

KAFUTI, C. ET AL.

The effect of light availability, tree height and age on the leaf-to-sapwood area ratio of a tropical long-lived heliophilous species

Chadrack Kafuti¹, Nils Bourland^{2,3,4}, and Hans Beeckman²

¹ Faculty of Agricultural Sciences, Department of Natural Resources Management, University of Kinshasa, PO Box 117 Kinshasa XI, DRC

² Royal Museum for Central Africa, Service of Wood Biology, Leuvensesteenweg 13, 3080 Tervuren, Belgium

³ Center for International Forestry Research, Situ Gede, Sindang Barang, Bogor (Barat) 16115, Indonesia

⁴ Resources & Synergies Development Pte Ltd, Raffles Quay 16, #33-03, Hong Leong Building, Singapore (048581)

kafuti3@gmail.com

Widely analyzed in the context of temperate forests, the leaf-to-sapwood area ratio (S , $m^2\ mm^{-2}$) has been suggested as an adjustment compensating for water flow resistance and a proxy for above ground biomass allocation. This ratio is based on predictions of the Pipe Model Theory¹ stating that the amount of leaf area sustained by an individual stem or branch is linearly related to the sapwood cross-sectional area of this stem or branch. This ratio has shown high environmental plasticity suggesting its usefulness in the prediction of plants response to environmental changes. For example, in a study comparing S value in montane and desert conditions, it has been found that S decreased from montane to desert suggesting that the amount of leaves plants produce per unit conducting area decreased in contrasted environmental conditions due to high transpirational demand. Despite these interesting results, useful insights on plant-environment relationships could only be provided if the variables that contribute to the observed variation in S are identified and included in models of plant growth. With this respect, correlative and empirical studies have identified direct and indirect relationships between S and parameters such as tree size (diameter at the breast height), soil fertility, genetic and stand conditions with regards to competition. However, less is known about the effect of light availability and tree height on S value, especially in a tropical rainforest context. To overcome this gap, we collected wood and leaf samples on ten individuals of *Pericopsis elata* (Harms) Meeuwen, a tropical long-lived heliophilous species. All leaves from the selected trees have been removed and counted, and a sample of 50 leaflets has been collected on each branches of diameter more than 2 cm. In addition, wood discs have been collected from the base of each branch where leaflets have been sampled, and at different locations (1 m distance from each other) from the trunk. The intraspecific variation and covariation of S with tree height, light availability and age will be assessed.

Keywords: *Pericopsis elata*, pipe model theory, biomass allocation, leaf-to-sapwood area ratio, water use efficiency, tropical forests, hemispherical photographs

¹ Shinozaki, K.; Yoda, K.; Hozumi, K.; Kira, T. (1964). A quantitative analysis of plant form - the pipe model theory : Further evidence of the theory and its application in forest ecology. *Japanese J. Ecol.*, 14, 133–139