Extending Greenseeker ™ Technology to Bermudagrass Pasture Land

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Introduction

- The Greenseeker™ technology allows producers to estimate yield potential and obtain N fertilization rates recommendations from NDVI readings based on algorithms for several grain crops.
- Currently, there is an algorithm developed for bermudagrass. However, the data set is not robust enough for accurate recommendations across a wide region.
- Many agricultural extension educators showed a great interest in extending the reach of this technology.

Objectives

- ✓ To collect extensive multi-year/location data in Oklahoma for improving the existing bermudagrass algorithm.
- ✓ To expose the OCES county educators to the Greenseeker™ technology for a better technology transfer and dissemination among producers.

Material and Methods

- Bermudagrass plots (2.5 x 6.0 m) with different Nitrogen rates were set in seven Oklahoma counties by their respective cooperative extension educator.
- Educators selected from four to six Nitrogen rates to work with it. Recommended rates to choose from were: 0, 28, 56, 84, 112, 168, and 224 kg ha^{-1}. Nitrogen was applied late spring.
- Three NDVI readings per plot were collected every two weeks in all plots from plot establishment to sample collection.

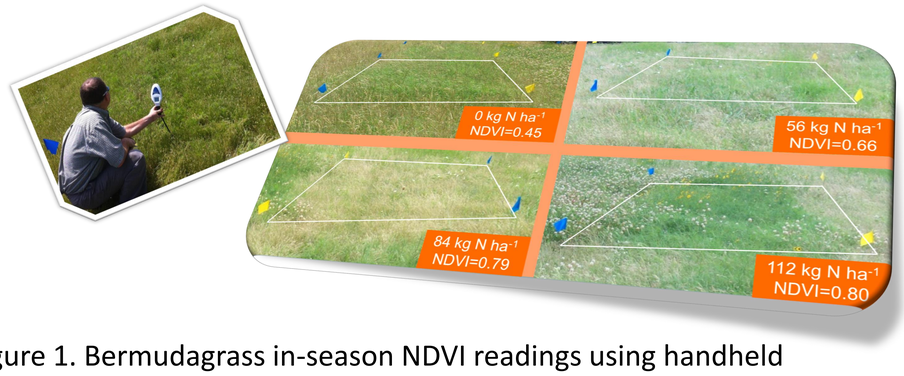

Figure 1. Bermudagrass in-season NDVI readings using handheld Greenseeker™.

- Biomass samples were collected close to bermudagrass sward stage which agrees with hay harvesting period. Three clippings, 1 m^2 quadrats, from each plot was collected, weighed, dried and weighed again.

Figure 2. Bermudagrass harvest and drying process.

Results and Discussion

- Eastern half of Oklahoma was represented in this study to represent the common bermudagrass production region.

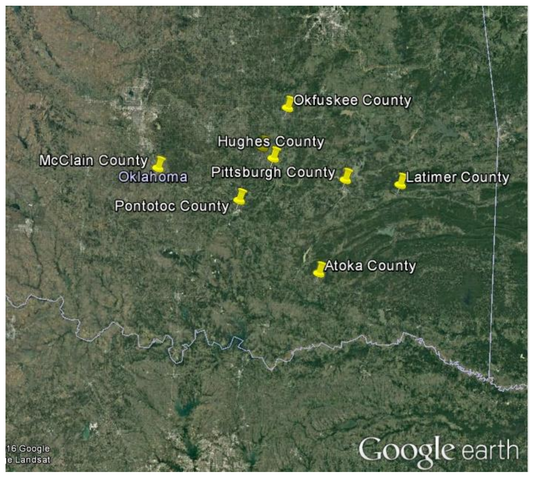

Figure 3: Oklahoma counties included in the project.

- Yield and NDVI were normalized across all locations. A quadratic polynomial fit best explained the relationship between N rates (x) and normalized yield (y). This is evidence that NDVI readings might be useful for estimating forage yield.

