Estimating aboveground carbon of teak-based agroforestry systems in sabah, malaysia using airborne LiDAR

ABSTRACT

As a sustainable land use system, agroforestry can potentially mitigate climate change mitigation by sequestering carbon and reducing greenhouse gasses (GHGs) emissions. Since the implementation of the Kyoto Protocol, agroforestry has been recognized as a GHGs mitigation strategy that requires accurate estimation of the carbon storage. Focusing on teak-based agroforestry systems in Sabah, Malaysia, this study examined the use of airborne Light Detection and Ranging (LiDAR) data for aboveground carbon (AGC) estimation. Field inventory data were collected at the agroforestry systems with different intercropping crops to calculate the field AGC. We derived height and canopy density metrics from the LiDAR data to correlate and regress with the field AGC. Stepwise multiple linear regression analyses resulted in a multivariate model that explains 88% of the AGC variance in the agroforestry systems. With the 25th and 55th height percentiles as predictors, the model had a cross-validated root-mean-square error (RMSEcv) of 6.12 Mg C ha-1 (Relative RMSEcv: 13.45%). As teak is one of the major plantation species in Southeast Asia, accurate LiDAR-based AGC estimation could assist in developing teakbased agroforestry systems for climate change mitigation in the region.