Identifying Optimal Geographic Distribution and Transportation Models Between Cotton Producers and Ginners in a Changing cotton Marketing Supply Chain

The objective of this project was to understand how changing gin infrastructure and transportation costs between cotton fields and gins would impact the ability of cotton producers to grow and market cotton in the future in lower Mid-South region of the United States. Starting in 2007, increasing disparities in the relative profitability of cotton versus alternative commodities such as corn and soybeans resulted in measurable reductions in cotton acreage and many cotton gins ceasing ginning operations. Much concern was placed on whether this reduced ginning infrastructure would impact the ability of this region to increase cotton acreage in the future if market conditions rebounded.

One of the main findings of this project was that different regions of the Mid-South were impacted differently from reduced gin infrastructure than others. In Louisiana, approximately 30% of fields growing cotton in the last high production year (2006) would see the distance between field and gin increase to 30 miles if the first and second closest cotton gins to their field ceased operations. In Arkansas, the elimination of active gins by 2009 along the cotton producing region of the Arkansas River would make it more costly to bring 2006 cotton acreage back into production given reduced gin infrastructure.

Further, researchers evaluated the costs of reduced ginning infrastructure and alternative models of transferring transportation costs of cotton from field to gin from the gin owner to producer would look like. Results indicated that if cotton gins transferred the entire shipping costs to the cotton producer, total variable costs per acre for cotton would increase approximately 1.3%, or $7.92 per acre, assuming an average maximum distance between cotton field and gin of 43 miles. These results should directly help producers identify addition costs they might incur if they chose to grow cotton in regions with more distance cotton ginning infrastructure and will be valuable to gins interested in developing alternative pricing for such products as gin seed rebates.

FINAL REPORT

APPENDIX

Contacts

James M. Fannin, Associate Professor, mfannin@agcneter.lsu.edu
Kenneth W. Paxton, Professor Emeritus, kpaxton@agcenter.lsu.edu
Dept. of Agricultural Economics and Agribusiness, LSU AgCenter
101 Martin D. Woodin Hall
Baton Rouge, LA 70803
(225) 578-0346

Isssue

The cotton ginning industry has undergone a series of changes since its beginning. The pace of these changes increased with the widespread adoption of mechanization for cotton production. In particular, the invention and adoption of the mechanical cotton picker in the 1950-60s greatly accelerated change in the ginning industry by increasing the rate at which the crop was harvested and, thereby, increasing pressure on gins to process cotton more quickly. In response to this pressure, gins began adopting various technologies to increase the rate at which they were able to process seed cotton. Gins were not able to increase processing capacity sufficiently to keep pace with available harvest capacity. The bottleneck in the process was the cotton trailers used to transport cotton from the field to the gin. Availability of cotton trailers limited the harvest/ginning process. There was a physical limit, defined by the number of trailers in a gin community, and a restricted area from which cotton could be transported to the gin.

These restrictions were removed with the widespread adoption of the module builder. Module builder technology was introduced in the early to mid 1970s and was widely adopted by the mid 1980s. Currently, virtually all cotton is transported to the gin in a module. The module builder and the associated module transport unit provided expandable storage for the harvested cotton and facilitated transporting seed cotton greater distances to the gin. The module builder essentially decoupled ginning capacity and harvest capacity because the harvested cotton could safely be stored in the module for an indefinite time period until it was ginned.

The ability to transport cotton greater distances with the module hauler has greatly expanded the area from which gins obtain seed cotton. With conventional cotton trailers, seed cotton was typically hauled 5-10 miles to the gin. Using the module, cotton can be hauled an average of 20 miles or more to the gin. The ability to transport seed cotton greater distances has contributed to the continued decline in gin numbers.

Cotton Production and Ginning Trends

As noted above, the ginning industry has undergone tremendous changes in the recent past. These changes have occurred while there has been significant change in the cotton production sector. Historically, cotton acreage has been declining in the United States since 1900 when there were about 25,000,000 acres of cotton. Cotton was yielding less than 200 pounds per acre, so total production in 1900 was just over 10 million bales. As shown in Figure 1, harvested cotton acreage reached a peak in the late 1920s and has declined since that time. On the other hand, cotton production has generally increased over the same period. This has been possible with increased productivity per acre. Currently, cotton production in the United States has averaged approximately 845 pounds of lint per acre during the last five years. Figure 2 illustrates the change in per acre lint yields in the United States. Note that per acre yields were relatively stable until the mid 1930s and since that time, the increase in per acre yield has been dramatic.

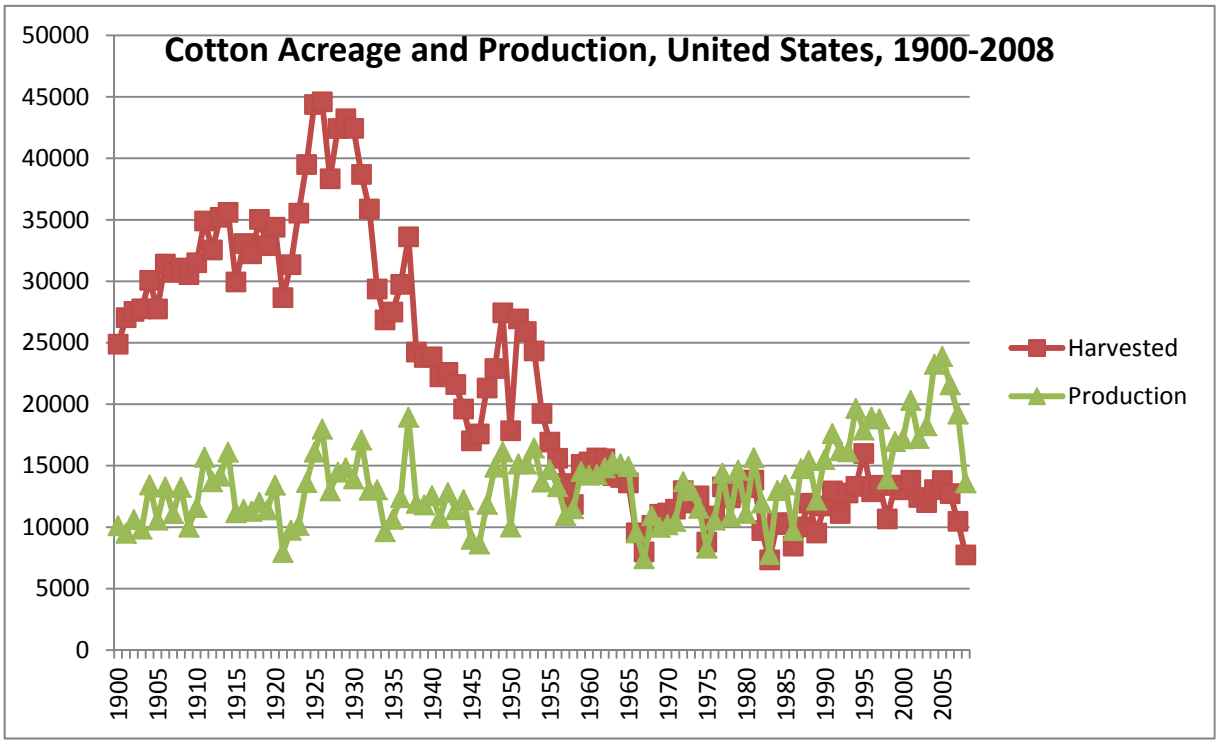


Figure 1. United States Cotton Harvested Acreage and Production, 1900-2008.
Source: National Agricultural Statistics Service , 2008.

Generally speaking, cotton production has been increasing since the low mark of the payment in kind (PIK) program year of 1983. In 1983, there were approximately 7.3 million acres of cotton producing just over 7.4 million bales of cotton. Since 1983 cotton acreage has increased, but, as illustrated in Figure 1, production has increased more rapidly primarily due to increases in cotton lint yields.

While cotton production has been increasing in recent years, the number of gins available to process that cotton has decreased. The number of gins in the United States and in the mid-south is illustrated in Figure 2. During the period 1997-2007, the number of gins has declined from 1,153 in 1997 to 806 in 2007. This represents a decline of 30 percent. In the mid-south, the decline in numbers has been slightly greater than the national trend. Gin numbers in the mid-south declined from 366 in 1997 to 244 in 2007, a decline of 33 percent.

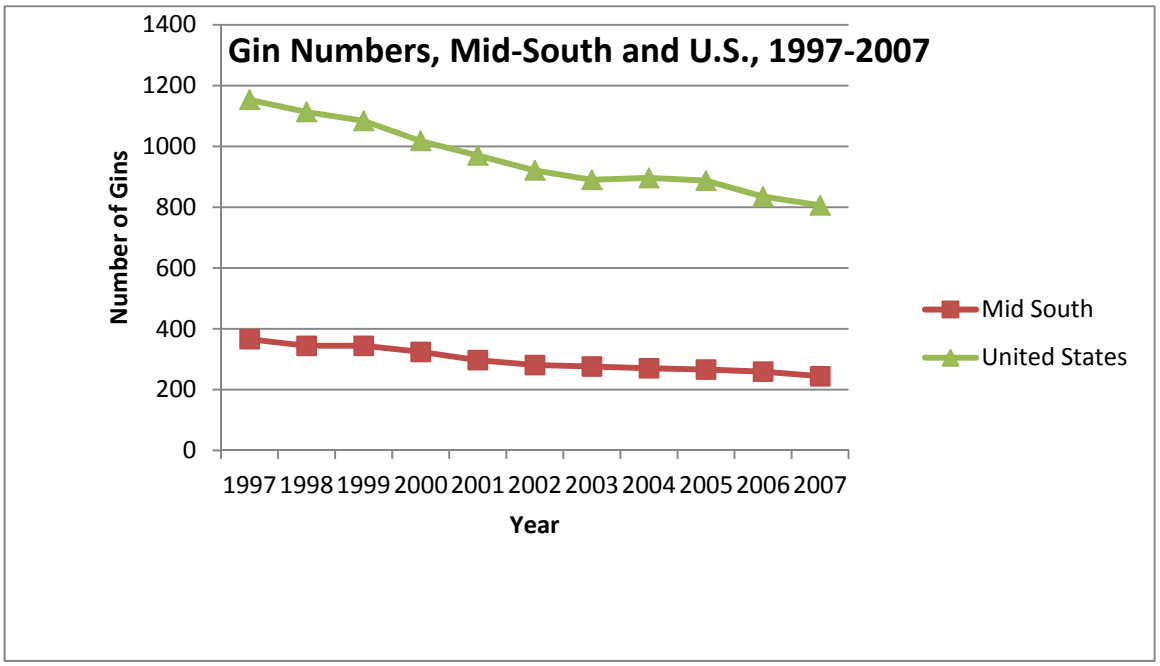


Figure 2. Total number of Cotton Gins in Mid-South and United States, 1997-2007.
Source: National Agricultural Statistics Service, 2008.

