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Precision Planting SmartDepth Evaluation for Assessing Seeding Depth Accuracy and Row-to-Row Variability

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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 especially for shallow seeded crops (e.g. cotton)



Evaluate performance (accuracy & row-to-row variability) of Precision Planting SmartDepth system

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:**

- Five corn seeding depths (1.50, 1.75, 2.00, 2.25 and 2.50 in.)
- Each depth replicated 5 times & randomized within the field
- All possible depth transitions included (e.g. 1.50 – 1.75 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

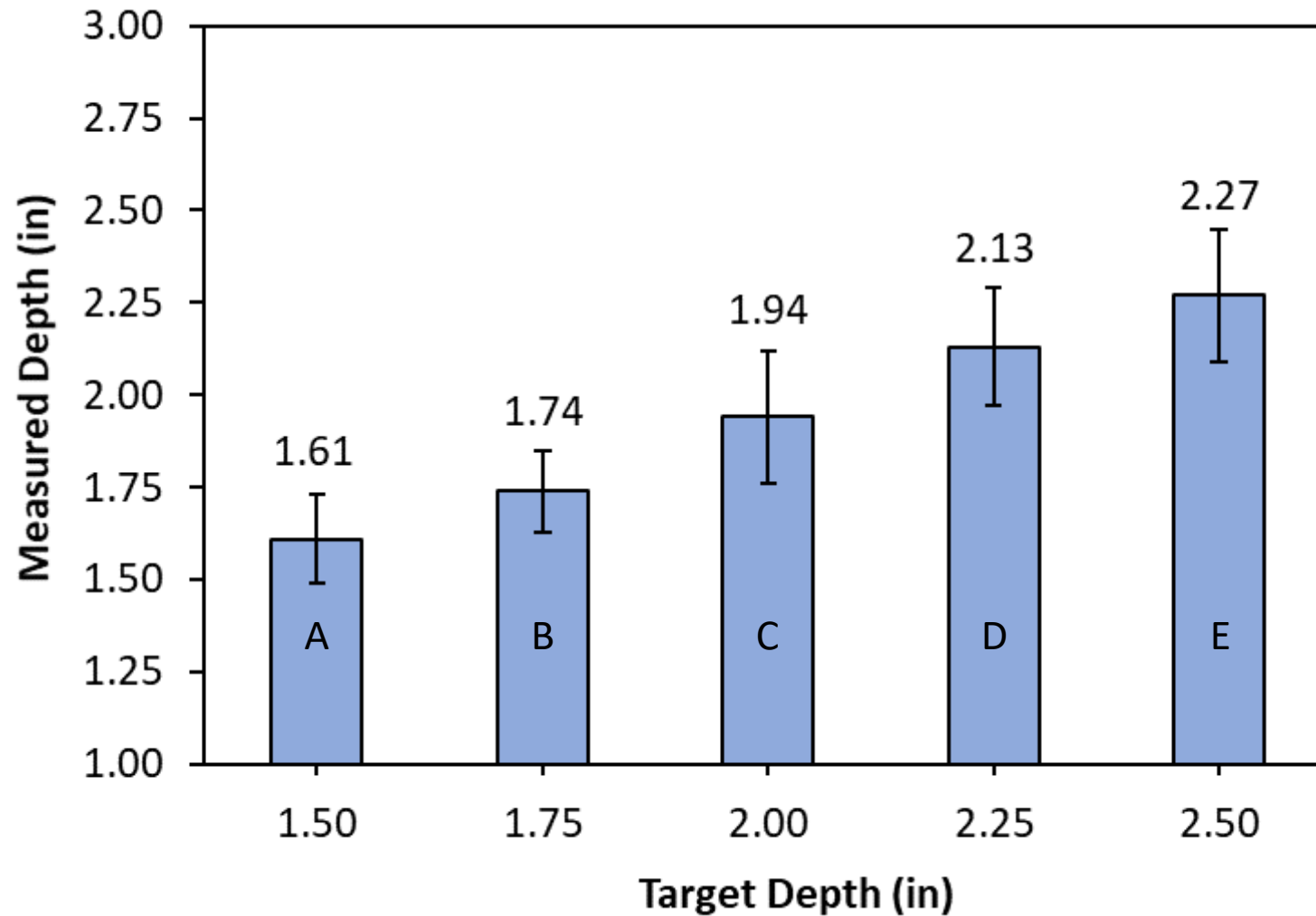
Transition distance –

- 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)



