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Land cover trajectory in the Caatinga biome: analysing trends, drivers and consequences with high resolution satellite time series in Paraiba, Brazil

Iana Rufino (2), John Cunha (1), Galvão Carlos (3), and Silva Nailson (4)

(2) Center for Natural Resources and Technology, Associate Professor, Federal University of Campina Grande, Campina Grande, Brazil (iana.alexandra@ufcg.edu.br), (1) Center for Sustainable Development of Semi-arid, Assistant Professor, PhD. Student of Natural Resources, Federal University of Campina Grande, Campina Grande, Brazil (john.e.cunha@gmail.com), (3) Center for Natural Resources and Technology, Associate Professor, Federal University of Campina Grande, Campina Grande, Brazil (carlos.o.galvao@gmail.com), (4) Center for Natural Resources and Technology, MSc. Student of Natural Resources, Federal University of Campina Grande, Campina Grande, Brazil (castronailson@gmail.com)

The Caatinga Biome is a unique Earth ecosystem with only 1% of conserved and protected areas (Oliveira et al, 2012). Human activities pressures high threaten Caatinga Biodiversity. Along the last decades, native green areas are changed by crops, livestock or those areas are reached by urban areas (Oliveira et al 2012; Fiaschi e Pianni, 2009; Sivakumar, 2007; Castelleti et al, 2004; Pereira et al, 2013; le Polain de Waroux & Lambin, 2012; Apgaua et al, 2013). Precipitation rates have high variability in space and time. High temperatures with small inter annual variability drives evapotranspiration up and turns the water scarcity the main challenge for sustainable life in rural areas. Sánchez-Azofeifa et al., (2005) try establishing research priorities for tropical dry forests and they recommend Scientific Community to focus on ecology and social aspects and possibilities of remote sensing techniques in those studies. Specific algorithms to produce estimates of energy balance and evapotranspiration of water to the atmosphere can process satellite images derived from several sensors. These estimates, combined with the analysis of historical time-series, allow the detection of changes in the terrestrial plant systems and can be used to discriminate the influences from human occupation and those from climate variability and/or change on energy fluxes and land cover. The algorithms have to be calibrated and validated using ground-based data. Thus, a large multiple source set of satellite and ground data has to be processed and comparatively analyzed. However, the high computational cost for image processing introduce further processing challenges. In order to face those challenges, this research explores the possibilities of using these medium resolution remote sensing products (30 meters), presenting a multitemporal long term analysis (24 months) to identify the land trajectory of one Semi-arid area (pilot) in the Caatinga biome. All processing steps use the statistical R package and GIS based tools in a automatic approach for the SEBAL (Bastiaanssen, 2000) and Fmask algorithms (Zhu e Woodcock, 2012). The main goal is to develop and provide an efficient remote sensing approach for a better understanding of “land cover trajectory” on an extremely vulnerable ecosystem driven by shifts on precipitation seasonality and extreme weather conditions.