# COST AND RETURN COMPARISONS OF TRANSGENIC COTTON SYSTEMS IN ARKANSAS

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## Abstract

Nineteen-ninety-nine was the second year of an ongoing study designed to examine the cost and returns associated with alternative pest control systems using transgenic and conventional cotton varieties. Ten varieties of conventional and transgenic seed were grown using Best Management Practices with the goal of maximizing profits. Per acre cost of insect and weed control and returns were determined for each treatment. Some of the transgenic varieties offer increased net returns over some of the conventional varieties.

## Introduction

The number of transgenic cotton varieties available for commercial production has increased greatly in recent years. Cotton producers now have multiple choices when choosing transgenic cotton varieties. The choice of variety now dictates the insect and weed control programs that will or can be used. This study examined 10 cotton varieties with various transgenic properties to identify economic strengths and weaknesses in these cotton systems.

## Methodology

This study was composed of 10 treatments, each replicated four times. The treatments were conventional and transgenic cotton varieties and their respective insect and weed control programs. Each treatment was farmed with the goal of maximizing profits. This arrangement was planted at Rohwer in Southeast Arkansas and at Keiser in Northeast Arkansas in plots 40 feet long by 4 rows wide arranged in a Randomized Complete Block Design. Best Management Practices were used for each individual treatment. Standard fertilization and irrigation programs were used on all plots at both locations. Cotton was planted at the Southeast Arkansas location on May 19, and at the Northeast Arkansas location on May 12.

Per acre cost of insect and weed control were determined for each treatment using the Mississippi State Budget Generator. Technology fees and seed costs are based on 3.45 seed per row foot in Southeast Arkansas and 4.1 seed per row foot in Northeast Arkansas. These figures are based on a ten pound per acre and twelve pound per acre seeding rate respectively for a medium size seed. Input prices are those used for the Arkansas 2000 Cotton Budgets, and returns over insect and weed control cost were calculated using the five year average price of cotton ($0.685/lb). The cost of planting was estimated to be $6.93 per acre for varieties that received a herbicide application at planting, and $6.30 per acre for the varieties that did not.

## Results

The herbicide treatments at each location are depicted in Tables 1 and 2. All of the plots at the Southeast Arkansas location received a pre-plant incorporated application. The conventional plots received a pre-emergence application while the herbicide tolerant varieties each received one post-emergence application. All of the plots at the Northeast Arkansas location received two post-emergence applications, each specific to the transgenic technology of the variety. These applications were sufficient to control weed pests in all plots.

Insect pressure was very light in Arkansas in 1999. This was especially true at each location for this experiment. The insect control measures at each location are depicted in Tables 3 and 4. All of the plots at both locations received one early season application for boll weevil and one late season application for worms. Additional sprays on the conventional varieties as opposed to the Bollgard varieties were not deemed necessary at either location.

Lint yields, weed and insect control costs, and returns for each treatment for each location are displayed in Tables 5 and 6. Neither yields nor returns were significantly different at the 5% level at either location. However, the trend in returns follows the trend in yield. The Stoneville varieties performed very well at the Southeast location and very poorly at the Northeast location. The two Roundup Ready varieties performed well at both locations. The Bollgard and stacked gene varieties yielded well, but were ranked low due to high technology fees and no savings on insect control costs.

## Conclusions

The primary indicator of net returns in this study is lint yield. In general, as yields decrease net returns decrease. Large technology fees can be offset by high yields, but producers should avoid varieties that have large technology fees and low yields. In addition, these results indicate that some of the transgenic varieties offer increased net returns over some of the conventional varieties, especially in heavy weed or insect infested areas. Still, conventional varieties can result in high net returns, especially when weed or insect pressure is light.

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Table 1. Herbicide programs for three classes of cotton varieties: Southeast Arkansas, 1999.

| Conventional | Roundup Ready | Buctril Tolerant |
|---|---|---|
| Prowl 4 EC at 1.8 pts/ac Zorial 80WP at 0.625 lbs/ac PPI on 5-12-99. | Prowl 4 EC at 1.8 pts/ac Zorial 80WP at 0.625 lbs/ac PPI on 5-12-99. | Prowl 4 EC at 1.8 pts/ac Zorial 80WP at 0.625 lbs/ac PPI on 5-12-99. |
| Cotoran at 1.2 pts/ac BC Pre-emergence 5-19-99 | Roundup Ultra at 1.5 pts/ac Banded on 6-9-99. | Buctril 4EC at 1 pt/ac Banded o 6-9-99 |

Table 2. Herbicide programs for three classes of cotton varieties: Northeast Arkansas, 1999.

