

**CHANGES IN GROWER COSTS AND RETURNS
ASSOCIATED WITH PRODUCING AND
MARKETING COTTON IN MISSISSIPPI,
1985-1996**

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Introduction

Recent changes in government agricultural policy, coupled with advancements in production technology, have resulted in increased awareness of risk management. Emphasis has been placed on the cotton growers ability to manage the risks associated with both production and marketing. To better approach methods that might be employed to assist cotton growers, a description of recent changes in the cost of producing and marketing cotton must be understood. The purpose of this research was to review the costs of producing and marketing cotton in Mississippi for the period 1985-1996.

The period under study (1985-1996) was characterized by a continuing increase in the cost of production inputs. Growers attempted to cope with this problem in two ways. First, they attempted to increase yield per acre. Second, they substituted less expensive items for more expensive items. The difficulty with the second approach is that the less expensive items are only less expensive on a per acre basis. They tend to be more expensive per unit. The basic substitution was in larger tractors and harvesters for labor.

Cotton grower participation in the marketing channel has seen dramatic changes over the past decade. Some of these changes benefited the individual grower (economic participation in the ginning and warehousing industries) while others worked to his disadvantage.

Some of the changes increased the financial risk faced by the grower. That is, the additional risk of the increased capital required by a grower to purchase larger equipment or to vertically integrate his production activity to include ginning and warehousing. The necessity to modernize many of the US cotton gins in the 1980's resulted from a combination of technologically dated machinery and the increasing costs associated with the use of such inefficient equipment. Growers were required to capitalize new gin plants. Forced by the high cost of new plants, the modernization process brought about a consolidation in the industry. As a result of this capital participation the ginning industry now rebates a significant percentage of its profits

back to the grower-owner. These profits vary from year to year and may be negative in some years. Thus, while the economic reorganization of the ginning industry has positioned the grower to receive more income, it has also created a situation such that in poor crop and/or low price years the economic plight of the grower is worsened. This is true because ginning revenue is directly proportional to crop size.

The Department of Agricultural Economics annually produces estimates of the cost of producing cotton in the State of Mississippi [4-15]. These estimates include charges through harvest and ginning. However, the estimates of ginning costs have remained constant at \$0.08 per pound for over 15 years. Recent changes in the marketing cost have renewed interest in the cost to growers that occur post-harvest.

Since the primary purpose of cost of production figures is to provide estimates of net returns (revenue minus cost), improvements in the estimates associated with the post-harvesting of cotton necessarily involve estimates of some of the revenues or rebates as well as the costs.

Definition of Terms

In this study, the yield employed was State average yield and the average yield for District 4 which is basically the South Delta. The market price is the average price received by Mississippi growers. The item labeled "government payment" is based on the grower payment yield, the deficiency payment and the deficiency percentage.

Direct costs are those costs that vary with production. Classic examples are fertilizer, fuel, herbicides, insecticides, labor, etc. A different yield was used for each year, thus the direct cost that is not proportional to yield must be separated from that which is proportional to yield. DCNYP denotes direct costs not proportional to yield. DCPY denotes direct costs proportional to yield. Direct costs proportional to yield are typically associated with ginning and hauling cost. However, the data sources [16, 29, 30, 31] utilized in this study, for ginning and warehouse rebates, are net of ginning charges. Therefore, DCPY denotes hauling cost and the cost of ginning is excluded from direct production cost, i.e., the Department of Agricultural Economics [4-15] lists ginning as a cost, this study does not.

Overhead costs reflect expenses that are significant costs associated with operating the entire farm business, but not necessarily specific to any particular enterprise (cotton or beans). Examples of farm overhead costs include tax services, record keeping, utilities, maintenance of turn rows and drainage systems, insurance, property taxes, etc. Overhead costs do not include living expenses nor salary for the owner/operator nor payments to farm managers (those people that exist between the farmer and the tractor drivers or laborers).

Several specific overhead expenditure items are grouped in the general overhead cost categories. For example, accounting supplies and service also include charges for tax services and bank service charges. Insurance estimates include charges for machinery, crop storage and other farm insurance. Other overhead includes charges for legal fees, farm organization membership dues, marketing advisory services and computer services. Farm overhead operating costs include tractor and machinery fuel, lubrication and repair costs associated with farm maintenance, grading turn rows, drainage maintenance and private road maintenance, etc. In addition, overhead estimates include costs associated with the operation of the farm shop and farm pick-up(s).