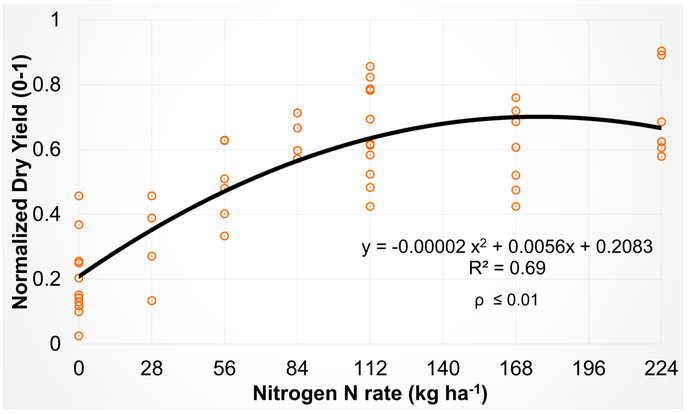

Figure 4: Correlation between N rates (x) and normalized yield.

- Correlations between normalized NDVI (x) and yield (y) were performed combining all locations for different weeks before harvest (WBH). NDVI was correlated to yield from three WBH to 'at harvest'. The highest correlation occurred at three WBH. Bermudagrass inflorescence decreased NDVI values late in the season even though dry matter production was higher.

Table 1: Statistical findings for normalized NDVI vs. yield correlation in all locations by each week before harvest.

	weeks before harvest								
	at harvest	1	2	3	4	5	6	7	8
ρ-value	**0.02***	**<0.01***	**<0.01***	**<0.01***	0.34	0.07	0.06	0.40	0.92
Intercept	0.42	0.16	0.19	**0.16**	0.10	0.17	0.12	0.19	0.54
Slope	0.20	0.52	0.56	**0.61**	0.49	0.62	0.70	0.54	-0.09
R^2 adj.	11%	36%	39%	**49%**	47%	30%	68%	24%	0.1%

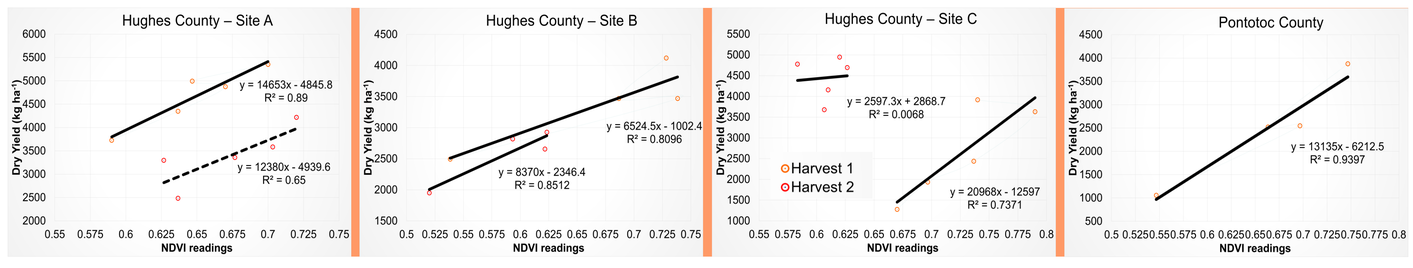

Figure 5: Correlation between NDVI (x) and yield (y) in each location at three weeks before harvest.

Conclusion

- Data suggest that NDVI was best correlated with yield at three weeks before harvest.
- Not having data for all locations for weeks four through seven likely impacted the results.
- Only five locations of nine responded to Nitrogen fertilization.

Take Home Message

- For next year, communication between educators and state specialist will improve.
- The protocol delivered to the educators will specify that readings should be taken once a week from five WBH.
- Educators learned the challenge of finding a location responsive to Nitrogen fertilizer, because good forage managers that tend to support extension projects always apply adequate levels of Nitrogen.