EVALUATION OF COST AND RETURNS FOR ROUNDUP READY COTTON

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Introduction

With the development of Roundup Ready cotton varieties, the arsenal of post-emergence herbicides used to control weeds in cotton has been expanded to include Roundup after planting. However, before producers choose to utilize this technology, they should be able to determine how added costs associated with Roundup Ready cotton (premium seed prices, technology fees and possible reductions in yield) compare with any savings in herbicide expenses. While economic data on other Roundup Ready crops are available, little costs and returns data on Roundup Ready cotton are available to help producers make the decision of whether to plant Roundup Ready cotton.

Objective

This study evaluates the costs and returns of Roundup Ready and conventional cotton varieties under multiple weed-control strategies as well as conventional tillage and no-tillage production systems.

Data and Methods

Using yield and quality data and production practices from 1996 field studies at the West Tennessee Experiment Station in Jackson, Tennessee, and the Milan Experiment Station in Milan, Tennessee, enterprise budgeting methods were employed to accomplish the objectives of this study. A summary of cultural practices which were used in these field studies are presented first followed by a description of how net revenues were estimated and analyzed.

Cultural Practices

The cotton cultivar 'Paymaster 1215RR' was planted at 15 lbs./ac. in four, 30-ft. long rows with 38-in. row spacing on May 14, 1996, at Jackson and May 15, 1996, at Milan. No-tillage and conventional tillage practices were used for each weed control program. The current weed control program and Roundup-Ready cotton alternatives for each tillage practice are summarized in Tables 1 and 2. The predominant weeds were palmer amaranth and velvetleaf at Jackson and common cocklebur and yellow nutsedge at Milan. All applications were made with four-row equipment and broadcast applied. The current weed-control program for the no-tillage system included an initial application of Roundup Ultra prior to planting, which the conventional tillage system did not receive, and then a combination of chemicals were used to control weeds. This current weed-control program was compared with two Roundup-Ready cotton treatments-- using Roundup Ultra (#1) solely and in conjunction with other herbicides (#2). The treatments were replicated between locations. However, at Jackson, the no-tillage system received additional applications on the Roundup-Ready treatments. In addition, the conventional tillage system at Jackson received additional applications on the current weed-control program and Roundup-Ready treatment #1.

Each treatment was replicated four times using a split-plot design. The two middle rows were harvested in each plot to determine yields and obtain seed cotton samples. At Jackson, the first harvest occurred on October 7, 1996, and the second harvest occurred on October 31, 1996. At Milan, the first harvest occurred on October 10, 1996, and the second harvest occurred on November 5, 1996. Samples of seed cotton were air dried and ginned to determine lint percentages and obtain lint samples. Lint fiber characteristics for each treatment were determined using high volume instrument (HVI) testing (USDA Agricultural Marketing Service Staff, 1993).

Budgeting Methods and Data

Net revenues--the estimated returns to a farmer for land, management, and risk--were obtained by estimating variable costs, fixed equipment and labor costs, and over-head costs for each weed control program, and subtracting the total cost from estimated total receipts (Boehlje and Eidman, 1984).

Cotton Price Data

The effect of a weed control program on quality of cotton produced can significantly impact the lint price that a farmer receives for cotton. Effective lint prices (base price adjusted for premiums or discounts based on staple, leaf, and color, then additional premiums or discounts are added for strength, extraneous matter, and micronaire) are determined based on the quality of the lint produced under the different weed control regimes. The only published source of producer price data for the study area that reports premiums and discounts from a base quality are quotations collected by the U. S. Department of Agriculture, Agricultural Marketing Service. These spot price quotations are compiled daily by market reporters for seven major market areas. Relevant quotations for this analysis are from the North Delta market area. The reported base quotation price is for Strict Low Middling (color 41, leaf 4, staple 38, micronaire 35-36 and 43-49, and strength 23.5-25.4) cotton. Price differences from the base for the various quality attributes are also reported. The price discount for leaf grade is reported for each color grade and staple length. The average base price of

$0.7211/lb. and price differences for the August 1996 to July 1997 marketing year were used to calculate effective lint prices from the fiber quality data for each treatment. Total receipts were calculated by multiplying lint yield times effective lint price for each treatment. Revenue for the sale of cotton seed was also included in total receipts (USDA, Agricultural Marketing Service Staff, August 1997).

