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ABOVE GROUND FOREST CARBON STOCK ASSESSMENT USING GF-1 SATELLITE DATA

Abstract

Forest are composed of carbon stored in different pools (living and non-living). When deforestation and forest degradation occur, the ultimate destination of carbon stock in the atmosphere. In recent times, Climate Change has become a serious issue and to mitigate its effects, global forest carbon stock needs to be measured. In this study, above-ground forest carbon stock has been estimated and mapped using GF-1 satellite data. The GF-1 data has been preprocessed for geometric and radiometric errors using metadata provided with the satellite datasets. Afterwards, atmospheric correction has been performed using FLAASH module in ENVI software followed by topographic correction using SCS+C correction. Field measurements were carried out in selected sites. In total, 90 sample plots were surveyed for tree and shrub biomass measurements using plot sizes of 0.1 ha and 0.01 ha respectively. The total above ground biomass at each plot was then converted to forest carbon stock using carbon fraction. The above ground carbon stock values ranged from 11.11 tons/ha to 157.74 tons/ha. In next step, 60% of total samples collected during field survey were used to estimate and map above ground forest carbon stock using multiple regression technique. We used 54 predictor variables that were extracted from GF-1 satellite datasets including spectral indices, texture variables and spectral feature transformations (reciprocals of each band and Principal Components analysis). The final algorithm developed during the study included NDVI, EVI, Entropy of Band 1, Entropy of Band 2, Reciprocal of Band 2 and Correlation of PC1 as predictor variables. The algorithm showed maximum correlation coefficient up to 81.13% with standard error of 18.89. The adjusted R-sq value was 78.3% having p-value within 0.02 for all the predictors used for development of algorithm. The study concludes that GF-1 satellite datasets can be successfully used for mapping above ground forest carbon stock using regression analysis.