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Compilation of Recent Studies Relating to Cotton Ginning, And Other Aspects of Cotton Marketing

R. Charles Brooks

Extension Associate Professor of Economics

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R. Charles Brooks
Extension Associate Professor

Agricultural Extension Service
North Carolina State University at Raleigh

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PREFACE

The volume of published research relating to the broad category of cotton marketing has increased rapidly in recent years. Research on ginning costs, storage, cotton quality, fiber testing, and other subject matter areas has been conducted and published by a large number of private and public agencies. At the same time there has been a steady increase in professional personnel in education and research relating to cotton marketing.

The proliferation of research results in cotton marketing and an increase in the number of people using and generating new knowledge have brought about a need for a compilation of research results in this area of work. This publication is an attempt to meet this need. The report focuses on the objectives, methods, procedures, and results of some of the major research efforts in recent years. These studies were published primarily during the period 1960-1967 and are classified into six principal subject matter areas in order to facilitate use of the report. In a few instances the publication was not available for review. An additional section pertaining to sources of statistical information on cotton is added at the end.

It is hoped that this publication will be of value to research workers, educators, and others interested in research findings relating to cotton marketing. Portions of this report were taken directly from the studies being reported. An effort has been made to report only the major findings of individual studies, but at the same time to give the reader background information concerning methodology and kinds of data used in the analyses. Readers desiring additional information from a particular study would need to refer to the publication summarized in this report.

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I. INVESTMENT REQUIREMENTS AND OPERATING COSTS OF COTTON GINS

Anderson, R. F. Costs of Assembling and Ginning Cotton in Georgia Related to Size of Gin, Bulletin N.S. 153, Experiment: Georgia Experiment Station, University of Georgia, Department of Agricultural Economics, March 1966, 35 pages.

The objectives of this study were: (1) to estimate the costs of assembling seed cotton from farms to gins under varying densities of cotton production in Georgia; (2) to develop estimates of investment and operating costs for a series of gins of different sizes and volumes; and (3) to relate changes in total costs of assembling and ginning to changes in production density, length of ginning season, and volume ginned. Data on seed cotton assembly costs were obtained from personal interviews with a sample of cotton producers in three counties in south Georgia. Data on investment and operating costs for cotton trailers were obtained from producers and ginners. Data on investment costs and operating costs for gin plants were obtained from gin machinery manufacturers and a sample of ginners in Georgia.

Results indicate that in areas of dense production, gins operating at low volumes can obtain additional cotton for a relatively small increase in assembly cost. In contrast, gins in areas of sparse production already processing large volumes would incur much higher costs per bale because of the longer distances from which cotton must be assembled. Costs per bale declined for all gin models as the volume of ginnings increased. The problem to the ginner becomes one of obtaining larger volumes without increasing assembly or other costs above the savings in ginning costs. The combined costs of assembly and ginning per bale declined as volumes of cotton increased for all models and all densities of production analyzed in the study. This indicates that reductions in the cost of ginning more than compensated for the increased costs of assembling cotton from a wider area.

Bradford, Henry W. Cotton Cooperatives on the Plains of Texas--Services and Benefits, FCS Circular 33, Washington: U. S. Department of Agriculture, Farmer Cooperative Service, February 1966, 54 pages.

Brooks, R. Charles. Planning Agricultural Processing for the South--Cotton Ginning, Series No. 6, Raleigh: North Carolina State University, Agricultural Policy Institute, Department of Economics, September 1966, 13 pages.

The purpose of this publication was to provide information on investment requirements, operating costs, and volume-cost relationships for four different size cotton gins. Gin sizes selected for study had operating capacities of 4, 6, 8, and 12 bales per hour. The length of ginning season was restricted to a maximum of 800 hours of operations per season.

Although small gins are relatively more profitable at low volumes of output, small gins must operate nearer capacity levels than larger gins in order to achieve profitable returns. As volume is increased up to capacity levels, ginning costs decline more rapidly for larger gins than for small ones. Operating costs per bale tend to be lower for the larger gins but remain relatively stable for each gin at various output levels. There was only a 3-5 percent variation in operating costs per bale when volume increases from 1,000 bales per season to capacity levels of output for the four gin plants analyzed.

Cable, C. Curtis, Looney, Zolon M., Wilmot, Charles A. Utilization and Cost of Labor for Ginning Cotton, Agricultural Economic Report No. 70, Washington: U. S. Department of Agriculture, Economic Research Service, Marketing Economics Division, April 1965, 31 pages.

