Implementation and Performance of Automated Peanut Digging Depth Technology on an Amadas 6-Row Digger

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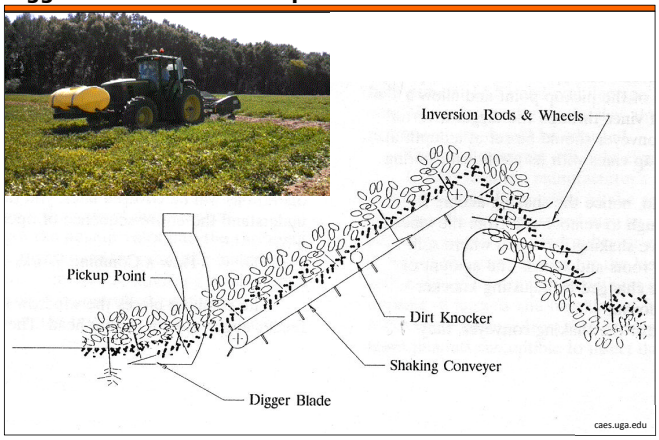
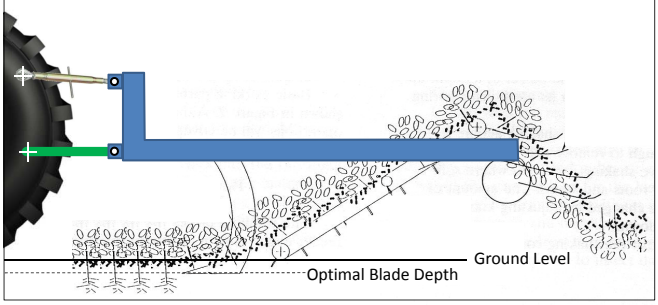
INTRODUCTION AND BACKGROUND

Digger-Shaker-Inverter Operation



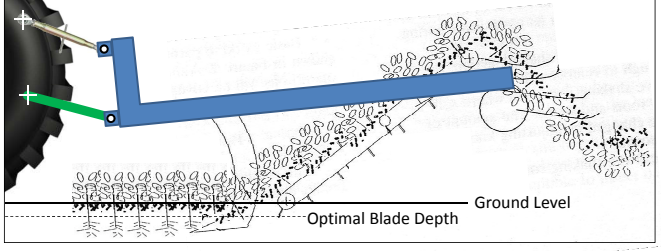
Top Link Adjustment: Proper Setting

Cut taproot 1 inch below pods



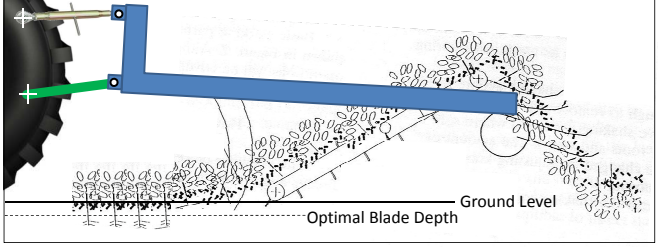
Top Link Adjustment Too Short

- Peanuts dug too deep
- Excessive soil on blades
- Plants pushed forward
- Taproot ripped

