

Final Project Report
Evaluation of Variable Rate Nitrogen Applications to Cotton
#04-471AL

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Objectives

The first objective of this study is to determine an appropriate method for selecting rates for variable rate nitrogen applications to cotton. The second objective is to evaluate yield response to the variable rate treatments and determine if VR N applications are economically feasible.

Introduction

Numerous projects have evaluated the benefits of variable rate fertilizer applications on grain crops; however, little variable rate research has been conducted on cotton. The purpose of this project is to evaluate the potential for variable rate nitrogen application to cotton. Nitrogen is a major nutrient input for cotton. The price of nitrogen has increased in recent years. Although variable rate applications of nitrogen may not decrease the total amount of nitrogen used the goal is to place the nitrogen where it will have the maximum return for both yield and profit.

Materials and Methods

This study incorporated three nitrogen treatments: traditional nitrogen fertilization (same rate across field); fertilization based on soil type (as determined by soil electrical conductivity map); and fertilization based on yield goals (as determined by multiple years of yield monitor data). A Veris 3100 Soil EC Mapping System, which measures soil electrical conductivity, was pulled in the field selected for this project. The yield goals were determined by looking at three years of yield monitor data. Each year's yield map was broken into 3 ranges, with the medium range containing the farmer's whole-farm average yield (broken into irrigated vs. non-irrigated). The yield maps were then layered to find areas that consistently yielded low, medium, and high. These areas were then designated as low, medium and high productivity zones.

A pre-plant nitrogen application of 40 lbs/acre was applied to all treatments. The variable rate portion of nitrogen application occurred during a side-dress application. Three nitrogen rates were selected for the side-dress application. These rates (high – 105 lbs., medium – 80 lbs. and low- 55 lbs.) were matched with yield potentials of high, medium and low. This was an irrigated field located in Lawrence County, Alabama. Yields were determined using an Ag Leader cotton yield monitor.

A companion study was initiated at the Tennessee Valley Research Center in Belle Mina, AL. This study consisted of three nitrogen rates (90, 110, and 130 lbs N/acre) replicated across a field. Forty pounds of N was applied pre-plant with the remainder applied during side-dress application. This was an irrigated field. Yields were determined using an Ag Leader yield monitor.

Results and Discussion

On-farm study:

Upon completion of the soil electrical conductivity maps, we discovered that the soil type treatment and yield goal treatment were essentially the same. Since soil electrical conductivity maps often reflect soil type, and soil types have varying yield potentials, this is a reasonable result. Therefore, yield responses will be summarized as response to standard treatment and response to variable rate (chart below). There were no significant yield differences between N rates within the yield potential zones. It appears that nitrogen was not the yield limiting factor.

Table 1. Seed Cotton yield (lbs/acre) for each N rate within each yield potential zone. There were no significant differences between N rates with individual yield potential zones.

	N	Low Yield Potential	Medium Yield Potential	High Yield Potential
	Lbs/acre			
Low N	95	1325	1910	1294
Medium N	120	1632*	1618*	1691*
High N	145	1921	2220	2029
LSD (p=.05)		385		204

- There were not enough replications of the Medium N Rate to include in statistical analysis (due to harvest pattern).

Research Station Study:

The medium and high N rates yielded significantly higher than the low N rate (Table 2). We plan to further analyze this data based on soil types and/or yield productivity zones.

Table 2. Yields of research station study in 2004 and 2005.

		2004		2005	
		Seed Cotton	Lint	Seed Cotton	Lint
Treatment	Lbs/acre	Lbs/acre			
Low N	90	3345c	1238c	3109b	1150b
Medium N	110	3568b	1320b	3271a	1210a
High N	130	3708a	1372a	3284a	1215a
LSD (p=.10)		59.8	22.2	74.2	27.4

Papers:

Burmester, Charles and SH Norwood. 2006. Nitrogen Fertilization Rates for Conservation Tillage Cotton Under Dryland and Irrigated Conditions. In Cotton Soil Management and Plant Nutrition Conference. Beltwide Cotton Conferences, San Antonio, TX.