# ECONOMIC EVALUATION OF BOLLGARD COTTON IN ARKANSAS: 1996

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## Abstract

Bt cottons will be widely adopted in Arkansas only if reduced insecticide costs and/or yield increases are sufficient to recover the technology charge and other added costs associated with producing them. In 1996, five farmers at four locations in Arkansas provided data for the economic evaluation of Bollgard cotton. The change in net income per acre of the Bt fields versus the non-Bt fields was determined by partial budgeting . The changes in net income attributable to the Bollgard variety ranged from a $15.70/acre decrease to a $176.80/acre increase. More research is needed to reduce yield variability in Bollgard cotton.

## Introduction

Nineteen-ninety-six marked the first year Bt cotton was readily available to cotton growers in Arkansas. Cotton produced in southern Arkansas typically has greater insect pressure than does cotton produced in northern Arkansas. This is true for all insects including tobacco bud worm and cotton boll worm. Worm pressure in northern Arkansas may not be sufficient to warrant wide spread use of Bt cotton. Southern Arkansas, however, should be a prime candidate for this new technology.

It is estimated that 35% of the cotton acres in Southeast Arkansas were planted to Bt cotton in 1996. Entomologists with the University of Arkansas generally agree that the Bt cotton acres received between zero and three worm sprays while the non-Bt cotton acres received three to five worm sprays in 1996. Bt cottons will be widely adopted in Arkansas only if reduced insecticide costs and/or yield increases are sufficient to recover the technology charge and other added costs associated with producing Bt cotton.

## Methodology

Early in 1996, five farmers at four locations in Arkansas were selected to provide data for the economic evaluation of Bollgard cotton. These farm cooperators were chosen based on their willingness to cooperate, good record keeping habits and an intent to grow some Bollgard cotton that year. The cooperators kept field records on Bt and non-Bt fields throughout the season. After harvest, yields on each field and any differences in input use between the fields were reported to the authors. Differences in input use occurred in the areas of insecticide use and application, plant growth regulators, defoliation, technology charge and extra seed cost. All other aspects of production, such as tillage, fertility and irrigation, were the same for both fields.

Partial budgeting was used to determine the change in net income per acre of the Bt field versus the non-Bt field. An output price of $0.70/lb was used to value the change in yields. Costs of insecticides, applications and other purchased inputs were provided by the cooperators.

## Results

Six pairs of observations on Bollgard versus a non-Bt variety were obtained for south Arkansas. The partial budgeting results are displayed in Tables 1, 2, and 3.

In Lafayette county, two fields side by side were used for the comparison. These two fields belonged to two different producers. One field was planted to Bollgard cotton and the other was planted with a non-Bt variety. The Bollgard field out yielded the non-Bt field by 82 lbs/acre. It also had $54.16/acre less insecticide and application costs. The Bollgard field required additional plant growth regulator and defoliation expenses as well as the $32.00/acre technology charge and an additional $1.20/acre in seed cost. The change in net income per acre then for the Bollgard field was $67.56 (Table 1).

The Crittenden county observation consisted of one field. The producer planted one-half of the field in a Bollgard variety and the other half in a non-Bt variety. The Bollgard cotton out yielded the non-Bt cotton by 34 lbs/acre. It also had $18.58/acre less insecticide and application costs than did the non-Bt. These two benefits minus the technology charge and extra seed cost of $33.20/acre resulted in a $9.18/acre net income advantage in favor of the Bollgard variety (Table 1).

In the northern part of Jefferson county, three observations were provided by one producer. Three fields were planted to a Bollgard variety while three comparable fields were planted to non-Bt varieties. In one of the three observations, the Bollgard variety out yielded the non-Bt variety by 267 lbs/acre, saved $24.01/acre in insecticide and application expense, but incurred an additional $4.62/acre in plant growth regulator expense as well as $33.40/acre for technology and extra seed cost. In this case the benefits out weighed the costs by $172.89/acre (Table 2).

The second observation in northern Jefferson county resulted in a $66.31/acre increase in net income attributable to the Bollgard variety. This came from a 108 lbs/acre increase in yield and $24.01/acre in insecticide savings.

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These two benefits more than offset the $33.30/acre in technology and seed costs of Bollgard cotton (Table 2).

The third observation in northern Jefferson county resulted in a $15.70/acre decrease in net income attributable to the Bollgard variety. The Bollgard variety saved $26.70/acre in insecticide and application costs, but yielded 13 lbs/acre less than the non-Bt variety. The reduction in insecticide expense was not enough to compensate for the $33.30/acre technology and seed cost much less make up for the loss in yield (Table 3).