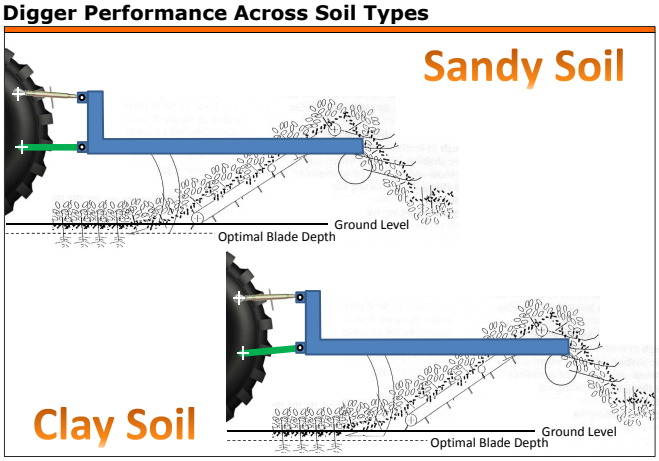


Top Link Adjustment Too Long

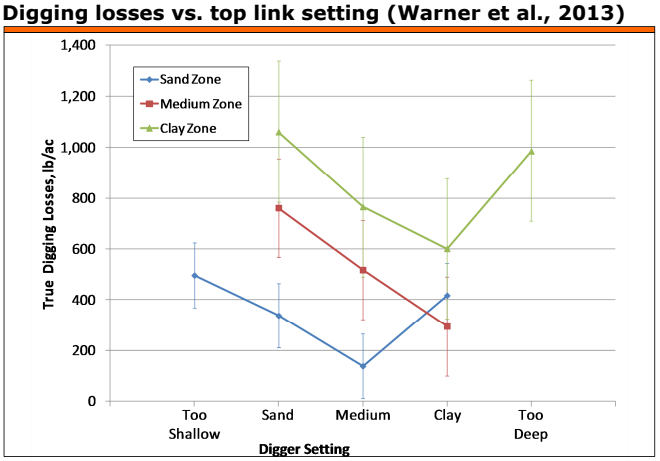
- Peanuts dug too shallow
- Some pods sheared
- Some pods left in soil



Digger Performance Across Soil Types



Digging losses vs. top link setting (Warner et al., 2013)



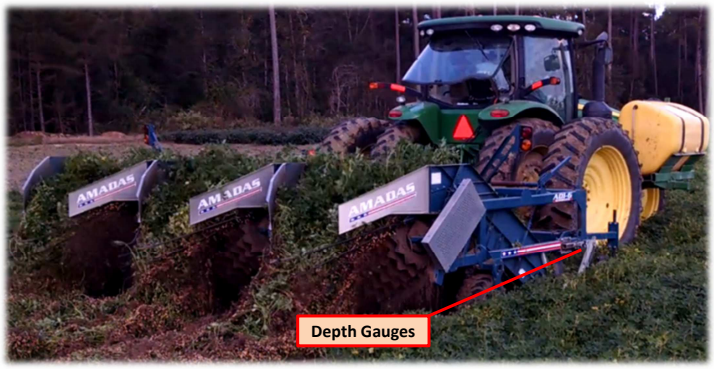
Automated Blade Depth Control

Objectives

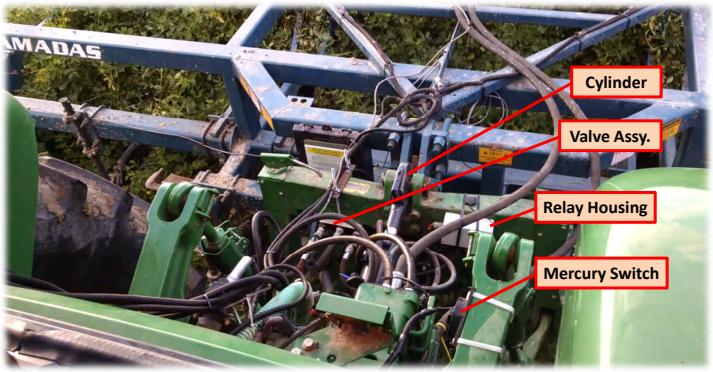
- Evaluate depth automation as function of soil EC
- Equip six row diggers with automated digging depth technology
  - Evaluate performance and control logic
  - Evaluate user interface and grower acceptance of technology

