

# Impact of the Boll Weevil Eradication Program on the West Tennessee Economy



*Boll Weevil. Courtesy USDA  
Agricultural Research Service*

*The boll weevil eradication program is an area-wide insect management program designed to eliminate the boll weevil as a pest in West Tennessee cotton production. The program was not only projected to positively impact cotton farm profitability but economic activity in all of West Tennessee.*

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**T**he boll weevil (pictured above) has been a major insect problem for Tennessee cotton producers.

In 1998, boll weevil infestations caused \$26/acre in insecticide costs and 48 lb/acre in yield losses for growers in Tennessee (Williams, 1999). Because the boll weevil is important in cotton production, farmers in West Tennessee are implementing the boll weevil eradication program (BWEP). The BWEP is a cooperative-government-and-grower-sponsored area-wide cotton insect management program designed to eliminate the boll weevil. The program has been successfully implemented in many areas of the U.S. Cotton Belt.

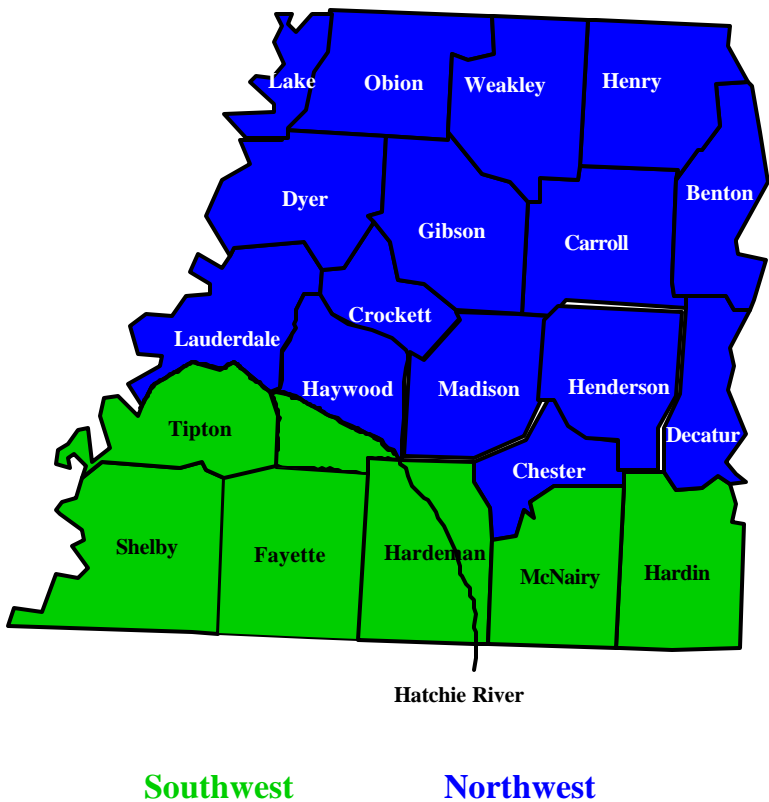
Economic analysis of the program in other cotton growing areas indicates that the BWEP positively impacts cotton yields, acreage, and production and reduces cost of production (Carlson, Sappie, and Hammig; Ahouissoussi, Wetzstein, and Duffy; Duffy et al.; Haney, Lewis, and Lambert; Tribble, McIntosh, and Wetzstein). In addition, cotton growers are not the only ones affected by the program. Firms that provide inputs such as insecticides or fertilizer or provide other services such as ginning and warehousing to cotton farmers will also be affected by the program. Thus, any changes in cotton production brought about by the BWEP may affect other areas of the economy. The

purpose of this study was to evaluate the potential effects of the boll weevil eradication program on economic activity in West Tennessee.

## **The Boll Weevil Eradication Program in West Tennessee**

Producers in southwest Tennessee voted to start the BWEP in 1998 (Figure 1). Growers in northwest Tennessee voted to start the BWEP in 2000. The U.S. Department of Agriculture, Animal and Plant Health Inspection Service (USDA-APHIS) is responsible for administration and technical support of the program. Aside from producers and USDA-APHIS, other main actors involved in the BWEP are: the Tennessee Boll Weevil Eradication Foundation, which oversees the program in Tennessee; the Southeastern Boll Weevil Eradication Foundation, which is responsible for program operations including pest monitoring and insecticide applications; and the Tennessee Department of Agriculture, which administers the regulatory functions of the program.