The purpose of this study was to obtain information that might help ginning firms lower their labor costs. Specific objectives of the study were: (1) to analyze the effects of plant layout, plant functions, and characteristics of the harvesting season on gin labor requirements and costs; (2) to develop labor performance standards for employees in typical gins during the peak of the season; (3) to determine the quantity and cost of labor actually used in typical gins during the peak of the season; and (4) to measure the savings in cost that could be realized from more efficient utilization of gin plant labor. Thirty-two gins located in the West, Texas High Plains, and Midsouth were selected for study. Input-output data and cost-output data were obtained from the gins.

Results indicate that gins in the West used an average of 59 man-minutes per bale during the peak week, compared with an average of 99 man-minutes for the entire season. Plants in the Texas High Plains used an average of 74 man-minutes per bale during the peak week and the season average was 167 man-minutes per bale. In the Midsouth, the average number of man-minutes used per bale was 73 for the peak week and 110 for the entire season. It was also found that three out of four gins had more employees in their day crews than they needed to operate efficiently during a peak day of the season. It was estimated that labor cost for the gins in the West could be reduced from $3.21 to $2.92 per bale. For the High Plains, labor costs per bale could be reduced from $3.75 to $2.96 and from $1.90 to $1.56 in the Midsouth.

Campbell, John D. Costs of Ginning Cotton by Cooperatives at Single-Gin and Two-Gin Plants, California and Texas, 1962, Marketing Research Report No. 640, Washington: U. S. Department of Agriculture, Farmer Cooperative Service, January 1964, 31 pages.

The primary purpose of this study was to determine and compare costs of ginning cotton in single-gin and two-gin plants in California and Texas. Results from the study are based on an analysis of data collected by personal survey of 36 cooperative ginning plants that operated 64 gins in 1961.

Comparative costs in the study were developed by the model approach. The major finding of this study was that single gins had a lower cost of 13 cents to $1.07 per bale than two-gin plants. This was caused primarily because cooperatives that operate two gins employ more office, supervisory, and skilled personnel on a year-round basis.

Campbell, John D. Costs of Using Cotton Basket-Storage Systems, Marketing Research Report No. 736, Washington: U. S. Department of Agriculture, Farmer Cooperative Service, November 1965, 25 pages.

The purpose of this study was to determine the cost of using cotton basket-storage systems. Examples of cost of ginning stored cotton and examples of total costs for plants using this method were developed. Data were obtained by personal interview with six of the seven gin cooperatives known to use basket storage in California and Texas in 1963.

It was estimated that the costs of storage in baskets ranged from $4.80 to $6.20 per bale in the San Joaquin Valley of California when 1.5 bales are stored per bale of basket capacity. In the Lubbock area of Texas, these costs ranged from $5.50 to $6.75 per bale. Ginning basket-stored cotton was estimated to cost $5.30 to $5.75 a bale in California and $6.00 to $6.15 a bale in Texas when excluding depreciation and other fixed costs. Costs shown in this report were estimates based on gins with a ginning capacity of ten bales per hour. When the costs of storing and ginning basket-stored cotton were combined with conventional ginning costs, in both states total cost per bale was lower for all volumes than costs for ginning solely in the conventional manner.

Campbell, John D. Effects of Electric Rates on Power Expenses of Cotton Gins--Arkansas, Oklahoma, Texas, Marketing Research Report 470, Washington: U. S. Department of Agriculture, Farmer Cooperative Service, July 1961, 26 pages.

Campbell, John D. Power Expenses of Cotton Gins by Types of Power, Marketing Research Report No. 520, Washington: U. S. Department of Agriculture, Farmer Cooperative Service, March 1962, 47 pages.

The purposes of this study were (1) to determine and compare expenses for equal amounts of gin power from different types and sources; (2) to provide information useful to ginners in choosing the most economical source of gin power; and (3) to find ways to reduce gin power expenses. Fifty-three ginners in Arkansas, Oklahoma, and Texas were interviewed during the 1959-60 season to obtain information on power expenses.

Results from the study indicate that natural gas engines were often the cheapest source of power from a total power cost standpoint. Power expenses as related to installed costs were highest for diesel engines and lowest for electric motors. Expenses per bale for electricity were over three times as much under some rate schedules as under others for the same amount of electricity.

Chapman, W. E., Jr. and Stedronsky, V. L. Comparative Performance of Saw and Roller Gins, Acala and Pima Cotton, Marketing Research Report No. 695, Washington: U. S. Department of Agriculture, June 1965.

Cocheba, Donald J. and Hudson, James F. "Transportation of Cotton Lint and Cottonseed in Louisiana," Louisiana Rural Economist, Baton Rouge: Louisiana State University, Department of Agricultural Economics and Agribusiness, Vol. 26, No. 4, November 1964, pp. 7-11.