MATERIALS & METHODS

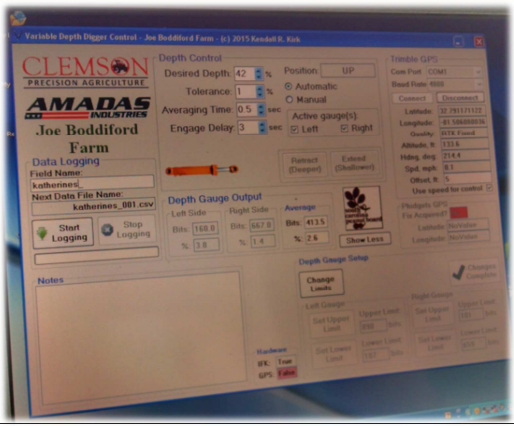
Amadas ADI-6 Fixed Frame Peanut Digger



Controls Mounted to Quick Hitch

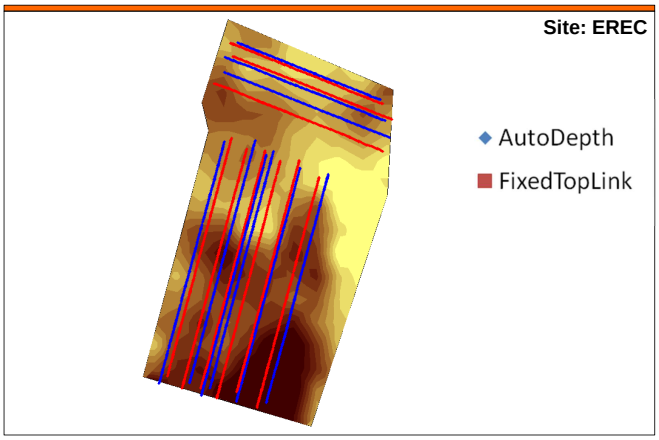


Data acquisition

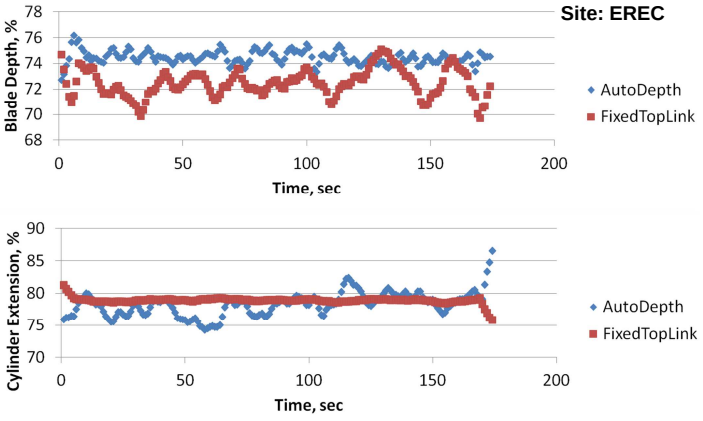


RESULTS: DEPTH AUTOMATION AS FUNCTION OF SOIL EC

KMC 2-Row Tests



Digger Performance – KMC 2-Row Tests – 10 sec avg.



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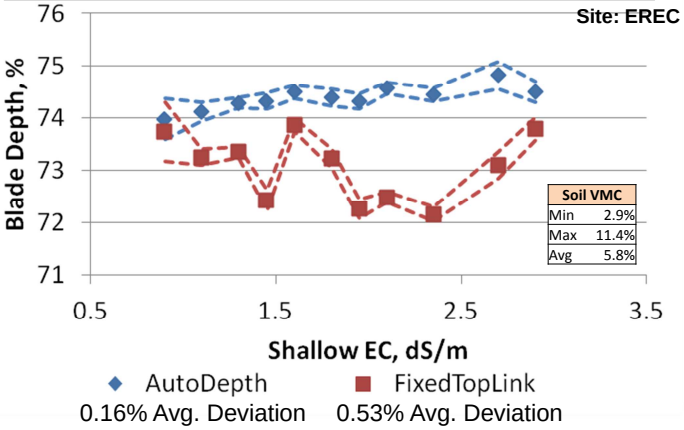
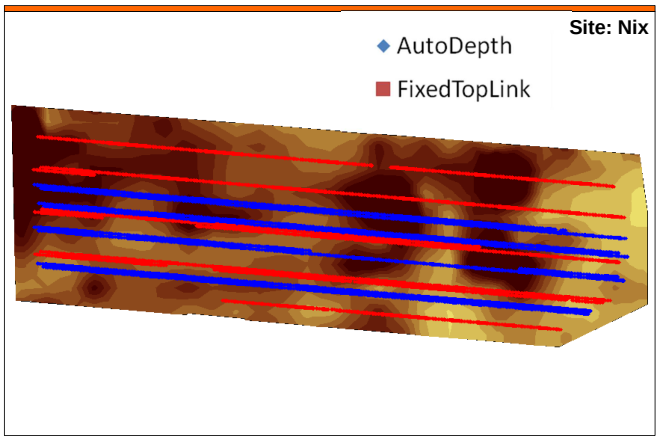


