Evaluating John Deere Cotton Picker Onboard Module Weighing System Accuracy for On-Farm Research Implementation

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(J. Kichler, W. Porter & J. Whitaker)
On-Farm Research is an excellent approach to gain knowledge on a product or practice in a real production environment.

Numerous on-farm research trials in cotton are implemented by university researchers, extension agents, and industry personnel every year.

Cotton yield is measured as an important response variable to evaluate the effect of different treatments (rate, variety, chemical etc.)
CURRENT PRACTICE

- Cotton pickers harvest cotton from each test strip (varying length) representing a treatment and build a round module (2000 – 5500 lbs)

- Cotton modules are weighed using large platform scales in the field. The process involves:
  - Transporting weighing scales to the field
  - Scale calibration before use to maintain measurement accuracy
  - Additional machinery (tractor with a front end loader) to move module
JOHN DEERE CP690

On-Board Round module weighing system:
- Comes standard on all CP690 cotton harvesters
- Provides round module weight for easier yield monitor calibration
- Ginners can utilize recorded module weights in their system

OBJECTIVES

1. Assess the accuracy of John Deere’s Onboard Module Weighing System in comparison to a calibrated platform scale

2. Evaluate the potential of the John Deere’s Onboard Module Weighing System for On-Farm Research Implementation
On-Farm Strip Trials:

- Colquitt County
  - Variety trial (2018 & 2019; replicated)
  - Fungicide trial (2019; replicated)

- Worth County
  - Variety trial (2019)

- Bulloch County
  - Variety trial (2019)

- Appling County
  - Variety trial (2019)
**DATA COLLECTION**

**Treatments:** Implemented in strips/large plots

**Plot size:** 6-row wide by field length (represents one replication)

**Harvest Procedure:**

1. Each strip (plot) harvested and wrapped separately as a round module (2000 – 5500 lbs)
2. Module weighed by cotton picker and weight displayed on CommandCenter™ display
3. Module weighed using calibrated platform scale and each module weight recorded
RESULTS

JD On-Board Module Weighing System (MWS) & UGA Platform Scale: Correlation

Colquitt County 2018 (42 bales) (JD Cotton Picker 1)

\[ y = 0.9141x + 340.47 \]
\[ R^2 = 0.9353 \]

Colquitt County 2019 (21 bales) (JD Cotton Picker 2)

\[ y = 1.1562x - 277.07 \]
\[ R^2 = 0.9597 \]
Colquitt County 2019 (14)  
(JD Cotton Picker 3)

Bullock County 2019 (11)  
(JD Cotton Picker 4)

Worth County 2019 (10)  
(JD Cotton Picker 6)

Appling County 2019 (11)  
(JD Cotton Picker 5)

Pooled Data (108)  
(All Cotton Pickers)
John Deere On-Board Module Weighing System Accuracy

<table>
<thead>
<tr>
<th>Year</th>
<th>County</th>
<th>Count</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Difference* (lbs)</th>
<th>Difference (%)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean</td>
<td>Std. Dev</td>
<td>Mean</td>
<td>Std. Dev</td>
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<tr>
<td>2018</td>
<td>Colquitt</td>
<td>41</td>
<td>175</td>
<td>53</td>
<td>9.3</td>
<td>3.6</td>
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<td>2019</td>
<td>Colquitt</td>
<td>14</td>
<td>678</td>
<td>109</td>
<td>9.8</td>
<td>1.6</td>
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<tr>
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<td>Colquitt</td>
<td>9</td>
<td>499</td>
<td>59</td>
<td>10.1</td>
<td>1.3</td>
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<td>Colquitt</td>
<td>12</td>
<td>440</td>
<td>60</td>
<td>9.5</td>
<td>1.3</td>
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<tr>
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<td>Bulloch</td>
<td>11</td>
<td>337</td>
<td>68</td>
<td>8.3</td>
<td>1.5</td>
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<tr>
<td>2019</td>
<td>Appling</td>
<td>11</td>
<td>169</td>
<td>42</td>
<td>5.5</td>
<td>1.7</td>
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<tr>
<td>2019</td>
<td>Worth</td>
<td>10</td>
<td>177</td>
<td>62</td>
<td>4.5</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>108</td>
<td>313</td>
<td>193</td>
<td>8.5</td>
<td>3.1</td>
</tr>
</tbody>
</table>

*Difference = JD On-Board Scale – UGA Platform Scale
### On-Farm Research Trials Evaluation – Scale Comparison

<table>
<thead>
<tr>
<th>Variety</th>
<th>UGA Platform Scale</th>
<th>JD On-Board MWS</th>
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</thead>
<tbody>
<tr>
<td>Level</td>
<td>Mean Weight (lbs)</td>
<td>Mean Weight (lbs)</td>
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<tr>
<td>---------------</td>
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<td>-----------------</td>
</tr>
<tr>
<td>ST 5471 GLTP</td>
<td>2112 A</td>
<td>2246 A</td>
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<td>DP 1538 B2XF</td>
<td>2082 A</td>
<td>2225 A</td>
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<td>DP 1646 B2XF</td>
<td>2015 A</td>
<td>2213 A</td>
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<tr>
<td>DP 1840 B3XF</td>
<td>2012 A</td>
<td>2153 A</td>
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<td>2069 AB</td>
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<tr>
<td>PHY 440 W3FE</td>
<td>1682 B</td>
<td>1850 B</td>
</tr>
</tbody>
</table>

ANOVA analysis and means comparison using $\alpha = 0.10$ (JMP Pro 14.1.0)

Letters not connected by same letter are significantly different at $p<0.10$

This represents JD Onboard MWS and UGA Platform scale weights that are statistically different from each other.
Results showed a strong correlation ($R^2 = 0.88 – 0.99$) between the JD Onboard MWS and a calibrated platform scale weights ($R^2 = 0.99$ for pooled data across six sites).

JD Onboard MWS weights were consistently higher (4.5 – 10.1%) than the platform scale weights for all sites/pickers.

Module weights recorded using the JD Onboard MWS exhibited similar statistical trends in varieties as shown by the platform scale weights.

JD Onboard MWS has the potential to be a reliable and time-saving method for yield evaluation during on-farm research trials; however more field scale data needs to be collected with the system fully calibrated and other sources of error minimized.
Thanks!

(Any questions or comments can be emailed to svirk@uga.edu)