Production Cost Data
Enterprise budgets were constructed for each treatment using the Agricultural Policy Analysis Center Budgeting System (Slinsky, *et al.*, 1996) in order to estimate the costs associated with the cultural practices specific to Jackson and Milan experiments. The budgets developed for this analysis diverged from field-trial cultural practices only in equipment size. Eight-row equipment was substituted for the four-row equipment in order to reflect actual farming conditions more accurately. Ginning and handling costs after harvest as a function of lint yield were added to the variable costs of each treatment.

Results

Lint yields and effective lint prices (base price plus premiums and discounts) for the three weed-control alternatives under tillage and no-tillage regimes for Jackson are presented in Table 3. The Milan lint yields and effective lint prices are presented in Table 4. Lint yields were significantly higher under the conventional tillage regime for all three weed-control treatments at both Jackson and Milan. The current weed-control program, which does not utilize Roundup after planting, produced the highest lint yields under all scenarios except for Milan conventional tillage. For the conventional tillage system at Milan, Roundup-Ready treatment #2 produced higher lint yields than the two alternatives.

The Jackson, Tennessee, no-tillage treatments and conventional Roundup-Ready treatment #1 received discounts for staple, leaf and color. The Milan no-tillage Roundup-Ready treatments and the conventional tillage current weed-control program and Roundup-Ready treatment #1 also received discounts for staple, leaf and color. All of the treatments received premiums for strength. The Jackson Roundup-Ready treatments received premiums for micronaire. None of the treatments at Milan received additional premiums or discounts. The effective price received ranged from $0.65/lb. to $0.73/lb. for both locations.

Total revenues, costs of production, and net revenues for each treatment are presented in Table 5 for Jackson and in Table 6 for Milan. The largest total revenues were produced by the conventional tillage systems at both locations. Under the no-tillage regime, the current weed-control treatment yielded the largest revenues at both locations.

The cost of production for the two Roundup-Ready cotton regimes was less than the cost of production for the current weed-control treatment at both locations (Tables 5 and 6). At Jackson, the cost reduction was greater under conventional tillage than under no-tillage. The cost of production under no-tillage was $23-$24/ac. less under no-tillage and $54-$55 less under conventional tillage at Jackson. At Milan the cost reduction was greatest between the no-tillage current weed-control system and the no-tillage Roundup-Ready treatment #1 ($56/ac.). The next largest difference was between the conventional tillage current weed-control treatment and conventional tillage Roundup-Ready treatment #1 ($46/ac.).

The largest net revenues came from the conventional tillage system treatments at Jackson, ranging from $757/ac. to $815/ac. The current weed-control treatment under the no-tillage system at Jackson had the next largest net revenue of $581/ac. The no-tillage system at Jackson produced the only negative net revenue of -$39/ac. for Roundup-Ready treatment #2. At Milan, the conventional tillage Roundup-Ready treatment #2 produced the largest net revenues ($528/ac.) followed by no-tillage current weed-control treatment ($288/ac.).

The largest revenue, when averaged by tillage system, was the Jackson conventional tillage system ($1,215/ac.) followed by the Milan conventional tillage system ($840/ac.). The lowest cost, averaged by tillage system, was the Milan conventional tillage system ($365/ac.) followed by the Milan no-tillage system ($371/ac.). The highest average net return across locations and tillage systems came from the conventional tillage site at Jackson ($789/ac.) followed by the conventional tillage site at Milan ($475/ac.). These results seem to indicate that conventional tillage systems produce higher net returns compared to no-tillage systems and that costs overall were lower at the Milan station because Jackson received extra herbicide treatments.

When net revenues are averaged for both locations, the largest revenue occurred in the current weed-control treatment with net revenues equal to $943/ac. followed by the Roundup-Ready treatment #1 ($863/ac.) and Roundup-Ready treatment #2 ($383/ac.). Roundup-Ready treatment #1 produced the lowest costs across treatments ($385/ac.) followed by Roundup-Ready treatment #2 ($383/ac.). The largest net returns across treatments comes from the current weed-control treatment at $513/ac. followed by the Roundup-Ready treatment #1 ($478/ac.).

Discussion

The conventional tillage system weed-control treatments produced higher lint yields, lint prices and total revenue. The conventional tillage treatments incurred lower production costs and produced higher net returns at Jackson and Milan than the no-tillage systems. The Roundup-Ready scenario performed better under conventional tillage than it did under no-tillage systems for both locations by producing higher revenues, incurring comparable or lower production costs, and generating higher net returns. One possible reason for

the difference in net returns between tillage systems is the moisture conserving benefits of no-tillage often are not realized in years with adequate rainfall like 1996.

