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CONTENTS

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On the cover - A common sight every fall is the white harvest of cotton. Modern machinery has increased the speed and efficiency of moving cotton from the field to the gin.

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An Economic Analysis of the Cotton Ginning Industry in Oklahoma

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An analysis of the capacity utilization and cost structure of the Oklahoma cotton ginning industry is presented. Significant over-capacity is present in Oklahoma's ginning industry. Larger gins had significantly lower cost per bale and higher profit per bale. The receipt of picked cotton was associated with a longer ginning season and higher profit per bale. Gins which received more modulized cotton also had a longer ginning season, but experienced lower revenues per bale and lower profits per bale. Data for the analysis came from 1991 Annual Gin Reports and a survey of gins.

Background

Oklahoma's cotton industry is concentrated in southwestern Oklahoma with the major production in Tillman, Jackson, Washita, Kiowa and Harmon counties (Oklahoma Agricultural Statistics, 1991). In 1991, cotton lint ranked as the second most valuable crop in Oklahoma, accounting for $82 million in farm value (Oklahoma Agricultural Statistics, 1991).

The principle cotton production states in the U.S. are Texas, California, Mississippi, Arizona, Louisiana, Arkansas, Tennessee, Alabama, Georgia, Missouri and Oklahoma. Oklahoma ranked eleventh in cotton production in 1990-91, accounting for around two percent of U.S. production (USDA, 1990). Cotton production statistics are subdivided into upland varieties and extra-long-staple varieties. Oklahoma produces the upland variety.

There are 1,131 cotton farms in Oklahoma representing 4.1 percent of the 27,673 cotton farms in the U.S (Meyer and Sanford, 1989). Oklahoma cotton farms average 743 acres (total farm size) while U.S. cotton farms had an average of 831 acres. In 1990, Oklahoma produced 370,000 acres of dryland cotton and 84,000 acres of irrigated cotton with average yields of 496 lbs. per acre and 865 lbs. per acre, respectively (Oklahoma Agricultural Statistics, 1991).

Oklahoma and Texas are the only states that use cotton strippers instead of mechanical cotton pickers as the primary method of harvest. Mechanical cotton pickers pass through the fields more than once (depending upon the maturity of the

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cotton and yields), while cotton strippers pass through the fields only once. A higher percentage of stems and other trash is included with cotton harvested by strippers. Therefore, the weight of product delivered from the fields necessary to produce each bale of cotton is greater for stripped cotton. Approximately 2,200 pounds of stripped cotton yield one 480 pound bale of cotton, 875 pounds of seed, 25 pounds of moisture and 820 pounds of trash. The same bale of cotton and 875 pounds of seed can be obtained from approximately 1,500 pounds of picked cotton, reducing the poundage handled by 32 percent (USDA, October 1983).

Oklahoma cotton producers have begun recently to adopt compactor and module hauling systems. Traditional harvesting and delivery systems (for both picked and stripped cotton) involve the use of cotton trailers which are unloaded as the cotton is ginned. The number of trailers available, and the hauling and delivery time can limit the speed of harvest for a particular producer. Because it is difficult to handle and store un-ginned cotton that is not compacted or in modules, Oklahoma cotton gins traditionally have operated only during the harvest season. The compactor and module system cotton can be stored on-farm at harvest time and ginned after the harvest is complete and/or when weather does not permit harvest. Unlike cotton trailers, the module system allows cotton to be transported to the gin at highway speeds. Because of the increased investment costs, the initial adoption of module systems has been limited to the larger producers.

Historically, gins have been established in almost every community of the cotton-producing region of Oklahoma. In the past, cotton producers preferred to haul their cotton only a short distance and wanted the trailers emptied and returned with a minimal delay. This resulted in over-capacity in the cotton ginning industry. For example, in 1974 it was estimated that the Oklahoma cotton ginning industry was operating at only 40 percent of capacity (Cleveland and Blakley, 1976). Since this time, the number of gins in Oklahoma and in the U.S. has decreased. The number of active cotton gins in the U.S. declined from 1,996 in 1982-83 to 1,634 in 1988-89 (USDA, 1990, p. 35). Oklahoma has seen a similar decrease from 79 gins in 1982 to 62 gins as of February 1990 (Oklahoma Corporation Commission).