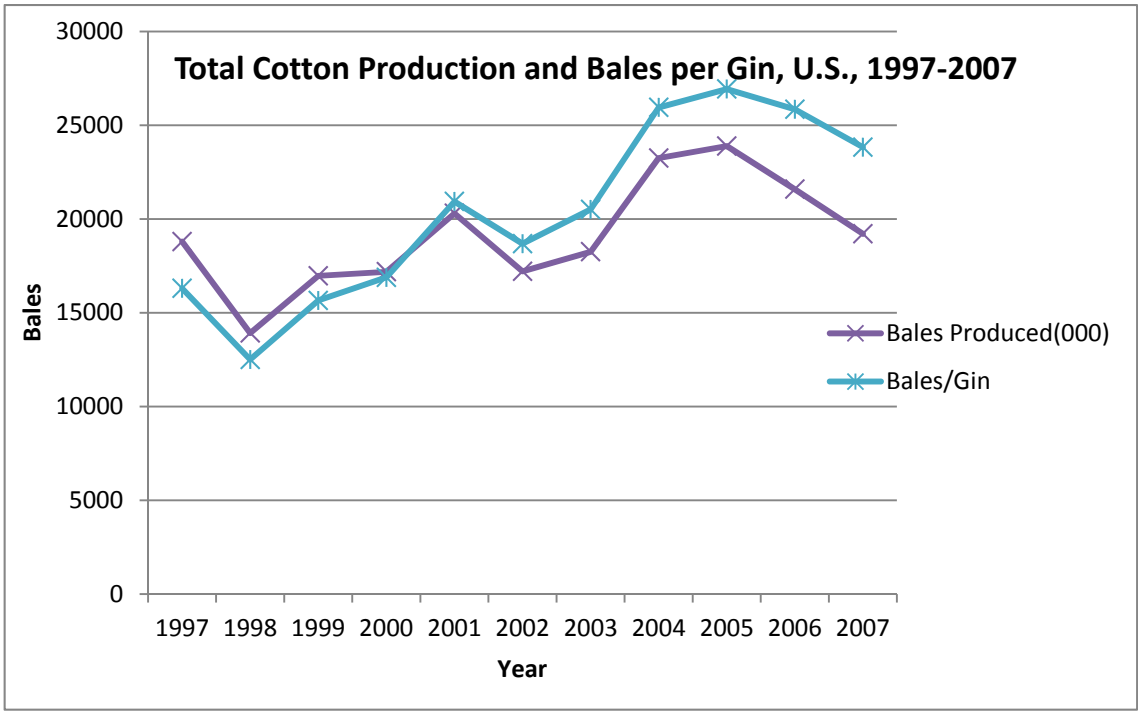


Figure 3. Total Cotton Production and Bales Per Gin, United States, 1997-2007.
Source: National Agricultural Statistics Service, 2008.

The continued decline in gin numbers and continued increase in production have led to increased volume per gin, as illustrated in Figure 3. In 1997 total cotton production was just under 20 million bales. Gin numbers totaled 1,153, so the volume per gin was about 16,000 bales. As the number of gins continued to decline, the volume per gin increased to a maximum in 2005. At this time total production was almost 24 million bales and there were less than 900 active gins in the United States. This led to a volume per gin of almost 27,000 bales. As production declined in 2006 and 2007, the number of active gins declined even more resulting in a volume per gin of almost 24,000 bales in 2007. The growing conern in the mid-south cotton community over the future availability of cotton ginning infrastructure is the motivation for the current project.

Approach

Objective 1

The challenge of gin infrastructure was approached through a three phase strategy. The first strategy was to measure the supply of cotton ginning infrastructure in the lower Mid-South. This was the first objective of the project. To accomplish this objective, we attempted to identify geographic distance between cotton fields in the Lower Mid-South and operating cotton gins.

Specifically, we used boll weevil eradication program geocoded cotton field data provided by the states of Louisiana and Arkansas. Unfortunately, due to the nature of the contractual arrangement Mississippi used to obtain their geocoded data for their program, they were unable to provide these data to investigators. To compensate, rather than focusing only on Southeast Arkansas, we included the entire Arkansas cotton growing region in our analysis including East Central and Northeast Arkansas cotton growing regions. We geocoded cotton gin locations based on street address information provided to us by the Southern Cotton Ginners Association (SCGA).

We then took the centroid point of each geocoded field and calculated straight line “as the crow flies” distance to each gin in each state. This resulted in a specific distance in miles between each cotton field/gin pair. At that point, we then identified the gin that had the minimum distance to each cotton field in the two states.

At this point, we created a scenario that would address potential infrastructure shortfalls in the region. First, we assumed that “sufficient” infrastructure would include maintaining the straight line distance from each cotton field to its nearest cotton gin in 2006. The 2006 year was the last high cotton acreage year in the Lower Mid South. To address infrastructure gaps, we estimated the increased distance between cotton field and gin if cotton produced on cotton field acreage in 2006 were required to be ginned by the reduced number of cotton gins available in 2009. We identified the gap based on the mileage change between the closest, second closest and third closest gin operating in 2009 to the 2006 cotton field that cotton would have had to have been sent. Further, we used Geographic Information System (GIS) software to visually identify cotton

gins and fields and create concentric circle zones to identify which gins fell outside given straight line distance thresholds.

Objective 2[1]

In the second objective, we estimate the foregone earnings or returns selected Mid-South cotton producing regions in Arkansas, Louisiana and Mississippi would have received if producers would not have been able to grow cotton due to lack of cotton ginning infrastructure. To calculate opportunity returns for the region from producing commodities other than cotton, we first create a baseline based on actual production. This baseline is achieved by calculating net returns per acre for selected counties in Arkansas, Louisiana, and Mississippi that had yields of cotton sufficiently high to be reported in all 12 years between 1997 and 2008 from National Agricultural Statistics Service (NASS) surveys (USDA/NASS). We calculate the revenue per acre per county as the average statewide price per unit recorded by NASS times the county (parish) yield per unit per acre. This is performed for cotton, corn, and soybeans. We then subtract the average statewide (or in a few cases multi-state region) variable costs per acre obtained from the Economic Research Service (USDA/ERS) from the revenue per acre to receive a net returns per acre above variable costs (or simply net returns per acre). We calculate this for each county (parish) for each of the three commodities and calculate a weighted average return per acre based on the proportion of each county's production in cotton, corn, and soybeans.

We then calculate opportunity returns per acre in a similar fashion. We first identify in each year the alternative commodity between corn and soybeans that would have generated the highest net returns per acre. This commodity's acreage is then increased by the number of acres of cotton grown in that year and a new weighted average net return per acre is calculated that represents the opportunity returns per acre. In a county in a given year where net returns per acre for corn and soybeans are less than cotton, the opportunity returns per acre would be less than the actual net returns per acre. For years when corn or soybeans had greater net returns than cotton, then the opportunity returns per acre would be greater than the actual returns per acre.

Objective 3

For objective 3, we considered an alternative gin seed rebate model to allow remaining cotton gins to share the costs of transportation between gins who have historically in most of the Mid-South paid for all of transportation costs from field to gin and cotton producers. Specifically, we address this by identifying the additional distance costs that would incur from 2009 cotton gins having to gin cotton from 2006 cotton fields. We use the 2010 ginning costs survey administered in the Mid-South by the Southern Cotton Ginning Association (SCGA) to estimate per mile costs

[1] This section was largely derived from the following selected paper: Fannin, J. M. and K. W. Paxton "Measuring the Relative Profitability of Mid-South Cotton Production from an Alternative Gin Seed Rebate Model" presented at the Annual Meetings of the Southern Agricultural Economics Association, Feb 8-11, 2011, Corpus Christi, TX. This is included in the Appendix

and then estimate the additional costs gins would pay for the further removed cotton acreage. We then evaluate the sharing of these costs between gin and producer.

Key Contributing Organizations

There have been several key contributing organizations that have assisted both the research products and marketing of research results. The primary organization has been the Southern Cotton Ginners Association (SCGA). This organization, headquartered out of Memphis, TN, is a collection of member cotton gins representing the five states of Arkansas, Louisiana, Mississippi, Missouri, and Tennessee. This organization provided key data inputs including address information of cotton gins for Louisiana, Arkansas and Mississippi, ginning cost and outlook information as a part of their tri-annual ginning cost survey, and provided agenda space to present preliminary results from the outputs of the FSMIP research. Also, the Louisiana and Arkansas Departments of Agriculture through their boll weevil eradication programs provided important geocoded cotton field data that was necessary to generate field to gin distances for this research.

Summary of Key Findings

When evaluating the change in gin infrastructure, we see several key findings. First, there was an increasing average distance between cotton field and gin between the 2006 year in Louisiana (the last year of high cotton acreage for the state) and 2009, two years following the big transition from cotton production to corn production in Louisiana. Average distance increased from 6.9 miles to 8.25 miles. Further, to address the question of available gin infrastructure if cotton production returned to previous 2006 highs, the average distance between 2006 cotton fields and 2009 gins would be slightly higher at 8.33 miles. These statistics are presented in Table 1.

Table 1. Changes in Average Distance Between Louisiana Cotton Fields and Gins.

Cotton Field to Gin (Distances in Miles)	2006	2009	2006 Fields to 2009 Gins
Average	6.90	8.25	8.33
Median	5.80	6.66	6.86
Standard Deviation	4.58	6.60	5.69

Source: Fannin, J. Matthew, Kenneth W. Paxton, and Huizhen Niu. “Measuring the Supply of Cotton Ginning Infrastructure in Louisiana.” Presentation made at the 2010 Beltwide Cotton Conferences, Jan 4-7, 2010, New Orleans, LA.

Further, sensitivity analysis was performed to understand how vulnerable 2006 cotton fields were to further gin closures past 2009. That is, assuming the long-term trend in gin closings continue, what would be the distance cotton would have to travel to be ginned. This second and third closest gin analysis is highlighted in Table 2.

Table 2. 2006 Cotton Fields to 2009 Nearby Gins.

	1st Closest	2nd Closest	3rd Closest
	Miles	**Miles**	**Miles**
Average	8.33	13.65	21.21
Median	6.86	12.39	19.52
	Percent	**Percent**	**Percent**
Less than 5 miles	34.00	6.90	0.57
Less than 10 miles	68.88	35.76	12.27
Less than 15 miles	85.89	62.90	33.51
Less than 25 miles	99.19	92.07	69.18

Source: Fannin, J. Matthew, Kenneth W. Paxton, and Huizhen Niu. "Measuring the Supply of Cotton Ginning Infrastructure in Louisiana." Presentation made at the 2010 Beltwide Cotton Conferences, Jan 4-7, 2010, New Orleans, LA.

As can be seen from the table, average distance from cotton field to gin increased from 8.33 miles when considering the nearest cotton gin, but increased to 21.21 miles when the first and second closest gins operating in 2009 were not operating. Also, we calculated the percent of cotton fields in 2006 would be within five, ten, fifteen, and twenty-five miles of the closest cotton gin. While one third of all 2006 cotton fields in Louisiana would be within five miles of their closest cotton gin operating in 2009 and almost all (99.19%) would be within 25 miles, these percentages drop off measurably when the closest two gins do not operate. Under this scenario, less than 1% of all cotton fields in Louisiana would be within five miles of a cotton gin and over 30% of 2006 Louisiana cotton fields would be over 25 miles removed from their third closest gin.

