Building on our Strengths in Precision Agriculture to Advance Peanut Production

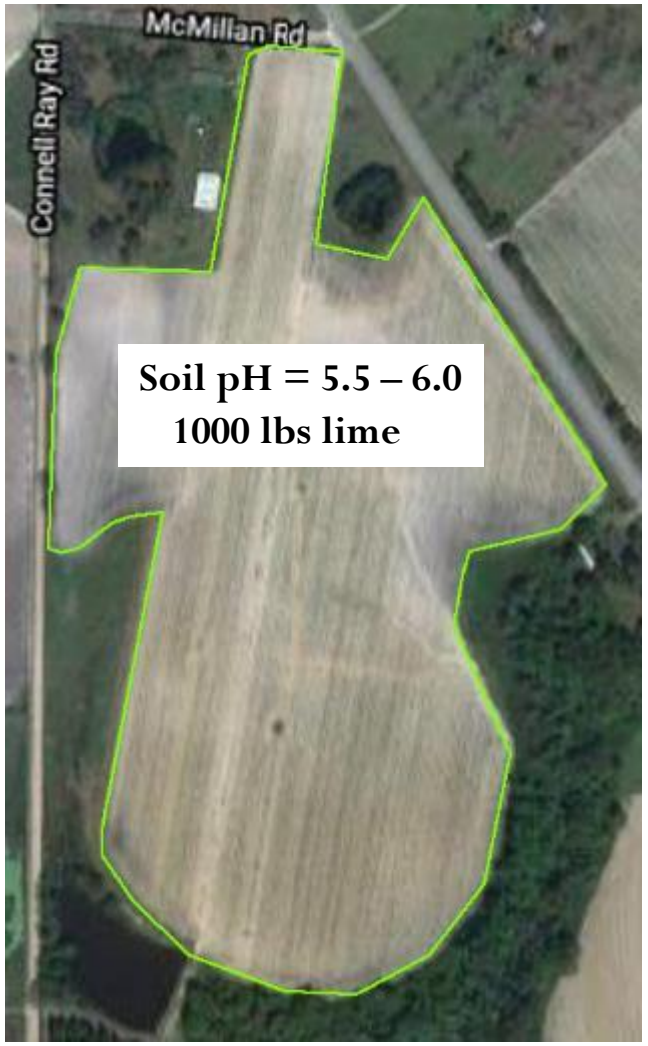
Simer Virk
Assistant Professor &
Extension Precision Ag Specialist
University of Georgia
@PrecAgEngineer

