Accuracy of Round Module Harvester Handlers and Minimizing Plastic Contamination

Wesley Porter, Ed Barnes, Seth Byrd, Guy Collins, Jeremy Kichler, Randy Norton, Brian Pieralisi, Jared Whitaker

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Current Situation

• Cotton Modules are currently weighed in the field using large truck style scales to weigh the round bales from the John Deere Cotton Pickers.

• However, JD 7760 (CP/CS) and CP/CS 690’s have the option to add an on-board module weighing system.
Question

• Can the on-board module weighing system be utilized to weigh trial data eliminating the need to have additional large flat scales present during harvest?

– The advantages of having this system are:
  • Simplicity
  • Elimination of scale maintenance and transportation
  • Shorten time and increase effectiveness of On-Farm trials
  • Reduce equipment requirements during harvest
Objectives

• The main objectives of this study were to:
  – Determine the reliability and accuracy of John Deere’s on-board module weighing system compared to traditional trial evaluation methods.
  – Evaluate the potential of the on-board system to be utilized for on-farm research trial evaluation.
2018-2019 Georgia Comparisons

- 2018 Colquitt County On-Farm Variety Trial (42)
- 2019 Colquitt County Fungicide Trial (9)
- All Data from 7 on farm trials (112 comparisons)
Results: 2018 Colquitt County OFT

JD On-board Scale (lbs) vs. UGA Platform Scale (lbs)

Regression line: $y = 0.9141x + 340.47$

$R^2 = 0.9353$
## Results: 2018 Colquitt County OFT

<table>
<thead>
<tr>
<th>Variety</th>
<th>UGA Platform Scale Weight</th>
<th>On-Board Picker Weight</th>
<th>Significance between PF Scale on JD On-Board System</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean Yield</td>
<td>Statistical Significance within Platform Scale Alpha = 0.10</td>
<td>Mean Yield</td>
</tr>
<tr>
<td>ST 5471 GLTP</td>
<td>2112 A</td>
<td></td>
<td>2246 A</td>
</tr>
<tr>
<td>DP 1538 B2XF</td>
<td>2082 A</td>
<td></td>
<td>2225 A</td>
</tr>
<tr>
<td>DP 1646 B2XF</td>
<td>2015 A</td>
<td></td>
<td>2213 A</td>
</tr>
<tr>
<td>DP 1840 B3XF</td>
<td>2012 A</td>
<td></td>
<td>2153 A</td>
</tr>
<tr>
<td>ST 5818 GLT</td>
<td>1983 A</td>
<td></td>
<td>2199 A</td>
</tr>
<tr>
<td>PHY 430 W3FE</td>
<td>1945 AB</td>
<td></td>
<td>2088 AB</td>
</tr>
<tr>
<td>CG 3885 B2XF</td>
<td>1930 AB</td>
<td></td>
<td>2085 AB</td>
</tr>
<tr>
<td>DP 1851 B3XF</td>
<td>1923 AB</td>
<td></td>
<td>2093 AB</td>
</tr>
<tr>
<td>PHY 480 W3FE</td>
<td>1888 AB</td>
<td></td>
<td>2067 AB</td>
</tr>
<tr>
<td>ST 6182 GLT</td>
<td>1842 AB</td>
<td></td>
<td>2015 AB</td>
</tr>
<tr>
<td>NG 5711 B3XF</td>
<td>1838 AB</td>
<td></td>
<td>2035 AB</td>
</tr>
<tr>
<td>NG 5007 B2XF</td>
<td>1837 AB</td>
<td></td>
<td>2038 AB</td>
</tr>
<tr>
<td>DG 3605 B2XF</td>
<td>1833 AB</td>
<td></td>
<td>2069 AB</td>
</tr>
<tr>
<td>PHY 440 W3FE</td>
<td>1682 B</td>
<td></td>
<td>1850 B</td>
</tr>
</tbody>
</table>
Results: 2019 Colquitt County Fungicide

\[ y = 1.1562x - 277.07 \]

\[ R^2 = 0.9597 \]
## Results: 2019 Colquitt County Fungicide

<table>
<thead>
<tr>
<th>Treatment</th>
<th>UGA Platform Scale Weight</th>
<th>On-Board Picker Weight</th>
<th>Significance between PF Scale on JD On-Board System</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean Yield</td>
<td>Statistical Significance within Platform Scale</td>
<td>Mean Yield</td>
</tr>
<tr>
<td>Untreated</td>
<td>4937</td>
<td>A</td>
<td>5452</td>
</tr>
<tr>
<td>Priaxor</td>
<td>4942</td>
<td>A</td>
<td>5456</td>
</tr>
<tr>
<td>Miravus</td>
<td>4930</td>
<td>A</td>
<td>5397</td>
</tr>
</tbody>
</table>
2018-2019 Georgia Data Pooled

