



The University of Georgia

Center for Agribusiness and Economic Development

College of Agricultural and Environmental Sciences

Economic Impact due to Elimination of Single-Gene Bollgard® Technology in the Georgia Cotton Industry

**Prepared by:
Archie Flanders, Don Shurley, and John McKissick
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Executive Summary

Cotton is Georgia's number one row crop in acreage and farm income. Anticipated changes in cottonseed technologies will have economic impacts in the Georgia cotton industry. Elimination of currently available technologies will lead to declines in cotton productivity. Reduced yields contribute to lost revenues associated with production, ginning, marketing, classing, and storage. Changes in the Georgia cotton industry have economic impacts throughout the state economy. The total economic output loss to the Georgia economy due to changing seed technology is \$128.32 million. Employment declines by 808 jobs as declining cotton production has impacts in other sectors of the state economy. Losses in total state wages and benefits are \$78.87 million. Income to farmers declines by \$54.65 million which averages \$59/acre. Economic impacts associated with a change in cottonseed technology are concentrated in rural Georgia counties with economies that are dependent on cotton production.

Economic Impact due to Elimination of Single-Gene Bollgard® Technology in the Georgia Cotton Industry

Cotton is Georgia's number one row crop in acreage and farm income. Georgia ranks second in the US in cotton acres planted and typically third in total cotton production. In 2007, Georgia accounted for 9.5% of US acres harvested and 8.7% of US production. In 2007, Georgia and US cotton acres decreased due to high prices and relatively high net returns from corn and soybeans, but cotton remains the state's largest crop in acreage and value. Georgia farmers planted 1.03 million acres of cotton in 2007. Cotton acres reached a high of 1.5 million acres in 1995 and again in 2000. The 2007 Georgia crop is valued at an estimated \$550 million of lint and cottonseed.

Situation

Almost all of Georgia cotton acreage is planted to transgenic varieties that are insect and/or herbicide resistant. More than 92% of Georgia acres are planted to single-gene Bollgard® (B1) varieties, and this acreage is almost exclusively Delta and Pine Land (DPL) varieties. More than 83% of the state's cotton acreage is planted to the DPL555BR variety. DPL555BR has proven to be a consistently high yielding variety in University of Georgia Official Variety Trials (OVT's) and in practice on the farm. Newer two-gene Bt varieties such as Bollgard II® and Widestrike® have not yet gained widespread acceptance.

There exists a wide array of available cotton technologies. University of Georgia research has demonstrated that the most significant factors in profitability between technologies are yield and choice of variety within a technology. Research has shown that while there are differences in inputs and production costs among technologies, such differences in costs are relatively small and may be offset by differences in yield. Georgia cotton farmers realize profitability, as well as convenience in using transgenic technologies.

The registration of B1 will expire September 30, 2009. Available stocks of seed will be phased out, but allowed for use in 2010 and 2011. Monsanto will not pursue re-registration, and both Monsanto and EPA plan to expedite the move to Bollgard® II (B2) technologies for insect resistance management. Without B1 technology, cotton producers would have to plant non-B1 varieties including B2, Widestrike®, non-transgenic, or other varieties with only herbicide resistance traits such as Roundup Ready®, Roundup Ready Flex®, and Liberty Link®. The economic implications of such a change in seed technology depend on differences in lint yield, cottonseed yield, seed cost and technology fees, as well as other applicable production and marketing costs.

Yield Considerations

Georgia cotton yields have been improving due to higher yielding varieties like DPL555BR, improved management of newer varieties, and improved pest control such as stink bugs. The 2003-2007 trend adjusted moving 5-year average cotton yield for Georgia is 805 lbs./acre. An average of UGA and Farm Service Agency estimates indicates that approximately 40% of Georgia's cotton production is irrigated.

In irrigated OVT's for 4 locations from 2003 through 2007, DPL555BR has averaged 15.3% higher yield than the top yielding B2 varieties. Other B1 varieties averaged 7% less than 555, but 10% higher than B2. In non-irrigated OVT's at 3 locations, the highest yielding B2 varieties averaged 7.4% less yield than DPL555BR and 6.6% less than other B1 varieties. Other B1 varieties did not show a significant yield difference when compared to DPL555BR, but DPL555BR and other B1 varieties had higher yields than non-Bt and B2 varieties.