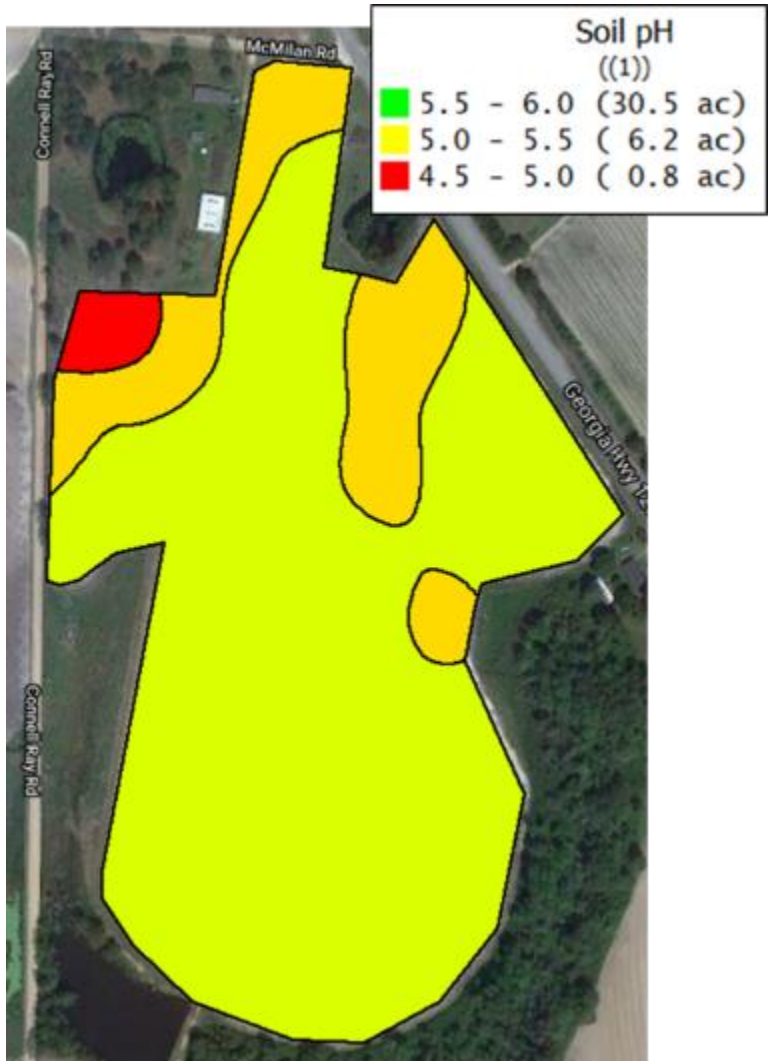
UNIVERSITY OF GEORGIA
EXTENSION

UNIVERSITY OF GEORGIA
DIGITAL AG

Precision Ag Applications in Peanut Production

Uniform Vs Variable-Rate Liming



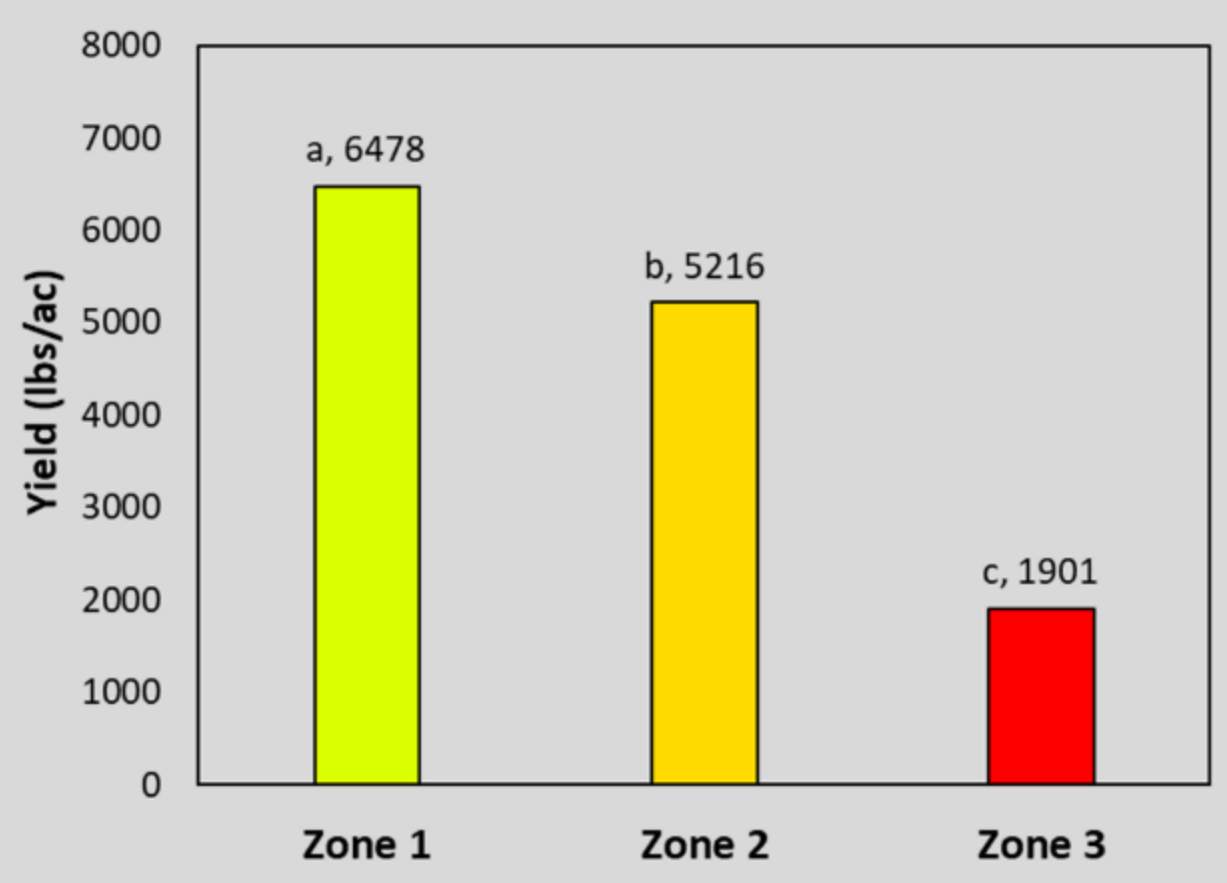


Soil Sampled using 2.5-ac grids

Soil pH: 5.50 – 6.00

Soil pH: 5.00 – 5.50

Soil pH < 5.00



Field	Size (acres)	Uniform Application — Rate (tons/ac)	Cost ($/ac)	Yield (lbs/ac)	Gross Rev. ($/ac)
Zone 1	30.5	0.5	$19	6,478	$1,376
Zone 2	6.2	0.5	$19	5,216	$1,108
Zone 3	0.8	0.5	$19	1,901	$404
Average/ac			**$19**	**6,171**	**$1311**

Field	Size (acres)	Variable-Rate Application — Rate (tons/ac)	Cost ($/ac)	Yield* (lbs/ac)	Gross Rev. ($/ac)
Zone 1	30.5	0.5	$19	6,478	$1,376
Zone 2	6.2	1.0	$38	6,000	$1,275
Zone 3	0.8	1.5	$57	4,000	$850
Average/ac			**$23**	**6,346**	**$1348**

Precision soil sampling and variable-rate lime application can increase the revenue by $27/ac in this field

(On average, past studies show average cost return of $14-$20 from GPS soil sampling and $VRT)

Precision Soil Sampling Strategies

Traditional Soil Sampling

(1-2 composite sample)

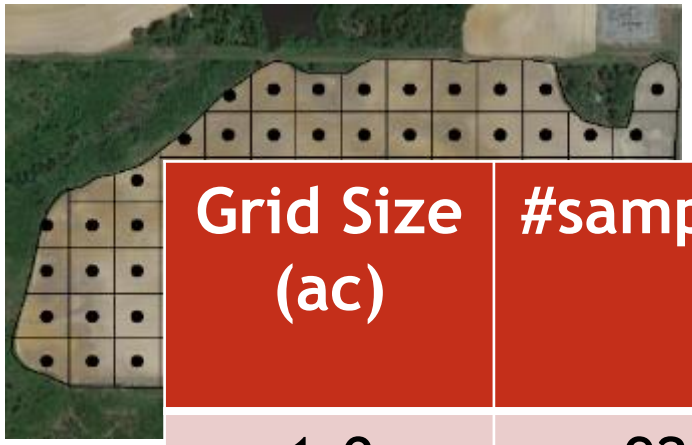
Grid Soil Sampling

(uniform sized grids)

Zone Soil Sampling

(zones based on certain soil/crop properties)

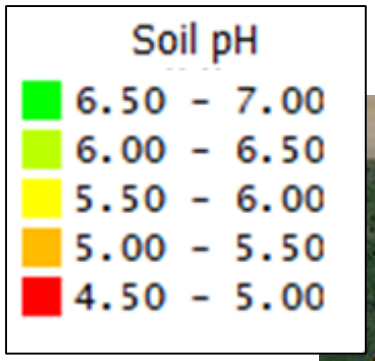
Is there an optimal grid size for precision soil sampling & VR liming?