This article reports on a study of the movement of cotton lint and seed from gins to warehouses and oil mills in Louisiana. The objectives of the study were to determine the various methods of transportation now being used and to determine the distances involved in the present transportation patterns as compared to optimum patterns.

For the most part ginners were found to be using the least cost method of transportation for their individual situations. The greatest opportunities for reducing transportation cost were found to be in the area of reducing the distances cotton lint and cottonseed are hauled. Excess cost incurred in moving cottonseed from gins to oil mills was found to be about three times that of moving cotton lint from gins to warehouses.

Covey, Charles D. and Hudson, James F. Cotton Gin Efficiency as Related to Size, Location and Cotton Production Density in Louisiana, Bulletin No. 577, Baton Rouge: Louisiana State University, Department of Agricultural Economics and Agribusiness, December 1963, 92 pages.

The objectives of this study were: (1) to develop estimates of seed cotton assembly costs for the most prevalent method of moving seed cotton in Louisiana; (2) to develop estimates of investment costs and operating costs for a range of gin sizes for different ginning volumes; (3) to evaluate the influence of cotton production density, assembly costs, length of ginning season, and seed cotton storage on optimum size and location of cotton gins; and (4) to demonstrate the application of the results to a selected area of Louisiana. The economic-engineering approach was used to determine estimates of gin cost data used in the study. Data were obtained from gin equipment manufacturers, gin surveys, and interviews with producers. The analysis was based on gin size models of 4, 8, 12, and 15 bales per hour. Assembly cost estimates were made for four levels of production density.

Results indicate that the average gin cost estimates for the four gin sizes analyzed continued to decline well beyond the largest volume encountered by any gin in Louisiana. It was found that the average cost curves indicate that assembly costs per bale increase with distance from the gin, but at a decreasing rate for all densities of production considered in the study. In most instances the increase in assembly cost was more than offset by lower ginning cost, suggesting that it was feasible to increase ginning volume by bringing in seed cotton from greater distances.

Griffin, A. C. and McCaskill, O. L. Storage of Seed Cotton in Trailers, Production Research Report No. 81, Washington: U. S. Department of Agriculture, Agricultural Research Service, March 1964, 18 pages.

The purpose of this study was to determine the effects of storing seed cotton in trailers on raw cotton quality and spinning performance. Suction and blow tests were conducted on duct and plenum chamber systems of moisture removal. It was found that air can be moved through seed cotton on trailers most effectively by using a suction system with a plenum chamber of maximum free area.

Preventing fiber color loss is the major problem in storing seed cotton in trailers. Color losses are reflected in lowered lint grades that reduce the market value of the cotton. Evidence was found in the study that cottonseeds undergo biological processes during seed-cotton storage similar to those they undergo in bulk storage, and that the moisture content of cottonseed largely determines whether a load of seed cotton may be safely stored or whether it will heat and suffer grade damage to the lint. It

was found that trailer storage of seed cotton does not adversely affect quality if the moisture content of the cottonseed is 10 percent or less. Storing seed cotton in trailers did not significantly affect fiber and spinning quality characteristics except for the color factor of lint grade unless severe heating of the load developed.

Handbook for Cotton Ginners, Agriculture Handbook No. 260, Washington: U. S. Department of Agriculture, Agricultural Research Service, February 1964, 121 pages.

This handbook was prepared to serve as a guide for cotton ginners interested in effective and efficient ginning to maintain quality characteristics of raw cotton. The handbook contains a series of articles prepared by authorities in the various subject matter fields. Sections are contained on growing and harvesting for quality ginning, the ginning process, materials handling, auxiliary equipment, power, and recommended ginning practices. The handbook is a valuable addition to aid ginners, educators, researchers, and others in the cotton industry.

Holder, Shelby H., Jr. Supply and Price Data on Cotton Gin Motes, Marketing Research Report No. 809, Washington: U. S. Department of Agriculture, Economic Research Service, November 1967, 24 pages.

The objectives of this study were: (1) to determine the proportion of gins collecting motes, and the handling and disposal practices used; (2) to provide supply information on a district, state, regional, and national basis; and (3) to obtain current data on the price of gin motes. Data were collected from 692 gins by representatives of the Cotton Division, Consumer and Marketing Service. These gins were selected from a random sample of gins in all cotton producing states. Data from the sample gins represented approximately 14 percent of all gins and about 17 percent of total bales ginned. Sample results were expanded by the use of U. S. Census reports in order to determine aggregate estimates for the 1966-67 season.