KMC 2-Row Tests



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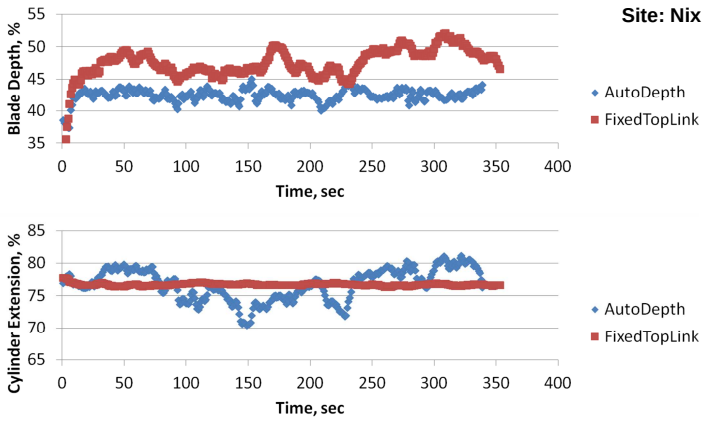

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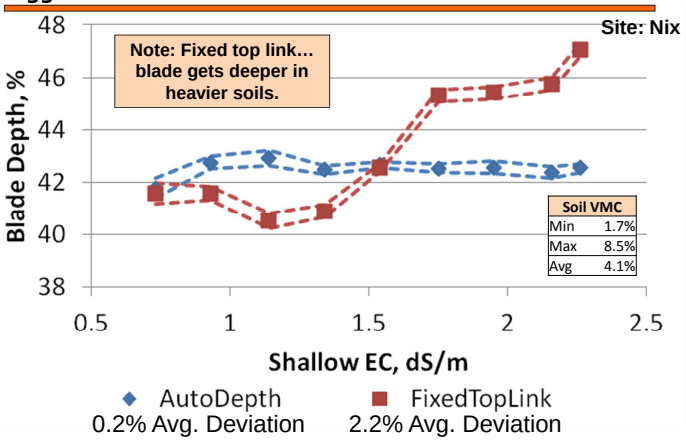
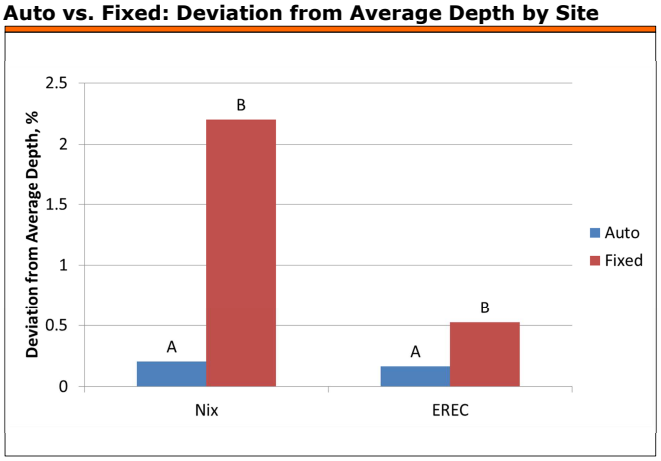
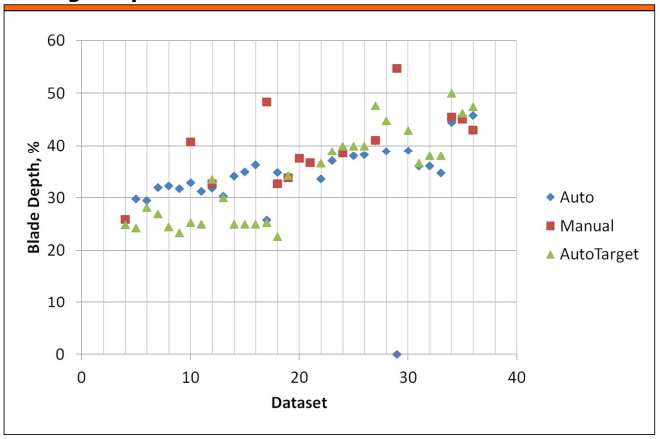