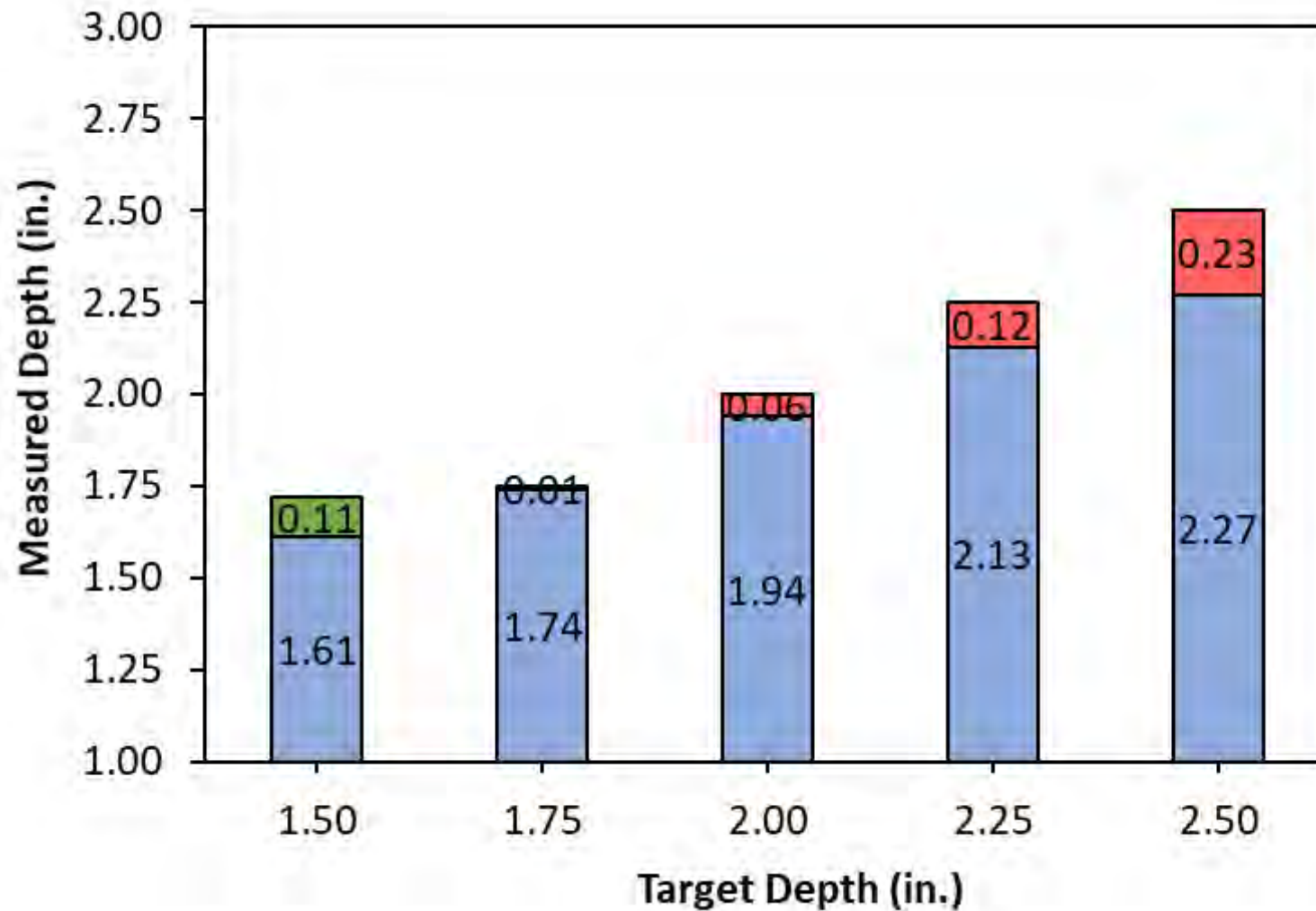
System Accuracy

Target vs Measured Depth

