



**Storing  
and  
Handling  
COTTON  
in Public Facilities**

**An Evaluation of  
Cost Structures  
in 1964-65 and 1969-70**

## ABSTRACT

Between 1964-65 and 1969-70, average occupancy levels of warehousing space dropped approximately 58 percent. This resulted in an increase in storage costs of \$2.23 per bale per year. The cost structure for the handling functions also increased significantly during this period. The principal forces affecting both the storage and handling functions were declining volume and increasing cost of inputs. These conclusions are based on an analysis of accounting and operating data obtained by personal interviews from a sample of firms in the industry. The results of the analysis also indicated that regional differences existed in the cost structure associated with warehouses and compresses.

Key Words: Cotton, warehouses, compresses, storing, handling, 1964 costs, 1969 costs, competitive costs.

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## HIGHLIGHTS

Smaller volumes of cotton available for storage and handling and continuing price increases for major inputs have increased cotton warehousing costs. Average occupancy of warehousing space dropped from about 57 percent of capacity in 1964-65 to 24 percent in 1969-70. During the 5 years, storage costs alone rose from \$3.53 per bale-year to \$5.76.

The results of the statistical analysis performed on the storage function indicated that differences existed in the cost structures associated with warehouses and compresses. The structure of variable costs in 1964 was essentially the same across all geographic regions for both types of facilities. By 1969, however, the overall variable cost structure of both types of facilities underwent a significant shift. In addition, the shifts in variable costs occurred at a rate that varied by geographic regions.

Facilities in the Southeast-South Central region had gained a definite cost advantage over those of the other regions by 1969. This advantage can be attributed to one or both of two reasons: (1) a lesser increase in the price of variable inputs; and (2) a more favorable change in the marginal productivity of the variable inputs. Even with its predominance of small operations, these facilities can store cotton at relatively low costs in plants of 15,000-bale capacity or larger, provided an occupancy level of 50 percent is maintained.

The results for fixed costs at warehouses were identical to those outlined under variable costs, that is, significant changes over time and a disappearance of geographic homogeneity. Fixed costs associated with compresses, however, varied significantly between geographic regions in both years and underwent a substantial change in all regions.

In general, the handling functions also experienced significant shifts in the cost structure over the 5-year period. Almost without exception, marginal costs were higher in 1969, indicating conclusively that rises in the price level outstripped increases in the productivity of the same inputs.

A framework of a minimum-cost warehousing complex, based on assumptions of perfect competition, was used to compare existing conditions within the industry. As an example, with the 1969-70 capacity and distribution of volume of cotton stored, total storage costs were estimated at \$5.76 per bale per year and out-of-pocket cost at \$3.63. Under conditions of perfect competition, total per bale cost would be reduced to an estimated \$3.59; out-of-pocket cost would be reduced to \$2.90 per bale, or a decrease of about 73¢. Establishment of rates equal to average total cost of \$3.59 per bale would maintain about 9.1 million bales of storage space, compared with the present estimated capacity of 27 million bales.

The impact of eliminating surplus capacity in warehouses will not likely be distributed across regions in direct proportion to existing capacity since storage costs are the major component of total cost. The Southeast has the most capacity to lose in an absolute sense because it has more space. Furthermore, this region has a distinct cost disadvantage since most firms have a capacity of 15,000 bales or less. In the other regions, economies of scale are evident, with the South Central region having a definite cost advantage.

Port compress facilities have several advantages over those of other regions. The most important of these is that they do not compete to any great degree with other compresses because they handle cotton for export, as opposed to domestically consumed cotton stored at other compresses. Although ports tend to have large plant facilities, there is little evidence of economies of scale because of their limited size range.

Compresses in the Southeast-South Central region have a slight cost advantage over the other regions because of a lower total cost structure and the large number of operations with capacity in excess of 50,000 bales. Since most of these large operations are in the South Central region, the greatest decline in capacity should occur in the Southeast. On the other hand, Southeast compresses, like warehouses, are nearest the South's textile mills and, because of that, have a favored position.

STORING AND HANDLING COTTON IN PUBLIC FACILITIES--  
AN EVALUATION OF COST STRUCTURES IN 1964-65 and 1969-70

by

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INTRODUCTION

The cotton warehouse and compress industry occupies an important position in the present system of marketing American cotton. The characteristics of the commodity, the manner in which it enters the marketing channels, many quality differences, and exacting specifications of cotton manufacturers make concentration of cotton into local and terminal warehouses essential to effective merchandising. Cotton merchants seldom see the actual bales which they merchandise, and depend on the compress and warehouse industry to provide all essential services associated with physical handling. Among the more important services which it provides are: receiving, including weighing, sampling, issuance of warehouse receipts, and identity preservation; storing; separating into uniform lots at the time of shipment; compression; and shipping.

Although cotton production was relatively stable from 1951-52 to 1964-65, storage capacity increased over 9 million bales. During this period, peak occupancy varied from 34 percent of total available capacity in fiscal 1951-52 to 94 percent in fiscal 1955-56 (table 1). Average occupancy levels varied from 21 percent during the 1951-52 season to 78 percent during the 1955-56 season. Primarily as a result of decreased exports, continued high production, and the Government storage program, peak occupancy levels remained fairly high through the 1964-65 season. The peak occupancy level during the 1964-65 season was about 71 percent. At this time, there were approximately 1,200 compress and warehouse installations approved by the Commodity Credit Corporation (CCC) to store Government-owned and price-support cotton.

Government-controlled cotton decreased from 9.9 million bales in 1956 to 1.6 million bales in 1961 and, as a result, average occupancy levels fell to about 37 percent in both the 1960-61 and 1961-62 seasons.

Following the 1961-62 season, occupancy levels again began to climb and reached 58 percent in 1963-64. During this time, volume stored increased and totaled about 19 million bales in 1964-65. Of this total, over 10 million bales were directly owned or controlled by the Government.

During the 5 years after 1964-65, cotton production declined, while storage capacity remained stable. As a result, average occupancy fell to about 25 percent in both 1968-69 and 1969-70. Government-controlled cotton also declined from 10.4 million bales in 1964-65 to 2.9 million bales in 1969-70.

The number of compress and warehouse installations approved by the CCC declined to about 900 by 1968-69. About 74 percent of these units, heavily

Table 1.--Total storage capacity, average occupancy, peak occupancy, and Government-controlled cotton, 1945-69

Year <u>1/</u>	Total capacity	Average occupancy	Peak occupancy	Government-controlled <u>1/</u>
	----- Million bales -----			
1945.....	15.5	8.2	10.6	6.9
1946.....	15.5	3.8	6.2	.8
1947.....	15.5	3.4	5.5	.006
1948.....	15.5	6.0	8.3	.004
1949.....	15.5	7.7	10.7	3.8
1950.....	15.5	4.1	7.0	3.5
1951.....	17.4	3.7	5.9	.008
1952.....	17.1	5.5	7.6	.029
1953.....	17.5	9.3	12.1	2.0
1954.....	17.1	11.6	14.0	7.0
1955.....	18.7	14.5	17.6	8.1
1956.....	21.4	13.4	16.9	9.9
1957.....	21.7	10.0	12.6	5.2
1958.....	22.0	9.8	12.8	2.9
1959.....	22.5	10.1	14.4	7.0
1960.....	22.4	8.4	12.2	5.0
1961.....	22.8	8.4	11.9	1.6
1962.....	22.8	11.6	14.7	4.7
1963.....	24.0	14.0	17.5	8.2
1964.....	26.4	15.2	18.8	10.4
1965.....	27.8	17.0	19.7	11.6
1966.....	28.4	14.2	18.3	12.2
1967.....	27.7	9.1	11.6	5.8
1968.....	27.0	6.8	9.8	.1
1969.....	26.6	6.3	9.1	2.9

1/ Year beginning August 1.

Source: Adapted from various statistical bulletins, U.S. Department of Agriculture.

concentrated in the southeastern part of the Cotton Belt, are small facilities without compression equipment. The remaining 26 percent are large facilities with equipment suitable for changing the size and densities of cotton bales. Although a few such compresses exist in the southeastern part of the Cotton Belt, most are in the South Central and Southwestern Belt regions, with the remainder in the far western area and at Gulf ports. Total storage capacity of about 27 million bales is concentrated primarily in the South Central, Southeastern, and Southwestern States--36, 22, and 23 percent, respectively. Of the remaining storage capacity, 9 percent is located in the West and about 10 percent at export points bordering on the Gulf, Pacific, and Atlantic seabords.



Although wages and other costs increased substantially from 1962 to 1965, warehousemen in general were able to maintain a reasonable cost-revenue relationship because of continued high occupancy levels.

More recently, however, the warehousing industry has experienced the most difficult times in its history. Significant reductions in production, which resulted in an extremely fast disappearance of Government-owned stocks, caused average occupancy levels to decrease from about 57 percent in 1964-65 to an estimated 24 percent in 1969-70, leaving excess warehousing space in most areas of the Belt. Along with the decline in Government-owned stocks was a corresponding reduction in gross handling and storage revenues of these firms. In the past, profitable operation of many firms depended upon storage and handling revenues received from the Government-owned stocks.

#### OBJECTIVES

The purposes of this study were to measure changes in the cost of handling and storage of cotton since fiscal 1964-65, to provide information on factors associated with these changes, and to estimate cost expected to prevail under pure competition. The specific objectives were to provide: (1) estimates of changes in cost of handling and storing cotton since fiscal 1964-65; (2) estimates of the effects on cost of handling and storing of varying volumes, size of plant, location, and types of facilities; and (3) estimates of rates expected to prevail under assumed conditions of free competition. This study, based on sample data representative of the industry, should be useful to managers and others who wish to compare their operations with data from other plants in their area. No attempt has been made to evaluate new technologies known to exist within the industry. Later reports will show results of economic-engineering studies of labor and equipment requirements and variations of costs among different methods of receiving, storing, compression, and shipping, including use of new technologies.

#### PROCEDURE

The cost data for an economic analysis of compress and noncompress warehouses were obtained by interviews with persons from firms in the industry for 1964-65 and 1968-69. The selection of plants to be studied was made independently for warehouses and compresses from a list of firms eligible to handle and store Government-owned or -loaned cotton. Firms were stratified by geographic area and capacity groups and a proportionate random sample was drawn from each stratum.

Compresses were stratified into three capacity-group levels and warehouses into five size groups. The sampling procedures were developed in consultation with the Statistical Reporting Service.

During 1964-65, personnel of 73 compress warehouses and 60 noncompress warehouses were interviewed. For 1968-69, a total of 120 firms were interviewed (appendix tables 29 and 30). The sample consisted of 72 compress warehouses

and 48 noncompress warehouses. The 1964-65 firms represented approximately 30 percent of the approved capacity and about 11 percent of the firms. For 1968-69, the sample represented about 36 and 13 percent of the capacity and firms, respectively. The smaller warehouse sample in 1968-69 resulted because some 300 firms went out of business since fiscal 1964-65.

Data were obtained for both years on quantities of cotton handled and stored, plant and equipment inventories, type of structure, and uses made of buildings and equipment. Crew organization and makeup, bales handled per hour in each function, number of pieces and type of equipment used, and other pertinent data were developed from the interviews. Moreover, all cost data pertinent to plant operation, including taxes, labor and management salaries, fuel, supplies, insurance, home office prorations, electricity, and other cost items were obtained for each facility. These data provided the basis for analyzing various operations within the plant. Allocation of cost items between handling and storage operations was done in a uniform manner in both years, according to the plan outlined in appendix A.

In both years, many differences were found in depreciation rates used for identical assets and in the amount of interest paid. To eliminate the effect of these variations, data were summarized using standardized rates as shown in the rate schedule in appendix A. The rates shown were applied to the acquisition cost of buildings and equipment. These adjustments resulted in a smoothing out of cost variations between plants. Large differences still existed, however, because some assets had been entirely depreciated, while other plants recently built or reorganized had much higher depreciation charges.

To eliminate these variations, the replacement cost of buildings and equipment was calculated for each facility. An average cost per square foot of \$2.15 for warehouses and \$2.30 for compress warehouses was used in 1964-65. Comparable costs used to develop estimates for 1969-70 were \$2.40 and \$2.57. These costs included buildings, water systems, spur tracks, outside blacktop or paving, and other improvements. These estimated costs were applied to the total number of square feet of floor space existing in each year. Depreciation was computed at 2.6 percent of the total cost derived.

Costs of all other assets at individual plants, except pressing machinery and land, were also calculated to reflect price levels existing at that time. For 1964-65, replacement costs for these items were calculated at 105 percent of the original acquisition cost. For 1969-70, costs were estimated at 110 percent of the original value. Replacement of compression equipment was estimated at \$115,000 and \$120,000 in 1964-65 and 1969-70, respectively. An allowance equal to the original cost of land was allowed in estimating return on investment in both years.

To further minimize the variations found among plants, interest on investment based on replacement cost estimates was computed for each plant. This was done because some plants--those newly constructed and older plants that had recently changed hands--showed substantial interest charges. Many plants of comparable age and structure, where company monies were being used for investment, showed no interest charges. Interest on investment was calculated at 6.0 percent for 1964-65 and 7.0 percent for 1969-70, and applied against one-half the replacement cost of buildings and equipment, plus the original cost of land.

Interest on working capital was also computed for each plant. These costs were calculated at 6.0 and 8.0 percent per annum on one-fourth of the out-of-pocket cost in 1964-65 and 1969-70, respectively.

Cost increases for 1969-70 for such items as labor, insurance, taxes, etc., were also computed. Rates of increase for each affected item are shown on page 45 of the appendix.

In developing storage requirements and competitive rates, it was assumed that only the amount of total storage space needed to handle and store the peak amount of cotton available would be utilized. Peak storage requirements for each area were established on the basis of carryover of cotton, plus projected monthly production, minus projected monthly disappearance. Requirements by area for 1969-70 are shown in appendix table 31. Average occupancy levels were established by determining the peak and average volumes of cotton in storage during the year. A ratio between peak volume and average volume in storage was then developed. For example, peak requirements for 1969-70 were estimated at 9,137 million bales, and average requirements at 6,309 million bales, which resulted in an average occupancy of about 70 percent. At the peak, however, plants would be occupied at 100 percent of capacity.

After establishment of average and peak occupancy levels, cost was recalculated for each plant to determine a new set of cost data, assuming each plant would be occupied on the average at 70 percent of its total capacity. The ratio between receipts and shipments, etc., and stored volume at sample plants was used to determine the amounts of cotton received, shipped, etc., and to expand the sample to the universe. For example, if plant A's receipts were 1.5 times as large as its stored volume in 1969-70, this ratio was used to determine the amount of cotton that plant A would receive if it were occupied at an average of 70 percent for the year. Assume plant A to have a capacity of 20,000 bales occupied at 70 percent on the average, or 14,000 bales. Multiplying this figure (14,000) by 1.5 (the ratio of receipts to stored volume) gives total receipts of 21,000 bales that could be expected at this plant. Similar calculations were made for other functions.

After all calculations had been made and a new cost developed for each function and group of plants, longrun and shortrun rates were established. To determine these rates, capacities available were plotted against cost, beginning with the least-cost plants. Each point on the graph indicated the total amount of storage available at specified cost increments. The point at which available capacity equaled peak storage requirement was determined as the competitive rate or the marginal firm's cost. <sup>1/</sup> Longrun competitive rates would provide a sufficient return to cover the marginal firm's depreciation and interest on the replacement cost of the facilities, plus all out-of-pocket cost. As calculated for marginal firms, the rates include normal returns to capital equal to that

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<sup>1/</sup> The marginal firms are defined as those whose unit and marginal cost would just equal the established rate when operating at the industry's average occupancy.

which could be earned in investments of equal risk. All firms with cost lower than the marginal firms would derive a net profit, since their unit cost would be less than that of the marginal firms.

Shortrun competitive rates would cover the marginal firms' out-of-pocket cost only and would not provide for interest or depreciation charges. For purposes of this report, it was assumed that firms would continue to operate so long as their out-of-pocket costs were covered. Firms with out-of-pocket cost lower than the marginal firms would be maximizing returns or minimizing their losses since all or a portion of fixed cost could be recovered.

Covariance analysis was used to determine the effects of volume, size, and capacity on the cost of storing and handling of cotton in each area and for each type of facility. No attempt was made to inject any aspects of differences in levels of efficiency other than that reflected in the basic data obtained from study firms. Tests of statistical significance were used to determine which subgroups of data--geographical or time--should be combined under one regression equation and to determine the appropriate functional form. Regression equations were fitted by functions (receiving, storage, etc.) for each year by geographic region and type of facility. Separate analyses were made for different years if statistical analyses indicated separate equations to be appropriate. The analyses were based on total annual cost for individual warehouses and compresses and then converted to a per bale cost. Detailed information on determining the significance of a regression equation is shown in appendix C.

