

## Vegetation Indices Available in the GreenSeeker® Sensor

There are several vegetation indices defined, evolving from more than thirty years of research in remote sensing and aerial imaging. In precision agriculture applications, two of the most commonly used indices are the Ratio and the Normalized Difference (NDVI), each comparing the relative reflectance of plant material and soils at two wavelengths. Additional modifications of the indices have been developed to compensate for various conditions of the plant canopy and background soil.

Five indices are available from the NTech Industries GreenSeeker® Sensors. The sensor always outputs NDVI, plus an additional index (default is IRVI), which makes it possible to *compare indices on the same data at the same time*. This can be changed by connecting the sensor directly to a computer. Once selected, the output options are stored in the sensor, and remain in effect until explicitly changed.

NDVI	Normalized Difference Vegetation Index
SA-NDVI	Soil Adjusted
WDR-NDVI	Wide Dynamic Range
RVI	Ratio
IRVI	Inverse Ratio

## Index Equations

The wavelength bands are in the visible and infra-red (NIR) regions of the spectrum. Sensors output at ~660nm (Red) and ~770nm (NIR). Half-power bandwidths are approximately 25nm.

$ndvi = \frac{r_{NIR} - r_{VIS}}{r_{NIR} + r_{VIS}}$	Normalized Differential Vegetation Index
$sandsvi = \left( \frac{r_{NIR} - r_{VIS}}{r_{NIR} + r_{VIS} + L} \right) (1 + L)$	Soil-Adjusted NDVI
$wdrndvi = \frac{ar_{NIR} - r_{VIS}}{ar_{NIR} + r_{VIS}}$	Wide Dynamic Range NDVI
$rvi = \frac{r_{NIR}}{r_{VIS}}$	Ratio (NIR/RED)
$irvi = \frac{r_{VIS}}{r_{NIR}}$	Inverse Ratio (RED/NIR)

The 'a' and 'L' values for the SA and WDR indices, respectively, are entered and stored in the Sensor. SA-NDVI reverts to NDVI if L = 0, and WDR-NDVI reverts to NDVI if a = 1. Typical value for a is 0.1; typical value for L is 0.5.

## References

University of Sheffield Remote Sensing: GEO6370 Vegetation Indices  
<http://www.shef.ac.uk/~bryant/6370/veg/vegsoil.htm>

U.S. Water Conservation Laboratory: How a Vegetation Index Works  
<http://www.uswcl.ars.ag.gov/epd/remsen/Vi/Vlworks.htm>

Mark Servilla: The First Steps to Understanding Agriculture Remote Sensing  
<http://www.eomonline.com/modernagsite/archives/Servilla.html>

USGS: Wide Dynamic Range VI application  
<http://www.gap.uidaho.edu/Bulletins/12/The Wide Dynamic Range Vegetation Index.htm>

BGR: A Comparison of Slope-Based Vegetation Indices for Agricultural Applications  
<http://www.biogeorecon.com/vegindcs.htm>