



Biophysical characterization of tropical montane rain forest of Central Sulawesi Indonesia

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Tropical rain forests are among the most important biomes in terms of annual carbon (C) turnover and evapotranspiration. They contain about 40% of the biomass and account for about 50% of the annual net primary production of the biosphere. But their productive capacities are poorly understood and this is essentially true for tropical South East Asia, where field data are not yet available. We studied biophysical properties in a natural tropical montane rain forest (1° 39.476'S 120° 10.409'E, at an altitude of 1416 m) of Central Sulawesi, Indonesia in order to estimate photosynthetic properties such as carboxylation capacity of RUBISCO (V_{cmax}), electron-transport capacity (J_{max}), and dark respiration rate (R_d). We estimated leaf morphological and biochemical properties such as leaf mass per area (LMA), leaf nitrogen concentration (N) and leaf phosphorus concentration (P) of five major tree species (*Castanopsis buruana*, *Gracinia dulcis*, *Lithocarpus havilandii*, *Phaleria coccinea* and *Vernonia arborea*). To determine photosynthetic parameters steady state leaf gas exchange rates were measured with a portable photosynthesis apparatus (LI-6400, Li-Cor, Lincoln, USA) to get the relationships between CO₂ concentrations and carbon assimilation rate, between photosynthetic photon flux and carbon assimilation rate and dark respiration rate at different leaf temperatures. Photosynthetic capacity and leaf properties varied greatly among and within species and within individual tree crowns. V_{cmax} and J_{max} at 25°C leaf temperature vary greatly among species and range from 20.48 to 66.84 $\mu\text{mol m}^{-2} \text{s}^{-1}$ and 47.35 to 105.4 $\mu\text{mol m}^{-2} \text{s}^{-1}$ respectively. The ratio J_{max} / V_{cmax} also varies among species and ranged from 1.57 to 2.27. R_d at 25°C leaf temperature and Q₁₀ range from 0.76 to 1.09 $\mu\text{mol m}^{-2} \text{s}^{-1}$ and 1.4 to 2.02 respectively among species. All photosynthetic parameters had strong and significant

relationships with LMA. Values of LMA, N_a and P_a of average of five species are 95.95 g m^{-2} , 1.5 g m^{-2} and 0.073 g m^{-2} respectively. The results of this study are used to develop a model parameterization of the spatial distribution of photosynthetic parameters throughout the canopy of the mixed tropical forest. This is a requirement to accurately simulate carbon dioxide fluxes and biomass production in tropical montane rain forests. The study was supported by DFG, SFB 552 "STORMA"