Actively responding to the season

At the SPAA Forum, Jim Wilson suggested that the best strategy for mid-season N fertilizer was to apply it only to the responsive areas.

***Jim Wilson**, Soilessentials*

Active crop sensors allow crop scouting and real-time management of nitrogen and agrichemicals.

Until recently PA has been based around the use of historical data to manage soils and crops. This works well for the management of factors that change slowly over time but is not as useful for reacting to the season. Active sensors, such as CropCircle™, Yara N-Sensor® and GreenSeeker®, are able to identify variation in characteristics of a growing crop.

Active crop sensors use an inbuilt light source to illuminate the crop and measure the crop's reflectance in several specific wavelengths. While the human eye is a crucial active crop sensor, it cannot see the infrared wavelength. The sensors currently on the market measure the reflectance of red light and the infrared spectrum by the plant.

Plants use most of the blue and red light for photosynthesis, while most of the green light is reflected; that is why we see plants as green. Virtually no infrared wavelengths are used for photosynthesis, so they are also reflected. Therefore, a stressed plant has a lower reflectance of red and infrared light (Figure 1). It is these differences that the active sensors are able to quantify.

Reflectance of the infrared wavelengths has been found to be closely related to crop biomass, while the red reflectance is connected with the level of chlorophyll, which the sensors can detect changes in before they are seen with the human eye.

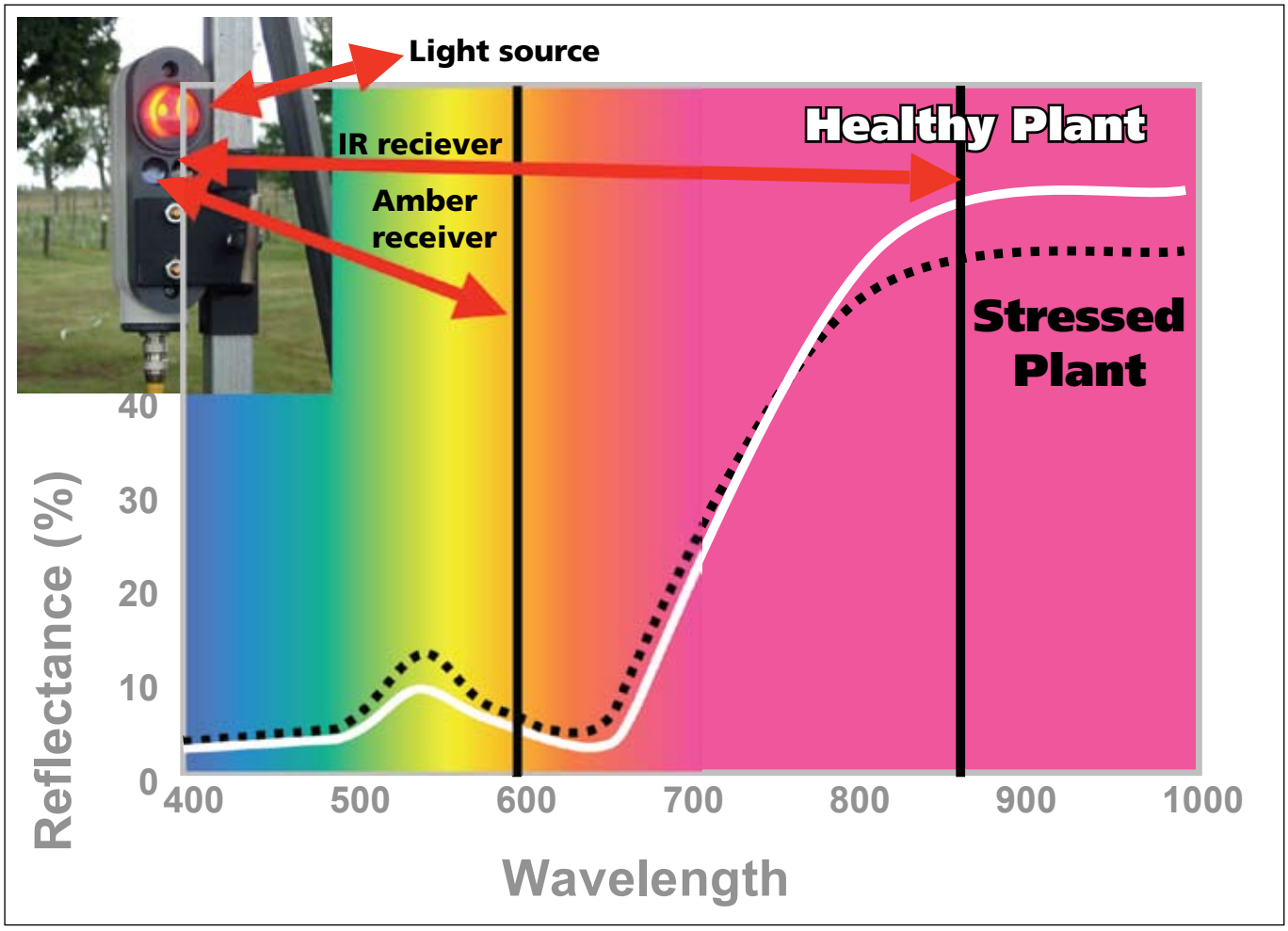
Different weather patterns cause crops to grow and respond differently to inputs on different soil types. In-crop management needs to respond to these differences if the objective is to generate a more even return across the whole paddock. Active sensors provide the ideal tool to identify these differences.