Once the program starts, all cotton producers are required by state law to participate (Barker, 1997). Individual producers may opt out of the program in any year by not growing cotton. BWEP personnel, rather than farmers, are responsible for boll weevil control.



**Figure 1.** Boll Weevil Eradication Program Areas in West Tennessee

However, farmers are still responsible for controlling other cotton insects. Growers provide most of the funding for the program with additional resources from USDA-APHIS, the Southeastern Boll Weevil Eradication Foundation, the Tennessee Department of Agriculture, and the Tennessee State Legislature.

### Estimating the Economic Impacts of the Program

Because the program is being implemented differently for the southwest and northwest regions, separate economic impact analyses were conducted for the two cotton production areas. A ten-year planning horizon was adopted for the analysis. The active eradication phase of the program is expected to last five years. By the end of this period, the full benefits of the BWEP should be realized. However, program costs are spread over seven years to keep the cost at a manageable level for producers. After the active phase is completed, a post-eradication phase is designed to prevent boll weevil re-infestations. Based on the payment schedule of the program, two periods were considered when estimating economic impacts of the program: the BWEP period (year one through year

seven) and the post-BWEP period (year eight through year ten).

Enterprise budgets were developed to estimate cotton net returns with and without the BWEP. Yield damage and control costs for the boll weevil reported by farmers in a 1997 mail survey were used to estimate the expected net revenue gain per acre from 100 percent boll weevil control with the eradication program (Edens et al.). The baseline budgets denote the net returns in the absence of the BWEP. The baseline budgets were then modified to estimate the impact that the BWEP would have on net returns.

Changes in production costs with the eradication program were estimated using the University of Tennessee Agricultural Policy Analysis Center (APAC) Budgeting System (Slinsky et al.). Yields and prices to estimate gross receipts under the baseline and BWEP scenarios were generated for a ten-year period using the APAC Policy Analysis System (POLYSYS) model (De La Torre Ugarte et al.).

The effects of the projected net revenue gain/acre on cotton acreage and economic activity in each region were evaluated using an acreage response model and the Impact for Planning (IMPLAN) input-output model. The regional acreage response models were used to predict the change in acreage for cotton and competing crops due to the program. The input-output model was used to evaluate the impact that changes in cotton net returns, acreage, and production would have economic activity in the region. Additional information about the data and methods used for this study is found in Suarez, Larson, and English (2000).

### Farm Level Impacts

Baseline cotton budgets and the projected changes in revenues, costs, and net returns with the BWEP are presented in Table 1. Because of improved yields from lower insect damage, the BWEP was expected to increase revenues from lint and cottonseed by \$58/acre (13 percent) for the BWEP period in the southwest. Revenue gains in the post-BWEP period were predicted to be somewhat higher than for the BWEP period. Total costs increased by \$19/acre (5 percent) for the BWEP period but decreased by \$6/acre (1 percent) for the post-BWEP period. Insecticide costs declined by \$8/acre (28 percent) in the BWEP period, however, the insecticide cost savings were more than offset by program assessment costs and increased ginning expenses. In the post-BWEP period, insecticide

Table 1. Projected Changes in Cotton Enterprise Net Returns from the Boll Weevil Eradication Program (BWEP) for West Tennessee

Item	Cotton Production Region <sup>a</sup>					
	Southwest			Northwest		
	Base-line <sup>b</sup>	Change from the baseline BWEP Period <sup>c</sup>	Post-BWEP Period <sup>d</sup>	Base-line <sup>b</sup>	Change from the baseline BWEP Period <sup>c</sup>	Post-BWEP Period <sup>d</sup>
	\$/acre					
<b>Revenues</b>	447.95	57.78	67.13	505.36	47.77	55.34
<b>Variable Costs</b>						
<i>Insecticides</i>	28.75	! 7.91	! 16.67	18.54	! 3.74	! 9.15
<i>Assessment</i>	0.00	22.39	7.50	0.00	22.39	5.00
<i>Other</i>	269.77	4.97	4.86	270.30	4.44	4.72
<b>Total</b>	298.58	19.45	! 4.31	288.84	23.10	0.57
<b>Fixed Cost</b>	113.51	! 0.90	! 1.53	111.98	! 0.66	! 0.77
<b>Total Cost</b>	412.03	18.56	! 5.84	400.82	22.44	! 0.20
<b>Net Returns</b>	65.92	39.22	72.76	104.81	25.33	55.54

<sup>a</sup> See Figure 1.

