GreenSeeker Test Drive in Wheat

2012 Crop Year
Justin Knopf, Knopf Farms, Gypsum, KS
Andy Holzwarth, Bottomline Agronomy, Wichita, Kansas

KARTA
Kansas Ag Research & Technology Association

Rationale

- Predicting correct N rate for winter wheat can be a challenge
- Sensor-based N application allows for real-time N rate determination in field
- Potential for increased N use efficiency by putting "correct" amount of N in the right place
- Potential for increased profit/acre
- To purchase a complete N sensor system is a significant investment

Objectives

- Use on-farm research techniques to compare sensor-based variable N application to "standard uniform rate"
- Improve ability to efficiently and effectively carry out on-farm research

Materials and Methods

- Treatments
  - 1 – Uniform N rate based on KSU N recs
  - 2 – Variable N rate based on real-time sensor reading and built in algorithm
- Foundational fertility program will be the same with both treatments
- Treatment difference will occur on final N pass

Materials and Methods

- Both sites were wheat following soybeans
- Foundational fertility
  - 100lbs MESZ (12-40-0-10S-1Zn) in furrow
  - 50-0-0-5S applied with stream bars first week Dec
    - N rich strip applied at this time – 2x rate
  - 15-0-0-15Cl applied broadcast with herb mid Jan
- Last N pass on Mar. 9-10 at Feekes 5
  - Treatment 1 – Uniform 45-0-0
  - Treatment 2 – Variable rate based on sensor

Materials and Methods

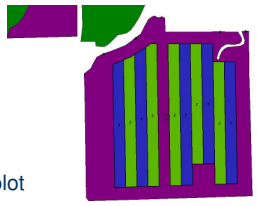
- Sensor – GreenSeeker RT200
  - 6 sensors mounted to front of 4730 sprayer
- Rate Controller – JD GS2
- Data Management Software – EasiSuite
- S Sheds site seeded Oct 21, harvested Jun 9
- Assaria site seeded Oct 6, harvested May 30
- Good stands/growing conditions until May, then dry throughout grainfill

Materials and Methods

Materials and Methods

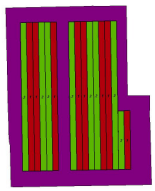
Materials and Methods – S Shed

- Strip plot design
- 5 replications of 2 treatments
- 180ft wide strips
- Ensures at least several clean yield monitor passes per plot



Materials and Methods – Assaria

- Strip plot design
- 8 replications of 2 treatments
- 90ft wide strips
- Ensures at least several clean yield monitor passes per plot

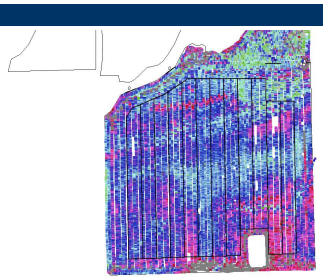


Analysis

- Used EasiSuite to lay grid over as-applied map to create treatment strips (plots)
- Buffered plots by ½ header width to ensure that only full header widths of treatment yield data was included
- Aggregated data to each plot and recorded as-applied N and yield data into Excel spreadsheet

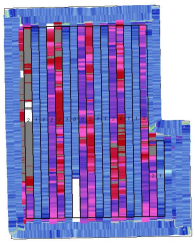
Analysis – S Sheds N Rate

Analysis – S Sheds Harvest Map

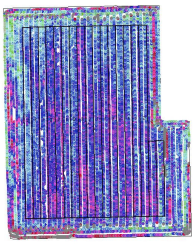


Anaylsis – S Sheds Harvest

Analysis – Assaria N Rate



Analysis – Assaria Harvest Map



Analysis

- Analysis of Variance was conducted with the MIXED procedure in SAS 9.2
- Each site was analyzed independently

Results – S Sheds

Location	Treatment	Avg N Rec lb ac^{-1}		Yield		NUE lb bu^{-1}	
Sheds	Flat Rate	45.0	b	58.8		0.77	b
	Greenseeker	57.6	a	58.8		0.98	a
		ANOVA P>F					
	Treatment	0.0007		1		0.0026	
	LSD (0.05)	3.7		1.7		0.09	

Results – S Sheds

- Uniform rate = 45.0 lbs N/ac
- GS avg rate = 57.6 lbs N/ac
- GreenSeeker applied an average of 12.6 lbs/ac more N
  - 12.6 units * $.55/unit = $6.93/acre more cost
- Yield was equal in both treatments

Results - Assaria

Location	Treatment	Avg N Rec lb ac^{-1}		Yield		NUE lb bu^{-1}	
Assaria	Flat Rate	45.0	a	59.4	a†	0.76	a
	Greenseeker	32.5	b	57.9	b	0.56	b
		ANOVA P>F					
	Treatment	<0.0001		0.0656		0.0001	
	LSD (0.05)	2.7		1.6		0.06	

† LSD on Grain Yield at 0.10

Results – Assaria

- Uniform rate = 45.0 lbs N/ac
- GS avg rate = 32.5 lbs N/ac
- GreenSeeker applied an average of 12.5 lbs/ac less N
  - 12.5 units * $.55/unit = $6.88/acre less cost
- Yield was 1.5 bu/ac less with GS
  - 1.5 bu/ac * $7.75 = $11.63/acre less revenue

Discussion

- Experienced one of the driest Mays on record
  - 1.19" vs 4.75" average
  - Over a 3.5" deficit added to ongoing deficit
  - Likely decreased N response
- Would our results be better had we put less N on in the first application?
- Would our results be better had we waited until feekes 6 or 7?

Conclusions

- In two locations on our farm in 2012, GreenSeeker did not pay its way
- However, I certainly have not "given up" on this technology and management approach
- GreenSeeker and controller did a good job of changing rates and keeping up with rate changes

Conclusions

- A lot seems to be dependent upon a successful calibration on N rich strip
- Next time I would put less N on in the first whole field application
- Later sensor readings and corresponding application leads increases accuracy of predicted N rate

Thank You

- KARTA for the grant on this project
- Andy Holzwarth
- Lucas Haag

Questions?