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)

Introduction

- 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

Source: https://www.deere.com/en/harvesting/cp690-cotton-picker/

Objectives

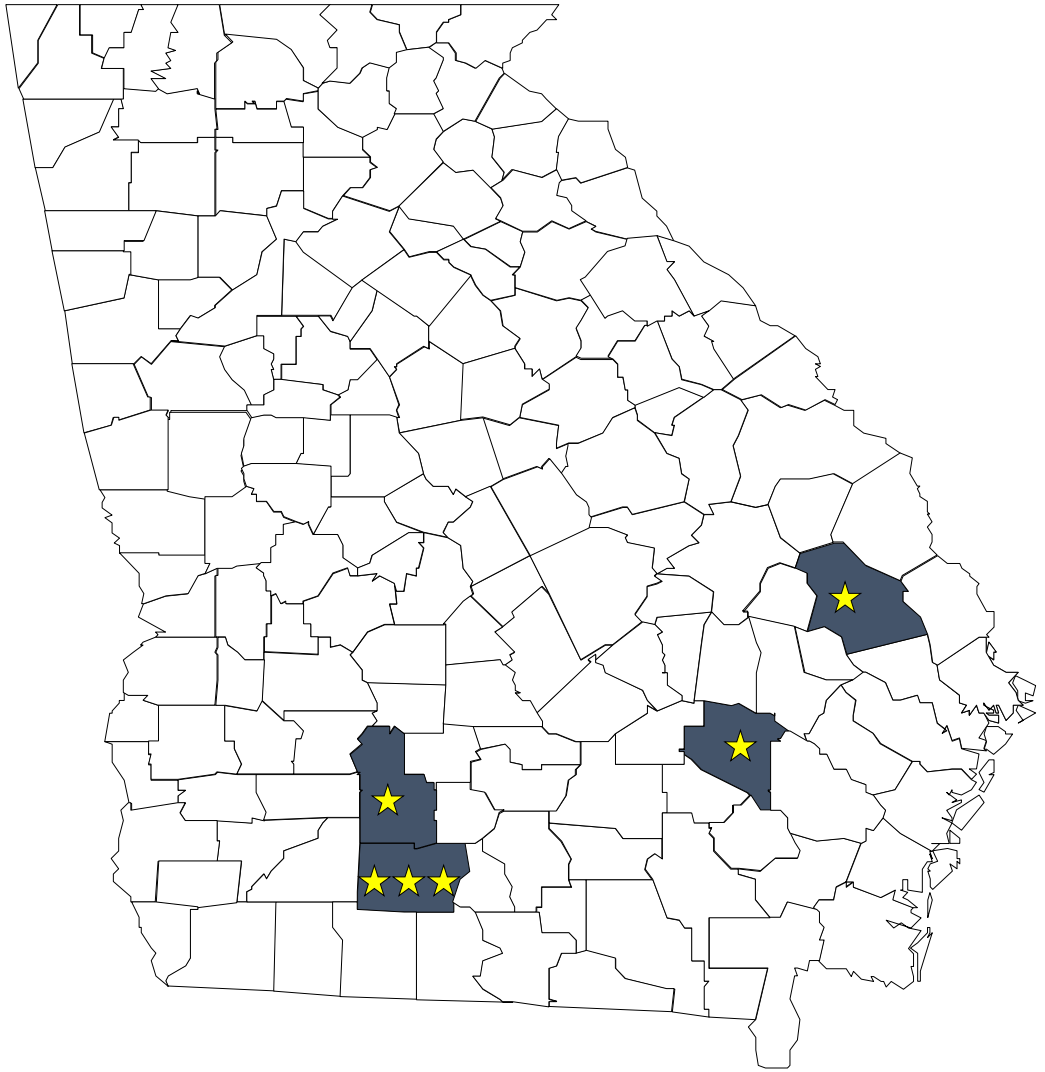
1. Assess the accuracy of John Deere's Onboard Module Weighing System in comparison to a calibrated platform scale

2. Evaluate the potential of the John Deere's Onboard Module Weighing System for On-Farm Research Implementation

Methods

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)