Objectives

The purpose of this study is to examine the current status of the Oklahoma cotton ginning industry. The three primary objectives of the study are to (1) evaluate the financial performance, capacity utilization and cost structure of the Oklahoma cotton gin industry; (2) determine the impact of harvesting method and use of on-farm compaction and modulization on ginning costs; and (3) determine the impact of gin size on ginning costs.

Data

The cost data used in this study were obtained from the 1991 Annual Gin Reports provided to the Oklahoma Corporation Commission, which regulates commercial cotton ginning in Oklahoma. This data included information on capacity per ten-hour day, length of ginning season, total bales ginned, ginning revenue and a breakdown of ginning costs. Additional data were obtained from a survey administered in 1991 which elicited information concerning the trade territory serviced by the gin, the percentage of picked and stripped cotton and the percentage of cotton delivered in trailers (as opposed to modules). Complete data were obtained for 57 gins.

Results

Overall

Oklahoma gins had an average capacity of 111 bales per ten-hour day and ginned an average of 6,059 bales during the 1990-91 season. The gins operated an average of 87 days during the 1990-91 season. However, had the gins operated at their reported rated capacity, the season's volume could have been completed in 49 days of full capacity operation. The majority (96 percent) of the volume was custom ginned, with company-owned bales accounting for the other four percent. Stripping was the predominant harvesting method, accounting for 88 percent of cotton delivered to Oklahoma gins. Approximately 70 percent of the cotton was transported to the gins in trailers. The remaining 30 percent was compacted on the farm and hauled in as modules. Ninety-six percent of the gins had square bale presses, and 18 percent had power unloading systems.

Labor expenses (wages, workman's compensation and social security) represented the largest single expense of the gins, accounting for 36 percent of total expenses. Other major expense categories included: repairs (15 percent), fuel and power (11 percent), and depreciation (14 percent). Overall, ginning expense averaged $45.75 per bale ginned. Variable expenses such as labor, fuel, repairs, lubrication, utilities, insurance on customer cotton, and drayage averaged $33.56 per bale, while fixed costs such as property insurance, ad valorem taxes, and depreciation averaged $12.19 per bale.

Ginning fees made up 94 percent of all ginning revenues with the sales of bags and ties accounting for the remainder. Revenues averaged $43.38 per bale which implies that the ginning industry was, on average, operating below the break-even point during the 1990-91 season. On average, the industry was operating at 86 percent of the volume necessary to meet all variable and fixed expenses. Improvements and additions to plant and equipment averaged over $45,000 in 1991.

Gin Size

In order to analyze the impact of gin size on costs, revenues and performance, the gins were divided into four equal groups based on their rated capacity per ten-hour day (Table 1). Capacity per ten-hour day ranged from 55 bales per day for the smallest category to 184 bales per day for the largest group. Twenty-four percent of the cotton received by the larger gins was picked cotton, which was almost twice the overall average. Fifty-eight percent of the cotton delivered to the largest category of gins was in the form of compacted modules, while the other categories received less than 30 percent as modules.

The length of ginning season varied directly with the size of the gin. The largest gins operated an average of 110 days during the 1990-91 season, producing 69 percent of their rated 100-day capacity. The smallest category of gins operated only 69 days with average production of 33 percent of their rated 100-day capacity.

Costs also decreased with gin size (Table 2). The smallest gins had an average cost per ginned bale of over $53. The largest gins reported costs of $33 per bale. Some of this difference was due to the shorter ginning season and lower capacity utilization of the smaller gins which raised the increased fixed cost per bale. The smaller two categories of gins had a fixed cost per bale of $13.58 while the larger two categories averaged $10.84 per bale. The under-utilization of capacity was largely responsible for the fixed costs disadvantage of the smaller gins. Variable costs per bale also decreased with gin size, from $42 per bale for the smallest gins

Table 1. Operating characteristics by capacity category.

	Largest	Large	Medium	Small	Overall
Number of Gins	14	14	14	15	57
Capacity (bales/day)	184	120	86	55	111
Bales Ginned in 1991	13,261	5,788	3,773	1,723	6,059
Ginning Season (days)	110	90	78	69	87
Stripped	76%	85%	92%	97%	87%
Modules	58%	24%	29%	12%	31%
Percent Capacity	69%	49%	44%	33%	49%

Table 2. Cost Characteristics by Capacity Category.