Cotton Production Economic Impacts to the State Economy

Changes in the Georgia cotton industry have economic impacts throughout the state economy. Cotton production leads to sales of inputs and agricultural services, as well as purchases that are due to income earned directly in production and in related industries. Economic impacts in the cotton industry have the greatest effects on county economies with the most dependence on cotton production. Research at the Center for Agribusiness and Economic Development at the University of Georgia indicates that cotton production had a \$1.4 billion economic output impact in the 2006 state economy and led to 11,700 jobs. Cotton production composes more than 1% of the total economy in 46 Georgia counties. Figure 1 shows that of these 46 counties, total economic output impact from cotton is greater than 3% of the economy in 21 counties, greater than 7% in 10 counties, and greater than 10% in 3 counties.

Principles of Economic Impact Analysis

Economic impacts can be estimated with input-output models (IMPLAN) that separate the economy into various industrial sectors such as agriculture, construction, manufacturing, trade, and services. An input-output model calculates how a change in the cotton industry changes output, income, and employment in other industries. These changes, or impacts, are expressed in terms of direct and indirect effects. Impacts are interpreted as the contribution of cotton production to the total economy. Direct effects represent the initial impact on the economy of cotton production. Indirect effects are changes in other industries caused by direct effects of production and include changes in household spending due to changes in economic activity. Thus, the total economic impact is the sum of direct and indirect effects. Input-output analysis can interpret the effects of an enterprise in a number of ways including output (sales), labor income (employee compensation and proprietary income), employment (jobs), and tax revenue.

Output impacts are a measure of economic activity that results from cotton production expenditures in a specific industrial sector. Output is equivalent to sales, and the output multiplier indicates how initial economic activity in one sector leads to sales in other sectors. Personal income impacts measure purchasing power that is created due to the output impacts. This impact provides the best measure of how standards of living are affected for residents in the impact area.