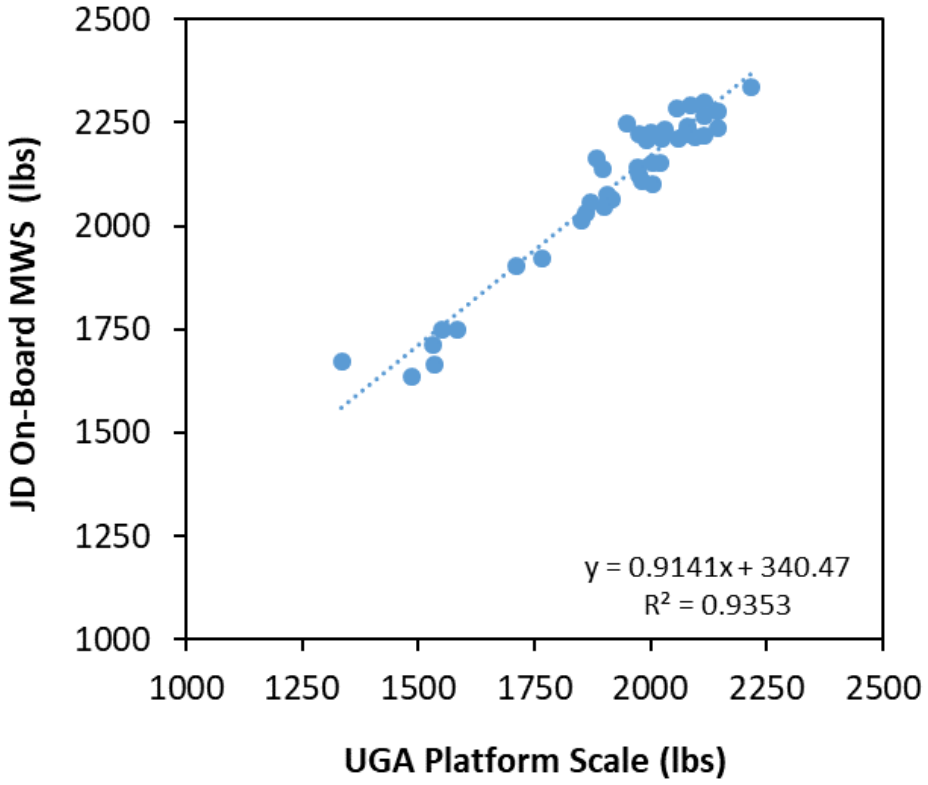
Harvest Procedure:

