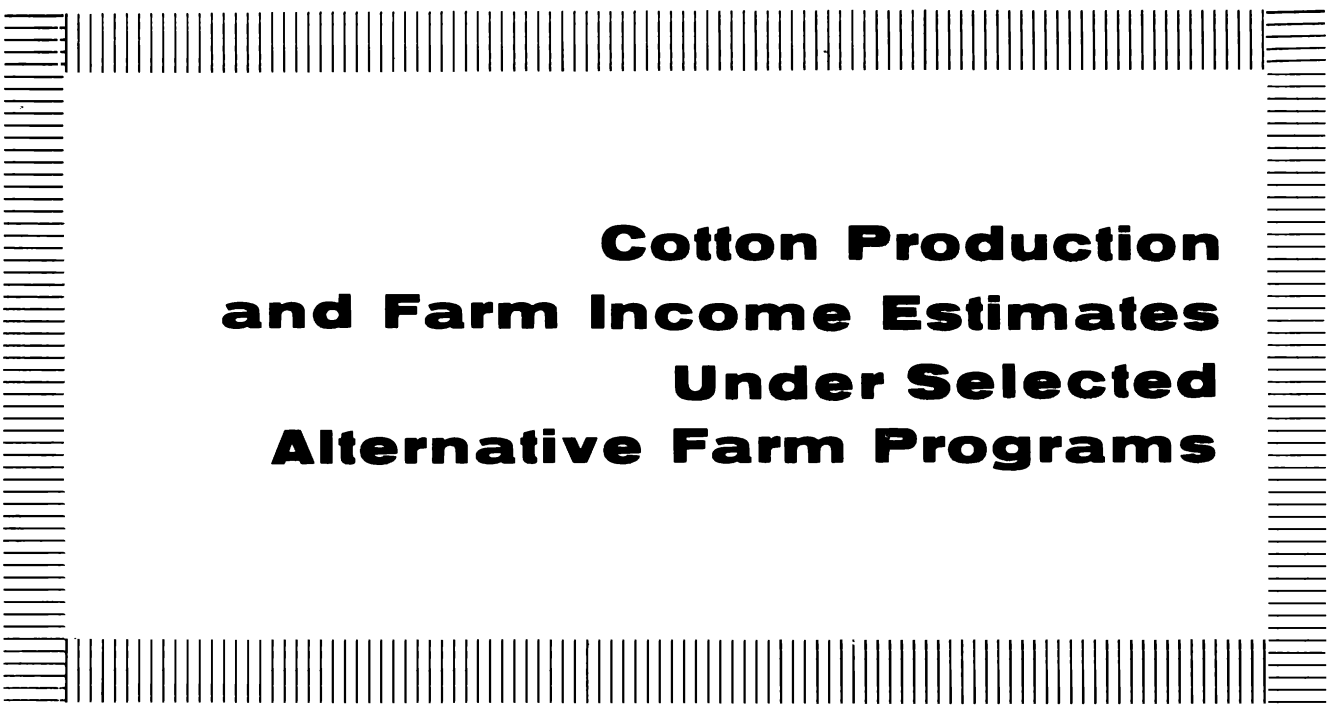


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**Cotton Production  
and Farm Income Estimates  
Under Selected  
Alternative Farm Programs**

## ABSTRACT

Alternative farm programs for cotton were examined for their effect on acreage and production of cotton and other crops in the Cotton Belt, farm income there, and Government costs. A moderate reduction in the market price of cotton would have little effect on production of cotton or other crops if support payments were made as in 1969. If cotton support payments and marketing quotas were removed, cotton acreage would be reduced 18 to 50 percent below estimates based on a continuation of the 1969 farm program, depending on the price for cotton. Acreage of feed grains, wheat, and soybeans would increase. Government costs would be greatly reduced, but farm income over variable costs would decline 22 to 31 percent.

Increasing support payments would increase cotton production. With no production restrictions, and with support payments at 10 to 14 cents per pound on 8 million acres, approximately the same quantity of cotton would be produced as with a continuation of the 1969 program, but at substantially lower Government costs.

Keywords: Agricultural policies, agricultural programs, cotton, supply response, support payments, price support payments, acreage allotments, marketing quotas, farm income, Government costs, subsidies, linear programming.

## PREFACE

This study of cotton supply response to changes in price and Government programs was done by the Aggregate Production Analysis Team (APAT) of the Farm Production Economics Division (FPED), Economic Research Service, USDA. The team consists of the Production and Resource Response Group of FPED's Production Adjustments Branch and FPED regional analysts located at various field offices across the United States. The overall objective of APAT is to provide quantitative estimates of aggregate production and resource adjustments that would result from changes in prices, costs, resource supplies, and Government programs. The estimates include assessment of the impacts on farm income and U.S. treasury costs.

APAT uses an integrated analysis system which brings together data from many sources, several econometric techniques, and well-informed individual judgment and technical skills. This system, called the Aggregate Production Analysis System (APAS), has been described by Sharples and Schaller.\* At the present time, APAS combines linear programming at both the firm and area levels, multiple regression, and other statistical techniques. This system facilitates effective cooperation in research programs of FPED and the various land-grant universities.

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\*Schaller, W. Neill. "A National Model of Agricultural Production Response," *Agr. Econ. Res.* 20: 33-46, Apr. 1968; and Sharples, Jerry A. and Schaller, W. Neill, "Predicting Short-Run Aggregate Adjustment to Policy Alternative," *Amer. Jour. of Agr. Econ.* 50: 1523-1536, Dec. 1968.

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## SUMMARY

If the cotton loan rate is dropped to 90 percent of the estimated world cotton price, cotton production restrictions are apparently not required to prevent excessive carryover. Instead, support payments added to that loan rate are needed to induce the level of production which can be marketed at the world price level. These conclusions are drawn from experience under the Food and Agriculture Act of 1965 and from programming analysis.

Estimated acreage and production of cotton and other major crops in the Cotton Belt, plus farm income there and Government costs, vary according to different program and price assumptions. With a continuation of the 1969 farm program, an estimated 11.8 million acres of cotton would be planted in the Cotton Belt States, with production amounting to 12.2 million bales. Under this benchmark level--which includes acreage allotments, marketing quotas, support payments for estimated domestic needs, and guaranteed loans at 90 percent of the estimated world price--acreage would approximate that planted in 1969 and 1970.

Reduction of the average market price of cotton from the 1969 level of 22 cents per pound of lint to 20 cents--with all other provisions of the 1969 program intact--would have little effect on acreage or production of cotton or other major crops in the Cotton Belt.

However, elimination of marketing quotas and support payments for cotton would have a significant effect. Under such conditions and with an average market price of 22 cents, cotton acreage would decrease 18 percent from the benchmark level, from 11.8 million to 9.7 million acres. At a 19.5-cent price, acreage would decrease 29 percent, to 8.4 million acres. A 17-cent price would reduce acreage by 47 percent, to 6.3 million acres. Cotton production under the three price levels would decrease with the decreased acreage, but not proportionally because the areas in which acreage would decrease the most would generally be the lower yielding areas.

The decline in cotton acreage would result in increased acreage of other major crops grown in Cotton Belt States. Soybeans would become the primary substitute in the Mississippi Delta and in the Southeastern States. Feed grains and wheat would replace cotton in Texas and Oklahoma. In the Southwestern States, feed grains would be the major substitute.

Under the alternative of no marketing quotas and no support payments, farm income would be affected with varying severity, depending upon area. With a 22-cent average price for cotton--and the realized price assumed to be the same as the expected price--the returns over variable costs would drop an average of 22 percent below the benchmark level. With a 19.5-cent and a 17-cent average price, the reduction would be 27 and 31 percent, respectively. If fixed costs were considered, the percentage reduction in net farm income would be even greater.

Another program alternative that assumes varying levels of support payment on 50 percent of the 1969 allotment results in estimates of

increased cotton acreage. At each successive level of support payment between 2 cents and 14 cents per pound of lint, planted acreage would increase. It would reach an estimated 11.6 million acres at the 14-cent level. This acreage is only slightly less than the estimate for a continuation of the 1969 program. However, estimated production would be somewhat higher than the benchmark level because cotton production would shift to areas with lower cost and higher yield.

Some decline in the acreage of other crops would occur with varying levels of support payment for cotton. As the payment increases, the acreage of other crops, particularly soybeans, would decline because of shifts to cotton production.

Returns over variable costs and total Government payments would increase as the support payment rate increased. Compared with Government payments under the 1969 benchmark program, however, such payments would decline with varying levels of support. The reductions would range from \$200 million to \$650 million, depending on the support payment rate. However, farm income would be reduced by an amount approximately equal to the reduction in Government payments.

# COTTON PRODUCTION AND FARM INCOME ESTIMATES UNDER SELECTED ALTERNATIVE FARM PROGRAMS

by

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## INTRODUCTION

The agricultural sector of the American economy is efficient and is advancing technologically. The history of the past half century reveals a continually decreasing number of farmworkers being better able to supply the food and fiber needs for an increasing population. The productive capacity of agriculture now far exceeds the effective demand for a number of products. Public programs to support farm product prices and reduce the supply of major agricultural products, including cotton, have long been employed.

### Past Farm Programs Affecting Cotton

#### Agricultural Marketing Act of 1929

The first major approach to a cotton surplus problem was an attempt to stabilize prices through orderly marketing. The Federal Farm Board, established by the Agricultural Marketing Act of 1929, made loans to cooperatives for storage of agricultural commodities. But, partly because of reduced demand for cotton, the board was unable to maintain prices or to prevent accumulation of stocks.

#### Programs in Effect During 1933-65

In 1933, production controls were combined with commodity loans. In most years since then, cotton acreage has been controlled and prices have been supported by various public programs. With prices supported at levels generally prevailing during 1933-65, acreage controls were necessary during most of the period to prevent the accumulation of excessive carryover. During periods when marketing quotas were not in effect (1936-37, 1943-49, and 1951-53), production expanded and carryover increased (fig. 1).

The Agricultural Adjustment Act of 1933 was declared unconstitutional in 1936 and was replaced by the Soil Conservation and Domestic Allotment Act. The new act offered payments to farmers for shifting acreage from soil-depleting crops to soil-conserving uses, but it did not provide

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1/ Members of the Aggregate Production Analysis Team stationed respectively at Stillwater, Okla., Washington, D.C., Athens, Ga., and Tucson, Ariz.