It was found that about 38 percent of U. S. gins collected motes in 1966-67, amounting to almost 82 million pounds of motes. Two-thirds of the motes collected were collected by gins in the Southwestern and Western regions. Ginners received an average of 3.25 cents per pound for baled motes and 0.86 cents per pound for loose motes. Regional prices for baled motes ranged from 2.79 cents per pound in the Southeast to 4.22 cents in the West. The price differential between loose and baled motes was not

sufficient to pay baling costs in the Southeast and South Central regions. Current and future emphasis on air pollution will increase and this could cause added incentive to collect motes. The proportion of bales from which motes were collected, plus average pounds of gin motes removed per bale, developed from the gins in this study, could be used to estimate mote supplies for future crops.

Lafferty, D. G. Cost Relationships in High-Capacity Cotton Gins, Southern Cooperative Series Bulletin 88, Fayetteville: University of Arkansas, Agricultural Experiment Station, January 1964, 25 pages.

This study was conducted under the Southern Regional Cotton Market Project, SM-24. The purpose of the study was to evaluate the effects of gin capacity and volume on ginning costs for the Delta areas of Arkansas, Louisiana, Mississippi, Missouri, and Tennessee. When the study was begun, only a few gins were equipped with high capacity machinery and, for this reason, the needed data were synthetically generated by using models based on ginning requirements and cost information obtained from gin manufacturers. Six gin models with capacities of 3, 4, 6, 8, 9, and 12 bales per hour were analyzed. The transportation of cotton and cotton products to and from the gin and the storage of these products were not considered part of the cost of operating the gin. Three ginning-storage situations were assumed in order to determine the length of ginning season. They were: (1) seed cotton not stored, (2) seed cotton stored for short period, and (3) seed cotton stored for long periods sufficient to permit year-round ginning

Results from the study indicate that the ginning cost per bale declines as the number of hours of operation and the volume ginned are increased. For a given number of hours of operation, the cost declined as the size of the gin was increased. At low volumes, the cost per bale was higher for the larger gins.

Looney, Zolon M., Wilmot, Charles A., Holder, Shelby H., Jr., and Cable, C. Curtis, Jr. Cost of Storing Seed Cotton, Marketing Research Report No. 712, Washington: U. S. Department of Agriculture, Economic Research Service, May 1965, 23 pages.

The objectives of this study were (1) to determine costs of establishing and operating three specific types of seed-cotton storage facilities, (2) to analyze the effects of seed-cotton storage operations on the overall costs of ginning firms, and (3) to compare the costs of increasing the rate of ginning by building new plants or modernizing existing plants.

Data for the study were obtained from nine gin firms with seed-cotton storage facilities located in the Midsouth, Texas High Plains, and California. Systems of seed-cotton storage analyzed in the study were portable basket storage on the gin yard, bulk storage on the gin yard, and bulk storage on the farm.

It was found that seed-cotton storage in portable baskets was the most practicable of the three methods studies. This method would require an investment of approximately $34,100 for storage of 500-bale capacity and $219,400 for storage of 5,000-bale capacity. However, it was found that the cost of storage would more than offset the reduction in ginning costs associated with a larger volume. In most cases it was found that storage would be more costly than increasing ginning capacity through modernizing or building a new gin plant.

Raskopf, B. D. Factors Associated with Cotton Ginning Problems in Tennessee, Bulletin 366, Knoxville: The University of Tennessee, Agricultural Experiment Station, September 1963, 45 pages.

The objectives of this study were: (1) to identify and evaluate the important economic problems in the ginning industry of Tennessee, and (2) to develop some alternative approaches for solving these problems. Regularly published data and surveys of ginners, producers, and truckers provided data for the study.

Information on the changes in cotton production and the number of gins is presented. The low volume per gin is given as one of the main problems faced by ginners. Ginning models were developed which would minimize the cost of ginning with given volumes under conditions of no seed cotton storage and with seed cotton storage. It was found that the per-bale cost of ginning declines rapidly up to a ginning rate of 1,200 hours per season. It was also found that as the gins increase in capacity per hour, the cost per bale for labor and power and fuel declines. Some gins might be able to increase their volumes and reduce per-bale costs through the use of seed cotton storage facilities.

Thompson, Russell G., Ward, James M., and Graves, James W. Cotton Ginning Costs and Revenues from Accounting Records, Departmental Information Report 64-1, College Station: Texas A&M University, Department of Agricultural Economics and Sociology, 1964, 11 pages.

The purpose of this study was to use accounting records to estimate ginning revenues and costs for cooperative gin plants in the High Plains and Lower Rio Grande Valley areas of Texas. Records from the Houston Bank for Cooperatives were used to analyze the costs and returns for 130 gin plants.

