

Sensors 4: Introduction to spectral reflectance – Active sensors

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Pedro Andrade and John Heun

- I. Introduction
 - A. Early developments
 - 1. Beck and Vyse 1995 patent
 - 2. Oklahoma State early contributions
 - B. Applications of active-spectral reflectance in precision agriculture
 - 1. Weed detection
 - 2. Corn and small grains fertility management (w/ GPS)
 - 3. Cotton growth and defoliation management (w/ GPS)

- II. Principles of operation
 - A. Light absorption by vegetation
 - 1. Visible and near Infrared portions of electromagnetic spectrum
 - B. Optics of active sensors
 - 1. Light source (polychromatic LEDs)
 - 2. Light modulation
 - 3. Multi-channel photo-detectors

- III. Field deployment
 - A. Practical implications of inverse-square Law of light
 - 1. Effect of distance from target
 - 2. Sensitivity of reflectance indices
 - B. Sensor field performance
 - 1. Sensor body temperature
 - 2. Canopy architecture

- IV. Instrumentation
 - A. Commercially available systems
 - B. Data logger and GPS interface
 - C. Serial signal output

1. RS-485 network for multiple Cropcircle sensors
2. In-door demonstration:
 - a) Use of CropCircle ACS-430 with RS-232 serial output
 - b) Use of hand-held Trimble NDVI sensor

References

Holland, K.H., Lamb, D.W., and Schepers, J.S., 2012. Radiometry of proximal active optical sensors (AOS) for agricultural sensing. IEEE journal of selected topics in applied earth observations and remote sensing, Vol. 5, NO. 6, 1793 – 1802.

Kipp, S., Mistele, B. and Schmidhalter, U., 2014. The performance of active spectral reflectance sensors as influenced by measuring distance, device temperature and light intensity. Computers and electronics in agriculture. Vol. 100, 24–33

Emily Rutto, E., and Arnall D. B. The History of the GreenSeeker™ Sensor. Oklahoma Cooperative Extension Fact Sheet PSS-2260. Oklahoma State University

On-line resources

Contact vendors for information on options, pricing and technical support:

Greenseeker (Trimble): <http://www.trimble.com/Agriculture/greenseeker.aspx>

CropCircle (Holland Scientific): <http://hollandscientific.com/>

Yara N-sensor ALS (agrimon): <http://www.agrimon.de/en/products/sensors-agronom>