



# Airborne and satellite remote sensing of grapevines for vineyard management. Does image resolution count ?

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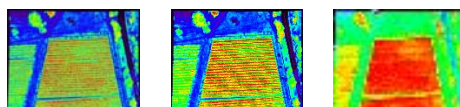
## False-colour



Resolution (Pixel size) = 20 cm

1 m

3 m



## NDVI

Images of 1.5 Ha Cabernet Sauvignon (single-wire trellising) CSU vineyard, Riverina, NSW showing the impact of image resolution on the detail of imagery. Note that when image resolution  $\approx$  vine-row spacing, a lot of the "noise" disappears.

## We ask...

If remote sensing of photosynthetically-active biomass (PAB) can be linked to variations in fruit quality, eg fruit maturity, TA, pH and total phenolics & colour in red winegrapes, **can low-spatial resolution imagery do the same job as high-spatial resolution imagery?**

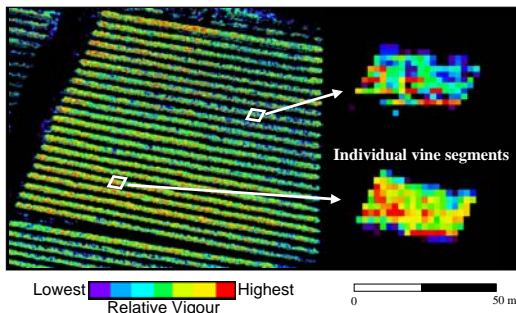


Low-cost airborne imaging systems such as UNEBird (pictured here) provide cm-resolution imagery and interchangeable spectral bands: currently NIR (770 nm), R (650 nm), G (550 nm), B (450 nm). Such data can be used to evaluate existing or planned satellite-borne systems.

## The issues...

High-resolution imagery offers

- Separation of vines from inter-row crop
- **But requires more complex algorithms to separate vine canopy from non-vine pixels**
- **Larger vineyards requires multiple images**



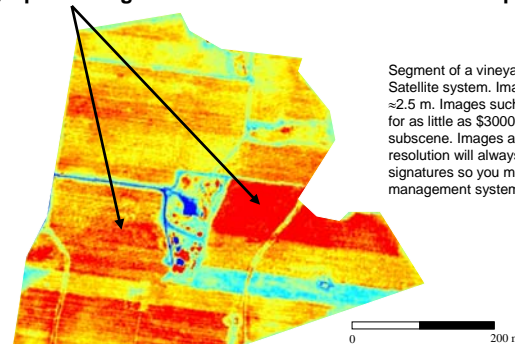
Centimetre-resolution imagery can be processed to remove non-vine information and characterize shape & size of canopies. Computer programs such as *VineCrawler* (Hall et al. 2003) can do this! Such processing tools will add cost to the end product.

Low resolution images offer

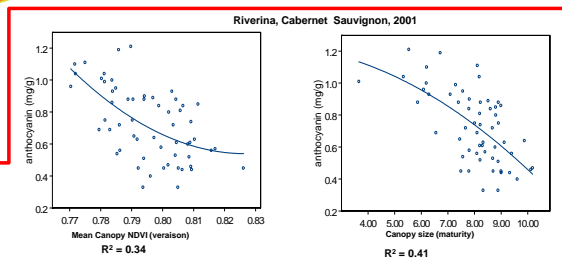
- Potential of greater coverage per single image
- Simpler processing (all pixels are mixed pixels)
- **BUT because mixed pixels contain vine and cover-crop spectral signatures, errors can be introduced**

**Evidence to date suggests canopy size can explain as much of the variance observed in remotely sensed images of grapevines as canopy density (Hall 2003). But this is vineyard-specific !**

## Symptoms of greater PAB- but is it vine or covercrop ?

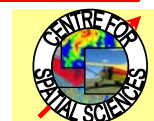


Segment of a vineyard imaged using the Quickbird Satellite system. Image format = NDVI, resolution  $\approx$  2.5 m. Images such as these can be purchased for as little as \$3000 for a single 8 km X 8 km subscene. Images at the vine row-spacing resolution will always mix vine and cover-crop signatures so you must select the right vine management system to suit this type of image.



References:  
 Hall, A., Louis, J. & Lamb, D.W. (2003). "Characterising and mapping vineyard canopy using high spatial resolution aerial multispectral images". *Computers & Geosciences*. 29 (7): 813-822.  
 Hall, A. (2003). "Defining grapevine and vineyard characteristics from high resolution remotely sensed optical imagery" PhD thesis, Charles Sturt University.

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