On the basis of operations for the period 1954-59, revenues per bale received in the valley varied from $18.71 to $20.05 compared to a range of $17.02 to $17.72 for comparable gin plants on the High Plains. Results indicate that differences in harvesting methods between the High Plains and the Lower Rio Grande Valley accounted for significant differences in ginning costs per bale and resulted in different ginning charges.

Costs per bale were considerably greater in the Lower Rio Grande Valley than for comparable gin plants on the Plains. Costs per bale ranged from $8.41 to $16.49 for the single-battery gin plants and from $9.72 to $16.66 for the multiple-battery gin plants on the High Plains. In the Valley, single-battery gin plants had total costs per bale ranging from $13.92 to $19.92. Adequate data were not available to provide cost estimates for multiple-battery plants in the Valley area.

Thompson, Russel G., Ward, James M., and Graves, James W. Cotton Ginning Costs from Model Gin Plant Analysis, Departmental Information Report 64-3, College Station: Texas A&M University, Department of Agricultural Economics and Sociology, 1964, 23 pages.

The objective of this study was to use model gin plant analysis to estimate ginning revenues and costs for gin plants in the High Plains, Rolling Plains, and Lower Rio Grande Valley areas of Texas. Estimates of short-run total costs per unit of volume were estimated for model plants of three capacities in each area. The costs were analyzed on the basis of ginning seasons ranging in length from 400 to 1,600 hours and for two alternative labor situations.

Results indicate that in all situations ginning costs per bale decreased continuously as the volume ginned increased. Ginning costs per bale could be reduced by extending the length of the ginning season. Seed cotton storage did not appear to be an effective method of reducing costs of ginning for the areas included in the study.

Wilmot, Charles A. and Alberson, David M. Effects of Oversized Motors on Power Costs in Ginning Cotton, ERS 203, Washington: U. S. Department of Agriculture, Economic Research Service and Agricultural Research Service, November 1964, 28 pages.

The objectives of this study were: (1) to determine the extent of and reasons for using oversized motors in cotton gins; (2) to determine the interrelationships between overmotoring and power costs; (3) to develop a simplified means for measuring power requirements; and (4) to determine the economic feasibility of correcting for overmotoring in cotton gins. The

analysis was based on data obtained from 18 gin plants located in California, Arizona, New Mexico, and West Texas.

Results from the study indicate that there was a substantial excess of connected horsepower in practically all gins analyzed. Actual power requirements can be easily determined by using three electrical measuring instruments in combination and interpreting the results directly from the charts developed for this purpose by the authors of this report.

Wilmot, Charles A., Stedronsky, Victor L., and others. Engineering and Economic Aspects of Cotton Gin Operations ... Midsouth, West Texas, Far West, Agricultural Economic Report No. 116, Washington: Economic Research Service, July 1967, 43 pages.

The objectives of this study were (1) to develop machinery and equipment specifications for ten different capacity ratings and for two different types of harvesting methods, (2) to estimate operating costs, (3) to examine the importance and means of improving operating efficiencies, and (4) to identify and describe factors determining optimal gin size for specific cotton-producing regions. The model gin arrangements were planned for the Far West and the Midsouth, where the cotton is mainly machine picked, and for West Texas, where the cotton is mainly machine stripped. Peak capacity ratings of the models began at six bales per hour and increased at two-bale intervals to the largest capacity rating of 24 bales per hour.

Estimated investment costs for the gin models ranged from $200,000 to $505,000, depending upon gin plant size and method of harvest. In the Midsouth total ginning cost per bale ranged from $14.94 for the smallest plant to $10.21 for the largest. The range was from $15.58 to $10.61 in the Far West, and from $15.25 to $10.53 in West Texas. All operating cost calculations were based on the assumption that each gin model would be operated at 85 percent of manufacturer's capacity rating and would handle the maximum seasonal volume attainable without storage of seed cotton.

II. STORAGE, DISTRIBUTION AND OTHER MARKETING COSTS AFTER GINNING

Costs of Storing and Handling Cotton at Public Storage Facilities, 1964-65, ERS-306, Washington: U. S. Department of Agriculture, Economic Research Service, October 1966, 40 pages.

The purpose of this study was to estimate the cost of storing and handling cotton at public warehouses in 1964-65. The estimates were obtained from accounting data and operational information of 133 public cotton storage facilities representing about 30 percent of the storage capacity approved by the government for storing cotton in 1964-65.

Estimates were obtained for average total cost and for average variable cost which excluded allowances for depreciation and interest in investment. Separate estimates were determined for each major geographical area. Total cost per bale for insured storage at all plants averaged $3.08 annually, varying from $2.76 per year in the South Central area to $4.07 per year in the West. Average out-of-pocket cost for storage for all plants was $2.62 per bale per year. Estimates were also developed for receiving, break-out, and shipping.