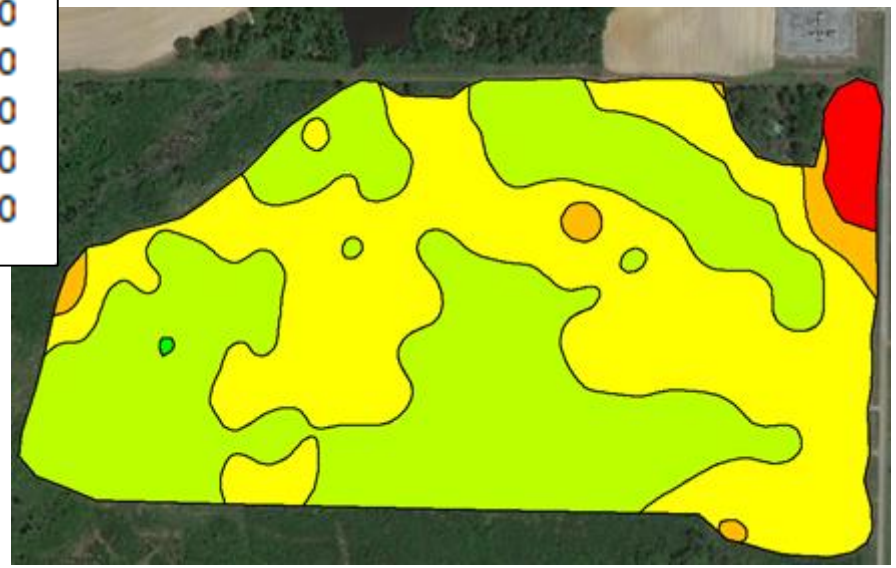
Grid Size (ac)	#samples	Soil Sampling/ Labor Costs ($)	Sample Analysis Costs ($)	Total Cost ($)
1.0	92	460	552	1012
2.5	35	414	210	624
5.0	17	368	102	470
7.5	13	368	78	446
10.0	8	368	48	416

7.5 ac

10.0 ac



Actual Soil pH Variability (163 Samples)



1 ac (92 samples)

2.5 ac (35 samples)

5 ac (17 samples)

Grid Size – Application Accuracy vs Cost

Field 1

Grid Size	Accuracy (%)	Cost ($/ac)
1.0	90	20
2.5	85	14
5.0	75	15
7.5	66	20
10.0	34	17

Field 2

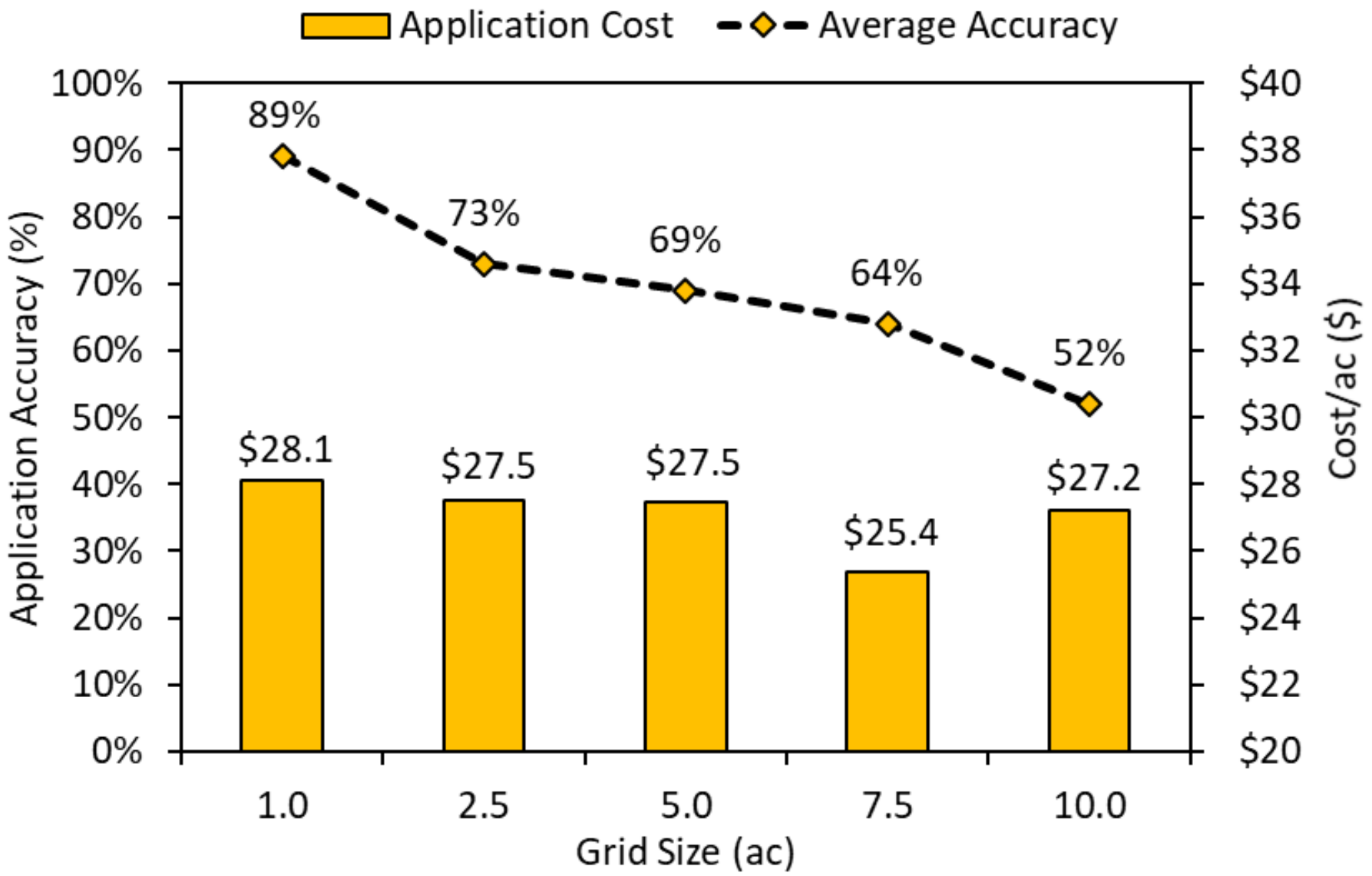
Grid Size	Accuracy (%)	Cost ($/ac)
1.0	87	43
2.5	66	35
5.0	51	31
7.5	46	33
10.0	45	41

