

Measuring Leaf Area Index in Asian Rubber Plantations – a Challenge

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Introduction

Leaf area index (LAI) as the quotient of one sided leaf area per unit ground area (m^2m^{-2}) is an indicator used to describe the structure and density of plant canopies. By measuring or estimating LAI accurately key ecosystem processes essential for the assessment of impacts on climate or system balances such as evapotranspiration and carbon accumulation can be characterized. Literature data on LAI in rubber plantations varies profoundly between tools and techniques used for the respective study.

Methods

We have tested 5 different techniques for the determination of LAI in rubber in two plantations in Xishuangbanna, PR China; 15 trees have been selected, 8 measurements per tree, 3 times a day, over a period of 4 months. Data has been analyzed using SAS software.

Results

Similar to the results of our literature survey, our results show a great variability resulting from the devices used, the total amount of photosynthetically active radiation (PAR) at the time of measurement and the time of measurement itself (esp. for LAI 2000).

Young plantation		Device	Mature plantation	
High PAR	Low PAR		High PAR	Low PAR
2.0 – 2.5	2.3 – 2.5	LAI 2000	3.0 - 4.0	3.1 - 4.0
4.8	4.3	SunScan	4.7	3.7
2.6	2.3	HemiView	1.0	1.1
3.1		Litter traps	2.8	
5.0 - 6.0		Remote sensing	Same as young	

Table 1 gives an example for results following the best practice advises from the respective guidelines. Data for Litter traps has been gathered in 1m x 1m litter cages over the course of one year, Remote sensing data is based on the NASA Earth Observatory LAI dataset for the research area.



Conclusion

This study shows that, even when considering best practice standards of each measuring device, the results obtained from different techniques can vary quite profoundly. We were surprised by the margin of variability between measuring devices, or, when considering PAR for example, between background conditions. We hope that more future publications on plantation based LAI measurements will include detailed information on sampling layout, including a discussion on the reasons for choosing certain measuring techniques under their respective environments.