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In-Field Performance Evaluation of Precision Planting SmartDepth at Varying Seeding Depths in Cotton

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(M. Tucker, J. Kichler, R. Meena, C. Byers, M. Sapkota)

Planter Technology Trends

- Timely and uniform emergence is important for optimal stand establishment
- Increased interest in improving planter performance (i.e. seed metering and placement accuracy)
- Numerous advanced planting technology options available today to utilize.

Precision Planting SmartDepth

- Allows depth changes from the cab as field conditions change
- Removes row-to-row depth variability (same depth across the whole planter)
- Precise depth for shallow seeded crops (e.g. cotton)

Evaluate performance of Precision Planting SmartDepth in varying seeding depths in cotton

Methods

6-row John Deere MaxEmerge *XP* Planter

PP vDrive

PP DeltaForce

PP SmartDepth

PP 20|20 Gen 3

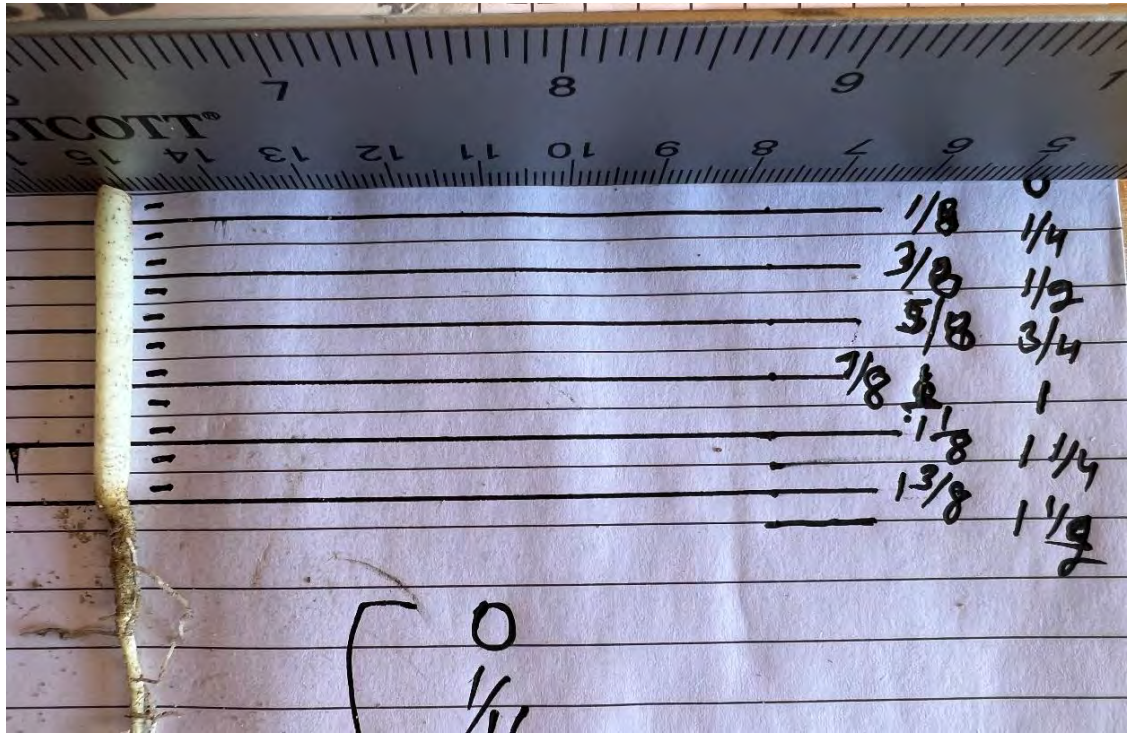
Treatments & Layout

- **A variable depth prescription (Rx) map:**
  - 0.50, 0.75, 1.00, 1.25 & 1.50 inch
  - Each depth replicated 5 times & randomized within the field
  - All possible depth transitions included (e.g. 0.5 – 1.5 in.) during planting
- **Rx map uploaded into the 20|20 display and implemented:**
  - SmartDepth was calibrated using PP's recommended procedure
  - All other planting parameters remained constant (e.g. seeding rate, speed, etc.)