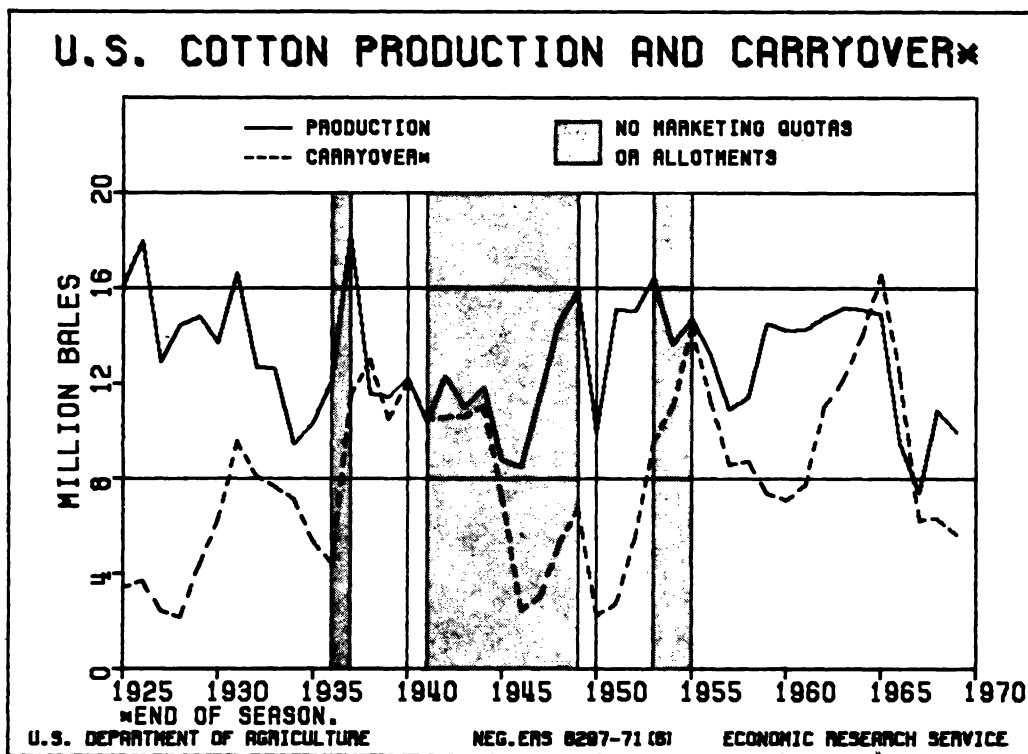


Figure 1

marketing quotas. This program had no effective controls on cotton production, and in 1937 a record crop of 18.9 million bales was produced. Under the Agricultural Adjustment Act of 1938, there was a return to marketing quotas and acreage allotments.

During 1943-49, allotments and marketing quotas were not in effect. In the post-war years 1945-49, cotton acreage expanded slowly (fig. 2). The acreage in cultivation on July 1, 1949, was 17 percent above the 1938-43 average and 59 percent above 1945 acreage, the lowest in the war period. The large acreage in 1949 may have been partly due to anticipation of allotments in 1950.

In 1951, after cotton acreage allotments were removed at the beginning of the Korean war, cotton acreage jumped to a peak which has not been exceeded. From 1950 to 1951, the acreage planted to cotton increased 55 percent. This increase may be attributed to the high price received for the 1950 crop relative to prices received for competing crops, to the prospective small carryover at the end of the 1950-51 season, and to anticipated demand to fill war needs. These factors provided a much stronger incentive to expand cotton acreage than did factors existing in 1945-49.

After 1947, foreign cotton acreage and production also expanded. Most of the increase in foreign acreage occurred during 1948-55, when the U.S. export price of cotton was higher than in either prior or subsequent years. But, because of rising yields per acre, foreign production continued to increase after 1955. Foreign consumption increased along with production but the increase in consumption was not sufficient for



# U.S. COTTON ACREAGE AND YIELD\*

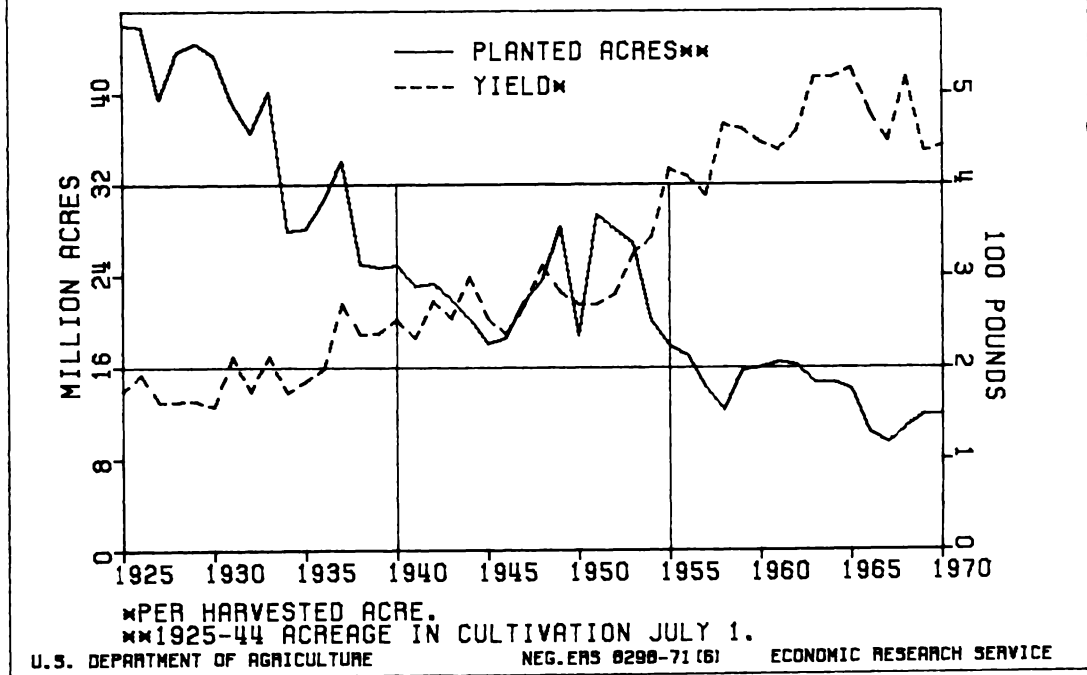


Figure 2

U.S. exports to regain pre-World War II levels. In 1952-54, U.S. exports were below those of 1945-51 (table 1).

The Agricultural Trade Development and Assistance Act (P.L. 480) was passed in 1954 to stimulate exports of agricultural commodities by allowing sales for foreign currencies. Cotton exports under this program during 1954-70 totaled almost 15 million bales and in some years comprised a considerable part of total cotton exports. Direct subsidies were also used to stimulate exports. During 1955-63, cotton was sold from Commodity Credit Corporation stocks to foreign mills at 5.75 cents to 8.5 cents per pound below prices paid by domestic mills. As a result, the domestic price of cotton was maintained above the price in foreign markets by approximately the amount of the subsidy. As a result of these two programs, average annual exports of cotton during 1955-63 exceeded those of the previous 10 years, but they have declined since 1963.

The Soil Bank Program was enacted in 1956 to reduce supply by taking farmland out of production. The acreage reserve part of the program, which was in effect in 1956-58, was designed to reduce the amount of land planted to allotment crops. A payment of 15 cents per pound of lint was offered to growers to remove allotment acreage from cotton production. In 1958, nearly 5 million acres of cotton under allotment were placed in acreage reserve (table 2). The conservation reserve part of the Soil Bank Program was designed to remove general cropland from production under long-term contracts. The acreage diverted from cotton production under this phase of the program reached a maximum of about 0.7 million acres in 1960. At the beginning of the 1956 crop year the carryover exceeded 14 million bales; by the end of the 1960 season it had been

Table 1.--Upland cotton production, distribution, and carryover, 1925-70

Season beginning August 1	Production	Distribution			Carryover at end of season
		Domestic mill consumption	Exports	Total	
-----1,000 bales-----					
1925-29.....	15,244	6,486	8,239	14,764	3,221
1930-32.....	14,661	5,422	7,961	13,423	8,071
1933-35.....	11,092	5,703	6,089	11,828	6,728
1936.....	12,381	7,850	5,433	13,328	4,447
1937.....	18,934	5,691	5,595	11,352	11,492
1938-44.....	11,894	9,338	2,339	11,711	11,204
1945.....	9,011	9,056	3,613	12,729	7,272
1946.....	8,638	9,881	3,544	13,441	2,456
1947.....	11,859	9,204	1,960	11,184	3,036
1948.....	14,873	7,694	4,746	12,475	5,241
1949.....	16,124	8,732	5,771	14,540	6,781
1950.....	9,950	10,357	4,108	14,492	2,196
1951.....	15,102	9,116	5,515	14,666	2,741
1952.....	15,044	9,358	3,048	12,456	5,511
1953.....	16,400	8,476	3,760	12,311	9,570
1954.....	13,655	8,730	3,445	12,235	11,028
1955.....	14,678	9,085	2,194	11,279	14,399
1956.....	13,260	8,496	7,540	16,036	11,269
1957.....	10,882	7,900	5,707	13,607	8,615
1958.....	11,428	8,594	2,766	11,360	8,733
1959.....	14,487	8,879	7,178	16,058	7,404
1960.....	14,205	8,131	6,625	14,756	7,090
1961.....	14,255	8,783	4,906	13,689	7,741
1962.....	14,754	8,258	3,348	11,606	11,016
1963.....	15,169	8,468	5,661	14,129	12,125
1964.....	15,060	9,019	4,038	13,057	14,031
1965.....	14,868	9,356	2,936	12,292	16,574
1966.....	9,502	9,350	4,656	14,006	12,280
1967.....	7,388	8,854	4,161	13,015	6,258
1968.....	10,869	8,116	2,723	10,839	6,366
1969.....	9,937	7,879	2,753	10,632	5,653
1970.....	10,540				

Table 2.--Upland cotton allotments, planted acreage, diversion, and diversion payment rate, 1949-70

Crop year	Allotment	Planted	Acreage reserve	Conserva- tion reserve <u>1/</u>	CAP CCP <u>2/</u>	Diverted	Allotment not planted or diverted		Diversion required	Diversion payment rate	
							1,000 acres	Percent		Percent	Mandatory
1949.....		28,277									
1950.....	21,554	18,761					2,793	13.0			
1951.....		29,288									
1952.....		27,957									
1953.....		26,778									
1954.....	21,379	20,015					1,364	6.4			
1955.....	18,113	17,947					166	.9			
1956.....	17,391	17,033	<u>3/</u> 1,121	<u>3/</u> 26			358	2.1			
1957.....	17,585	14,226	3,016	114			229	1.3			
1958.....	17,555	12,299	4,926	180			150	.9			
1959.....	<u>4/</u> 17,346	15,765		517			1,064	6.1			
1960.....	<u>4/</u> 17,553	16,017		683			853	4.9			
1961.....	18,458	16,526		679			1,253	6.8			
1962.....	18,102	16,197		620			1,285	7.1			
1963.....	16,250	14,699		562			989	6.1			
1964.....	<u>5/</u> 16,168	14,726		448		<u>6/</u> 488	506	3.1			
1965.....	<u>5/</u> 16,177	14,075		390		<u>6/</u> 933	779	4.8			
1966.....	<u>5/</u> 15,998	10,269		367	174	4,562	626	3.9	12.5	10.50	10.50
1967.....	<u>5/</u> 15,796	9,380		295	290	4,847	984	6.2	12.5	10.78	10.78
1968.....	<u>5/</u> 15,691	10,844		230	290	3,074	1,253	8.0	5.0	10.76	6.00
1969.....	<u>5/</u> 15,601	11,820		85	290		3,406	21.8	0	0	0
1970.....	<u>5/</u> 16,434	12,061			315		4,058	24.7	0	0	0

1/ Land used for cotton in year prior to entering conservation reserve.

2/ Cropland Adjustment Program and Cropland Conversion Program.

3/ Program established after the crop was planted.

4/ Base allotment plus increase for grower selection of choice "B" alternative, which allowed farmers to plant 140 percent of allotment. However, loan rate was 15 percentage points below the rate for planting regular allotment.

5/ Total effective allotment is less than total base allotment because of adjustments for yield differential when allotments are sold or released for reapportionment.

6/ Difference between total effective allotment and domestic allotment on participating farms.

reduced to 7 million bales. But the carryover built up again in the early 1960's.

Under the Cotton-Wheat Act of 1964, further attempts were made to improve the balance between supply and demand of cotton by providing payments of 3 cents per pound in 1964 and 4.35 cents per pound in 1965 to farmers who planted only the domestic allotment. This act also provided for a subsidy to domestic handlers or textile mills equal to the subsidy paid for export. This change removed the competitive advantage which foreign manufacturers had over domestic mills, but the total effect of the act on production and carryover was very small. Carryover reached a peak of nearly 17 million bales at the end of the 1965 crop year.

