THE ECONOMICS OF BT COTTON IN THE MISSISSIPPI DELTA–A PROGRESS REPORT

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Abstract

Data was taken on 13 to 15 farms in the Mississippi Delta in 1997, 1998, and 1999 to measure the entomological and economic impact of Bt cotton when compared with conventional cotton. Data from 1997 showed that insect control costs were slightly less for conventional cotton. In 1998, data showed that in the face of a heavier tobacco budworm problem, there was a significant reduction in insect control costs for Bt cotton. In 1999, all cotton insect problems were very low and the data indicated a smaller cost for insect control in conventional cotton.

Introduction

The introduction of genetically modified cotton varieties with the *Bacillus thuringiensis* gene generated a great deal of controversy in its early years concerning their biological effectiveness and economic value. A study was initiated in 1997 to address some of these issues. The biological (entomological) data for this study is being collected by an entomologist in the Pest Management Research Unit, USDA, Jamie Whitten Laboratory, Stoneville, MS. The economic data is being collected by agricultural economists located at Delta Research and Extension Center and at the Department of Agricultural Economics at Mississippi State University.

Methodology

Data for this study were collected from commercial farms in the Mississippi Delta. Final results will be based on four years of data. This report presents the economic data for the first three years of the study. It was important to ensure a geographical distribution of Delta farms so that differences in infestations could be detected. Farms100 miles north and 65 miles south of Stoneville were selected as well as farms located near the eastern and western edge of the Mississippi Delta. Fourteen producers participated in 1997, 15 in 1998, and 13 in 1999.

On each farm paired fields or split fields were selected to standardize soil and topographic variability. Treatment one of each farm was a Bt cotton variety and the second treatment was a conventional variety (grower choice of specific varieties). Insect counts were made on a weekly basis to obtain temporal data on levels of infestations on each farm.

Economic data wereobtained bi-weekly on each trip-over-the-field; tractor and equipment size were identified, and the kind and rates of the various inputs such as fertilizer, seed and pesticide were obtained. This information was used to develop a cost of production budget for the conventional and Bt cotton treatments on each farm. The MSU Budget Generator was employed for these calculations (Spurlock et. al. , 1992). Input prices are those published in Ag Economics Report #77, #97 and #96 for 1997, 1998 and 1999, respectively (Lee, et. al., 1996, 1997, 1998). The tests were harvested using the farmer's cotton picker and three or four reps per treatment were harvested in each field (or split field) to obtain yield estimates. The seed cotton from each plot was weighed in a boll buggy equipped with electronic load cells. In addition, two 50-pound samples were obtained from each plot to be ginned at the microgin at the USDA Ginning Laboratory at Stoneville, MS.

Gross income was calculated by utilizing the average price received by farmers in Mississippi. Cotton seed price was fixed at 5 cents per pound. Total specified costs were calculated. Total specified costs include all direct costs plus fixed costs for farm machinery. No costs were included for ginning. Ginning charges are a function of yield and could lead to some erroneous conclusions when comparing costs among farms with considerably different yields. Land costs, general farm overhead and management are not included.

Cost per unit of production was calculated as yield divided by total specified costs. Total insect control costs per acre include application costs. In the Bt treatment, the technology fee is also included in the insect control costs.

Results

Table 1 presents 3-year average data for the conventional and Bt treatments with the differences calculated as conventional minus Bt. Tobacco budworm infestations were relatively light in 1995 and, thus, insect control costs for conventional cotton were slightly less expensive. Insect control costs in 1997 for the conventional treatments were $85.40 per acre compared to $91.34 for the Bt treatment, a difference of

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$5.93 per acre. Yield and gross income were very similar for both treatments as were total expenses and total returns above specified expenses. Production practices (other than insect control) on each farm were nearly identical for each treatment. Other than the technology fee for Bt, the only consistently higher cost associated with Bt cotton was a slight increased use of plant growth regulators.

