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EXTENSION

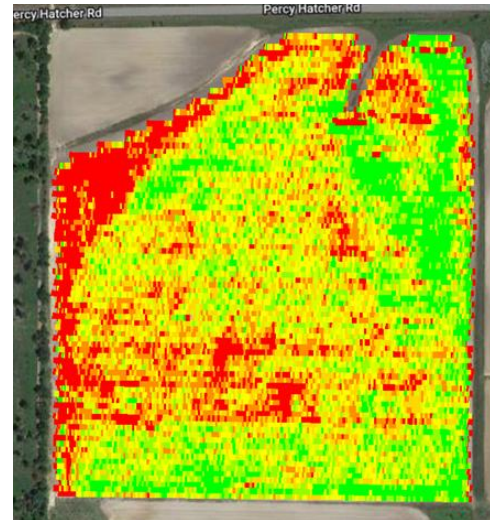
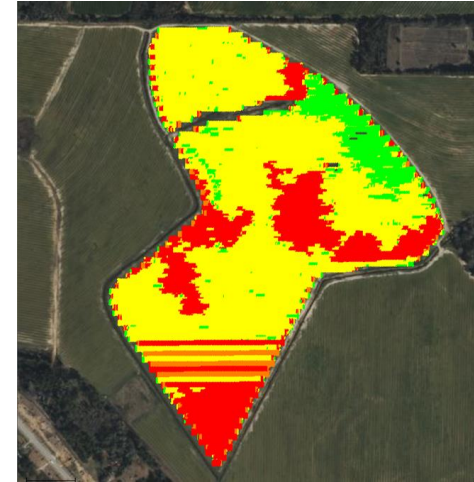
Precision Ag Technology Applications and Considerations in Row-Crops

Simer Virk

Extension Precision Ag Specialist
University of Georgia

Precision Ag Technology Applications

- **Fertilization:** Precision soil sampling and variable-rate applications
- **Planting:** Precision seed metering and placement
- **Pest Management:** Section control, rate controller and nozzle type/droplet size
- **In-Season Crop Management:** in-season aerial imagery, VR applications and aerial application technologies
- **Harvest:** Yield monitoring and mapping



Precision Soil Sampling – Optimal Grid Size



1.0 ac



2.5 ac



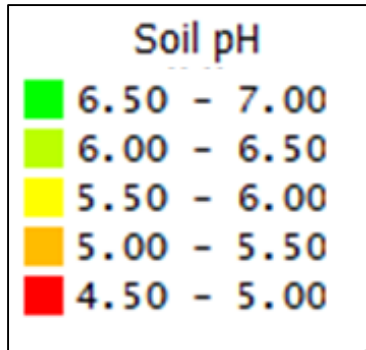
5.0 ac



7.5 ac



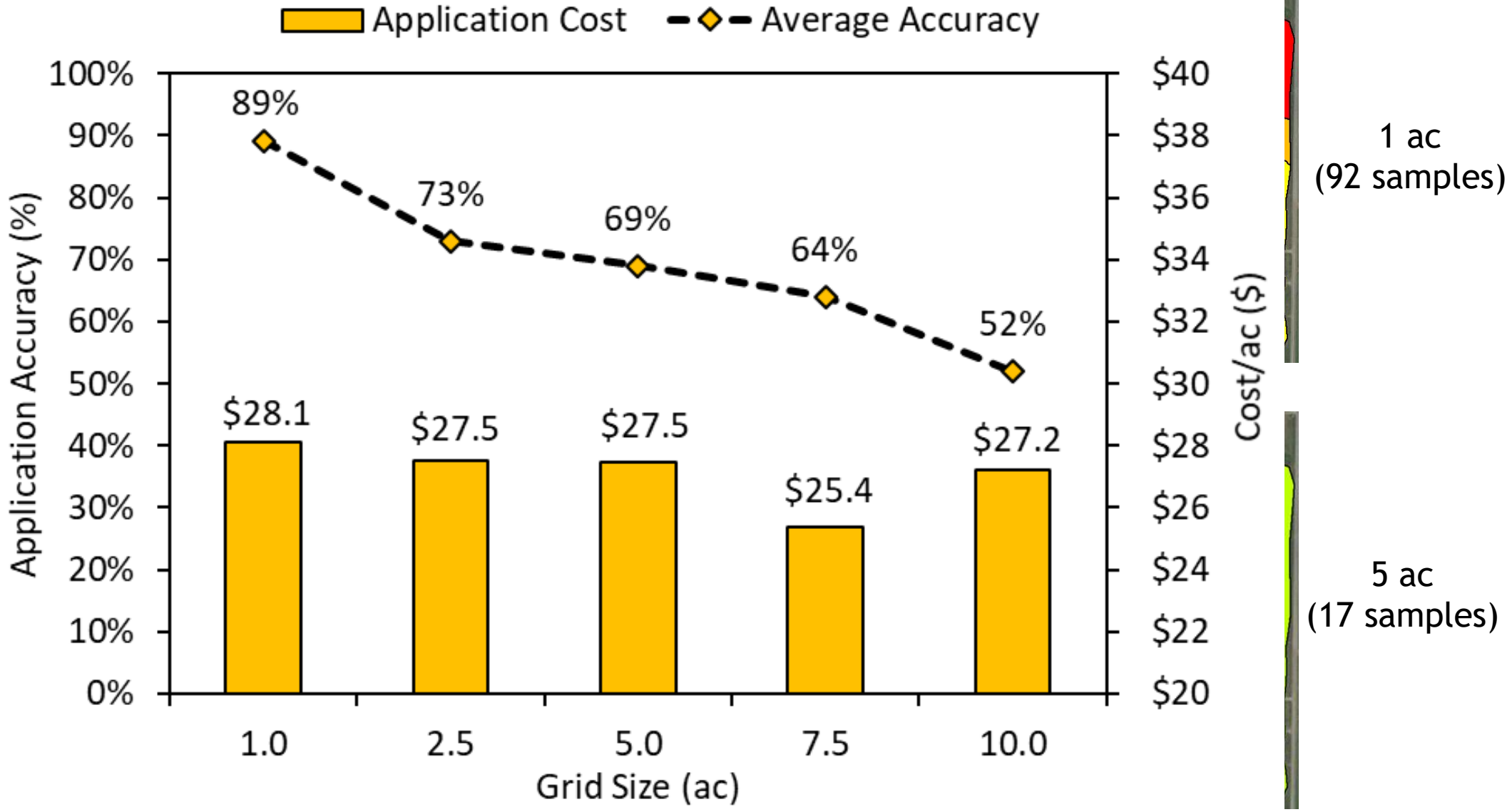
10.0 ac



Actual Soil pH
Variability
(163 Samples)



2.5 ac
(35 samples)



Grid Size – Accuracy vs Cost

Field 1

Grid Size	Accuracy (%)	Cost (\$/ac)
1.0	89	20
2.5	85	14
5.0	75	15
7.5	66	20
10.0	34	17

Field 2

Grid Size	Accuracy (%)	Cost (\$/ac)
1.0	87	43
2.5	66	35
5.0	51	31
7.5	46	33
10.0	45	41

Field 3

Grid Size	Accuracy (%)	Cost (\$/ac)
1.0	95	34
2.5	93	30
5.0	87	32
7.5	62	30
10.0	30	39

Does a fixed grid size adequate for all fields?

