



Tropentag, September 17-19, 2014, Prague, Czech Republic

“Bridging the gap between increasing knowledge and decreasing resources”

## Comparison of Leaf Area Index Measurements in Rubber Plantations and Secondary Forest in Xishuangbanna, China

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### Abstract

Rubber trees (*Hevea brasiliensis*), which are considered as huge water consumers, have replaced most of the forests in Xishuangbanna, Yunnan, China. Leaf area index (LAI) is the total one-sided area of leaf tissue per unit ground area, and it is a key parameter in ecophysiology for up-scaling gas exchange from leaf to canopy level, for quantifying water loss by evapotranspiration, and for describing canopy dynamics and its microclimate.

In order to assess the impact of the land-use change in Xishuangbanna on the local and regional water balance, precise LAI measurement in forests and rubber plantations are needed. First results of experiments conducted in Menglun, Xishuangbanna, in a young (13 years old) and a mature (22 years old) rubber plantation, and in a secondary rain forest indicated that canopy dynamics differ widely between rubber plantations and forests, resulting in different water use patterns and altered heat fluxes.

Many methods have been developed to quantify LAI, and it is crucial to select the most appropriate technique according to a specific situation, object of interest, required accuracy, the time of measurement, the research scale, and the available budget. Nevertheless, LAI is not easily to quantify, and comparative measurements in plantations and forests need to consider the different canopy structures. In order to improve the precision of these measurements, different methods have been compared. LAI measurements were conducted in different distances from the individual trees and across the plots, during different times of the day (morning, midday, afternoon) according to the recommended requirements, and under different sky conditions. Measurements were carried out using light absorption method (SunScan, Delta-T Devices Ltd, Cambridge, UK), gap fraction method (LAI-2000, LI-COR, Nebraska USA; and hemispherical photography: Hemiview, Delta-T Devices Ltd, Cambridge, UK), and a destructive method. Pros and cons of each of the used instruments when measuring uniform and heterogeneous high canopy trees will be discussed and recommendations for comparative LAI studies in heterogeneous stands will be presented.

**Keywords:** Forest, Hemiview, LAI-2000, leaf area index, rubber, SunScan