Pooled Data

\[ y = 1.0991x - 48.775 \]

\[ R^2 = 0.9974 \]
2020 AZ, GA, MS, NC, OK, Pooled Data

Field Scale vs. Handler Weight

$y = 0.939x - 3.3243$

$R^2 = 0.9828$
Results: Multiple Sites

MS All Data

- \( y = 0.853x + 376.62 \)
  \( R^2 = 0.8609 \)
- \( y = 0.8594x + 325.4 \)
  \( R^2 = 0.9876 \)
- \( y = 0.9723x + 6.1812 \)
  \( R^2 = 0.9888 \)
- \( y = 0.8727x + 308.81 \)
  \( R^2 = 0.9345 \)
- \( y = 0.9901x - 216.81 \)
  \( R^2 = 0.9786 \)
- \( y = 0.8745x - 14.713 \)
  \( R^2 = 0.9162 \)
Results: Multiple Sites

OK All Data

\[ y = 0.8303x + 154.09 \]
\[ R^2 = 0.9568 \]

\[ y = 0.9142x + 62.297 \]
\[ R^2 = 0.9979 \]
Conclusions

• With over 415 different loads collected from multiple states, harvesters and harvester types (CP vs. CS) the John Deere On-Board weighing system had a strong correlation to a calibrated platform scale system ($R^2 = 0.97$).

• In one trials with replicated data, the On-board system was statistically similar to the platform scale in 9 of the 14 treatments.
  – Additionally the On-board system was able to accurately determine significant differences between treatments even if it’s weight predictions were not the same as the platform scale.
Conclusions

• Based on these observations the John Deere On-Board module weighing system can be used as a viable option for determining treatment differences for On-Farm trials.

• However, if the system has not been calibrated and the data require high accuracy, a field scale is suggested.

• The system accuracy can be increased via applying a calibration equation because it has a strong enough correlation to a calibrated platform scale that it can be utilized for accurate weight predictions.
Plastic Contamination

All Extraneous Matter for 2020 Crop

Bales with Ext

- Prep: 996
- Bark: 440,855
- Grass: 12,361
- Seedcoat: 1,050,430
- Oil: 161
- Spindle Twist: 387
- Other: 316
- Plastic: 3,403

(thru 01/21/2021)
Plastic Contamination

2018 Crop vs. 2019 Crop vs. 2020 Crop to date

Samples Called Plastic

- 2018: 3,035
- 2019: 4,913
- 2020: 3,403

Crop Size

- 2018: 17,812,931
- 2019: 19,380,847
- 2020: 13,628,348

(thru 01/21/21)
Plastic Contamination

2019 vs 2020 Crops - Plastic by Office

Bales

Dumas: 602 (2019), 332 (2020)
Memphis: 539 (2019), 430 (2020)
Lubbock: 613 (2019), 556 (2020)
Plastic Contamination

2020 Crop - Plastic Calls by Color

89.5% Attributed to Round Module Wrap

(thru 1/21/2021)
Issues with Plastic Contamination
Foreign Material
Feeder House at the Gin
Identifying Module Damage

Field → Gin Yard → Module Feeder

Jason Ward – NCSU; Bobby Hardin – Texas A&M; Lubbock Gin Lab
Identifying Module Damage

Field → Gin Yard → Module Feeder

Anticipated Outcome – Identification of sources of module damage followed with educational materials to prevent in future.

Jason Ward – NCSU; Bobby Hardin – Texas A&M; Lubbock Gin Lab
Placement and Field Handling of Modules

- Repair wrap tear prior to pickup
- Don’t attempt to slide modules with loader
- Lift the module 12 inches or more above the ground when transporting in the field
Staging Modules in the Field

- Stage only in well drained areas, such as turn-rows
- Space 4-8 inches apart to allow air circulation, drying and loading into module trucks (accounts for tipping angle)
- Align modules to facilitate loading
Transportation to Gin

- When Using Module Truck:
  - Modify bed chain with smooth lugs
  - Modify chain tail wheel lugs to smooth paddle style
  - Don’t run modules into truck headboard
  - Synchronize chain speed with ground speed
  - Operator training is essential
Opening Round Modules

Full-size modules only

No Cut Zone

Inner tail

White Label

Outer Seam

Preferred cut location

Safe Cutting Zone
Acknowledgements and Additional Resources

• We would like to acknowledge all (Las Cruces, Lubbock, Stoneville) of the USDA-ARS Gin Labs for the hard work they are doing to help the gin be able to better remove plastic if it does make it into the module feeder.

• For additional resources on how to reduce plastic contamination during the harvest, transport and ginning processes please go to the following sites:
  – https://www.cotton.org/tech/quality/contamfree.cfm
QUESTIONS?

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