Potential of Normalized Difference Vegetation Index Derived from Multispectral Optical Satellite Imagery to Estimate Stand Basal Area and Biomass of Mangroves

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Normalized Difference Vegetation Index is one of the frequently employed vegetation index in research which utilizes the information extracts from optical satellite images and often shows significant relationships with many forest structural attributes. The present study was conducted at mangrove forest located in Vidattaltivu nature reserve, Mannar, Sri Lanka to evaluate the suitability of Normalized Difference Vegetation Index to estimate and map vegetation structural attributes of mangroves. A total of forty quadrats (100 m^2) were placed at different distances from the seaward side. Diameter at breast height was measured in trees in each quadrat and stand basal area was calculated. Above-ground and below-ground tree biomasses were estimated using already available common allometric equations for mangroves. Multi-spectral image of Landsat 8 Operational Land Imager was obtained and the image was radiometrically corrected. Subsequently, Normalized Difference Vegetation Index was computed and regression models were developed. Best fit models were selected to estimate and map stand basal area, above-ground biomass and below-ground biomass of mangroves. Field sampling method resulted average values of 22.25±9.06 m^2 ha^{-1}, 205.18±98.66 t ha^{-1} and 86.54±39.26 t ha^1 while remote sensing method generated average values of 22.64±3.75 m^2 ha^{-1}, 197.46±37.81 t ha^{-1} and 85.54±14.99 t ha^{-1} for stand basal area, above-ground biomass and below-ground biomass respectively. Maps generated through remote sensing method manifested their potential in interpreting mangrove structural attributes effectively and efficiently with respect to field based techniques where the sampling process is rather a difficult task with relatively high time and monetary demands.

Keywords: Vegetation indices, Landsat 8, Mangroves, Vidattaltivu