#### Food and Agriculture Act of 1965

This act provided four major changes in the upland cotton program:

1. The loan rate was set at not more than 90 percent of the estimated world price. The price support loan rate for the 1966 crop was reduced 8 cents per pound. (The domestic price of cotton fell accordingly (table 3).)
2. So-called price support payments were provided on the normal production from the domestic acreage allotment in an amount which, when added to the loan, would provide not less than 65 percent of parity on the projected production from the permitted acreage, or at a rate of not less than 9 cents a pound. The domestic allotment was fixed at not less than 65 percent of the total allotment. "Price support payment" rates ranged from 9.42 cents a pound in 1966 to 16.80 cents in 1970 (table 3).
3. Payments could be made for diverting acreage from cotton to conserving uses.
4. Producers with 1965 allotments were permitted to stay out of the program and plant acreage in excess of their allotment in years when the carryover declined, provided they sold their cotton on the export market. The maximum acreage of cotton planted under this provision of the law was 38,000 acres.

In 1966, mandatory diversion was set at 12.5 percent of the allotment and the diversion payment rate for both voluntary and mandatory diversion was set at 10.5 cents per pound. Farmers with 82 percent of the cotton allotment diverted at the maximum rate of 35 percent, farmers with 2 percent of the allotment diverted at the 25-percent rate, and farmers with 16 percent of the allotment diverted at the minimum mandatory rate of 12.5 percent. Nearly 4.6 million acres of allotment were diverted and the planted acreage was reduced to 10.3 million acres, or 3.8 million acres below that of the previous year (table 2). With essentially the same program in 1967 as in 1966, diversion increased to 4.8 million acres and the planted acreage dropped to 9.4 million acres (table 2). In 1966 and 1967, yields per acre were substantially below normal and production dropped to less than 10 million bales. Carryover at the end of the 1967 marketing year was down to 6.3 million bales. Due to the shortage of longer staple lengths of cotton, the price of these staple lengths rose well above the loan rate and the season's average price for all upland cotton was substantially higher than the loan rate.

Table 3.--Upland cotton loan rate, season average price, support payment rate, and subsidy rate, 1949-70

Year beginning August 1	Loan rate, Middling 1-inch <sup>1/</sup>	Season average price	Support payment rate	Subsidy payment rate	
				Export	Domestic
-----Cents-----					
1949.....	30.03	28.57			
1950.....	30.25	39.90			
1951.....	32.36	37.69			
1952.....	32.41	34.17			
1953.....	33.50	32.10			
1954.....	34.03	33.52			
1955.....	34.55	32.27		2/7.50	
1956.....	32.74	31.63		2/7.21	
1957.....	32.31	29.46		2/6.19	
1958.....	35.08	33.09		6.5	
1959.....	34.10 A 28.40 B	31.56		8.0	
1960.....	32.42 A 26.63 B	30.08		6.0	
1961.....	33.04	32.80		8.5	
1962.....	32.47	31.74		8.5	
1963.....	32.47	32.02		8.50	
1964.....	30.00	29.62	3/3.50	6.50	6.50
1965.....	29.00	28.03	3/4.35	5.75	5.75
1966.....	21.00	20.64	9.42		
1967.....	20.25	25.39	11.53		
1968.....	20.25	22.02	12.24		
1969.....	20.25	20.6	14.73		
1970.....	20.25		16.80		

<sup>1/</sup> A--Loan rate for growers who participated in Plan A of Agricultural Adjustment Act of 1958, under which the harvested acreage could not exceed the allotment. B--Loan rate for growers who participated in Plan B of Agricultural Adjustment Act of 1958, under which the harvested acreage could exceed the allotment by 40 percent.

<sup>2/</sup> Difference between CCC export sale price and average price for Middling 1-inch cotton in the designated spot markets.

<sup>3/</sup> Paid to small producers and producers planting only domestic allotment.

In 1968, the payment rate for voluntary diversion was reduced to 6 cents per pound and mandatory diversion was reduced to 5 percent of the total allotment. With voluntary diversion at 6 cents per pound, farmers with about half the U.S. allotment planted their full allotment and the remaining half planted only their domestic allotment. Diversion in 1968 dropped to 3.1 million acres, a decline of 1.7 million acres. Planted acres increased 1.4 million acres. The percentage of allotment neither planted nor diverted continued to rise. Production in 1968 was about equal to disappearance, but disappearance was the lowest in 30 years (table 1).

Voluntary and mandatory diversion were eliminated in 1969, but planted acreage increased only about 1 million acres. Yield per acre dropped to 433 pounds and production was only about 10 million bales, or less than disappearance.

In 1969, farmers who held 7.5 percent of the total allotment did not plant any cotton. Those farmers who did plant cotton planted only 81.8 percent of the acreage that was allotted to them. Only about one-half of the nondomestic allotment, on which growers received no support payment, was planted to cotton. The percentage of the 1969 cotton acreage allotment that was planted differs markedly by area (figs. 3 and 4). In most areas of the Southeast region, farmers planted only a very small percentage of their nondomestic allotment. On the other hand, in most areas of the Southwest region, and in the High Plains, the Mississippi River Delta, and the Missouri Boot Heel, farmers planted 86 percent or more of their total allotted acreage.

In 1970, the national upland cotton acreage allotment was set at 17 million acres, compared with 16 million acres in 1969. Despite an increase of 1 million acres in the acreage allotment, only 241,000 acres more of cotton were planted than in 1969.

The experience with the Food and Agriculture Act of 1965 raised the question of whether production controls were needed with support payments limited to cotton production used domestically and with the loan rate at 90 percent of the world price.

### Objective of Report

The Food and Agriculture Act of 1965, as extended, expired at the end of the 1970 crop year. Prior to that time, many alternatives were proposed for inclusion in new farm legislation. In the following sections of this report, selected key alternatives are evaluated for their effect on acreage and production of cotton and other major crops in the Cotton Belt, on farm income there, and on Government costs.

The alternatives evaluated are:

1. A benchmark estimate based on continuation of the farm program that was in effect in 1969. This benchmark estimate provides a basis for evaluating the results of other alternative programs.
2. A continuation of the 1969 program but with an assumed decrease of 2 cents per pound in the U.S. average price for cotton.

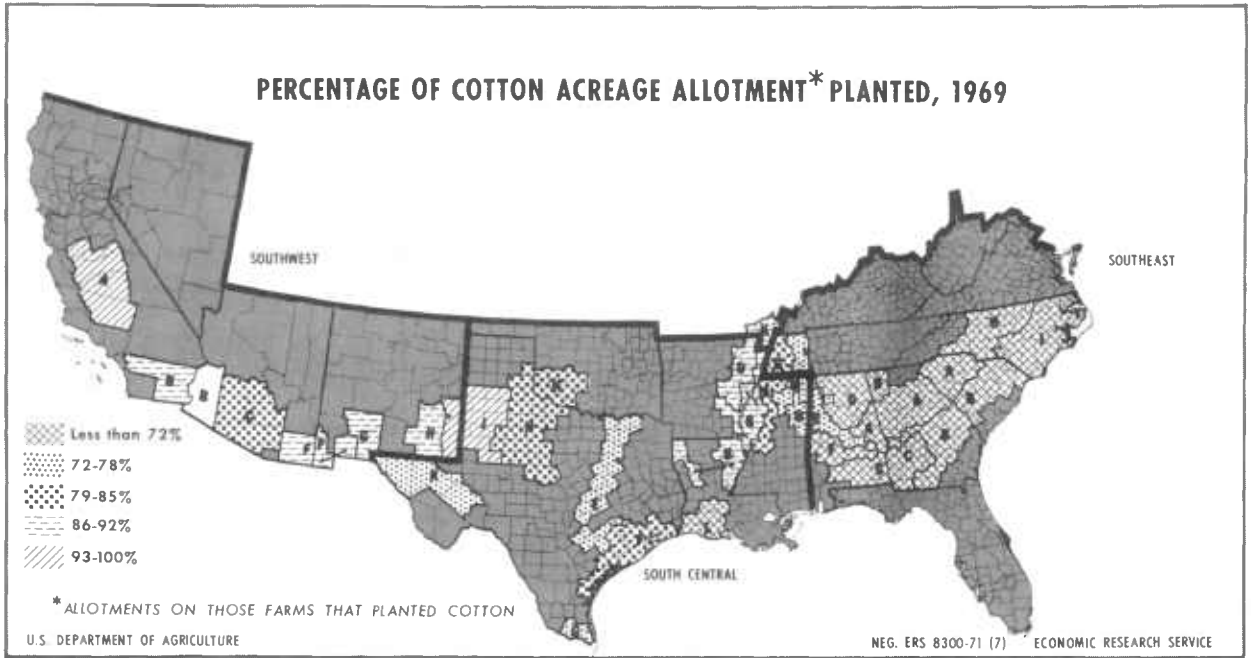


Figure 3

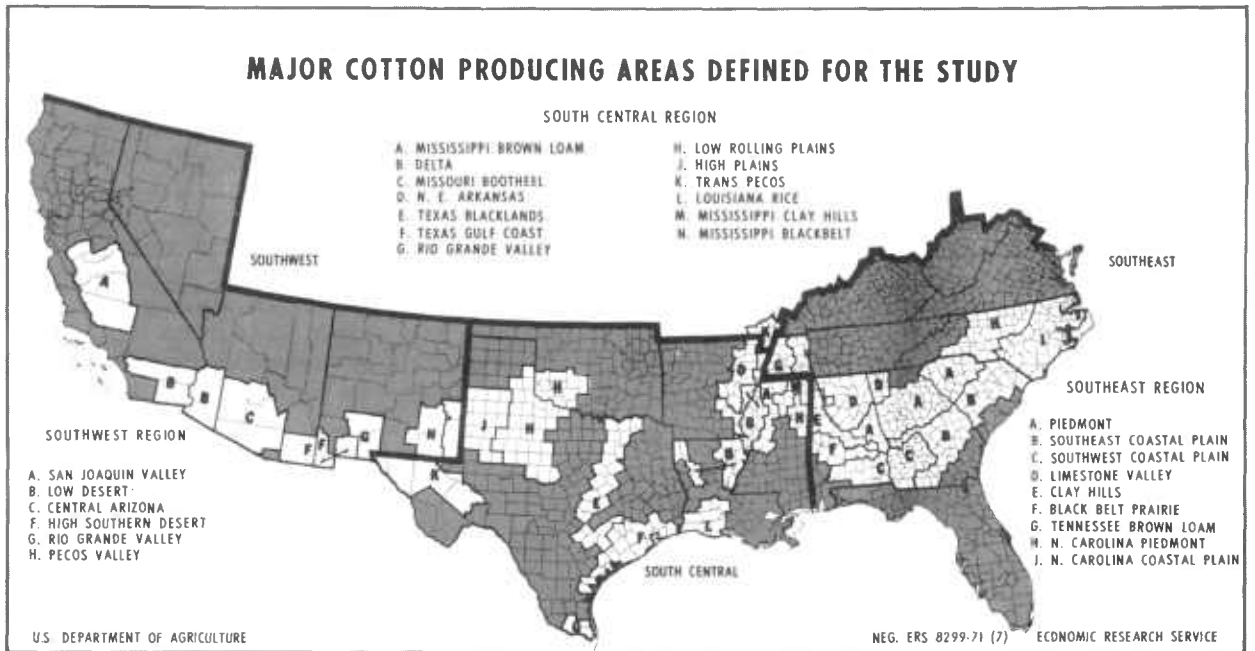


Figure 4

3. A program with no cotton acreage allotments, marketing quotas, or support payments for cotton, with assumed alternative U.S. average cotton prices of 22 cents, 19.5 cents, and 17 cents per pound.
4. A program with no marketing quotas or limits on the acreage of cotton that could be grown, with the domestic allotment set at 50 percent of the 1969 total allotment, and with support payments for the domestic allotment at alternative rates ranging from 2 to 14 cents per pound, assuming a U.S. average market price of 19.5 cents per pound for cotton.