<sup>b</sup> Denotes beginning simulated revenues, costs, and net returns in the absence of the BWEP.

<sup>c</sup> Average for year one through year seven after the program starts.

<sup>d</sup> Average for year eight through year ten after the program starts.

cost savings increased to \$17/acre (58 percent).

Given the changes in revenues and costs, net returns

rose by \$39/acre (59 percent) in the BWEP period. The expected increase in net returns over baseline values more than doubles in the post-BWEP period to \$73/acre (110 percent).

For the northwest, cotton revenues were expected to rise by \$48/acre (9 percent) for the BWEP period and by \$55/acre (11 percent) for the post BWEP period. Total costs increased by \$22/acre (6 percent) for the BWEP period but remained unchanged from the baseline for the post-BWEP period. Insecticide costs declined by \$4/acre (20 percent) for the BWEP period and by \$9/acre (49 percent) for the post-BWEP period. Because yield gains and insecticide cost savings were lower in the northwest, the impact of the eradication program on net returns was smaller than for the southwest. Net returns rose by \$25/acre (24 percent) in the BWEP period and \$56/acre (53 percent) in the post-BWEP period.

Table 2. Projected Changes in Crop Acreage from the Boll Weevil Eradication Program (BWEP) in West Tennessee

Region/ Crop	BWEP Period <sup>a</sup>		Post-BWEP Period <sup>b</sup>	
	Base- line <sup>c</sup>	Change from Base- line	Base- line <sup>c</sup>	Change from Base- line
	Planted acres			
<b>Southwest <sup>d</sup></b>				
<i>Cotton</i>	125,464	7,972	135,303	27,071
<i>Corn</i>	53,713	! 1,030	62,105	! 2,884
<i>Soybeans</i>	196,074	! 1,390	168,053	! 5,137
<i>Wheat</i>	109,249	! 5,551	119,038	! 19,053
<b>Northwest <sup>d</sup></b>				
<i>Cotton</i>	373,138	7,121	380,383	24,955
<i>Corn</i>	282,798	! 1,712	288,429	! 5,837
<i>Soybeans</i>	663,952	! 1,422	578,251	! 6,159
<i>Wheat</i>	515,112	! 3,986	587,937	! 12,960

<sup>a</sup> See Table 1 footnote a.

<sup>b</sup> See Table 1 footnote b.

<sup>c</sup> Denotes simulated acreage in the absence of the BWEP

<sup>d</sup> See Figure 1.

### Regional Crop Acreage Impacts

Projected changes in acreage caused by the BWEP are presented in Table 2. Crops competing against cotton in this analysis were corn, soybeans, and wheat. Cotton acreage in the southwest was projected to expand by 7,972 acres (6 percent) in the BWEP period and by 27,071 acres (20 percent) in the post-BWEP period. In the northwest, the expansion in cotton acreage for the BWEP period was predicted to be 7,121 acres or an increase of 2 percent. In the post-BWEP period, cotton acreage was expected to rise by 24,955 acres or an increase of 7 percent. Given the positive impact on farm-level net returns, farmers in West Tennessee were projected to expand acreage by 15 thousand acres (3 percent) in the BWEP period and 52 thousand acres (10 percent) in the post-BWEP period.

### Regional Economic Impacts

Key economic indicators for the baseline economy (in the absence of the BWEP) and the projected changes in economic activity brought about by the BWEP are presented in Table 3. Industry output is the value of production summed across all industries and is a measure of total economic activity. Employment is the total number of jobs in the region.

