Ramoelo A, Cho M. Mathieu R. Skidmore A.K, Scherf M, Heitkonig I, Prins H.H.T, Asner G. **2010**,
Hyperspectral remote sensing techniques for grass nutrient estimations in savannah ecosystems,

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Abstract

Information on the distribution of grass quality (nutrient concentration) is crucial in understanding rangeland vitality and facilitates effective management of wildlife and livestock. The spatial distribution of grass nutrient concentration occurs at various scales such as local, regional and global scale. Traditional field techniques to measure grass nutrient concentration have been reported to be laborious and time consuming. Remote sensing techniques provide opportunity to map grass nutrient contents at various scales. An unprecedented challenge in grass nutrient estimation in savannas is that these areas are characterised by heterogeneity in soil and plant moisture (greenness), soil nutrients, grazing pressures, temperature and human activities. The aim of this study is to explore the following questions. (1) Which *in-situ* variables are important in modelling ecosystem state (nutrients concentration)? (2) How *in-situ* variables and remote sensing data can be used to develop a robust model to predict nutrient concentration? The study area consists of a land use gradient ranging from the Kruger National Park (KNP, Tshokwane area. Private Game Reserves (Sabie Sabie and Mala Mala) to Communal land (Bushbuckridge area). The data used include *in-situ* measured grass nutrient concentrations (N, P, K, Na, Ca, N:K, Mg, Zn, Cu, B, Mn), geology and soil types, rainfall, temperature and land-use as well as analytical spectral device (ASD) field-measured hyperspectral remote sensing data sets collected in March 2009. The ASD field data were re-sampled to Carnegie Airborne Observatory (CAO) hyperspectral image data using CAO spectral response function. Statistical techniques were used to integrate in-situ variables with remote sensing to predict nutrient concentrations at field and synthetic CAO hyperspectral data. Several environmental variables contributed to the good performance of the grass biochemical models. Improved results were acquired when integrating environmental and remote sensing variables to estimate grass biochemicals, e.g. N.