Field 3

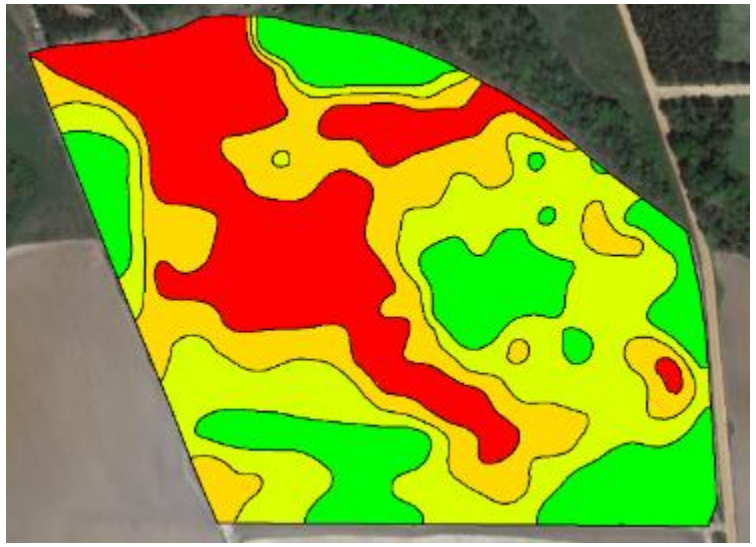
Grid Size	Accuracy (%)	Cost ($/ac)
1.0	95	34
2.5	93	30
5.0	87	32
7.5	62	30
10.0	30	39

Application Cost = Soil sampling cost + soil analysis cost + cost of lime

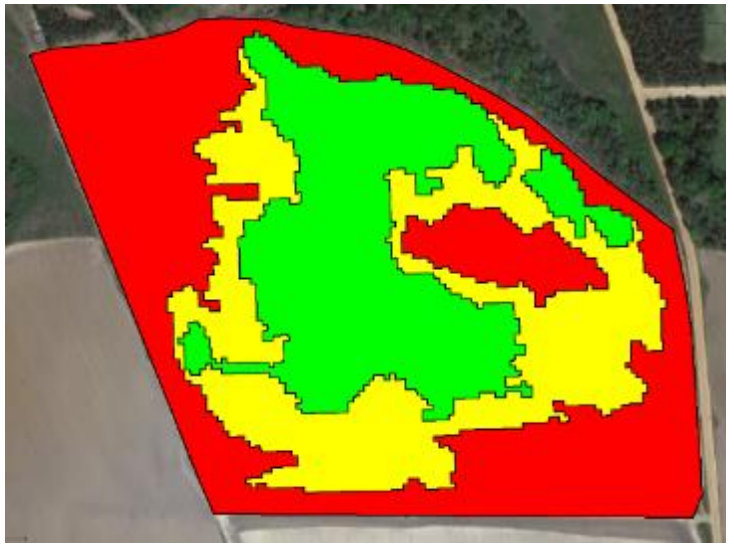
Influence of Grid Size on Lime Application Accuracy and Cost



Zone Sampling

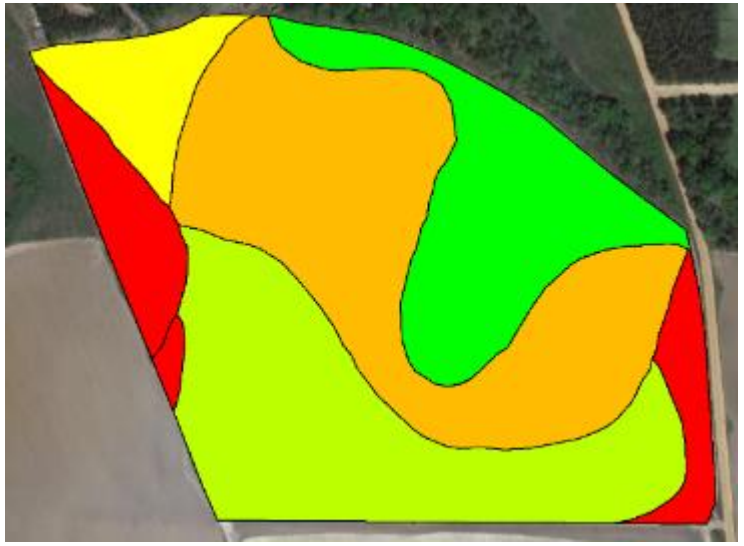


Soil EC/Texture (4 zones)

