No-Till Cotton Yield Response to a Wheat Cover Crop: The Yalobusha County Experience, 2000-2004 Steve Cummings Yalobusha County Agent MSU-ES, Coffeeville, MS Dave Parvin Professor and Economist Department of Agricultural Economics MAFES/MSU, Mississippi State, MS Seth Dabney Research Agronomist USDA/ARS National Sedimentation Laboratory Oxford, MS

<u>Abstract</u>

The rapid adoption of genetically modified seed which allows over-the-top applications of glyphosate herbicides has dramatically increased the acreage devoted to no-till cotton and opened new opportunities to consider cover crops and no-till cotton in situations where previously it was not practical. A paired field experimental design was employed to compare no-till cotton following a wheat cover crop to no-till cotton not following a wheat cover crop. Wheat as a cover crop was found to significantly increase the yield of no-till cotton by 96 pounds of lint per acre.

Introduction

Cover crops grow during periods when the soil would otherwise be fallow. A cover crop may be defined as vegetation managed to protect and improve soil, crop or water quality (Dabney, Delgado, and Reeves). Researchers often limit their work on cover crops to impacts on soil and water quality. No-till production systems which include adequate winter ground cover have the potential to reduce soil erosion by 90 to 95% of that for conventional (chisel/disk) tillage, which would satisfy mandated soil loss restrictions on many upland sites used for annual cotton production (Triplett, Dabney, and Siefker). Economic viability is the key question concerning the use of cover crops. Growers can utilize both small plot and large grower-scale demonstrations to make decisions on cover crops, but Yalobusha County growers seem to be more willing to accept large plot research, because such tests better reflect their time and equipment restraints.

Currently cotton growers have a renewed interest in cover crops. Monsanto's Roundup Ready (RR) technology, introduced in 1996, allows over-the-top application of glyphosate herbicides. In 2004, 97% of Mississippi's cotton acreage was planted to genetically modified seed [USDA]. The rapid adoption of RR technology in cotton has opened new opportunities to consider cover crops and no-till cotton in situations where previously it was not practical. Currently cotton growers have a renewed interest in cover crops for several reasons:

- 1. Input prices are up.
- 2. Growers desire cheaper systems of production.
- 3. Production systems that require fewer trips-over-the-field are less expensive.
- 4. No-till systems require fewer trips.
- 5. Monsanto's new GMS, Roundup Ready, has reduced the level of management required to successfully produce NT cotton.
- 6. Cover crops may increase grower returns.

The objective of this study was to evaluate how wheat as a cover crop affects the yield and profitability of no-till cotton where grown on large blocks of commercial cotton.

Yalobusha County

Mississippi's cotton acreage is traditionally described as Delta or Hill (non-Delta). Yalobusha County is in the Brown Loam area, a portion of the Hill section of the State. Currently, Yalobusha County has 10 cotton farmers (Parvin, et al) that collectively produce more than 15,000 acres of cotton. Yalobusha County cotton growers use one or two planting patterns. The conventional planting pattern is 38"-solid. The second planting pattern is ultra-narrow-row (UNR).

Methodology

Studies were conducted on commercial cotton grown in Yalobusha and adjacent counties. A paired field experimental design was employed, and 21 paired comparisons made from 2000-2004.

Two planting patterns were involved. With Mississippi's standard method of cotton production, cotton is produced on raised beds, in equally spaced 38-inch rows and planted with a regular planter. An alternative method of cotton production is referred to as ultra-narrow-row cotton. It is planted flat with a grain drill in equally spaced 7.5-inch rows. There is no expected yield difference (given a soil type) for no-till cotton planted to either planting pattern. Hence, the data was pooled over planting patterns with the 21 sets of paired fields as replications (pairs as reps).

Similar fields of known size, variety, planting date, production practices, and with the same expected yield were paired. In one field, cotton followed a wheat cover crop [Cover Crop Treatment]. In the paired field, cotton did not follow a wheat cover crop [Check]. No-till cotton production begins in the spring with a burndown herbicide application. The burndown herbicide application destroyed the wheat cover crop in the Cover Crop Treatment and any voluntary winter cover in the Check. Consequently, the only cost difference between the treatment was associated with planting the wheat cover crop and hauling and ginning the difference in yields. All varieties in this study were of the Roundup Ready type. Production (lbs. of lint/field) was obtained from gin records. Yield (lbs. of lint/acre) was calculated as production divided by field size (acres). The difference between paired field yields was tested with a paired different t-test, p < 0.05.

Results & Discussion

Table 1 summarizes the paired treatment yield differences for five years and two planting patterns. Twenty of the 21 paired differences of wheat cover versus no wheat cover favor wheat cover. The difference averaged 96 lbs. of lint/acre. The difference is statistically significant [calculated t = 7.74; tabular t (05, 20 df) = 2.085].

The cost of a wheat cover crop is estimated to be \$0.12 per pound for wheat planting seed and \$5.00 per acre for the seeding operation [Cotton 2004 Planning Budgets]. Mississippi growers have been varying the seeding rate from 50 to 80 pounds depending on the seeding method (ground or air) and other factors (primarily soil type and slope). Eighty lbs./acre is utilized to calculate the cost of wheat planting seed for this economic comparison.

At a price of 0.60/lb. of lint and 0.05/lb. of cottonseed and using an assumption of 1.55 lbs. of cottonseed/lb. of cotton lint, the value or the average yield response is 65.04/acre. Eighty pounds of wheat planting seed plus application cost is 14.60 per acre. The cost of hauling (0.02/lb. of lint) and ginning (0.08/lb. of lint) the additional 96 pounds is 9.60. The net value of the average response to a wheat cover crop 65.04 - 14.60 - 9.60 or 40.84/acre.

Table 1. Yield (lbs. of lint/acre), no-till cotton following a wheat cover crop [Cover Crop Treatment] v. no-till cotton following no wheat cover crop [Check], two planting patterns, Mississippi, 2000-2004.

Year	Producer No.	Planting Pattern	Pair	Cover Crop Treatment	Check	Difference
2000	1	38-solid	1	755	624	130
2001	1	38-solid	2	1,190	1,030	160
2001	1	UNR	3	878	726	152
2002	1	38-solid	4	1,071	1,009	62
2002	1	UNR	5	952	894	58
2002	2	38-solid	6	932	768	164
2002	2	UNR	7	986	830	156
2002	3	38-solid	8	765	710	55
2002	3	UNR	9	750	700	50
2003	1	38-solid	10	1255	1065	190
2003	2	38-solid	11	1112	987	125
2003	2	UNR	12	1085	913	172
2003	3	38-solid	13	872	787	85
2003	3	UNR	14	825	745	80
2004	1	38-solid	15	1129	1022	107
2004	2	38-solid	16	1060	1013	47
2004	2	UNR	17	757	665	92
2004	3	38-solid	18	828	793	35
2004	3	UNR	19	778	821	-43
2004	4	38-solid	20	1124	1062	62
2004	4	UNR	21	938	844	94
Average				954	858	96

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