Data Collection

Seed depth measurements –

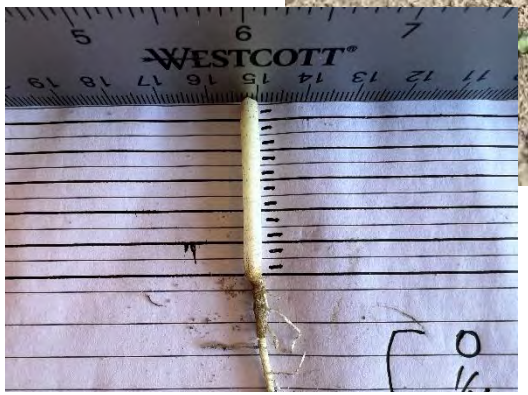
- all 6 planter rows
- 20 randomly selected plants within each row
- depth measured up to accuracy of 1/16 inch



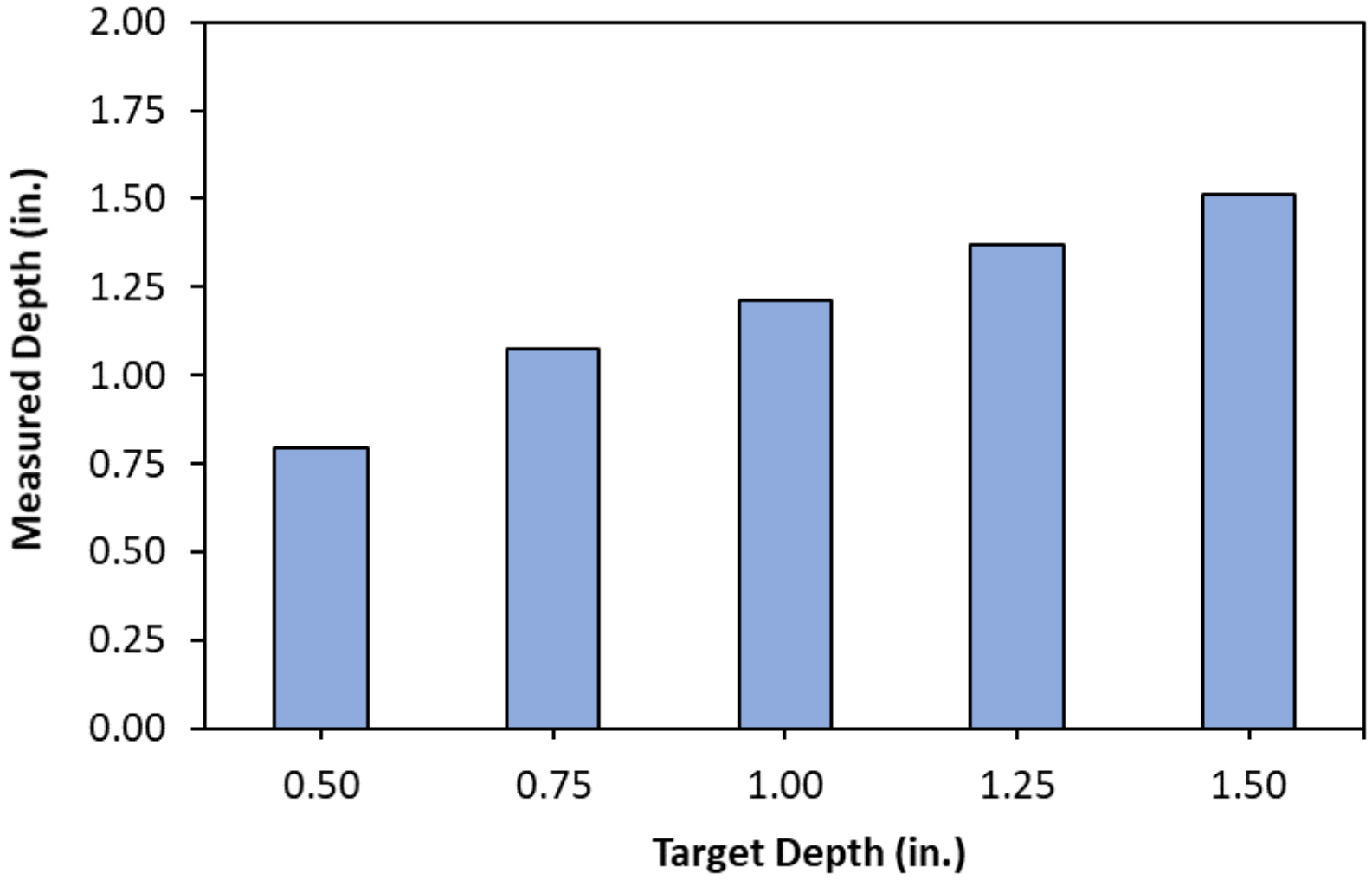
Data Collection

Transition distance –