| Conventional | Roundup Ready | Buctril Tolerant |
|---|---|---|
| Staple at 0.4 oz/ac Banded on 6-11-99 | Roundup Ultra at 2.25 pts/ac Broadcast on 6-10-99. | Buctril at 1.5 pts/ac Banded on 6-10-99. |
| Bladex at 1.5 pts/acre MSMA at 3.0 pts/acre Directed 7-3-99 | Bladex at 1.5 pts/acre Roundup Ultra at 1.5 pts/acre Directed 7-3-99 | Bladex at 1.5 pts/acre Buctril at 1.0 pts/acre Directed 7-3-99 |

Table 3. Insecticide programs for conventional and Bollgard cotton varieties: Southeast Arkansas, 1999.

| Conventional | Bollgard |
|---|---|
| Vydate CLV @ 8.5 oz/ac | Vydate CLV @ 8.5 oz/ac |
| Provado at 3.75 oz/ac 6-18-99 | Provado at 3.75 oz/ac 6-18-99 |
| Karate Z @ 1.83 oz/ac 7-31-99 | Karate Z @ 1.83 oz/ac 7-31-99 |

Table 4. Insecticide programs for conventional and Bollgard cotton varieties: Northeast Arkansas, 1999.

| Conventional | Bollgard |
|---|---|
| Vydate CLV @ 10 oz/ac 6-22-99 | Vydate CLV @ 10 oz/ac 6-22-99 |
| Karate @ 3.2 oz/ac 8-4-99 | Karate @ 3.2 oz/ac 8-4-99 |

Table 5. Lint yields, weed and insect control costs, and returns for each treatment: Southeast Arkansas, 1999.

| Variety | Yield* | Weed control cost | Insect control cost | Tech fee, seed, and planter cost | Returns** |
|---|---|---|---|---|---|
| ST 474 | 1153 a | $31.37 | $30.55 | $16.62 | $711.27 a |
| DP 5415 RR | 1148 a | $35.05 | $30.55 | $23.26 | $697.52 a |
| NuCOTN 33B | 1077 a | $31.37 | $30.55 | $42.96 | $632.87 a |
| PM 1220RR | 1044 a | $35.05 | $30.55 | $26.07 | $623.47 a |
| ST BXN47 | 1039 a | $38.04 | $30.55 | $20.69 | $622.44 a |
| PM 1560BG | 1064 a | $31.37 | $30.55 | $44.55 | $622.37 a |
| DP 5415 | 987 a | $31.37 | $30.55 | $15.37 | $598.81 a |
| PM 1218BG/RR | 1032 a | $35.05 | $30.55 | $53.08 | $588.24 a |
| DP 5111 | 955 a | $31.37 | $30.55 | $15.37 | $576.89 a |
| DP 458 B/RR | 943 a | $35.05 | $30.55 | $49.89 | $530.47 a |

* Yields with the same letter are not significantly different at the 5% level.

** Returns over weed control costs, insect control costs, technology fee, seed costs, and cost of planting. Assuming a cotton price of $0.685/lb. Returns with the same letter are not significantly different at the 5% level.

Table 6. Lint yields, weed and insect control costs, and returns for each treatment: Northeast Arkansas, 1999.

| Variety | Yield | Weed control cost | Insect control cost | Tech fee, seed, and planter cost | Returns* |
|---|---|---|---|---|---|
| DP 5415 RR | 1,329 a | $27.68 | $19.16 | $25.63 | $837.66 a |
| DP 5111 | 1,258 a | $26.02 | $19.16 | $16.33 | $800.10 a |
| DP 5415 | 1,189 a | $26.02 | $19.16 | $16.33 | $752.67 a |
| PM 1220 RR | 1,163 a | $27.68 | $19.16 | $29.00 | $720.78 a |
| PM 1218BG/R | 1,197 a | $27.68 | $19.16 | $58.40 | $714.62 a |
| PM 1560BG | 1,154 a | $26.02 | $19.16 | $48.54 | $696.87 a |
| NUCOTN 33B | 1,127 a | $26.02 | $19.16 | $46.41 | $680.27 a |
| ST 474 | 1,038 a | $26.02 | $19.16 | $17.82 | $647.98 a |
| ST BXN47 | 1,036 a | $30.46 | $19.16 | $23.57 | $636.78 a |
| DP 458 B/RR | 1,073 a | $27.68 | $19.16 | $54.55 | $633.39 a |

* Yields with the same letter are not significantly different at the 5% level.

** Returns over weed control costs, insect control costs, technology fee, seed costs, and cost of planting. Assuming a cotton price of $0.685/lb. Returns with the same letter are not significantly different at the 5% level.