Cotton Merchandising in Texas, Costs for the 1964-65 Season, Research Report No. 84, Austin: The University of Texas, Cotton Economic Research, August 1966, 50 pages.

The purpose of this study was to estimate the costs of marketing cotton in Texas during the 1964-65 season. Data were obtained from over 40 merchant-shipper firms and cooperatives located in the central markets of Dallas, El Paso, Houston-Galveston, and Lubbock. Separate cost estimates were developed for each market area by type of cost, including buying and local delivery, carrying charges, compression, selling overhead, and miscellaneous marketing costs.

The average merchandising costs for Texas shippers was $13.97 per bale for domestic shipments and $22.58 per bale for foreign shipments. The largest cost item was transportation, followed by compression charges and overhead costs.

Harris, William F. Shippers' Services and Costs in Marketing United States Cotton, Research Report No. 87, Austin: The University of Texas, Cotton Economic Research, May 1967, 30 pages.

The purpose of this study was to obtain information relating to merchandising costs in the movement of cotton from gins in the United States to domestic and foreign mills. Results presented in the report are based on analyses of data from 128 shipper firms located in the 15 official spot markets plus Bakersfield and El Paso. The sample included all of the large firms, 35 percent of the medium-size firms and 20 percent of the small firms. Eighty-five percent of all active firms in the United States were included.

Personal interviews were held with each shipper to obtain cost and volume data for domestic and foreign shipments in 1964-65. Weighted averages for purchases, sales, and costs of merchandising were developed for the major regions of the United States. The national merchandising cost to domestic outlets averaged $13.56 per bale, compared to a cost of $23.24 per bale to foreign outlets. Transportation costs averaged $5.31 per bale to domestic outlets and $13.46 per bale to foreign outlets. Estimates were developed for each of eight cost items for each market included in the study.

Potter, Joseph R., Jr. The Traffic Pattern of American Raw Cotton Shipments, Season 1961-1962, Marketing Research Report No. 705, Washington: U. S. Department of Agriculture, Economic Research Service, April 1965, 35 pages.

The purpose of this study was to determine the traffic pattern of raw cotton shipments by areas. Results from the study are based on a 1963 survey of shipments from warehouses approved by the Commodity Credit Corporation. The data do not coincide exactly with production data because reshipments were included in the study.

It was found that 73 percent of the 14 million bales shipped from warehouses in 1961-62 moved by railroad. Trucks were used mainly for short hauls within the Southeastern Region, some shipments from the South Central Region to the mill area, and shipments from nearby production areas to ports. The traffic pattern of shipments was developed for each of the four major cotton regions.

III. MECHANICAL SAMPLING OF COTTON

Cable, C. Curtis, Jr., Smith, Harvin R., and Looney, Zolon M. Comparison of Mechanically Drawn Samples with Cut Samples for Evaluating Cotton Quality, Marketing Research Report No. 654, Washington: U. S. Department of Agriculture, Economic Research Service, and Agricultural Marketing Service, April 1964, 28 pages.

The objectives of this study were (1) to compare mechanically drawn samples with cut samples for determining initial grade, staple length, color, and other quality characteristics of cotton and (2) to analyze the usefulness of mechanical samples stored for two years in evaluating quality changes in bales also stored for a period of two years. A total of 800 bales of California and Texas High Plains cotton from the 1959 crop were selected for study. Gin flat, gin standard density and compress-standard density bales were included in the study. Bales were stored in Lubbock and Houston, Texas, and Bakersfield, California.

Results from the study indicate that mechanical samples drawn during ginning were just about as reliable and useful for merchandising purposes as cut samples taken immediately after ginning. Average bale value and average grade were slightly higher and average staple length was slightly lower for mechanical samples than for cut samples. Average values differed by only 10 cents per bale and none of the bale differences were statistically significant. Except for grade classification, mechanical samples were equal to cut samples for reflecting initial quality characteristics of cotton.

It was found that mechanical samples stored for extended periods could not be used successfully under existing marketing practices for merchandising cotton. Stored mechanical samples tended to be lower in grade than freshly cut samples from the same bale. Average staple length of stored mechanical samples was significantly lower than that of freshly cut samples from the Texas bales and no significant differences for the California bales. Grade and staple differences were greater for cotton stored in Houston and differences were greater for compress-standard bales than for flat or gin standard bales.

Cooper, Maurice R., Cooper, J. D., and Pritchard, D. L. Mechanical Sampling of Cotton, Marketing Research Report No. 412, Washington: U. S. Department of Agriculture, Marketing Economics Research Division, Agricultural Marketing Service, and Marketing Division of Farmer Cooperative Service, July 1960, 35 pages.