The current weed-control treatment produced higher lint yields, lint prices, and net revenues than did the Roundup-Ready treatments. However, the Roundup-Ready treatments incurred lower production costs than the current weed control program.

Because we had only one year of data for this analysis, the results of this study should be viewed with caution. Additional data is required before a more extensive analysis and broad recommendations can be made.

References

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Table 1. No-tillage system, current and Roundup Ready weed control program, Jackson and Milan, Tennessee, 1996.

Application	Current Control	Roundup Ready #1	Roundup Ready #2
1st	Roundup Ultra (4-17)[a]	Roundup Ultra (4-17)	Roundup Ultra (4-17)
2nd	Prowl Cotoran Gramoxone Extra X-77 (5-17)	Roundup Ultra (5-22)	Roundup Ultra (5-22)
3rd	Staple X-77 (6-24)	Roundup Ultra (6-13)	Roundup Ultra (6-13)
4th	Cobra MSMA (7-16)	Roundup Ultra (6-24)[b]	Roundup Ultra (6-24)[b]
5th	----	Roundup Ultra (7-16)[b]	Direx MSMA (7-16)

[a]Month and day applied are in parentheses.
[b]Treatment was applied on the Jackson, Tennessee, plots only.

Table 2. Conventional tillage system, current and Roundup Ready weed control program, Jackson and Milan, Tennessee 1996.

Application	Current Control	Roundup Ready #1	Roundup Ready #2
1st	Prowl Cotoran (5-16)[a]	Roundup Ultra (6-3)	Roundup Ultra (6-3)
2nd	Staple X-77 (6-13)	Roundup Ultra (6-24)	Roundup Ultra (6-24)
3rd	Cobra MSMA (6-27)[b]	Roundup Ultra (7-16)[b]	Direx MSMA (7-16)
4th	Cobra MSMA (7-16)	Roundup Ultra (7-16)[b]	----

[a]Month and day applied are in parentheses.
[b]Treatment applied on the Jackson, Tennessee, plots only.

Table 3. Lint yield and effective lint price for Jackson, Tennessee in 1996.

Tillage Practice Weed Control Program	Lint Yield	Lint Price[c]
No-Tillage	(lbs./ac.)	($/lb.)
Current Program[a]	1280	0.70
Roundup Ready #1[a]	1163	0.66
Roundup Ready #2[a]	518	0.66
Conventional Tillage		
Current Program[b]	1454	0.73
Roundup Ready #1[b]	1446	0.73
Roundup Ready #2[b]	1422	0.73

[a]See Table 1. for description.
[b]See Table 2. for description.
[c]Price adjusted for premiums and discounts.

Table 4. Lint yield and effective lint price for Milan, Tennessee in 1996.

Tillage Practice Weed Control Program	Lint Yield	Lint Price[c]
No-Tillage	(lbs./ac.)	($/lb.)
Current Program[a]	821	0.73
Roundup Ready #1[a]	666	0.65
Roundup Ready #2[a]	746	0.70
Conventional Tillage		
Current Program[b]	1004	0.70
Roundup Ready #1[b]	1010	0.70
Roundup Ready #2[b]	1067	0.73

[a]See Table 1. for description.
[a]See Table 2. for description.
[c]Price adjusted for premiums and discounts.

Table 5. Revenue, total cost, and net returns for Roundup Ready cotton versus a conventional weed control program, Jackson, Tennessee, 1996.

Tillage Practice Weed Control Program	Revenue ($/ac.)	Total Cost ($/ac.)	Net Returns ($/ac.)
No-Tillage			
Current Program	1046	465	581
Roundup Ready #1	903	441	462
Roundup Ready #2	403	442	-39
Conventional Tillage			
Current Program	1220	462	757
Roundup Ready #1	1222	407	815
Roundup Ready #2	1202	408	795

Table 6. Revenue, total cost, and net returns for Roundup Ready cotton versus a conventional weed control program, Milan, Tennessee, 1996.

Tillage Practice Weed Control Program	Revenue ($/ac.)	Total Cost ($/ac.)	Net Returns ($/ac.)
No-Tillage			
Current Program	691	403	288
Roundup Ready #1	511	347	164
Roundup Ready #2	610	364	246
Conventional			
Tillage			
Current Program	815	390	424
Roundup Ready #1	816	344	472
Roundup Ready #2	889	361	528