Estimates reflect the shortrun situation--the situation that would prevail in the year immediately following a given change in the farm program.

### Method of Analysis

The cotton producing sector of the United States was divided into three regions to provide specific regional responsibilities to the research team. Within these regions, cotton production areas were delineated according to homogeneity of production response, soil characteristics, crops produced, and other factors (fig. 4). These areas account for about 90 percent of the total production of most major crops in the Cotton Belt States.

For each production area, typical crop enterprise budgets were developed for each major crop and, in some cases, for each major method of production of that crop. The budgets were developed under a common set of assumptions to provide consistency in results between production areas and regions. The input coefficients represent the average for all farms in the area or resource situation. Prices used for inputs were those prices farmers in the area would expect to pay for the 1970 crop season. Since there is very little information available to delineate between the use of operator and family labor and hired labor for an individual crop budget, all labor was charged at the prevailing wage rate. Inasmuch as the major emphasis of the research was directed toward shortrun analysis, fixed costs of production were not considered. Thus, the budgets as developed reflect only the variable costs of production.

With these budgets, linear programming models were developed for each area. These models used aggregate restraints for cropland and allotments. They were made more predictive through the use of aggregate flexibility restraints which limited the amount of production adjustment possible for each crop. The flexibility restraints were based on the historical adjustments that farmers in each area had previously made in crop acreages and were used to represent factors which cannot be measured but which affect adjustment.

The flexibility restraints were developed by each regional analyst using the method he felt would give the best results for a particular area. The simplest method was to use the standard deviation of historical acreage as a basis for setting the maximum change which could occur. Where there was a significant trend in acreage, the standard error of the projected acreage was used. Other methods used cost of production distributions to determine percentages of production affected by a given change in price or support payments. These data were then used either externally to the programming model or within the model itself to adjust the flexibility restraints. Estimation of the flexibility restraint



coefficients is a very critical aspect of the model; thus, judgment was used to determine the most desirable method for each area.

Within this framework, linear programming solutions were obtained for each area for each of the specified alternative programs. In some cases, the aggregate estimates from the linear programming models were modified to reflect unusual situations. Estimates of response were made for minor areas not programmed.

## ANALYSIS OF ALTERNATIVE PROGRAMS

This section presents the results of the programming analysis. It includes information on expected crop acreages, production, Government payments, and farm income changes under various Government program and price assumptions for cotton.

### The Benchmark Program

The benchmark program is based on the cotton, wheat, and feed grain programs that were in effect during the 1969 crop year.

#### Program Assumptions

The Government program assumptions for upland cotton included:

1. A national cotton allotment of 16 million acres, with marketing quotas in effect.
2. A national average price support loan rate of 20.25 cents per pound for Middling 1-inch at average locations.
3. A support payment of 14.73 cents per pound on the normal production from the domestic allotment (65 percent of the total allotment). To be eligible for such payment on all the domestic acreage allotment, farmers must plant at least 90 percent of their domestic allotment.
4. Small farms (those with allotments of 10 acres or less or with projected production from the allotment of 3,600 pounds or less) would be eligible for a payment of 11.26 cents per pound on the projected yield from their nondomestic allotment (35 percent of their total allotment). They could receive this payment without planting any cotton.
5. No mandatory diversion of acreage from cotton or diversion payments for voluntary diversion.
6. No penalty or reduction in cotton acreage for skip-row planting of cotton.

The analysis included the following provisions concerning the wheat program:

1. A national wheat allotment of 51.6 million acres.
2. Price support loans at a national average of \$1.25 per bushel.
3. Domestic marketing certificate payments at \$1.52 per bushel on the normal production from 43 percent of the allotment.

4. Required diversion to conservation uses of an acreage equal to 15 percent of the allotment, without payment.
5. Payments for voluntary diversion of land from wheat to conserving uses, up to 50 percent of the allotment. The rate of payment for diversion is 50 percent of the county loan rate times the normal yield.
6. Substitution of feed grains for wheat or vice versa for producers participating in both wheat and feed grain programs.
7. Voluntary participation. Any farmer could grow wheat without taking part in the program.

The analysis included the following provisions concerning a voluntary feed grain program:

1. Required diversion of 20 percent of the base acreage of corn, sorghum, and barley to conserving use to qualify for support payments and loans. No diversion payments would be made for this minimum diversion except for small farms.
2. Payments for voluntarily diverting additional acreages from feed grains, up to 30 percent of the feed grain base acreage, with the diversion payment rate set at 45 percent of the loan rate plus support payment times the projected yield.
3. National average price support loan rates of \$1.05 per bushel for corn, \$1.61 per hundredweight for sorghum, and 83 cents per bushel for barley.
4. Support payments of 30 cents per bushel for corn, 53 cents per hundredweight for sorghum, and 20 cents per bushel for barley, on the normal yield from 50 percent of the feed grain base acreage of each crop.
5. Producers who participate in both the feed grain and wheat programs could substitute wheat for feed grains, or vice versa.

The acreage allotments and price support loan rates that were in effect in 1969 for extra long staple cotton, rice, peanuts, and tobacco were assumed to remain in effect. Support payments on extra long staple cotton also were assumed to be the same as in 1969.

#### Price Assumptions

The following national average market prices were assumed for the analysis:

Cotton--22 cents per pound  
Wheat--\$1.30 per bushel  
Corn--\$1.05 per bushel  
Barley--90 cents per bushel  
Grain sorghum--\$1.60 per hundredweight  
Soybeans--\$2.20 per bushel

These prices represent projected season average prices for the 1969 crop year, based on estimates made in December 1968, when the research was begun.

Specific prices for each area were estimated by applying historical area price differentials to the national average prices. Area prices for cotton reflect the price differentials that prevailed in October and December 1969, as determined by the weighted average prices for the various grades, staples, and micronaire readings of the cotton produced in each area.

### Cotton Acreage and Production

The benchmark estimate of upland cotton amounted to 11.8 million planted acres, or about 76 percent of the total effective cotton allotment (table 4). The analysis indicated about 11.2 million harvested acres and an average yield of 523 pounds of lint per harvested acre. Expected production with normal yields would amount to 12.2 million bales (500 pound gross weight bales). 2/

### Other Crops, Acreage and Production

Feed grains--corn, grain sorghum, barley, and oats--accounted for the largest planted acreage of other crops in the Cotton Belt States, followed by soybeans and wheat. The benchmark solution shows 19.6 million acres of feed grains in the Cotton Belt yielding a combined production of 31.6 million tons (table 4). The solution further indicates 15.8 million acres of soybeans and 12.8 million acres of wheat under the program provisions and prices assumed for the benchmark situation.

### Reduction in Market Price of Cotton

The estimates in table 4 for 20-cent cotton show the expected response of cotton and other major crops to a 2-cent reduction in the market price of cotton. For this solution, no changes were made in the prices of other commodities or in the Government program provisions used for the benchmark situation.

### Upland Cotton Acreage and Production Effects

The analysis indicates that with a 2-cent drop in the market price of cotton, the acreage planted to cotton would decrease 3.4 percent. This decrease amounts to about 400,000 acres and 300,000 bales of cotton on a national basis. The impact of the price decline varied among geographic areas (fig. 5). Regional decreases ranged from 2.1 percent in the Southwest region to 5.2 percent in the Southeast region.

The main impact of a 2-cent reduction in the price of cotton would be on the proportion of the nondomestic allotment planted to cotton. The analysis indicates that even with a 22-cent national average price

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2/ This does not include production of 56,000 bales of extra long staple cotton from 51,000 planted acres. Long staple cotton acreage and production would be the same under each alternative program that was considered.

Table 4.--Estimated effect of a 2-cent drop in the market price of cotton on acreage and production of major crops in the Cotton Belt

Item	Unit	Benchmark <sup>1/</sup>	20-cent cotton
Upland cotton:			
Effective allotment.....	Mil. acres	15.6	15.6
Percentage of allotment planted.....	Percent	75.6	73.1
Domestic allotment.....	Mil. acres	10.2	10.2
Planted acreage.....	do.	11.8	11.4
Harvested acreage.....	do.	11.2	10.9
Yield per harvested acre.....	Pound	523.0	524.0
Production.....	Mil. bales	12.2	11.9
Feed grains:			
Acreage harvested for grain			
Corn.....	Mil. acres	7.4	7.5
Grain sorghum.....	do.	8.7	8.7
Oats.....	do.	1.5	1.5
Barley.....	do.	2.0	2.0
Total.....	do.	19.6	19.7
Production.....	Mil. tons	31.6	31.8
Wheat:			
Planted acreage.....	Mil. acres	12.8	12.9
Production.....	Mil. bu.	307.7	319.8
Soybeans:			
Planted acreage.....	Mil. acres	15.8	15.9
Production.....	Mil. bu.	390.5	392.4

<sup>1/</sup> Based on 1969 cotton, wheat, and feed grain programs and price expectations. See text, pp. 11-13, for more detail.

for cotton, several areas would produce only at the domestic allotment level. In these areas, a change in the domestic allotment could have a greater impact on cotton production than a 2-cent change in the price of cotton.

#### Other Crop Acreage and Production Effects

The analysis indicates that the relatively small decrease in cotton acreage resulting from a 2-cent price drop would have little effect on the acreage and production of major competing crops. The main effect would be a slight increase in the planted acreage of these crops, which include soybeans, wheat, and feed grains. Each would increase about 100,000 acres over the benchmark estimate.