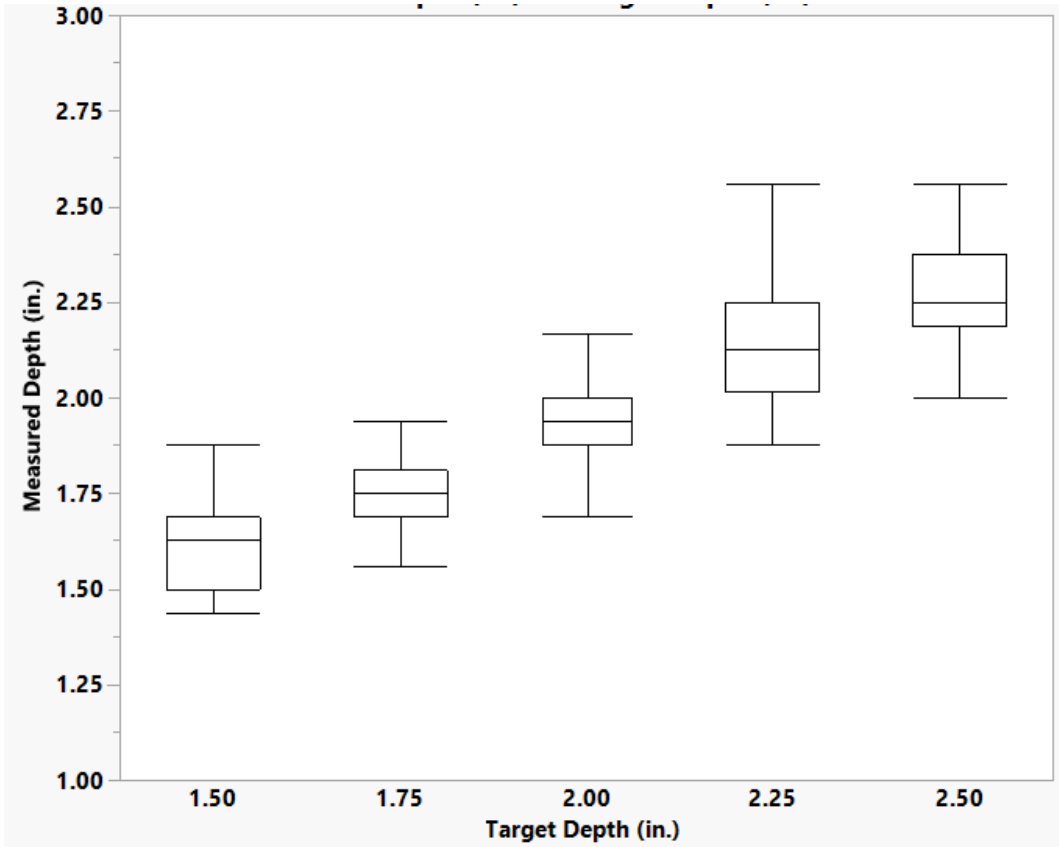


System Accuracy

Target vs Measured Depth

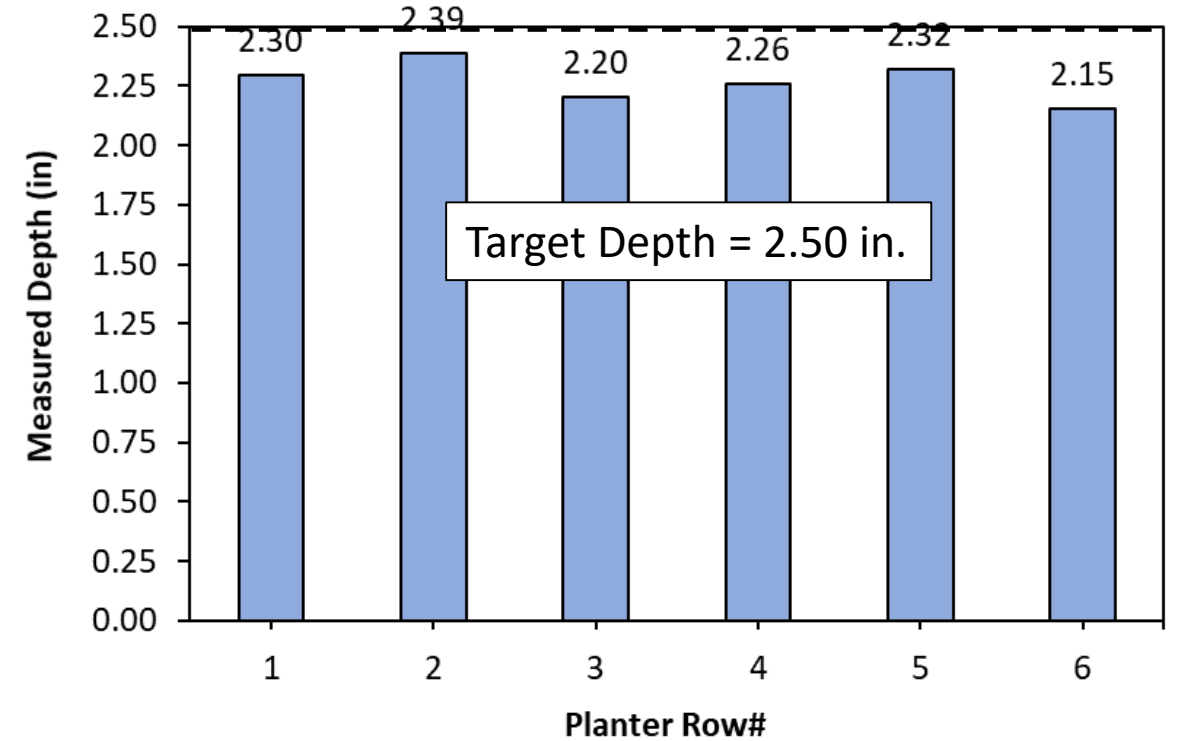