#### COST ANALYSIS BY FUNCTION

This section compares costs by type of facility and geographic regions for 1964-65 and 1969-70 for each major warehousing function. Since there are marked differences in operating practices, costs were calculated for warehouses and compresses separately. Regression equations were fitted to data from each region, or from combinations of regions as indicated by covariance analyses. These regressions were then used to derive the per bale cost for typical firms at various size levels.

##### Receiving

Receiving includes unloading bales upon arrival at the warehouse, tagging, weighing, sampling as required, issuing a warehouse receipt, and moving into temporary storage or to the compression room.

Average total cost for this service at warehouses rose from 94¢ per bale in 1964-65 to \$1.31 per bale in 1969-70 (tables 2 and 3). Comparable costs in compressing warehouses are 68¢ and \$1.01 per bale. Variable cost accounted for 80 percent or more of the total in both years. Costs for labor and materials-handling equipment were the two most important items of this total (tables 4 and 5).

A major portion of the increased total unit cost between the 2 years is due to an increase in prices after fiscal 1964-65. For example, the cost of

Table 2.--Estimated weighted average cost per bale for handling and storing cotton, by area and type of facility, fiscal 1964-65 1/

Area and type of facility	Estimated cost for--									
	Receiving		Storage		Break-out		Shipping		Combined	
	Out-of-pocket	Total cost	Out-of-pocket	Total cost	Out-of-pocket	Total cost	Out-of-pocket	Total cost		
2/ : cost 3/	2/ : cost 3/	2/ : cost 3/	2/ : cost 3/	2/ : cost 3/	2/ : cost 3/	2/ : cost 3/	2/ : cost 3/	2/ : cost 3/		
Dollars										
<b>Southeast 4/</b>										
Warehouses.....	0.916	0.836	3.204	2.616	0.854	0.829	0.442	0.395	5.416	4.676
Compresses.....	.820	.726	4.836	3.612	.508	.485	.406	.316	6.590	5.139
All plants.....	.906	.825	3.372	2.716	.819	.795	.438	.387	5.535	4.723
<b>South Central 5/</b>										
Warehouses.....	1.198	.958	3.240	2.292	1.127	1.079	1.033	.741	6.598	5.061
Compresses.....	.678	.593	3.300	2.364	.474	.474	.349	.300	4.801	3.731
All plants.....	.746	.640	3.288	2.355	.559	.551	.438	.357	5.031	3.903
<b>Southwest 6/</b>										
Warehouses.....	.796	.711	3.972	2.940	.454	.452	.431	.355	5.653	4.458
Compresses.....	.685	.581	3.552	2.472	.448	.448	.349	.285	5.034	3.786
All plants.....	.706	.606	3.636	2.561	.449	.449	.365	.298	5.156	3.914
<b>West 7/</b>										
Compresses.....	.679	.609	4.464	3.348	.489	.481	.402	.320	6.034	4.758
<b>Gulf ports 8/</b>										
Compresses.....	.650	.575	3.972	2.868	.467	.467	.660	.573	5.749	4.483
<b>United States</b>										
Warehouses.....	.940	.837	3.312	2.616	.841	.814	.522	.438	5.615	4.705
Compresses.....	.680	.594	3.636	2.616	.469	.467	.406	.342	5.190	4.020
All plants.....	.763	.671	3.528	2.616	.588	.578	.443	.373	5.322	4.238

1/ Based on estimated 1964-65 volumes.

2/ Includes depreciation and interest on investment calculated on replacing existing facilities and equipment at 1964 prices.

3/ Excludes depreciation and interest on investment.

4/ Includes Alabama, Georgia, North Carolina, and South Carolina.

5/ Includes Arkansas, Louisiana, Mississippi, Missouri, and Tennessee.

6/ Includes Oklahoma and Texas, excluding district 6.

7/ Includes Arizona, California, New Mexico, and district 6, Texas.

8/ Includes port facilities of Louisiana and Texas.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 3.--Estimated weighted average cost per bale for handling and storing cotton, by area and type of facility, fiscal 1969-70 1/

Area and type of facility	Estimated cost for--									
	Receiving		Storage		Break-out		Shipping		Combined	
	Out-of-pocket	Total cost	Out-of-pocket	Total cost	Out-of-pocket	Total cost	Out-of-pocket	Total cost	Out-of-pocket	Total cost
2/	2/	2/	2/	2/	2/	2/	2/	2/	2/	2/
----- Dollars -----										
<b>Southeast 4/</b>										
Warehouses.....	1.547	1.295	7.716	5.112	0.776	0.739	1.192	0.925	11.231	8.071
Compresses.....	1.143	.929	6.720	4.296	.749	.734	.684	.506	9.296	6.465
All plants.....	1.477	1.232	7.544	4.971	.771	.738	1.104	.853	10.896	7.794
<b>South Central 5/</b>										
Warehouses.....	1.075	.806	3.336	1.848	.901	.847	.662	.489	5.974	3.990
Compresses.....	1.154	.917	5.880	3.840	.613	.570	.635	.463	8.282	5.790
All plants.....	1.134	.889	5.244	3.342	.685	.639	.642	.470	7.405	5.340
<b>Southwest 6/</b>										
Warehouses.....	1.089	.870	4.764	2.892	.690	.631	.857	.666	7.400	5.059
Compresses.....	1.050	.785	5.844	3.084	.459	.415	.551	.361	7.904	4.645
All plants.....	1.066	.819	5.412	3.007	.551	.501	.673	.483	7.702	4.810
<b>West 7/</b>										
Warehouses.....	.936	.667	7.056	4.824	.295	.255	.413	.297	8.700	6.043
Compresses.....	.530	.457	4.056	2.808	.680	.648	.530	.381	5.796	4.294
All plants.....	.606	.496	4.599	3.167	.608	.574	.508	.365	6.321	4.602
<b>Gulf ports 8/</b>										
Compresses.....	1.146	.958	5.412	3.300	.656	.604	.839	.623	8.053	5.485
<b>United States</b>										
Warehouses.....	1.306	1.058	6.120	3.927	.748	.702	.960	.738	9.134	6.426
Compresses.....	1.013	.807	5.532	3.425	.606	.567	.624	.446	7.775	5.245
All plants.....	1.130	.908	5.762	3.626	.659	.617	.758	.563	8.309	5.714

1/ Based on estimated 1969-70 volumes.

2/ Includes depreciation and interest on investment calculated on replacing existing facilities and equipment at 1964 prices.

3/ Excludes depreciation and interest on investment.

4/ Includes Alabama, Georgia, North Carolina, and South Carolina.

5/ Includes Arkansas, Louisiana, Mississippi, Missouri, and Tennessee.

6/ Includes Oklahoma and Texas, excluding district 6.

7/ Includes Arizona, California, New Mexico and district 6, Texas.

8/ Includes port facilities of Louisiana and Texas.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 4.--Estimated weighted average cost per bale for receiving, storage, and break-out for all warehouses, compresses, and warehouses and compresses combined, by cost item, fiscal 1964-65 1/

Cost item	Estimated cost for--									
	Receiving		Storage		Break-out		Warehouses: compresses: combined		Warehouses: compresses: combined	
	All	Warehouses: compresses: combined	All	Warehouses: compresses: combined	All	Warehouses: compresses: combined	All	Warehouses: compresses: combined	All	Warehouses: compresses: combined
----- Dollars per bale -----										
<b>Fixed costs: 2/</b>										
Depreciation.....	0.032	0.022	0.025	0.030	0.049	0.043	0.003	*	0.003	*
Insurance.....	.005	.003	.004	.005	.005	.005	*	*	*	*
Taxes.....	.007	.006	.006	.007	.017	.013	*	*	*	*
Leases and rentals.....	.019	.004	.009	.027	.011	.016	*	*	*	*
Other.....	.009	.002	.004	.003	.001	.002	.003	*	*	*
Interest on investment.....	.081	.071	.074	.037	.039	.038	.027	0.002	0.002	.009
Total fixed costs.....	.153	.108	.122	.109	.122	.117	.033	.002	.002	.012
-----										
<b>Variable costs:</b>										
Personnel expense.....	.572	.392	.449	.077	.090	.086	.656	.312	.419	.139
Handling equipment.....	.060	.066	.064	.010	.016	.014	.121	.147	.139	.139
Insurance.....	--	--	--	.035	.022	.026	--	--	--	--
Repairs and maintenance.....	.015	.006	.009	.009	.014	.012	*	*	*	*
Utilities.....	.011	.004	.006	.005	.005	.005	.004	*	*	*
Home office.....	.024	.027	.026	.007	.013	.011	.008	.001	.003	.004
Supplies.....	.055	.048	.050	.001	.004	.003	.002	.005	.005	.004
Office supplies and expense.....	.004	.004	.004	.002	.002	.002	.001	*	*	*
Claims.....	--	*	*	.002	.003	.003	--	--	--	--
Transportation expense.....	.016	.005	.008	.004	.002	.003	.004	*	*	*
Other.....	.021	.012	.015	.011	.007	.008	.008	*	.008	.008
Interest, working capital.....	.009	.008	.008	.004	.003	.003	.004	.002	.002	.003
Total variable costs.....	.787	.572	.640	.167	.181	.176	.808	.467	.576	.588
Total fixed and variable costs.....	.940	.680	.763	.276	.303	.294	.841	.469	.588	.588

1/ Based on estimated 1964-65 volumes.

2/ Includes depreciation and interest on investment calculated on replacing existing facilities and equipment at 1964 prices.

\*Less than \$0.0005 per bale.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 5.--Estimated weighted average cost per bale for receiving, storage and break-out for all warehouses, compresses, and warehouses and compresses combined, by cost item, fiscal 1969-70 <sup>1/</sup>

Cost item	Estimated cost for--											
	Receiving			Storage			Break-out					
	All	Warehouses	Compresses	All	Warehouses	Compresses	All	Warehouses	Compresses	All	Warehouses	Compresses
----- Dollars per bale -----												
<b>Fixed costs: <sup>2/</sup></b>												
Depreciation.....	0.098	0.071	0.082	0.106	0.108	0.107	0.042	0.039	0.040			
Insurance.....	.019	.009	.013	.012	.009	.010	.013	.008	.010			
Taxes.....	.028	.028	.028	.022	.031	.022	.022	.025	.024			
Interest on investment.....	.142	.135	.138	.076	.068	.072	.004	*	.002			
Total fixed costs.....	.287	.243	.261	.216	.216	.216	.081	.072	.076			
<b>Variable costs:</b>												
Personnel expense.....	.776	.525	.625	.155	.113	.130	.511	.404	.449			
Handling equipment.....	.084	.065	.073	.013	.013	.013	.109	.103	.106			
Cotton insurance.....	--	--	--	.027	.010	.017	--	--	--			
Licenses and bonds.....	--	--	--	.006	.006	.006	--	--	--			
Repairs and maintenance.....	.011	.013	.012	.024	.036	.031	--	*	*			
Utilities.....	.023	.010	.015	.012	.005	.008	.001	--	*			
Home office expense.....	.050	.051	.050	.026	.025	.025	.003	*	*			
Supplies (compress).....	.017	.058	.042	.007	.007	.007	.017	.006	.007			
Office supplies expense.....	.003	.010	.007	.003	.005	.004	--	--	--			
Claims.....	--	--	--	.002	.013	.009	--	--	--			
Transportation expense.....	.005	.005	.005	.003	.003	.003	--	--	--			
Other.....	.022	.012	.016	.013	.007	.009	.001	--	--			
Interest, working capital.....	.028	.021	.024	.003	.002	.002	.025	.021	.023			
Total variable costs.....	1.019	.770	.869	.294	.245	.265	.667	.534	.583			
Total fixed and variable costs..:	1.306	1.013	1.130	.510	.461	.481	.748	.606	.659			

<sup>1/</sup> Based on estimated 1969-70 volumes.

<sup>2/</sup> Includes depreciation and interest on investment calculated on replacing existing facilities and equipment at 1964 prices.

\*Less than \$0.0005 per bale.

Note: The sum of individual costs may not always add to the totals due to rounding.



labor and materials-handling equipment alone rose over 25 percent during the time. The reduction in volumes received (about 28 percent), however, had some effect on unit cost, since some fixed costs are allocated to the receiving function.

Covariance analysis of warehouse costs indicated that the fixed portion of the total cost structure for receiving, as represented by the constant term, had changed measurably so that one equation would not fit both years (table 6). The regression coefficient, or efficiency measure, however, was unchanged over time. The cost structures of regions were similar enough that a single equation was appropriate for all regions within each year.. Total receiving cost per bale at warehouses in both years derived from the estimating equations in table 6 are presented in table 7.

When comparing the warehouse receiving costs shown in table 7, several findings emerge. One is the obvious economies of scale in both years, but particularly in 1969-70. Second, the cost structure of the smaller warehouses was affected by time to a greater extent than that of the larger firms. Not only was the competitive position of large warehouses improved relative to that of the small firm, but the large firm was able to offset increases in price of inputs much more easily than the small warehouse. For instance, a firm receiving 5,000 bales in 1964-65 would have had to increase its operation by 160 percent to 13,000 bales just to maintain a per bale cost of \$1.06. On the other hand, a firm receiving 22,000 bales in 1964-65 would have had to increase its operation only 60 percent to maintain a per bale cost of 80¢ per bale.

Table 6.--Warehouses: Cost relationships for receiving cotton, fiscal 1964-65 and 1969-70

Year	Constant	:Regression coefficient 1/:		:Percent variation explained
		: $b_1$	: $b_2$	
1964-65 2/.....	1.25847	0.83132 **	-0.00390**	75
1969-70.....	3.71225	.83132 **	- .00390**	75

1/ The estimating equation is  $Y = a + b_1X + b_2X^2$ .

Y = total cost of receiving at individual warehouses in thousands of dollars

X = total bales received at individual warehouses in thousands of bales.

2/ Two observations omitted.

\*\* Significant at the 1-percent level.

Although similar relations between volumes received and total cost were found to exist in compresses, regression analyses reveal that the cost structure varied across geographic regions to such an extent that one equation was not appropriate for all four regions in either year (table 8). Moreover, the

Table 7.--Warehouses: Estimated total cost per bale for receiving cotton, fiscal 1964-65 and 1969-70 1/

Thousand bales received	1964-65	1969-70
	<u>Dollars</u>	
1.....	2.086	4.540
2.....	1.453	2.680
3.....	1.239	2.057
4.....	1.130	1.744
5.....	1.064	1.554
6.....	1.018	1.427
7.....	.984	1.334
8.....	.957	1.264
9.....	.936	1.209
10.....	.918	1.164
11.....	.903	1.126
12.....	.889	1.094
13.....	.877	1.066
14.....	.867	1.042
15.....	.857	1.020
16.....	.848	1.001
17.....	.839	.983
18.....	.831	.967
19.....	.823	.953
20.....	.816	.939
21.....	.809	.926
22.....	.803	.914
23.....	.796	.903
24.....	.790	.892
25.....	.784	.882
30.....	.756	.838
35.....	.731	.801
40.....	.707	.768
45.....	.684	.738
50.....	.661	.711

1/ The per bale costs in this table were obtained by dividing estimated total annual cost by bales received. Total annual costs were derived from the following regression equations:

$$1964-65: Y = 1.2585 + .8313X - .0039X^2$$

$$1969-70: Y = 3.7123 + .8313X - .0039X^2$$

Y = total cost of receiving at individual warehouses in thousands of dollars

X = total bales received at individual warehouses in thousands of bales.

Note: See table 6 for additional information on the above equations.

Table 8.--Compresses: Cost relationships for receiving cotton, fiscal 1964-65 and 1969-70

Region and year	Constant	Regression coefficients 1/		Percent variation explained
		b <sub>1</sub>	b <sub>2</sub>	
Southeast -				
South Central:				
1964-65.....	11.24846	0.26335**	0.00303*	94.9
1969-70.....	9.52014	.85416**		83.9
Southwest:				
1964-65.....	6.24217	.53234**		95.2
1969-70.....	10.36723	.78521**		98.4
West:				
1964-65.....	23.29175	.42217**		85.3
1969-70.....	20.24570	.28790**		84.4
Ports:				
1964-65.....	17.26755	.50087**		96.5
1969-70.....	36.07088	.69758*		45.4

1/ The estimating equation is:

$$Y = a + b_1X + b_2X^2 \text{ for the Southeast-South Central, 1964}$$

$$Y = a + b_1X \text{ for all other regions}$$

Y = total receiving cost at individual compresses in thousands of dollars

X = total bales received at individual compresses in thousands of bales.