The land charge is estimated as the average cash cost of renting average yielding cotton land. The management charge is associated with professional farm managers. For example, in 1985, the charge is \$6.01 per acre. This would require approximately 5,000 acres to justify a manager with an annual salary of \$30,000.

Much of the Mississippi crop is irrigated. A portion of the direct and fixed irrigation costs per acre are included in the cost of production estimates. This study employs Louisiana {1,17-27} irrigation costs because they are reported on a per acre basis while Mississippi [4-15] irrigation costs are reported on all "acre-inch" basis (requiring the user to know the number of applications and the number of acre-inches per application). However, the costs are the same for 3 applications of 1-2 acre-inches. Specifically, this study assumes that 36 percent of the acreage in the state is irrigated (16% in the South Delta).

Marketing costs include warehouse cost, classing fee [2], merchandising fee, and Cotton Board fee [3]. Warehouse cost is comprised of storage fee, receiving charge, compress charge, and loadout fee.

Cost of production estimates are typically reported on a per acre of cotton basis. Generally this acre includes government payments. However, at the farm level there are other acres such as the set-aside acres which require cost. The cost in this category is labeled set-aside maintenance. It is estimated at \$8.01 per acre (for the set-aside acreage). It reflects the cost of two trips across the field, one for field cultivation and one for disking.

Trends in Selected Cost Categories and Inputs

Producer returns from cotton continue under pressure from both escalating production and marketing costs (Appendix Tables 1 and 2). Between 1985-1986 and 1995-1996, direct costs have risen 37% (Table 1) while marketing costs have risen 40% per bale (Table 2).

Of the items listed in Table 1, only fixed costs per acre and hours of labor per acre declined. Other costs have increased dramatically. Some of the increases were associated with attempts to increase yield and others with price advances.

Insecticide is a special cost category and a portion of the increase is associated with insecticide resistance.

Diesel fuel has declined in price and in terms of dollars per acre (Appendix Table 1). From 1985-1986 to 1995-1996 the price of diesel fuel fell by 28% from \$0.935 to \$0.67. Expenditures on diesel fuel were \$15.74 per acre in 1985-1986 and \$11.17 in 1995-1996; a reduction of 29%. Tractor size (and picker size) has increased over the study period. The larger units require more fuel per hour but fewer hours per acre so that the gallons of fuel per acre has remained almost constant.

Fertilizer

During the 1985-1986 period, the fertility program specified 110 lbs of anhydrous ammonia(82% N) plus lime. By 1995-1996, the anhydrous ammonia had been replaced by liquid nitrogen (32%) at the rate of 425 lbs per acre. Additionally, 200 lbs of potash has been added per acre. The net result was an increase of 143% in fertilizer material cost.

Herbicide

In 1985-1986, the herbicide program was as follows: 1.80 lbs of Bladex, 0.62 lbs of Cotoran, 1.6 pints of Cotoran + MSMA, 0.08 lbs of Fusilade, 1.60 lbs of MSMA, and 0.50 lbs of Treflan. By the 1995-1996 period, the herbicide program had generally remained constant, but with the addition of Zorial. While there were some changes in rates, the basic components of Bladex, Cotoran, Fusilade, MSMA, and Treflan were consistent throughout the 10-year period. The 17% increase in herbicide program cost is almost entirely due to price increases.

Insecticide

The 1985-1986 insecticide program included 0.10 lbs of Bidrin, 4.00 pints of EPN + MP, 1.0 pounds of Methyl Parathion, 0.15 lbs of Orthene, and 0.40 lbs of Pydrin. By 1995-1996, Temik had become a standard practice. EPN + MP had lost its label, Pydrin had been replaced by a more modern synthetic pyrethroid. Orthene was no longer a standard insecticide and Larvin at the ovicide and insecticide rate had become a standard practice. The 92% increase in insecticide material cost was related to insecticide resistance and to more expensive compounds.

Harvest Aid

During the 1985-1986 period, DEF was applied at 1.30 lbs/acre as the only harvest aid material. By the 1995-1996 period, the rate of DEF had fallen to 1.0 lbs. DROPP was utilized in combination with DEF at a rate of 0.063 lbs. per acre. Additionally, 1.0 lbs of Prep is indicated per acre in the cotton budgets. This dramatic increase of over 400% in harvest aid material cost was an effort by the grower to minimize the loss associated with poor harvest weather by maximizing the number of acres requiring only one harvest.

Fungicide

The budget showed no change in the fungicide program for the entire period. The fungicide listed is Terraclor Super X at 1.0 lbs. The increase of over 200% in fungicide cost was entirely due to the change in price.

