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Description and Performance of a Crop Canopy Reflectance Sensor for Nitrogen Management in corn and forage.

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Crop canopy sensors that measures reflectance at 550, 632, 600, 680 and 800 nm were used to assess chlorophyll status in corn (Zea mays, L.) and in brachiaria grass (Brachiaria brizantha, cv - Marandú). The sensors are interfaced with a differential global positioning system (DGPS) to facilitate the generation of field reflectance maps. Downward looking sensors for each waveband were normalized to a conpanion upward looking sensor to compensate for changing light conditions. A white reference panel was used during the normalization procedure. Experimental data were collected during 2000/01 crop seasons from small plot research at the MSEA site near Shelton, NE, and in Sete Lagoas and São Carlos, Brazil. Experiments for corn in the USA included 5 N rates (0, 50, 100, 150 kg/ha and as needed defined by chlorophyll readings) and in Brazil (0, 20, 40, 60 and 80 kg/ha). For brachiaria grass in Brazil, the study consisted of two sources of N fertilizer as ammonium nitrate and urea at (0,50,100 and 200 kg/ha). Results show that the 550 nm wave band was the most sensitive to assess variations in leaf chlorophyll content (assumed to be N status induced by varying levels of N application) and that variation in the sensor readings are highly correlated with ground-based chlorophyll meter readings for both corn or brachiaria. In the USA, the sensor was mounted on a high-clearance applicator for geo-referenced-on-the-go measurements in an irrigated corn-field. The mapping capabilities of the sensors indicate the potential for them to detect N stresses and subsequently direct localized application of variable rate N fertilizer. Ideally, the amount of N applied would depend on: the crop growth stage,

mineralization potential of soil, yield goal, etc. The maps of crop reflectance show the versatility of the sensor for detecting anomalies in biomass production and ground cover. The appropriate wave bands and normalized vegetation index are selected. The sensor is robust in its operation and provides a number of data collection options. can be used under cloud conditions. However, significant efforts are still needed to deal with the soil background reflectance under incomplete ground cover situations and to determine the appropriate algorithms to translate sensor output into meaningful management options.

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