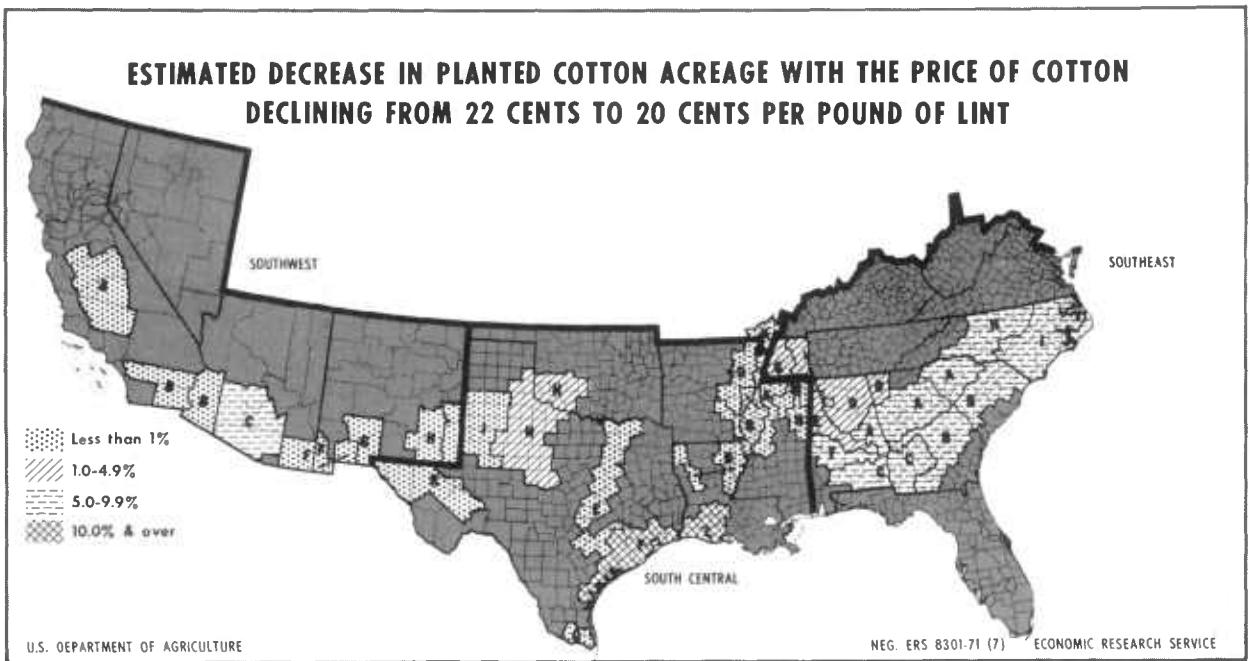


Figure 5

### Income Effects

The solution based on 20-cent cotton shows a 4.5-percent drop in aggregate returns over variable costs (table 5). Loss of income from cotton due to a price reduction of 2 cents would be only partly offset by increases in income from other crops. The income effect of a change in cotton price would also vary by geographic area (fig. 6). The impact of a cotton price decline on income would be less in areas having highly competitive production alternatives than in areas where cotton is the only important crop.

#### A Program with No Cotton Support Payments or Acreage Restrictions

What would happen to production and income without allotments or marketing quotas and penalties to restrict the acreage of cotton that farmers could plant and without cotton support payments to increase farm income and encourage the planting of cotton? There is speculation about these questions. There was no year during the recent period of low cotton prices when the production of cotton was neither limited by acreage allotments nor encouraged by support payments. These questions, therefore, cannot be answered directly by looking at the history of cotton production.

In this section, it is assumed that there are no upland cotton acreage allotments, marketing quotas, or support payments, but that provisions of the farm program with respect to all other crops remain as in the benchmark program. Analyses based on these conditions were made for

Table 5.--Estimated effect of a 2-cent drop in the market price of cotton on farm income in the Cotton Belt 1/

Item	Benchmark <u>2/</u>	20-cent cotton
-----Million dollars-----		
Total amount:		
Gross value of crops.....	4,612.5	4,469.2
Government payments--		
Upland cotton program.....	721.6	716.6
Wheat program.....	73.3	74.1
Feed grain program.....	188.4	188.3
Other payments.....	10.0	10.0
Total.....	993.3	989.0
Total gross income.....	5,605.8	5,458.2
Variable costs.....	2,835.2	2,811.3
Returns over variable costs.....	2,770.6	2,646.9
Decrease in returns over variable costs compared with benchmark program .....		123.7
-----Dollars-----		
Amount per acre of cropland:		
Gross value of crops.....	82.41	79.85
Government payments--		
Upland cotton program.....	12.89	12.80
Wheat program.....	1.31	1.32
Feed grain program.....	3.37	3.37
Other payments.....	.18	.18
Total.....	17.75	17.67
Total gross income.....	100.16	97.52
Variable costs.....	50.66	50.23
Returns over variable costs.....	49.50	47.29
Decrease in returns over variable costs compared with benchmark program.....		2.21
-----Percent-----		
Percentage decrease in returns over variable costs compared with benchmark program.....		4.5

1/ This table covers only those cotton producing areas for which linear programming models were prepared.

2/ Based on 1969 cotton, wheat, and feed grain programs and price expectations. See text, pp. 11-13, for more detail.



Table 6.--Estimated effect of no cotton support payments or no marketing quotas on acreage and production of major crops in the Cotton Belt, under alternative cotton market prices

Item	Unit	Benchmark <sup>1/</sup>	A program with no cotton support payments or marketing quotas--		
			With 22-cent cotton	With 19.5-cent cotton	With 17-cent cotton
Upland cotton:					
Effective allotment.....	Mil. acres	15.6	---	---	---
Percentage of allotment planted.....	Percent	75.6	---	---	---
Domestic allotment.....	Mil. acres	10.2	---	---	---
Planted acreage.....	do.	11.8	9.7	8.4	6.3
Harvested acreage.....	do.	11.2	9.2	8.0	5.9
Yield per harvested acre.....	Pounds	523.0	554.0	563.0	562.0
Production.....	Mil. bales	12.2	10.6	9.4	7.0
Feed grains:					
Acreage harvested for grain--					
Corn.....	Mil. acres	7.4	8.0	8.2	8.3
Grain sorghum.....	do.	8.7	9.2	9.3	9.8
Oats.....	do.	1.5	2.1	2.1	2.2
Barley.....	do.	2.0	2.0	2.1	2.3
Total.....	do.	19.6	21.3	21.7	22.6
Production.....	Mil. ton	31.6	34.3	34.9	36.2
Wheat:					
Planted acreage.....	Mil. acres	12.8	13.1	13.4	14.1
Production.....	Mil. bu.	307.7	332.3	336.7	356.2
Soybeans:					
Planted acreage.....	Mil. acres	15.8	16.1	16.2	16.7
Production.....	Mil. bu.	390.5	397.6	400.5	414.5

<sup>1/</sup> Based on 1969 cotton, wheat, and feed grain programs and price expectations. See text, pp. 11-13, for more detail.



2. The production of cotton would tend to shift from low-yielding areas, such as the Blacklands of Texas, to high-yielding areas, such as the Mississippi River Delta and the San Joaquin Valley of California, thus raising the U.S. average yield.

Under the benchmark program, an estimated 12.2 million bales of cotton would be produced. If there were no support payments on upland cotton and no marketing quotas, it is estimated that total cotton production would decline to 10.6 million bales with 22-cent cotton; to 9.4 million bales with 19.5-cent cotton; and to 7.0 million bales with 17-cent cotton.

The elimination of cotton support payments and marketing quotas would have different effects in various cotton production areas. In some areas, cotton acreage would expand substantially if marketing quotas were removed, even if there were no support payments. In other areas, little or no cotton would be grown without support payments. This is illustrated by figure 7 and discussed by price level below.

Cotton acreage by area with 22-cent cotton.--At the 22-cent price, it is estimated that cotton acreage would expand in the following areas of the Cotton Belt: (1) Mississippi River Delta, (2) Missouri Bootheel, (3) Mississippi Brown Loam area, (4) Mississippi Clay Hills, (5) Louisiana Rice area, (6) Texas Gulf Coast, (7) Low Rolling Plains of Texas and Oklahoma, (8) High Southern Desert area of New Mexico and Arizona, (9) Low Desert area of Arizona and California, and (10) San Joaquin Valley, California. In 1969, farmers in most of these areas planted a large percentage of their total cotton allotment. With an expected market price for cotton similar to that of 1969, most farmers who planted their full allotment in 1969 could be expected to expand their cotton acreage if acreage allotments and marketing quotas were not in effect. It is estimated that in some areas--such as the Low Rolling Plains of Texas and Oklahoma--cotton acreage would change very little; while in other areas--such as the Low Desert and High Southern Desert areas of the Southwest--cotton acreage would expand by 75 percent or more. On the whole, it is estimated that cotton acreage in these 10 areas would expand 20 percent.

However, cotton acreage would decline in most other areas of the Cotton Belt, with the decline ranging from moderate in some areas to drastic in others. A decline of less than 25 percent would occur in the High Plains of Texas and New Mexico, in Oklahoma, in the Mississippi Black Belt, and in the Tennessee Brown Loam area. Upland cotton would practically disappear from the Texas Blacklands, the Trans-Pecos area of Texas, and the Lower Rio Grande Valley.

Cotton acreage by area with lower prices for cotton.--Lowering the market price of cotton to 19.5 cents or 17 cents per pound would reduce the number of areas where cotton acreage would expand and increase the number of areas where cotton acreage would decline drastically (fig. 7). At the 17-cent price, it is estimated that only producers in the Mississippi River Delta and in the Brown Loam and Clayhills areas of Mississippi would plant a larger acreage of cotton than they would under the benchmark program. In a few of the other areas, cotton acreage would decline moderately. But in most other areas, cotton would virtually disappear if the price were this low.

**COTTON ACREAGE WITH NO SUPPORT PAYMENTS OR MARKETING QUOTAS  
AS A PERCENTAGE OF COTTON ACREAGE UNDER BENCHMARK PROGRAM**

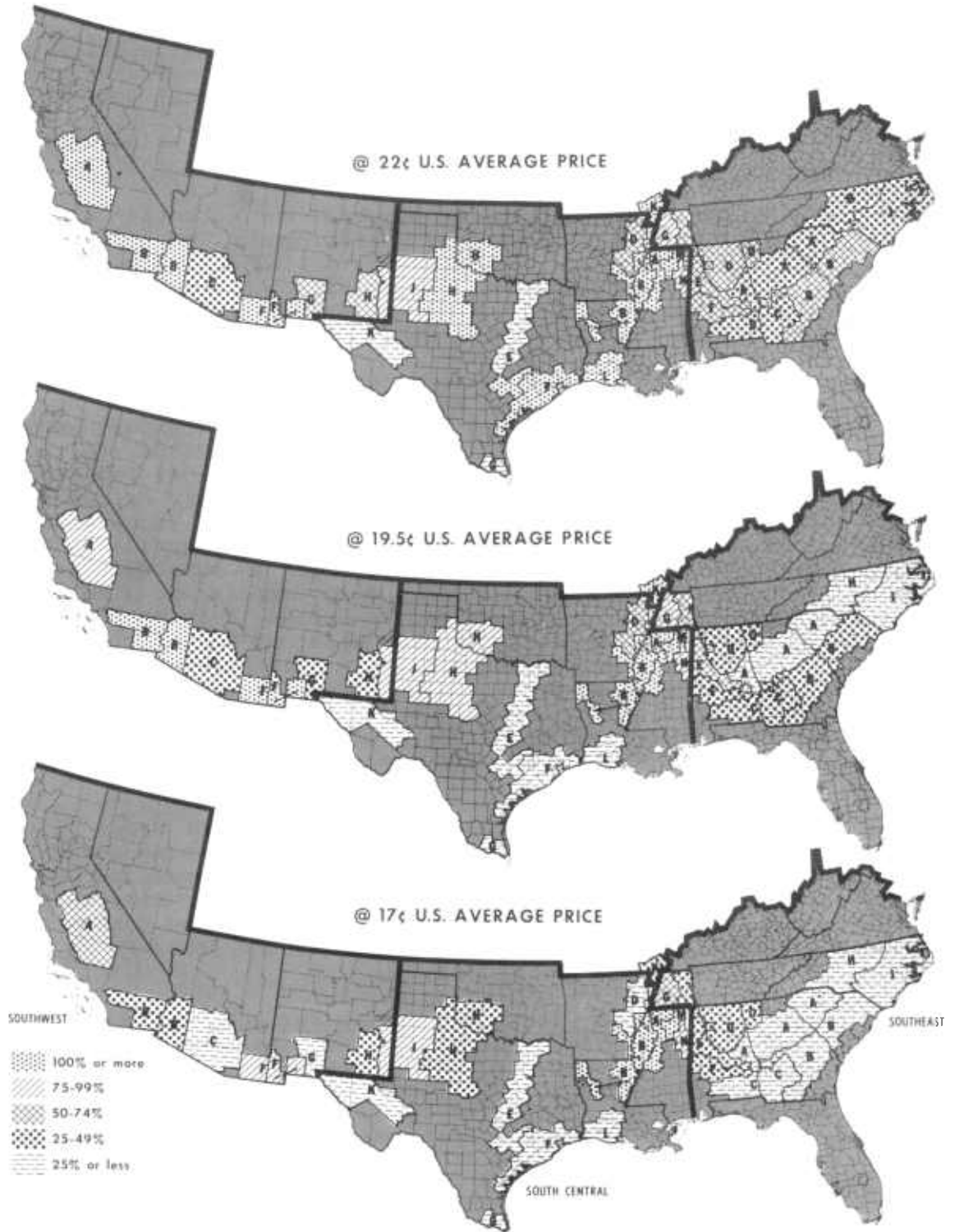


Figure 7

## Other Crops, Acreage and Production Effects

Elimination of cotton support payments and marketing quotas would affect the acreage of feed grains, wheat, and soybeans that would be grown in the Cotton Belt. The specific crops that would be substituted for cotton vary from area to area. In the Mississippi River Delta areas and in areas of the Southeast region, soybeans are the principal alternative crop to cotton; less important crops include corn, oats, and wheat. In Texas and Oklahoma, wheat and feed grains--particularly grain sorghum--are the major alternatives to cotton. In the Southwest region, feed grains--particularly sorghum and barley--are the principal alternative crops.