	Largest	Large	Medium	Small	Overall
Variable Cost/Bale	$28.36	$30.47	$33.13	$41.68	$33.56
Fixed Cost/Bale	$10.95	$10.72	$15.77	$11.39	$12.19
Total Cost/Bale	$39.31	$41.20	$48.90	$53.08	$45.75
Revenue/Bale	$42.91	$45.35	$43.80	$43.47	$43.38
Profit/Bale	$3.60	$2.15	($5.10)	($9.61)	($2.37)
Percent of Break-Even	121%	124%	46%	52%	86%
Total Assets/bale	$48.02	$47.23	$32.21	$37.30	$41.12
Return on Assets	12%	15%	-38%	-87%	-10%
Market Share	73%	80%	77%	92%	81%

to $28 per bale for the largest gins. The breakdown of expenses among the categories was fairly constant for all of the gin size categories.

Gin fees are based on the amount of cotton processed (hundred weight) as well as the number of bales produced. The 14 gins classified as "large" had the highest revenue per bale with an average of $45 per bale. The largest category of gins had the lowest revenue per bale averaging $42 per bale. However, the variation in revenue probably had more to do with the type of cotton received than gin size. Gins which received a greater proportion of stripped cotton tended to have higher revenue per bale since they processed a greater volume of raw cotton for each bale ginned.

The apparent cost economies of cotton ginning had predictable impacts on profitability levels. Profit per bale declined with gin size from $3.68 per bale for the largest group of gins to -$9.61 per bale for the smallest group. The larger gins had a higher total level of assets and a higher level of assets per bale ginned. The largest gins had a book value of assets of $48 per bale. The smallest group averaged $41 per bale (partially due to a greater number of gins with fully depreciated facilities). The larger gins were operating at 121 percent of the volume needed to recover all variable and fixed costs while the smallest category of gins operated at only 52 percent of their break-even point.

Information concerning the size of each gin's trade territory (measured as a radius from the gin) was included in the survey. Market share for each gin was estimated by comparing the amount of cotton produced in the trade territory reported by the gin with the amount of cotton received by the gin. The trade territory production was estimated by determining the proportion of the county's cotton base acreage contained in the trade area radius. On average, gin production represented 81 percent of the cotton produced in the trade area. This implies that the gins' estimates of trade territory tended to be optimistic and/or that the mileage radius was an imperfect measure of the true trade territory. The market share data made it clear that the level of cotton production in the trade had a bigger impact on capacity utilization than did competitive pressures. The smallest category of gins (which had the most severe under-utilization problems) averaged a 92 percent market share. The market share for the larger gins averaged only 73 percent.

Harvesting and Delivery Method

Eighty percent of the gins received only stripped cotton while the remainder received a combination of picked and stripped cotton. The gins that received picked cotton also tended to be larger and to receive more modulized cotton (Table 3). While the gins that received more stripped cotton had slightly higher revenue per bale (ginning fees), their total cost per bale was also higher. The gins that received picked cotton had higher profit per bale due to their lower total costs per bale. These gins also experienced a longer ginning season. Apparently the increased fees generated from ginning stripped cotton are insufficient to cover the increased labor and handling time.

Table 3. Comparison of gins that receive only stripped cotton with those that receive stripped and picked cotton, 1991.

	Stripped	Stripped & Picked	Overall
Number of Gins	46	11	57
Proportion Picked	0%	63%	12%
Modules Received	20%	71%	30%
Capacity (bales/day)	101	151	111
Bales Ginned in 1991	4,856	11,086	6,059
Ginning Season (days)	86	93	87
Revenue/Bale	$43.84	$41.48	$43.38
Total Cost/Bale	$47.55	$38.24	$45.75
Profit/Bale	($3.71)	$3.24	($2.37)
Market Share	82%	80%	81%

Table 4. Comparison of gins that receive all of their cotton in trailers with gins that receive some of their cotton in modules, 1991.

	Trailers	Mixed	Overall
Number of Gins	31	26	57
Percent Modules	0%	66%	30%
Proportion Picked	21%	2%	12%
Capacity (bales/day)	91	134	111
Bales Ginned in 1991	3,986	8,551	6,059
Ginning Season (days)	76	102	87
Labor Cost/Bale	$7.01	$7.80	$7.38
Total Cost/bale	$47.39	$43.80	$45.75
Revenue/bale	$45.73	$40.58	$43.38
Profit/Bale	(1.66)	(3.21)	(2.37)
Market Share	84%	78%	81%

Slightly more than half of the gins received cotton only from trailers with the remainder receiving a combination of trailers and modules. The length of the ginning season was related to the receipt of modulized cotton (Table 4). The gins which received 100 percent of their cotton in trailers operated an average of 76 days while the remaining gins had an average season of 102 days. The gins which received modulized cotton had lower total cost per bale but also experienced lower revenues per bale.