For Arkansas, we replicated the approach of matching 2006 cotton fields to 2009 gins. However, while some of the patterns that occurred in Louisiana also occurred in Arkansas, Arkansas's gin infrastructure would become more geographically challenged. This is highlighted in Figure 4.

In particular, it can be seen that cotton fields in Arkansas are grown all across Eastern Arkansas, with concentrations in Northeast Arkansas, East Central Arkansas that spread along the Arkansas River towards Little Rock and Southeast Arkansas. While some gin infrastructure was lost in all regions, a disproportionate share of gins along the Arkansas River in East Central Arkansas that operated in 2006 did not operate in 2009. This geographic capacity constraint would have less impact for those cotton producers with fields near the confluence of the Arkansas and Mississippi Rivers as they can access other gins along the Mississippi. On the other hand, cotton producers with fields further up the Arkansas River may be challenged to find gins that are willing to take cotton and pay the increased transportation cost to ship cotton from these long distances to their gins.

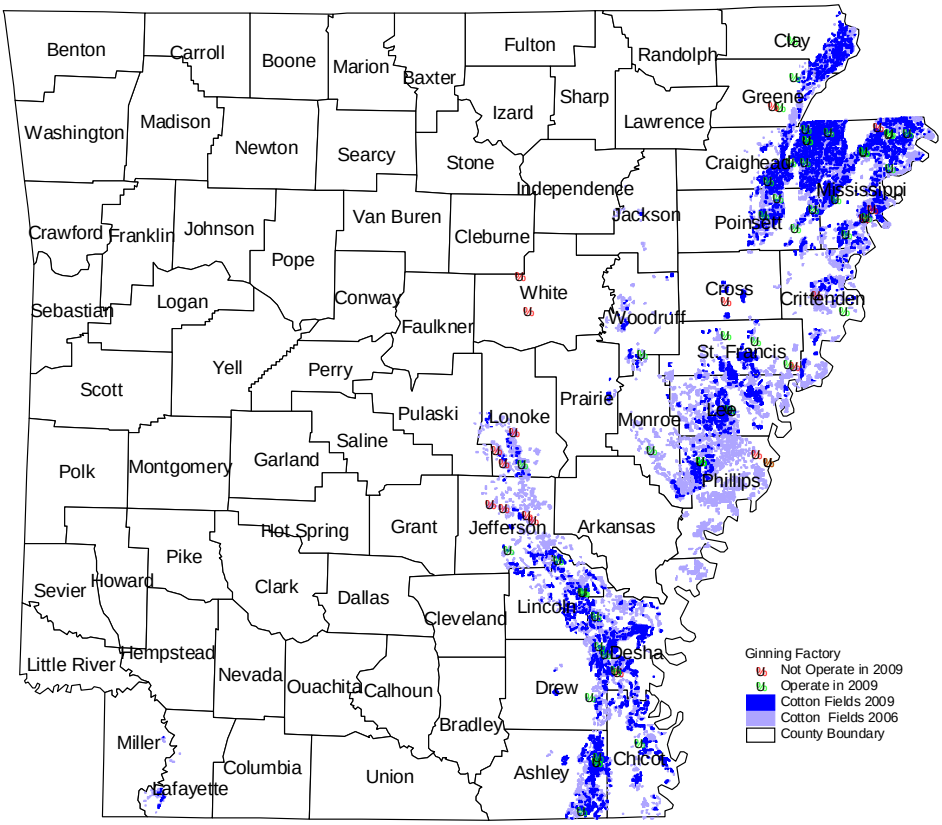


Figure 4. Cotton Ginning Infrastructure in 2009 compared to Location of 2006 Cotton Fields.

In Louisiana, the lost gins tended to be more geographically distributed leaving gin alternatives that were further away, but not logistically prohibitive. As can be seen in in paper by Fannin, Paxton and Niu (2010) (Appendix); however, Louisiana has limited redundancy of gins remaining along the Red River cotton growing region of the state (small cotton producing region running from Central to Northwest Louisiana). If any of those gins chose not to operate, cotton producers along the Red River may be challenged similarly to those cotton producers along the Arkansas River.

Objective 2

Our results showed that over the 12-year period, opportunity returns foregone exceeded estimated returns by 35% (Table 3). That is, the net returns to growing the most profitable commodity per acre between corn or soybeans across the selected cotton growing counties and parishes of Arkansas, Louisiana, and Mississippi would have netted returns 35% above estimated actual net revenue per acre. In the first six years (1997-02), the opportunity returns exceeded actual returns by just over 20% and by 43% for the 2003-08 period. The 2007-08 period showed

opportunity returns foregone by 37%. These results point to a likelihood that cotton producers recognized that they were foregoing measurable returns per acre by staying in cotton. The price spike for corn in 2007 helped push many Mid-South cotton producers toward planting more profitable alternative commodities than cotton at the time.

Table 3. Opportunity Returns Foregone for Mid-South Cotton Producing Counties.

	12 Year Average (1997-2008)	6 Year Average (1997-2002)	6 Year Average (2003-2008)	2 Year Average (2007-2008)
Estimated Net Revenue Per Acre (Cotton)	$100.11	$70.40	$130.40	$207.25
Opportunity Revenue Per Acre (Corn or Soybeans)	$135.57	$85.36	$186.72	$283.87
Opportunity Revenue Lost	$35.46	$14.96	$56.32	$76.62
% Revenue Lost	35.42%	21.25%	43.19%	36.97%

When evaluating the 54 individual counties from the three-state cotton producing region, Corn was the most profitable commodity to plant 72% compared to soybeans if cotton was not planted.[2] Since 2003-08 was the time period with the greatest foregone earnings, we evaluated the percent of county earnings per acre foregone when cotton was grown other than the more profitable commodity between corn and soybeans. The results indicate that only 6, or 12.5% of all counties analyzed had foregone earnings that were less than 33%. Second, 20, or 37% of counties could have doubled their net earnings per acre if they had grown a more profitable commodity other than cotton. What is most interesting about the figure is there is not real pattern to the foregone earnings. There counties with low and high foregone earnings both near the Mississippi River as well as those counties on the edges of the alluvial plain

What does this finding suggest about producers' decisions? We believe this simple opportunity cost analysis shows that producers did not simply make a last-minute decision to grow corn when corn prices were firm during the planting window of 2007. In particular, we believe producers actually evaluated the foregone returns to growing alternative commodities to cotton for several years prior to 2007 and were considering a greater proportion of their acreage in commodities other than cotton. The increasing price of corn helped these Mid-South producers get pushed "over the edge" to planting these alternative commodities at greater levels.

How much of the switch was due to the decoupling of federal farm subsidy payments to commodity acreage allotments versus increases in demand for alternative fuels brought about by renewable fuels standards? While this is not a parametric analysis that attempts to tease out the marginal effects, Table 3 does provide some insights. The first six years after the 1996 Farm Bill passed (1997-2002) showed that the opportunity revenue gained was just over 1/5th above actual

[2] Alternative commodities other than corn and soybeans were not considered in the set of alternatives. Commodities such as rice are not as easily substitutable across all cotton acreage in the Mid-South cotton counties and parishes.

returns per acre. Much of these opportunity returns could have simply been changes in expected returns per acre for commodities at the beginning of the planting season and actual net returns or the result of crop mix diversification strategies. The 20 % foregone earnings may have simply been returns given up to avoid greater downside return risk.

On the other hand, the 2003-08 period shows that producers' foregone earnings more than doubled from the previous six-year period. The large switch to corn in 2007 was enabled by renewable fuels standards, but also increases in large percentages from the decoupling legislation of the previous decade. That is, "Freedom to Farm" did not see its greatest influences on the Mid-South in terms of volatility of commodity production pressure on grain handling infrastructure and overcapacity challenges to the cotton industry until more than a decade had past. Yet, farmers were able to cash in on that switch at the expense of the cotton input and processing infrastructure that was penalized.

Objective 3

We find that the average round trip hauling cost of cotton by gins from field to gin based on the results from the 2010 Mid-South Gin Information survey (which includes cotton gins from Arkansas, Louisiana, Missouri boot heel, Mississippi and Tennessee averaged $0.046 per bale per round trip mile. Since the average distance from the 2010 Gin Information survey was estimated to be 14 miles one way, if Mid-South cotton gins would transfer the entire cost of shipping cotton from field to gin to producers, the cost to producers for the average distance would be 28 miles round trip times $0.046 per bale per mile, or $1.29 per bale. Assuming an acre of cotton will yield an average of 2 bales per acre, the cost per acre to the producer of having to pay to have their cotton shipped from field to gin would equal approximately $2.58 per acre.

To put this cost in perspective, total direct expenses for a representative irrigated acre of cotton in Louisiana in 2012, is estimated at $608 per acre based on 2012 budgets generated by the LSU AgCenter. The $2.58 would add only four tenths of one percent to the direct cost per acre given the average distance.

Now let's assume the gin would pass on the total hauling costs assuming the producer was having cotton hauled from the average maximum distance cotton was hauled from field to gin in the gin information survey (43 miles). The maximum distance would be 86 round trip miles times $0.046 per bale per mile, $3.96 per bale, or $7.92 per acre. Using the same previous assumptions for Louisiana cotton production, the $7.92 per acre would represent a 1.3% increase to total variable costs to the producer. If we hold other factors constant, if a producer had no cotton gin that would gin his or her cotton without paying full hauling costs, a farmer in this scenario would need the expected returns to cotton to exceed other alternative commodities by approximately $7.92 per acre or more to maximize expected profits growing cotton.

Finally, we evaluate the additional cost under Louisiana's scenario of 2006 cotton production with 2009 gins. We assume the worst case scenario from Objective 1, that is, producers would lose access to their first and second closest gins and that approximately 30% of cotton fields would be further than 25 miles from the third closest gin. Under this scenario, we assume that producers would have to pay for 25 miles of one way costs (50 round trip miles). At 50 miles round trip times 0.046 per bale per mile equals $2.30 per bale cost to the producer. Based on approximately 630,000 acres planted in cotton in Louisiana in 2006, we assume under this scenario cotton produced from 189,000 acres would be forced to pay the $2.30 per bale cost. The overall cost then to producers of cotton overall in the state would be 189,000 times two bales per acre times $2.30 or $869,400. Such costs to the producer could be borne either directly through a charge to the producer from the gin, or, as we argue in the original proposal, be deducted from the gin seed rebate that is distributed from the gin annually from gin ownership to cotton producer.

Discussion of Current and Future Benefits

There are several benefits from this research project. Current benefits have included an increased awareness to gin ownership as well as cotton producers in the Mid-South to geographic capacity of ginning infrastructure. The second, and probably more important, is an understanding of the relative cost to producers of transferring hauling costs of cotton from gin owners to cotton producers. Such a transference or partial transference may have the ability to maintain expected net returns to cotton gins at a level such these gins can remain operational. At the same time, farmers who have cotton as a commodity alternative may now incorporate anticipated costs of the loss of nearby ginning infrastructure into their budgets for cotton versus alternative commodities. Reducing the uncertainty of ginning capacity may allow some producers to continue to include cotton as a part of their acreage distribution even in the context of more highly profitable commodity alternatives.