Having its own light source means that an active sensor can be used in all light conditions and the readings are more stable as the light conditions are the same for every scan. This makes imagery from sensors more replicable or useful for measuring changes over a period of time. The reflectance recorded in

Biography

Jim Wilson was a keynote speaker at the SPAA Crop Scanning Forum and joined several of the PA Group Crop walks in August. He is a cereal and potato grower from Scotland. Jim has gained broad experience using in-crop scanning and satellite imagery in his own crops and those of farmers for which his business, Soilessentials, provides agronomic services based on PA technology. Soilessentials is also an agent for the sensing technology CropCircle™ and for Mojo RTK.

Figure 1. The changes in crop reflectance between a healthy and stressed plant. (Source Jim Schepers, USDA).



satellite images can be distorted by atmospheric conditions.

Scans can be carried out in real time, providing direct feedback to the controller to vary inputs such as nitrogen or growth regulators on-the-go. Alternatively the scan can be conducted during another operation, e.g. spraying, and the information assessed in the farm office where an application map is produced. This map is then used by the variable rate controller to modify input rates by location.

Both techniques allow growers to respond to crop variability introduced by current weather patterns. What an active scanner cannot do is predict the future or identify what is actually limiting crop growth. Therefore, the farmer and agronomist still need to make decisions on what treatment, if any, is appropriate and if all other limiting factors have been eliminated to determine nitrogen rates.

new roles are developing for active sensors

Currently the main job of an active sensor is to redistribute nitrogen to the locations in the paddock where it will be best used. New roles are developing for active sensors to identify where inputs such as herbicides, growth regulators or modified seeding rates are most required.

In the UK we have found the easiest way to improve nitrogen use efficiency, and consequently return, is to apply nitrogen only to responsive areas. The CropCircle™ calibrations are based on the Home Grown Cereals Authority's Wheat Growth Guide. Therefore, it provides a map of the amount of nitrogen in the crop at the time of scanning. In the UK there has been very good correlation between the CropCircle™ active sensor and the identification of the crops nitrogen status.

The results from applying this form of variable rate nitrogen management in the UK have recorded a yield increase of three percent, compared to uniform applications of nitrogen. This figure is inline with results from similar trials in South Australia.

Calibrations are currently being developed under Australian conditions for CropCirle™.

More information on active sensors can be found in Precision Ag News Volume 3 Issue 1.

For more information

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