Variation in vineyard productivity and wine quality in a steeply sloping landscape

CSIRO

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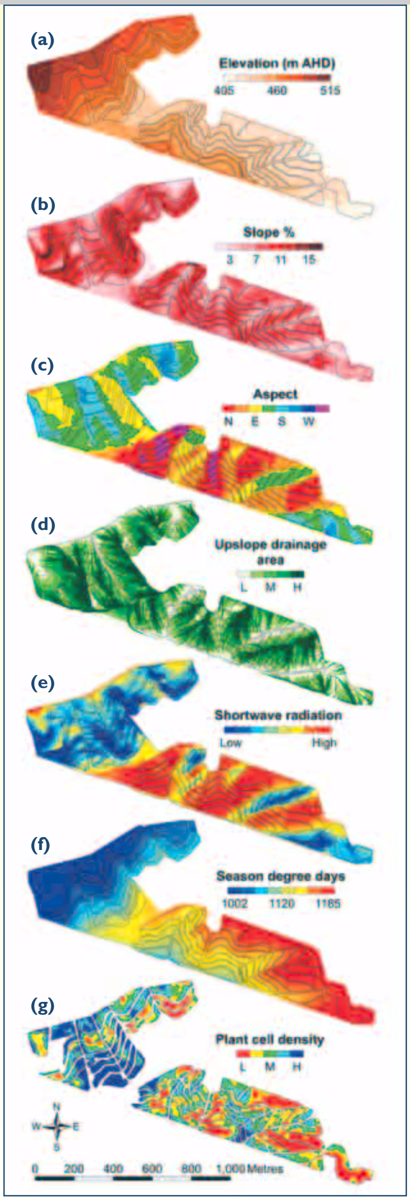

Figure 1. Variation in selected attributes of an Eden Valley vineyard.

BACKGROUND

Topographic variation, often associated with variation in soil properties, has been shown to be a key driver of variation in vineyard performance. However, most of the research which leads to this conclusion has been conducted in relatively flat landscapes (eg Coonawarra, Padthaway, Sunraysia). We were interested to assess the feasibility of adopting Precision Viticulture in steeply sloping landscapes, and to see whether in such landscapes, topography might be so dominant over other sources of variation that they can be ignored.

DATA COLLECTION AND ANALYSIS

This study was carried out at an Eden Valley vineyard planted to mixed varieties with a range in elevation of 109 m. A digital elevation model of the site (Figure 1a) was used as the basis for generating a number of topographic indices (eg Figures 1b-d) and for examining variation in solar radiation (Figure 1e) and temperature (Figure 1f). Remotely sensed imagery (Figure 1g), yield mapping and sampling of target vines (2004-2006) were used to measure vineyard performance. *k*-means clustering of interpolated map data suggests that aspect controls potential photosynthesis (irradiation), and through interactions with slope and position in the landscape, controls temperature.

Figure 2 shows that in a 12 ha section planted to Riesling, low yields were generally associated with lower temperatures and lower upslope area, a surrogate for soil water availability. In spite of these findings, we were unable to conclude that topography dominates other data layers (eg soil properties) as correlations between topographic attributes and indices of vineyard performance were generally weak. Thus, other information may also be useful in supporting the implementation of targeted vineyard management.

Chemical analysis of juice, and sensory analysis of wines supports the current strategy of harvesting this block in different parcels destined for different products at different price points. However, spatial analysis of fruit quality indices has identified an opportunity to improve the parcelling of fruit to ensure that each harvested parcel is appropriate to its intended commercial end-use (Figure 3).

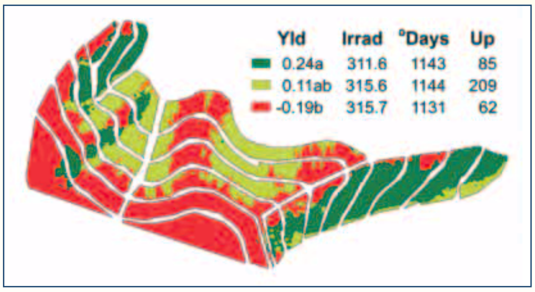

Figure 2. Results of *k*-means clustering of mean yield (2004-2006; Yld), January irradiance (Irrad), season degree days (°Days) and upslope drainage area (Up). Yield data have been normalised (mean = 0).

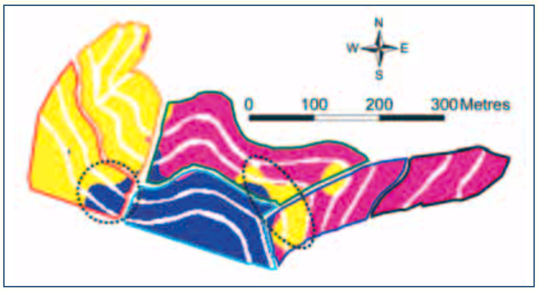

Figure 3. Results of *k*-means clustering of baumé, TA and total phenolics at vintage (2004-2006), boundaries delineating the existing commercially harvested parcels and areas (dotted lines) where modification of these may be warranted.

CONCLUSION

A Precision Viticulture approach to wine production is just as appropriate for this steeply sloping site as has been shown for other, flatter locations.

ACKNOWLEDGMENTS

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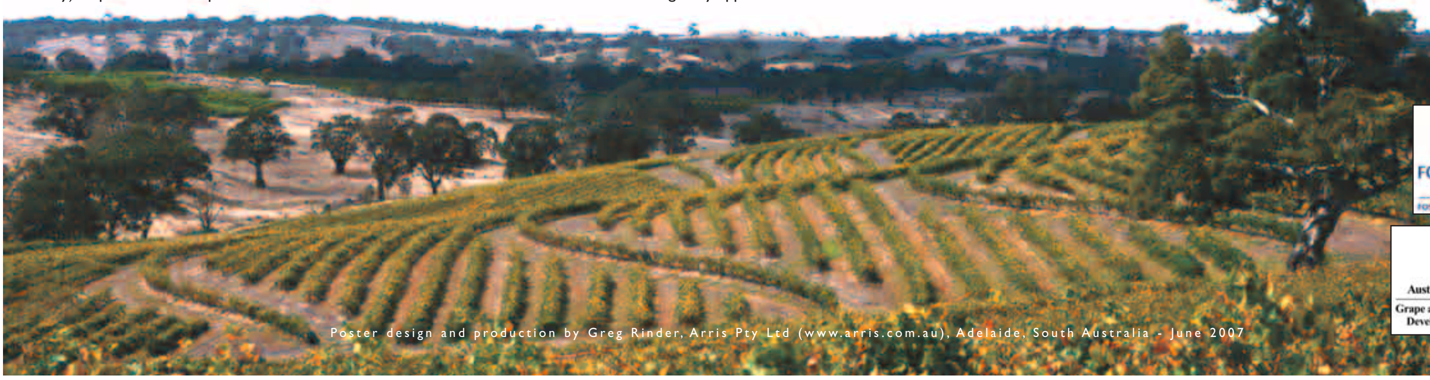

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