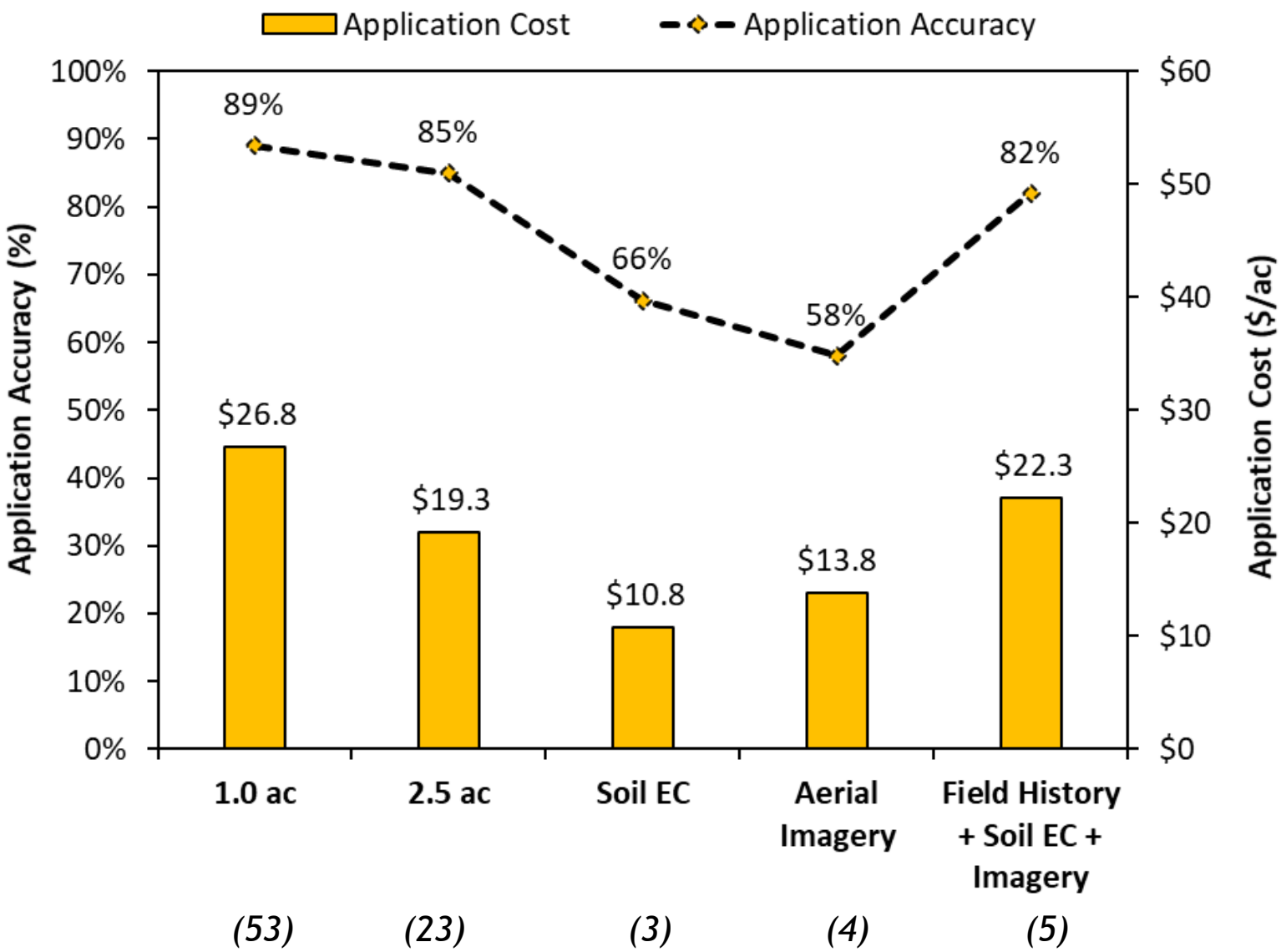


In-Season Crop Imagery/NDVI (3 zones)

Grower knowledge/field history
+ Soil EC + In-season Crop Imagery
(5 zones)



Grid Size vs Zone Sampling - Lime Application Accuracy and Cost



Peanut Planting

- Peanut seeding rates are considerably higher than other crops (corn and cotton)
- Planting speed is normally slower (3.0 – 3.5 mph)
- Until recently, most of the planting technology advancements have been focused primarily towards other crops (primarily corn)

Planting Technology

Seed Monitor*

- Population (over or under)
- Seed Singulation (98 - 100%)
- Seed Spacing (<> target)
- Spacing Quality (95-100%)

by-row planting feedback

Peanut Seed Meters

John Deere

- *staggered 56-cell seed plate*
- *ground driven*
- *vacuum : 12-14*

Monosem

- *singulated 48-cell seed plate*
- *ground driven*
- *doubles eliminator*
- *vacuum : 20-25*

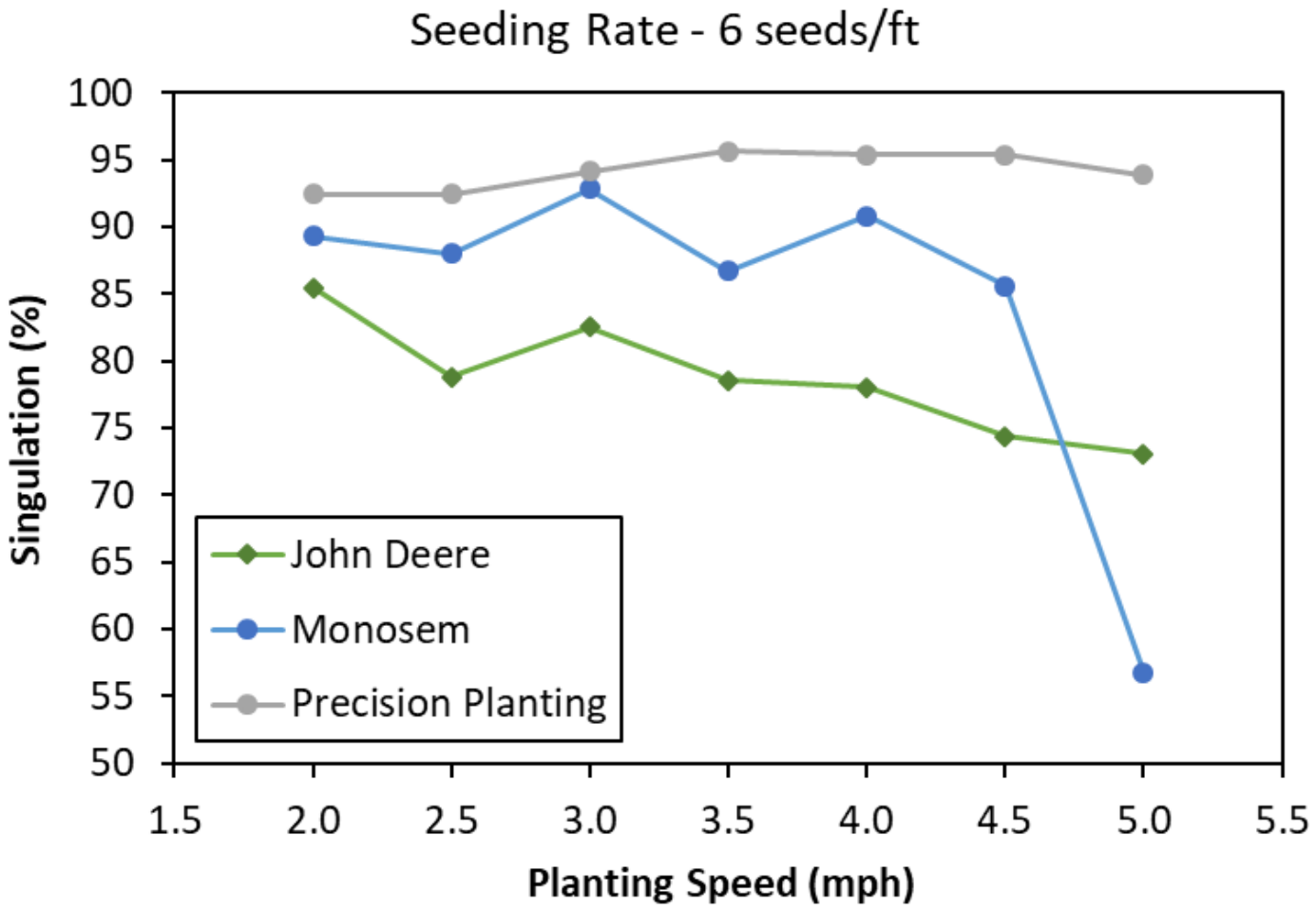
Precision Planting

- *singulated 32-cell seed plate*
- *electronically driven*
- *doubles eliminator & ejector*
- *vacuum : 20-30*

