity below the canopy and away from the canopy was determined using lux meter and net photosynthesis rate was estimated using a standard equation. TOC in plant was calculated to be 396.31 t $ha^{-1}$. It comprised of above ground carbon, 336 ± 123 t $ha^{-1}$ and of below ground carbon, 60.3 ± 9.7 t $ha^{-1}$. TOC in soil was recorded to be 110.1 ± 16.7 t $ha^{-1}$ and thus the TOC in the whole ecosystem was estimated to 506.4 t $ha^{-1}$. This is relatively high value compared to values reported for other tropical ecosystems in the world; tropical forests, 122.73 t $ha^{-1}$; deserts and semi deserts, 41.98 t $ha^{-1}$; tropical savannas and grasslands, 117.33 t $ha^{-1}$ and also crop lands, 80.00 t $ha^{-1}$. The estimated TOC content in Sahasthawela mangrove (20.9 ha) was 10,583.9 t. This amount was equivalent to 38,843 t of $CO_2$ and further, it was equivalent to the amount of $CO_2$ emitted

by combustion of 14,722,439 l of diesel or 16,825,644 l of gasoline in motor vehicles. Sahasthawela mangrove has a net photosynthesis rate of 2445.07 ± 263.4 $gCm^{-2}$/year indicating it's high carbon removal capacity. These values are comparable with those estimated for the west coast. This is the first comprehensive study on carbon stocking ability of Ampara District in the east coast mangrove providing sufficient proof to consider east coast mangrove ecosystems as an effective carbon sink.

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**Keywords:** Mangrove Ecosystem, Carbon stocks, Carbon sinks, Total organic carbon