EVALUATION OF TILLAGE PRACTICES IN COTTON USING MULTI-TEMPORAL UAS VEGETATION INDEX DATA

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Abstract

Recently, Unmanned Aerial System (UAS) platforms with sensors covering the red-edge and near-infrared bands have been developed for agriculture research. Therefore, vegetation indices (VIs) originally developed for traditional remote sensing have become applicable to UAS. Conservation tillage systems have been known to improve soil structure and water infiltration, which can increase yield and farm sustainability over time. However, repeated tillage continues to be a common practice among farmers and quantitative comparison between conventional tillage (CT) and no-till (NT) fields is often inconsistent. In this study, we used multi-temporal high-resolution temporal UAS data for the quantitative analysis of tillage effects on cotton growth and yield. Data was acquired ten times by two different RGB and NIR UAS platforms, DJI Phantom 4 Pro and DJI Matrice 100 with SlantRange 3p. Ground reflectance panels and an ambient illumination sensor were used for radiometric calibration in RGB and NIR orthomosaic images, respectively. Based on the derived reflectance values, RGB- and NIR-based vegetation indices were calculated for the comparison between CT and NT treatments. The results showed that distinct differences in vegetation index values exist between tillage treatments during the growth period. NT fields consistently displayed higher vegetation index values and cotton lint yields.