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## Continuous Monitoring of Visible and Near-Infrared Band Reflectance from a Rice Paddy for Determining Nitrogen Uptake Using Digital Cameras

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**Abstract:** A two-band digital imaging system—one band for the visible red band (RED, 630–670 nm) and the other for the near infrared band (NIR, 820–900 nm)—was devised and positioned at a height of 12 m above a rice field of 300 m<sup>2</sup> in area during the 2007 growing season. The imaging system automatically logged bird's-eye view images at 10-min intervals from 0800–1600 every day. Radiometric corrections for the pairs of two-band images were done using solar irradiance sensors and preceding calibrations to calculate daily band-reflectance and the normalized difference vegetation index (NDVI) values for 9 plots of rice plants, with 3 levels of planting density and basal fertilization. The daily-averaged reflectance values in the RED and the NIR bands showed different but smooth seasonal changing patterns according to the growth of plants. At the maximum tiller number and the panicle formation stages, the RED and NIR reflectance values had correlation coefficients (*r*) of 0.79 and 0.81 with above-ground nitrogen absorption per unit land area (NA, g m<sup>-2</sup>), respectively, whereas the NDVI using the two band reflectance values showed *r*-value of -0.13. An empirically derived equation for the NA using two band reflectance values showed *r*-value of 0.96 and a root mean square of error (RMSE) 0.5 g m<sup>-2</sup> (10% of the mean observed NA) in the estimation for the original (not validated) data

set acquired at the maximum tiller number and the panicle formation stages. The results indicated that reflectance observation in the RED and NIR bands using the digital imaging system was potentially effective for assessing rice growth.

**Keywords:** [Digital camera](#), [Near-infrared](#), [Nitrogen absorption](#), [Red](#), [Reflectance](#), [Rice](#), [SPAD](#)

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