\* Significant at the 5-percent level.

\*\* Significant at the 1-percent level.

geographic regions as a group could not be fitted for the 2 years with a single equation or coefficient. This indicates that both variable and fixed costs had changed significantly in all regions.

The estimated total cost per bale associated with a given volume of receipts for both years is shown in table 9. Except for the Southeast-South Central area in 1964-65, the receiving costs in each area declined most rapidly at the lower receiving volumes and remained relatively stable at high volumes of receipts in both years.

### Storage

Services normally included in the storage function are: moving bales into designated storage areas, stacking bales into tiers, recording the location by compartment row and bale number, maintaining stacks, and performing other necessary custodial functions during the period of time bales remain in the warehouse.

At warehouses, total annual per bale cost for storage (including depreciation and interest estimated on current replacement values) is estimated to have risen from \$3.31 (28¢ a month) in 1964-65 to \$6.12 (51¢ a month) in 1969-70--an increase of \$2.81 (tables 2 and 3). Increases in annual out-of-pocket cost of about \$1.31 per bale (11¢ a month) accounted for 48 percent of the total. The remaining 52 percent increase in cost can be attributed to fixed cost, reflecting primarily increases in estimated replacement values.

In compresses, annual cost per bale rose from \$3.64 (30¢ a month) in 1964-65 to \$5.53 (46¢ a month) in 1969-70. Out-of-pocket cost in the latter year averaged \$3.43 (29¢ a month)--an increase of 81¢ over comparable cost in 1964-65. Expressed on a monthly basis, out-of-pocket cost averaged 28.5¢ a bale in 1969-70--an increase of 7¢ over monthly storage cost in 1964-65. With a decline in use of facilities from 60 percent in 1964-65 to 30 percent in 1969-70, this increase in per bale fixed cost is primarily because total fixed costs are spread over fewer bales, rather than to increases in total fixed cost.

Covariance analysis indicated that when relating total fixed costs of plant capacity or total variable costs to plant capacity and percent occupancy, one equation was not appropriate in either case for both 1964-65 and 1969-70. This indicates that a significant change occurred in both the fixed costs and variable costs of warehouses between the years (table 10). Another point is that the warehouse cost structure did not vary significantly across geographic regions in 1964-65. However, by 1969-70, the changes that had apparently occurred in the cost structure of the industry had taken place at differing rates between geographic regions.

At this point, a brief explanation is necessary as to the economic rationale behind the causal effects resulting in the significance of the included variables. Fixed cost includes the calculated depreciation and interest on buildings and capital equipment having an operating life of several years' duration, with buildings being the largest component. Since increasing plant capacity requires more buildings and equipment, the level of a plant's capacity becomes a reasonably good indication of the associated fixed costs. This statement is supported

Table 9.--Compresses: Estimated total cost per bale for receiving cotton, by area and number of bales received, fiscal 1964-65 and 1969-70 1/

Thousand bales received	Cost per bale							
	Southeast -		Southwest		West		Ports	
	South Central							
	1964-65	1969-70	1964-65	1969-70	1964-65	1969-70	1964-65	1969-70
	Dollars							
10.....	1.418	1.806	1.157	1.822	2.751	2.312	2.228	4.305
15.....	1.059	1.489	.948	1.476	1.975	1.638	1.652	3.102
20.....	.886	1.330	.844	1.304	1.587	1.300	1.364	2.501
25.....	.789	1.235	.782	1.200	1.354	1.098	1.192	2.140
30.....	.729	1.171	.740	1.131	1.199	.963	1.076	1.900
35.....	.691	1.126	.711	1.081	1.088	.866	.994	1.728
40.....	.666	1.092	.688	1.044	1.004	.794	.933	1.599
45.....	.650	1.066	.671	1.016	.940	.738	.885	1.499
50.....	.640	1.045	.657	.993	.888	.693	.846	1.419
55.....	.635	1.027	.646	.974	.846	.656	.815	1.353
60.....	.633	1.013	.636	.958	.810	.625	.789	1.299
65.....	.633	1.001	.628	.945	.781	.599	.767	1.253
70.....	.636	.990	.622	.933	.755	.577	.748	1.213
75.....	.641	.981	.616	.923	.733	.558	.731	1.179
100.....	.679	.949	.595	.889	.655	.490	.674	1.058
125.....	.732	.930	.582	.868	.609	.450	.639	.986
150.....	.793	.918	.574	.854	.577	.423	.616	.938

1/ The costs in this table were obtained by dividing estimated total annual cost by bales received. Total annual costs were derived from the respective equations presented in table 8.

Table 10.--Warehouses: Cost relationships for storing cotton, fiscal 1964-65 and 1969-70

Region and year	Constant	Regression coefficients 1/		Percent variation explained
		b <sub>1</sub>	b <sub>2</sub>	
<u>Variable costs:</u>				
1964-65:				
All regions combined.....	-8.24903	1.04620**	0.17901**	75.9
1969-70:				
Southeast - South Central.....	-.58149	.61274**	.16595*	83.6
Southwest.....	-9.95231	.85670**	.33506**	92.3
<u>Fixed costs:</u>				
1964-65:				
All regions combined.....	4.21761	.66924**		64.1
1969-70:				
Southeast - South Central.....	3.65049	.53604**		92.4
Southwest.....	2.22926	.74720**		95.5

1/ The estimating equations are:

$$Y_1 = a + b_1X_1 + b_2X_2$$

$$Y_2 = a + b_1X_1$$

Y<sub>1</sub> = total variable cost of storage at individual warehouses in thousands of dollars

Y<sub>2</sub> = total fixed cost of storage at individual warehouses in thousands of dollars

X<sub>1</sub> = total capacity of individual warehouses in thousands of bales

X<sub>2</sub> = percent occupancy of individual warehouses.

\* Significant at the 5-percent level.

\*\* Significant at the 1-percent level.

by the significance of coefficients for capacity and the reasonably high percentage of change in the independent variables that was explained.

The factors affecting variable costs tend to be more complex than those affecting fixed costs. These factors can be grouped into two categories--size of operation and degree of utilization of facilities.

All other things equal, an increase in the size of the operation probably introduces management to new sets of problems and, in all likelihood, intensifies some of the old ones. However, an enlargement of the operation may also permit the use of new equipment and techniques that make the operation more efficient. With these possible relationships in mind, size of plant could logically explain some of the fluctuations in variable, as well as fixed, costs.

On the other hand, given a size of plant, the quantity of cotton stored in the plant, that is the degree of utilization, would likely have an impact on total variable costs. Percent occupancy reflects the degree of utilization and was included as the second independent variable. Again, the significance of the coefficients and the high percentage of change in the independent variable that was explained support the choice of variables.

In 1964-65, relatively large cost reductions in terms of average total cost per bale could be achieved in warehouses of all sizes just by increasing the utilization of the storage facilities. Similarly, when utilizing the respective facilities at more than 20-percent occupancy, economies of scale could be realized. As an illustration of their combined effects, a warehouse of 75,000-bale capacity and 90-percent occupancy could store cotton at 17.4¢ per bale-month, as opposed to 69.6¢ for a 10,000-bale capacity warehouse operating at 20-percent occupancy (table 11).

In 1969-70, the reduction in average total cost of storage made possible by increasing the scale of operation or fuller utilization of facilities were equally as great as those of 1964-65 (table 12). Also, in 1969-70, the Southeast-South Central region had a distinctly lower cost structure than did the Southwest throughout the different combinations of plant sizes and degrees of utilization.

It is obvious from table 12 that, even with its predominance of small operations, warehouses in the Southeast-South Central region can store cotton at relatively low costs in plants of 15,000-bale capacity or larger, provided an occupancy level of better than 50 percent is maintained.

The regression fitted to the variable cost data for compresses indicates that a certain degree of homogeneity existed in these costs across all geographic regions in 1964-65 (table 13). Five years later, these costs had undergone a significant change and at rates that differed among regions. All of this is shown in table 13 by the preclusion of combining 1964-65 and 1969-70 data and by the inclusion of separate equations for each region in 1969-70.

Fixed costs yielded a somewhat similar pattern. They exhibited such a degree of heterogeneity that different equations were required for each region in both years. This is in contrast to the finding that the variable cost structure did not vary by regions in 1964-65.

Table 11.--Warehouses: Estimated total cost per bale-month for storing cotton, by percent occupancy and capacity, all regions, fiscal 1964-65 1/

Percent occupancy <u>2/</u>	Capacity (1,000 bales)				
	10	20	30	50	75
	----- Dollars -----				
20.....	0.696	0.706	0.708	0.711	0.712
30.....	.514	.495	.489	.484	.482
40.....	.422	.390	.379	.370	.366
50.....	.368	.327	.313	.303	.297
60.....	.332	.285	.269	.257	.251
70.....	.306	.255	.238	.225	.217
80.....	.286	.233	.214	.200	.193
90.....	.271	.214	.196	.181	.174

1/ The per bale-month costs in this table were obtained by dividing total annual cost by bale-months of storage. Total annual costs were obtained by summing total annual variable costs and total annual fixed costs which were derived from the regression equations presented in table 10.

2/ The percent occupancy is found by dividing bale-months of storage by the total capacity expressed in bale-months.

Estimates of the cost per bale-month of storage are presented in tables 14 and 15. The estimates are representative of rather typical firms in each of five categories of different plant capacities. Included over a wide range are the variable bale-months of storage as represented by percent occupancy. The cost advantage of the large compress over its smaller counterpart is obvious as is the cost advantage of high utilization in any size plant.

Changes did occur in the relation of various regions to other regions between 1964-65 and 1969-70. The most noticeable one was the general improvement in the cost structure of the ports in both a relative and absolute sense. The position of the West appears to have deteriorated, compared with the other three regions.

The level of average costs in ports shifted upward at all occupancy levels with each jump in capacity, because total fixed costs increased more than proportionately with each increment in capacity. This is shown by the regression coefficient in the ports' fixed cost equation being greater than one (table 13).





Table 13.--Compresses: Cost relationships for storing cotton, fiscal 1964-65 and 1969-70

Region and year	Constant	Regression coefficients 1/		Percent variation explained
		b <sub>1</sub>	b <sub>2</sub>	
<u>Variable costs:</u>				
1964-65: 2/ 1969-70:	-10.64845	0.73011**	0.72500**	74.5
Southeast				
South Central.....	-20.18237	0.54037**	1.33906**	82.0
Southwest.....	-24.33897	0.52911**	1.65218**	97.3
West.....	-36.23303	1.04421**	0.97798**	94.0
Ports.....	-11.66397	0.77839**	0.35710**	84.1
<u>Fixed costs:</u>				
Southeast -				
South Central:				
1964-65.....	12.24133	0.57979**		62.8
1969-70.....	12.43488	0.41366**		84.4
Southwest:				
1964-65.....	- 7.52722	0.91786**		92.7
1969-70.....	-16.20694	0.93809**		98.6
West:				
1964-65.....	12.73087	0.77338**		94.9
1969-70.....	18.12773	0.62127**		94.6
Ports:				
1964-65.....	-44.18234	1.56306**		82.0
1969-70.....	-46.54761	1.21650**		90.1

1/ The estimating equations are:

$$Y_1 = a + b_1X_1 + b_2X_2$$

$$Y_2 = a + b_1X_1$$

$Y_1$  = total variable cost of storage at individual compressing facilities in thousands of dollars

$Y_2$  = total fixed cost of storage at individual compressing facilities in thousands of dollars

$X_1$  = total capacity of individual compressing facilities in thousands of bales

$X_2$  = percent occupancy of individual compressing facilities.

2/ 1 equation represents the cost structure for all regions in 1964-65.

\*\* Significant at the 1-percent level.



Table 15.--Compresses: Estimated total cost per bale-month for storing cotton by percent occupancy, capacity, and regions, fiscal 1969-70 <sup>1/</sup>

Region	Storage capacity	Percent occupancy <sup>2/</sup>																	
		20	30	40	50	60	70	80	90										
	1,000 bales																		
----- Dollars -----																			
Southeast -																			
South Central....		50	0.556	0.445	0.390	0.356	0.334	0.318	0.306	0.297									
		75	.503	.385	.326	.291	.266	.250	.237	.228									
		100	.477	.355	.294	.258	.234	.216	.203	.193									
		150	.450	.325	.262	.225	.200	.182	.169	.158									
		200	.437	.310	.246	.208	.183	.165	.152	.140									
Southwest.....																			
		50	.549	.458	.412	.384	.366	.353	.344	.336									
		75	.570	.441	.376	.338	.312	.294	.280	.270									
		100	.580	.433	.359	.314	.285	.264	.248	.236									
		150	.591	.425	.341	.291	.258	.234	.216	.203									
		200	.596	.420	.333	.280	.244	.219	.200	.186									
West.....																			
		50	.724	.538	.444	.387	.350	.323	.303	.288									
		75	.735	.527	.422	.359	.318	.287	.265	.248									
		100	.741	.521	.412	.345	.301	.270	.247	.228									
		150	.747	.515	.401	.331	.285	.252	.227	.208									
		200	.749	.513	.395	.325	.277	.243	.218	.199									
Ports.....																			
		50	.406	.290	.232	.198	.175	.158	.146	.136									
		75	.547	.379	.293	.242	.209	.185	.167	.152									
		100	.618	.423	.324	.265	.226	.198	.177	.161									
		150	.690	.466	.355	.288	.243	.211	.187	.169									
		200	.725	.488	.370	.299	.252	.218	.192	.173									

<sup>1/</sup> The per bale-month costs in this table were obtained by dividing total annual costs by bale-months of storage. Total annual costs were obtained by summing total annual variable costs and total annual fixed costs which were derived from the regression equations presented in table 13.

<sup>2/</sup> The percent occupancy is found by dividing bale-months of storage by the total capacity expressed in bale months.

In both years, the Southeast-South Central region exhibited a generally more favorable cost structure in terms of lower storage costs for compresses of all sizes, compared with the Southwest and ports. Because compresses with 100,000-bale capacity were not included in the Southeast sample, the cost figures presented for compresses in this range under the Southeast-South Central grouping should be interpreted as applying to the latter of the two areas.

The average total costs of storage in compresses vary among regions in the degree of utilization (table 3). Facilities were utilized much more in the West than in other regions (appendix table 30). For instance, a comparison of cost figures for 20-percent occupancy in the Southwest and 50-percent occupancy in the West clearly demonstrates why the West had the lower costs of the two. In a similar vein, the Southeast-South Central had 30-percent occupancy, with most firms falling in the under-100,000-bale capacity groups. This is also a high cost range. Likewise, 30-percent occupancy in ports coupled with the fact that most ports have large facilities explains their cost position.

Table 15 clearly illustrates that the reductions in costs from further utilization of facilities are great and increase with the size of plant. In addition, large economies of scale are possible for all regions except the ports if the plant can be operated at better than 50-percent occupancy.

#### Break-out

Services performed in this operation include identifying bales ordered for shipment, removing from stacks and setting out from storage, transporting to the shipping area, press room, or loading platform.

Total cost per bale for breaking-out at warehouses decreased from 84¢ in 1964-65 to 75¢ in 1969-70 (tables 2 and 3). At compresses, however, total per bale cost showed a gain from 47¢ in 1964-65 to 61¢ in 1969-70.

The decrease in the cost noted for breaking-out bales in warehouses runs counter to the direction of the change in compress costs as well as that of other functions. This decrease was at least partially due to a large increase in volume which resulted in more efficient use of labor and other inputs necessary to remove bales from storage. In 1969-70, for instance, only 25 percent of all warehouses surveyed broke-out less than 3,000 bales; while in 1964-65, 55 percent of all warehouses broke-out less than 3,000 bales. In warehouses, the cost structure associated with break-out changed to such an extent between 1964-65 and 1969-70 that a separate equation was required for each year (table 16). Table 17 shows that the degree to which firms were concentrated in the 3,000-bale range was the primary factor resulting in higher cost in 1964-65.

The large increase noted in the regression coefficient (table 16) indicates that increases in input prices between 1964-65 and 1969-70 far outstripped any increases in productivity that might have occurred.