Auto vs. Fixed: Deviation from Average Depth by Site

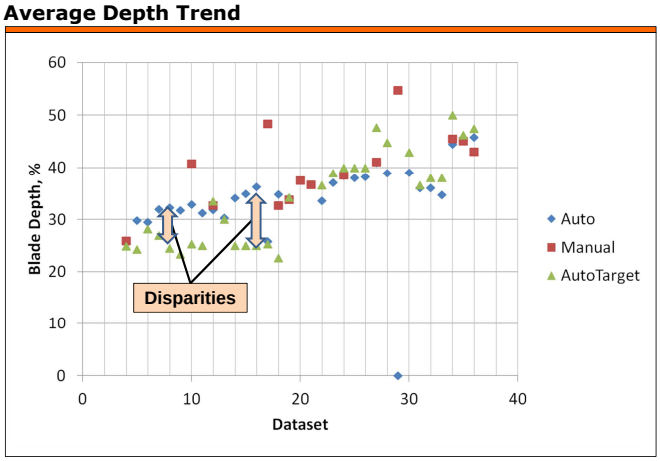


RESULTS: IMPLEMENTATION ON GROWER'S 6-ROW DIGGER

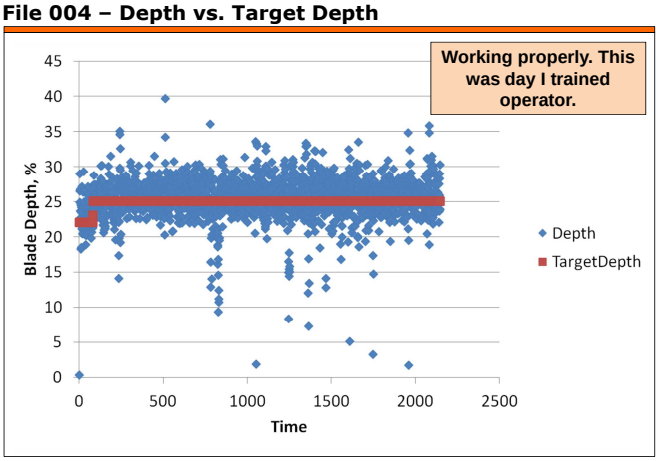
Average Depth Trend



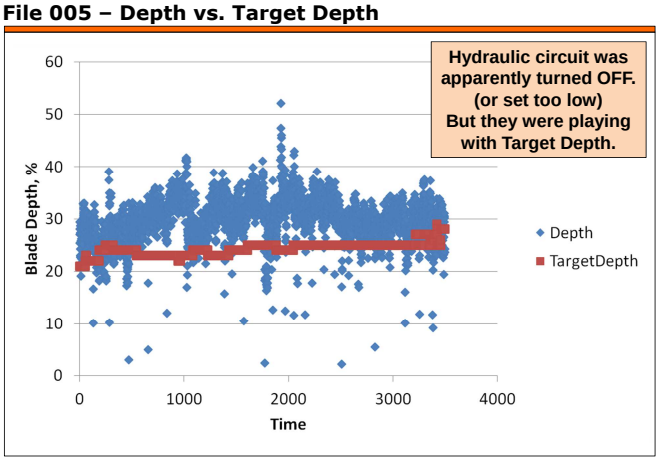
Average Depth Trend



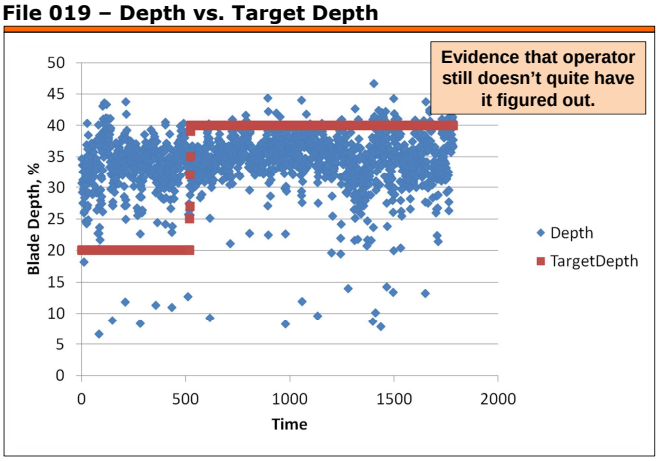
File 004 – Depth vs. Target Depth



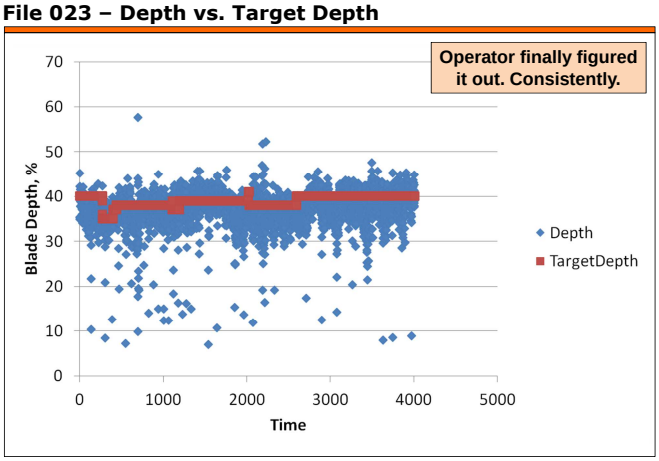
File 005 – Depth vs. Target Depth



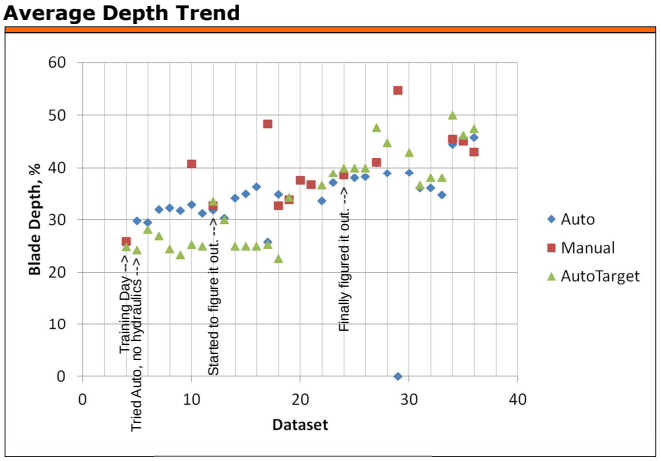
File 019 – Depth vs. Target Depth



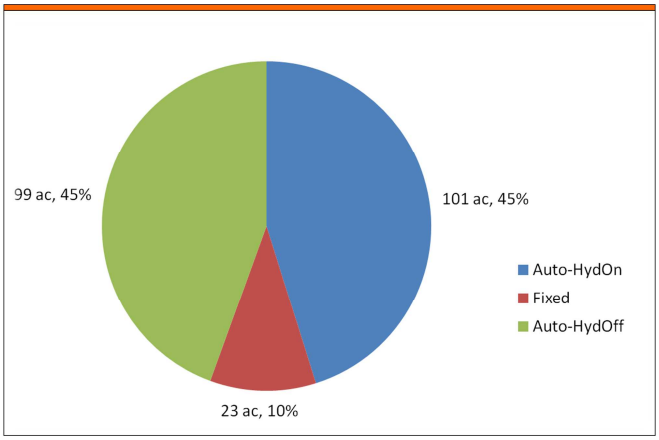
File 023 – Depth vs. Target Depth



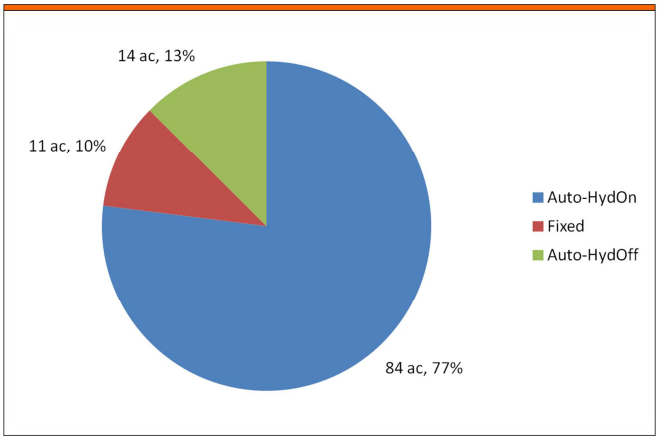
Average Depth Trend