Seed Singulation

Singulation (%) at different speeds (6 seeds/ft)

Planting Speed (mph)	John Deere	Monosem	Precision Planting
2.0	85%	89%	92%
2.5	79%	88%	92%
3.0	83%	93%	94%
3.5	79%	87%	96%
4.0	78%	91%	95%
4.5	74%	86%	95%
5.0	73%	57%	93%



John Deere

Planting Speed	Seeding Rate (seeds/ft)					
(mph)	3	4	5	6	7	8
2.0	90	88	88	85	87	82
2.5	90	86	84	79	78	85
3.0	90	88	84	83	77	77
3.5	86	85	81	79	77	78
4.0	85	82	78	78	73	71
4.5	91	82	78	74	71	69
5.0	84	80	75	73	71	62

Monosem

Planting Speed	Seeding Rate (seeds/ft)					
(mph)	3	4	5	6	7	8
2.0	91	90	89	89	88	92
2.5	90	92	91	88	92	87
3.0	91	89	90	93	84	86
3.5	94	91	92	87	68	67
4.0	89	91	92	91	81	53
4.5	89	92	88	86	53	44
5.0	90	89	85	57	38	34

Precision Planting

Planting Speed	Seeding Rate (seeds/ft)					
(mph)	3	4	5	6	7	8
2.0	94	90	91	92	96	94
2.5	90	91	90	92	95	93
3.0	92	91	92	94	94	97
3.5	91	92	94	96	96	95
4.0	92	92	94	95	96	91
4.5	93	92	94	95	95	96
5.0	93	95	95	94	93	-

Precision Seed Metering

Mechanical Seed Meters

Electric Seed Meters/Drives

Planter Downforce Technology

For Peanuts:

- **NOT ENOUGH** – results in shallower planting depths (reduced emergence)
- **TOO MUCH** – does not impact emergence as long as planting depth is attained

Downforce Technology Options



Active Downforce Systems

Benefits:

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

Planting Technology

Controlled Seed Delivery:

Provides controlled seed delivery to the furrow from the seed meter

SmartFirmer:

Provides real-time information on soil properties (moisture, temp and organic matter) during planting

SmartDepth:

Enables real-time seed depth adjustments based on a preset range, soil moisture, or OM

Spray Technology

Common Nozzles used for Peanut Pest Management

Standard Flat-Fan (XR)

Air-Induction (AIXR)

Dicamba Tip (TTI)

