



Spatial and Temporal Dynamics of the Leaf Area Index of the Caatinga Biome

Everton Alves Rodrigues Pinheiro (1), Quirijn de Jong van Lier (1), and Klaas Metselaar (2)

(1) Center for Nuclear Energy in Agriculture, University of São Paulo, Piracicaba (SP), Brazil (evertonvest@yahoo.com.br),

(2) Department of Environmental Sciences, Wageningen University, The Netherlands

Leaf Area Index (LAI) is an important characteristic of ecosystems with a prominent role in processes such as transpiration, photosynthesis and interception. The Caatinga biome is a unique semiarid ecosystem occurring in a specific region of Brazil. An important main feature of this biome is the leaf shedding and regenerative capacity of its species. The aim of this study was to quantify both spatial and temporal dynamics of the LAI of the Caatinga biome in the Aiuaba Experimental Basin, an integrally-preserved Caatinga reserve, coordinates 6°42' S; 40°17' W. The research site (12 km²) was divided into three main Soil and Vegetation Associations (SVA). For each SVA the soil type and root depth are respectively, Acrisol – 0.8 m, Luvisol – 0.6 m and Regosol – 0.4 m. The LAI was estimated by SEBAL algorithm applied to eleven satellite images from Landsat 5. The values of LAI estimated by SEBAL were correlated to the mean soil water content of the 15 days previous to the satellite image date. Eight images were used to generate a simple regression model, yielding a range of coefficient of determination from 0.89 to 0.92. Three other images were used to validate the equations. The Nash-Sutcliffe efficiency coefficient ranged from 0.76 to 0.94. Using the validated correlations, the LAI was calculated over the time for each of the three SVA, from 2004 to 2012. For SVA1, SVA2 and SVA3, the average values of LAI during the rainy season were 0.97, 1.12 and 1.07, respectively. During the dry season, the mean values were 0.15 for SVA1 and 0.11 for SVA2 and SVA3. The vegetation showed abrupt LAI changes, and the average previous 15 days soil water content was a good indicator for this. The study has shown that the maximum LAI was relatively stable over the years, occurring between March and April. The spatial behavior of LAI appeared to be similar, independently of the soil type and root depth.