The total increase in the acreage of alternative crops would be greater than the decrease in the planted acreage of cotton. A substantial percentage of the cotton acreage in the United States is planted in skip-row patterns that require more than 1 acre of cropland to grow an acre of cotton. Thus, in effect, each reduced acre of cotton would be replaced with more than one acre of alternative crops. There would also be a tendency for a smaller percentage of the cotton to be planted in skip-row patterns if marketing quotas were eliminated. This would release additional cropland for planting to other crops. Also, certain of these released acres would become available for double cropping, such as barley or wheat followed by sorghum or soybeans during the same year.

Feed grains.--The elimination of cotton support payments and marketing quotas would shift several million acres of land from the production of cotton to the production of feed grains. The bulk of the increase would occur in the South Central region, with some increases occurring throughout most of the Cotton Belt.

With cotton priced at 22 cents a pound, it is estimated that feed grain acreage in the Cotton Belt would be 1.7 million acres above the benchmark acreage, resulting in a 2.7 million-ton increase in feed grain production (table 6). Of this production increase, 2.0 million tons would be accounted for by the South Central region, 0.6 million by the Southeast, and 0.1 million by the Southwest.

At the 17-cent cotton price, an estimated 3.0 million acres more of feed grain would be harvested than under the benchmark program, resulting in an increase in feed grain production of 4.6 million tons. Of this, 2.7 million tons would be accounted for by the South Central region, 0.9 million by the Southeast, and 1.0 million by the Southwest.

The increase in feed grain production in the South Central region would come about largely through an increase in sorghum acreage in the High Plains of Texas and Oklahoma and in the Rio Grande Valley of Texas. The acreage of corn and oats would increase markedly in the Blacklands of Texas.

In the Southeast, increases in the acreage and production of corn and oats would occur in all areas in response to the decline in cotton acreage.

For the Southwest, the analysis indicates that only a slight change would occur in the aggregate production of feed grains in response to the elimination of cotton support payments and marketing quotas if the

U.S. price of cotton averaged 22 cents. At that price, cotton acreage would increase and feed grain acreage would decrease in certain areas such as the San Joaquin Valley of California. Other areas--Central Arizona, for example--would produce less cotton and more sorghum and barley. With cotton at 19.5 cents or less per pound, however, total cotton acreage in the Southwest would decline, and a large percentage of this acreage would be shifted to the production of barley, sorghum, and corn.

Wheat.--With no cotton support payments and no marketing quotas, and an average price of 22 cents a pound for cotton, wheat acreage in the Cotton Belt would increase 0.3 million acres over the benchmark level (table 6). At the 17-cent cotton price, the wheat acreage increase would be an estimated 1.3 million acres, resulting in the production of an additional 49 million bushels of wheat.

Wheat acreage would decline somewhat in areas such as the Mississippi River Delta, where cotton acreage could be expected to increase if cotton support payments and marketing quotas were removed. However, a large increase in wheat acreage would occur in areas where little cotton would be produced without support payments and marketing quotas. A substantial increase in wheat acreage would occur in most areas in the Southeast region, in the High Plains area of the South Central region, and in Central Arizona in the Southwest region. With a U.S. average price of 17 cents for cotton, more than a half million acres of land in the Low Rolling Plains would be shifted from cotton to wheat.

Soybeans.--With no cotton marketing quotas or support payments and with cotton priced at 22 cents per pound, the net acreage of soybeans in the Cotton Belt is estimated to increase by 0.3 million acres (table 6). A large reduction in soybean acreage would take place in the Mississippi River Delta due to the expansion of cotton acreage there. But cotton acreage would contract in areas of the Southeast and in Northeast Arkansas, and more soybeans would be grown. This would offset the reduction of soybean acreage in the Delta and adjoining areas.

If the price of cotton fell to 19.5 cents per pound, an estimated 0.4 million acres more of soybeans would be planted than under the benchmark program. If cotton sold for only 17 cents, the acreage of soybeans would be still greater, and all soybean producing areas except the Delta would share in the increase.

### Government Payments Effects

Payments to farmers under the 1969 upland cotton program amounted to \$821 million. If support payments on cotton were eliminated and there were no cotton marketing quotas, payments to Cotton Belt farmers under the feed grain and wheat programs would increase slightly. Elimination of the 1969 cotton support payment of 14.73 cents a pound would result in a net reduction in Government payments of slightly more than \$800 million. 3/

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3/ See footnote 1, table 7.

## Farm Income Effects

Elimination of cotton support payments causes a reduction in farm income because production would not increase following the elimination of marketing quotas. The lower the price of cotton, the more pronounced the income reduction would be.

Table 7 compares the gross value of the crops that would be produced under such conditions with the gross value of crops produced under the benchmark program. Data also show the income from Government payments, total gross income, variable costs, and income over variable costs. It should be noted that costs, as shown, include only the variable costs-- items such as seed, fertilizer, and labor, for example--that vary in direct proportion to the acreage of each crop produced. Fixed costs, such as real estate taxes, depreciation on farm machinery and equipment, and interest on investment are not included. Thus, the income over variable costs is the amount of income that is available to pay fixed costs and to provide a return to farmers for their investment and management. Inasmuch as the fixed costs, except for possible changes in the machinery component, are the same for each alternative farm program, the differential in income over variable costs between two alternative farm programs also measures the change in net income to farmers between the two programs.

Farm income with 22-cent cotton.--Assuming no change in the price of cotton compared with that under the benchmark program, it is estimated that removal of support payments and marketing quotas would reduce the total income over variable costs by 22 percent for those farms in the Cotton Belt for which linear programming models were prepared. Such income would drop from \$2,771 million to \$2,161 million. Although net income would drop about \$610 million, the percentage reduction would be substantially greater than 22 percent, since fixed costs were not considered in calculating income over variable costs. The reduction in net income would amount to an average of \$10.84 per acre for the 60 million acres of cropland on the farms. On the average, income would be reduced \$1,700 a year on a farm containing 160 acres of cropland; on a 320-acre farm, income would be cut \$3,500; and on a 640-acre farm, it would be \$7,000 less.

The effect on income of no support payments and no marketing quotas under a 22-cent cotton price would vary among areas (fig. 8). In some cotton farming areas, income would drop by more than \$25 per acre of cropland, while in other areas the reduction would be less than \$5 per acre.

The areas that would experience the greatest reduction in income are those that now receive the largest cotton support payments per cropland acre. These are also areas that produce a high yield of cotton per acre and in which the domestic cotton allotment makes up a substantial proportion of the cropland acreage. In general, the Southwest would be more seriously affected than the other two regions.

A reduction in income would occur not only in areas where cotton acreage would be reduced, but also in areas where cotton acreage would expand if there were marketing quotas. In the San Joaquin Valley, for example, income would be reduced by \$24.67 per cropland acre, despite the increase that would take place in cotton acreage.

Table 7.--Estimated effect of no cotton support payments or no marketing quotas on farm income in the Cotton Belt, under alternative cotton market prices 1/

Item	Benchmark <u>2/</u>	A program with no cotton support payments or marketing quotas--		
		With 22-cent cotton	With 19.5-cent cotton	With 17-cent cotton
-----Million dollars-----				
Total amount:				
Gross value of crops.....	4,612.5	4,603.3	4,357.6	4,098.2
Government payments--				
Upland cotton program.....	721.6	0	0	0
Wheat program.....	73.3	74.2	75.7	81.2
Feed grain program.....	188.4	200.2	199.7	199.0
Other programs.....	10.0	10.0	10.0	10.0
Total.....	993.3	284.4	285.4	290.2
Total gross income.....	5,605.8	4,887.7	4,643.0	4,388.4
Variable costs.....	2,835.2	2,727.0	2,613.9	2,472.0
Income over variable costs.....	2,770.6	2,160.7	2,029.1	1,916.4
Decrease in income over variable costs: compared with benchmark program.....		609.9	741.5	854.2
-----Dollars-----				
Amount per acre of cropland:				
Gross value of crops.....	82.41	82.30	77.86	73.22
Government payments--				
Upland cotton program.....	12.89	0	0	0
Wheat program.....	1.31	1.33	1.35	1.45
Feed grain program.....	3.37	3.58	3.57	3.56
Other programs.....	.18	.18	.18	.18
Total.....	17.75	5.09	5.10	5.19
Total gross income.....	100.16	87.39	82.96	78.41
Variable costs.....	50.66	48.73	46.70	44.17
Income over variable costs.....	49.50	38.66	36.26	34.24
Decrease in income over variable costs: compared with benchmark program.....		10.84	13.24	15.26
Percentage decrease in income over variable costs compared with bench- mark program.....		22	27	31

1/ This table covers only those cotton producing areas for which linear programming models were prepared. Government payments as shown in this table differ from those specified in the section entitled "Effect on Government Payments," because this table does not include all cotton farms in the Nation.

2/ Based on 1969 cotton, wheat, and feed grain programs and price expectations. See text, pp. 11-13, for more detail.

