Sugarcane yield monitoring update - CSE022

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A number of attempts have been made to monitor sugarcane yield variation within a block in Australia. These have ranged from the early yield monitoring systems based on discrete mass measurement, to the current focus of predicting yield via surrogate measurements based on chopper pressure, feed train roller displacement and elevator power. Recent work aimed at assessing commercially available sensors suggested that there were several areas in which there was room for improvement.

Rather than testing commercially available sensors, the work described in this article sought to evaluate the yield measurement concepts. These concepts included the pressure drop across the elevator and chopper motors, a load cell in the elevator floor and the angle of opening of the top feed roller. These concepts cover those being employed in the commercial units, both past and present.

Trials were conducted during the 2010 season in the Bundaberg region and in both the Bundaberg and Herbert regions in 2011. Campbell Scientific CR3000 dataloggers were used to read each of the sensors at 40 Hz and record the averaged value every second, along with GPS coordinates. In addition to this sensor data, sugarcane yield was also measured directly to determine the accuracy and resolution of the respective yield monitoring concepts. Yield was determined using two methods - mill (bin) weight data for individually consigned sub-blocks and weighed 50 m row samples.

The initial analysis of the data consisted of a visual comparison of the sensor derived yield maps (see Figure 1). The yield maps derived from chopper power, elevator power and the volumetric measurement (roller opening) had the greatest agreement, in absolute value, with the range of values being tighter for the loadcell-derived yield maps.

Rather than being overly concerned about absolute accuracy as displayed in Figure 1, the maps shown in Figure 2 have been displayed in high-medium-low to compare spatial structure. The high and low yielding areas can be seen to occur in the same locations on all maps and this is in agreement with the 50 m derived map. The main area of inconsistency in the maps occurs at the ends of the field. When the harvester leaves the field, there is a sequence of events that include the chopper being turned off when the elevator is still operating. The reverse of this is true when re-entering the field (ie. chopper on with elevator off).

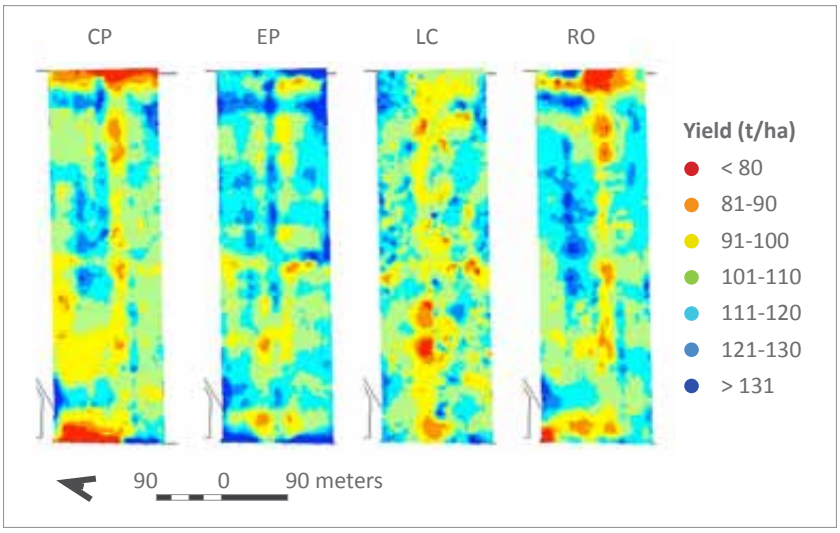

FIGURE 1 (RIGHT) | The yield maps for each of the monitoring concepts (CP-chopper power, EP-elevator power, LC-load cell, RO-roller opening).