At compresses there was again sufficient variation among regions and over time that eight individual equations were required to represent the cost structure for breaking-out cotton (table 18). In 1964-65, break-out cost in the

Southwest compared favorably with other regions at smaller volumes and had a distinctive cost advantage over the other areas when breaking-out 35,000, or more bales (table 19). By 1969-70, the Southwest had greatly improved its competitive edge and expanded it to all levels of operation (table 19). During 1969-70, no port facilities had break-out volumes of less than 60,000 bales. Therefore, cost estimates for port facilities handling less than this amount should be ignored.

Table 16.--Warehouses: Cost relationships for breaking-out cotton, fiscal 1964-65 and 1969-70

Year	Constant	Regression coefficient 1/	Percent variation explained
1964-65 2/.....	1.55211	0.36194**	83.4
1969-70 3/.....	1.04316	.51654**	73.7

1/ The estimating equation is  $Y = a + bX$

Y = total cost of break-out at individual warehouses in thousands of dollars

X = total bales broken-out at individual warehouses in thousands of bales.

2/ 1 observation omitted.

3/ 2 observations omitted.

\*\* Significant at the 1-percent level.

### Shipping

Services making up this function generally include segregating bales into lots, checking for accuracy, and loading into railcars or onto trucks.

At warehouses, the average total cost per bale increased from 52¢ in 1964-65 to 96¢ in 1969-70--an increase of about 44¢ per bale (tables 2 and 3). Increases in labor cost account for a substantial portion of the total, averaging 26.4¢ per bale, or an amount equal to the total labor cost in 1964-65 (appendix tables 44 and 45).

In contrast, cost at compresses increased only 21¢ per bale over the 41¢ per bale cost in 1964-65 (tables 2 and 3). Of this total, increased cost for labor amounted to only 5¢ per bale and increases in fixed cost accounted for 12.2¢ per bale (appendix tables 46 and 47).

Estimated average costs for shipping varying volumes from warehouses were calculated from equations presented in table 20 and when related to volumes shipped show a substantial upward shift in the entire cost structure. Costs associated with lower volumes have been subjected to a proportionate greater shift in costs which increases the competitive disadvantage of the smaller

Table 17.--Warehouses: Estimated total cost per bale for breaking-out cotton  
fiscal 1964-65 and 1969-70 1/

Thousand bales broken-out :	1964-65	:	1969-70
:	----- <u>Dollars</u> -----		
1.....:	1.914		1.560
2.....:	1.138		1.038
3.....:	.879		.864
4.....:	.750		.777
5.....:	.672		.725
6.....:	.621		.690
7.....:	.584		.666
8.....:	.556		.647
9.....:	.534		.632
10.....:	.517		.621
11.....:	.503		.611
12.....:	.491		.603
13.....:	.481		.597
14.....:	.473		.591
15.....:	.465		.586
16.....:	.459		.582
17.....:	.453		.578
18.....:	.448		.574
19.....:	.444		.571
20.....:	.440		.569
21.....:	.436		.566
22.....:	.432		.564
23.....:	.429		.562
24.....:	.427		.560
25.....:	.424		.558
30.....:	.414		.551
35.....:	.406		.546
40.....:	.401		.543
45.....:	.396		.540
50.....:	.393		.537

1/ The per bale costs in this table were obtained by dividing estimated total annual cost by bales broken-out. Total annual costs were derived from the following regression equations:

$$1964-65: Y = 1.55211 + 0.3619X$$

$$1969-70: Y = 1.04316 + 0.51654X$$

Y = total cost of break-out at individual warehouses in thousands of dollars

X = total bales broken-out at individual warehouses in thousands of bales.

Note: See table 16 for additional information on the above equations.

Table 18.--Compresses: Cost relationships for breaking-out cotton, by area, fiscal 1964-65 and 1969-70

Region and year	Constant	Regression coefficients 1/		Percent variation explained
		b <sub>1</sub>	b <sub>2</sub>	
Southeast -				
South Central:				
1964-65 2/.....	5.30431	0.27800**	0.00150	86.1
1969-70.....	2.73561	.55499**		71.7
Southwest:				
1964-65.....	8.02976	.23761**	- .00089**	72.4
1969-70.....	1.76956	.51144**		82.4
West:				
1964-65.....	11.48474	.35176**		50.8
1969-70.....	14.31163	.44221**		56.0
Ports:				
1964-65 2/.....	8.95921	.33600**		84.2
1969-70.....	-2.49182	.64306**		71.5

1/ The estimating equation is:

$$Y = a + b_1X + b_2X^2 \text{ for Southeast-South Central, 1964-65 and Southwest, 1969-70}$$

$$Y = a + b_1X \text{ for all other regions}$$

Y = total annual cost of break-out at individual compresses

X = total bales broken-out at individual compresses.

2/ 1 observation omitted.

\*\* Significant at the 1-percent level.



Table 19.--Compresses: Estimated total cost per bale for breaking-out cotton, by area and number of bales broken-out, fiscal 1964-65 and 1969-70 1/

Thousand bales broken-out	Cost per bale							
	Southeast -		Southwest		West		Ports	
	1964-65	1969-70	1964-65	1969-70	1964-65	1969-70	1964-65	1969-70
	----- Dollars -----							
10.....	0.823	0.829	1.041	0.679	1.500	1.873	1.232	0.394
15.....	.654	.737	.773	.616	1.117	1.396	.933	.477
20.....	.573	.692	.639	.582	.926	1.159	.784	.518
25.....	.528	.664	.559	.560	.811	1.015	.694	.543
30.....	.500	.646	.505	.544	.735	.919	.635	.560
35.....	.482	.633	.467	.531	.680	.851	.592	.572
40.....	.471	.623	.438	.520	.639	.800	.560	.581
45.....	.463	.616	.416	.511	.607	.760	.535	.588
50.....	.459	.610	.398	.502	.581	.728	.515	.593
55.....	.457	.605	.384	.495	.561	.702	.499	.598
60.....	.456	.601	.371	.488	.543	.681	.485	.602
65.....	.457	.597	.361	.481	.528	.662	.474	.605
70.....	.459	.594	.352	.474	.516	.647	.464	.607
75.....	.461	.591	.345	.468	.505	.633	.455	.610
100.....	.481	.582	.318	.440	.467	.585	.426	.618
150.....	.538	.573	.291	.390	.428	.538	.396	.626
200.....	.605	.569	.278	.342	.409	.514	.381	.631
250.....	.674	.566	.270	.296	.398	.499	.372	.633

1/ The per bale costs in this table were obtained by dividing estimated total annual costs by bales broken-out. Total annual costs were derived from the respective equations presented in table 18.

Table 20.--Warehouses: Cost relationship for shipping cotton, fiscal 1964-65 and 1969-70

Year	Constant	Regression coefficient 1/	Percent variation explained
1964-65 2/.....	1.06995	0.26337**	87.8
1969-70 2/.....	3.60154	.51018**	73.1

1/ The estimating equation is  $Y = a + bX$

Y = total cost of shipping at individual warehouses in thousands of dollars

X = total bales shipped at individual warehouse in thousands of bales.

2/ 1 observation omitted.

\*\* Significant at the 1-percent level.

warehouse. To illustrate, at the 1,000-bale level, cost increased by 209 percent, from \$1.33 per bale in 1964-65 to \$4.11 per bale in 1969-70. At the 16,000-bale level (the average of all warehouses in 1969-70), costs increased only 122 percent, from 33.0 to 73.5¢ per bale (table 21).

Table 20 reveals that both the constant term and the coefficient increased over time. This indicates that the level of both fixed and variable costs rose, causing a shift in the cost structure for warehouses.

In accordance with the other handling functions at compresses, sufficient variation existed between regions and years to require eight separate equations (table 22). Excluding ports, there was evidence that both fixed and variable cost had increased between the 2 years in each of the other regions (table 22).

In both years, compresses in the Southwest held a definite advantage over other areas for most volume increments (table 23). In 1964-65, the Southeast-South Central region held a competitive advantage over the West, but by 1969-70 the West had improved its position. At the 35,000-bale level, the West and Southeast-South Central regions have virtually the same unit cost; but at higher levels the West has a decided advantage over the Southeast-South Central region.

#### COMPRESSION

Two types of compression are performed at most facilities offering this service: standard density and high density. In some areas, practically all cotton is compressed to standard density (an average of 24 pounds per cubic foot) on arrival at compresses to conserve storage space. In some parts of the Cotton Belt, bales are stored at gin densities until shipping orders are received. In contrast, high-density compression (33 pounds per cubic foot) is almost always done at time of shipment. Because of differences in the two types of compression, separate cost analyses were made in this report.

Table 21.--Warehouses: Estimated total cost per bale for shipping cotton, fiscal 1964-65 and 1969-70 1/

Thousand bales shipped	1964-65	1969-70
	----- <u>Dollars</u> -----	
1.....	1.333	4.112
2.....	.798	2.311
3.....	.620	1.711
4.....	.531	1.411
5.....	.477	1.230
6.....	.442	1.110
7.....	.416	1.025
8.....	.397	.960
9.....	.382	.910
10.....	.370	.870
11.....	.361	.838
12.....	.353	.810
13.....	.346	.787
14.....	.340	.767
15.....	.335	.750
16.....	.330	.735
17.....	.326	.722
18.....	.323	.710
19.....	.320	.700
20.....	.317	.690
21.....	.314	.682
22.....	.312	.674
23.....	.310	.667
24.....	.308	.660
25.....	.306	.654
30.....	.299	.630
35.....	.294	.613
40.....	.290	.600
45.....	.287	.590
50.....	.285	.582

1/ The per bale costs in this table were obtained by dividing estimated total annual cost by bales shipped. Total annual costs were derived from the following regression equations:

1964-65:  $Y = 1.06995 + 0.26337X$

1969-70:  $Y = 3.60154 + 0.51018X$

Y = total cost of shipping from individual warehouses in thousands of dollars

X = total bales shipped from individual warehouses in thousands of bales.

Note: See table 20 for additional information on the above equations.

Table 22.--Compresses: Cost relationships for shipping cotton, by area, fiscal 1964-65 and 1969-70

Region and year	Constant	Regression coefficients 1/		Percent variation explained
		b <sub>1</sub>	b <sub>2</sub>	
Southeast -				
South Central:				
1964-65.....	3.16258	0.21608**	0.00088**	97.2
1969-70.....	4.30591	.53106**		82.0
Southwest:				
1964-65.....	2.02011	.29859**		96.0
1969-70.....	9.57704	.30831**		94.1
West:				
1964-65.....	8.71191	.2911**		84.3
1969-70.....	13.26608	.30659**		85.4
Ports:				
1964-65.....	18.32727	.42874**		73.8
1969-70.....	-13.86659	.74105**		96.2

1/ The estimating equation is:

$$Y = a + b_1X + b_2X^2 \text{ for Southeast-South Central, 1964-65}$$

$$Y = a + b_1X \text{ for all other regions}$$

Y = total annual cost of shipping from individual compresses in thousands of dollars

X = total bales shipped from individual compresses in thousands of bales.

\*\* Significant at the 1-percent level.

Table 23.--Compresses: Estimated total cost per bale for shipping cotton, by area and number of bales shipped, fiscal 1964-65 and 1969-70

Thousand bales shipped	Cost per bale							
	Southeast -		Southwest		West		Ports	
	South Central							
	1964-65	1969-70	1964-65	1969-70	1964-65	1969-70	1964-65	1969-70
	Dollars							
10.....	0.541	0.962	0.501	1.266	1.170	1.633	2.261	--
15.....	.440	.818	.433	.947	.880	1.191	1.651	--
20.....	.392	.746	.400	.787	.735	.970	1.345	0.048
25.....	.365	.703	.379	.691	.648	.837	1.162	.186
30.....	.348	.675	.366	.628	.590	.749	1.040	.279
35.....	.337	.654	.356	.582	.548	.686	.952	.345
40.....	.330	.639	.349	.548	.517	.638	.887	.394
45.....	.326	.627	.343	.521	.493	.601	.836	.433
50.....	.323	.617	.339	.500	.473	.572	.795	.464
55.....	.322	.609	.335	.482	.458	.548	.762	.489
60.....	.322	.603	.332	.468	.444	.528	.734	.510
65.....	.322	.597	.330	.456	.433	.511	.711	.528
70.....	.323	.593	.327	.445	.424	.496	.691	.543
75.....	.324	.588	.326	.436	.415	.483	.673	.556
100.....	.336	.574	.319	.404	.386	.439	.612	.602
150.....	.369	.560	.312	.372	.357	.395	.551	.649
200.....	.408	.553	.309	.356	.343	.373	.520	.672
250.....	.449	.548	.307	.347	.334	.360	.502	.686

1/ The per bale costs in this table were obtained by dividing estimated total annual cost by bales shipped. Total annual costs were derived from the respective equations presented in table 22.

### Standard Density

The interval between 1964-65 and 1969-70 was one of increasing cost for compressing cotton to standard density. The per bale cost for the United States in 1969-70 was \$2.21, which represented an increase of 63 percent over the comparable figure for 1964-65 (appendix tables 48 and 49). By individual regions, the costs in 1969-70 ranged from \$2.13 in the South Central region to \$2.45 in ports.

Out-of-pocket cost averaged \$1.74 per bale in 1969-70, compared with \$1.12 in 1964-65. Labor costs of \$1.03 in 1969-70 and 72¢ in 1964-65 account for the major portion of these costs and attest to the high degree of inefficiency that exists within this operation.

Eight individual equations are again used, one for each of the four regions in each of the 2 years, indicating significant differences in the cost structure of each entity (table 24).

From table 25, two things are apparent. One is the general increase in the costs associated with standard density compression for all the regions. Second, in a relative sense, the competitive positions of three regions remained unchanged. The exception was the Southwest, which found itself with a competitive advantage relative to the Southeast-South Central in 1969-70 at all volumes of operation. In contrast, in 1964-65 the Southwest was at a disadvantage relative to the Southeast-South Central area at all levels except the two lowest.

### High Density

Between 1964-65 and 1969-70, U.S. average total cost per bale for high density compression rose from \$1.99 to \$2.73 (appendix tables 50 and 51). In 1969-70, firms in the Southwest were, as a group, the low-cost compresses with an average cost of \$2.20 per bale for high density. Ports had the second lowest compression costs at \$2.50 per bale--30¢ per bale above those of the Southwest. Out-of-pocket costs were \$1.64 in 1964-65 and \$2.17 in 1969-70, or between 80 and 85 percent of total costs in both years. Labor cost comprised between 50 and 60 percent of these variable costs.

The application of covariance analysis to the high density compression cost data as a function of bales compressed shows that the variation that existed in 1964-65 in the individual cost structures of the four regions had disappeared by 1969-70. The result was that no significant differences could be found in 1969-70 as evidenced by the use of one regression equation in table 26 for all four regions.

The lower cost structure of the Southeast-South Central regions in 1964-65 (table 27) was obviously more than offset by the effects of greater economies of scale in the Southwest. Under such circumstances, the larger volumes compressed by individual firms in the Southwest would give this region an effectively lower average cost for that year.

In 1969-70, the common cost structure clearly reflected the rise in the price level (table 27). It appears from the large regression coefficient for

1969-70 (table 26) that the productivity of the compression inputs, a large part of which is labor, did not increase nearly as much as their price.

Table 24.--Compression: Cost relationship for compressing standard density bales, by area, fiscal 1964-65 and 1969-70

Region and year	Constant	Regression coefficient 1/	Percent variation explained
Southeast -			
South Central:			
1964-65.....	13.35072	0.85336**	87.2
1969-70.....	22.23482	1.26660**	78.3
Southwest:			
1964-65.....	11.09221	1.02397**	99.2
1969-70.....	18.69267	1.15939**	97.2
West:			
1964-65.....	8.99901	1.29319**	88.5
1969-70.....	20.18487	1.58778**	92.7
Ports:			
1964-65.....	1.80254	1.46634**	99.9
1969-70.....	5.41722	1.86818**	98.4

1/ The estimating equation is:

$Y = a + bX$  for all regions in both years

Y = total cost of compression at individual facilities in thousands of dollars

X = total bales compressed at individual facilities in thousands of bales.

\*\* Significant at the 1-percent level.

#### Summary of Cost Analysis by Function

Potential problems in any industry--both of which are equally important--are the cost structure of the industry and revenue. Unfortunately, the cotton warehousing industry is having trouble with both.

Costs have increased for U.S. firms providing storage and handling services for cotton over the period 1964-65 to 1969-70. On the average, both fixed and out-of-pocket costs have increased (tables 2 and 3).