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

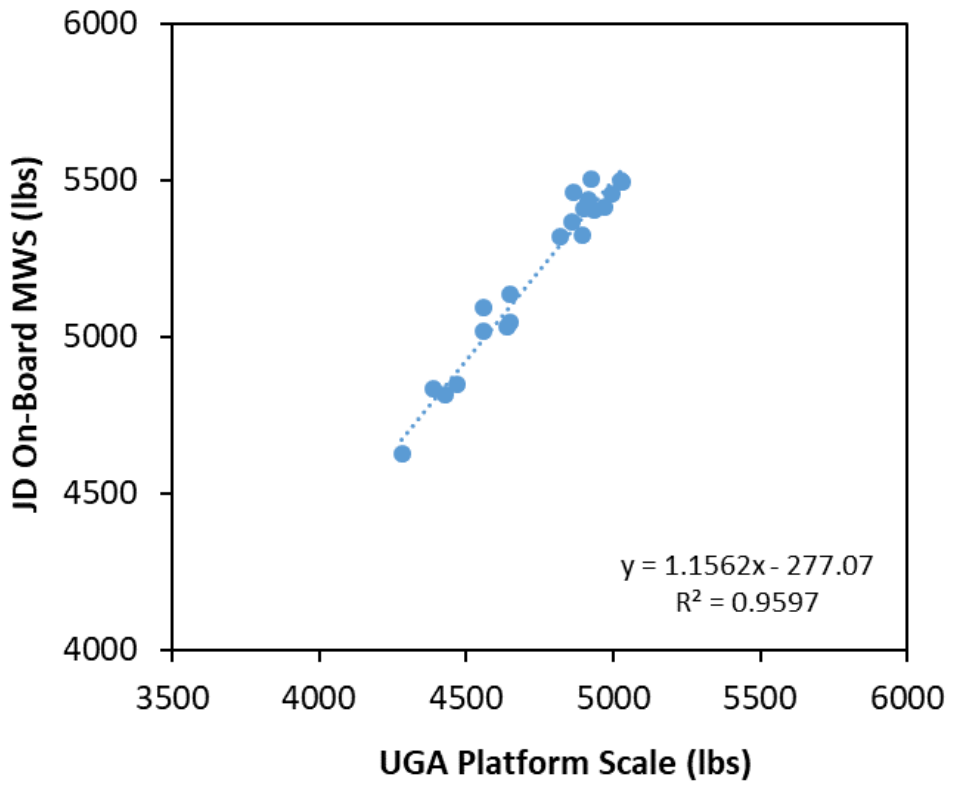
RESULTS

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

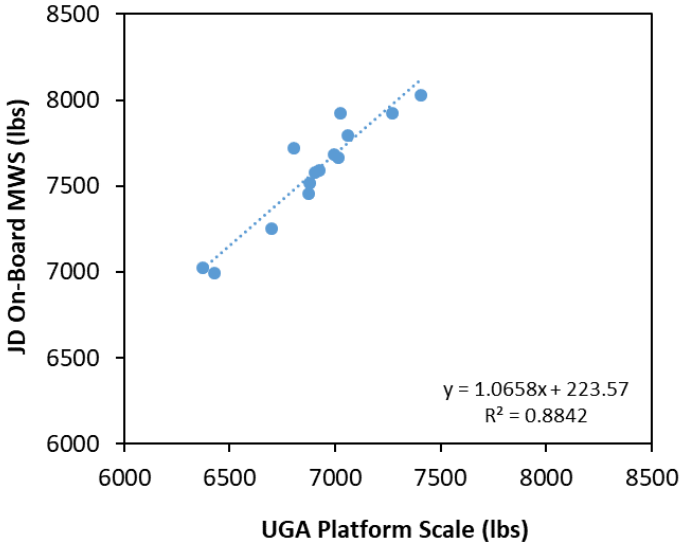
Colquitt County 2018 (42 bales)
(JD Cotton Picker 1)



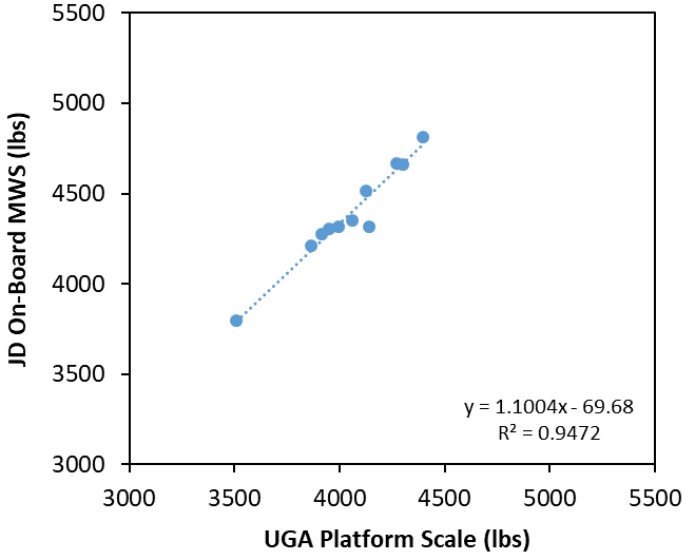
Colquitt County 2019 (21 bales)
(JD Cotton Picker 2)



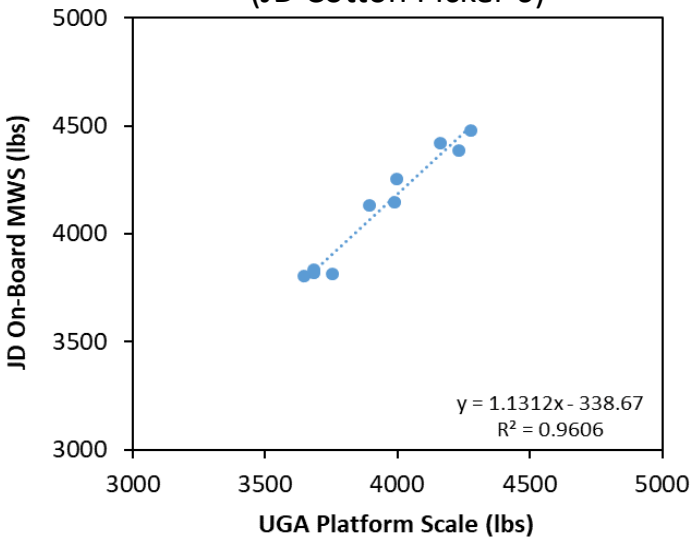
Colquitt County 2019 (14)
(JD Cotton Picker 3)



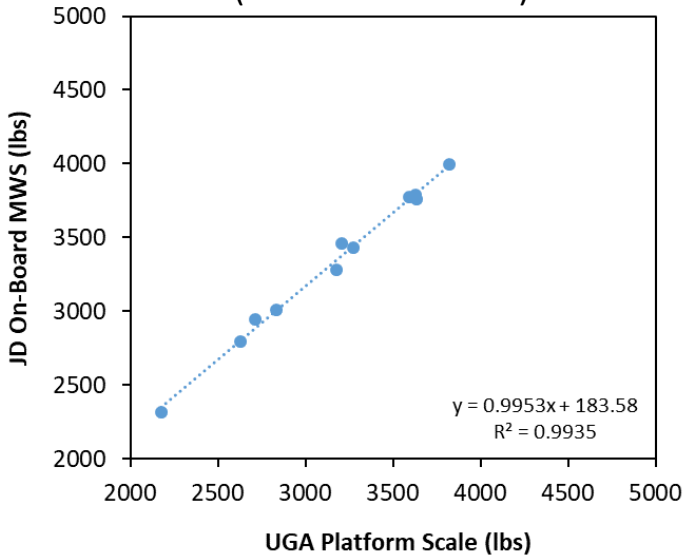
Bullock County 2019 (11)
(JD Cotton Picker 4)