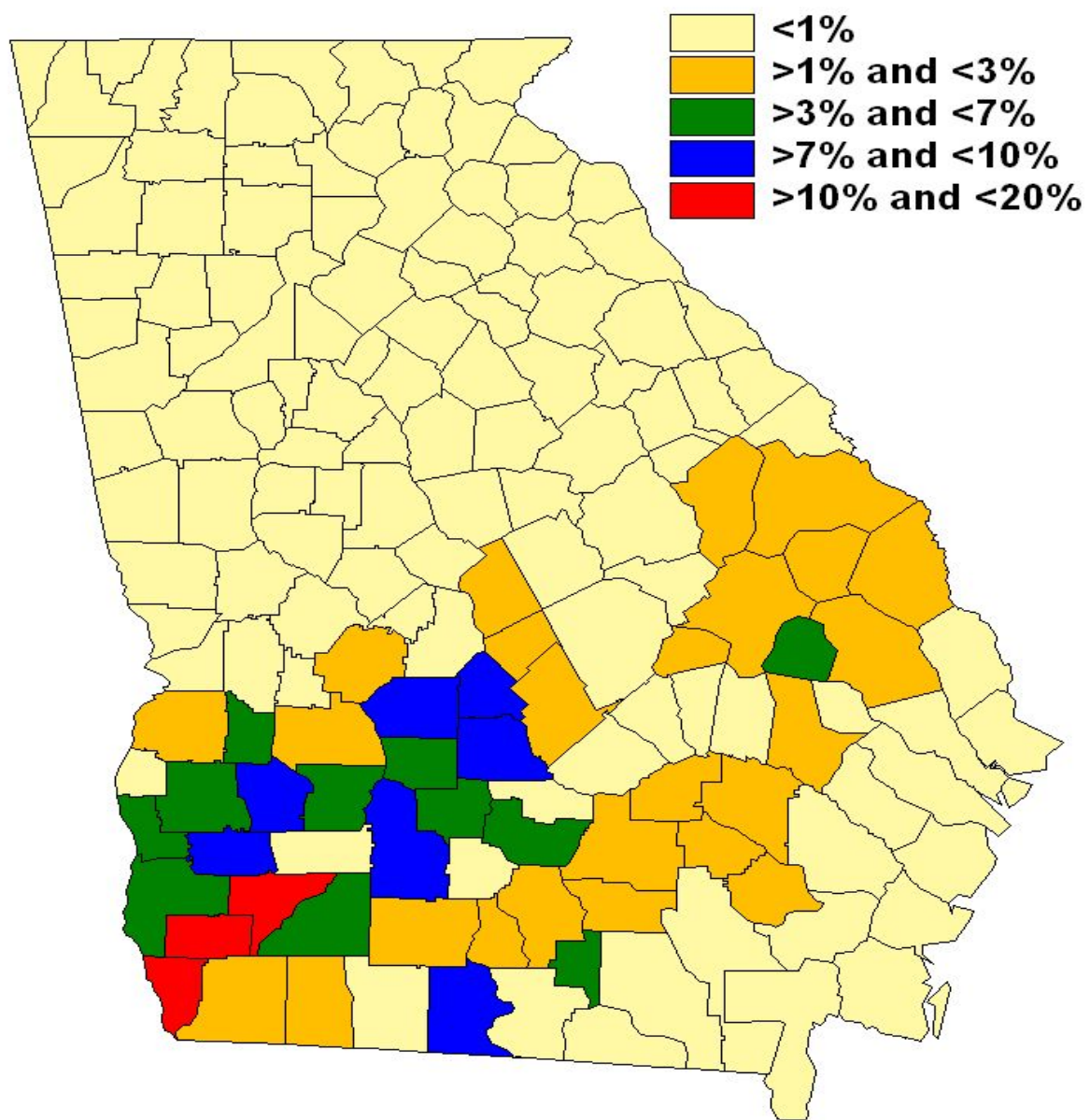


Figure 1. Economic Impact of Cotton Production as Percent of Total County Economy, 2006

Cotton production involves a specified number of employees that is determined by the available technology. Employment multipliers indicate the effect on employment resulting from cotton production initiating economic activity. IMPLAN indirect employment includes both full-time and part-time jobs without any distinction. Jobs calculated within an IMPLAN industrial sector are not limited to whole numbers and fractional amounts represent additional hours worked without an additional employee. With no measure of hours involved in employment impacts, IMPLAN summations for industrial sectors which include fractional employment represent both jobs and job equivalents. Since employment may result from some employees working additional hours in existing jobs, instead of terming indirect employment impacts as “creating” jobs, a more accurate term is “involving” jobs or job equivalents. The same reasoning applies to situations in which jobs are lost due to contraction of an industry.

Methodology for Analysis

Only a small amount of B2 acreage is currently planted in Georgia, and that acreage is packaged with RF or LL technology. This analysis assumes elimination of all B1 acres would lead to all former B1 acreage switching to B2RF technology. Increased seed costs and technology fees would total \$12.95/acre. Changing the seed technology available leads to average irrigated and non-irrigated farm yield reductions of 87.5 lbs./acre. Georgia B1 cotton acreage consists of DPL555BR (83.6%) and other B1 (8.8%) for a total of 92.4% B1 varieties. Applying the combined B1 portion to 1.0 million total cotton acres leads to 924,000 acres involved in changing seed technology to B2 varieties. Yield, prices, and costs represent expectations for the 2008 production year. Expected cotton yield is 805 lbs./acre. Cotton is valued at \$0.70/lb. and cottonseed at \$150/ton.

Costs, returns, and input expenditures are calculated for production with the currently available B1 seed varieties and production with B2 varieties. Yield reductions lead to changes in returns, input expenditures, and marketing costs which are applied to an input-output model. Results from IMPLAN are interpreted as economic impacts that are due to changing seed technology.

Economic Impacts due to Changing Seed Technology

Value of production losses totaling \$56.60 million are equal to the loss in lint sales due to changes in seed technology. Reduced yields contribute to lost revenues in ginning, marketing, classing, storage, as well as inputs related to harvesting. The direct output impact of reduced production is \$64.48 million in Table 1 with indirect output losses of \$63.85 million. The output impact totals \$128.32 million, and this is the economic loss to the Georgia economy due to changing seed technology. Economic impacts represent losses throughout the state, but are concentrated in cotton dependent counties from Figure 1. An assumption of this analysis is that farmers do not change planted acreage or production practices as seed technology changes. Thus, the number of farmers and hired employees does not change as direct employment in Table 1. However, indirect employment declines by 808 jobs as declining production impacts other sectors of the economy. Direct labor income lost is \$54.65 million in Table 1. Hired labor is considered a lumpy expenditure and employee compensation does not decrease. Thus, lost direct income is entirely farmer income. The average loss in direct income is \$59/acre. Indirect labor income impacts are \$24.22 million for total income losses of \$78.87 million. Diminished economic activity and income losses impact tax

revenues collected by state and local governments. State tax revenue losses are \$2.36 million, and local governments in the state have declining revenues of \$1.84 million.