Table 25.--Compression: Estimated total cost per bale for standard density, by area and number of bales compressed, fiscal 1964-65 and 1969-70 <sup>1/</sup>

Thousand bales compressed	Cost per bale							
	Southeast -		Southwest		West		Ports	
	1964-65	1969-70	1964-65	1969-70	1964-65	1969-70	1964-65	1969-70
	----- Dollars -----							
5.....	3.524	5.714	3.242	4.898	3.093	5.625	1.827	2.952
10.....	2.188	3.490	2.133	3.029	2.193	3.606	1.647	2.410
15.....	1.743	2.749	1.763	2.406	1.893	2.933	1.587	2.229
20.....	1.521	2.378	1.579	2.094	1.743	2.597	1.556	2.139
25.....	1.387	2.156	1.468	1.907	1.653	2.395	1.538	2.085
30.....	1.298	2.008	1.394	1.782	1.593	2.261	1.526	2.049
35.....	1.235	1.902	1.341	1.693	1.550	2.164	1.518	2.023
40.....	1.187	1.822	1.301	1.627	1.518	2.092	1.511	2.004
45.....	1.150	1.761	1.270	1.575	1.493	2.036	1.506	1.989
50.....	1.120	1.711	1.246	1.533	1.473	1.991	1.502	1.977
55.....	1.096	1.671	1.226	1.499	1.457	1.955	1.499	1.967
60.....	1.076	1.637	1.209	1.471	1.443	1.924	1.496	1.958
65.....	1.059	1.609	1.195	1.447	1.432	1.898	1.494	1.952
70.....	1.044	1.584	1.182	1.426	1.422	1.876	1.492	1.946
75.....	1.031	1.563	1.172	1.409	1.413	1.857	1.490	1.940
100.....	.987	1.489	1.135	1.346	1.383	1.790	1.484	1.922
125.....	.960	1.444	1.113	1.309	1.365	1.749	1.481	1.912

<sup>1/</sup> The per bale costs in this table were obtained by dividing estimated total annual cost by bales compressed at standard density. Total annual costs were derived from the respective equations presented in table 24.



Table 26.--Compression: Cost relationships for compressing high density bales, by area, fiscal 1964-65 and 1969-70

Region and year	Constant	Regression coefficients 1/		Percent variation explained
		b <sub>1</sub>	b <sub>2</sub>	
1964-65:				
Southeast -				
South Central..	2.49236	1.47947**		97.6
Southwest.....	7.41324	1.60395**		92.8
West.....	13.84294	1.73451**		95.4
Ports.....	23.66139	.69302**	0.01278	94.7
1969-70:				
All regions.....	2.21698	2.43955**		82.4

1/ The estimating equation is:

$$Y = a + b_1X + b_2X^2 \text{ for ports, 1964-65}$$

$$Y = a + b_1X \text{ for all other regions}$$

Y = total annual cost of high density compression at individual facilities in thousands of dollars

X = total bales compressed at individual facilities in thousands.

\*\* Significant at the 1-percent level.

In particular, the average total cost of storing and handling cotton in U.S. warehouses increased by 45 percent between 1964-65 and 1969-70. The increase in average variable costs resulted primarily from the general rise in price level that exceeded the increase in productivity of the inputs. An important factor contributing to the rise in the average fixed costs was the tremendous drop in volume of cotton in storage. This is, of course, the divisor used in computing average fixed costs which would vary inversely with the quantity in storage, given a cost level.

In 1964-65, significant differences between the cost structure of warehouses situated in the three broad geographical regions were totally absent. Similarly, there were no such differences in the handling functions in 1969-70. However, in 1969-70, a significant difference in storage costs existed among the various regions; and since storage costs make up 60 to 65 percent of the combined storage and handling costs, this exception is noteworthy.

Obviously, all regions began from a common cost base and, with respect to the handling functions, were subjected to forces of change that were identical in direction and magnitude. However, storage costs increased at varying rates,

Table 27.--Compression: Estimated total cost per bale for high density, by area and number of bales compressed, fiscal 1964-65 and 1969-70 1/

Thousand bales compressed	Cost per bale				
	Southeast - South Central	Southwest	West	Ports	All regions
	1964-65				1969-70
----- Dollars -----					
5.....	1.978	3.087	4.503	5.489	2.883
10.....	1.729	2.345	3.119	3.187	2.661
15.....	1.646	2.098	2.657	2.462	2.587
20.....	1.604	1.975	2.427	2.132	2.550
25.....	1.579	1.900	2.288	1.959	2.528
30.....	1.563	1.851	2.196	1.865	2.513
35.....	1.551	1.816	2.130	1.816	2.503
40.....	1.542	1.789	2.081	1.796	2.495
45.....	1.535	1.769	2.042	1.794	2.489
50.....	1.529	1.752	2.011	1.805	2.484
55.....	1.525	1.739	1.986	1.826	2.480
60.....	1.521	1.728	1.965	1.854	2.476
65.....	1.517	1.717	1.947	1.887	2.474
70.....	1.515	1.709	1.932	1.925	2.471
75.....	1.513	1.703	1.919	1.967	2.469
100.....	1.504	1.678	1.873	2.208	2.462
125.....	1.499	1.663	1.845	2.481	2.457

1/ The per bale costs in this table were obtained by dividing estimated total annual cost by bales compressed. Total annual costs were derived from the respective equations presented in table 26.

as evidenced by the existence of a sufficient difference in the structure of storage costs in 1969-70, either fixed or variable, to preclude the fitting of one regression equation to all regions.

The results sketch out an entirely opposite picture for compresses. One, both the storage and handling aspects of the cost structure in compresses, changed significantly between 1964-65 and 1969-70. Two, in both years a significant degree of variation existed between compresses situated in the four regions. Compresses in the Southwest consistently had the most favorable cost structure. Ports generally possessed the highest cost structure, but economies of scale resulting from large operations at port facilities generally had a somewhat offsetting effect.

Average total cost in compresses rose much less than did those in warehouses--21 percent and 45 percent, respectively. However, the volume of cotton handled by compresses declined to a lesser extent than that of warehouses--42 percent and 58 percent. In every case involving four regions and six functions of storage, handling, and compression, a separate equation was required for the 2 years under study. The requirement of a separate equation for each year indicates the occurrence of a significant change in the structure of total costs between the 2 years.

Two factors contributed to the increase in the per bale costs for compresses. First, total costs jumped significantly between 1964-65 and 1969-70. Second, a large drop took place in the volume of cotton stored and handled. The even greater increase in the per bale costs associated with warehouses was due primarily to the drastic drop in the quantity of cotton stored and handled.

#### COST UNDER PURELY COMPETITIVE CONDITIONS

The analysis presented in the preceding section of this paper had dual objectives: first, to measure the changes that occurred in cost for each warehousing function after fiscal 1964-65 and, second, to show how volumes handled and stored affected operating cost. The pertinent issue was that of detailing the present cost structure and the magnitude of changes that have occurred in operating costs. From the preceding analyses, the cotton warehousing industry has clearly experienced a sharp and continuing decline in the amounts of cotton available for handling and storage, as well as continued increases in the cost of most of its inputs. Faced with this situation, many firms, no doubt, will go out of business.

To illustrate the conflicting situation facing the industry in the area of longrun economic planning, cost data were calculated assuming conditions of perfect competition within the industry, whereby only the total amount of space needed to handle and store peak volumes of cotton would be utilized. In such a situation, available cotton would be stored in the more efficient facilities. The purpose of this analysis is not necessarily to suggest that high-cost marginal firms be discontinued, but to present in an objective manner information which might permit individual firms to evaluate their position in the industry.

## Theoretical Framework

The analysis in this section is based on the following assumptions: (1) the warehouse industry operates under purely competitive conditions; (2) no individual firm can influence market price when acting alone; and (3) there exists freedom of movement into and out of the market. Under these conditions, equilibrium will exist when the marginal costs of individual firms equal marginal and average revenue or price. The combined supply of the service offered by all firms would then equal the demand. If the price rises above the equilibrium point, quantity demanded would be less than the supply offered at that price and some sellers would not be able to sell their total supply. Competition by sellers then would be expected to reduce the storage rate to a point where available storage supply equals demand. Conversely, if the storage rate should fall below the equilibrium rate, competition would drive the rate up until equilibrium is again reached.

Firms with average total costs higher than the new equilibrium rate (average revenue under perfect competition) would cease to operate in the long run. A firm must recover an amount equal to all costs if it is to remain in operation. Failure to do so would result in a depletion of its capital assets. In the short run, however, a firm could rationally be expected to continue operation with rates below its average total cost if such a rate equaled, or exceeded, average variable or out-of-pocket costs. In fact, a firm may continue to operate for a time even if total revenue is less than total variable cost in hopes of improved conditions in the future. The rational firms, however, would be expected to cease operations immediately if rates received fall below average variable cost because their operating deficit would exceed losses sustained with facilities idle.

### Assumptions

For the purposes of this analysis, additional assumptions are: (1) Only the amount of total available warehousing space needed to store the estimated peak volumes of cotton would be used; (2) each operator would attempt to maximize profits or minimize losses and would utilize his space at 100 percent of capacity at the peak of the season; (3) average utilization would be equal to the peak requirements divided by the average amount of cotton on hand for the year; (4) available cottons would be stored in the least-cost plants; and (5) competitive rates for the industry would equal the cost of the marginal firms; that is, the cost of the last firm's space needed to fulfill total storage requirements at the peak of the season.

### Present Storage Revenue-Cost Situation

Up to and including fiscal 1964-65, warehousemen received their revenue from both private and Government sources, with Government the largest single source. By 1969-70, the Government had disposed of a large part of its holdings and was no longer a major buyer of warehousing services. As a result, the industry now must depend upon the private sector for most of its revenues. Many submarginal firms desiring to remain in business no doubt will reevaluate their cost-revenue relationships and might attempt to increase their charges.

However, without cooperative action by competitors, such action would be expected to lead to major loss of volume and revenue. To be effective, firms possessing a large majority of the total would have to raise their charges and maintain them at the higher level. With such a large number of firms in the industry, expectations of such cooperation tend to be unrealistic. Doubtless, some, and eventually all, of the efficient low-cost firms would lower their charges in an attempt to increase, or merely maintain, their volume.

Competitive Storage Revenue-Cost Situation

In an industry such as cotton warehousing, where vast amounts of surplus capacity exist, establishment of rates equal to estimated costs for marginal firms (the last firm's capacity needed to meet peak storage requirements) would have a profound effect on the industry. Simply eliminating much of the surplus capacity would reduce the industry's total fixed cost and increase the utilization for the remaining facilities. As an example, total annual storage costs for all facilities operating in 1969-70 have been estimated at \$5.76 per bale and out-of-pocket cost at \$3.63. Under competitive conditions which would utilize only those facilities necessary to handle and store peak volumes, total storage cost (total cost for the marginal firms) would be reduced to an estimated \$3.59 per bale per year (table 28). Moreover, out-of-pocket cost would be reduced to \$2.90 per bale--a decrease of 73 cents per bale.

Table 28.--Estimated annual competitive rates for handling and storing cotton, by area, fiscal 1969-70 1/

Area	Competitive rates for--			
	Storage		Storage and handling	
	Longrun <u>2/</u>	Shortrun <u>3/</u>	Longrun <u>2/</u>	Shortrun <u>3/</u>
----- Dollars per bale -----				
Southeast.....	3.516	2.904	5.387	4.579
South Central <u>4/</u> ..	3.732	2.988	5.530	4.709
Southwest <u>4/</u> .....	3.468	2.926	5.843	5.023
West.....	5.484	4.548	7.472	6.026
All areas.....	3.588	2.904	5.617	4.718

1/ Cost based on 1969-70 price levels and volumes. Data shown are based on the assumption that all facilities utilized were utilized at 70 percent of capacity and that average monthly stocks equal 70 percent of estimated peak requirements. Handling includes receiving, break-out, and shipping.

2/ Cost of marginal firms, including depreciation and interest on investment.

3/ Cost of marginal firms, excluding depreciation and interest on investment.

4/ Louisiana port facilities are included with the South Central and Texas ports with the Southwest.

Establishment of a rate equal to the estimated competitive rate of \$3.59 per bale would maintain sufficient space to store the peak volume of 9.1 million bales expected for fiscal 1969-70 and would result in an annual utilization rate of about 70 percent for those plants remaining in operation. Belt-wide, such a rate would eliminate nearly 68 percent of the existing space in the long run.

#### IMPLICATIONS

It is difficult to make conclusions concerning changes in the importance of compresses relative to warehouses because the two types of facilities tend to serve two different functions. Compressing is done to reduce bulkiness for transportation purposes.

A large portion of the textile industry is located in the Southeast. Therefore, the short distances involved in moving cotton produced in the Southeast from farm to processor make compressing unnecessary in this area. Regional shifts in cotton production would likely have a major impact on the relative importance of compresses and warehouses. Such speculation, however, is beyond the scope of this study.

Continued surpluses of storage space, declining volumes, and increasing prices are underlying economic forces which will cause the industry to work itself toward an equilibrium position. However, because of variations among areas in the amount of storage space required, differences in cost levels, and the distribution of facilities between compresses and warehouses, the equilibrium position for each area may be different. The results of this study provide a good indication as to how the impact of the adjustments process will be distributed.

In warehouses, the cost structure associated with handling cotton was found to be essentially the same across all regions, as opposed to some variation in storing cotton. The impact of eliminating surplus capacity in warehouses will not likely be distributed across regions in direct proportion to existing capacity since storage costs are the major component of total or combined storage and handling costs. Obviously, the Southeast has the most capacity to lose in an absolute sense since it has more space. Also, since most firms in this region have a capacity of 15,000 bales or less, it is at a distinct cost disadvantage. In terms of size, the firms with relatively small facilities will, as a group, bear the major portion of the burdens associated with declining industry capacity. No doubt some small firms will be able to compete favorably with larger operations; but on the average, their costs are higher and a large portion are not competitive. Economies of scale are evident in the South Central and Southwest regions which have more large facilities than the other regions. However, the South Central region has a definite cost advantage and should stand to lose less total capacity of warehouse space relative to the Southwest.

A somewhat different cost situation was found to exist for compresses. The structure of total costs differed between regions, meaning that the impact of the downward adjustment in capacity would not likely be distributed evenly or proportionately across all regions. However, in common with warehouses there was strong evidence of economies of scale which would indicate that the impact of adjusting firms out of the industry would fall more on the smaller operations as a group.

Of the five groups of compresses, the distinctive characteristics of ports should be recognized. First, they do not compete to any great degree with the other compresses. Ports primarily handle cotton destined for export as opposed to the domestically consumed cotton stored at other compresses. Their volume is dependent for the most part upon foreign demand for U.S. cotton which will, in turn, partly determine the total capacity needed. Ports tend to have large plant facilities so that, with only a limited range in size, there is little evidence of economies of scale. Ports have generally higher costs for inputs and are not the lowest cost group of compresses. Because of their noncompetitive nature any forces of change will reflect the competitive position of U.S. cotton on the world market.

The other four regions are to some extent in direct competition with one another for domestically produced cotton, although cotton would not be expected to move westward for storage because of the general movement eastward for consumption. The Southeast-South Central region has slightly lower average costs and therefore a slight cost advantage over the other regions. Two factors account for this advantage. First, the Southeast-South Central region tends to have a lower total cost structure than the other regions. Second, its larger number of operations with capacity in excess of 50,000 bales gives it the additional benefit derived from economies of scale. From the point of view of being cost disadvantaged, the Southeast should suffer the proportionately greatest decline in capacity since there are so few large operations in this area. However, the Southeast, like the ports, is in a somewhat unique position. The demand for their services reflects mill demand for cotton and the need to concentrate at least working inventories near consumption points. Additionally, demand for compression results primarily from mill demands for compression of flat cotton from the Southeast to facilitate storage and handling with cotton from other areas.

There was little difference between the level of costs in the Southwest and West, particularly among the larger plants with about the same utilization of capacity. As mentioned previously, the average size of existing operations probably will increase in all four regions as a larger proportion of small firms are forced out.

Faced with sharp increases in cost of inputs and stronger competition for available stocks, the warehousing industry may be unable to increase charges sufficiently to cover increases in operating cost. As a result, many firms may no longer be profitable and may be unable to accumulate sufficient capital necessary for improving present facilities or constructing modern facilities which will provide efficient low-cost operation. If these firms are to continue operating they will need to adjust their operations to offset these changes, but it is questionable whether all will be able to do so successfully. The future of the cotton storage and handling industry will depend upon a sufficient number of these firms being able to successfully adjust their operations for more efficient handling and storage.