Pulse-Width Modulation (PWM) Technology

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

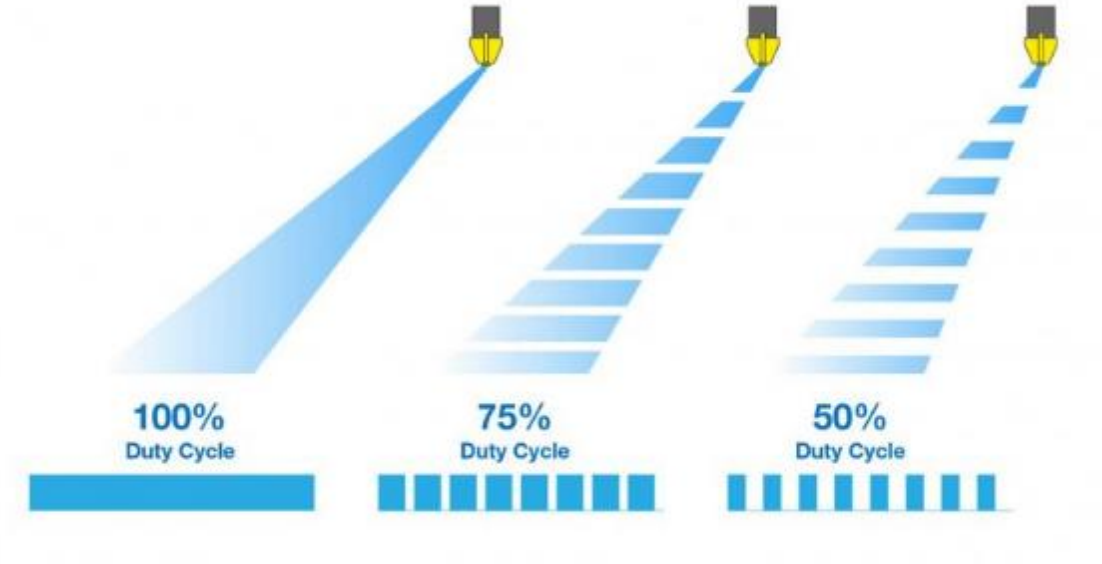
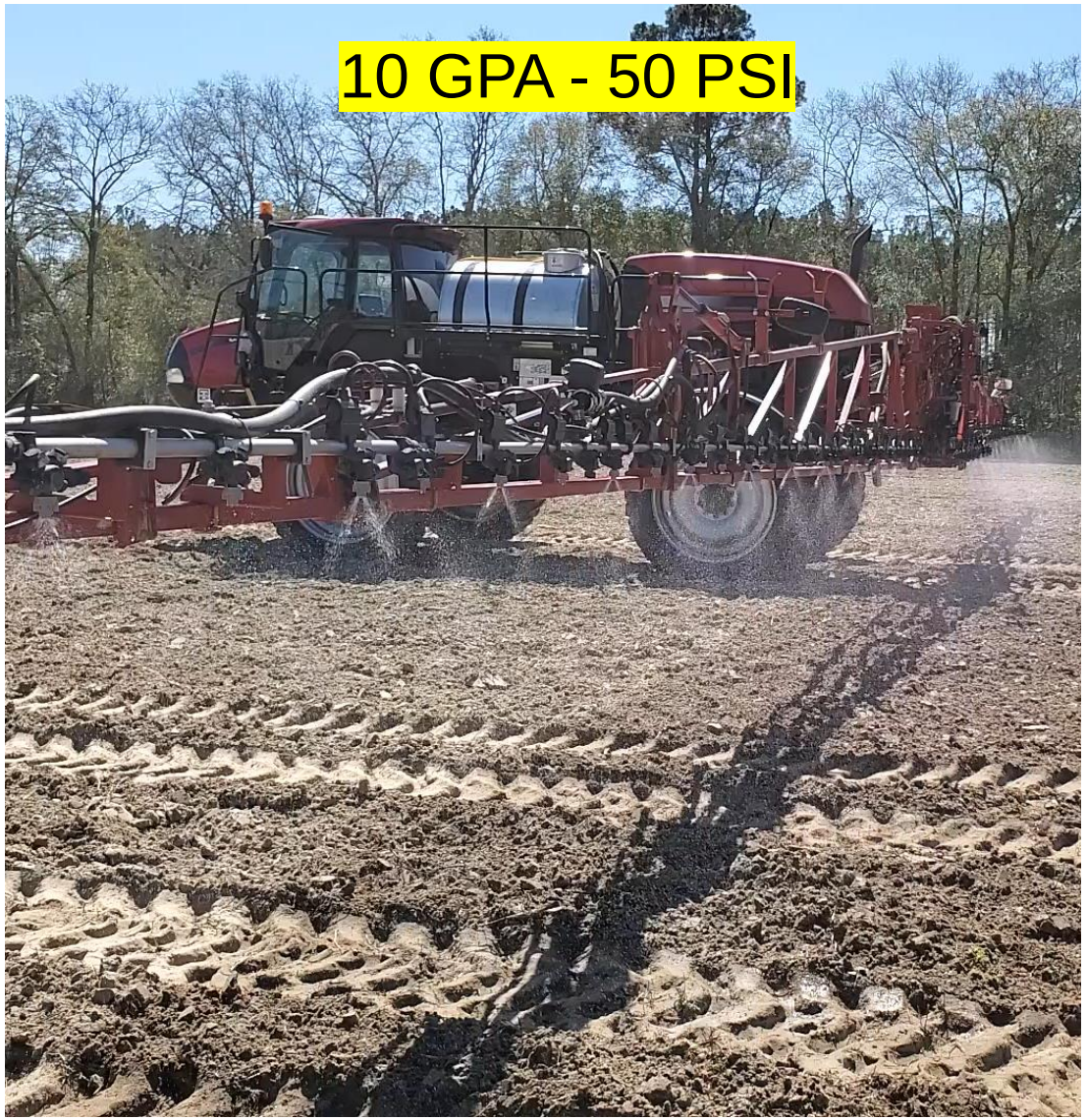
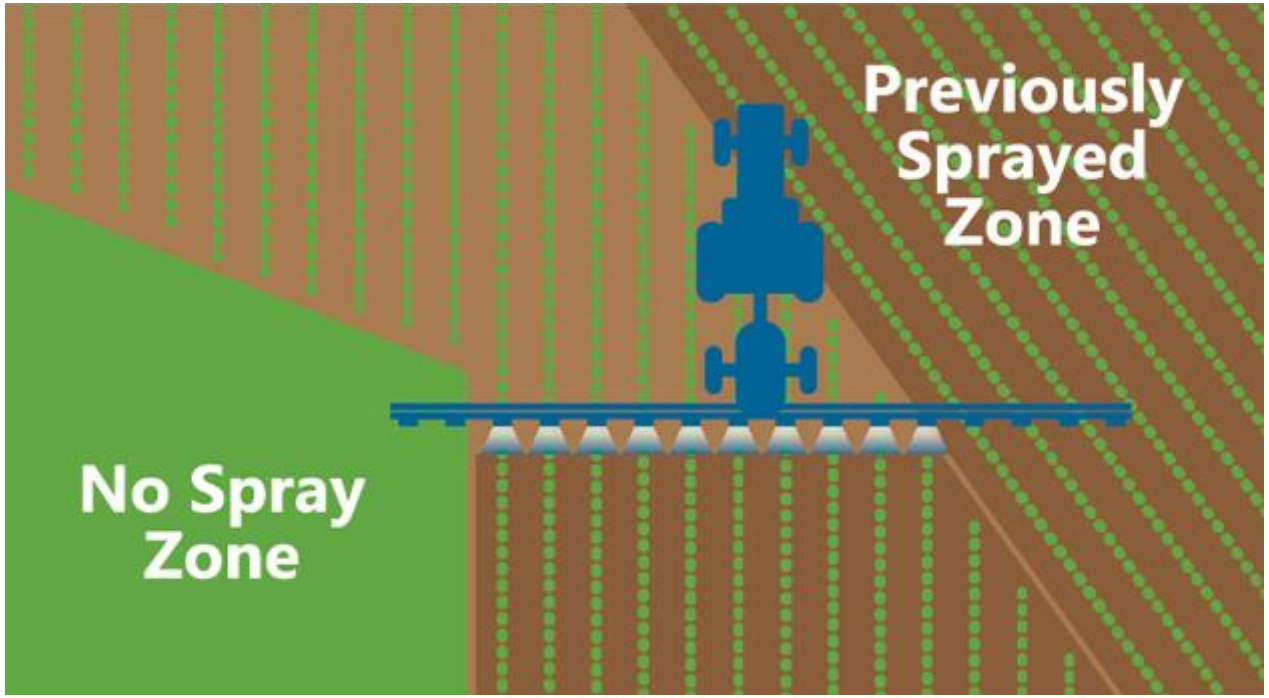


