

In-crop sensing

In-crop applications of nutrients, particularly urea are becoming widely accepted as a more productive and profitable option. Traditionally, such applications have been determined by pre-seeding soil tests. However, SPAA and several growers have been experimenting with systems that help determine in

crop nutrient requirements based on crop reflectance.

This year, Sam Trengove, Allan Mayfield Consulting, has been running trials using and/or comparing three different sensor systems: the N-Sensor, GreenSeeker and Crop Circle. Sam has compiled

the following information as a summary of the attributes of each of these systems. These help set the scene for the three reports from growers on their experience with in-crop sensing as a basis for nutrient decisions. In future issues results from Sam's research will be presented.

Attribute	N-Sensor	GreenSeeker	Crop Circle
Height to canopy	Height of tractor cab roof	0.8-1.2m	0.25-2.2m (optimal 0.5-1m)
Field of view	Approx 50m ² (changes with sensor height)	Width = 0.6m (does not change with sensor height)	Width (m) = 0.57 x height
Frequency of measurement (Hz = readings per second)	1Hz	Configured between 0.33 to 50Hz	Configured between 1 to 20Hz
Light source	Old model – no New model (ALS 2005) – yes (Xenon flash lamp)	Yes (Light emitting diodes)	Yes (Polysource™)
Wavebands emitted from light source	Not specified	Red (660nm) and NIR (770nm)	Red (650nm) and NIR (880nm) or Amber (590nm) and NIR (880nm)
Outputs	Applied N rate varying according to indicative crop N status. Also records a biomass index	N rate based on N-rich strip. Also outputs vegetative indices NDVI, SAVI, WDRVI, SRI and IRVI.	Vegetative indices NDVI, SRI, R _{NIR} , R _{VIS} , WDRVI
Mount	Tractor cab	Handheld, boom or vehicle	Handheld, boom or vehicle
Weight	15kg	800g	385g

Indices and equations

NDVI = Normalised Difference Vegetation Index = $(R_{NIR} - R_{Red}) / (R_{NIR} + R_{Red})$

WDRVI = Wide Dynamic Range Vegetation Index = $(R_{NIR} - R_{Red}) / (R_{NIR} + R_{Red})$

WDRVI reverts to NDVI if $a = 1$, a typical value for a is 0.1.

SRI = Simple Ratio Index = R_{NIR} / R_{Red}

IRVI = Inverse Ratio Vegetation Index = R_{Red} / R_{NIR}

SAVI = Soil Adjusted Vegetation Index = $((R_{NIR} - R_{Red}) / (R_{NIR} + R_{Red} + L)) * (1 + L)$

SAVI reverts to NDVI if $L = 0$, a typical value for L is 0.5.

R_{NIR} = Near Infrared band reflectance

R_{VIS} = Visible (red) band reflectance

Sensor model/package	Set-up	Variable rate control	Sensor interface/software	Approx price
N-Sensor	One sensor, cab mounted	Yes	N-Sensor terminal	\$29,500 (UK price)
N-Sensor ALS (active light source)	One sensor, cab mounted	Yes	N-Sensor terminal	\$51,700 (UK price)
GreenSeeker Handheld	One sensor, mounted on a handheld pole or vehicle mount	No, scouting and mapping only	Ntech Capture and RTMapper loaded onto a pocket PC	\$4,640 + \$670 for RTMapper software
GreenSeeker RT100	One sensor, tractor mounted	No, scouting and mapping only.	Ntech Capture and RTMapper, loaded onto a pocket PC	\$3,800 + \$670 for RTMapper software
GreenSeeker RT200	Six sensors, boom mounted	Yes	RTCommander	\$19,870
Crop Circle Handheld/ mapping	One sensor, mounted on a handheld pole or vehicle mounted	No, scouting and mapping only	GeoSCOUT GLS 400, or data captured using a laptop PC, PDA or other data acquisition devices	
Crop Circle Mapping/ VRA	Incorporates one to eight sensors, boom mounted	Yes	GeoSCOUT GLS 420	

The sensors with variable rate control capability are incompatible with some spreaders/controllers. Information on compatibility is available from the sensor manufacturers and dealers.

For more information

National Distributor

N-Sensor

None

http://fert.yara.co.uk/en/crop_fertilization/advice_tools_and_services/n_sensor/index.html

Greenseeker

Fairport

www.ntechindustries.com www.fairport.com.au/greenseeker/#3

Crop Circle

gps-Ag

www.hollandscientific.com www.gps-ag.com.au