Specific Items

Pickers and tractors cost were up from 32% to 55%. The defoliant DEF and DROPP have both increased in cost by more than 50%.

The fertilizers listed have increased in cost from 12% to 15%. However, the more expensive fertilizers are those that were not available in 1985-1986, so that a direct 10-year comparison is not possible. We note that fertilizer cost per acre, which does reflect the new fertilizer, has increased by 143% per acre (Table 1).

The herbicides Treflan and Zorial have increased by 23% and 44%, respectively. The insecticide Methyl Parathion has increased by 61%. Orthene is suffering from resistance and still increased by 19%. Temik increased by 15%.

The per hour cost of labor was up by 42%, however, the hours/acre for cotton was down by 55%.

The adjustments made by Mississippi growers have resulted in dramatically increased investment costs at that point in time when new equipment is purchased. Basically, growers have increased tractor size so that they have experienced the increase in tractor price for a given size, plus the increase in cost associated with moving to a larger size. Additionally, growers made the transformation from 2-row to 4-row pickers. This reduced harvesting costs per acre, especially fixed cost per acre, but required a larger investment. The benefit was reduced labor hours per acre.

Marketing Costs

Increases in marketing costs were associated with changes in cash market trading rules imposed on producers by the merchandising sector beginning with the 1995 crop. Via group action merchants began deducting charges for warehouse load out and compression from proceeds paid to growers. This change in the cash market rules resulted in a \$5.86 per bale increase in warehouse costs between 1985-1986 and 1995-1996. Additionally, USDA Cotton Division classing fees charged to growers increased from \$1.07 per bale in 1985-1996 to \$1.55 per bale 1995-1996 (Table 2).

Legislative changes in the Commodity Credit Corporation (CCC) loan program also worked to the disadvantage of the producer. Prior to 1996 the CCC loan program allowed the producer to enter cotton in the CCC loan and plan for marketing that cotton over an eighteen month period. The current program allows cotton to be under loan for a maximum for ten months, effectively reducing the producers market planning horizon by eight months. The

purpose of the eighteen month loan program was to allow producers to take advantage of potentially higher prices at some later time. The current legislation has forced producers to market their production in a shorter time period, or to hold cotton until the end of loan period, thereby marketing it during the harvest season of the following year's crop, traditionally a period of relatively low prices.

Changes in public policy, specifically cotton policy, imposed a significant change in producer returns. In 1985 and 1986 the target price was 81 cents per pound. In 1986 the target price began an annual decline, falling to 72.90 in 1990. It remained at 72.90 cents through 1995. In 1996 the target price concept was abandoned via the F.A.I.R. Act. Additionally, the loan price, at 57.30 cents per pound in 1985, tended to vary from year to year. The cotton CCC loan rate ranged from 50.00 cents to 52.35 cents between 1988 and 1994. The loan rate was 51.92 cents in both 1995 and 1996.

Table 2 summarizes the changes in the grower cost of marketing cotton for 1985-1986 v. 1995-1996. Some structural changes occurred in 1995 and 1996 which make the marketing costs large relative to the previous years. The 1995-1996 marketing costs (Rule 5) relative to 1985-1986 (Rule 3) have increased by 40 percent.

Net Returns per Acre Based on State Average Yield

Estimated net returns per acre based on State average yield (8 row equipment, Mississippi, 1985-1996 are reported in Table 3). Table 3 reflects one acre of cotton with the government payment. Two of the twelve years show an estimated negative net return. The average is \$39.02 per acre, a return of 6.4% of average total cost. These costs are trivial in a sense that they do not reflect the farm firm cash situation. There are other acres that incurred costs.

Estimated Returns per Farm, 1,000 Acre Cotton Farm with 1,000 Base Cotton Acres, 8 Row Equipment, State Average Yield Mississippi, 1985-1996

Calculations for a 1,000 acre farm are also reported (Table 4). Note the 1985 set-aside requirement was 200 acres and that the payment percentage was 100 and held at that level until 1991 when it reduced to 85%. The payment yield was set to 800 lbs of lint per acre. The market price was the average price received by Mississippi growers.

Primarily because the variability in yield, total revenue varies from approximately \$400,000 to almost \$700,000 per year for the farm. Total costs vary from over \$433,000 to almost \$670,000. Seven of the twelve years have positive net returns, but the 12-year average net return is a negative \$11,760, a negative 2.2% return on average total cost.