Table 1. Cotton Production Losses: Annual Georgia Economic Impacts

	Direct Impact	Indirect Impact	Total Impact
Output (\$)	64,478,040	63,845,066	128,323,106
Labor Income (\$)	54,646,680	24,224,728	78,871,408
Employment	0	808	808
State Taxes (\$)			2,361,621
Local Taxes (\$)			1,844,586

Table 2 shows the distribution of economic impacts among major industrial sectors. The agricultural sector has the greatest impacts for output, labor income, and employment. Employment declines in the agricultural sector are concentrated in ginning, but extend to other agricultural support industries including those related to marketing. Some declines in agricultural employment are due to decreased demand in other agricultural production sectors that are impacted by declining income. A decline in the services sector of 255 jobs occurs because of decreased spending. Decreased employment in the trade sector is concentrated in retail trade as demand decreases due to declining income. Labor income decreases in all sectors of Table 2, but the \$54.65 million direct income impact in Table 1 indicates that farmers are the most adversely affected.

Table 2. Cotton Production Losses: Annual Economic Impacts to Major Sectors, Georgia

Sector	Output (\$)	Labor	
		Income (\$)	Employment
Agriculture	74,386,072	62,031,816	356
MC ¹	253,924	102,601	2
Utilities	1,471,014	315,632	2
Manufacturing	5,349,896	807,293	14
Transportation, Warehousing	1,551,180	660,742	14
Trade	10,213,556	4,045,450	119
FIRE ²	8,089,299	2,128,648	42
Services	19,691,291	8,616,705	255
Government & Non NAIC's	7,316,874	162,523	4
Total	128,323,106	78,871,408	808

¹Mining and Construction

²Finance, Insurance, and Real Estate

Summary

Cotton is Georgia's number one row crop in acreage and farm income. Anticipated changes in cottonseed technologies will have economic impacts in the Georgia cotton industry. Elimination of currently available technologies will lead to declines in cotton productivity. Reduced yields contribute to lost revenues associated with production, ginning, marketing, classing, and storage. Changes in the Georgia cotton industry have economic impacts throughout the state economy. The total economic output loss to the Georgia economy due to changing seed technology is \$128.32 million. Employment declines by 808 jobs as declining cotton production has impacts in other sectors of the state economy. Employment declines in the agricultural sector are concentrated in ginning, but extend to other agricultural support industries including those related to cotton marketing. A decline in the services sector of 255 jobs occurs because of decreased spending. Decreased employment in the trade sector is concentrated in retail trade as demand decreases due to declining income. Losses in total state wages and benefits are \$78.87 million. Income to farmers declines by \$54.65 million which averages \$59/acre. Diminished economic activity and income losses impact tax revenues collected by state and local governments. State tax revenue losses are \$2.36 million, and local governments in the state have declining revenues of \$1.84 million. Economic impacts associated with a change in cottonseed technology are concentrated in rural Georgia counties with economies that are dependent on cotton production.

The Center for Agribusiness & Economic Development



The Center for Agribusiness and Economic Development is a unit of the College of Agricultural and Environmental Sciences of the University of Georgia, combining the missions of research and extension. The Center has among its objectives:

To provide feasibility and other short term studies for current or potential Georgia agribusiness firms and/or emerging food and fiber industries.

To provide agricultural, natural resource, and demographic data for private and public decision makers.

To find out more, visit our Web site at: <http://www.caed.uga.edu>

Or contact:

John McKissick, Director
Center for Agribusiness and Economic Development
Lumpkin House
The University of Georgia
Athens, Georgia 30602-7509
Phone (706)542-0760
caed@agecon.uga.edu

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