The purpose of this study was to provide information helpful in evaluating mechanical sampling and in recognizing and overcoming the barriers to the wider use of mechanical sampling. Data for the study were obtained by personal interview and mail questionnaire from representatives of the cotton industry, equipment manufacturers, and others with experience relating to both mechanical and conventional sampling.

Three different makes of mechanical samplers were in use. Results from the study indicate that each possesses distinctive features, but they all extract, accumulate, press, and package a series of subsamples taken at intervals while the bale is being ginned. It was found that in 1958 the cost of owning and operating a mechanical sampler that takes 18-inch packages ranged from about 33 cents per bale sampled at an annual volume of 9,000 bales to 45 cents at an annual volume of 4,000 bales. These estimated costs were between 16 and 22 cents per 9-inch sample. Estimates for the cost of obtaining cut samples ranged both below and above the cost per sample when using a mechanical sampler. Only a few gins in the United States had volume sufficiently large to justify a mechanical sampler.

Shaw, C. Scott and Franks, Gerald N. Automatic Sampling of Cotton at Gins, ARS42-33, Washington: U. S. Department of Agriculture, Agricultural Research Service, January 1960, 25 pages.

The purpose of this study was to review some of the recent developments in automatic sampling equipment and to relate the merits of mechanically drawn samples to conventional cut samples. It was found that despite the merits of mechanical sampling, difficulties have been encountered in overcoming the long-established hand method. The use of automatic sampling equipment in gins at the time of the study was confined mainly to California and the Southwest. The location and number of gins equipped with automatic samplers in May 1959 were: California, 56; Texas, 87; Arizona, 5; New Mexico, 3; Oklahoma, 1; and Mississippi, 1. The authors found that mechanically drawn samples were representative of the contents of the bale and that recent improvements in automatic sampling could lead to more widespread usage in the future.

IV. EFFECTS OF HARVESTING AND GINNING PRACTICES ON COTTON QUALITY

Bennett, O. L., Erie, L. J., and MacKenzie, A. J. Boll, Fiber and Spinning Properties of Cotton as Affected by Management Practices, Technical Bulletin No. 1372, Washington: U. S. Department of Agriculture, Agricultural Research Service, June 1967, 109 pages.

This bulletin brings together information on boll, fiber, and spinning properties of cotton from research studies conducted under intensive management at locations having a wide range of soil and climatic conditions. This information will aid in predicting boll, fiber, and spinning properties of cotton when grown under various management practices at different locations and under different climatic conditions. Field experiments to determine the effects of various management practices on yield and fiber quality were conducted in Alabama, Arizona and California during the period from 1951 through 1962. All experiments were on irrigated cotton except for experiments in Alabama for tests involving moisture variables.

It was found that proper fertilization was necessary for maximum boll and fiber development of cotton. Fiber properties were altered by adverse soil moisture conditions. Boll and fiber properties varied considerably with date bolls were set. Results from the study indicate large differences exist in boll and fiber properties between varieties at all three locations. Similar management practices tended to affect boll and fiber properties of cotton in a similar manner at all three locations.

Cable, C. Curtis, Jr. and Looney, Zolon M. Effects and Costs of Cleaning Lint in Arkansas Cotton Gins, Bulletin No. 595, Fayetteville: University of Arkansas, Agricultural Experiment Station, December 1957.

Effects of Cleaning Practices at Gins on Fiber Properties and Mill Performance of Cotton. A Progress Report, Marketing Research Report No. 269, Washington: U. S. Department of Agriculture, Agricultural Marketing Service, Marketing Research Division, August 1958, 19 pages.

Effects of Cotton Ginning Practices on Market Quality of Cotton: A Mississippi Delta Variety, 1958-59, Marketing Research Report No. 576, Washington: U. S. Department of Agriculture, January 1963.

Garner, Warren E. and Mullikin, Robert A. Effects of Certain Drying Treatments in Ginning on Fiber Properties and Spinning Performance of Southeastern Cotton, Crop of 1960, Production Research Report No. 85, Washington: U. S. Department of Agriculture, Agricultural Research Service, December 1964, 16 pages.

The major objective of this study was to determine the fiber-quality and spinning-quality differences caused by processing cotton at the gin to a constant fiber moisture level using various combinations of temperature and exposure to drying. Another objective was to help establish benchmarks of quality for Southeastern cotton, and thereby provide guides for production methods that will yield cotton fibers of maximum inherent quality. The analysis was based on cotton from the Coker 100A variety grown in South Carolina in 1960.