Field 1

Lime

Grid Size	Accuracy (%)	Cost (\$/ac)
1.0	89	20
2.5	85	14
5.0	75	15
7.5	66	20
10.0	34	17

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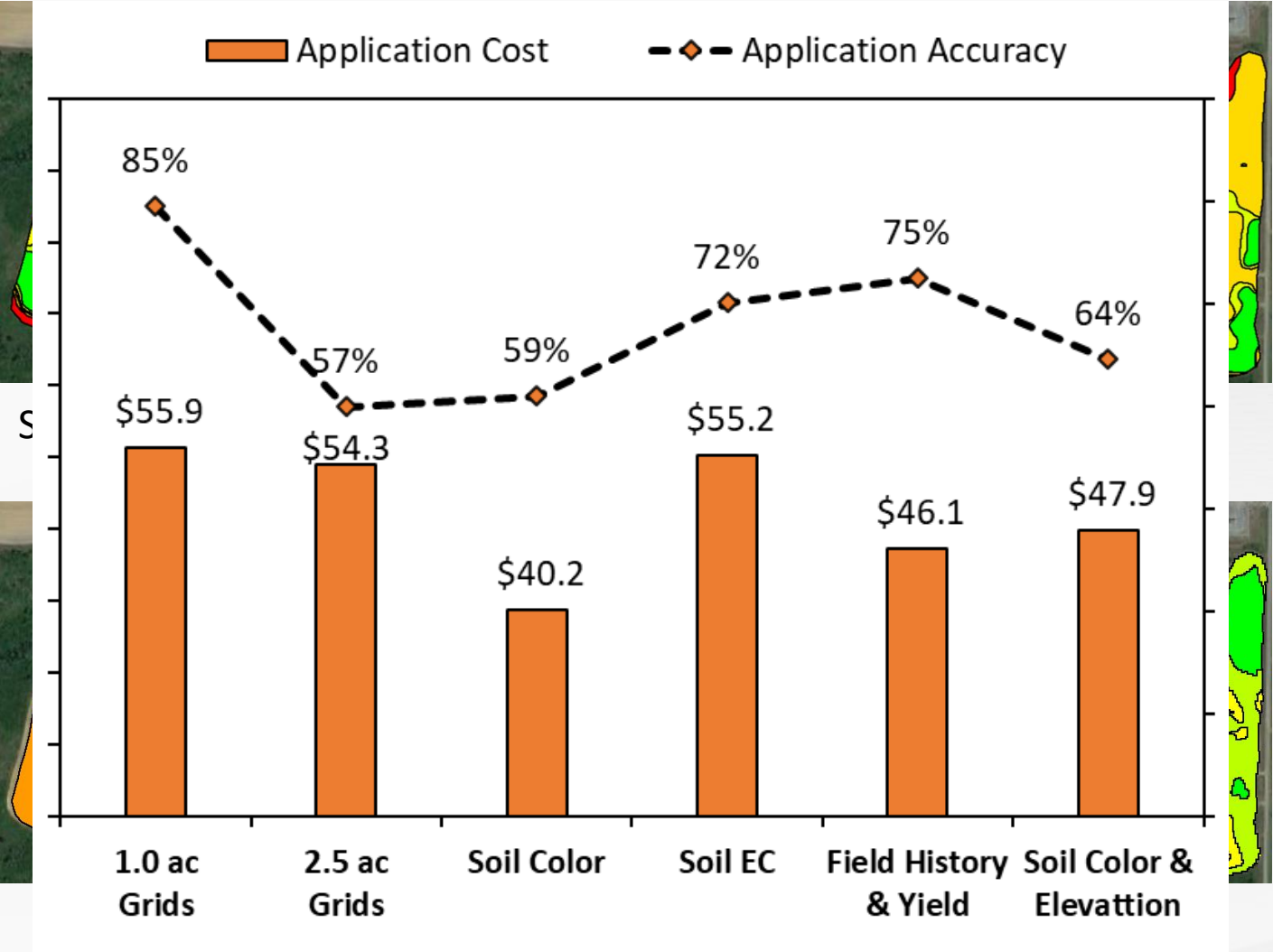
Grid Size	Accuracy (%)	Cost (\$/ac)
1.0	92	16
2.5	82	15
5.0	70	13
7.5	74	14
10.0	77	10

K

Grid Size	Accuracy (%)	Cost (\$/ac)
1.0	88	89
2.5	72	85
5.0	66	82
7.5	49	86
10.0	44	86

How do we make a grid size decision here?

Zone Sampling Strategies



Each zone = 3 - 10 soil cores mixed together to make a composite sample

Overall less number of soil samples

Planting Technologies

Timely and uniform stand establishment is critical to maximize yield potential!

- ✓ Seeding Rate
- ✓ Seeding Depth
- ✓ Seed Spacing

Seed Monitor: (by-row feedback)

- Population (over or under)
- Seed Singulation (98 - 100%)



Seed Singulation



$$\text{Singulation (\%)} = 100 - \text{skips (\%)} - \text{multiples (\%)}$$

What affects singulation?

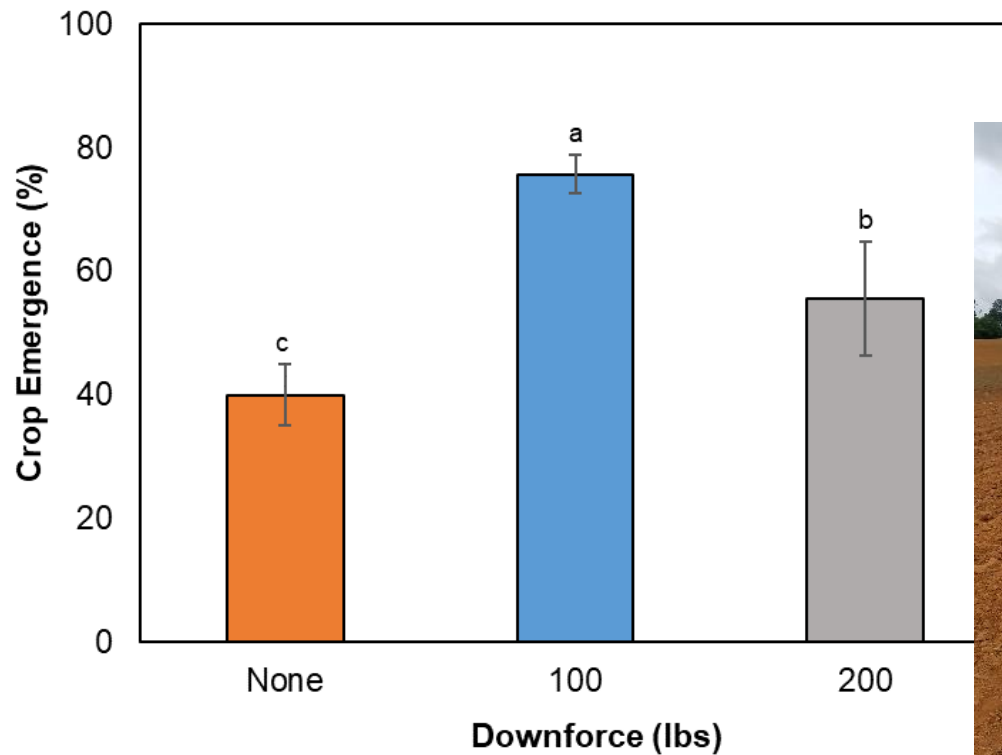
- Seed meter setup
- Planter settings (e.g. vacuum)
- Ground speed
- Row-unit vibration
- Field conditions.....