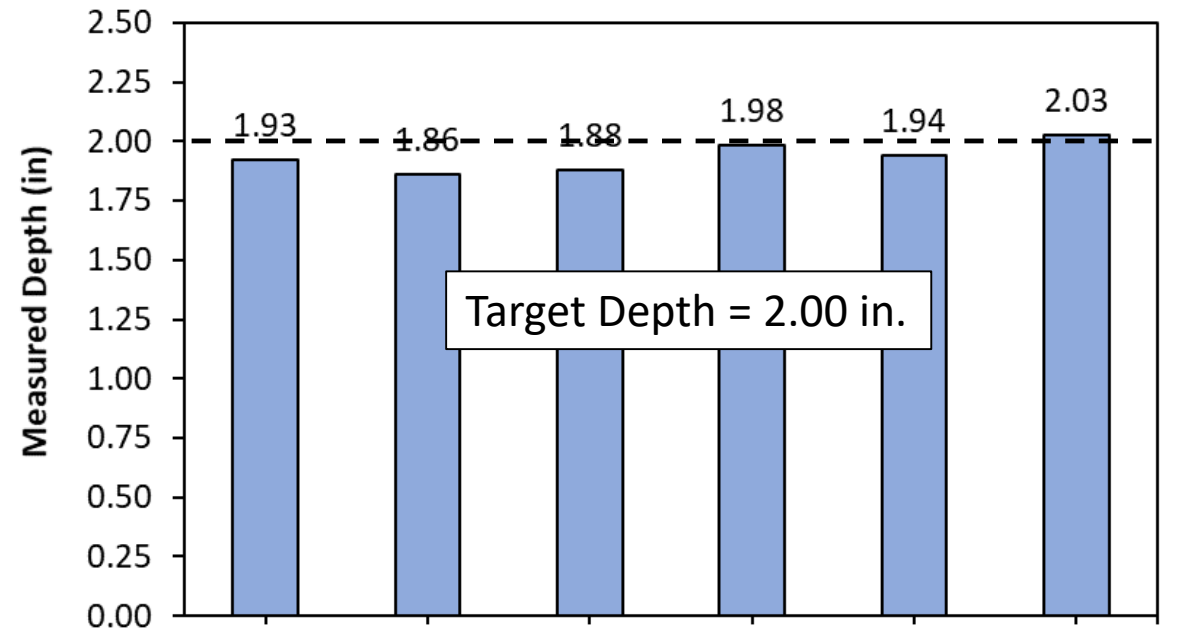
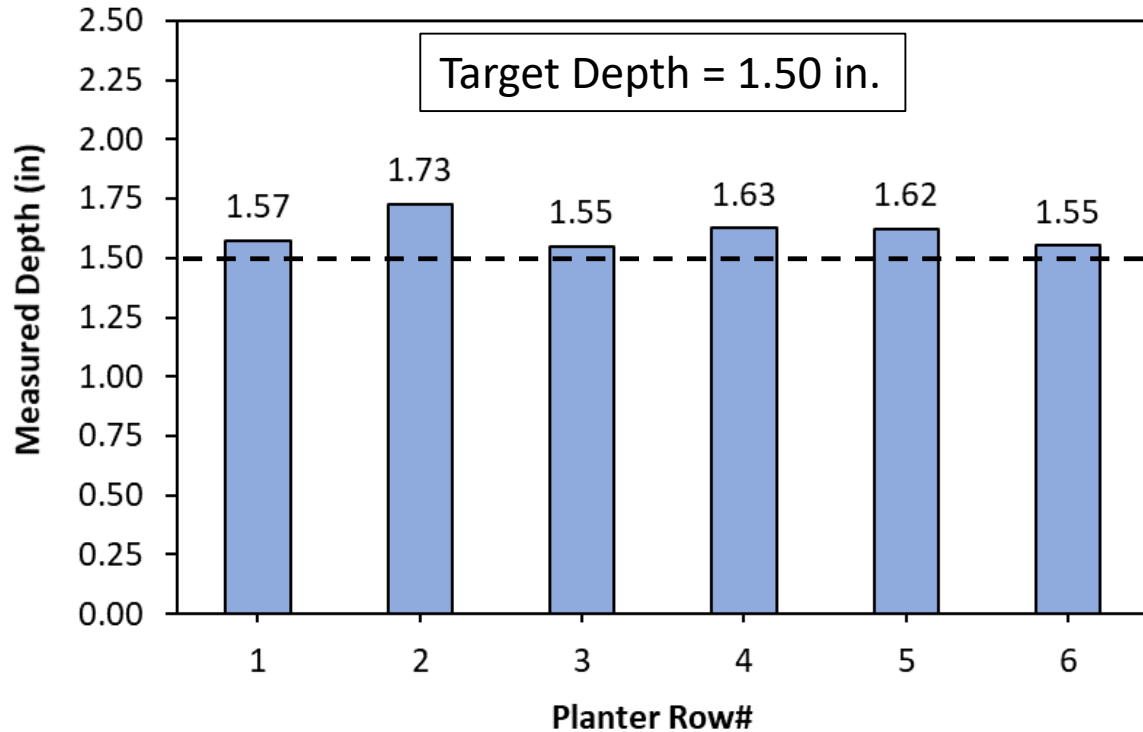