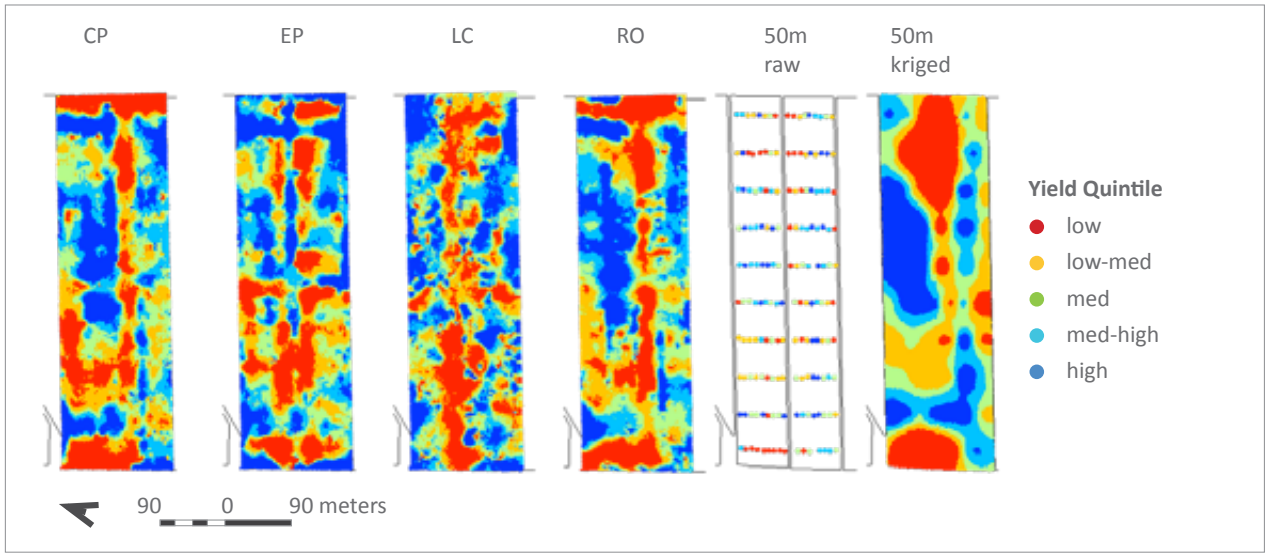

FIGURE 2 (BELOW) | The yield maps for each of the monitoring concepts shown in 20th percentiles (CP-chopper power, EP-elevator power, LC-load cell, RO-roller opening, 50 m-derived from the weigh bin data, with raw and kriged data being shown).