It was not possible to fully separate the impact of harvesting and delivery methods on ginning costs and profitability from the impact of gin size. Gins which received a greater proportion of picked cotton and cotton modules were clearly more profitable. However, these gins also tended to be larger. Using the available data, these two effects could not be fully isolated. The proportion of modulized cotton received was associated with a longer ginning season, lower revenue per bale, and lower profit per bale.

Geographic Location

Approximately one-quarter of the gins were located in Tillman and Jackson counties, which are Oklahoma's top cotton-producing counties. The next three cotton-producing counties (Washita, Kiowa, and Harmon) are home to another quarter of the gins. Surrounding counties, including Beckham, Caddo, Greer, Comanche, Custer, McClain, Grady, Canadian, Roger Mills and Stephens, account for most of the remaining cotton production and are home to all but two of the remaining gins.

Not surprisingly, gins in the major cotton-producing counties were larger, operated for a longer ginning season, and ginned more cotton during the 1990-91 season than did gins in the smaller cotton-producing counties (Table 5). The 50 percent of gins located in the top five cotton-producing counties operated closer to full capacity than did other gins. These gins were also above average in the proportion of picked cotton received and the proportion of cotton delivered to the gins in modules. Gins from the major producing counties had lower cost per bale and substantially greater profits per bale. The production level of these gins accounted for a smaller than average proportion of reported trade area production (a smaller market share).

Conclusions

Despite the reduction in the number of gins during the last ten years, significant over-capacity is still present in Oklahoma's cotton ginning industry. This situation has resulted in low capacity utilization, short ginning seasons and low profitability. However, larger gins which tended to be located in major cotton-producing counties experienced longer ginning seasons and operated closer to full capacity.

Table 5. Comparison of gins in the Oklahoma counties with the greatest cotton production with gins in counties with less cotton production.

	Top-2	Top-5	Remaining	Overall
Number of Gins	15	28	29	57
Ginning Season (days)	105	99	76	87
Capacity (bales/day)	156	139	83	111
Bales Ginned in 1991	12,585	9,233	2,994	6,059
Proportion Picked	30%	20%	5%	12%
Percent Modules	47%	40%	20%	30%
Labor Cost/Bale	$10.93	$9.11	$5.65	$7.38
Total Cost per Bale	$37.97	$40.56	$50.76	$45.75
Revenue/Bale	$42.83	$42.74	$44.00	$43.38
Profit/Bale	$4.85	$2.18	($6.76)	(2.37)
Percent of Capacity	81%	66%	32%	49%
Market Share	75%	76%	86%	81%

The present over-capacity has direct negative impacts on the profitability of Oklahoma gins. During the 1990-91 season, 30 percent of the gins reported a loss for their cotton ginning operation. If Oklahoma gins had been able to operate at their full rated capacity for a 100-day ginning season, fixed cost per bale would have decreased sufficiently to result in a net profit for most gins.

Significant economies of scale appear to be present in cotton ginning. Larger gins have lower fixed cost per bale (partially because they operate at closer to full capacity) and lower variable costs per bale. Because of this cost advantage, the larger gins experienced higher profitability. The larger gins had a lower market share in their reported trade territory. This is not surprising since the larger gins tended to be concentrated in a few counties.

Harvesting and delivery methods also impact gin profitability. Gins which received a greater proportion of picked cotton and cotton modules were clearly more profitable. The proportion of modulized cotton received was associated with a longer ginning season, lower revenue per bale, and lower profit per bale. Since the gins which received more picked cotton and more cotton modules tended to be larger, some of their profit advantage may be due to cost economies.

As more cotton producers adopt on-farm compaction and module delivery systems and are able to economically haul cotton greater distances, the potential for further reduction in gin numbers will increase. These results have indicated that ginning costs would be reduced if Oklahoma's ginning industry operated with fewer, larger gins. Additional research is now needed to determine if the reduction in ginning cost would be sufficient to offset the increased costs of transporting cotton to the gins, which a further reduction in gin numbers would involve.

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