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Attempts in Estimating Mangrove Forest Biomass

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Abstract

The biomass of a plant is the weight of its total organic matter content dried to a constant moisture, usually expressed in kilograms or metric tons. This consists of both Above Ground Biomass (AGB) which includes leaf, branch and steam, and Below Ground Biomass (BGB) which includes roots. Compared to the AGB, BGB is difficult to quantify. The biomass of a living tree consists of 50% water, 25% carbon and the remaining 25% is made up from other elements such as Phosphorus (P), Nitrogen (N), Potassium (K), Calcium (Ca) and Magnesium (Mg). Mangroves are among the most Carbon-rich forests in the tropics with higher productivity and a capacity to sink carbon four times superior to other tropical forests. However, the extent of mangrove forests declined by 30–50% over the past 50 years because of infrastructure development, aquaculture expansion and overexploitation. Meanwhile, the increasing trend of greenhouse gases such as Carbon Dioxide (CO_2), Methane (CH_4) and Nitrous Oxide (N_2O) draws attention to the potential of Carbon storage in mangroves that are stored as part of its biomass. Therefore, it is required to generate information on mangrove forest biomass in relation to controlling the greenhouse gases in the atmosphere. Quantifying biomass in mangroves is usually performed by a ground survey, which provides consistent means of assessing the biomass. There are three primary methodologies of assessing mangrove forest biomass: (i) Remote Sensing (RS) technologies, (ii) destructive harvesting of trees, and (iii) mathematical models. These mathematical models easily estimate AGB via measured biophysical parameters like tree diameter at breast height (DBH) and height (H), or wood density (WD). Destructive harvesting of trees provides the most precise estimates whereas RS technologies require field data to calibrate and validate products. Accurate estimation mangrove biomass and the usage of RS technologies will provide insights to stakeholders on the importance of conserving mangroves and is crucial for commercial exploitation for national level developmental planning, scientific studies on ecosystem productivity, understanding energy and nutrient flows, evaluating the impact of changes in tropical forests to the global carbon cycle and understanding the crucial role of mangroves in combating climate change.

Keywords: *Above ground biomass, Remote sensing, Mathematical models, Destructive harvesting, Carbon storage*