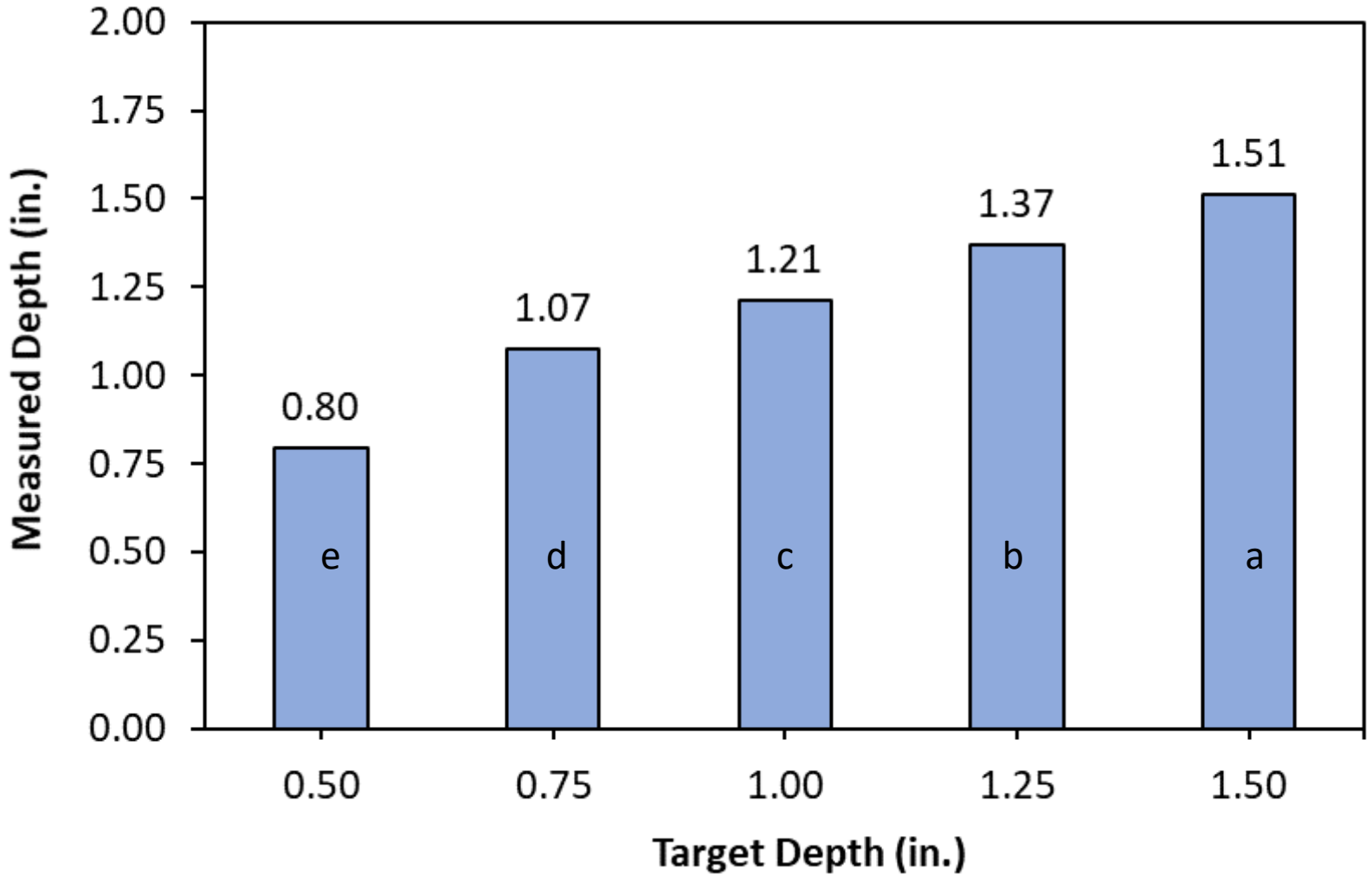
- Transition locations for depth changes were marked using RTK GPS
- A distance of 5 ft prior to the transition and 10 ft after the transition (rows 3 and 4) was marked
- Depth was measured for all plants in the transition zone (15 ft)



