Active Sensor Readings for Assessing Sugarcane Crop Canopy Chlorophyll Status

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Sugarcane (*Saccharum spp.*) is an important source of Brazilian ethanol bio-fuel. More than 50% of automobiles manufactured in Brazil are flexible fuel vehicles, capable of using fuel mixtures up to100% ethanol or gasoline. Thus, there is increasing need to increase sugarcane yields for ethanol production. Increased demand for crop production raises environmental concerns including: mismanagement of nitrogen (N) fertilizer and nitrate leaching into ground water. Remote sensing technologies are being applied to sugarcane crops to identify variety and estimate yield. The potential to apply canopy reflectance information, as a means to assess nitrogen (N) content for assisting in crop management decisions, has not yet been fully explored. In-season, real time N application has been proposed in corn (Zea mays L.) instead of pre-season N application, in order to reduce N loss to the environment and increase plant nitrogen use efficiency. The objective of this work was to explore the use of active sensor readings of sugarcane crop canopy as a means for managing in-season N applications. The active sensor we evaluated is the model ACS-210 Crop Circle made by Holland Scientific. It generates its own source of modulated light (pulsed at ~40,000 Hz) in two wavebands (visible (590nm +/-5.5nm) and NIR (880nm +/-10nm)) and then measures the percent of source light reflected back from the crop canopy. A field experiment was conducted in 2005 using 5 N fertilizer rates and 5 potassium fertilizer rates with four repetitions. Active sensor readings were collected on several growth stages and converted into the NDVI = (NIR - Vis) / (NIR + Vis). There were no differences in sensor-determined NDVI values for potassium treatments. However, NDVI values increased with increasing rates of N fertilizer applied on all measurement dates, suggesting that it is possible to remotely assess and identify crop canopy N status. Future possibilities for N management with this sensor in sugarcane will be discussed.