Recommendations for Future Research

There is one key opportunity for research related to transportation that will impact ginning infrastructure on marketing of the cotton commodity in the next decade. There has been recent adoption of the cotton module harvester/builder by cotton producers in the Mid-South. This piece of equipment is replacing the traditional harvesting activities performed by both the cotton picker and module builder. The equipment operates similar to a round hay baler where the harvester picks the cotton from the plant and then immediately compresses the cotton and raps it into either a round or square bale that is then deposited in the field. These round or square bales of cotton are much smaller than the traditional cotton module and can be transported on traditional hauling equipment such as flat beds hooked to eighteen wheel trucks. This technology attempts to impact gin infrastructure in that it will potentially eliminate the need to own and maintain cotton module

trucks that can only be used for hauling cotton modules. Use of flat beds also increases the amount of cotton that can be transported from field to gin at any one time thereby reducing transportation costs. The ability to reduce transportation costs will similarly impact gin infrastructure, potential profitability of cotton producers and maintain the ability to market a domestic cotton supply under increasing competition from international markets.

Project Beneficiaries

The main project beneficiaries are the cotton ginners in the Mid-South attempting to maintain cotton infrastructure so that producers maintain the option to grow cotton in future years giving changing economic conditions to grow cotton.

Additional Information Generated by Project

Please see the Appendix attached.

Contact Person for the Project

James M. Fannin, Ph.D.,
Associate Professor
Department of Agricultural Economics and Agribusiness
LSU AgCenter
101 Martin D. Woodin Hall
Baton Rouge, LA 70803
225.578.0346
mfannin@agcenter.lsu.edu

APPENDIX

1) Measuring the Supply of Cotton Ginning Infrastructure in Louisiana (2010 Beltwide Cotton Conference Presentation)

2) Measuring the Relative Profitability of Mid-South Cotton Production from an Alternative Gin Seed Rebate Model (2011 Southern Agricultural Economics Association Annual Meeting Selected Paper)

3) 2010 Gin Information Survey (Southern Cotton Ginners Association Tri-Annual Survey)

MEASURING THE SUPPLY OF COTTON GINNING STRUCTURE IN LOUISIANA

J. Matthew Fannin
Kenneth W. Paxton
Huizhen Niu
Dept. of Agricultural Economics and Agribusiness, LSU AgCenter
Baton Rouge, LA

Abstract

The purpose of this technical paper is to estimate changing geographic capacity of cotton ginning infrastructure in Louisiana. In particular, cotton field locations are compared to cotton gin locations using geographic information system (GIS) technology. We compare changing average field to gin distance between 2006 and 2009 production years. We then evaluate how field to gin distance changes when we evaluate 2009 gins operating in Louisiana with 2006 cotton fields in the state (last high acreage year of cotton for Louisiana). Results indicate that average cotton field to gin distance increased approximately 20% from 2006 to 2009. When comparing 06 fields against 09 gins, field to gin distance increased only an additional 1%. However, visual analysis of GIS maps suggests that some traditional cotton growing regions of Northwest and Central Louisiana are vulnerable if certain gins were to shut down.

Introduction and Background

The cotton ginning industry has faced numerous challenges during the past three production seasons. A combination of reduced acreage combined with poor weather during harvest season resulted in many gins choosing to either not operate or run at well below capacity in 2009. Within the five state Mid-South region of Arkansas, Louisiana, Missouri, Mississippi and Tennessee, total bales ginned dropped from 5.1 million in 2006 to just under 3.4 million in 2008 (Cotton Ginnings 2008 Summary 2009). In Louisiana, production declined almost 75% from 1.2 million bales in 2006 to approximately 280,000 bales in 2008. While some of this loss was due to reduced yield in 2008 from poor harvest conditions brought about by the 2008 hurricane season, the key driving force was reduced cotton acreage planted.

Challenging market conditions in 2009 resulted in only 240,000 acres planted for the state. This combined with flooding rains at the time of harvest resulted in only 31 gins operating during harvest season. A total of 44 gins operated in the state during the same period during 2006.

Reduced acreage across the Mid-South has resulted in gins closing at an accelerated rate relative to historic trends. While anecdotal evidence from some ginners suggests their closure is temporary (especially for larger gins and gins with modern equipment), historical evidence suggests many gins that shut down never return to operation. Many in the cotton industry including ginners in the Mid-South are concerned that eroding ginning infrastructure may at some point in the future inhibit traditional cotton growing regions from being able to grow cotton thereby cutting off those areas from supplying their raw product into the remainder of the cotton marketing supply chain.

A recent research proposal submitted and funded by USDA's Agricultural Marketing Service Federal State Marketing Improvement Program by LSU AgCenter economists Matthew Fannin and Kenneth Paxton attempts to gain a better understanding how current and future ginning infrastructure loss might impact the cotton marketing supply chain. The project evaluates the current geographic capacity of ginning infrastructure, foregone income lost to agricultural producers if cotton cannot be grown due to a lack of infrastructure, and applying alternative gin seed rebate models to expand geographic coverage of existing gins. This paper focuses on geographic capacity of ginning infrastructure in Louisiana, one of three states (including portions of Arkansas and Mississippi) that are part of the project.

Methods, Data, and Results

To address changes in geographic capacity, distances between cotton fields and operating gins were measured. Cotton fields geographically coded as part of the Louisiana boll weevil eradication program were compared to the addresses of cotton gin locations provided by the Southern Cotton Ginners Association and the Louisiana Cotton and Grain Association. Based on these data, we constructed three distance calculations: 1) 2006 cotton fields to 2006 gins; 2) 2009 cotton fields to 2009 gins, and 3) 2006 cotton fields to 2009 gins. The third distance calculation was constructed to assess how sensitive current gin infrastructure would be to higher cotton acreage. Descriptive statistics for these calculations appear in Table 1.

Table 1. Changes in Average Distance Between Louisiana Cotton Fields and Gins.

Cotton Field to Gin (Distances in Miles)	2006	2009	2006 Fields to 2009 Gins
Average	6.90	8.25	8.33
Median	5.80	6.66	6.86
Standard Deviation	4.58	6.60	5.69

As can be seen from the table, average distance from cotton field to gin increased by 1.35 miles, or approximately 20%, between 2009 and 2006. Median distances were slightly shorter, but showed the same growth. There was a measurable change between average gin location to 2009 fields compared to 2006 fields. This was likely due to the geographic closure of gins between 2006 and 2009. Gins during this period that closed may have been next door to other gins that remained open. Hence, fields that would have been nearest a closed gin did not have that much further to travel to the next closes gin.

A more detailed analysis of field proximity to multiple gins is presented in Tables 2, 3, and 4. Here, we evaluate the percentage of all Louisiana cotton fields that are within five, 10, 15, and 25 miles of their closest three gins.

Table 2. Cotton Fields to Nearby Gins, 2006.

	1st Closest	2nd Closest	3rd Closest
	Miles	**Miles**	**Miles**
Average	6.89	10.76	15.95
Median	5.80	9.53	13.82
	Percent	**Percent**	**Percent**
Less than 5 miles	42.39	12.87	0.64
Less than 10 miles	78.12	52.45	27.53
Less than 15 miles	93.10	79.30	54.94
Less than 25 miles	99.91	97.70	88.59

As can be seen by Table 2, average distance to the third closest cotton gin expands to almost 16 miles in 2006. However, almost 89% of all 2006 cotton fields were within their third closest cotton gin based on gins operating in 2006.

When we look at Table 3, we get a somewhat better picture of how gin closures are affecting infrastructure capacity. The operating gin closures have expanded the average distance to the third nearest gin to 21 miles. Since some gins in Louisiana are private gins; that is, gins that only gin the gin owner's cotton, the first, and in a few cases the second, gin may not be a gin that will take an individual producer's cotton. Further, the percentage of gins that are within 25 miles of their closest gin drops to 72%. This means if the two closest gins would not take a producer's cotton, there is a 28% chance that producer's field would be beyond 25 miles of the next available gin.

Table 3. Cotton Fields to Nearby Gins, 2009.

	1st Closest	2nd Closest	3rd Closest
	Miles	**Miles**	**Miles**
Average	8.25	12.58	20.12
Median	6.65	10.85	17.23
	Percent	**Percent**	**Percent**
Less than 5 miles	35.11	9.24	0.61
Less than 10 miles	72.74	44.02	17.66
Less than 15 miles	86.09	70.87	44.10
Less than 25 miles	98.74	93.41	72.46

In Table 4, we don't see as great as great a growth in the average distance to the third closest gin or reduction in the percentage of cotton fields more than 25 miles from their third closest gin. It does create concern, however, that beyond these statistics there may be certain geographic cotton producing areas that are more vulnerable to future gin closures than others. We explore this possibility by overlaying distance buffers around 2009 gins on 2006 cotton fields to see which cotton fields fell inside or outside the respective buffers. This map is presented in Figure 1.

Table 4. 2006 Cotton Fields to 2009 Nearby Gins.

	1st Closest	2nd Closest	3rd Closest
	Miles	**Miles**	**Miles**
Average	8.33	13.65	21.21
Median	6.86	12.39	19.52
	Percent	**Percent**	**Percent**
Less than 5 miles	34.00	6.90	0.57
Less than 10 miles	68.88	35.76	12.27
Less than 15 miles	85.89	62.90	33.51
Less than 25 miles	99.19	92.07	69.18

As can be seen from Figure 1, there is reasonable coverage of gins to most cotton fields in Northeast Louisiana. There is some increased distance between cotton gins bordering the Ouachita River on the western edge of Northeast Louisiana due to gin closures. Of greater concern is the gin infrastructure availability in Northwest and Central Louisiana. These areas are much more vulnerable to a gin closure and cotton producers would have more difficulty finding a gin to take their cotton without some concessions on transportation costs.

Conclusion

This technical paper represents initial results of understanding the geographic capacity of ginning structure on the cotton marketing supply chain in the Mid-South. Results show that while a 20% reduction in Louisiana gins has increased field to gin distances somewhat, almost all cotton fields are within 25 miles of a nearby gin. There is concern if the closure of ginning infrastructure continues and producers have to go to their second, and especially third, closes gin options.

Future extensions of this research include incorporating road networks in the field to gin measurements, including ginning capacity at each gin location, and extending the geographic analysis to Arkansas and Mississippi. This research should also assist ginners interested in evaluating the cost effectiveness of alternative transportation systems brought about by the new cotton picker baling systems. At a minimum, findings from this research should help remaining ginners have a better understanding of how they might make strategic decisions in the new world of increased volatility and uncertainty in the cotton marketing supply chain.