Image source: Dultmeier.com



Individual Nozzle Control

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



Site-Specific Pesticide Application Technology

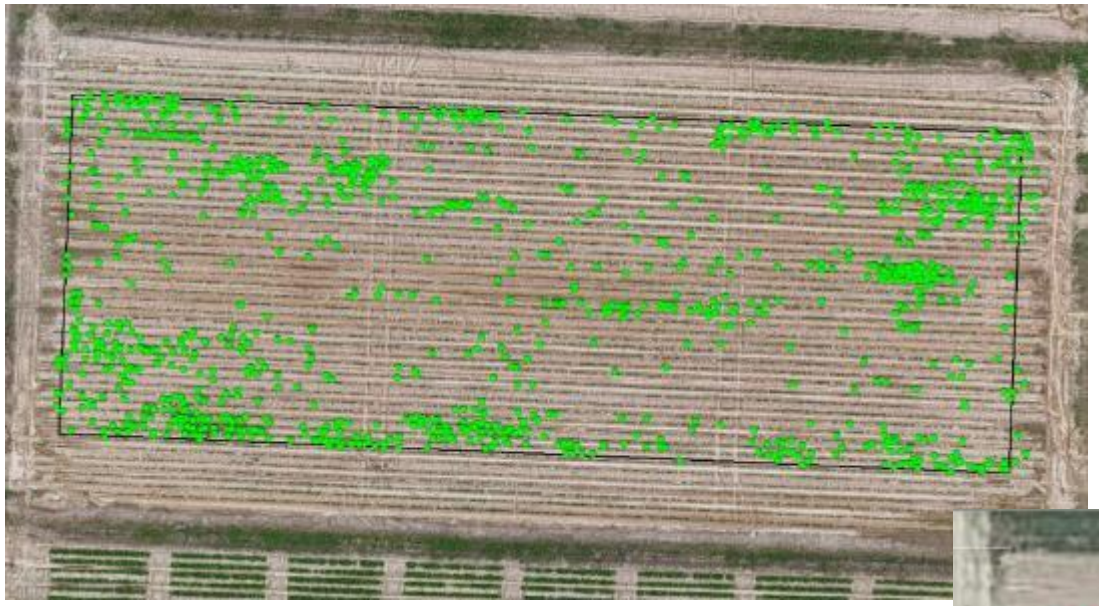
See & Spray Select: Broadcast and targeted spray on fallow ground (green-on-brown)

See & Spray Ultimate: Targeted spray in the crop (corn, soybean and cotton; green-on-green)

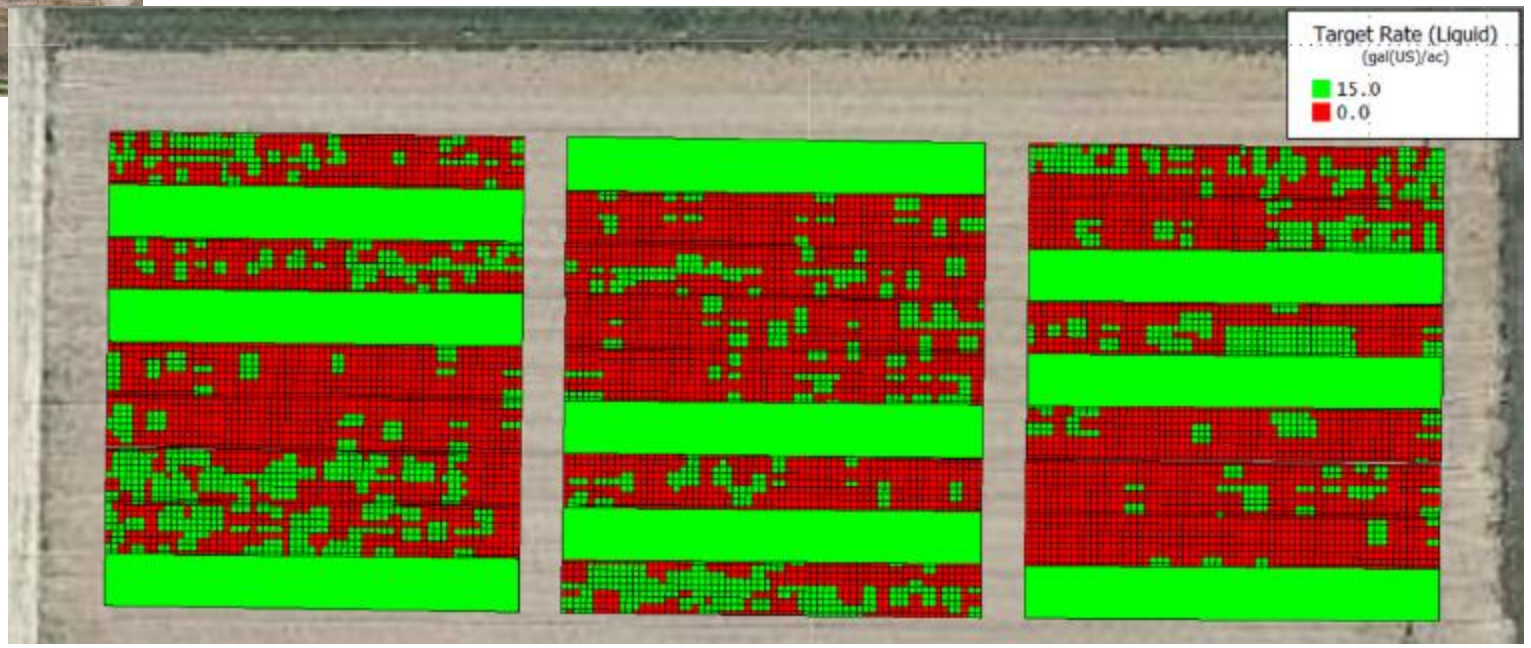
Image source: John Deere

Site-Specific Weed Management in Peanut

Site-Specific Weed Management



Method	Area Sprayed (%)	Efficacy (%)
Broadcast	100	91.3
Site-Specific	28	91.6



Spray Drone Fungicide Applications

Thanks!

Simer Virk
Extension Precision Ag Specialist
University of Georgia
Email: svirk@uga.edu
Website: https://agtechdata.uga.edu/
Twitter: @PrecAgEngineer

Southern Peanut Farmers Federation
MS AL GA FL
AN ALLIANCE

1785

UNIVERSITY OF GEORGIA
EXTENSION

GEORGIA PEANUTS