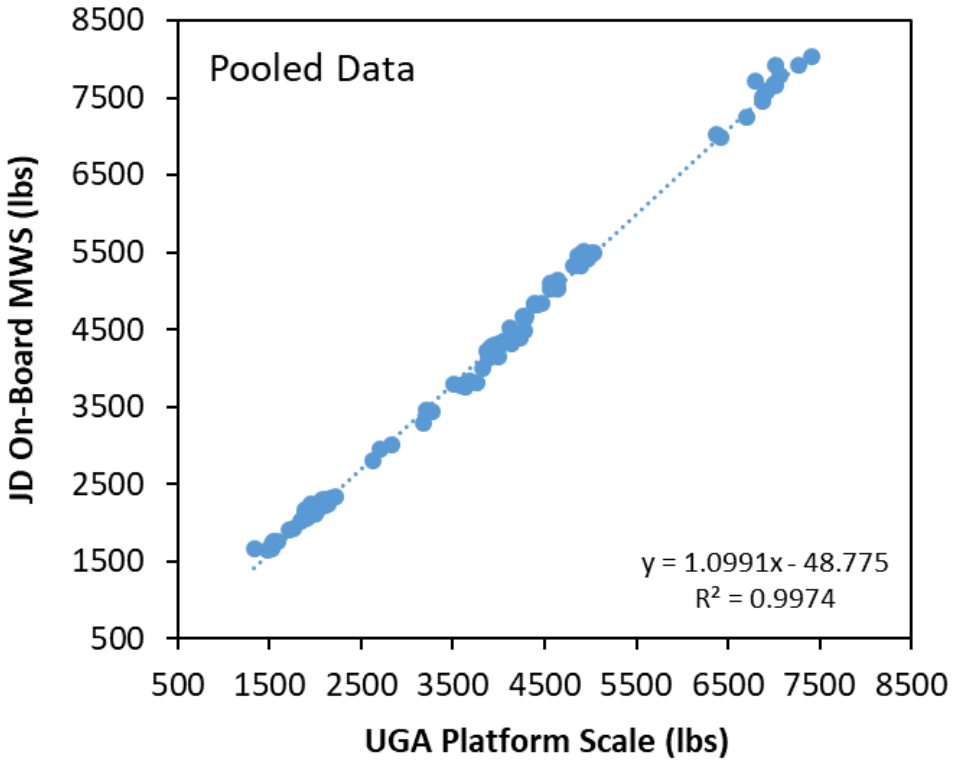
Worth County 2019 (10)
(JD Cotton Picker 6)



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



Pooled Data (108)
(All Cotton Pickers)



John Deere On-Board Module Weighing System Accuracy

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

*Difference = JD On-Board Scale – UGA Platform Scale

On-Farm Research Trials Evaluation – Scale Comparison

Variety	UGA Platform Scale		JD On-Board MWS	
Level	Mean Weight (lbs)		Mean Weight (lbs)	
ST 5471 GLTP	2112	A	2246	A
DP 1538 B2XF	2082	A	2225	A
DP 1646 B2XF	2015	A	2213	A
DP 1840 B3XF	2012	A	2153	A
ST 5818 GLT	1983	A	2199	A
PHY 430 W3FE	1945	AB	2088	AB
CG 3885 B2XF	1930	AB	2085	AB
DP 1851 B3XF	1923	AB	2093	AB
PHY 480 W3FE	1888	AB	2067	AB
ST 6182 GLT	1842	AB	2015	AB
NG 5711 B3XF	1838	AB	2035	AB
NG 5007 B2XF	1837	AB	2038	AB
DG 3605 B2XF	1833	AB	2069	AB
PHY 440 W3FE	1682	B	1850	B

Variety	UGA Platform Scale		JD On-Board MWS	
Level	Mean Weight (lbs)		Mean Weight (lbs)	
Untreated	4937	A	5452	A
Priaxor	4942	A	5456	A
Miravus	4930	A	5397	A

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

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

represent JD Onboard MWS and UGA Platform scale weights that are statistically different from each other

CONCLUSIONS

- 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

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Thanks!

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