Recent developments in Sugarcane yield monitoring.

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Previous Yield Monitoring Efforts (90’s – 00’s)

Researchers:
Dave/Graeme Cox (1998)
also Pagnano, Molin, Menegatti, Benjamin etc..

Companies:
CNH
AgGuide
TechAgro etc
The importance of yield maps

- Growers are paid on yield (+ CCS)
- Allows us to assess/quantify the variability in other parameters
  - soil,
  - variety,
  - disease,
  - nutrition,
  - irrigation, etc....
- Allows on-farm experimentation
Tested commercially available
None did a very good job
Went back to base concepts
Yield monitoring concepts
Lessons learnt  2008-2009

Yield monitors suboptimal for PA

• TechAgro provided the best results.
  ➢ performance reduced at high and variable pour rates

• MT data not adequate as a yield monitor
  ➢ harvester tracking and management in current form

• AgGuide unit marginally better than the MT unit.
  ➢ does not adequately perform as a yield monitor.
  ➢ AgGuide no longer supported or available

Factors limiting performance

• High / variable pour rates;
• Variation in machine ground speed
• Tangled crops / uneven feeding
• Data recording, handling and manipulation
Current system
– retrofitted to 1998 Cameco and 1997 Austoft

- Campbells CR3000 logger
- DGPS
- Pressures+speed sensors on chopper and elevator
- Elevator floor load cell+speed
- Feed roller separation
- Fuel flow
- Installed optical sensor (Price)
- Modem sends 15 min packets of data to server
2010 Bundaberg, consistency in results if data handled correctly
Issues with current technologies

• How the data is handled can be the difference between good yield maps and ......., remember rubbish in, rubbish out!!

• If you value the data, get the consignment right!!
• Current equipment has to be retro-fitted
• Use expensive loggers……
• Promises - YM “on this seasons harvester” – has recently happened
• No use made of CANBUS
• Lots of other information that could be useful
Recent direction

Analyze data using standard procedures “yield monitoring protocol guidelines”

“Sugarcane yield monitoring: a protocol for yield map interpolation and key considerations in the collection of yield data” – 2013 ASSCT Bramley and Jensen

Yield monitoring protocol:
- Accurate consignment
- Analysed on Per harvest event basis
- DGPS
- Ground speed >0.75 m/s, elevator speed >1.5 m/s
- 3 secs data deleted either side of a stoppage
- Data diluted to 3 sec accuracy
Consignment done quite well / Good calibration – a Burdekin example (26.8 ha)
Consignment done poorly / unsatisfactory calibration – a Herbert example (26.6 ha)
Current Direction

Development of data handling tool/app

“A methodology to assess the accuracy and reliability of yield monitor data” – 2016 ISSCT Jensen, Gobbett, Bramley and Garmendia

Steps for the tool/app;
• aggregating 15 min data packets,
• clipping to block boundaries,
• identifying individual harvest events,
• aligning with mill records,
• predicting yield and applying the filtering protocol
• kriging the data ready from yield map generation
Sugar - A robust mapping protocol is essential for data overlay and the delineation of management zones.
Future Direction

- Other analysis methods - denoising
- Desire to use CANbus.
- All sensors are there, so already a virtual yield monitor.
- Make use of in cab display,
- Already got GPS and data logging capabilities
- Enable real-time display of harvest path/yield.....
- Make life much easier, use existing sensor rather than retro-fitting....
- Capabilities of JDlink / My JD.....
- ........
- Evaluate our existing methods vs recently release YM
**Other work**

**Background**
- Hazard Analysis and Critical Control Point steps:
  1. Production process flow diagram
  2. Identify potential problems
  3. Identify key stages for monitoring
  4. Establish limits
  5. Monitoring
  6. Corrective measures
  7. Keep documentation

**Framework**
- Susceptibility
- Erosion
- Soil moisture
- Nitrogen
- Crop growth
- Tillage
- Side slopes
- Contouring
- Equipment uses
- Field K7 - Tillage Total

**Additional Notes**
- LCN Code: 0058
- Soil types: Medium to heavy clay loam
- Crop rotation
- Weed management
- Pest management
- Soil fertility
- Crop yields
- Economic analysis
- Environmental impacts