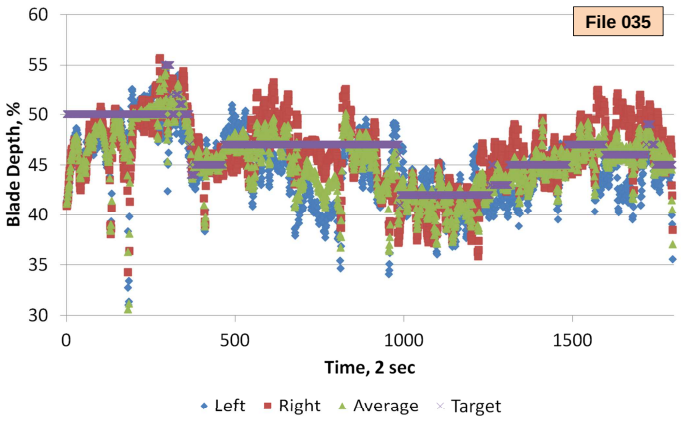
Percent Control Mode – Full Season



Percent Control Mode – Late Season



Depth Gauge Averaging – 10 sec Averages



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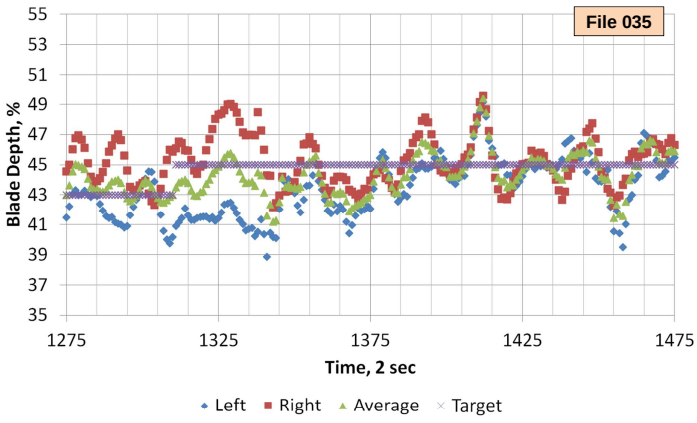

CONCLUSIONS

Conclusions – Blade depth as function of soil EC

- Automatic depth control significantly more stable depth than fixed top link
  - Nix Site Deviation: Auto = 0.2%; Fixed = 2.0%
  - EREC Site Deviation: Auto = 0.16%; Fixed = 0.53%
- Assumption that digger should be set up in heaviest soil should be reevaluated
  - Blade depth for a given digger angle not solely dependent on texture
  - Suggested digger setup location may also be dependent on soil moisture conditions

Automated digging depth technology on 6-row digger

- System design requirements
  - At least two depth gauges are required
  - Hydraulic flow sensing required
  - Custom hydraulic top link required
- Operator reaction/acceptance of technology
  - Immediately after training, operator apparently unclear on correct operation
  - Once comfortable with correct operation, operator apparently preferred automated depth control (77-90% of acreage)

Acknowledgments

Bud Bowers Farm (Luray, SC), Joe Boddiford Farms (Sylvania, GA), Walker Nix Farms (Blackville, SC)