PP SmartDepth System - CV & Accuracy



| Target (in.) | Measured (in.) | CV (%) | Accuracy (%) |
|--------------|----------------|--------|--------------|
| 1.50 | 1.61 | 8 | 93 |
| 1.75 | 1.74 | 6 | 99 |
| 2.00 | 1.94 | 9 | 97 |
| 2.25 | 2.13 | 7 | 95 |
| 2.50 | 2.27 | 8 | 91 |

Row-to-Row Depth Variability



Row-to-Row – Depth Variability

Mean Depth (in.)

| Row# | Target Depth (in.) | | | | |
|---------|--------------------|------|------|------|------|
| | 1.50 | 1.75 | 2.00 | 2.25 | 2.50 |
| 1 | 1.57 | 1.66 | 1.93 | 1.97 | 2.30 |
| 2 | 1.73 | 1.74 | 1.86 | 2.22 | 2.39 |
| 3 | 1.55 | 1.75 | 1.88 | 2.18 | 2.20 |
| 4 | 1.63 | 1.77 | 1.98 | 2.21 | 2.26 |
| 5 | 1.62 | 1.75 | 1.94 | 2.13 | 2.32 |
| 6 | 1.55 | 1.72 | 2.03 | 2.09 | 2.15 |
| Planter | 1.61 | 1.74 | 1.94 | 2.13 | 2.27 |

CV (%)

| Row# | Target Depth (in.) | | | | |
|---------|--------------------|------|------|------|------|
| | 1.50 | 1.75 | 2.00 | 2.25 | 2.50 |
| 1 | 5.3 | 6.9 | 6.6 | 7.9 | 5.6 |
| 2 | 5.2 | 4.3 | 12.8 | 3.4 | 5.9 |
| 3 | 8.1 | 4.2 | 7.2 | 10.7 | 4.7 |
| 4 | 9.9 | 9.4 | 4.9 | 4.4 | 5.7 |
| 5 | 6.0 | 3.8 | 3.7 | 5.0 | 6.1 |
| 6 | 6.7 | 5.3 | 12.8 | 4.9 | 14.2 |
| Planter | 7.7 | 6.1 | 9.1 | 7.5 | 8.1 |

