

ECONOMIC COMPARISONS BETWEEN ECOLOGICALLY-BASED & TRADITIONAL COTTON PEST MANAGEMENT SYSTEMS

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Abstract

Recent research findings on the interactions of beneficial insects, cotton, and biopesticides are generating new technologies for cotton production systems in the Southeastern United States. Eradication of the boll weevil from this region allows expanded consideration of ecologically-based pest management systems. Despite savings in Variable, Fixed, and Total Costs, lower yield levels realized from the ecologically-based systems result in lower Net Returns per acre.

Introduction

Newly emerging technologies from beneficial insect, plant, and biopesticide research, together with eradication of the boll weevil from the Carolinas, Florida, and Georgia, have opened a strategic opportunity for improved cotton pest management and production systems (Ruberson et. al., 1994; Sprague and Triplett, 1986). This 2-year field study uses conservation strip tillage practices to manipulate cotton habitat and foster biological control agents. Net Return and other economic comparisons are generated over the range of tillage and cover system combinations considered.

Research Design Outline

The research study took place on fields of two cooperating growers in South Georgia. Five production systems were developed from combinations of tillage choice (Conventional Deep Turn Tillage versus Strip Tillage) and cover crop choice (Crimson Clover, Rye, or None). A randomized block design was employed with six replications per system at each grower location.

Analytical Procedures

An enterprise budgeting approach was applied by respective production systems to generate per acre costs and returns. Input choices and application quantities were determined jointly among the researchers and cooperating producers. Output price represents a two-year state average for the study period (Georgia Agricultural Statistics Service). Input prices per unit were taken directly from producer records.

Statistical analyses were conducted using a 1-way randomized blocks ANOVA with CoStat Statistical Software (CoStat). Mean separations were accomplished using Least Significant Differences at the 5% level of significance.

Results

Yields

Conventional Tillage systems outyielded the Strip Tillage systems regardless of the type of cover chosen - clover, rye, or none. Among the cover crop systems, rye systems consistently exceed clover cover yields when compared under identical tillage practices. Wider variation in yield was observed for the Rye Cover treatments than with the Clover Cover.

Variable Costs

Cover crops combined with Conventional Tillage resulted in significantly higher Variable Costs than a No-Cover treatment or cover crops with Strip Tillage. Among the Strip Tillage treatments, the Rye Cover treatment had a significantly higher Variable Cost than the Clover Cover.

Fixed Costs

Conventional Tillage treatments imposed significantly higher Fixed Costs than Strip Tillage treatments. This finding would be expected given the additional tillage tools required for conventional tillage systems. Variation in Fixed Cost between the high and low extreme values was greater for Conventional Tillage than Strip Tillage.

Total Costs

Cover crops combined with Conventional Tillage resulted in significantly higher Total Costs than with No-Cover or Rye Cover treatments. Total Cost for the Clover Cover with Strip Tillage was significantly lower than all other treatments. This was partially due to lower marketing costs that were associated with the lower production yields.

Net Returns

All treatments considered in this study generated positive Net Returns on a per acre basis. Cover Crops combined with Conventional Tillage generated significantly higher average Net Returns than No-Cover and Strip Tillage treatments.

Conclusions

Despite insect controls obtained from beneficial arthropods, Conventional Tillage treatments outyielded Strip Tillage treatments and generated significantly higher levels of Net Returns. Yield differentials between Conventional Tillage and Strip Tillage systems must still be overcome before integrated systems employing conservation tillage-living cover crop features can provide economic profit advantages.

References

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Ruberson, J.R., G.A. Herzog, W.R. Lambert, & W.J. Lewis. 1994. Management of the beet armyworm, *Spodoptera exigua* in cotton: role of natural enemies. Florida Entomol.

Sprague, M.A. & G.B. Triplett. 1986. No-tillage and surface-tillage agriculture: the tillage revolution. Wiley & Sons, New York.

Table 1. Cotton Yields

Cover/Tillage	(Pounds of Lint Per Acre)		
	Average	High	Low
Rye-Conv	773.68 a	1,329.7	417.9
Clover-Conv	720.13 ab	991.0	453.1
None-Conv	666.83 bc	1,063.6	395.4
Rye-Strip	592.14 cd	1,039.3	355.7
Clover-Strip	516.81 d	707.9	355.7

* Letters denote statistically significant differences at the 5% level.

Table 2. Cotton Fixed Costs

Cover/Tillage	(Dollars Per Acre)		
	Average	High	Low
Rye-Conv	\$54.36 a	\$101.30	\$31.03
Clover-Conv	\$54.36 a	\$101.30	\$31.03
None-Conv	\$54.36 a	\$101.30	\$31.03
Rye-Strip	\$43.77 b	\$90.44	\$20.44
Clover-Strip	\$43.77 b	\$90.44	\$20.44

* Letters denote statistically significant differences at the 5% level.

Table 3. Cotton Variable Costs

Cover/Tillage	(Dollars Per Acre)		
	Average	High	Low
Rye-Conv	\$405.14 a	\$480.90	\$344.97
Clover-Conv	\$394.68 a	\$448.55	\$347.48
None-Conv	\$364.17 b	\$437.72	\$319.28
Rye-Strip	\$360.86 b	\$430.51	\$324.44
Clover-Strip	\$343.69 c	\$407.94	\$315.11

* Letters denote statistically significant differences at the 5% level.

Table 4. Cotton Total Costs

Cover/Tillage	(Dollars Per Acre)		
	Average	High	Low
Rye-Conv	\$459.51 a	\$551.76	\$376.00
Clover-Conv	\$449.04 a	\$549.58	\$378.51
None-Conv	\$418.58 b	\$538.75	\$350.31
Rye-Strip	\$404.64 b	\$482.44	\$350.75
Clover-Strip	\$387.46 c	\$480.26	\$335.55

* Letters denote statistically significant differences at the 5% level.

Table 5. Cotton Net Returns

Cover/Tillage	(Dollars Per Acre)		
	Average	High	Low
Rye-Conv	\$150.69 a	\$536.81	\$46.40
Clover-Conv	\$118.92 a	\$310.87	\$21.15
None-Conv	\$107.40 ab	\$300.11	\$-38.46
Rye-Strip	\$62.39 bc	\$368.74	\$-134.34
Clover-Strip	\$21.14 c	\$270.72	\$-123.16

* Letters denote statistically significant differences at the 5% level.