## APPENDIX A

### Allocation of Costs

Allocation of cost items to functions was made in a uniform manner for each plant according to the following plan:

#### A. Fixed cost

1. Building depreciation. Based on estimates obtained from warehousemen as to the percentage of total space utilized for storage, receiving, compression, shipping, and other functions.
2. Equipment depreciation.
  - a. Compress equipment--direct to compression.
  - b. Materials-handling equipment--percentage of total hours used in each function.
  - c. Other minor equipment--percentage of total revenue received from each function.
3. Insurance and taxes. Buildings insurance and taxes were allocated in same manner as item A-1; equipment in the same manner as items A-2a, A-2b, and A-2c.
4. Leases and rentals. Building leases were allocated to functions in the same manner as item A-1. Leases of equipment in same manner as equipment depreciation in items A-2a, A-2b, and A-2c.
5. Interest on capital investment. Percentage of total revenue received from each function.

#### B. Variable cost

1. Personnel expense.
  - a. Executive--percentage of total revenue received for each function.
  - b. Management--percentage of total labor hours for each function.
  - c. Supervisory--hours as recorded to specific service, remainder, percentage of total labor hours to each function.
  - d. Engineering and mechanics--estimates by firm personnel.
  - e. Handling labor--percentage of total labor hours to each function.
  - f. Watchmen and cleaning and maintenance--percentage of total warehouse space used in each function.



- g. Mechanics' helpers--estimated by firm personnel.
- h. Head clerk--percentage of total revenue received from each function.
- i. Other clerks--estimated by firm personnel.
- j. Repairs and maintenance--compression equipment direct; buildings and improvements same as item A-1; other plant equipment same as A-2b and A-2c.
- k. Materials-handling equipment--same as item 2b.
- l. License and bonds--direct to storage.
- m. Fuel compress--direct to compression.
- n. Other utilities--percentage of total revenue for each function.
- o. Home office--same as item n.
- p. Warehouse supplies--identifiable supplies direct to function, unidentifiable supplies percentage of total revenue received from each function.
- q. Office supplies--percentage of total revenue received from each function.
- r. Claims--direct to storage.
- s. Transportation expense--percentage of total revenue received from each function.
- t. Other miscellaneous cost--percentage of total revenue received from each function.
- u. Interest on working capital--percentage of total direct labor hours used in each function.

#### Replacement Costs

Replacement costs are based on estimates of current costs for a standard-type construction, that is, the typical type currently constructed.

Standard Depreciation Rate Schedule  
(Straight-line method)

Percent

Buildings and improvements:

Buildings (including sprinklers and foundations)	
Ironclad, wood frame.....	2.5
Brick, concrete, or steel.....	2.0
Wood.....	3.3
Compress equipment.....	3.0
Water tower and tanks.....	2.5
Railroad sidings.....	3.3
Roadways, pavement of grounds.....	5.0

Handling and automotive equipment:

Clamp trucks:	
5,000# and less.....	14.3
6,000# and over.....	16.7
Tractors.....	6.7
Trailers, warehouse, and yard.....	6.7
Handtrucks.....	4.0
Trucks, road.....	14.3
Automobiles.....	20.0
Conveyors.....	14.3

Other:

Office furniture and equipment.....	10.0
Shop equipment.....	6.7
Air compressor.....	6.7
Scales.....	5.0
Fire equipment.....	5.0
Personnel carriers.....	10.0
Motorized sweepers.....	14.3

Basis for Projecting 1968-69 Cost to 1969-70

The factors used to project 1968-69 costs to 1969-70 are shown below:

Cost items	Percentage increase from 1968-69 to 1969-70
<u>Fixed cost</u>	
Depreciation	1/
Insurance	6.0
Taxes	6.0
Interest on investment	6.0
<u>Variable cost</u>	
Labor	6.0
Personnel	6.0
Electricity, fuel, etc.	none
Repairs and maintenance buildings	6.0
Materials-handling equipment	11.0
Insurance, cotton	none
All other items	4.0

1/ Building cost computed at \$2.57 per square foot for compresses in 1969-70 and \$2.40 per square foot for warehouses. Depreciation was computed at 2.6 percent of the total cost so derived.

## APPENDIX B

Selected Tables

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Table 29.--Sample plants included in survey: Number, capacity and major services performed, by area and type of facility, fiscal 1964-65

Type of facility and area	No.	Total cotton storage capacity 1/	Total bale-months of storage	Average occupancy 2/	Average months of storage per bale	Receipts	Shipments	Revenue		Resampling and reweighing	
								Bales	Pct.		Months
<b>Warehouses: 4/</b>											
Southeast 5/.....	34	643,756	4,965,196	72.5	6.9	404,598	353,756	--	--	57,632	18,117
South Central 6/.....	13	471,980	4,148,490	61.3	9.1	113,608	50,950	--	--	22,922	10,528
Southwest 7/.....	13	196,400	1,587,285	65.8	6.3	131,122	152,729	--	--	12,133	23,237
Total warehouses...	60	1,312,136	10,700,971	70.0	7.1	649,328	557,435	--	--	92,687	51,882
<b>Compresses: 4/</b>											
Southeast 5/.....	3	126,280	664,551	44.2	4.5	95,324	86,772	93,550	4,252	29,809	565
South Central 6/.....	29	2,665,333	17,240,374	56.3	5.6	2,099,737	2,071,019	1,681,283	236,835	317,489	80,541
Southwest 7/.....	19	1,698,195	13,692,566	56.7	5.8	1,319,361	1,213,862	800,532	475,822	77,046	36,128
West 8/.....	12	1,010,100	5,893,875	51.7	3.4	1,332,572	1,226,562	659,492	564,824	12,844	388
Ports 9/.....	10	1,216,780	8,156,633	53.3	4.6	1,348,517	1,217,469	193,462	576,231	175,804	8,603
Total compresses...	73	6,716,688	45,647,999	55.0	5.2	6,195,511	5,815,684	3,428,319	1,857,964	612,992	126,225

1/ Includes space approved by CCC less space converted to other uses.  
 2/ Service performed requiring the removal of the bale from storage and return.  
 3/ Service performed at time of another service but usually at time of shipment.  
 4/ Warehouses are storage facilities without compress equipment. Compresses are storage facilities with compress equipment.  
 5/ Includes Alabama, Georgia, North Carolina, and South Carolina.  
 6/ Includes Arkansas, Louisiana, Mississippi, Missouri, and Tennessee.  
 7/ Includes Oklahoma and Texas, excluding district 6.  
 8/ Includes Arizona, California, New Mexico, and district 6, Texas, combined with Southwest in the analysis.  
 9/ Includes Gulf Port facilities in Louisiana and Texas.

Table 30.--Sample plants included in survey: Number, capacity, and major services performed, by area and type of facility, fiscal 1968-69

Type of facility and area	No.	Bales	Total cotton storage capacity 1/	Total bale-months of storage	Average occupancy	Average months of storage per bale	Months	Bales	Receipts	Shipments	Revenue		Resampling and reweighing
											Bales	compression	
<b>Warehouses: 4/</b>													
Southeast 5/.....	24	483,484		1,328,223	22.9	4.2	194,568	272,075	--	--	6,950	7,789	
South Central 6/.....	9	420,298		2,623,584	48.3	6.5	67,387	265,600	--	--	1,445	922	
Southwest 7/.....	12	346,860		1,905,938	36.3	4.6	290,930	223,906	--	--	2,163	22,184	
West 8/.....	3	15,500		70,200	34.5	3.0	15,651	12,110	--	--	4,358	189	
Total warehouses..	48	1,266,142		5,927,945	29.5	4.6	568,536	773,691	--	--	14,916	31,084	
<b>Compresses: 4/</b>													
Southeast 5/.....	5	247,900		838,906	29.0	3.7	148,534	201,972	97,841	8,239	7,363	796	
South Central 6/.....	27	2,598,750		7,533,256	31.4	4.7	1,247,945	1,269,754	849,802	106,208	57,806	27,598	
Southwest 7/.....	18	1,669,450		6,711,887	21.6	4.0	1,128,143	967,066	477,463	675,440	33,919	416,015	
West 8/.....	13	1,487,750		9,945,135	54.4	5.6	1,397,510	1,030,646	580,752	233,563	57,806	275,988	
Ports 9/.....	9	1,077,135		4,331,757	31.8	3.5	829,933	1,048,702	119,979	503,792	76,581	40,018	
Total compresses..	72	7,080,985		29,360,941	31.9	4.4	4,752,065	4,518,140	2,125,837	1,527,242	233,475	760,415	

1/ Includes space approved by CCC for cotton storage less space converted to other uses. Converted space was approximately 472,000 bales.

2/ Service performed requiring the removal of the bale from storage and returning to storage.

3/ Service performed at time of another service but usually at time of shipment.

4/ Warehouses are storage facilities without compress equipment. Compresses are storage facilities with compress equipment.

5/ Includes Alabama, Georgia, North Carolina, and South Carolina.

6/ Includes Arkansas, Louisiana, Mississippi, Missouri, and Tennessee.

7/ Includes Oklahoma and Texas, excluding district 6.

8/ Includes Arizona, California, New Mexico, and district 6, Texas, combined with Southwest in the analysis.

9/ Includes Gulf Port facilities in Louisiana and Texas.

Table 31.--Stocks of cotton: Estimated volumes stored in public storage and at compresses, by region and months, fiscal 1969-70 1/

Months	Region					Total
	South-east	South Central	South-west	West	Other	
----- <u>1,000 bales</u> -----						
Volumes in storage, end of:						
August.....	1,024.6	1,002.1	1,366.5	330.7	25.1	3,749.0
September.....	1,036.5	1,074.1	1,307.1	280.0	25.3	3,723.0
October.....	1,244.6	2,837.2	1,701.4	743.2	27.6	6,554.0
November.....	1,293.4	3,227.3	2,316.0	1,445.4	24.9	8,307.0
December.....	1,305.7	3,050.8	2,970.4	1,786.3	23.8	9,137.0
January.....	1,251.9	2,740.4	2,907.1	1,712.1	22.5	8,634.0
February.....	1,236.3	2,438.4	2,677.4	1,595.6	18.3	7,966.0
March.....	1,179.2	2,115.0	2,531.1	1,448.1	14.6	7,288.0
April.....	1,084.2	1,813.1	1,975.9	1,261.2	11.6	6,146.0
May.....	967.5	1,601.4	1,616.8	1,126.1	10.2	5,322.0
June.....	864.4	1,438.7	1,364.3	943.4	9.2	4,620.0
July.....	755.6	1,247.5	1,195.7	808.2	8.0	4,015.0

1/ Based on estimated production of 10.0 million bales. Monthly volumes in storage by region estimated based on 5-year average obtained from Current Industrial Report, Series M22P, U.S. Department of Commerce, Bureau of the Census (Monthly).



Table 32.--Receiving: Estimated cost per bale at selected warehouses, by area and United States, fiscal 1964-65

Cost item	Area			
	South- east	South Central	South- west	United States
	- - - - - Dollars per bale - - - - -			
<u>Fixed costs:</u> <sup>1/</sup>				
Depreciation.....	0.032	0.044	0.021	0.032
Insurance.....	.006	.004	.002	.005
Taxes.....	.008	.005	.003	.007
Leases and rentals.....	.015	.050	.007	.019
Other.....	.010	.006	.004	.009
Interest on investment.....	.059	.198	.075	.081
Total fixed costs.....	.130	.307	.112	.153
<u>Variable costs:</u>				
Personnel expenses.....	.584	.615	.457	.572
Handling equipment.....	.050	.101	.075	.060
Repairs & maintenance.....	.016	.018	.003	.015
Other utilities.....	.009	.027	.007	.011
Home office.....	.022	.010	.051	.024
Warehouse supplies.....	.055	.065	.046	.055
Office supplies.....	.004	.005	.004	.004
Claims.....	--	--	--	--
Transportation expenses.....	.020	.003	.010	.016
Other.....	.018	.036	.018	.021
Interest, working capital.....	.008	.011	.013	.009
Total variable costs.....	.786	.891	.684	.787
Total fixed and variable costs....	.916	1.198	.796	.940

<sup>1/</sup> Depreciation and interest on investment based on replacing facilities and equipment at 1964-65 price levels.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 33.--Receiving: Estimated cost per bale at selected warehouses, by area and United States, fiscal 1969-70 1/

Cost item	Area				
	South- east	South Central	South- west	West	United States
	- - - - - Dollars per bale - - - - -				
<u>Fixed costs:</u> <sup>2/</sup>					
Depreciation.....	0.114	0.096	0.070	0.082	0.098
Insurance.....	.021	.027	.011	.014	.019
Taxes.....	.036	.017	.017	.034	.028
Leases and rentals.....	--	--	--	--	--
Interest on investment.....	.138	.173	.149	.057	.142
Total fixed costs.....	.309	.313	.247	.187	.287
<u>Variable costs:</u> <sup>3/</sup>					
Personnel expenses.....	1.000	.530	.594	.502	.776
Handling equipment.....	.113	.034	.067	.067	.084
Repairs & maintenance.....	.011	.014	.009	.013	.011
Other utilities.....	.022	.015	.019	.017	.023
Home office.....	.029	.071	.066	.087	.050
Warehouse supplies.....	.004	.035	.031	.008	.017
Office supplies.....	--	.009	.006	.002	.003
Claims.....	--	--	--	--	--
Transportation expenses.....	.002	.018	.002	.004	.005
Other.....	.021	.017	.027	.024	.022
Interest, working capital.....	.036	.019	.021	.025	.028
Total variable costs.....	1.238	.762	.842	.749	1.019
Total fixed and variable costs..	1.547	1.075	1.089	.936	1.306

1/ Based on estimated production of 10.0 million bales. Volumes of cotton were assumed to be distributed in the same pattern as prevailed in 1968-69.

2/ Depreciation and interest on investment based on replacing facilities and equipment at 1969-70 price levels.

3/ Cost developed from sample firms for 1968-69 were adjusted to reflect estimated changes expected to be incurred in 1969-70.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 34.--Receiving: Estimated cost per bale at selected compresses, by area and United States, fiscal 1964-65

Cost item	Area					
	South- east	South Central	South- west	West	Ports	United States
	----- <u>Dollars per bale</u> -----					
<b>Fixed costs:<sup>1/</sup></b>						
Depreciation.....	0.037	0.024	0.019	0.025	0.017	0.022
Insurance.....	.004	.004	.002	.002	.003	.003
Taxes.....	.011	.006	.002	.007	.008	.006
Leases and rentals.....	.006	*	.004	.001	.017	.004
Other.....	.003	.002	.002	.003	.003	.002
Interest on investment..	.057	.065	.091	.052	.075	.071
<b>Total fixed costs.....</b>	<b>.118</b>	<b>.101</b>	<b>.120</b>	<b>.090</b>	<b>.123</b>	<b>.108</b>
<b>Variable costs:</b>						
Personnel expenses.....	.533	.385	.383	.398	.387	.392
Handling equipment.....	.063	.079	.058	.060	.050	.066
Repairs & maintenance...	.011	.007	.004	.006	.003	.006
Other utilities.....	.008	.003	.002	.011	.004	.004
Home office.....	.008	.028	.035	.034	.012	.027
Warehouse supplies.....	.052	.053	.043	.057	.037	.048
Office supplies.....	.006	.005	.003	.003	.003	.004
Claims.....	--	--	--	.002	--	*
Transportation expenses..	*	.001	.013	.002	.006	.005
Other.....	.014	.009	.014	.010	.015	.012
Interest, working capital.....	.007	.007	.010	.006	.010	.008
<b>Total variable costs..</b>	<b>.702</b>	<b>.577</b>	<b>.565</b>	<b>.589</b>	<b>.527</b>	<b>.572</b>
<b>Total fixed and variable costs.....</b>	<b>.820</b>	<b>.678</b>	<b>.685</b>	<b>.679</b>	<b>.650</b>	<b>.680</b>

<sup>1/</sup> Depreciation and interest on investment based on replacing facilities and equipment at 1964-65 price levels.