Singulation Map

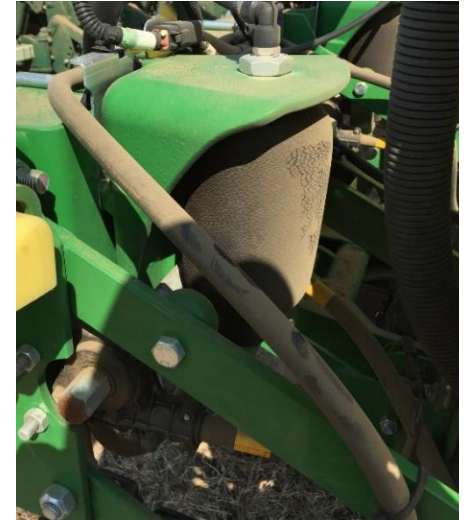
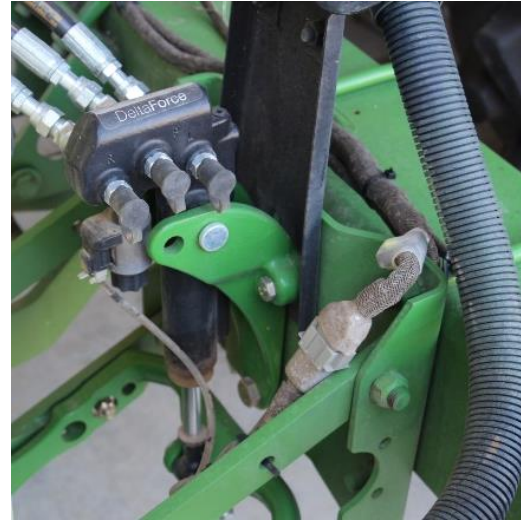
Seeding Depth and Downforce

For Corn and Cotton:

- Both **not enough** and **too much downforce** can affect stand establishment



Downforce Technology



Active Downforce Systems

Benefits:

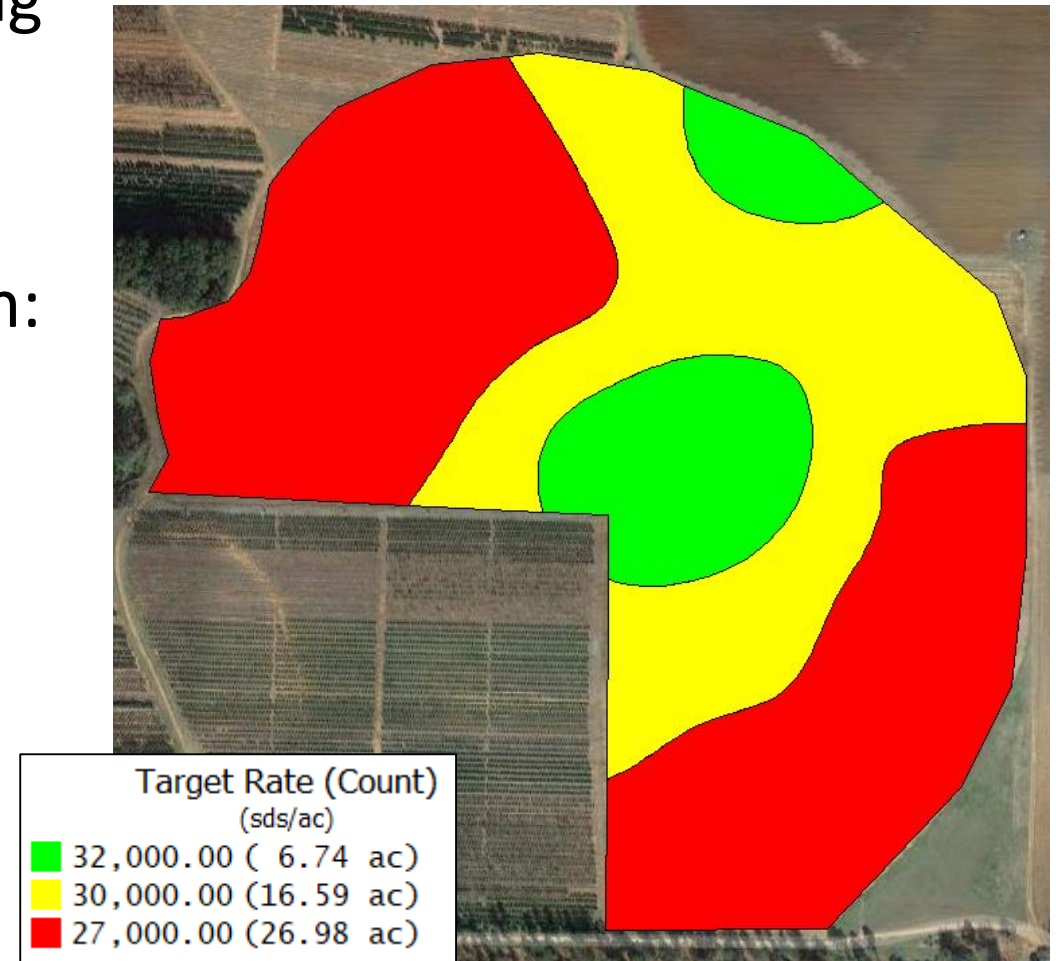
- Enable automatic downforce adjustments as field conditions change
- Improves seed placement in varying field conditions

Variable-Rate Seeding

Why? Optimize inputs spatially by matching population with productivity zones.

How? Management Zones can be based on:

- Irrigation
- Soil Type
- Yield History
- Soil EC (organic matter etc.)