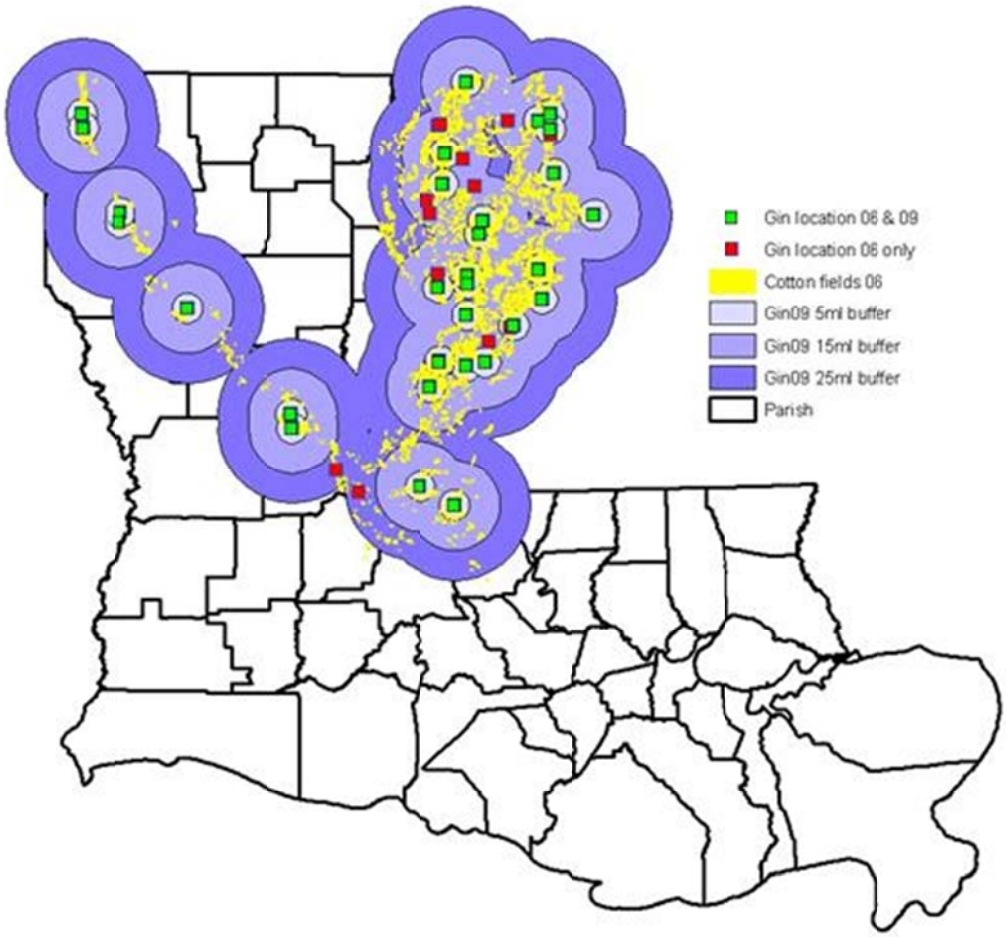


Figure 1.

References

Cotton Ginnings 2008 Annual Summary. 2009. National Agricultural Statistics Service, United States Department of Agriculture. Ct Gn 1 (09). May.

Measuring the Relative Profitability of Mid-South Cotton Production from an Alternative Gin Seed Rebate Model

J. Matthew Fannin, Associate Professor
mfannin@agcenter.lsu.edu

Kenneth W. Paxton, Professor
kpaxton@agcenter.lsu.edu

Department of Agricultural Economics and Agribusiness
Louisiana State University Agricultural Center
101 Ag. Administration Bldg
Baton Rouge, LA 70803

Selected Paper prepared for presentation at the Southern Agricultural Economics Association Annual Meeting, Corpus Christi, TX, February 5-8, 2011

Copyright 2011 by J. Matthew Fannin and Kenneth W. Paxton. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

Introduction

The purpose of this paper is to assess the opportunity returns forgone to cotton producers in the lower Mid-South region of the United States for growing cotton, compared to alternative commodities[3]. We calculate the actual net returns per acre for selected cotton-producing counties in Arkansas, Louisiana, and Mississippi. In addition, we calculate the opportunity returns per acre if the acres planted in cotton were planted in the highest net return commodity per acre between corn and soybeans during the period 1997 through 2008.

Our results find that producers in these cotton producing-counties faced sizeable opportunity revenues foregone averaging 43% between 2003 and 2008. Most observers of the cotton industry would argue that these foregone revenues are a function of historical cotton producers not planting a higher proportion of their acreage in the more-profitable corn enterprise in 2007 and 2008. However, opportunity revenues per acre foregone averaged 37% in the 2007-08 period. This finding suggests that cotton producers recognized a few years prior to the corn price spike in 2007 that alternative commodities, such as corn and soybeans, would generate greater returns on their land. Our research suggests that the higher corn price helped push cotton producers over the edge into planting a greater percentage of their acreage in alternative commodities.

Background

Cotton production in the Mid-South faced two major shocks that have changed the dynamic of the industry. The 1996 Farm Bill, titled at the time "Freedom to Farm" decoupled farm subsidy payments from the base acreage commodity in which producers had been enrolled (USDA/ERS, 1996)**.** This change was meant to allow producers to move acreage into the most

[3] This research was funded through the Federal State Marketing Improvement Program, Agricultural Marketing Service, United States Department of Agriculture.

profitable commodity in a given year, based on supply and demand conditions of the market. Hence, the outcome of such a policy change was intended to increase earnings for farm households, but with a possible side effect of increased volatility in commodity production from year to year. The second major policy shift was the role the renewable fuels standard mandates the federal government was imposing to increase use of alternatives to fossil fuel production (USDA, Westcott). Corn was the primary commodity to benefit from this policy mandate because of its existing mature starch-based ethanol production technology.

How has cotton fared in the Lower Mid-South since the 1996 Farm Bill? In Table 1, we evaluate total production of cotton, corn, and soybean planted acres in Arkansas, Louisiana, and Mississippi between 1997 and 2007. While we see some volatility in commodities prior to 2007, we see major reductions in cotton acreage planted and increases in production of corn and soybeans planted during in 2007 and 2008. What are the implications for the major reduction in cotton on the Mid-South region?

Some of our previous research has attempted to address the consequences of this acreage reduction. In Fannin, Paxton, and Barreca (2008), we found out that the net effect to Louisiana's economy from the almost 300,000 acre switch from cotton to corn was only $700,000, or 0.57% greater output impact and a value-added effect reduced by only 0.89% if cotton would have been produced. The benefits were driven primarily by the increased farm household income spending in the state economy from increased net returns from corn. On the other hand, the input supply industries and processing industries were negatively impacted because it cost more to grow an acre of cotton than corn and there were greater processing costs locally for cotton (ginning) than for corn (elevator handling).

In Fannin, Paxton, and Niu (2010), we evaluated the cotton ginning industry by looking at the changes in transportation logistics brought about by the reduced cotton acreage and reduction in gins that operated between 2006 and 2009. In this study, we evaluated how far cotton would be transported if 2006 cotton acreage in Louisiana would have to be ginned by the reduced gin infrastructure of 2009. While 2006 cotton fields would be on average just under 9 miles away from a cotton gin operating in 2009, these same fields would be 14 miles away from the second closest cotton gin and 21 miles away from the third closest cotton gin. Almost 30 percent of cotton fields in 2006 would be more than 25 miles from their third nearest cotton gin in 2009.

While these studies suggest that some of the cotton infrastructure has been challenged under the reduced cotton acres planted and harvested, what are the motivations for producers in this region to continue to plant alternative commodities to cotton? Was the move to corn in 2007 a last-minute decision based on the high price of corn at the time of planting? What might the future hold for cotton acreage in future years?

In the next section, we evaluate the opportunity returns that cotton producers have foregone from growing cotton over a recent 12-year period. In particular, we evaluate what net returns producers would have received if they had planted their cotton acres in either corn or soybeans.

Methods

To calculate opportunity returns for the region from producing commodities other than cotton, we first create a baseline based on actual production. This baseline is achieved by calculating net returns per acre for selected counties in Arkansas, Louisiana, and Mississippi that had yields of cotton sufficiently high to be reported in all 12 years between 1997 and 2008 from

National Agricultural Statistics Service (NASS) surveys (USDA/NASS). We calculate the revenue per acre per county as the average statewide price per unit recorded by NASS times the county (parish) yield per unit per acre. This is performed for cotton, corn, and soybeans. We then subtract the average statewide (or in a few cases multi-state region) variable costs per acre obtained from the Economic Research Service (USDA/ERS) from the revenue per acre to receive a net returns per acre above variable costs (or simply net returns per acre). We calculate this for each county (parish) for each of the three commodities and calculate a weighted average return per acre based on the proportion of each county's production in cotton, corn, and soybeans.

We then calculate opportunity returns per acre in a similar fashion. We first identify in each year the alternative commodity between corn and soybeans that would have generated the highest net returns per acre. This commodity's acreage is then increased by the number of acres of cotton grown in that year and a new weighted average net return per acre is calculated that represents the opportunity returns per acre. In a county in a given year where net returns per acre for corn and soybeans are less than cotton, the opportunity returns per acre would be less than the actual net returns per acre. For years when corn or soybeans had greater net returns than cotton, then the opportunity returns per acre would be greater than the actual returns per acre.

Results

Aggregate

Aggregate findings for the 54 counties in the three state-region are presented in Table 2. It should be noted that all prices and costs were measured in nominal terms and not adjusted for inflation. As can be seen from the table, estimated net revenue per acre averaged just over $100 in the 12-year period. However, this net return was influenced by greater net returns in later

years with the 2003-08 period averaging $130 per acre. The 2007-08 period with high corn prices resulted in net returns exceeding $200 per care.

When comparing the opportunity revenue foregone, we see that over the 12-year period, counties in these cotton producing areas gave up $35 per acre or 35% of their potential net returns by growing cotton rather than either the more profitable corn or soybean commodity. The foregone opportunity cost for the 1997-2002 period was only 21% compared to the 2003-08 period of 43%.

How might we evaluate the foregone returns? That is, why might these producers have chosen a lower net return commodity in cotton than corn or soybeans over the period if producers are profit maximizers? The first reason may have been incomplete information. Producers may have expected a given price for their commodity with a given yield and a given production cost per acre at planting that did not come to fruition by harvest time. Producers may have made a correct assessment of the profit maximizing commodity to grow, but external forces impacting prices, or adverse weather patterns affecting yields made the end result appear as if they chose the lower-profit commodity at the outset.

Second, producers may have chosen to produce cotton because they receive additional income streams from growing cotton. The most common income stream that cotton producers receive is a gin seed rebate. Most ginners in the Mid-South gin for seed that means the net returns to ginning is the difference in the revenues received from marketing seed from the costs to operate the gin. Returns from the gin are divided between the owners of the gin (who are often cotton producers in the Mid-South) and cotton producers as a gin seed rebate. Gin seed rebates are not guaranteed in every year and can range from being very minimal to being a measurable percentage of the overall return per acre. However, their volatility makes it difficult for

producers to use this rebate in evaluating net returns for planting decisions. Anecdotal evidence from guided conversations with cotton ginners regarding gin seed rebates suggests few ginners in the Mid-South have producers come to them requesting a guaranteed gin seed rebate level ahead of the planting season. Likewise, very few ginners in the Mid-South promise gin seed rebate levels in advance of planting or harvest to recruit acreage to their facility to gin.

Third, producers use cotton as legitimate part of a risk minimization strategy. While some growers may purchase crop insurance to mitigate yield risk, other producers diversify their acreage into different commodities to avoid a catastrophic negative yield outcome on all acreage planted. Still others plant cotton because they have sunk fixed cost in cotton production and harvesting equipment that needs to be spread out over many production seasons.

