

WEEKLY NDVI RELATIONSHIPS TO HEIGHT, NODES AND PRODUCTIVITY INDEX FOR LOW, MEDIUM, AND HIGH COTTON PRODUCTIVITY ZONES

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Abstract

Airborne multispectral imaging systems can provide fast data gathering over large areas and have the capability of collecting image data in very narrow and contiguous spectral bands through the visible, near infrared and mid-infrared regions of the electromagnetic spectrum with high spatial resolution. These data sets can be used either to monitor temporal changes in crops, for detecting abnormalities in the field, or to map production field vigor/productivity zones for use in Variable Rate crop application systems.

The purpose of this work was the study of the relationships between NDVI (Normalized Vegetation Index) obtained by the use of the GreenSeeker® ground-based imaging system and cotton plant physical measurements in four cotton fields managed by conventional crop production practices. This work further compares GreenSeeker® NDVI data to that obtained from Aircraft based multispectral image systems.

Each field was classed into three productivity zones called low (L), medium (M), and high (H) zones. Classing was based on previously obtained multispectral aircraft imagery with productivity zones based on NDVI values using an unsupervised classification procedure. SSToolbox® software was used as the Geographical Information System (GIS) for this study. Four fields were selected for replications. Image data from Greenseeker® and field physical measurements were collected weekly from first-square through crop termination. Field data was collected each week for cotton Height (HT), Total Nodes, Elongation of 4th Internode (EL) with final plant maps collected after defoliation but prior to harvest using standard total plant map methodology. Final plant map data collected at each field sample point included: Stand Count, First Position Retention, Height, Total Nodes and Total Bolls.

Greenseeker® NDVI values agreed with the ground truth physical field data when compared on a weekly basis. There were no significant differences between zones for NDVI, HT, EL, and Node values in the early weeks. The values of NDVI, HT, and Nodes were significantly different for all zones the last two weeks prior to defoliation or NAWF 850, while EL values showed no difference. Low, Medium and High NDVI values were associated with the equivalent Low, Medium and High physical plant measurements obtained from the mapped Low, Medium and High productivity zones.

When compared over a three year period, zones were stable with 81% of the total 1 meter by 1 meter pixels correctly mapped, for zone, in each of the years 2001, 2002, and 2003 based on a 2001 aircraft image. When these zone values were compared to GreenSeeker® NDVI mapped zones, these data sets were not different.

GreenSeeker® accurately represented the zones as identified by historical and same year aircraft image data.

Weekly GreenSeeker® NDVI data agreed with weekly physical ground truth plant measurements.

GreenSeeker® ground based imaging systems should have utility as a key component in an image based variable rate crop production system. GreenSeeker® can be used in conjunction with or as a replacement for aircraft platform multispectral imagery in many applications.