Zones based on Soil Type and Yield History

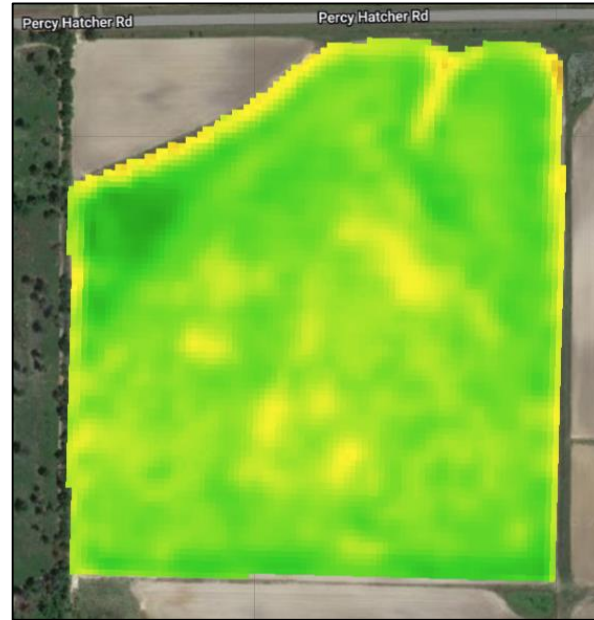
Variable-Rate Seeding



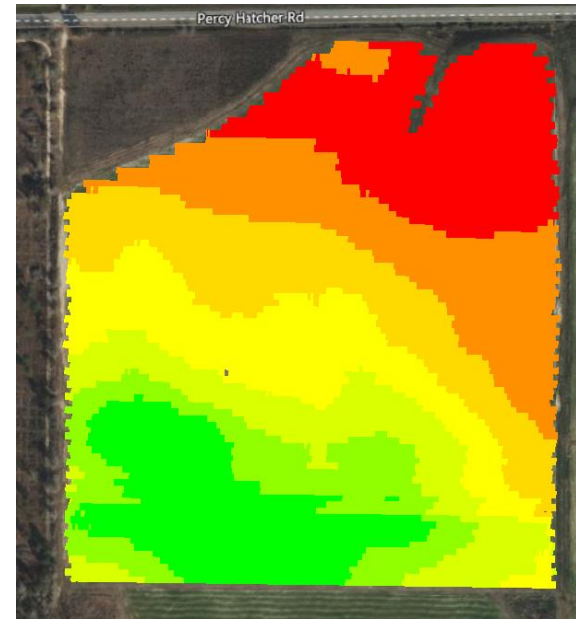
Management Zones



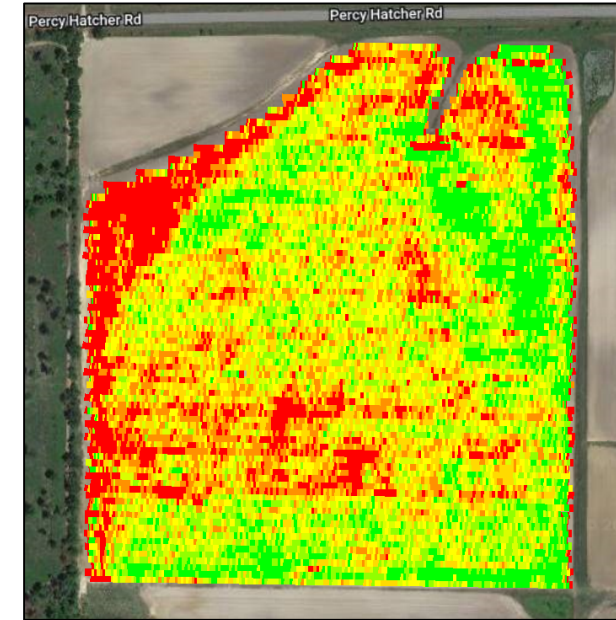
Soil Type or Texture



In-season crop imagery



Elevation

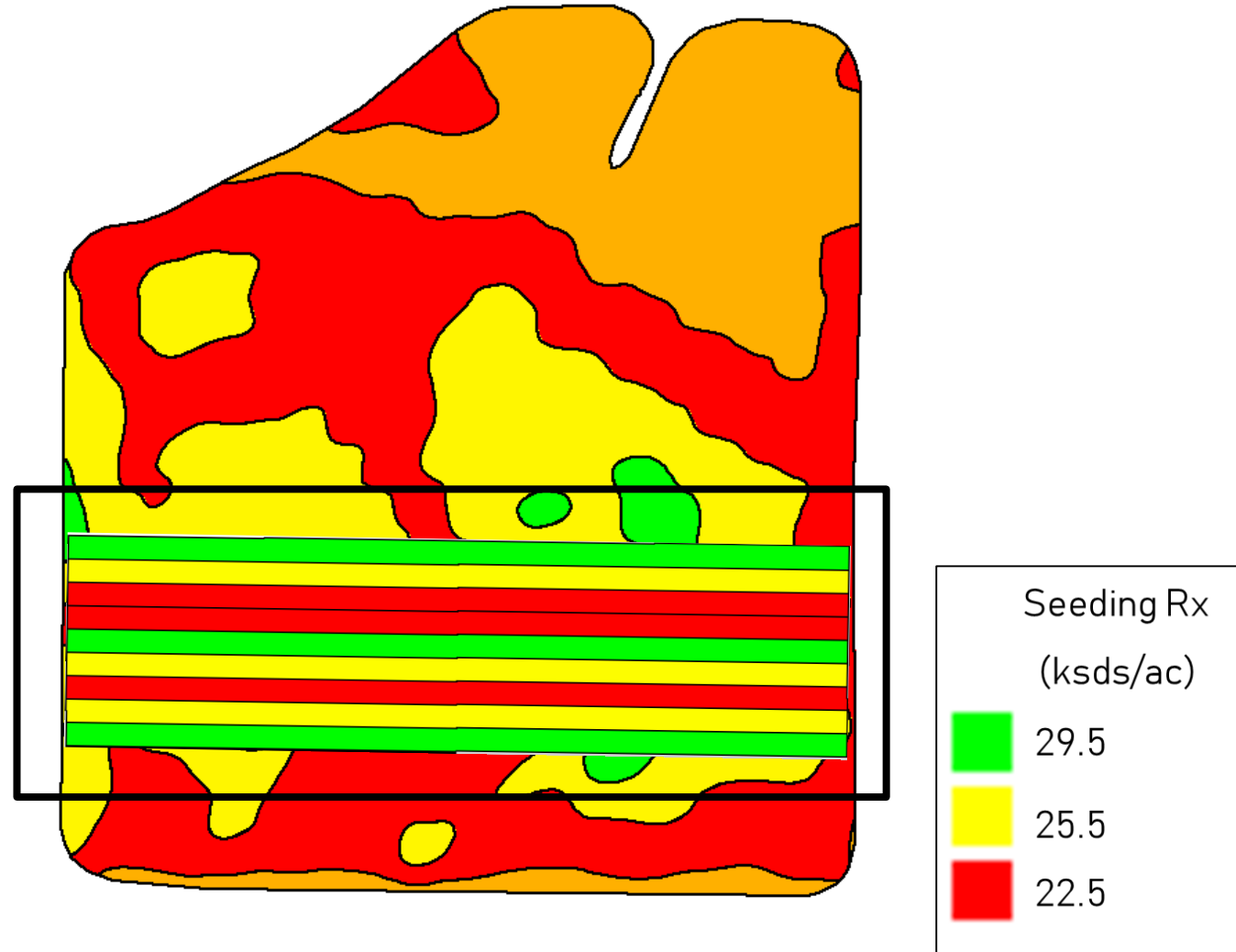


Yield Map

Delineating management zones using different soil and/or crop spatial attributes

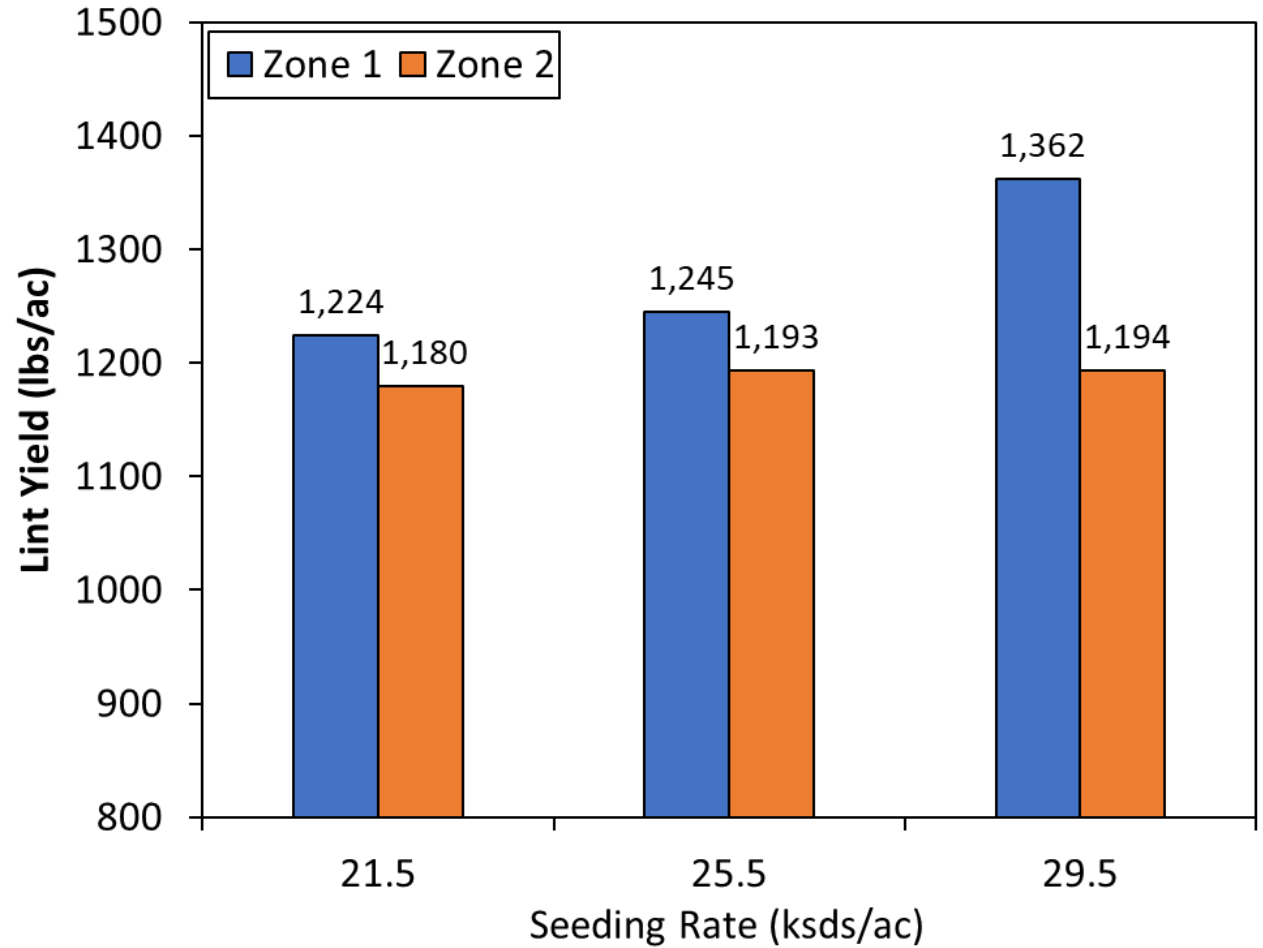
Seeding Rate Strips

- Two to three zones in each field
- Three Seeding Rates
 - 22.5 (ksds/ac)
 - 25.5 (ksds/ac)
 - 29.5 (ksds/ac) (*Grower Nominal*)
- Three replications and seeding rates randomized within each replication
- Each pass represented a seeding rate (800 - 1350 ft length)