One of the interesting questions that stakeholders in the industry may argue is that the six year, 43% opportunity cost foregone in the 2003-08 period would have been primarily influenced by the high net returns primarily to corn in the 2007-08 period. We calculated the opportunity returns per acre and found that the opportunity returns forgone in this period only reached 37% above actual net returns. Given that the 2003-08 period is a weighted average of returns over six years, it suggests that opportunity returns per acre were even greater than 43 % during a portion of the preceding 2003-06 period.

What does this finding suggest about producers' decisions? We believe this simple opportunity cost analysis shows that producers did not simply make a last-minute decision to grow corn when corn prices were firm during the planting window of 2007. In particular, we believe producers actually evaluated the foregone returns to growing alternative commodities to cotton for several years prior to 2007 and were considering a greater proportion of their acreage

in commodities other than cotton. The increasing price of corn helped these Mid-South producers get pushed "over the edge" to planting these alternative commodities at greater levels.

How much of the switch was due to the decoupling of federal farm subsidy payments to commodity acreage allotments versus increases in demand for alternative fuels brought about by renewable fuels standards? While this is not a parametric analysis that attempts to tease out the marginal effects, Table 2 does provide some insights. The first six years after the 1996 Farm Bill passed (1997-2002) showed that the opportunity revenue gained was just over 1/5th above actual returns per acre. Much of these opportunity returns could have simply been changes in expected returns per acre for commodities at the beginning of the planting season and actual net returns or the result of crop mix diversification strategies. The 20 % foregone earnings may have simply been returns given up to avoid greater downside return risk.

On the other hand, the 2003-08 period shows that producers' foregone earnings more than doubled from the previous six-year period. The large switch to corn in 2007 was enabled by renewable fuels standards, but increased in large percentages from the decoupling legislation of the previous decade. That is, "Freedom to Farm" did not see its greatest influences on the Mid-South in terms of volatility of commodity production pressure on grain handling infrastructure and overcapacity challenges to the cotton industry until more than a decade had past. Yet, as Fannin, Paxton, and Barreca (2008) argue, farmers were able to cash in on that switch at the expense of the cotton input and processing infrastructure that was penalized.

County Analysis

When evaluating individual counties, we evaluated the net returns foregone from the 54 counties that were uniquely identified as growing a sufficient threshold of cotton to be reported by NASS for 12 consecutive years between 1997 and 2008. Corn was the most profitable

commodity to plant 72% compared to soybeans if cotton was not planted.[4] Since the 2003-08 period was the time period with the greatest foregone earnings, we evaluated the percent of county earnings per acre foregone when cotton was grown other than the more profitable commodity between corn and soybeans. These results are shown in Figure 1.

The results indicate that only 6, or 12.5% of all counties analyzed had foregone earnings that were less than 33%. Second, 20, or 37% of counties could have doubled their net earnings per acre if they had grown a more profitable commodity other than cotton. What is most interesting about the figure is there is not real pattern to the foregone earnings. There counties with low and high foregone earnings both near the Mississippi River as well as those counties on the edges of the alluvial plain.

Conclusions

This simple research exercise evaluated the level of opportunity revenues foregone by cotton producers from selected counties and parishes in three Mid-South States. We calculated county-level net returns per acre from actual levels of production for cotton, corn, and soybeans over a twelve year period. We then calculated the opportunity returns per acre by substituting the acres planted in cotton with the acres planted in the most profitable commodity between corn and soybeans for each county in each year.

Our results showed that over the 12-year period, opportunity returns foregone exceeded estimated returns by 35%. In the first six years (1997-02), the opportunity returns exceeded actual returns by just over 20% and by 43% for the 2003-08 period. The 2007-08 period showed opportunity returns foregone by 37%. These results point to a likelihood that cotton producers recognized that they were foregoing measurable returns per acre by staying in cotton. The price

[4] Alternative commodities other than corn and soybeans were not considered in the set of alternatives. Commodities such as rice are not as easily substitutable across all cotton acreage in the Mid-South cotton counties and parishes.

spike for corn in 2007 helped push many Mid-South cotton producers toward planting more profitable alternative commodities than cotton.

What does the most recent pattern project for future planting decisions by Mid-South producers? First, producers have a primary interest in return on investment. This net returns analysis suggests that producers are very aware of the relative profitability of all commodities that are available for them to produce. Today's producer is much less loyal to a particular commodity than he/she is to a higher net return. Relative prices will be combined with relative costs in producers' minds when choosing among competing commodities. Also, there may a small level of "stickiness" in planting the previous year's commodity if the relative returns are sufficiently close to the highest net return commodity. This is especially the case if we are talking about switching acreage from corn or soybeans to cotton when that producer has not grown cotton in two or three years. If the returns for these commodities are sufficiently close to cotton, the lower cost per acre to grow the crop may come into play, favoring corn or soybeans. Further, as cotton production technology shifts, such as the adoption of the combination cotton picker module builder, the fixed cost investment to get back into cotton production may be prohibitive even if returns over variable costs suggest planting cotton. In those cases, only a major exogenous shock to commodities where cotton soars upward and corn and soybeans simultaneously drop will be one of the few opportunities for major swings upward in cotton production.

References

Energy Policy Act of 2005, copy of the act available at: http://www.epa.gov/oust/fedlaws/publ_109-058.pdf .

Fannin, J.M., K.W. Paxton, and H. Niu. "Measuring the Supply of Cotton Ginning Infrastructure in Louisiana." In *Proceedings of the 2010 Beltwide Cotton Conferences*. New Orleans, LA. Jan 4-7, 2010.

Fannin, J.M, K.W. Paxton, and J. Barreca. "Evaluating the Switch from Cotton to Corn: Impacts on the Louisiana Economy." *Louisiana Agricultural Experiment Station Bulletin*. Bulletin Number 888. February 2008.

USDA, "Regional Roadmap to Meeting the Biofuels Goals of the Renewable Fuels Standard by 2022, USDA Biofuels Strategic Production Report, June 23, 2010, Available at: http://www.usda.gov/documents/USDA_Biofuels_Report_6232010.pdf.

USDA/ERS, Cost and Returns Data, Available at: http://www.ers.usda.gov/Data/CostsAndReturns/TestPick.htm#historic2. Accessed January 2011.

USDA/ERS, "1996 FAIR Act Frames Farm Policy for 7 Years," *Agricultural Outlook Supplement*, April 1996, Available at: http://www.ers.usda.gov/Publications/AgOutlook/AOSupp.pdf

USDA/NASS Crop Acreage and Yield, Available at: http://quickstats.nass.usda.gov/. Accessed January 2011.

Westcott, P.C., "Ethanol Expansion in the United States: How Will the Agricultural Sector Adjust? FDS-07D-01, May 2007, Available at: http://www.ers.usda.gov/Publications/FDS/2007/05May/FDS07D01/

Table 1. Commodity Acres Planted for Selected States in Selected Years (Thousands of Acres).

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
AR- TOTAL	4,820	4,705	4,475	4,490	4,170	4,175	4,265	4,430	4,320	4,470	4,320	4,360
CORN	190	235	105	180	190	265	365	320	240	190	610	440
COTTON	980	920	970	960	1,080	960	980	910	1,050	1,170	860	620
SOYBEANS	3,650	3,550	3,400	3,350	2,900	2,950	2,920	3,200	3,030	3,110	2,850	3,300
LA - TOTAL	2,485	2,435	1,975	2,020	1,825	1,900	1,805	2,020	1,830	1,805	1,690	1,870
CORN	430	700	340	380	315	580	520	420	340	300	740	520
COTTON	655	535	615	710	870	520	525	500	610	635	335	300
SOYBEANS	1,400	1,200	1,020	930	640	800	760	1,100	880	870	615	1,050
MS- Total	3,545	3,550	3,490	3,390	3,180	3,160	3,100	3,240	3,200	3,240	3,080	3,085
CORN	460	550	340	390	400	550	550	460	380	340	960	720
COTTON	985	950	1,200	1,300	1,620	1,170	1,110	1,110	1,210	1,230	660	365
SOYBEANS	2,100	2,050	1,950	1,700	1,160	1,440	1,440	1,670	1,610	1,670	1,460	2,000

Table 2. Estimated Net Returns per Acre for Selected Mid-South Counties and Parishes.

	12 Year Average (1997-2008)	6 Year Average (1997-2002)	6 Year Average (2003-2008)	2 Year Average (2007-2008)
Estimated Net Revenue Per Acre	$100.11	$70.40	$130.40	$207.25
Opportunity Revenue Per Acre	$135.57	$85.36	$186.72	$283.87
Opportunity Revenue Lost	$35.46	$14.96	$56.32	$76.62
% Revenue Lost	35.42%	21.25%	43.19%	36.97%

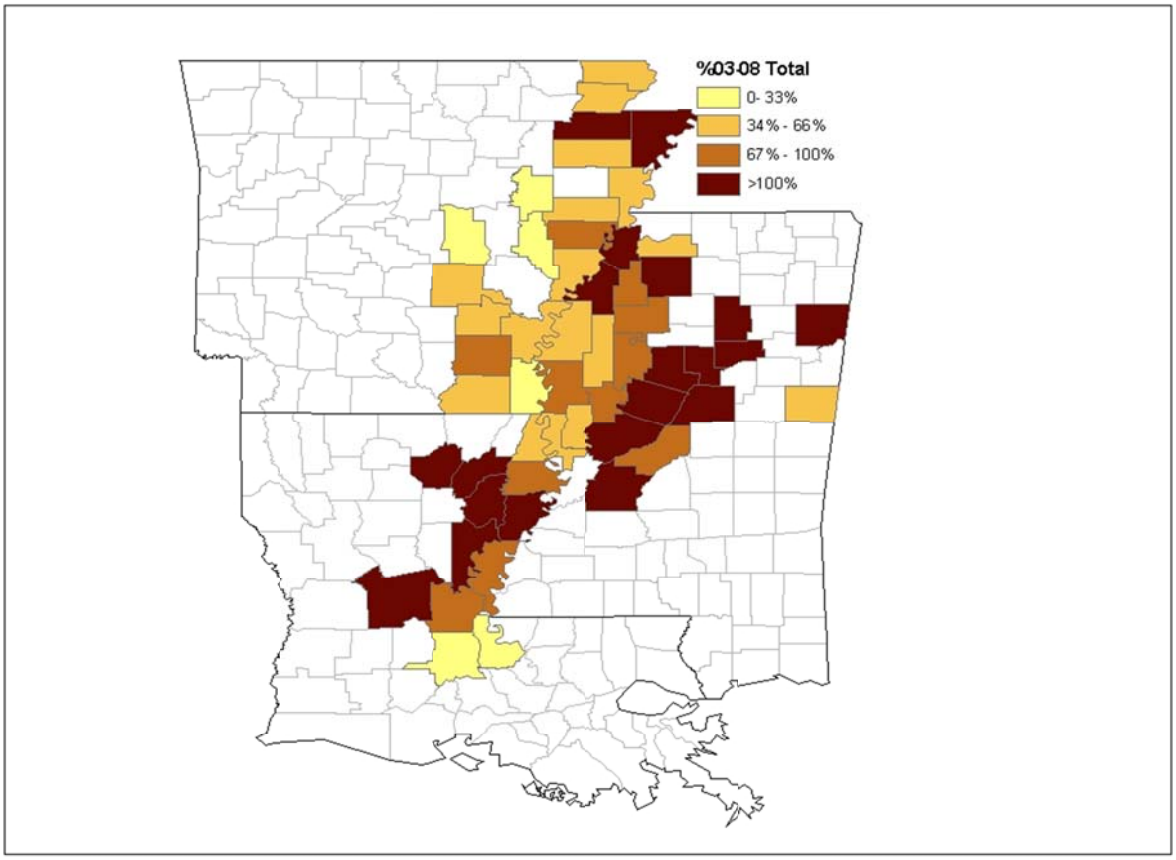


Figure 1. Percent of Foregone Earnings Between 2003 and 2008 from Growing Cotton Compared to Growing Corn or Soybeans.