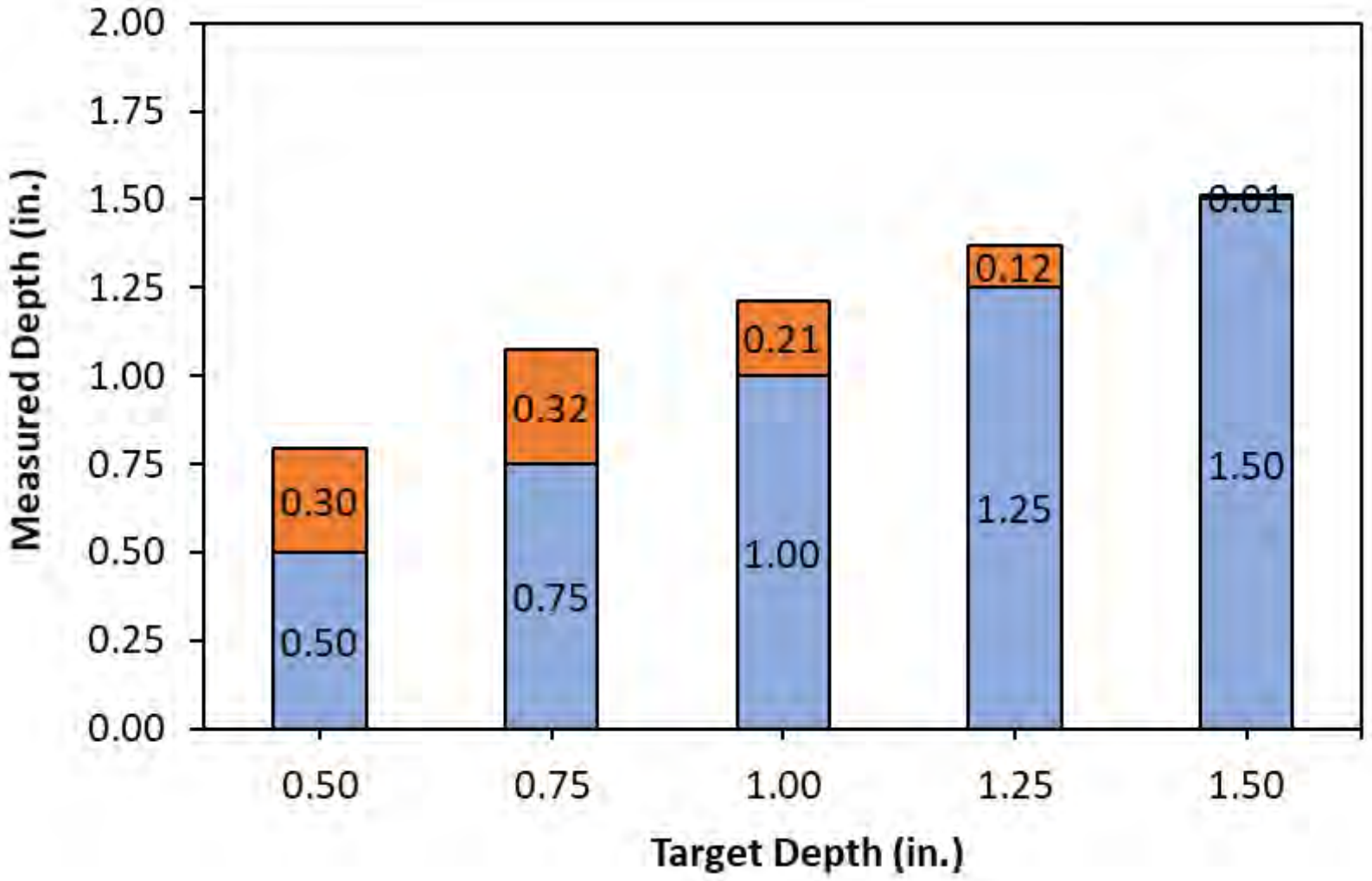
Results


2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Measured Depth (in.)
0.50
0.75
1.00
1.25
1.50
Target Depth (in.)

