Sugar Research Australia

Information Sheet

IS14018

Remote Sensing in Precision Agriculture

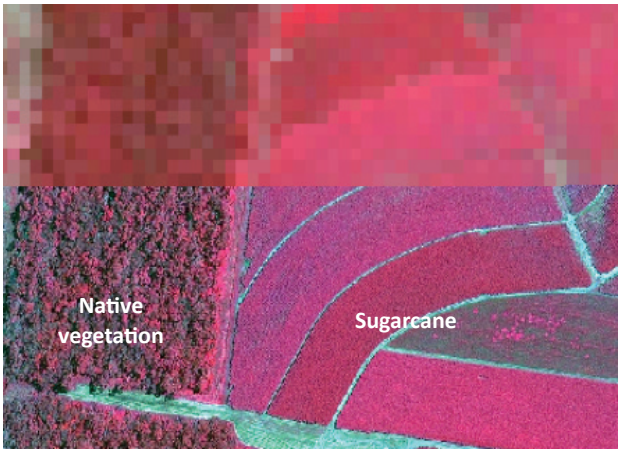
Sugarcane is a crop that becomes increasingly difficult to access in the field as it grows. Remote sensing (RS) is one way to obtain information about a paddock when field access is limited.

RS is the acquisition of information about an object without making physical contact with the object. In agriculture, RS generally refers to imagery obtained from satellites or aircraft, including unmanned aerial vehicles (UAVs).

There are many different sources of remotely-sensed imagery with varying resolutions (levels of detail) and swaths (area covered by an image).

RS can be used to obtain imagery that includes multiple spectrums of light, including those that are not visible to the human eye such as infra-red and near-infra-red (NIR).

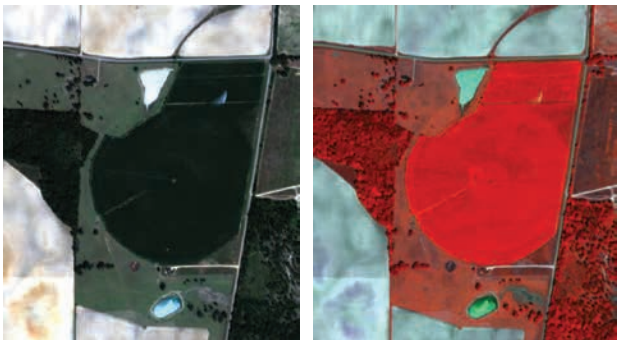
Multi-spectral imagery measures several light wavelengths at the same time.



Above: Satellite imagery showing low resolution (top, SPOT 10m) and high resolution (bottom, GeoEYE 0.5m) of a sugarcane farm (right) next to native vegetation (left).

The high-resolution imagery shows much more detail, however, low-resolution imager can be useful for certain tasks and is often cheaper.

Image courtesy of Andrew Robson, University of New England Precision Agriculture Research Group.



Above: Quickbird satellite images showing natural color on the left and color plus NIR on the right. NIR images can show variation in vegetation that is not visible to the human eye and is a good indicator of plant health.

Images courtesy of Troy Jensen, USQ-NCEA.

Agricultural Uses of RS

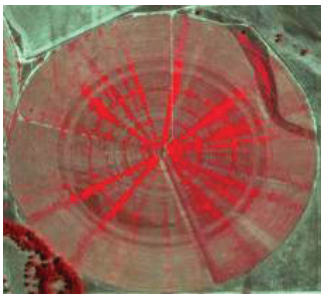
Remotely-sensed imagery has a variety of potential uses in sugarcane, including:

- estimating crop yields
- detecting diseases
- identifying pest and weed coverage
- evaluating uniformity of irrigation
- observing changes in plant growth over time
- assessing the impacts of severe weather events.

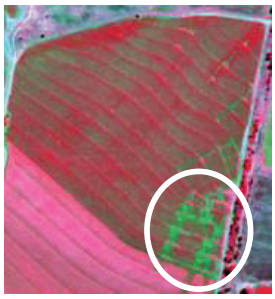
Issues within a field can often be identified remotely before they can be identified on the ground, especially when crop access is limited. To gain the most from remotely-sensed data, field validation of observations is important. In some cases images can be used to guide sampling of the crop or soil to measure characteristics of interest across a range of values.

Below are some examples of what imagery can show us about a cane crop:

Insect cane grub damage

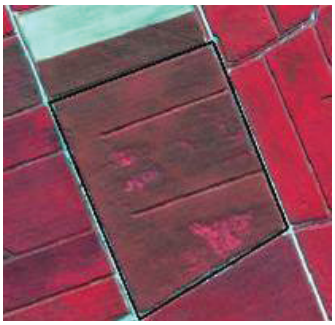


Poor irrigation



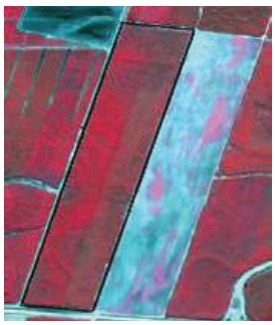
Erosion

Prior land use



Weeds: 5 per cent of crop

Lodging: 9.6 per cent of crop



Variety differences

Replicated trials

Image courtesy of Andrew Robson, University of New England Precision Agriculture Research Group.

RS Research in Sugarcane

Recent research has identified several opportunities for the use of RS as a sugarcane management tool and SRA has funded ongoing research to refine these tools. Current remote sensing projects seek to answer questions such as:

- How can we refine the use of satellite imagery for industry-wide yield forecasting?
- Can satellite imagery be used as a method for screening research and breeding trials?
- What remote sensing tools would work best to measure canopy nitrogen status?
- Can remote sensing be used to monitor the spread of Yellow Canopy Syndrome?
- How can remote sensing be used to implement an effective pest management strategy for cane grubs?

Researchers are also identifying the most cost-effective sources of imagery for different activities. Many image providers require minimum purchases that are larger than the size of a farm so it is advantageous for growers, millers, researchers and industry advisors to work together to obtain and share imagery. Once imagery is purchased and processed, it can be used for multiple purposes and provide benefits throughout the industry value chain.