Ginning Information Survey -- 2010 Season

Section 1. Ginning Costs. This section includes questions from Tommy Valco on your ginning costs from the 2010 season. These are identical questions asked from previous ginning cost surveys sent out by SCGA.

Capacity

Number of bales ginned: _____ Actual Days Operated _____

Number of Shifts _____ Hours per Shift _____

Type cotton ginned:

Machine picked _____% Round Modules _____ %

Stripped, field cleaned _____%

Stripped, not field cleaned _____%

Avg hourly ginning rate: _____ bale/hr Rated Gin Capacity: _____ bale/hr.

Energy Usage

Total electricity used during season: _____KWH.

Total cost of electricity used during season: $ _____.

Total drier fuel used during season:

_____ Gallons of liquified gas **OR** _____ cubic feet of natural gas.

Total cost of drier fuel for season: _____ .

Labor Costs

Total seasonal labor cost: $_____ Avg. Number of season workers_____.

Include: seasonal wages, workers comp. insurance, social security, fringe benefits, etc.
(Do not include permanent, full- time employees.)

Total full time labor cost: $ _____ Avg. Number full-time workers _____.

Include: bonuses, workers comp. insurance, social security, fringe benefits, etc.
If these employees spend part of their time on associated businesses such as bale warehousing, farm supplies, etc., please include only your estimate of the part applicable to ginning.

Other Costs

Cost of Bagging _____$/bale and Ties ***circle one*** (Wire or Plastic) _____ $/bale.

Cost of repairs and maintenance: $_____
(Do not include capital improvements, capacity increases, or system modifications.)

12. Capital Improvements or Modifications: $_____

13. Description of Improvements_____

14. Module Hauling Costs $_____ Tarps $ _____

Section 2. Current Issues. This section includes questions about the current structure of ginning in the Mid-South. These questions will help SCGA and its members better understand trends and challenges facing the industry in coming years.

Ownership Structure

15. How many owners does your gin have?_____
(Count direct/extended family members as one owner)

16. What percent of gin ownership is concentrated in the largest owner_____%?

17. What percentage of your total cotton ginned in 2010 was cotton produced on land either owned or controlled by gin ownership?_____

Transportation

18. What percentage of the cotton ginned in 2010 was transported from fields with a given distance from the gin? (total should sum to 100%)
< 5 miles_____% 5 to 10 miles_____% 11 to 25 miles_____% >25 miles_____%

What was the longest distance you transported traditional/round modules from field to gin in 2010?
_____ miles.
What percentage did this longest hauled cotton make up your total cotton ginned in 2010?
_____%

19. If you ginned the smaller round modules in 2010, how much have you spent in total retrofitting your gin to process these smaller modules (Either in 2010 or prior years)? $_____

20. What specific retrofitting activities did you perform?_____

21. What percentage of these smaller round modules was transported with traditional module trucks?_____%
flatbed or modified flatbed trailer_____% Other_____% Please describe_____
Is there a given distance from the gin at which you switch from using module trucks to flatbed trailers? (Yes / No) If yes, what distance_____? If no, why not?_____

22. Did you use custom haulers to transport the "smaller on-board" modules to the gin?
(Yes / No). If Yes, what percent of the smaller modules was custom hauled_____%

Outlook for 2011 and Beyond

23. How many bales do you expect to gin in 2011?_____

24. What percentage of the cotton you expect to gin in 2011 will be sourced from fields how far away from the gin? (total should sum to 100%)
< 5 miles_____% 5 to 10 miles_____% 11 to 25 miles_____% >25 miles_____%

25. What percent of cotton in 2011 do you expect to gin from traditional modules?_____% On-board module harvesters?_____% (total should sum to 100%)

26. In the next three years, what is the probability
The number of producers you gin for remains about the same or decreases slightly?_____%
The number of producers you gin for increases as your competitor gins go out of business?_____%
You go out of business and your producers gin their acreage at a competitor gin?_____%

STATE: _____ GIN NAME (Optional): _____

Person furnishing information (Optional): _____

RETURN OR **FAX TO:** Southern Cotton Ginners Association, 874 Cotton Gin Pl.
Memphis, TN 38106, FAX 901/947-3103

Ginning industry: A self-assessment in challenging production environment

The cotton ginning industry has faced numerous challenges during the past three production seasons.

A combination of reduced acreage combined with poor weather during harvest season resulted in many gins choosing to either not operate or run at well below capacity in 2009.

To address these challenges, cotton ginners affiliated with the Southern Cotton Ginners Association (SCGA) began a self assessment of their industry in 2007.

With support of the SCGA Foundation and Thomas Valco, Agricultural Research Service, Matthew Fannin and Kenneth Paxton with the LSU AgCenter measured the economic impacts and multiplier effects of the cotton ginning portion of the cotton supply chain on the five-state Mid-South economy.

One of the major issues to come out of that analysis was the eroding ginning infrastructure. Fannin and Paxton were able to receive a grant from USDA's Agricultural Marketing Service Federal State Marketing Improvement Program to assess how declining infrastructure might impact local availability of gin infrastructure in historic cotton growing regions.

The project evaluates the current geographic capacity of ginning infrastructure, foregone income lost to agricultural producers if cotton cannot be grown due to a lack of infrastructure, and applying alternative gin seed rebate models to expand geographic coverage of existing gins.

Fannin and Paxton's initial findings focus on ginning infrastructure in Louisiana, one of three states (including portions of Arkansas and Mississippi) that are part of the project.

Cotton fields geographically coded as part of the Louisiana boll weevil eradication program were compared to the addresses of cotton gin locations provided by the SCGA and the Louisiana Cotton and Grain Association.

"At first glance, the numbers suggest that local gin availability is not an issue in Louisiana despite a reduction in the number of gins operating from 44 in 2006 to 31 in 2009" notes Fannin.

In 2006, the average "as the crow flies" distance between cotton field and gin in Louisiana totaled 6.90 miles. This increased slightly to 8.25 miles in 2009.

Over 42% of cotton fields in Louisiana were within five miles of a gin in 2006 with still over 35% remaining within that same distance in 2009.

"These results did not answer the question we truly wanted to ask," Fannin says. "We really wanted to test to see how our currently reduced ginning capacity would support a larger cotton crop, if and when it returned to the Mid-South."

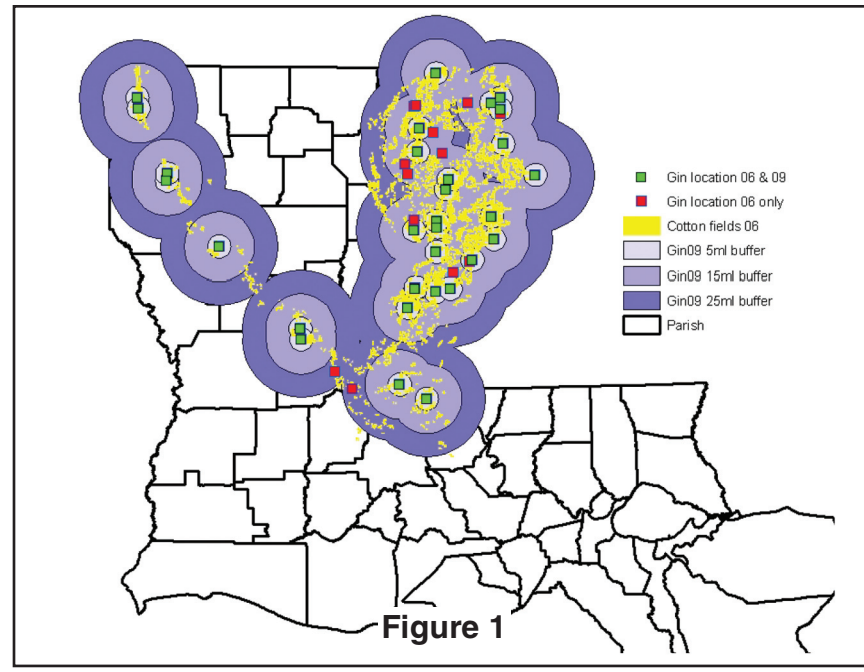


Figure 1

To test this question, Fannin and Paxton compared the distances of the 31 gin operations in 2009 against the last high cotton acreage year in Louisiana (635,000 acres in 2006).

"Findings from this research should help remaining ginners have a better understanding of how they might make strategic decisions in the new world of increased volatility and uncertainty in the cotton marketing supply chain."

They found that the average distance to the nearest cotton gin only increased to 8.33 miles. The average distance to the second closest cotton gin was 13.65 and third closest just exceeded 21 miles.

This analysis presented some cause for concern. While almost 100 percent of cotton fields were within 25 miles of their closest gin, only 69 percent of fields were within 25 miles of their third closest gin.

More alarming, however, was a geographic analysis of these gin locations. In **Figure 1**, the 2009 gin locations are mapped over cotton fields in 2006. The green dots represent 2009 operating gins; the red dots represent those gins that operated in 2006 but were closed in 2009. The colored circles around the green dots represent five, 15, and 25 mile buffers (distances) from the 2009 operating gins.

"We see much of northeast Louisiana's cotton acreage in close proximity to multiple gins," Fannin says. "However, future cotton acreage is more vulnerable in the Red River valley regions of northwest and central Louisiana.

"A small number of fields in these regions are outside or nearly outside the 25 mile buffer. A few additional gin closures in these two areas could make these historical cotton producing regions challenged to find gins willing to take their cotton without some concessions on transportation costs."

Future extensions of this research include incorporating road networks in the field to gin measurements, including ginning capacity at each gin location, and extending the geographic analysis to Arkansas and Mississippi.

This research should also assist ginners interested in evaluating the cost effectiveness of alternative transportation systems brought about by the new cotton picker baling systems.

At a minimum, findings from this research should help remaining ginners have a better understanding of how they might make strategic decisions in the new world of increased volatility and uncertainty in the cotton marketing supply chain.