The final observation of this study was provided by a producer in southern Jefferson county. Again, one field was split in half with Bollgard cotton on one side and a non-Bt variety on the other. In this observation, a $176.80/acre increase in net income can be attributed to the Bollgard variety. Most of this benefit came from the 292 lbs/acre of additional lint harvested from the Bollgard cotton. In addition, the Bollgard variety incurred $26.81/acre less insecticide costs. The Bollgard cotton was second picked, so an additional $21.06/acre of harvest expense was incurred as well as the $33.35/acre technology and seed expense (Table 3).

## Summary

Six observations on returns and expenses for Bt and non-Bt cotton in comparable situations were obtained from Arkansas cotton producers in 1996. The change in net income attributable to the Bollgard variety ranged from a $15.70/acre decrease to a $176.80/acre increase. In only one of the observations was the insecticide savings sufficient to cover the added costs of the Bollgard cotton. Of the five observations where the Bollgard variety affected an increase in net income, an increase in lint yield was also present.

## Further Considerations

This evaluation is based on six observations, at various locations in the state, all chosen a priori in an effort to make fair comparisons. It is not, however, a controlled experiment. The tests are not replicated, nor is the sample size sufficiently large to draw conclusive evidence concerning the change in net income attributable to the Bollgard cotton variety across the state of Arkansas.

Cotton producers across Arkansas have mixed feelings about their experience with Bollgard cotton in 1996. Bollgard cotton yields were very erratic across fields. This may be weather related, management related, or seed quality related. A wide variation in yields could make growing Bollgard cotton more risky than growing the non-Bt varieties.

Cost savings alone were not sufficient to recover the additional costs associated with the Bollgard varieties in 5 of the 6 observations. Cost data from three additional observations were provided by a producer in Desha county. In two of the observations, the total cost per acre for the Bollgard and non-Bt varieties were comparable. In the third observation, costs on the Bollgard field exceeded those on the non-Bt field by approximately $35/acre.

Bollgard cotton was grown in three of the Cotton Research Verification Trials (CRVT) in 1996. CRVT fields in Chicot and Phillips county performed well and were comparable in cost and yields to non-Bt fields. A CRVT field of Bollgard cotton in Jefferson county, however, received eight in-season insecticide treatments making it the most expensive field in the CRVT for 1996. Most of the in-season treatments were for boll weevils.

Bt cotton varieties should be most economical in areas of high worm incidents and low boll weevil incidents. Increased management may be needed to control yield variability. In 1996 increased yields from the Bollgard cotton was needed in many cases to justify the extra expense.

Table 1. Change in Net Income per Acre Attributable to Bollgard Cotton: Two Observations, 1996.

| County | Lafayette | Crittenden |
|---|---|---|
| Revenue | $ 57.40 | $23.80 |
| Insecticide Savings | 54.16 | 18.58 |
| PGR Costs | 3.85 | 0 |
| Harvest Costs | 6.95 | 0 |
| Technology & Seed | 33.20 | 33.20 |
| Change in Net Income | $ 67.56 | $ 9.18 |

Change in net income is calculated by adding revenue and insecticide savings, then subtracting PGR costs, harvest costs, and technoloby.

Table 2. Change in Net Income per Acre Attributable to Bollgard Cotton: Two Observations, 1996.

| County | Jefferson, North 1 | Jefferson, North 2 |
|---|---|---|
| Revenue | $ 186.90 | $ 75.60 |
| Insecticide Savings | 24.01 | 24.01 |
| PGR Costs | 4.62 | 0 |
| Harvest Costs | 0 | 0 |
| Technology & Seed | 33.40 | 33.30 |
| Change in Net Income | $ 172.89 | $ 66.31 |

Change in net income is calculated by adding revenue and insecticide savings, then subtracting PGR costs, harvest costs, and technoloby.

Table 3. Change in Net Income per Acre Attributable to Bollgard Cotton: Two Observations, 1996.

| County | Jefferson, North 3 | Jefferson, South |
|---|---|---|
| Revenue | $ (9.10) | $ 204.40 |
| Insecticide Savings | 26.70 | 26.81 |
| PGR Costs | 0 | 0 |
| Harvest Costs | 0 | 21.06 |
| Technology & Seed | 33.30 | 33.35 |
| Change in Net Income | $ (15.70) | $ 176.80 |

Change in net income is calculated by adding revenue and insecticide savings, then subtracting PGR costs, harvest costs, and technology.