\* Less than \$0.0005 per bale.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 35.--Receiving: Estimated cost per bale at selected compresses, by area and United States, fiscal 1969-70 1/

Cost item	Area					
	South- east	South Central	South- west	West	Ports	United States
	----- <u>Dollars per bale</u> -----					
<b>Fixed costs:</b>						
Depreciation.....	0.081	0.079	0.094	0.027	0.055	0.071
Insurance.....	.011	.011	.009	.004	.009	.009
Taxes.....	.026	.027	.034	.015	.037	.028
Leases and rentals.....	--	--	--	--	--	--
Interest on investment..	.133	.158	.171	.046	.133	.135
<b>Total fixed costs.....</b>	<b>.251</b>	<b>.275</b>	<b>.308</b>	<b>.092</b>	<b>.234</b>	<b>.243</b>
<b>Variable costs:</b>						
Personnel expenses.....	.676	.574	.524	.287	.640	.525
Handling equipment.....	.070	.073	.058	.045	.084	.065
Repairs & maintenance...	.022	.017	.010	.002	.018	.013
Other utilities.....	.014	.008	.012	.009	.011	.010
Home office.....	.029	.090	.036	.033	.003	.051
Warehouse supplies.....	.029	.068	.051	.037	.089	.058
Office supplies.....	.007	.014	.004	.002	.021	.010
Claims.....	--	--	--	--	--	--
Transportation expenses..	.002	.003	.012	.001	.005	.005
Other.....	.020	.009	.015	.007	.014	.012
Interest, working capital.....	.023	.023	.020	.015	.027	.021
<b>Total variable costs..</b>	<b>.892</b>	<b>.879</b>	<b>.742</b>	<b>.438</b>	<b>.912</b>	<b>.770</b>
<b>Total fixed and variable costs.....</b>	<b>1.143</b>	<b>1.154</b>	<b>1.050</b>	<b>.530</b>	<b>1.146</b>	<b>1.013</b>

1/ See footnotes, table 33, for basic assumptions.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 36.--Storage: Estimated cost per bale at selected warehouses, by area and United States, fiscal 1964-65

Cost item	Area			
	South- east	South Central	South- west	United States
	----- Dollars per bale -----			
<u>Fixed costs:</u> <sup>1/</sup>				
Depreciation.....	0.024	0.044	0.048	0.030
Insurance.....	.005	.004	.005	.005
Taxes.....	.007	.007	.009	.007
Leases and rentals.....	.027	.024	.029	.027
Other.....	.003	.001	.002	.003
Interest on investment.....	.036	.037	.046	.037
<b>Total fixed costs.....</b>	<b>.102</b>	<b>.117</b>	<b>.139</b>	<b>.109</b>
<u>Variable costs:</u>				
Personnel expenses.....	.080	.056	.080	.077
Handling equipment.....	.009	.006	.017	.010
Repairs & maintenance.....	.008	.017	.009	.009
Cotton, insurance.....	.034	.043	.031	.035
Other utilities.....	.005	.005	.008	.005
Home office.....	.005	.004	.024	.007
Warehouse supplies.....	*	.002	.002	.001
Office supplies.....	.002	.002	.002	.002
Claims.....	.001	.003	.003	.002
Transportation expenses.....	.005	.001	.003	.004
Other.....	.012	.011	.009	.011
Interest, working capital.....	.004	.003	.004	.004
<b>Total variable costs.....</b>	<b>.165</b>	<b>.153</b>	<b>.192</b>	<b>.167</b>
<b>Total fixed and variable costs....</b>	<b>.267</b>	<b>.270</b>	<b>.331</b>	<b>.276</b>

<sup>1/</sup> Depreciation and interest on investment based on replacing facilities and equipment at 1964-65 price levels.

\* Less than \$0.0005 per bale.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 37.--Storage: Estimated cost per bale per month at selected warehouses, by area and United States, fiscal 1969-70 1/

Cost item	Area					United States
	South-east	South Central	South-west	West		
	----- Dollars per bale -----					
<b>Fixed costs:</b>						
Depreciation.....	0.124	0.067	0.092	0.139	0.106	
Insurance.....	.013	.008	.010	.018	.012	
Taxes.....	.029	.005	.013	.054	.022	
Leases and rentals.....	--	--	--	--	--	
Interest on investment.....	.093	.057	.064	.047	.076	
<b>Total fixed costs.....</b>	<b>.259</b>	<b>.137</b>	<b>.179</b>	<b>.258</b>	<b>.216</b>	
<b>Variable costs:</b>						
Personnel expenses.....	.244	.047	.110	.123	.155	
Handling equipment.....	.017	.002	.012	.016	.013	
Repairs & maintenance.....	.028	.020	.020	.025	.024	
Cotton, insurance.....	.036	.019	.011	.047	.027	
Licenses and bonds.....	.008	.003	.003	.005	.006	
Other utilities.....	.016	.004	.010	.014	.012	
Home office.....	--	.013	.027	.069	.026	
Warehouse supplies.....	.009	.008	.005	.002	.007	
Office supplies.....	.004	.002	.002	.002	.003	
Claims.....	.002	.005	.001	--	.002	
Transportation expenses.....	.002	.004	.004	.003	.003	
Other.....	.014	.013	.011	.020	.013	
Interest, working capital.....	.004	.001	.002	.004	.003	
<b>Total variable costs.....</b>	<b>.384</b>	<b>.141</b>	<b>.218</b>	<b>.330</b>	<b>.294</b>	
<b>Total fixed and variable costs...</b>	<b>.643</b>	<b>.278</b>	<b>.397</b>	<b>.588</b>	<b>.510</b>	

1/ See footnotes, table 33, for basic assumptions.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 38.--Storage: Estimated cost per bale at selected compresses, by area and United States, fiscal 1964-65

Cost item	Area					
	South- east	South Central	South- west	West	Ports	United States
	Dollars per bale					
<b>Fixed costs:<sup>1/</sup></b>						
Depreciation.....	0.053	0.040	0.053	0.061	0.061	0.049
Insurance.....	.008	.005	.004	.006	.006	.005
Taxes.....	.022	.013	.012	.031	.028	.017
Leases and rentals.....	.009	.002	.016	.001	.036	.011
Other.....	.003	.001	.001	.002	.002	.001
Interest on investment..	.049	.040	.040	.036	.037	.039
<b>Total fixed costs.....</b>	<b>.144</b>	<b>.101</b>	<b>.126</b>	<b>.137</b>	<b>.170</b>	<b>.122</b>
<b>Variable costs:</b>						
Personnel expenses.....	.116	.079	.088	.116	.100	.090
Handling equipment.....	.022	.015	.014	.021	.012	.016
Repairs & maintenance...	.024	.014	.014	.017	.009	.014
Cotton, insurance.....	.036	.029	.014	.029	.007	.022
Other utilities.....	.009	.004	.005	.007	.008	.005
Home office.....	.006	.013	.015	.022	.007	.013
Warehouse supplies.....	.002	.005	.003	.007	.003	.004
Office supplies.....	.005	.003	.001	.002	.001	.002
Claims.....	.003	.003	.003	.002	.001	.003
Transportation expenses..	.019	*	.004	.002	.002	.002
Other.....	.012	.006	.007	.006	.007	.007
Interest, working capital.....	.005	.003	.002	.004	.004	.003
<b>Total variable costs...</b>	<b>.259</b>	<b>.174</b>	<b>.170</b>	<b>.235</b>	<b>.161</b>	<b>.181</b>
<b>Total fixed and variable costs.....</b>	<b>.403</b>	<b>.275</b>	<b>.296</b>	<b>.372</b>	<b>.331</b>	<b>.303</b>

<sup>1/</sup> Depreciation and interest on investment based on replacing facilities and equipment at 1964-65 price levels.

\* Less than \$0.0005 per bale.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 39.--Storage: Estimated cost per bale per month at selected compresses, by area and United States, fiscal 1969-70 1/

Cost item	Area					
	South- east	South Central	South- west	West	Ports	United States
	----- Dollars per bale -----					
<b>Fixed costs:</b>						
Depreciation.....	0.115	0.102	0.152	0.060	0.107	0.108
Insurance.....	.011	.008	.011	.006	.009	.009
Taxes.....	.027	.026	.032	.030	.048	.031
Leases and rentals.....	--	--	--	--	--	--
Interest on investment..	.087	.068	.078	.044	.069	.068
<b>Total fixed costs.....</b>	<b>.240</b>	<b>.204</b>	<b>.273</b>	<b>.140</b>	<b>.233</b>	<b>.216</b>
<b>Variable costs:</b>						
Personnel expenses.....	.170	.118	.120	.073	.105	.113
Handling equipment.....	.011	.014	.011	.013	.014	.013
Repairs & maintenance...	.069	.041	.025	.025	.047	.036
Cotton, insurance.....	.010	.014	.006	.016	.003	.010
Licenses and bonds.....	.012	.008	.004	.001	.005	.006
Other utilities.....	.007	.003	.005	.010	.004	.005
Home office.....	.012	.036	.015	.037	.003	.025
Warehouse supplies.....	.005	.010	.004	.006	.007	.007
Office supplies.....	.006	.005	.002	.002	.016	.005
Claims.....	.003	.030	.004	.002	.005	.013
Transportation expenses..	.001	.001	.007	.001	.002	.003
Other.....	.012	.004	.007	.010	.005	.007
Interest, working capital.....	.002	.002	.004	.002	.002	.002
<b>Total variable costs..</b>	<b>.320</b>	<b>.286</b>	<b>.214</b>	<b>.198</b>	<b>.218</b>	<b>.245</b>
<b>Total fixed and variable costs.....</b>	<b>.560</b>	<b>.490</b>	<b>.487</b>	<b>.338</b>	<b>.451</b>	<b>.461</b>

1/ See footnotes, table 33, for basic assumptions.

Note: The sum of individual costs may not always add to the totals due to rounding.



Table 40.--Break-out: Estimated cost per bale at selected warehouses, by area and United States, fiscal 1964-65

Cost item	Area			
	South- east	South Central	South- west	United States
	- - - - - Dollars per bale - - - - -			
<u>Fixed costs:</u> <sup>1/</sup>				
Depreciation.....	0.003	0.004	0.001	0.003
Insurance.....	*	*	*	*
Taxes.....	*	--	--	*
Leases and rentals.....	*	*	--	*
Other.....	.003	.003	*	.003
Interest on investment.....	.026	.054	.003	.027
<b>Total fixed costs.....</b>	<b>.032</b>	<b>.061</b>	<b>.004</b>	<b>.033</b>
<u>Variable costs:</u>				
Personnel expenses.....	.698	.743	.321	.656
Handling equipment.....	.089	.295	.115	.121
Repairs & maintenance.....	*	--	--	*
Other utilities.....	.005	.003	.001	.004
Home office.....	.011	.002	--	.008
Warehouse supplies.....	.001	.006	.006	.002
Office supplies.....	.001	.001	*	.001
Transportation expenses.....	.005	.001	*	.004
Other.....	.008	.011	.002	.008
Interest, working capital.....	.004	.004	.005	.004
<b>Total variable costs.....</b>	<b>.822</b>	<b>1.066</b>	<b>.450</b>	<b>.808</b>
<b>Total fixed and variable costs.....</b>	<b>.854</b>	<b>1.127</b>	<b>.454</b>	<b>.841</b>

<sup>1/</sup> Depreciation and interest on investment based on replacing facilities and equipment at 1964-65 price levels.

\* Less than \$0.0005 per bale.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 41.--Break-out: Estimated cost per bale at selected warehouses, by area and United States, fiscal 1969-70 1/

Cost item	Area				
	South- east	South Central	South- west	West	United States
	- - - - - Dollars per bale - - - - -				
<b>Fixed costs:</b>					
Depreciation.....	0.037	0.051	0.045	0.040	0.042
Insurance.....	.016	.011	.010	.008	.013
Taxes.....	.029	.009	.017	.025	.022
Leases and rentals.....	--	--	--	--	--
Interest on investment.....	--	.003	.014	--	.004
<b>Total fixed costs.....</b>	<b>.082</b>	<b>.074</b>	<b>.086</b>	<b>.073</b>	<b>.081</b>
<b>Variable costs:</b>					
Personnel expenses.....	.551	.620	.437	.164	.511
Handling equipment.....	.105	.125	.121	.047	.109
Repairs & maintenance.....	--	--	--	--	--
Other utilities.....	--	.001	.002	--	.001
Home office.....	--	.002	.011	--	.003
Warehouse supplies.....	.008	.050	.014	--	.017
Office supplies.....	--	--	--	--	--
Transportation expenses.....	--	--	--	--	--
Other.....	--	.004	.001	--	.001
Interest, working capital.....	.030	.025	.018	.011	.025
<b>Total variable costs.....</b>	<b>.694</b>	<b>.827</b>	<b>.604</b>	<b>.222</b>	<b>.667</b>
<b>Total fixed and variable costs...</b>	<b>.776</b>	<b>.901</b>	<b>.690</b>	<b>.295</b>	<b>.748</b>

1/ See footnotes, table 33, for basic assumptions.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 42.--Break-out: Estimated cost per bale at selected compresses, by and United States, fiscal 1964-65

Cost item	Area				
	South- east	South Central	South- west	West	Ports
	<u>Dollars per bale</u>				
<u>Fixed costs: 1/</u>					
Depreciation.....	0.001	--	--	0.002	--
Insurance.....	*	--	--	--	--
Taxes.....	--	--	--	--	--
Leases and rentals.....	--	--	--	.001	--
Other.....	.001	--	--	.001	--
Interest on investment..	.022	--	--	.008	--
Total fixed costs.....	.024	--	--	.012	--
<u>Variable costs:</u>					
Personnel expenses.....	.413	.312	.289	.329	.310
Handling equipment.....	.043	.155	.147	.138	.153
Repairs & maintenance...	--	--	--	--	--
Other utilities.....	.001	--	--	.002	--
Home office.....	.007	--	--	.002	--
Warehouse supplies.....	.003	.006	.007	.002	.002
Office supplies.....	.002	--	--	.001	--
Transportation expenses..	.009	--	--	--	--
Other.....	.004	--	--	.002	--
Interest, working capital.....	.002	.001	.005	.001	.002
Total variable costs...	.484	.474	.448	.477	.467
Total fixed and variable costs.....	.508	.474	.448	.489	.467

1/ Depreciation and interest on investment based on replacing facilities equipment at 1964-65 price levels.

\* Less than \$0.0005 per bale.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 43.--Break-out: Estimated cost per bale at selected compresses, by area and United States, fiscal 1969-70 1/

Cost item	Area					
	South- east	South Central	South- west	West	Ports	United States
	----- <u>Dollars per bale</u> -----					
<b>Fixed costs:</b>						
Depreciation.....	.015	.043	.037	.032	.052	.039
Insurance.....	.005	.008	.005	.013	.008	.008
Taxes.....	.014	.030	.008	.021	.055	.025
Leases and rentals.....	--	--	--	--	--	--
Interest on investment..	--	--	.007	--	--	*
<b>Total fixed costs.....</b>	<b>.034</b>	<b>.081</b>	<b>.057</b>	<b>.066</b>	<b>.115</b>	<b>.072</b>
<b>Variable costs:</b>						
Personnel expenses.....	.610	.390	.321	.444	.361	.404
Handling equipment.....	.066	.112	.052	.138	.151	.103
Repairs & maintenance....	--	--	.002	--	--	*
Other utilities.....	--	--	--	--	--	--
Home office.....	--	--	.001	--	--	*
Warehouse supplies.....	.010	.008	.001	.010	.005	.006
Office supplies.....	--	--	.008	--	--	*
Transportation expenses..	--	--	--	--	--	--
Other.....	--	--	--	--	--	--
Interest, working capital.....	.029	.022	.017	.022	.024	.021
<b>Total variable costs...</b>	<b>.715</b>	<b>.532</b>	<b>.402</b>	<b>.614</b>	<b>.541</b>	<b>.534</b>
<b>Total fixed and variable costs.....</b>	<b>.749</b>	<b>.613</b>	<b>.459</b>	<b>.680</b>	<b>.656</b>	<b>.606</b>

1/ See footnotes, table 33, for basic assumptions.