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 |

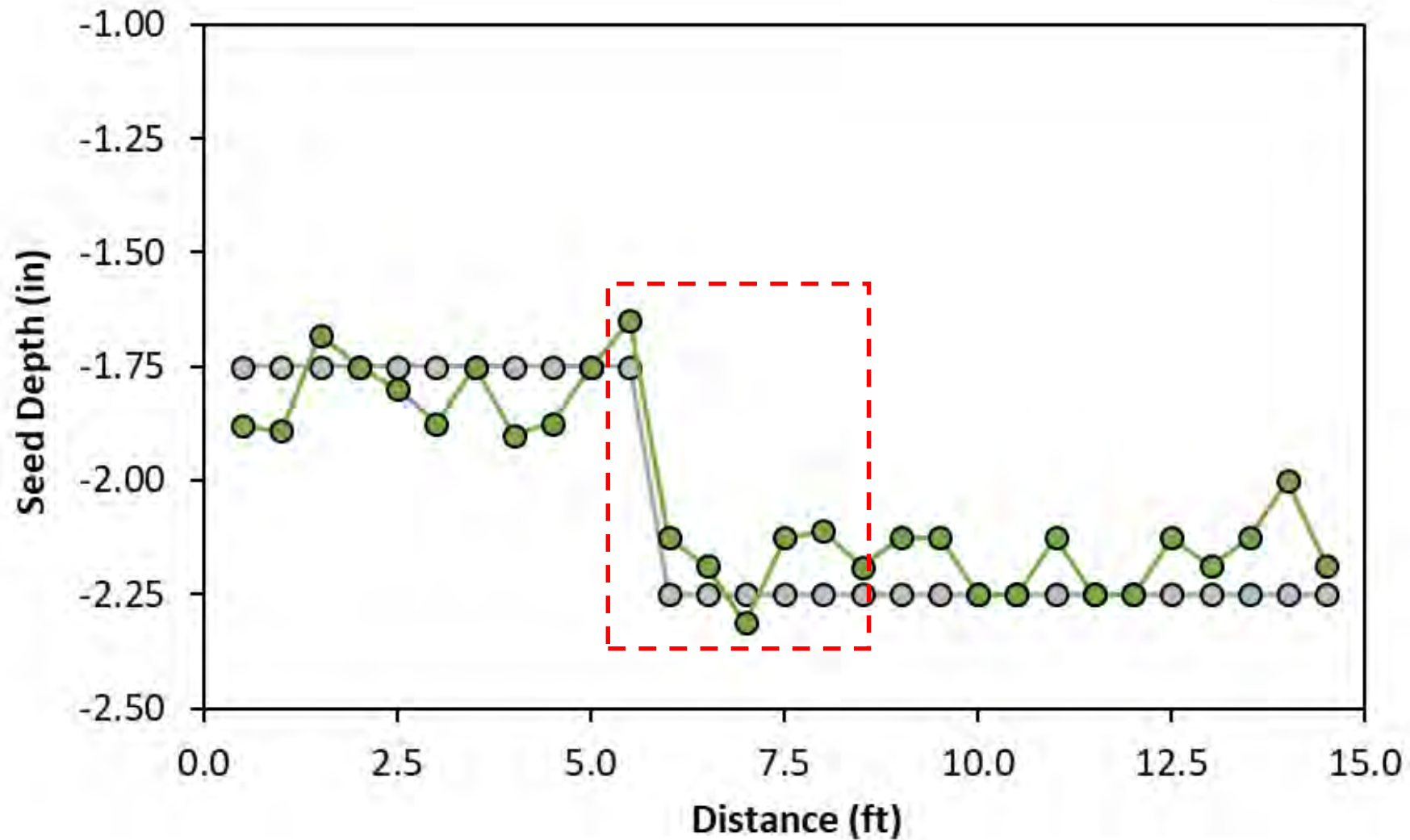
All depth transitions occurred within less than 5 ft.

Planting speed = 4.5 mph (6.6 fts)

Transition time = 0.76 sec

System Response - Rate Transitions

1.75 – 2.25 inch (0.50 inch)



Summary

➤ System Accuracy:

- The PP SmartDepth system was able to achieve the target seeding depths with >90% accuracy. Actual seeding depth was always shallower for 2.0 – 2.5 in.
- Row-to-row depth variability was mostly low across all seeding depths (CV < 10%).

➤ System Response:

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

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

Thanks!

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