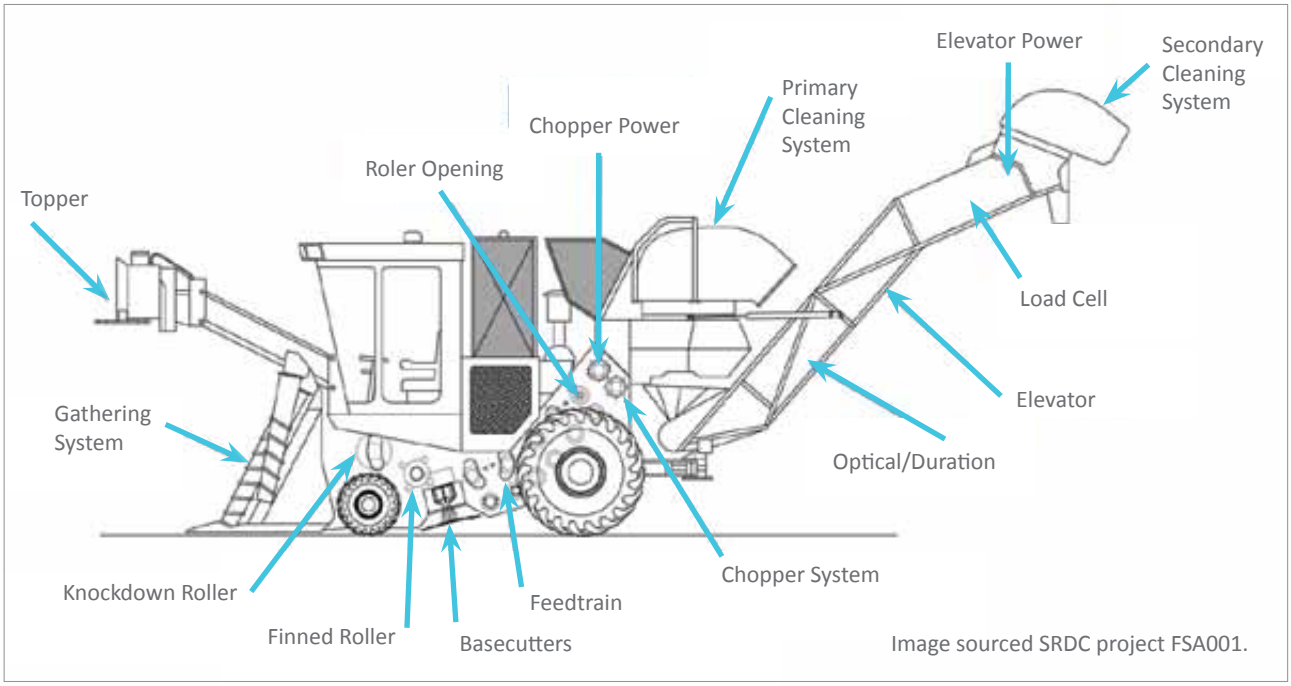

Image sourced SRDC project FSA001.

This sequence allows for the haulout to be positioned under the elevator. Hence, depending on the sensor being evaluated, there may be some inconsistencies at the ends of the field. For a more consistent analysis, the last 10 m of the field should be removed to overcome these anomalies. The results therefore give us confidence that there is considerable potential to develop these methods further in order to refine existing systems and/or to develop new ones.

The current work found that there were consistent similarities between all sensors tested in terms of the yield maps derived from them. Although the sensors were not identical to those used in commercial yield monitors, the sensing location and concepts were the same as in the commercial products tested previously. This suggests that how sensor information is sampled and recorded and the means by which the data is handled and manipulated post-harvest, may in fact have a greater bearing on the result than the choice of sensing concept. Of particular note here are issues associated with data cleaning and trimming and the calibration of sensor data to mill weights. Other issues have been identified (ie. presentation of crop to harvester, speed of operation, etc) that may also come into play and affect the accuracy of the various sensors. Under ideal conditions however, the relative difference in sensor performance may be due to how data is managed post harvest.

Further analysis of these results will include a statistical analysis of the sensor and 50 m plot data. This will provide an objective comparison between actual variability experienced in the field and the yield maps derived from the sensor outputs. This study was also repeated during the 2011 harvest (on the same block) so consistencies in the spatial structure of the yield data can be compared from one year to the next.

The authors acknowledge the funding provided by the Sugar Research and Development Corporation to enable the project CSE022 'A collaborative approach to Precision Agriculture RDE for the Australian Sugar Industry' to be undertaken, and the assistance provided by BSES staff in conducting the trials. The kind support (and tolerance) of the Hubert Family is also greatly appreciated.

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Congratulations Alison and Trevor

The 2012 Bundaberg Sugar Industry Productivity Achievement Awards where held on Friday, 18 February. This annual event recognises the outstanding achievements of local growers, millers and service providers.

Amongst the winners on the night were BSES Limited staff Trevor Willcox and Alison Findlay.

Trevor received the Contribution to Productivity Award, and Alison was presented with the Young Industry Achiever award.

Trevor commenced his employment with BSES in January 1970. He was District Productivity Coordinator at Bundaberg in the 1990s and returned as Area Development Manager in 2004 and is currently Extension Leader – South. Trevor said an award such as this means alot to him, as they show that the industry appreciates the productivity improvements that result from BSES extension.

Alison commenced her employment as a Technician with BSES in January 2007. Alison said she was honoured to receive the award, and hopes her work has contributed positively to the industry.

PICTURED | Trevor (above) and Alison (below) receiving their awards from Ray Hatt, General Manager of Bundaberg Walkers.