**CHANGE IN NET INCOME PER CROPLAND ACRE WITH NO COTTON SUPPORT PAYMENTS OR MARKETING QUOTAS, COMPARED WITH BENCHMARK PROGRAM**

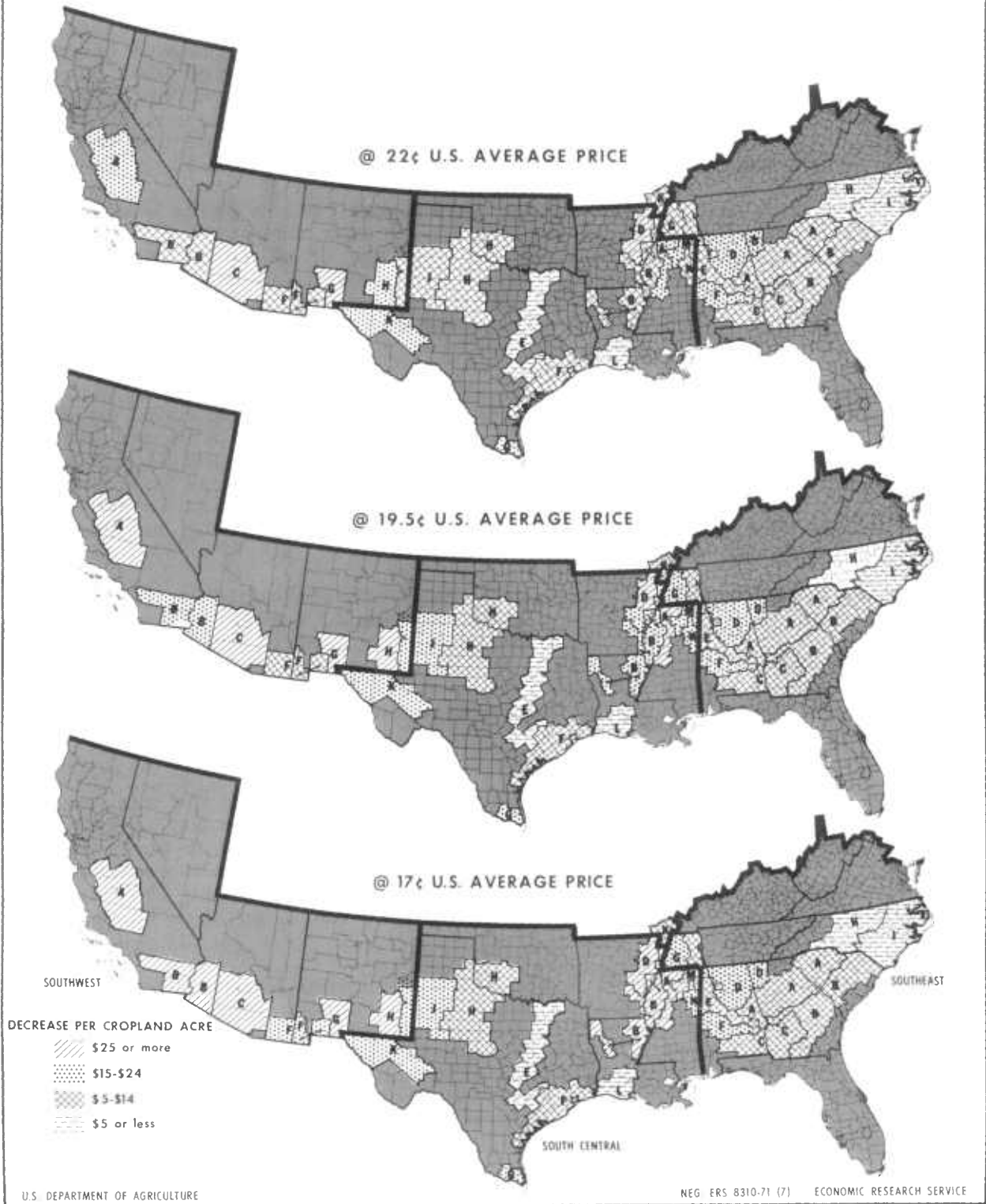


Figure 8

The reduction in the aggregate income of U.S. cotton growers would be somewhat less than the amount of the cotton support payments that would be lost to them.

Farm income with 19.5-cent cotton.--With cotton at 19.5 cents per pound and no support payments or marketing quotas, the aggregate income over variable costs is estimated at \$2,029 million, compared with \$2,771 million for the benchmark program--a reduction of 27 percent or \$13.24 per cropland acre (table 7). Income per farm would be reduced, on the average, by about \$2,100 per year on farms with 160 acres of cropland; by \$4,250 on 320-acre farms; and by \$8,500 on 640-acre farms.

Compared with the 22-cent price, this lower cotton price would cause farmers' income to drop significantly in a greater number of producing areas (fig. 8). However, some areas such as the Trans-Pecos and Blacklands areas of Texas and several areas of the Southeast would not suffer a much greater loss in farm income--because even at the higher price, cotton would virtually disappear from these areas without cotton support payments.

Farm income with 17-cent cotton.--If the average market price of cotton were only 17 cents per pound, the income of farmers would be cut still further. It is estimated that, on the average, income over variable costs would be reduced by \$15.26 per cropland acre--a cut of 31 percent from the benchmark level (table 7). On the average, farmers who operate 160 acres of cropland would suffer a \$2,450 annual reduction in net returns; those with a 320-acre farm would receive \$4,900 less; and those with 640 acres would suffer a cut of \$9,750.

Farmers in virtually all areas of the Southwest would suffer a severe cut in income (fig. 8). On the other hand, farmers in most areas of the Southeast and in some areas of the South Central region would face only a slight to moderate reduction in income per cropland acre and per farm. Again, this occurs because cotton virtually disappears from these areas with 22-cent cotton and no support payments.

#### Alternative Support Payment Rates

One of the features of the 1965 Food and Agriculture Act was the establishment of a domestic cotton allotment. For production on the domestic allotment, the act provided so called price support payments at a rate which, when added to the established loan rate, would provide a return equal to a specified percentage of parity. Under the 1965 act, the domestic allotment level was established at not less than 65 percent of the total allotment.

In proposing new programs for cotton, questions were raised concerning both the domestic allotment and the price support level. With increases in per acre yields, the acreage required to provide for domestic consumption has decreased. It is estimated that about 7.8 million acres--or about 50 percent of the total 1969 allotment--would produce the quantity of cotton that was consumed domestically in 1969-70. Evidence also indicates that many producers would grow cotton with support payments much lower than those established in the 1965 act.

To evaluate the effect of various alternative support payment rates, a series of analyses were made for payment rates ranging from zero to 14 cents per pound of lint at 2-cent intervals. These payments were assumed



to be made on a domestic cotton acreage allotment equal to 50 percent of the total 1969 cotton allotment, with no marketing quotas or limits on the acreage of cotton that could be grown. A U.S. average price of 19.5 cents per pound for cotton was assumed. Program provisions and prices for all other commodities were considered to be the same as those for the benchmark program.

There are some cotton farmers who have low production costs and who would produce more than the domestic allotment without benefit of support payments. For those farmers, increases in support payments would not affect acreage planted but would increase farm income. Farmers with higher production costs can profitably produce cotton only when a support payment is received. At the payment rate sufficient for these farmers to produce cotton, they will grow only the domestic allotment. At higher rates, no additional cotton will be grown on these farms, since support payments apply only to the domestic production, but farm income will increase. Thus, the estimates provide a basis for evaluating the support payment level that would be needed to induce a specified level of production to meet domestic consumption plus desired levels of export and carryover.

### Cotton Acreage and Production Effects

As previously indicated, the planted acreage of cotton is estimated at 11.8 million acres for the benchmark situation and at 8.4 million acres for the alternative of no marketing quotas, no support payments, and a 19.5-cent average price for cotton. These acreages exceed the domestic allotment level of 7.8 million acres assumed for this phase of the analysis. Thus, domestic consumption requirements most likely could be met without support payments if production restraints were removed. However, if more production is desired, support payments would be necessary.

If a 2-cent support payment were provided for production on the domestic allotment, it is estimated that the planted acreage would increase to 9.1 million acres (table 8). With each 2-cent increase in support, more farmers could profitably produce cotton on the domestic acreage allotment and the aggregate planted acreage would increase 100,000 to 800,000 acres. With the support payment at 14 cents a pound, the planted acreage is estimated at 11.6 million acres, or approximately the same as estimated for the benchmark situation.

As the acreage of cotton increases, total production also increases. However, the percentage increase in production is less than that in acreage because the increasing acreage occurs in lower yielding areas and on poorer quality land. The average yield per harvested acre decreases from a high of 572 pounds per acre with a 2-cent support payment to 542 pounds with a 14-cent support payment.

The adjustments in cotton production which would occur between areas if marketing quotas were removed can be shown by comparing the production and per acre yield for the benchmark and the 14-cent support payment estimates. Under the benchmark program, planted acreage is estimated at 11.8 million acres, total production at 12.2 million bales, and yield per harvested acre at 523 pounds. The programming results from the alternative of no marketing quotas and a 14-cent support payment show planted acreage at 11.6 million acres, a 0.2 million-acre reduction. However, the estimate of production is 12.5 million bales, a 0.3 million-bale increase. This increase occurs because the average per acre yield is estimated at 542 pounds, a 19-pound per acre increase. Inasmuch as a

Table 8.--Estimated effect of alternative support payment rates on acreage and production of major crops in the Cotton Belt <sup>1/</sup>

Item	Unit	Benchmark <sup>2/</sup>	Support payment rates per pound of lint							
			0 cent	2 cents	4 cents	6 cents	8 cents	10 cents	12 cents	14 cents
Upland cotton:										
Effective allotment.....	Mil. acres	15.6	---	---	---	---	---	---	---	---
Percentage of allotment planted.....	Percent	75.6	---	---	---	---	---	---	---	---
Domestic allotment <sup>3/</sup> .....	Mil. acres	10.2	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
Planted acreage.....	do.	11.8	8.4	9.1	9.4	9.7	10.3	11.1	11.5	11.6
Harvested acreage.....	do.	11.2	8.0	8.4	8.9	9.2	9.8	10.6	10.9	11.1
Yield per harvested acre.....	Pounds	523.0	563.0	572.0	566.0	566.0	562.0	547.0	547.0	542.0
Production.....	Mil. bales	12.2	9.4	10.0	10.6	10.9	11.5	12.1	12.3	12.5
Feed grains:										
Acreage harvested for grain--										
Corn.....	Mil. acres	7.4	8.2	8.2	8.1	8.1	8.1	7.7	7.6	7.6
Grain sorghum.....	do.	8.7	9.3	9.1	9.0	8.9	8.9	8.8	8.7	8.7
Oats.....	do.	1.5	2.1	2.0	2.0	2.0	2.0	1.8	1.8	1.8
Barley.....	do.	2.0	2.1	2.0	2.0	2.0	2.0	1.9	1.9	1.9
Total.....	do.	19.6	21.7	21.3	21.1	21.0	21.0	20.2	20.0	20.0
Production.....	Mil. tons	31.6	34.9	34.1	33.9	33.1	32.1	32.4	32.1	32.1
Wheat:										
Planted acreage.....	Mil. acres	12.8	13.4	13.4	13.3	13.2	13.1	13.1	12.8	12.7
Production.....	Mil. bu.	307.7	336.7	333.1	331.0	329.7	327.6	324.9	316.0	315.0
Soybeans:										
Planted acreage.....	Mil. acres	15.8	16.2	16.1	16.0	15.9	15.8	15.8	14.6	14.5
Production.....	Mil. bu.	390.5	400.5	397.5	397.0	395.4	392.8	390.6	388.5	387.2

<sup>1/</sup> The U.S. average price for cotton is assumed to be 19.5 cents a pound; no marketing quotas are in effect; and the domestic cotton acreage allotment is equal to 50 percent of the total 1969 allotment.

<sup>2/</sup> Based on 1969 cotton, wheat, and feed grain programs and price expectations. See text, pp. 11-13, for more detail.

<sup>3/</sup> Domestic allotment was 65 percent of the total allotment for the benchmark program and 50 percent of the total 1969 allotment for the remaining alternatives.

shift of production to higher yield areas would occur, it is also likely that the average cost per pound would be reduced.

### Effect on Acreage and Production of Other Crops

The increase in cotton acreage that occurs as the support payment is increased from 0 to 14 cents per pound reduces the acreage of all major competing crops. Cotton acreage increases from 8.4 million acres to 11.6 million acres, a 3.2 million-acre increase. Feed grains decrease from 21.7 million to 20.0 million acres, a 1.7 million-acre decrease. Wheat decreases 0.7 million acres, from 13.4 million to 12.7 million acres. Soybeans decrease from 16.2 million to 14.5 million acres, a 1.7 million-acre decrease. Thus, the total decrease in acreage of competing crops is 4.1 million acres, 0.9 million acres more than the increase in cotton acreage. This occurs because more of the cotton acreage would be shifted to skip-row planting patterns.