Output for the baseline in the southwest amounted to \$51.4 billion. Agriculture, including agricultural and related services, accounted for less than 1 percent of total industry output in the region. Cotton contributed \$80.3 million (0.2 percent) to regional output and was the largest activity in the agricultural sector. The small contribution of agriculture to total output in the southwest was influenced by the role of the large city of Memphis in Shelby County. More than 80 percent of population and households and 90 percent of personal income in the region were from Shelby County.

Industry output of \$16.8 billion for the northwest was much smaller than for the southwest. Agriculture accounted for about 4 percent of output and 6 percent of employment in the northwest. Cotton was the largest activity in the agricultural sector and contributed \$238 million (1.4 percent) to total regional output.

Economic activity is expected to expand modestly in response to the eradication program. For the southwest, total industry output is expected to expand by \$17.1 million and employment is projected to rise by 204 jobs for the BWEP period. Because more cotton is grown in the northwest, projected gains in output and employment were larger. Industry output rose by \$30.9 million and employment expanded by 403 jobs.

Projected economic gains in the post-BWEP period were somewhat larger than the expected gains in the BWEP period. Industry output in the southwest expanded by \$26.3 million and employment increased by 212 jobs. For the northwest, output climbed by \$41.3 million and employment rose by 434 jobs.

Even though the anticipated economic impact of the BWEP on the regional economy as a whole is relatively small, the impact of the program on agricultural sectors and the industries that provide goods and services to agriculture is expected to be much larger. Industry output for the business sectors expected to be the most affected by the BWEP for the post BWEP period is presented in Figure 2. Direct

**Table 3. Predicted Changes in Regional Economic Activity from the Boll Weevil Eradication Program (BWEP) in West Tennessee**

Region/ Economic Indicator	Baseline <sup>a</sup>	Change from Baseline	
		BWEP Period <sup>b</sup>	Post- BWEP Period <sup>c</sup>
1994 Dollars (millions)/Jobs			
<b>Southwest <sup>d</sup></b>			
<i>Output</i>	51,356.340	17.103	26.298
<i>Employment</i>	664,552	204	212
<b>Northwest <sup>d</sup></b>			
<i>Output</i>	16,756.060	30.872	41.289
<i>Employment</i>	224,384	403	464
<b>Total</b>			
<i>Output</i>	68,112.400	47.975	67.993
<i>Employment</i>	888,936	607	676

<sup>a</sup> Denotes economic activity in the absence of the BWEP.

<sup>b</sup> See Table 1 footnote a.

<sup>c</sup> See Table 1 footnote b.

<sup>d</sup> See Figure 1.

effects resulted from changes in final demand brought about by the BWEP. These direct impacts explained 61 percent (\$41.8 million) of the total gain in industry output. The largest direct impact of the program was from the change in the value of crop production. The Food Grains (wheat), Feed Grains (corn), and Oil Bearing Crop (soybeans) sectors were projected to have smaller output because of reduced acreage with the program. However, the reduction in wheat, corn, and soybean output was more than offset by the gain in output from the Cotton sector through improved yields and expanded acreage. Consequently, the value of crop production was projected to rise by \$36 million in the post BWEP period. Other direct impacts of the program were related to changes in goods and services purchased by farmers (not shown in Figure 2). For example, the Agriculture, Forestry, Fishery Services sector was projected to

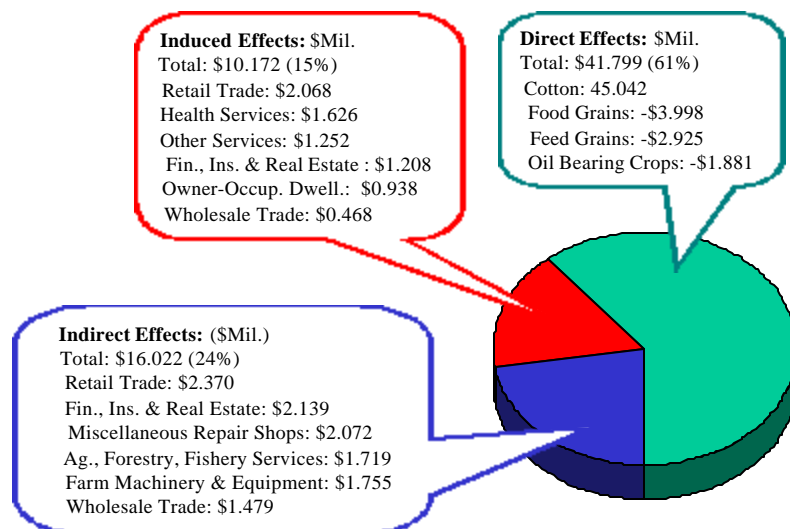


Figure 2. Projected Direct, Indirect, and Induced Impacts of the Boll Weevil Eradication Program (BWEP) on Industry Output in West Tennessee, Post-BWEP period

benefit from increased demand for ginning and insect control services because of the expansion in cotton acreage and production.