Measuring the Relative Profitability of Mid-South Cotton Production

J. Matthew Fannin and Kenneth W. Paxton
Ag. Economics and Agribusiness
LSU AgCenter

SCGA Annual Meeting
February 24, 2011

innovate . educate . improve lives
for the latest research-based information on just about anything, visit our Web site: www.lsuagcenter.com
LSU AgCenter Research & Extension

Funding Source

- **Federal State Marketing Improvement Program (FSMIP), Agricultural Marketing Service, USDA**

Research Question

- **Mid-South acreage since 2007 has been dominated by commodities other than cotton – mostly corn or soybeans**
- **Did this switch occur primarily because of the corn price spike in 2007 or were other factors at play prior to 2007?**

Policy Background

- When the 1996 Farm Bill (Freedom to Farm) decoupled actual production decisions from commodity program acreage, program acreage no longer “guaranteed” threshold production in a region
- This policy change created a necessary condition for the drop off in cotton acreage in the Mid-South we have seen recently

Cotton Production 1997-2006

- Cotton acreage was higher in 2006 than in 1997 immediately after Farm Bill changes for AR and MS (almost the same for LA)
- Small reductions in cotton after peak in 2001, but rebounds by 2005 and 2006

Historical Production

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
AR- TOTAL	4,820	4,705	4,475	4,490	4,170	4,175	4,265	4,430	4,320	4,470	4,320	4,360
CORN	190	235	105	180	190	265	365	320	240	190	610	440
COTTON	980	920	970	960	1,080	960	980	910	1,050	1,170	860	620
SOYBEANS	3,650	3,550	3,400	3,350	2,900	2,950	2,920	3,200	3,030	3,110	2,850	3,300
LA - TOTAL	2,485	2,435	1,975	2,020	1,825	1,900	1,805	2,020	1,830	1,805	1,690	1,870
CORN	430	700	340	380	315	580	520	420	340	300	740	520
COTTON	655	535	615	710	870	520	525	500	610	635	335	300
SOYBEANS	1,400	1,200	1,020	930	640	800	760	1,100	880	870	615	1,050
MS- Total	3,545	3,550	3,490	3,390	3,180	3,160	3,100	3,240	3,200	3,240	3,080	3,085
CORN	460	550	340	390	400	550	550	460	380	340	960	720
COTTON	985	950	1,200	1,300	1,620	1,170	1,110	1,110	1,210	1,230	660	365
SOYBEANS	2,100	2,050	1,950	1,700	1,160	1,440	1,440	1,670	1,610	1,670	1,460	2,000

Net Returns

- We ask whether net returns may have signaled the change in cotton acreage in advance of 2007?
- We calculate net returns for cotton, corn and soybeans for the 52 counties and parishes that produced measurable cotton reported by NASS for 12 consecutive years (1997-2008)

Net Returns

- **After calculating net returns for each commodity, we calculate the opportunity returns per acre foregone by not choosing to plant the commodity with the highest returns per acre**

Analysis

- When we split up the 12 year period between the first and second six year periods, greater net returns were foregone by producers in the latter six year period
- However, when we split the last six years between the first four and last two, the 03-06 period had greater foregone net revenues than the high corn and soybean price years 07-08

Net Returns Results

	12 Year Average (1997-2008)	6 Year Average (1997-2002)	6 Year Average (2003-2008)	2 Year Average (2007-2008)
Estimated Net Revenue Per Acre	$100.11	$70.40	$130.40	$207.25
Opportunity Revenue Per Acre	$135.57	$85.36	$186.72	$283.87
Opportunity Revenue Lost	$35.46	$14.96	$56.32	$76.62
% Revenue Lost	35.42%	21.25%	43.19%	36.97%

Analysis

- These results suggest Mid-South producers recognized that they were “giving up” net returns by continuing to plant cotton as compared to corn and soybeans
- The high 2007 corn price may have just been the “tipping point” which pushed cotton centric producers to take the money and run

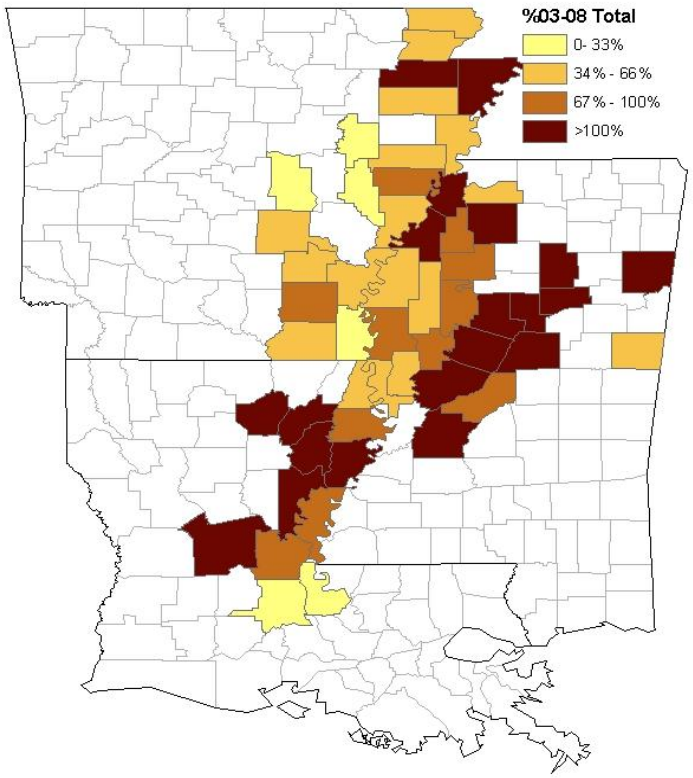
Analysis

- Why might net returns for cotton have had a hard time competing with corn and soybeans over the last 6 to 8 years?
  - Price is part of the answer
  - Relative yield returns
    - Anecdotal evidence suggests that cotton producers have not received relative yield growth at the same rate as corn and soybeans

Analysis

- Yield differentials in the Mid-South can be driven by
  - Irrigation versus dry land ratios
  - Improved seed varieties
- As the ratio of irrigated to dry land increases, the drought tolerance advantage of cotton fades as producers have less downside yield risk to corn and soybeans

County Analysis



County Analysis

- **Approximately 37% of counties could have doubled their net returns per acre if they would have planted the most profitable commodity instead of cotton that season**

County Analysis

- Why might producers not choose most profitable crop?
  - Price was lower at planting than at harvest
  - Yield was lower at harvest than expected
  - Producers chose to minimize downside yield risk by diversifying commodity acreage
  - Producers receive other supply chain revenue streams (gin seed rebates, equity returns from gin ownership

Conclusions

- Cotton has seen measurable reductions in Mid-South acreage starting in 2007
- These reductions, while argued to be driven by the corn price swing of 2007, were likely the result of multiple years of foregone net earnings by producers
- Future swings back to cotton would require major swings in net revenue back to cotton given cotton's expensive cost to plant (possibly occurring in early 2011)

Thank You

- **J. Matthew Fannin**
  mfannin@agcenter.lsu.edu

- **Kenneth W. Paxton**
- **kpaxton@agcenter.lsu.edu**

Ginning Infrastructure Update

Mid-Year SCGA Meetings
Little Rock, AR
July 19th, 2011

LSU AgCenter
Research & Extension

2010 Ginning Information Survey

- A collaboration between
  - Southern Cotton Ginners Association (Tim Price)
  - Agricultural Research Service (Tommy Valco)
  - LSU AgCenter (Matt Fannin and Ken Paxton)

Financial Support

- Project funded by USDA Agricultural Marketing Service Federal State Marketing Improvement Program
- Project Number USDA 12-25G-0888
- Project Duration Sep 2009 – Feb 2012

Ginning Information Survey

- Combination of Ginning Cost Survey (Tommy Valco) and ginning industry trends (Fannin and Paxton)
- First round surveys received early May through early July
- All results based on 2010 ginning season unless otherwise stated

Ginning Information Survey

- Present preliminary results today
- Final results to be presented at Beltwide conference and/or annual meetings in 2012
- Present a portion of overall results

Ginning Information Survey

- Total responses received to date: 41
- Represents approximately 23% of surveys received
- Preliminary results presented based on surveys received through July 8
- Results will be revised based on additional surveys received after mid-year meetings

LSU AgCenter Research & Extension

Survey Results

- Average number of bales ginned from respondents
  - 22,816 (expected 27,750 in 2011)
- Average number of days operated
  - 49
- Number of respondents running one shift in 2010
  - 44%

Survey Results

Ownership Structure

- Average number of owners
  - 9
- Average number of owners for gins with less than 10 owners
  - 2.96

Survey Results

Ownership Structure

- Percent respondents 100% owner of gin
  - 33%
- Percent of ownership for largest shareholder/owner of gin with >2 owners
  - 24%

Survey Results

- Percentage of cotton ginned that was owned/controlled by gin ownership 2010
  - 55%
- Percentage of cotton ginned that was owned/controlled by gin ownership in 2007
  - 51%

Survey Results

- Percent of cotton ginned by distance from field to gin 2010 (expected 2011)
  - < 5 miles: 17.57% (16% 2011)
  - 5 to 10 miles: 33.23% (32% 2011)
  - 11 to 25 miles: 32.69% (38% 2011)
  - >25 miles: 16.51% (14% 2011)
- While half of cotton still comes from within 10 miles of gin, percentage of most remote cotton almost equals closest cotton

LSU AgCenter Research & Extension

Survey Results

- Average longest hauled cotton by gin 2010
  - 43 miles
- Average longest hauled cotton by gin 2007
  - 36 miles
- Statistics confirm anecdotal evidence that gins are traveling increased distances for cotton and they are likely becoming an increasing percentage of total cotton ginned

LSU AgCenter Research & Extension

Ginning Survey Results

- Percent of bales ginned from on-board module harvesters in 2010
  - 9%
- Average gin spending for retrofitting gin to handle on-board modules
  - $139,850
- Percent of expected bales ginned from on-board module harvesters in 2011
  - 21%

LSU AgCenter Research & Extension

Synthesis of Preliminary Findings

- Expected bales ginned up either from a combination of increased acreage and/or gin consolidation
- Increased distances modules traveled from field to gin suggests it's economically sound at least in the short term, possibly long term

LSU AgCenter Research & Extension

Synthesis of Preliminary Findings

- On-board harvester modules a growing percentage of modules ginned
- This technological change leads to a number of future questions each gin will have to answer
  - Do I invest to handle these new modules?
  - What technologies change in the supply chain? handling equipment, hauling, etc.
  - How does ownership along the supply chain change?

LSU AgCenter Research & Extension

New Study

- Federal State Marketing Improvement Program approved second phase of cotton ginning research study
- Focused on transportation logistics and ownership issues surrounding new onboard module harvester technology
- Original $20k investment by Foundation has now leveraged an additional $126K, or a multiplier of 6, over 2 funded studies

LSU AgCenter Research & Extension

THANK YOU!

LSU AgCenter Research & Extension

Contact Information

- J. Matthew Fannin, Ph.D.
  Kenneth Paxton, Ph.D.

  Dept. of Agricultural Economics and Agribusiness
  LSU AgCenter
  101 Martin D. Woodin Hall
  Baton Rouge, LA 70803
  Phone (225) 578-3282
  Fax (225) 578-2716
  mfannin@agcenter.lsu.edu
  kpaxton@agcenter.lsu.edu