Discussion

The farm critic will quickly point out that estimates based on average state yields indicate that one-half of the farmers are doing better than the numbers reported. Conversely, it should also be emphasized that estimates based on average state yield means that one-half of the farmers are doing poorer. However, to address this criticism, District 4 yields were also analyzed. District 4 is generally referred to as the South Delta and is the highest yielding district in the state.

Government payments associated with a single planted acre (Table 5) show that returns were positive in ten or twelve years of the study period. The twelve year average was \$106.59.

The whole farm situation (Table 6) indicated average returns were \$45,282 or an 8.4% return on average total cost. The costs and revenue per acre are associated with planted acres of cotton. In most years the entire cotton based was not planted because of set aside requirements of the acreage reduction program. However, the whole farm model must account for the costs associated with non-planted acres. Thus, per acre net returns cannot be assumed to reflect a linear relationship with net farm profits. consequently, in some years with relatively profitable per acre net returns, the farm net return was negligible.

Implications

A recent study by Spurlock and Gillis (28) investigating net revenue for cotton in the North and South Delta areas of Mississippi, reported the range in net revenue for the two regions in 1994. Assuming that the observed difference in the mean and minimum values represents 3 standard deviations, we obtained estimates of \$119.54 and \$118.75 per acre for the South and North Delta, respectively. These standard deviations are similar to a Louisiana estimate based on a 1984 survey and reported in 1988 [22].

With the standard deviation at the average or \$119.15, then the results of this study imply that 55% of the cotton growers in Mississippi lost money during the period of 1985-1996. Similarly, from 1985-1996, in the high yielding District 4, 57% of the growers made money. Conversely, 58% of the South Delta producers made money in the study period.

Stated another way, two-thirds of the Mississippi cotton growers experienced net returns in the range of negative \$131.30 to \$107.78 per acre during the period 1985-1996. Thus, one grower in six made more than \$107 while one grower in six lost more than \$131 per acre. In District 4, two-thirds of the cotton growers experienced net returns between negative \$73.47 and \$164.03 per acre, while one in six lost more than \$73 and one in six made more than \$164 per acre.

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Table 1. Percentage Change in Selected Production Input Categories and Items, MS, 1985-86 vs. 1995-96

Item	Unit	1985-1986	1995-1996	% Increase
Direct and Fixed Cost				
DCNPY ¹	\$/a	240.43	331.83	37
FC	\$/a	92.95	80.58	(13)
Material Cost (Excluding Application)				
Harvest Aid	\$/a	4.29	22.43	423
Fertilizer	\$/a	23.4	56.77	143
Fungicide	\$/a	3.18	11.53	263
Herbicide	\$/a	32.06	37.4	17
Insecticide	\$/a	31.97	61.38	92

Self-Propelled Equipment				
145 Horsepower Tractor	@	43,578	67,384	55
180 Horsepower Tractor	@	65,303	87,381	34
2-row picker	@	70,876	102,875	45
4-row picker	@	127,080 ²	167,675	32
Defoliant				
DeF	lb	3.30	5.44	65
Dropp	lb	62.50	95.29	52
Fertilizer				
Anhy. Ammonia 827	cwt	11.57	12.99	12
13-13-13	cwt	8.87	9.91	12
Urea - 46% ³	cwt	9.79	10.81	10
Lime-spread	ton	21.50	24.65	15
Herbicides				
Treflan	lb	6.14	7.55	23
Item	Unit	1985-1986	1995-1996	% Increase
Herbicides (continued)				
Zorial	lb	10.21	14.75	44
Insecticides				
Methyl P.	lb	2.75	4.44	61
Orthene	lb	7.91	9.42	19
Temik	lb	17.62	20.29	15
Labor				
Labor	\$/hr	4.48	6.37	42
Labor	hr/ac re	13.35	6.04	(55)

¹ Direct Cost Not Proportional to Yield

² 1990 price-first year in common use.

³ Solid

Table 2. Marketing Cost per bale, Mississippi, 1985-86 vs. 1995-96

Item	Unit	1985-1986	1995-1996	% Increase
Warehouse Cost	\$/bale	10.43	16.29	56
Classing Fee	\$/bale	1.07	1.55	45
Merch. Fee	\$/bale	2.25	2.25	0
Cotton Board	\$/bale	2.54	2.74	8
Total	\$/bale	16.29	22.83	40

Source: [1, 2, 19]

Warehouse rebates, gin rebates, and the average price received for cotton by Mississippi farmers for the 1996 crop were estimated based on available data at the time of the research.