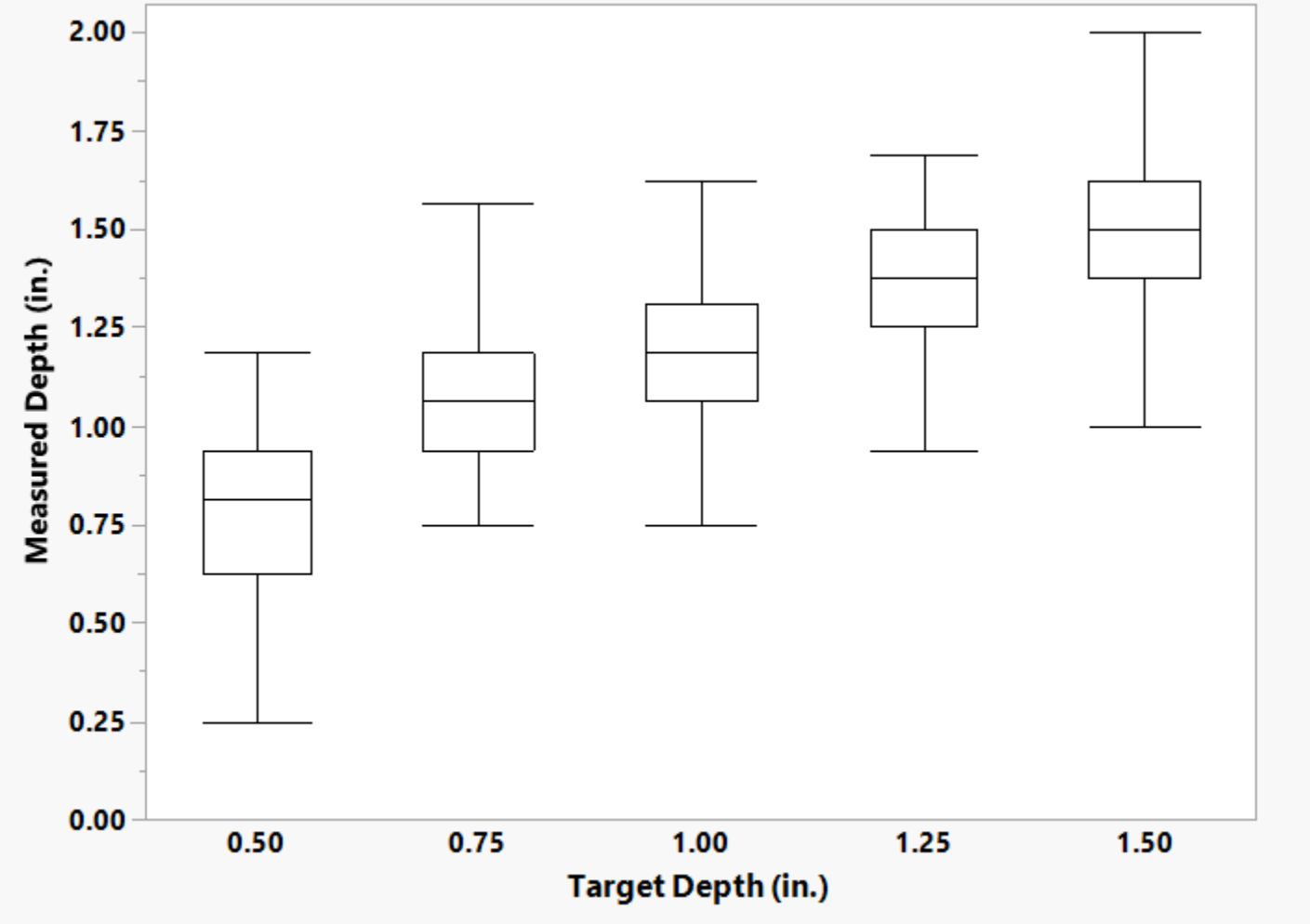
System Accuracy - Depth



Mean Depth

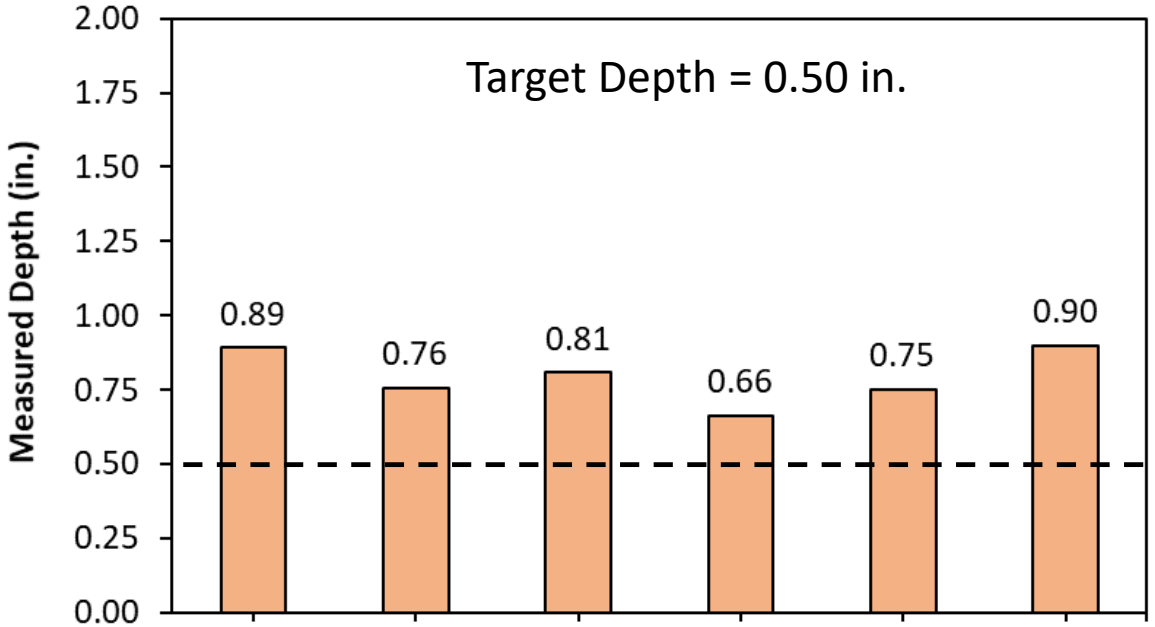

2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
Measured Depth (in.)
0.30
0.50
0.32
0.75
0.21
1.00
0.12
1.25
0.01
1.50
0.50
0.75
1.00
1.25
1.50
Target Depth (in.)