The 1998 crop year was a period when tobacco budworm infestations were somewhat heavier than normal. For this reason, added insecticide applications for tobacco budworm on conventional cotton resulted in higher insect control costs than for Bt cotton. Insect control cost was $29.13 higher per acre for the conventional treatment. The total cost of insect control for the Bt treatment was $107.71. This is also reflected in the higher cost for total specified expenses. Otherwise, the differences again are principally attributed to an increased use of plant growth regulators. It should be pointed out that in both 1997 and 1998 due to the fewer number of insect control applications, tarnished plant bug applications were slightly higher in Bt cotton than in conventional cotton. A relatively light insect infestation for all of the insect complexes associated with cotton occurred in 1999, therefore, costs were down. As infestations of boll worm and budworm were very light, these results indicate no economic benefits to Bt cotton in 1999.

Table 2 presents yield, income and selected cost items, averaged over the test period. There is almost no difference in the 3-year averages between conventional and Bt cotton. Yields differ by one pound of lint per acre. Gross income differs by less than one dollar per acre. Insect control cost favor the Bt treatment by $4.00 per acre.

Conclusions and Limitations

It can be concluded that the benefits of Bt is an almost absolute function of the levels of tobacco budworm infestations in a given year.

It would be an oversimplification to say that there is no significant difference between conventional and Bt cotton. Such a conclusion would be a mistake. It is generally agreed there is no practical way to predict the level of tobacco budworm infestations in a given year. A producer's decision to use Bt and what percentage Bt will be affected by several factors. Historically, certain areas have a consistently greater problem with tobacco budworm than other areas. These will utilize a large proportion of Bt. A second factor would be the concern with the problems associated with the severe outbreak of tobacco budworm such as occurred in Alabama and Mississippi in 1995. The final factor is the cost of the technology fee. Bt cotton varieties would have appeared much more favorably in all three of the years had the technology fee been lower.

This paper has not addressed the insurance aspect of Bt cotton varieties. The insurance value of this new technology may be quite large for some producers.

References

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Table 1. Difference in 3-year average economic data of conventional vs. Bt.

Item	Yield (lb/Acre)	Gross Income @$.60/lb	Total Specified Expenses ($/Acre)*	Returns Above S.E. ($/Acre)	Cost/Unit of Production ($/lb Lint)	Total Specified Insect Cost ($/Acre)**
1997						
Conventional	981	769.59	457.55	312.04	0.48	85.40
Bt	965	756.15	458.71	297.44	0.49	91.34
Difference	16	13.44	-1.16	14.61	-0.01	-5.93
1998						
Conventional	906	560.71	342.02	218.69	0.40	136.84
Bt	902	558.12	304.90	253.23	0.35	107.71
Difference	4	2.59	37.12	-34.54	0.05	29.13
1999						
Conventional	795	535.32	309.99	225.33	0.41	73.45
Bt	813	553.99	327.43	226.56	0.44	84.64
Difference	-18	-18.67	-17.44	-1.23	-0.02	-11.19

*Does not include ginning costs, land rent and general farm overhead
**Includes technology fee for Bt cotton

Table 2. Conventional vs. Bt economic data, 3-year average.

Year	Yield (lb/Acre)	Gross Income @$.60/lb	Total Specified Expenses ($/Acre)*	Returns Above S.E. ($/Acre)	Cost/Unit of Production ($/lb Lint)	Total Specified Insect Cost ($/Acre)**
			Conventional			
1997	981	769.59	457.55	312.04	0.48	85.40
1998	906	560.71	342.02	218.69	0.40	136.84
1999	795	535.32	309.99	225.33	0.41	73.45
Average	894	621.87	369.85	252.02	0.43	98.56
			Bt			
1997	965	756.15	458.71	297.44	0.49	91.34
1998	902	558.12	304.90	253.23	0.35	107.71
1999	813	553.99	327.43	226.56	0.44	84.64
Average	893	622.75	363.68	259.08	0.43	94.56
			Difference			
Conventional	894	621.87	369.85	252.02	0.43	98.56
Bt	893	622.75	363.68	259.08	0.43	94.56
Difference	1	-0.88	6.17	-7.05	0.00	4.00

*Does not include ginning costs, land rent and general farm overhead
**Includes technology fee for Bt cotton