Crop Emergence and Yield

Zone	Target Rate (ksds/ac)	Population (plants/ac)	Emergence* (%)
1	21.5	16,590 a	77%
1	25.5	19,494 b	76%
1	29.5	22,506 c	76%
<hr style="border-top: 1px dashed black;"/>			
2	21.5	17,935 a	83%
2	25.5	21,780 b	85%
2	29.5	24,119 c	82%

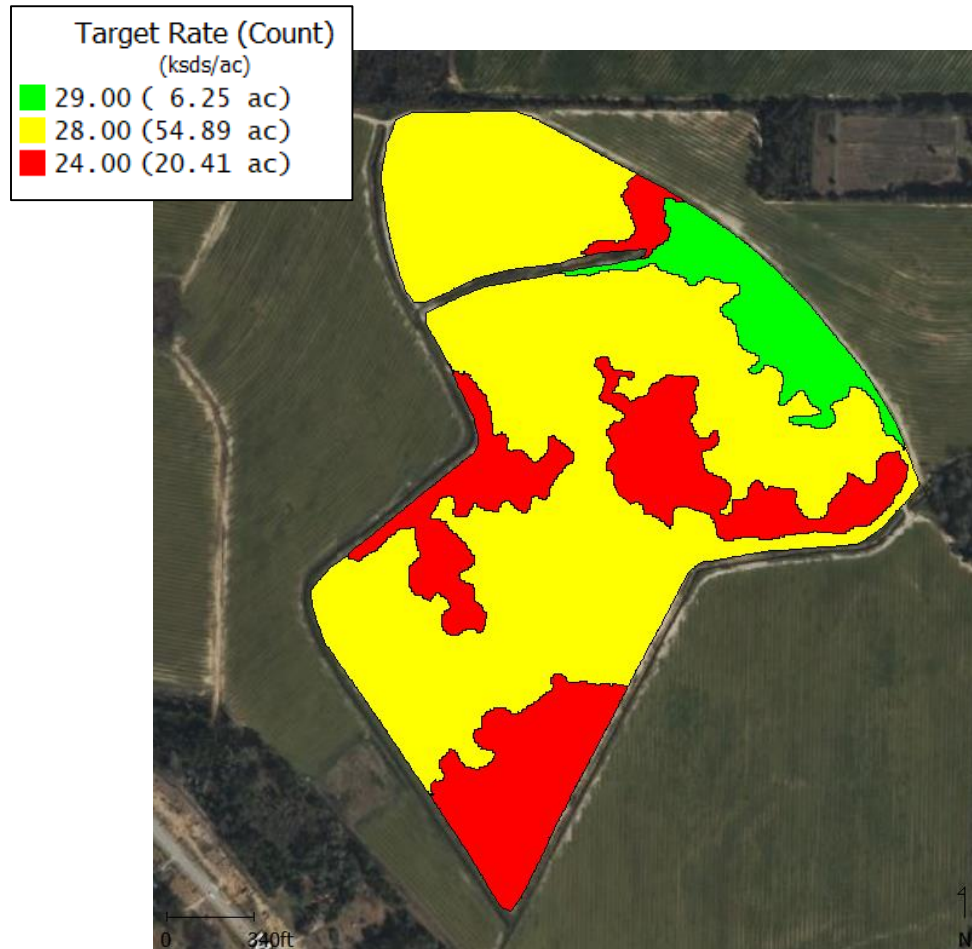


Cotton Seeding Rate Vs Yield Economics

Zone	Seeding Rate (seeds/ac)	Lint Yield (lbs/ac)	Gross Rev. per acre	Seed Cost (\$/ac)	Net Rev. per acre
1	22.5	1,224	\$1,004	\$62	\$942
1	25.5	1,245	\$1,021	\$70	\$951
1	29.5	1,362	\$1,117	\$81	\$1,035
2	22.5	1,180	\$968	\$62	\$906
2	25.5	1,193	\$978	\$70	\$908
2	29.5	1,194	\$979	\$81	\$898

*UGA Cotton Enterprise Budget: \$2.76/1000 seeds
Cotton price: \$0.82/lb

Variable-Rate Seeding - 2023



VR Seeding Prescription (Rx) Map



As-Applied (Planted) Map

Pest Management – Spray Technologies

Basic Spray Technologies:

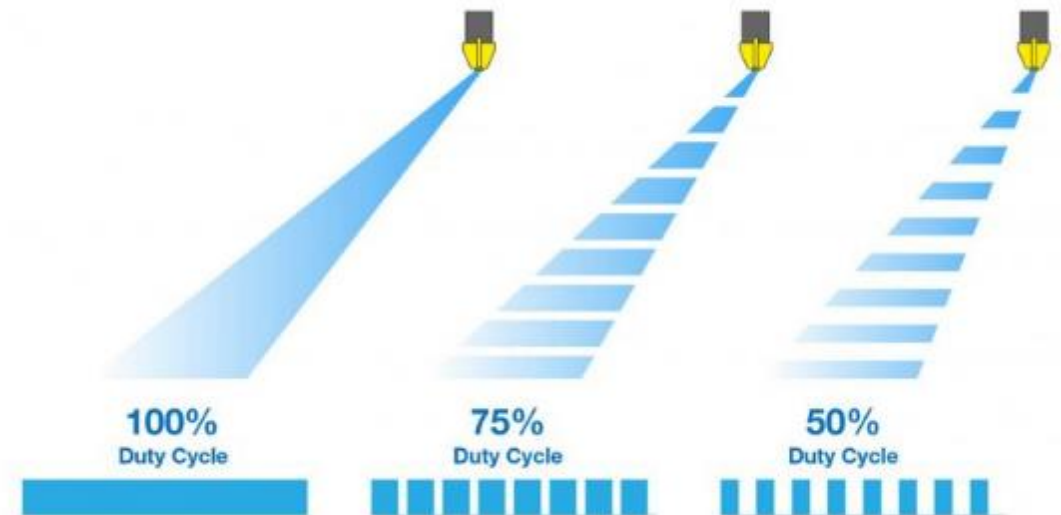
- Rate controller
- Automatic section control



Pulse-Width Modulation (PWM) Technology



- Constant spray pressure across the boom (droplet size control)
- Flow (rate) changes are accomplished by varying duty cycle