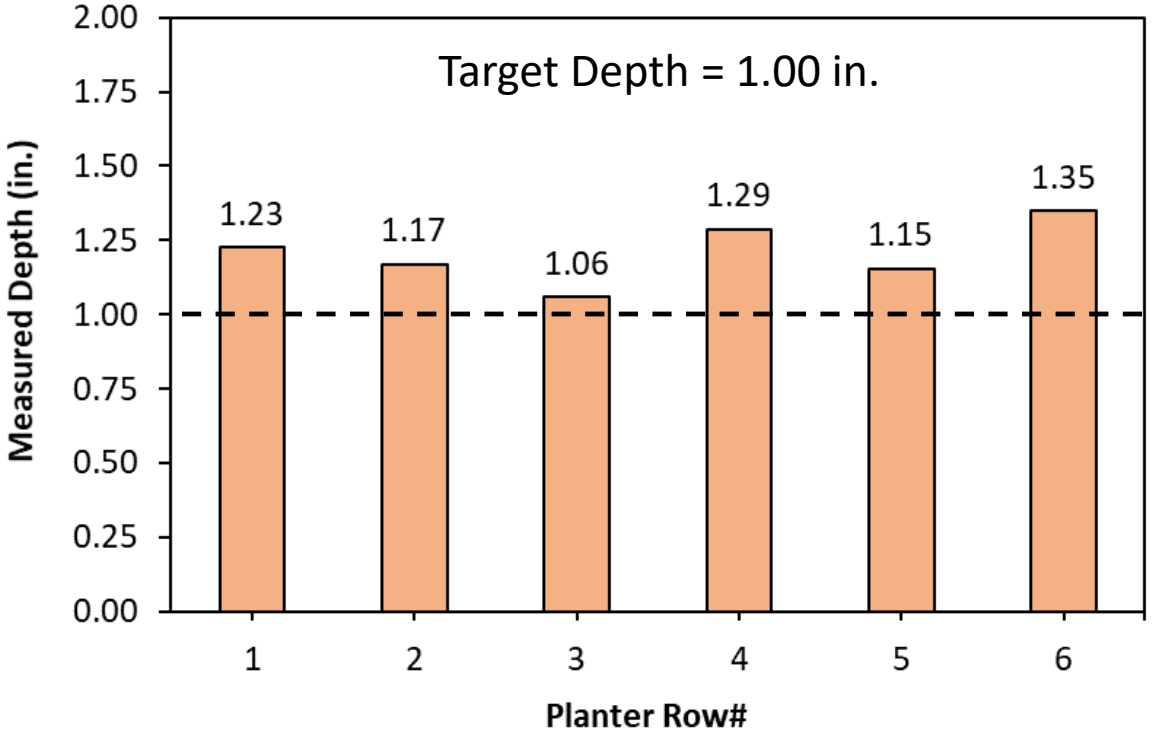
Depth - Accuracy & Variability

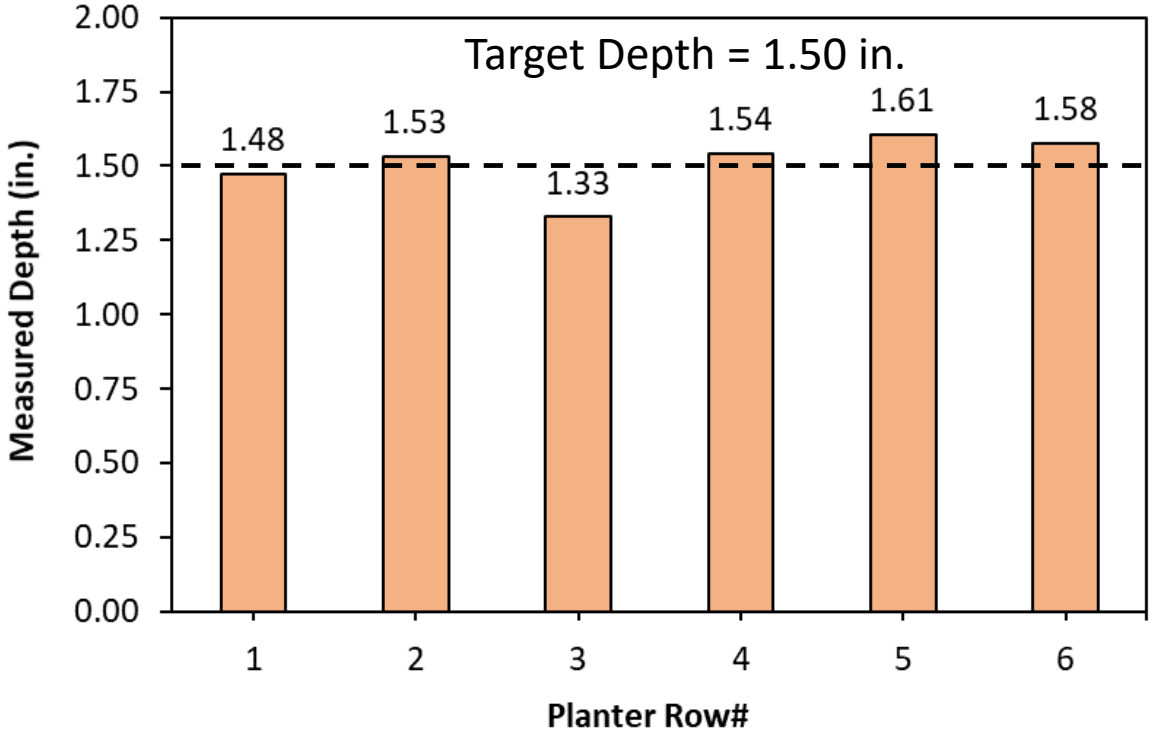


Target (in.)	Mean (in.)	Std. Dev. (in.)	CV (%)
0.50	0.80	0.20	25.5
0.75	1.07	0.18	16.4
1.00	1.21	0.19	15.5
1.25	1.37	0.18	13.1
1.50	1.51	0.22	14.8

