
PADDOCK AND REGIONAL SCALE YIELD PREDICTION OF CANE USING SATELLITE IMAGERY

By

ANDREW ROBSON¹, CHRIS ABBOTT¹,
DAVID LAMB², ROB BRAMLEY³

¹*Department of Employment Economic Development and Innovation, Kingaroy*

²*Precision Agriculture Research Group, University of New England, Armidale*

³*CSIRO Ecosystem Sciences, Adelaide*

THE PRE-HARVEST forecasting of regional cane production within any given season is of great importance to the Australian cane industry. If forecasts are inaccurate, marketers can incur significant financial penalties, with roll-on effects for mills and growers.

The use of remote sensing to predict yield is not a new concept, with progressive mills such as Mackay Sugar using SPOT satellite imagery for a number of years.

However, other regions are yet to implement this technology. Current research, funded by SRDC, has developed a preliminary algorithm for the Bundaberg region that has demonstrated accurate yield predictions for both large cropping regions and within individual crops.

The algorithm was developed from the correlation between NDVI (normalised difference vegetation index) values derived from a SPOT 5 image captured on 10 May 2010, with 2010 cane yields measured from whole blocks and from point source locations within individual crops ($R^2 = 0.61$; $n = 112$). These data included 12 varieties and 15 planting stages. To assess the robustness of the algorithm, it was applied to 2008 season imagery captured on the 31 March 2008. For 600 ha of cane, a yield of 39 707 tonnes of harvested cane or 66.5 tonnes cane per hectare (TCH) was predicted which was 3.8% under the actual delivered yield (41 255 t at 69 TCH).

The development of a subsequent algorithm using both 2008/2010 data ($R^2 = 0.6$; $n = 151$) did not improve the accuracy of the prediction, indicating that the relationship between yield and NDVI for the Bundaberg region may be consistent across seasons; this requires further validation using expanded datasets.

The production of potential yield maps prior to harvest is also of great benefit to cane growers. To test whether such maps could be developed from the regional yield prediction algorithm, the predicted yields of point source locations (area 200 m²) within two crops from the 2010 season were validated against measured hand cut samples.

When compared to a one to one relationship between actual and predicted yield, the predicted yields showed a tendency to over-predict in low yielding areas and under-predict in high yielding areas. Again, further refinement and validation of the algorithm in the 2011 season is expected improve the prediction accuracy.