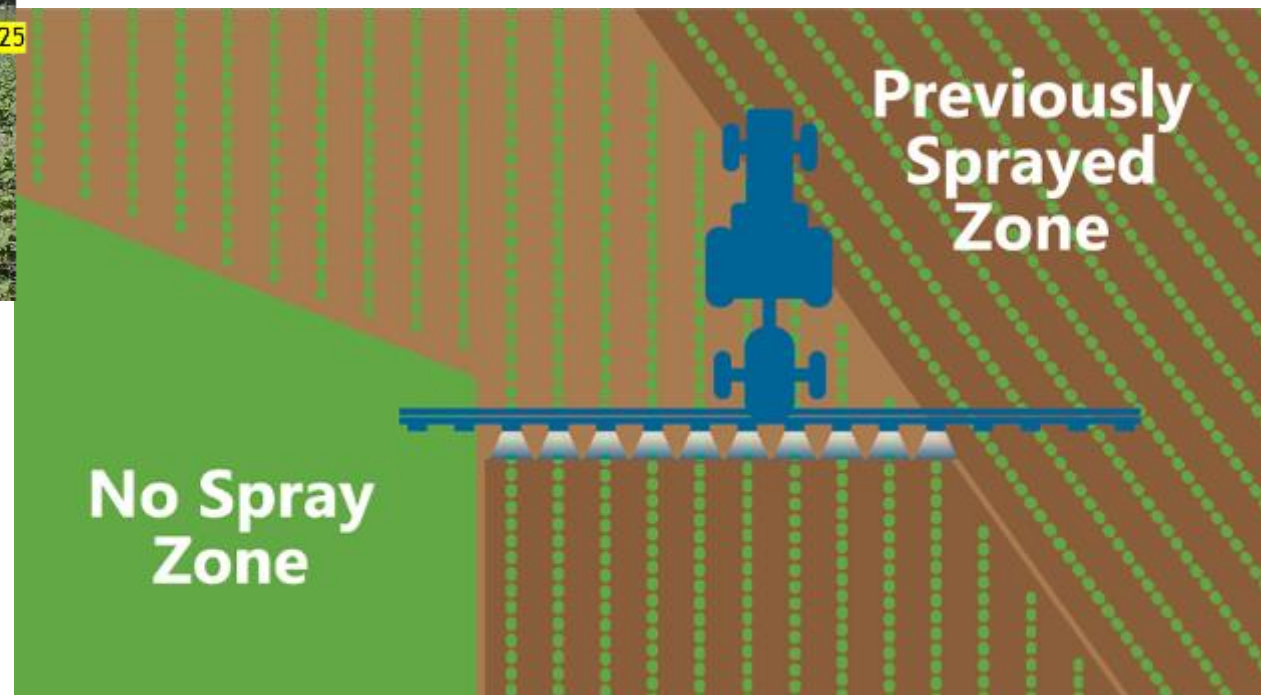


Individual Nozzle Control



- Individual nozzles can turn ON/OFF as they come out of spray and non-spray/already sprayed areas.

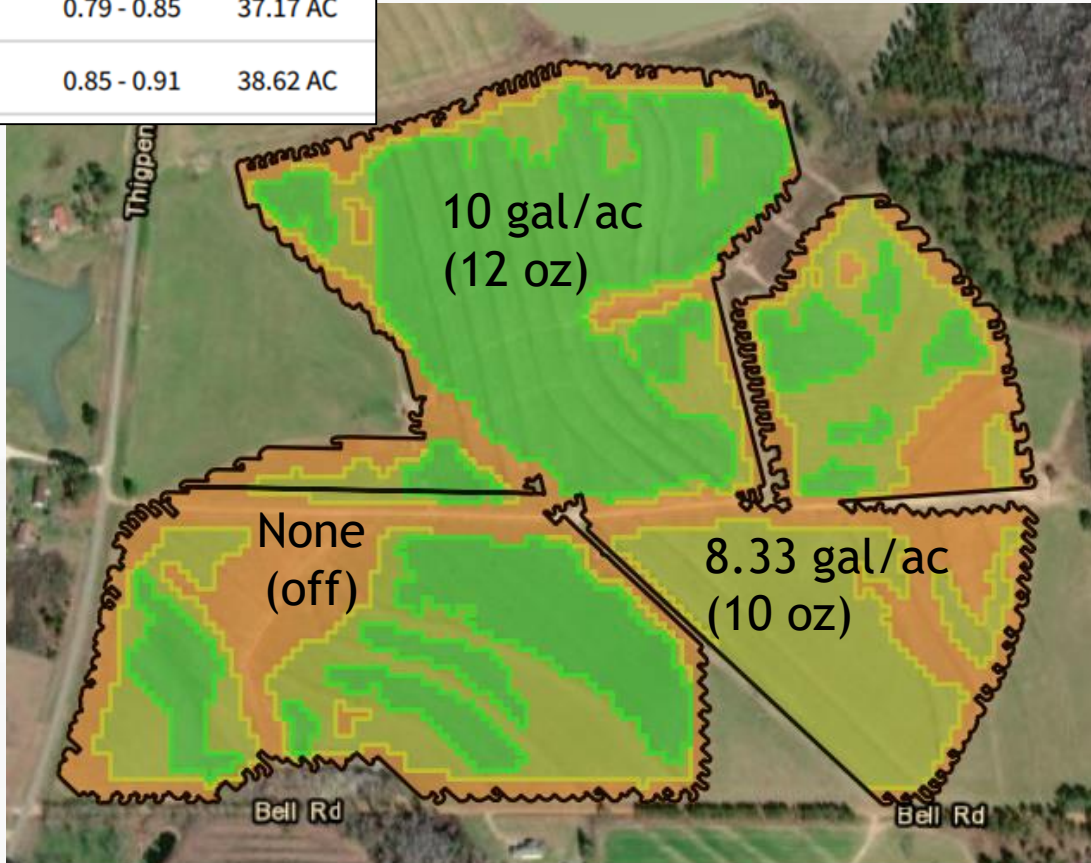
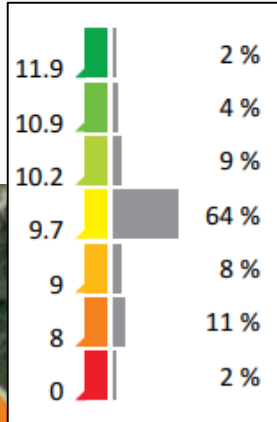
- Reduction in over-application and application in environmentally sensitive areas.



Plant Growth Management

(Variable-Rate PGR Applications)