Row-to-Row Depth Variability







Row-to-Row – Depth Variability

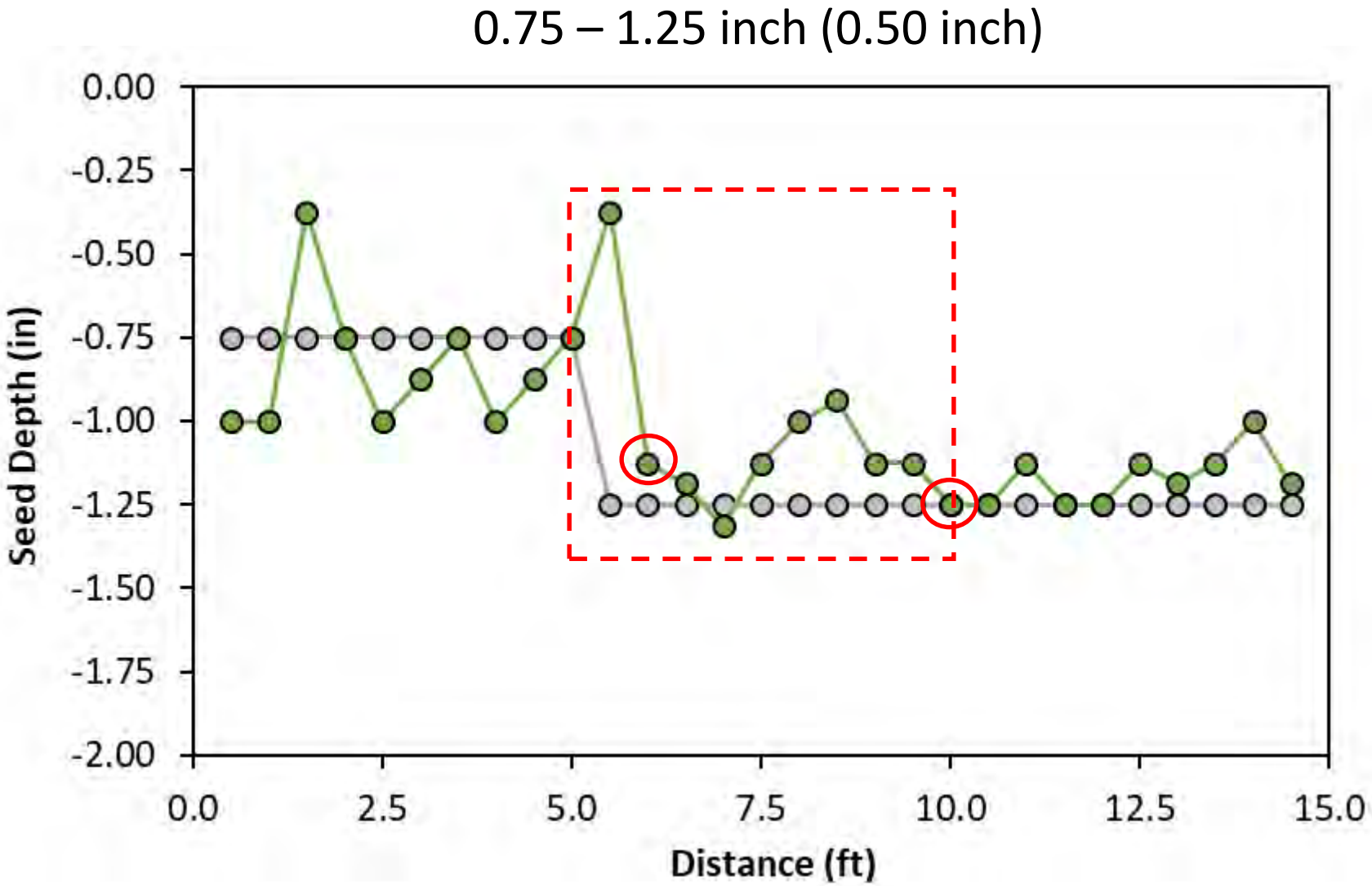
Mean Depth (in.)

Row#	Target Depth (in.)				
	0.50	0.75	1.00	1.25	1.50
1	0.89	1.09	1.23	1.33	1.48
2	0.76	1.06	1.17	1.42	1.53
3	0.81	1.03	1.06	1.24	1.33
4	0.66	1.01	1.29	1.37	1.54
5	0.75	1.04	1.15	1.42	1.61
6	0.90	1.21	1.35	1.43	1.58

CV (%)

Row#	Target Depth (in.)				
	0.50	0.75	1.00	1.25	1.50
1	25.2	14.5	11.7	12.4	9.4
2	33.2	17.2	10.3	12.8	14.4
3	21.6	17.7	21.1	11.7	13.4
4	29.9	17.5	16.0	14.1	13.5
5	15.7	14.5	14.3	11.6	17.3
6	15.0	12.6	8.8	12.0	13.2

System Response - Rate Transitions



Depth Transition Distance

Depth Increment/decrement (in.)	Transition Distance (ft)
0.25	1.9 – 3.6
0.50	2.3 – 4.1
0.75	2.9 – 4.4
1.00	3.2 – 4.9

All depth transitions occurred within less than 5 ft.

Planting speed = 4.5 mph (6.6 fts)

Transition time = 0.76 sec

Summary

- **System Accuracy:**
  - Measured seeding depth was always greater than the target depth.
  - Row-to-row depth variability existed across all seeding depths (CV = 8.8 to 29.9%).
  - Row-to-row variability was highest for 0.50 inch depth and then decreased thereafter.

- **System Response:**
  - Transition between seeding depths were quick (< 5 ft) indicating fast response time of the SmartDepth system (≤ 0.76 sec).

Future Work: Analyze corn and peanut data to compare trends noticed in cotton. Evaluate influence tillage and soil type on system accuracy.

Thanks!

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