Direct effects of the BWEP also resulted in secondary effects on economic activity. These secondary effects are referred to as indirect and induced impacts. Indirect effects explained 24 percent (\$16 million) of the total impact on output. These indirect effects reflect, in part, expected changes in purchases of seed, fertilizer, herbicide, insect scouting services, post harvest cotton ginning and handling services, and other inputs by farmers with a change in the crop mix. In order of descending industry output, the six sectors expected to be most impacted by the BWEP were: Retail Trade; Finance, Insurance, & Real Estate; Miscellaneous Repair Shops; Farm Machinery & Equipment; Agriculture, Forestry, Fishery Services; and Wholesale Trade. The Miscellaneous Repair Shops sector includes activities for agricultural equipment and machinery repairs.

Induced effects measure the expected impact of the BWEP on household spending. Induced effects

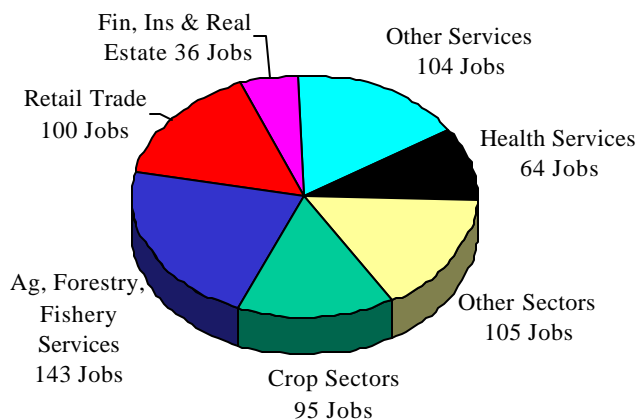


Figure 3. Projected Impacts of the BWEP on Employment By Industry Sector in West Tennessee, Post-BWEP Period

explained 15 percent (\$10.2 million) of the total gain in output. Sectors selling goods and services for household consumption that were expected to be most positively impacted by the BWEP were: Retail Trade; Health Services; Other Services; Finance, Insurance, and Real Estate; Owner-Occupied Dwellings; and Wholesale Trade.

Expected effects on employment by industry sector for the post-BWEP period are presented in Figure 3. Cotton and Agricultural, Forestry, Fisheries Services were projected to see the largest increases in employment. Agricultural, Forestry, Fisheries Services employment increased by 53 jobs in the southwest and by 90 jobs the northwest. Most of the negative employment effects were in the crop sectors affected by the expansion of cotton acreage: Food Grains, Feed Grains, and Oil Bearing Crops. However, cotton production is more labor intensive than wheat, corn, or soybean production so there was a net positive impact of 95 jobs on crop sector employment. Other sectors projected to have sizable gains in employment were Retail Trade, Health Services, and Other Services.

### Summary

This study found that the Boll Weevil Eradication Program will positively impact cotton net returns in West Tennessee. The projected improvement in net returns resulted from higher yields with reduced insect damage and from lower insect control costs. Because of the positive impact on net returns, farmers were predicted to expand cotton acreage by 10 percent after the program is completed. The changes in cotton net returns and acreage were also projected to positively impact economic activity in the region. Total crop sector output and employment increased as a result of the program. In addition, businesses that provide goods and services to the crop sector were also predicted to have positive gains in industry output and employment. And finally, businesses that sell goods and services to households were predicted to benefit from the program because of higher income.

### Acknowledgments

This research was supported by Cotton Incorporated Project No. 97-449TN and Tennessee Agricultural Experiment Station Project No. 76.

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E11-1215-00-002-01