ZONE	SPAN	AREA
1	0.3 - 0.79	31.57 AC
2	0.79 - 0.85	37.17 AC
3	0.85 - 0.91	38.62 AC

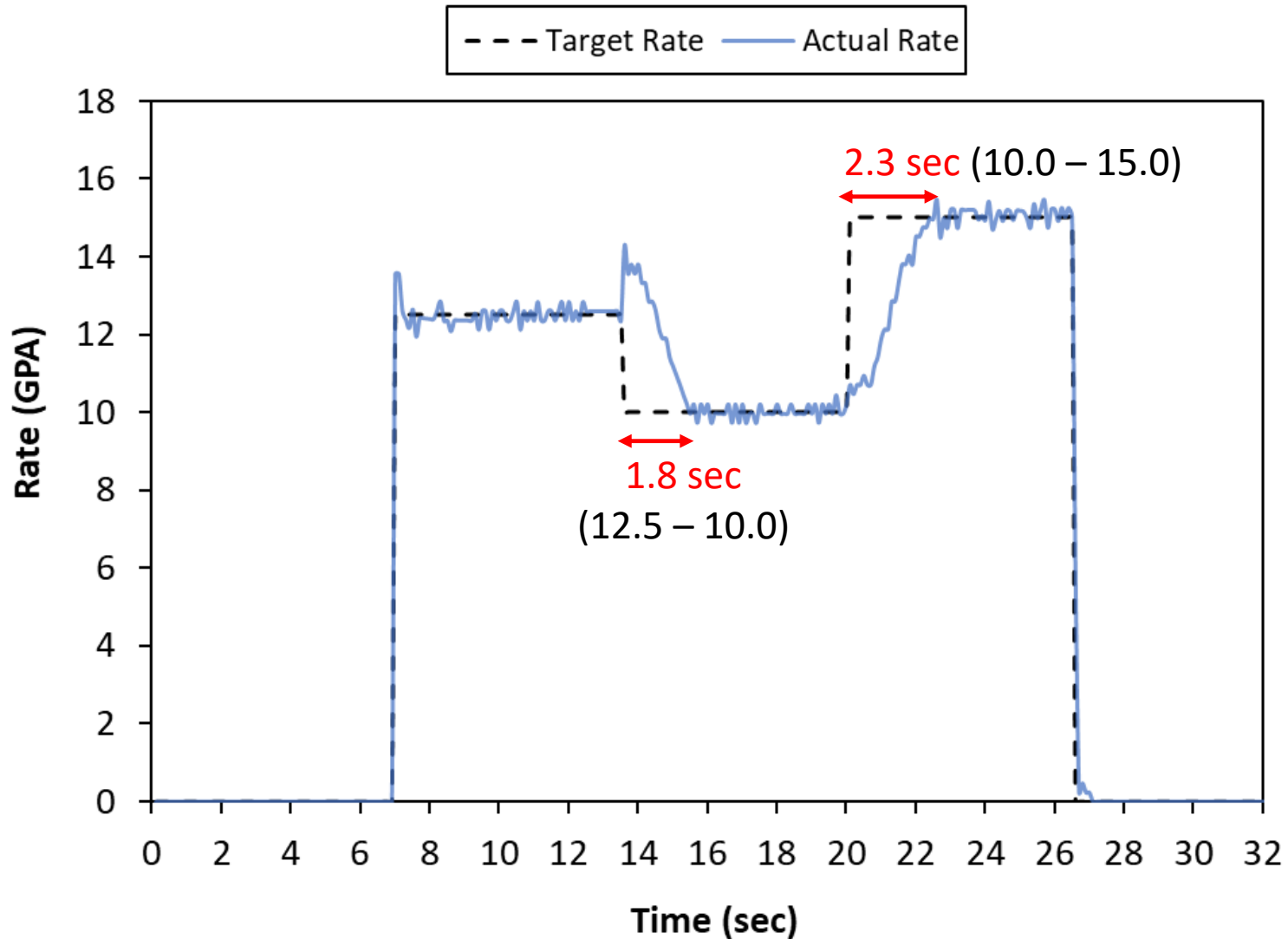


In-season aerial imagery



As-applied PGR Map

Sprayer Accuracy – VR Application

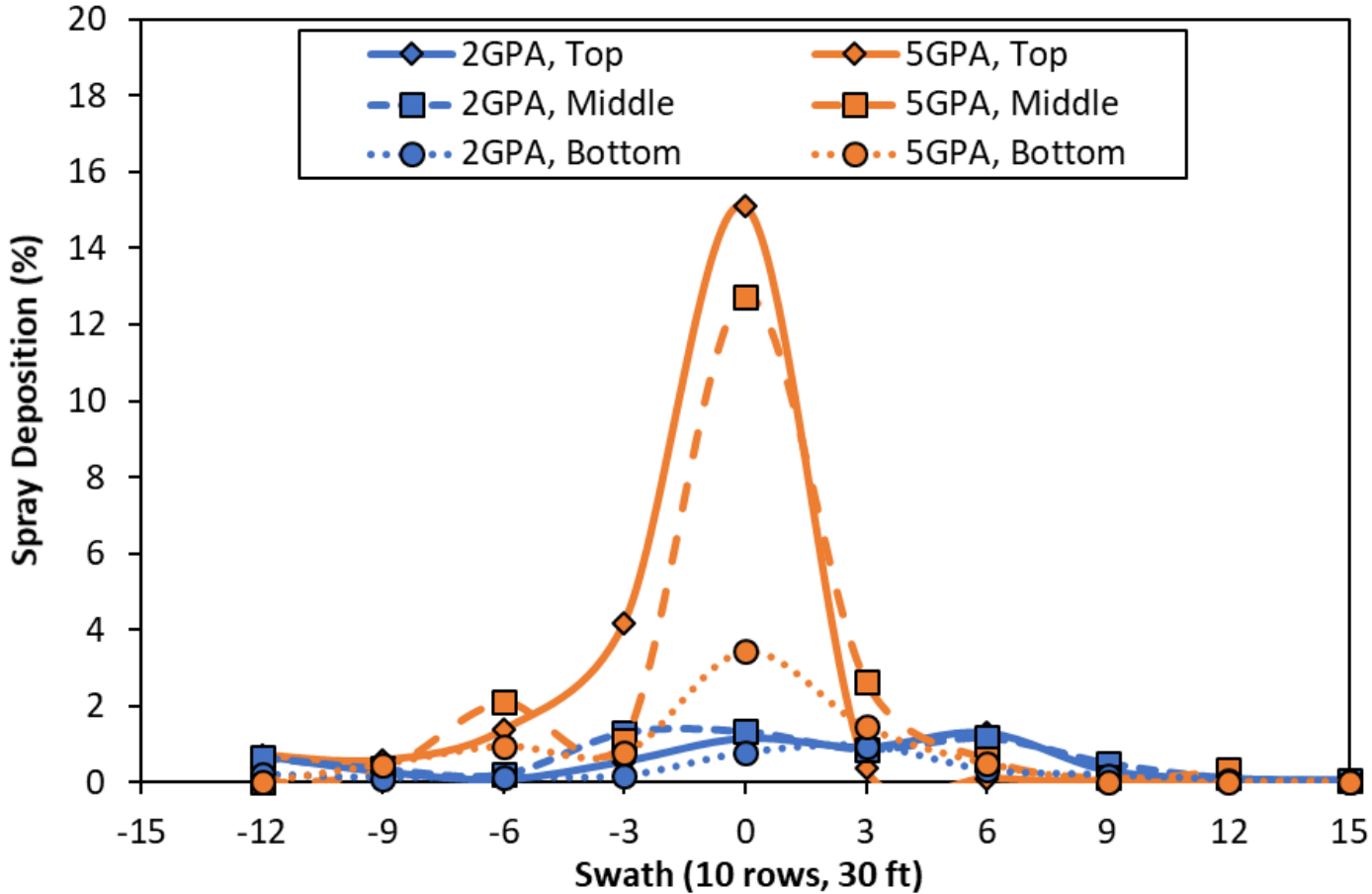


Ground Speed (mph)	Length required for rate stabilization (ft)
8	28
10	35
12	42
14	49
16	56