Production of feed grains and wheat declines by about the same percentage as the decline in acreage. Soybean production, however, would not decline as much as the acreage.

### Farm Income Effects

Aggregate returns over variable costs from crop production are reduced from \$2,771 million for the benchmark program to \$2,029 million for the alternative of 19.5-cent cotton and no support payments (table 9). The decrease occurs because of the decrease in cotton price and the elimination of Government payments for the cotton program.

With support payments on cotton, income over variable costs increases at each successively higher rate of payment. The increase comes from the increase in Government payment on cotton already in the previous estimates and from the increase in cotton acreage induced by the additional payment.

Although the estimated cotton acreage is almost the same at the 14-cent level as for the benchmark, returns over variable costs are \$286 million less than for the benchmark. The reduced domestic allotment and the slightly lower support payment rate cause a \$204 million reduction in Government cotton payments; also, the 2.5-cent lower cotton price plus the adjustments in acreages of the various crops cause an \$82 million reduction in gross value of crops produced. This decrease in returns over variable costs amounts to 10 percent, or \$5.11 per acre of cropland.

## IMPLICATIONS OF RESULTS

Our analyses reflect those crop production adjustments which would be profitable for farmers in the short run, with the farm machinery and other resources they now have. For farmers to continue to grow cotton over the long run, returns from cotton production would have to be sufficiently higher than returns from alternative crops to allow for the replacement of specialized machinery and equipment--such as harvesters--that are needed for cotton production. In some areas, the income over variable costs for cotton production with no cotton support payments would be only a little more than the returns from alternative crops. Farmers would continue to grow cotton as long as their present machinery lasted. However, over the long run, as the specialized machinery for cotton production wore out, some farmers would not replace that machinery because of the low level of returns from cotton, and cotton acreage would decline

Table 9.--Estimated effect of alternative support payment rates on farm income from crop production in the Cotton Belt 1/

Item	Unit	Benchmark <u>2/</u>	Support payment rates per pound of lint							
			0 cent	2 cents	4 cents	6 cents	8 cents	10 cents	12 cents	14 cents
<b>Total amount:</b>										
Gross value of crops.....	Mil. dol.	4,612.5	4,357.6	4,400.1	4,429.3	4,457.1	4,501.1	4,518.5	4,524.6	4,530.0
Government payments--										
Upland cotton program.....	do.	721.6	---	54.7	113.6	<b>178.8</b>	<b>241.4</b>	348.0	438.2	517.0
Wheat program.....	do.	73.3	75.7	74.4	75.2	75.6	75.7	74.5	74.5	74.5
Feed grain program.....	do.	188.4	199.7	197.2	198.9	197.1	192.2	192.7	194.0	194.0
Other programs.....	do.	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total.....	do.	993.3	285.4	336.3	397.7	461.5	519.3	625.2	716.7	795.5
Total gross income.....	do.	5,605.8	4,643.0	4,736.4	4,827.0	4,918.6	5,020.4	5,143.7	5,241.3	5,325.5
Variable costs.....	do.	2,835.2	2,613.9	2,663.8	2,691.6	2,714.5	2,760.1	2,820.7	2,833.1	2,841.2
Income over variable costs.....	do.	2,770.6	2,029.1	2,072.6	2,135.4	2,204.1	2,260.3	2,323.0	2,408.2	2,484.3
Decrease in income over variable costs compared with benchmark program.....	do.	---	741.5	698.0	635.2	566.5	510.3	447.6	362.4	286.3
<b>Amount per acre of cropland:</b>										
Gross value of crops.....	Dol.	82.41	77.86	78.62	79.13	79.63	80.42	80.73	80.84	80.94
Government payments--										
Upland cotton program.....	do.	12.89	<b>0.00</b>	.98	2.03	3.19	4.31	6.22	7.83	9.23
Wheat program.....	do.	1.31	1.35	1.33	1.34	1.35	1.35	1.33	1.33	1.33
Feed grain program.....	do.	3.37	3.57	3.52	3.56	3.53	3.44	3.44	3.47	3.47
Other programs.....	do.	.18	.18	.18	.18	.18	.18	.18	.18	.18
Total.....	do.	17.75	5.10	6.01	7.11	8.25	9.28	11.17	12.81	14.21
Total gross income.....	do.	100.16	82.96	84.63	86.24	87.88	89.70	91.90	93.65	95.15
Variable costs.....	do.	50.66	46.70	47.60	48.09	48.50	49.31	50.40	50.62	50.76
Income over variable costs.....	do.	49.50	36.26	37.03	38.15	39.38	40.39	41.50	43.03	44.39
Decrease in income over variable costs compared with benchmark program.....	do.		13.24	12.47	11.35	10.12	9.11	8.00	6.47	5.11
Percentage decrease in income over variable costs compared with benchmark program.....	Percent		27	25	23	20	18	16	13	10

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1/ This table covers only those cotton producing areas for which linear programming models were prepared. The U.S. average price for cotton is assumed to be 19.5 cents a pound; no marketing quotas are in effect; and the domestic cotton acreage allotment is equal to 50 percent of the total 1969 allotment.

2/ Based on 1969 cotton, wheat, and feed grain programs and price expectations. See text, pp. 11-13, for more detail.

further than indicated by this analysis.

In fact, in a few areas--such as the Trans-Pecos area of Texas--the income from farming over variable costs with no cotton support payments or marketing quotas would drop to such a low level that it would be inadequate to cover fixed cash outlays and leave any significant return to farmers for their land, labor, and management. In such a case, the area would become submarginal for farming and would eventually go out of agricultural production as farm machinery and equipment and other depreciable items wore out.

Over the long run, the acreage and production of cotton with no marketing quotas and no cotton support payments or with low support payments, therefore, would be less than is indicated by the figures presented in this report.

#### Land Value Effects

Farmland values, allowing for a number of other influences, are theoretically determined by capitalizing the return expected from agricultural production. In areas where allotted crops are grown, the higher returns from the allotted crops have been capitalized into land value. Thus, the cotton allotment--which, in essence, assures a subsidy to the farmer--has an asset value. Discontinuance of the subsidy would reduce farmers' assets by the amount of its capitalized value. Since the return per acre of cropland is reduced for each of the proposals analyzed as compared with the benchmark situation, these programs could all be expected to have an adverse effect on farmland values.

The reduction in returns to farming caused by these changes in the cotton program would increase the difficulty that many farmers have in paying current mortgages on farmland. The instances of foreclosure would be increased.

#### Cotton Quality Effects

Although not a direct purpose of this analysis, some conclusions can be drawn concerning the effect of the program alternatives on the quality of cotton. Any of the changes proposed indicates a shift in the proportion of cotton produced by the major areas. In every instance, a larger percentage of cotton production would come from the Mississippi Delta and certain Southwest irrigated areas. These areas produce a cotton with longer staple and higher quality grade than the national average. Thus, the average quality of the cotton produced in the United States could be expected to improve with the change in program. The prices used in the study are based on present quality differentials for the respective areas. With quality distribution changes, the area price differentials would most likely change in comparison with the U.S. average price.

#### Relation Between Cotton Production Costs, Market Prices, and Support Payments

The U.S. Department of Agriculture has surveyed the costs of producing cotton. The average total cost of producing cotton in the United States in 1966, according to the 1966 survey, was 26.6 cents per pound,

including charges for land and items of general farm overhead.<sup>4/</sup> Land charges included in this cost estimate are based on rent paid or the current market value of land owned. This market value reflects an opportunity cost to the operator, but is not necessarily a cost based on what he paid for the land. Land rents also reflect a part of the income from the higher prices received for cotton prior to 1966.

During 1955-65, the loan rate for Middling 1-inch cotton ranged from 26.63 cents to 35.08 cents and the season average price received by U.S. farmers for upland cotton ranged from 28.03 cents to 33.09 cents a pound (see table 3). During the period, the U.S. farm price of cotton was above the world price by an amount approximately equal to the subsidy to exporters.

For the 1966 crop and for subsequent crops, the farm loan rate was reduced to 90 percent of the estimated world price. Since 1966, the season average price received by farmers for cotton has ranged from 20.6 cents to 22.02 cents a pound except for the small crop of 1967, which sold for an average of 25.39 cents a pound (table 3).

Beginning with the 1966 crop, direct support payments were made to growers to offset the reduction in farm income resulting from the adjustment of U.S. cotton price supports to the world price level. Since then, the price of cotton for most producers has been below their total cost of production as computed from the 1966 survey.

## APPENDIX

### AN ALTERNATIVE METHOD OF ESTIMATING THE PLANTED ACREAGE OF COTTON WITH NO ALLOTMENTS AND NO SUPPORT PAYMENTS

Alternative estimates of planted cotton acreage with no allotments and no support payments were made from the acreage planted in 1951-53, the proportion of allotments planted in 1963, the proportion of nondomestic allotments planted in 1969, and the distribution of 1966 variable cotton costs. This method assumes that the planted acreage in 1951-53, when cotton acreage allotments were not in effect, was about the maximum farmers would plant with the price of cotton relatively high compared with prices of competing crops. Larger acreages of cotton were planted before controls were established in 1933, but the acreage planted in 1951 was about the largest planted in the 1943-49 and 1951-53 periods, when there were no allotments. Unfortunately, this experience of planted acreage of cotton without allotments is nearly 20 years old and the possibility exists that improved production techniques may increase the proportion of cropland that farmers would plant to cotton. On the other hand, the increasing proportion of unused allotments after 1954 would indicate that there was a shift away from cotton before the loan rate was dropped to 90 percent of the world price in 1966.

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<sup>4/</sup> See: Starbird, I.R., and French, B.L., Supplement to Costs of Producing Upland Cotton in the United States, 1964, (1966 Supplement to Agr. Econ. Rpt. No. 99), U.S. Dept. of Agr., Econ. Res. Serv., Sept. 1969.

The maximum acreage planted in 1951-53 was adjusted for the change in cropland reported by the Census of Agriculture from 1949 to 1964 to allow for the expansion of available cropland in some areas such as the Mississippi Delta and the contraction in other areas such as the Southeast. The adjusted 1951-53 maximum acreage of cotton was multiplied by the percentage of the allotment planted in 1963 to give an estimate of planted acreage with no allotment and no support payments at about 34 cents per pound. The last year before incentives were offered for not planting the full allotment was 1963. The estimate of planted acres at 22 cents a pound was obtained by multiplying the 1951-53 maximum acreage by the proportion of nondomestic allotment planted in 1969. The distribution of variable costs obtained from the 1966 Cotton Cost Survey was used to interpolate between 22 cents and 34 cents a pound and to extrapolate to prices below 22 cents a pound.

The estimate of planted cotton acreage obtained by this method varies from 20.7 million acres at 34 cents a pound to 5.5 million acres at 17 cents a pound (table 10). The decline in planted acreage increases as the price is dropped from 34 cents to 17 cents a pound.

Table 10.--Estimated planted acreage of cotton with no allotments and no support payment, with price varied from 17 cents to 34 cents per pound of lint

Price	Acreage	Change in acreage
<u>Cents/pound</u>	<u>Million acres</u>	
34.0.....	20.7	---
32.0.....	20.0	.7
30.0.....	19.2	.8
28.0.....	18.0	1.2
26.0.....	16.0	2.0
24.0.....	14.0	2.0
22.0.....	10.8	3.2
19.5.....	8.6	2.2
17.0.....	5.5	3.1

