Precision Cultivating Technologies for Improved Weed Control in Cotton

Mark C. Siemens[1], Bill McCloskey[2], Pedro Andrade-Sanchez[1], Blase Evancho[3] and Randy Norton[4]

[1]Dept of Ag. and Biosystems Engineering, [2]School of Plant Science, [3]Pinal/Pima Coop. Extension, [4]Dept of Soil, Water Env. Science, University of Arizona

Background

- Herbicide resistant weeds increasingly problematic in Arizona cotton
- Cultivation effective management tool
- Limitations of standard cultivator
  - Controls only the weeds between crop rows
  - Poor lateral precision

Objectives

- Determine if cultivator weed control efficacy can be improved using:
  - GPS-RTK guided tractors
  - In-row weeding tools
  - Camera guided cultivators

Treatments

1) Conventional – 10” uncultivated (band)
2) GPS-RTK – 6” band
3) GPS-RTK – w/ fingers – 6” band
4) Camera guidance – 3.5” band
5) Camera guidance w/ fingers – 3.5” band

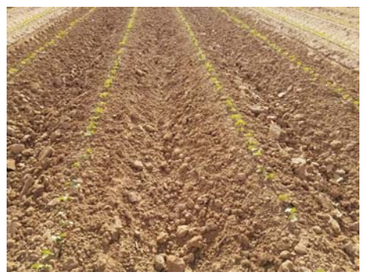
Specialized Equipment

In-row finger weeder

Camera guided cultivator

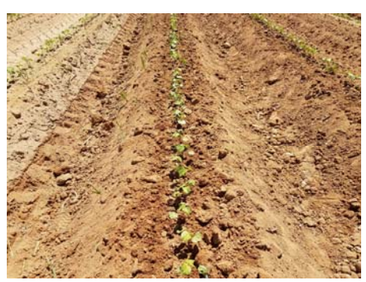
Post Cultivation

GPS-RTK – 6” band



GPS-RTK w/ fingers – 6” band

Cam-Guide – 3.5” band



Cam-Guide w/fingers - 3.5” band

Results

Weed Control Efficacy

Treatment	Prostrate Pigweed	Other Broadleaf	All Grasses	All Weeds
	(%)	(%)	(%)	(%)
Conventional – 10”	80	68	40	68
GPS-RTK – 6”	65	60	57	62
GPS-RTK w/fingers – 6”	87	75	60	75
Cam-Guide – 3.5”	82	95	79	82
Cam-Guide w/fingers- 3.5”	90	97	73	85

Outreach

Field day presentations and demos

On-farm demos

Conclusions (first year study)

- GPS-RTK tractor use did not significantly improve weed control
- Finger weeders
  - Controlled roughly 50% of in-row broadleaf weeds
  - Not effective on LARGE, deep rooted grassy weeds
- Camera guidance
  - Allowed for close cultivation, increasing weed control by ~ 1/3rd
  - In conjunction w/fingers - excellent SMALL broadleaf control (>90%)
- Further study merited

Action Video - https://youtu.be/ooQrn1W1J8Q

Acknowledgements: Project partially funded and supported by Arizona Cotton Growers, Cotton Inc. and K.U.L.T.-Kress, LLC.