Spray Drone Applications



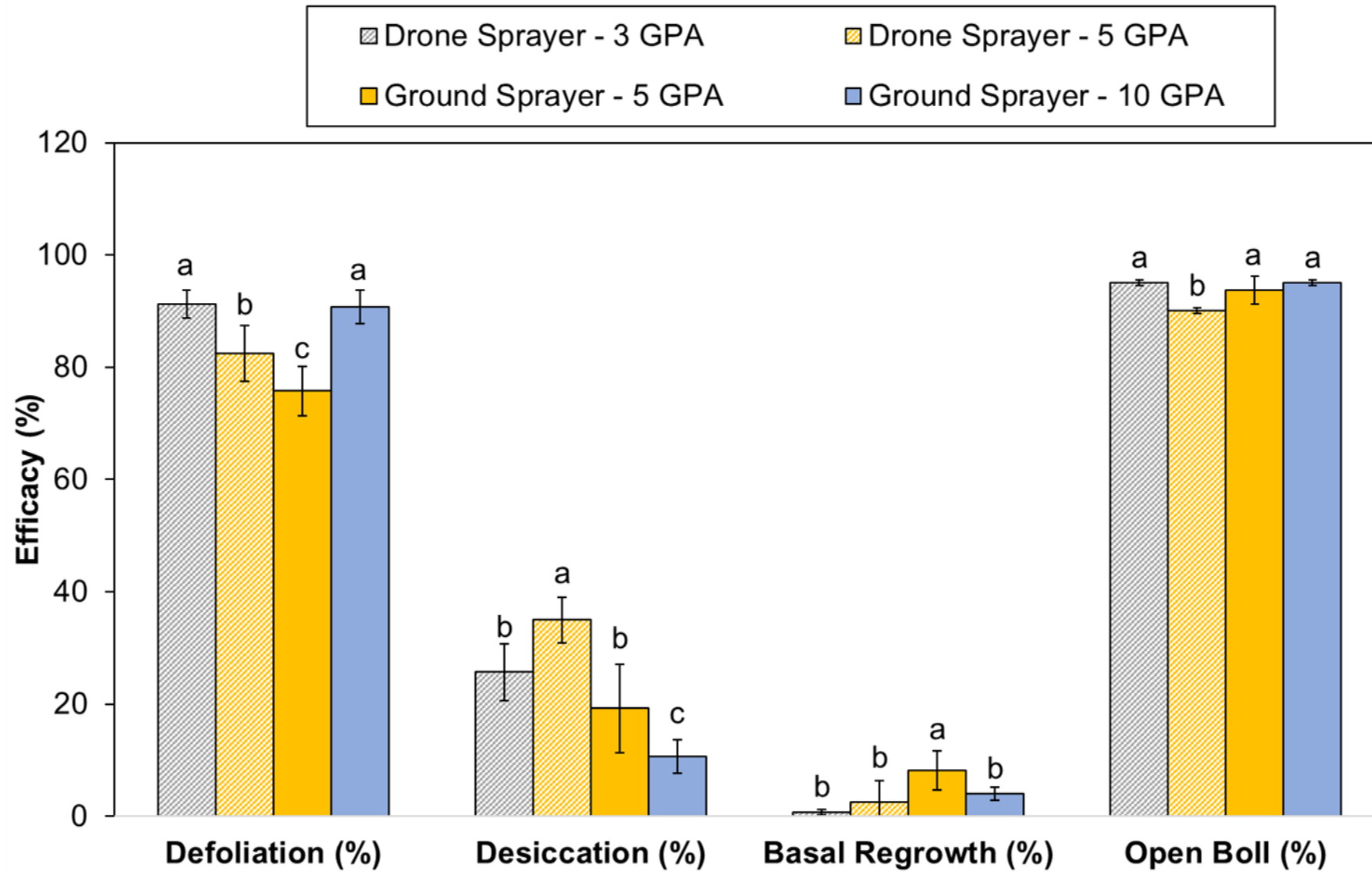
Corn Fungicide Efficacy



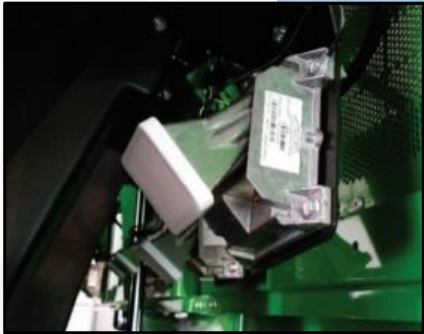
Disease ratings (Tar Spot, Northern Corn Leaf Blight and Southern Corn Rust) at Tifton Site

Treatment	TS (%)	NLB (%)	SCR (%)
2 GPA	0.0685	1.97 b	0.0351 b
5 GPA	0.0000	0.03 b	0.0067 b
Control	0.0074	6.70 a	0.4345 a

Cotton Defoliation Efficacy



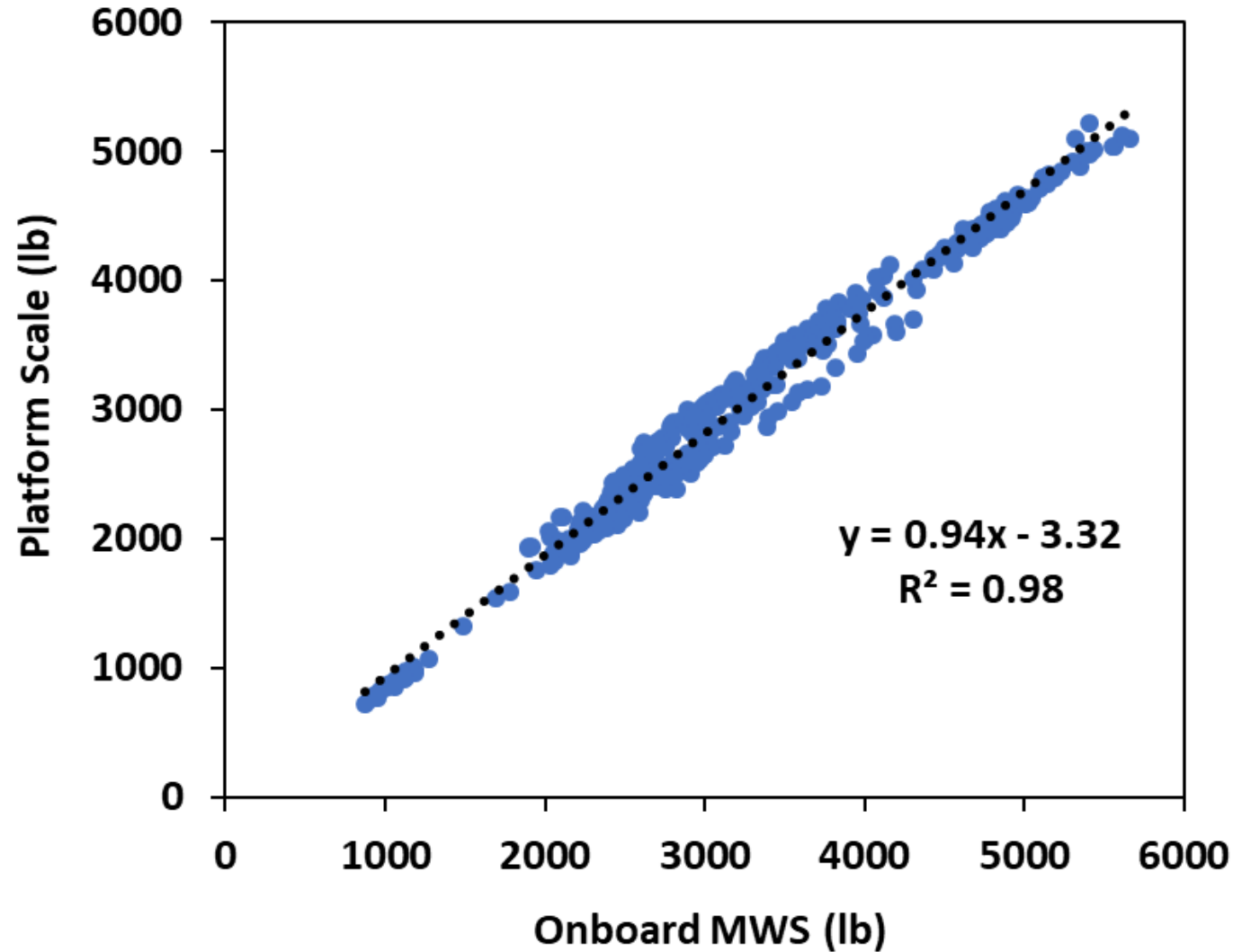
Harvest Technologies



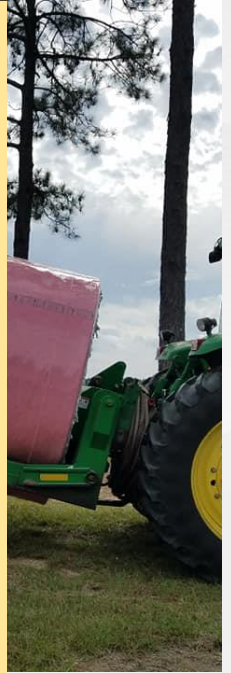
Harvest Technologies



Yield	Pass#	Area (ac)
	Pass1	1.12
	Pass2	1.11
	Pass3	1.11
	Pass4	1.10
	Pass5	1.12
	Pass6	1.11
	Pass7	1.11
	Pass8	1.10
	Pass9	1.12

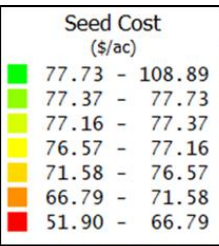


Error (%)	Platform
9.0	
7.6	
9.2	
7.8	
-2.7	
7.0	
8.0	
-1.9	
11.8	

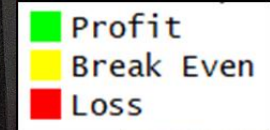


7.2%

Tools for Data Management and Analysis



Seed Cost per Acre



Profit/Loss per acre

Thanks!

Simer Virk

Extension Precision Ag Specialist

University of Georgia – Tifton

Email: svirk@uga.edu

Phone: (334) 750-8130

Twitter: @PrecAgEngineer