\* Less than \$0.0005 per bale.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 44.--Shipping: Estimated cost per bale at selected warehouses, by area and United States, fiscal 1964-65

Cost item	Area			
	South- east	South Central	South- west	United States
	Dollars per bale			
<u>Fixed costs:</u> <sup>1/</sup>				
Depreciation.....	0.022	0.221	0.034	0.051
Insurance.....	.005	.009	.003	.005
Taxes.....	.008	.016	.005	.009
Leases and rentals.....	.014	.214	.010	.041
Other.....	.005	.002	.002	.004
Interest on investment.....	.028	.073	.044	.036
Total fixed costs.....	.082	.535	.098	.146
<u>Variable costs:</u>				
Personnel expenses.....	.260	.342	.208	.265
Handling equipment.....	.048	.068	.063	.053
Repairs & maintenance.....	.017	.025	.005	.017
Other utilities.....	.006	.020	.006	.008
Home office.....	.007	.006	.030	.010
Warehouse supplies.....	.001	.014	.001	.003
Office supplies.....	.001	.002	.002	.001
Transportation expenses.....	.006	.002	.004	.005
Other.....	.009	.014	.007	.009
Interest, working capital.....	.005	.005	.007	.005
Total variable costs.....	.360	.498	.333	.376
Total fixed and variable costs....	.442	1.033	.431	.522

<sup>1/</sup> Depreciation and interest on investment based on replacing facilities and equipment at 1964-65 price levels.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 45.--Shipping: Estimated cost per bale at selected warehouses, by area and United States, fiscal 1969-70 1/

Cost item	Area				
	South- east	South Central	South- west	West	United States
	- - - - - Dollars per bale - - - - -				
<b>Fixed costs:</b>					
Depreciation.....	0.092	0.066	0.059	0.087	0.079
Insurance.....	.020	.020	.009	.014	.017
Taxes.....	.025	.010	.014	.038	.020
Leases and rentals.....	--	--	--	--	--
Interest on investment.....	.175	.107	.132	.029	.142
<b>Total fixed costs.....</b>	<b>.312</b>	<b>.203</b>	<b>.214</b>	<b>.168</b>	<b>.258</b>
<b>Variable costs:</b>					
Personnel expenses.....	.705	.292	.451	.154	.529
Handling equipment.....	.079	.039	.067	.013	.064
Repairs & maintenance.....	.011	.011	.006	.022	.010
Other utilities.....	.030	.007	.018	.008	.021
Home office.....	--	.017	.045	.043	.017
Warehouse supplies.....	.005	.050	.016	.001	.016
Office supplies.....	.006	.005	.004	.001	.005
Transportation expenses.....	.003	.007	.001	.002	.003
Other.....	.020	.031	.022	.011	.021
Interest, working capital.....	.021	.010	.013	.003	.016
<b>Total variable costs.....</b>	<b>.880</b>	<b>.459</b>	<b>.643</b>	<b>.258</b>	<b>.702</b>
<b>Total fixed and variable costs..</b>	<b>1.192</b>	<b>.662</b>	<b>.857</b>	<b>.426</b>	<b>.960</b>

1/ See footnotes, table 33, for basic assumptions.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 46.--Shipping: Estimated cost per bale at selected compresses, by area and United States, fiscal 1964-65

Cost item	Area					
	South- east	South Central	South- west	West	Ports	United States
	Dollars per bale					
<u>Fixed costs:</u> <sup>1/</sup>						
Depreciation.....	0.025	0.019	0.024	0.033	0.020	0.020
Insurance.....	.003	.002	.002	.003	.003	.003
Taxes.....	.008	.006	.005	.009	.007	.007
Leases and rentals.....	.004	*	.004	.001	.019	.004
Other.....	.005	.001	.001	.004	.003	.003
Interest on investment..	.065	.032	.043	.056	.080	.043
Total fixed costs.....	.110	.060	.079	.106	.132	.080
<u>Variable costs:</u>						
Personnel expenses.....	.191	.196	.163	.161	.349	.200
Handling equipment.....	.036	.062	.061	.050	.114	.062
Repairs & maintenance...	.008	.005	.006	.006	.003	.003
Other utilities.....	.009	.002	.003	.010	.004	.003
Home office.....	.007	.009	.016	.037	.012	.012
Warehouse supplies.....	.002	.003	.001	.009	.001	.001
Office supplies.....	.006	.003	.002	.003	.003	.003
Claims.....	--	--	--	.002	--	*
Transportation expenses..	.010	*	.006	.004	.015	.006
Other.....	.018	.005	.007	.008	.017	.007
Interest, working capital.....	.008	.004	.005	.006	.010	.005
Total variable costs..	.296	.289	.270	.296	.528	.320
Total fixed and variable costs.....	.406	.349	.349	.402	.660	.400

<sup>1/</sup> Depreciation and interest on investment based on replacing facilities and equipment at 1964-65 price levels.

\* Less than \$0.0005 per bale.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 47.--Shipping: Estimated cost per bale at selected compresses, by area and United States, fiscal 1969-70 1/

Cost item	Area					
	South- east	South Central	South- west	West	Ports	United States
	----- <u>Dollars per bale</u> -----					
<b>Fixed costs:</b>						
Depreciation.....	0.041	0.066	0.065	0.073	0.072	0.066
Insurance.....	.006	.006	.005	.007	.007	.006
Taxes.....	.016	.023	.010	.020	.039	.021
Leases and rentals.....	--	--	--	--	--	--
Interest on investment..	.137	.106	.125	.076	.144	.112
<b>Total fixed costs.....</b>	<b>.200</b>	<b>.201</b>	<b>.205</b>	<b>.176</b>	<b>.262</b>	<b>.205</b>
<b>Variable costs:</b>						
Personnel expenses.....	.328	.265	.225	.172	.341	.253
Handling equipment.....	.044	.055	.031	.045	.102	.053
Repairs & maintenance...	.013	.015	.005	.011	.010	.011
Other utilities.....	.014	.006	.010	.018	.011	.010
Home office.....	.036	.051	.025	.066	.003	.040
Warehouse supplies.....	.010	.015	.018	.008	.032	.016
Office supplies.....	.007	.008	.003	.004	.042	.010
Claims.....	--	--	--	--	--	--
Transportation expenses..	.003	.002	.008	.002	.007	.004
Other.....	.022	.007	.013	.023	.015	.013
Interest, working capital.....	.007	.010	.008	.005	.014	.009
<b>Total variable costs..</b>	<b>.484</b>	<b>.434</b>	<b>.346</b>	<b>.354</b>	<b>.577</b>	<b>.419</b>
<b>Total fixed and variable costs.....</b>	<b>.684</b>	<b>.635</b>	<b>.551</b>	<b>.530</b>	<b>.839</b>	<b>.624</b>

1/ See footnotes, table 33, for basic assumptions.

Note: The sum of individual costs may not always add to the totals due to rounding.



Table 48.--Standard-density compression: Estimated cost per bale at selected compresses, by area and United States, fiscal 1964-65

Cost item	Area					
	South- east	South Central	South- west	West	Ports	United States
	Dollars per bale					
<u>Fixed costs:</u> <sup>1/</sup>						
Depreciation.....	0.129	0.078	0.089	0.059	0.122	0.0
Insurance.....	.005	.006	.007	.008	.009	.0
Taxes.....	.008	.005	.006	.024	.014	.0
Leases and rentals.....	.004	.001	.007	.003	.020	.0
Other.....	.008	.003	.004	.008	.006	.0
Interest on investment..	.197	.111	.194	.150	.168	.1
Total fixed costs.....	.351	.204	.307	.252	.339	.2
<u>Variable costs:</u>						
Personnel expenses.....	.831	.553	.767	.775	1.034	.7
Handling equipment.....	.054	.014	.029	.027	.004	.0
Repairs & maintenance...	.020	.045	.062	.073	.065	.0
Other utilities.....	.102	.092	.086	.109	.076	.0
Home office.....	.031	.031	.072	.063	.030	.0
Warehouse supplies.....	.186	.103	.084	.116	.121	.1
Office supplies.....	.024	.009	.007	.011	.006	.0
Claims.....	--	--	--	.003	--	*
Transportation expenses..	.017	.002	.027	.003	.009	.0
Other.....	.039	.017	.030	.028	.033	.0
Interest, working capital.....	.020	.013	.019	.015	.021	.0
Total variable costs..	1.324	.879	1.183	1.223	1.399	1.0
Total fixed and variable costs.....	1.675	1.083	1.490	1.475	1.738	1.3

<sup>1/</sup> Depreciation and interest on investment based on replacing facilities and equipment at 1964-65 price levels.

\* Less than \$0.0005 per bale.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 49.--Standard-density compression: Estimated cost per bale at selected compresses, by area and United States, fiscal 1969-70 1/

Cost item	Area					
	South- east	South Central	South- west	West	Ports	United States
	----- Dollars per bale -----					
<b>Fixed costs:</b>						
Depreciation.....	0.150	0.199	0.203	0.173	0.151	0.186
Insurance.....	.009	.007	.009	.007	.007	.008
Taxes.....	.031	.022	.019	.020	.035	.023
Leases and rentals.....	--	--	--	--	--	--
Interest on investment..	.269	.271	.393	.191	.266	.286
<b>Total fixed costs.....</b>	<b>.459</b>	<b>.499</b>	<b>.624</b>	<b>.391</b>	<b>.459</b>	<b>.503</b>
<b>Variable costs:</b>						
Personnel expenses.....	1.168	.928	.980	1.106	1.218	1.026
Handling equipment.....	.058	.052	.030	.056	.035	.046
Repairs & maintenance...	.209	.130	.126	.094	.334	.153
Fuel, compress.....	.127	.112	.098	.108	.078	.105
Other utilities.....	.020	.015	.024	.004	.016	.016
Home office.....	.053	.156	.083	.101	.017	.103
Warehouse supplies.....	.099	.144	.119	.243	.195	.159
Office supplies.....	.011	.024	.010	.010	.013	.016
Claims.....	--	--	--	--	--	--
Transportation expenses..	.004	.011	.025	.003	.006	.012
Other.....	.033	.015	.035	.057	.019	.029
Interest, working capital.....	.043	.039	.040	.051	.055	.044
<b>Total variable costs..</b>	<b>1.825</b>	<b>1.626</b>	<b>1.570</b>	<b>1.833</b>	<b>1.986</b>	<b>1.709</b>
<b>Total fixed and variable costs.....</b>	<b>2.284</b>	<b>2.125</b>	<b>2.194</b>	<b>2.224</b>	<b>2.445</b>	<b>2.212</b>

1/ See footnotes, table 33, for basic assumptions.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 50.--High-density compression: Estimated cost per bale at selected compresses, by area and United States, fiscal 1964-65

Cost item	Area					
	South- east	South Central	South- west	West	Ports	United States
	Dollars per bale					
<u>Fixed costs:</u> <sup>1/</sup>						
Depreciation.....	0.170	0.113	0.113	0.071	0.133	0.113
Insurance.....	.005	.012	.008	.007	.012	.012
Taxes.....	.021	.008	.007	.034	.011	.011
Leases and rentals.....	.013	.001	.007	.002	.021	.002
Other.....	.015	.005	.004	.014	.006	.006
Interest on investment..	.206	.246	.249	.167	.198	.222
<b>Total fixed costs.....</b>	<b>.430</b>	<b>.385</b>	<b>.388</b>	<b>.295</b>	<b>.381</b>	<b>.377</b>
<u>Variable costs:</u>						
Personnel expenses.....	1.018	.839	.884	.930	1.083	.900
Handling equipment.....	.010	.022	.027	.034	.021	.022
Repairs & maintenance...	.060	.063	.080	.067	.069	.066
Other utilities.....	.130	.132	.111	.135	.093	.122
Home office.....	.003	.052	.122	.120	.026	.077
Warehouse supplies.....	.433	.345	.288	.374	.321	.333
Office supplies.....	.022	.013	.008	.011	.008	.011
Claims.....	--	.002	.001	.009	--	.002
Transportation expenses..	.001	.003	.040	.006	.006	.011
Other.....	.056	.027	.041	.027	.039	.033
Interest, working capital.....	.027	.022	.029	.019	.030	.022
<b>Total variable costs..</b>	<b>1.760</b>	<b>1.520</b>	<b>1.631</b>	<b>1.732</b>	<b>1.696</b>	<b>1.600</b>
<b>Total fixed and variable costs.....</b>	<b>2.190</b>	<b>1.905</b>	<b>2.019</b>	<b>2.027</b>	<b>2.077</b>	<b>1.987</b>

<sup>1/</sup> Depreciation and interest on investment based on replacing facilities and equipment at 1964-65 price levels.

Note: The sum of individual costs may not always add to the totals due to rounding.

Table 51.--High-density compression: Estimated cost per bale at selected compresses, by area and United States, fiscal 1969-70 1/

Cost item	Area					
	South- east	South Central	South- west	West	Ports	United States
	----- <u>Dollars per bale</u> -----					
<b>Fixed costs:</b>						
Depreciation.....	0.229	0.305	0.205	0.242	0.123	0.241
Insurance.....	.018	.013	.005	.006	.005	.009
Taxes.....	.037	.042	.014	.028	.023	.030
Leases and rentals.....	--	--	--	--	--	--
Interest on investment...	.460	.315	.344	.315	.224	.321
<b>Total fixed costs.....</b>	<b>.744</b>	<b>.675</b>	<b>.568</b>	<b>.591</b>	<b>.375</b>	<b>.601</b>
<b>Variable costs:</b>						
Personnel expenses.....	1.683	1.037	1.099	1.182	1.150	1.138
Handling equipment.....	.193	.128	.026	.066	.059	.087
Repairs & maintenance...	.471	.307	.127	.138	.288	.241
Fuel, compress.....	.178	.140	.082	.147	.093	.124
Other utilities.....	.040	.015	.025	.057	.021	.028
Home office.....	.112	.159	.055	.227	.004	.123
Warehouse supplies.....	.068	.300	.122	.413	.357	.267
Office supplies.....	.019	.030	.011	.012	.053	.024
Claims.....	--	--	--	--	--	--
Transportation expenses..	.011	.013	.018	.005	.013	.013
Other.....	.036	.030	.037	.045	.024	.034
Interest, working capital.....	.054	.055	.034	.064	.065	.053
<b>Total variable costs...</b>	<b>2.865</b>	<b>2.214</b>	<b>1.636</b>	<b>2.356</b>	<b>2.127</b>	<b>2.132</b>
<b>Total fixed and variable costs.....</b>	<b>3.609</b>	<b>2.889</b>	<b>2.204</b>	<b>2.947</b>	<b>2.502</b>	<b>2.733</b>

1/ See footnotes, table 33, for basic assumptions.

Note: The sum of individual costs may not always add to the totals due to rounding.

Determining Significance of a Regression Equation

Covariance analysis was used to determine which subgroups of data--geographical or time--should be combined under one regression equation and determine the appropriate functional form. There were three hypotheses tested in connection with fitting regressions to group combinations. They are: (1)  $H_1$ : One regression can be used for all groups. (2)  $H_2$ : The regression coefficient for each group is the same (constant terms are different). (3)  $H_3$ : A separate regression equation is required for each group. Under the covariance technique, direct tests of the first two hypotheses are made. The tests were carried out sequentially and the third hypothesis was accepted only after rejection of the first two.

Selection of Function

The selection of the functional form was dependent upon the derived estimating equation meeting certain prespecified conditions: (1) the equation must explain a reasonably high percentage of the variation in the costs ( $R^2 > 0.50$ ); (2) the regression coefficient of all independent variables ( $X_i$ 's raised to the first power) must be positive; and (3) all regression coefficients must be statistically significant.

Condition one is rather arbitrary. As the coefficient of multiple determination,  $R^2$  is an implicit indicator of the causal relationship between the independent variable(s) and the dependent variable and the equation should explain at least a substantial proportion of the variation in the dependent variable. Of course, a high proportion is nearly always preferable.

Condition two must be met for the handling functions because the coefficient reflects an average marginal cost for the industry, since the equation estimates total annual costs for individual firms based on volume handled. In theoretical terms, producing with a negative marginal cost is irrational and it is assumed that producers as a whole are rational.

The storage function is treated in a slightly different manner. The two components of total cost, fixed and variable costs, are estimated separately. Total fixed cost is estimated as a function of plant capacity. Expectations are that total fixed cost will increase with size of plant, thus yielding a positive coefficient.

Total variable cost (TVC) is estimated as a function of both capacity and utilization of facilities. Capacity is included to establish the level of the TVC curve, while percent occupancy determines the position on the respective TVC curve. The effect of an increase in the level of capacity would depend on the existence of economies or diseconomies of scale in a plant operation. A change in the degree of utilization is assumed to have a direct effect on TVC.

No assumption is made as to the sign of the constant term and no attempt will be made to draw implications from the size of the constant. When working

with a single firm, the constant term may, at times, be used as an indicator of fixed costs; that is the firm's costs if it ceased its operations. For an industry, the constant term, at best, would only be some sort of average fixed cost. Also, in the cases where no firms were operating near zero volume, drawing inferences about fixed cost based on the constant term entails an extrapolation outside the range of data on which the estimating equation is based. The validity of such an estimate would be highly suspect.

It is desirable to have every region in both years included under an estimating equation. Obviously, cases can arise for which all three conditions cannot be met simultaneously. If a functional form meeting all three conditions cannot be found, the third condition is compromised. Variable(s) that did not add significant information in a statistical context were added to improve the equation in an economic context. Likewise, statistically significant terms that caused a violation of condition two were dropped.

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