Input moisture levels were held at 6, 8, and 10 percent and drying treatments reduced moisture levels to the range of 5 to 7 percent. Drying treatments had only a minor effect on grade index and even less effect on staple length. Most fiber and spinning properties were either not affected or affected only slightly by various temperature-exposure combinations.

Holder, Shelby H., Jr., McCaskill, Oliver L., and Shanklin, Edward H. Effects of Reclaimed Gin-Loss Cotton on Lint Quality and Spinning Performance, Marketing Research Report No. 808, Washington: U. S. Department of Agriculture, Economic Research Service and Agricultural Research Service, November 1967, 10 pages.

The purpose of this study was to evaluate the effects on lint quality and spinning performance of blending reclaimed gin-loss cotton into bales of regular cotton. The test was composed of 12 bales of machine-picked cotton of one variety from the Mississippi Branch Experiment Station at Stoneville. Waste material from two stages of lint cleaning was conveyed pneumatically to the condenser of the experimental reclaimer machine.

Current testing methods and apparatus could not detect any adverse effect on lint quality from blending approximately 11 pounds of reclaimed gin-loss cotton into a bale. The only manufacturing or spinning properties showing any statistically significant difference that might be attributed to blending of gin-loss cotton into a bale were manufacturing waste and

neps per 1,000 yards of yarn. Manufacturing waste increased 3.1 pounds per 500-pound bale. After allowances for waste loss, about 7.6 pounds of material were utilized by the spinning process.

Although the test found few adverse effects from blending reclaimed gin-loss cotton, the authors did not suggest that it would be feasible as a commercial practice. They indicate that additional information is needed on the (a) effects of the practice on cotton's competitive position with other fibers, (b) effects not detected in fiber quality and spinning performance which might occur at dyeing and finishing stages of manufacturing, and (c) discounts which mills would make to offset increased manufacturing waste. Assuming that the practice could surmount these and other problems, the authors indicate that it would be possible to develop a full-scale model of the reclaiming and cleaning machine to be attached immediately behind the last stage of lint cleaning.

LaFerney, Preston E., Mullikan, Robert A., and Chapman, Walter E. Effects of Defoliation, Harvesting, and Ginning Practices on Micronaire Reading, Fiber Properties, Manufacturing Performance, and Product Quality of El Paso Area Cotton, Season 1960-61, Marketing Research Report No. 690, Washington: U. S. Department of Agriculture, Economic Research Service and Agricultural Research Service, January 1965, 33 pages.

The primary objective of this study was to determine the effects of different defoliation, gin cleaning, and gin drying treatments on several fiber, yarn, and processing variables, returns to producers, and costs of manufacturing. Secondary objectives were to compare first machine-picked cotton with second machine-picked cotton from the same plots and to compare first hand-picked cotton with first machine-picked cotton. Sixty-nine bales of Acala 1517C variety cotton from the 1960-61 season were used in the study.

Results from the study indicate that lint slide moisture was significantly related to many fiber, yarn, and processing characteristics. Generally, additional drying was associated with higher grade index, shorter fiber length, less uniformity or fiber length, lower fiber and yarn strength, lower nonlint content, and lower manufacturing waste than was normal drying. Premature defoliation lowered the average micronaire reading by only 0.2 unit, but the yarn break factor was 90 units lower and the yarn appearance index was 6 points lower than that of normal and undefoliated cotton. Acala 1517C, used in this study, has been supplanted by 1517D which the authors feel may respond similarly but at a higher average micronaire level.

The average staple length of cotton receiving normal and premature defoliation was 1/32 to 1/16 inch shorter than undefoliated cotton. Minimum cleaning at the gin produced longer and more uniform fibers than other cleaning treatments. However, after carding or after carding and combing, these differences disappeared. Cotton which had received minimum cleaning had 20 to 30 fewer neps per 100 square inches of carded web. There was no significant difference in the response of undefoliated and defoliated cotton to different cleaning treatments.

LaFerney, Preston E., Mullikin, Robert A., and Shaw, Charles S. Spinning Quality of Cotton as Affected by Gin Cleaning, Card Crusher Rolls and Varying Carding Rates, Mississippi, 1965-66 Season, Marketing Research Report No. 778, Washington: U. S. Department of Agriculture, Economic Research Service and Agricultural Research Service, December 1966, 33 pages.

The objectives of this study were (1) to determine the effects on the processing performance of cotton, of variations in seed cotton and lint cleaning at the gin, and the use of card crusher rolls at various carding rates, and (2) to study the relationships among these effects, the costs of processing, and the present marketing system. Results were based on 36 bales of 1965 crop cotton from the Delta area of Mississippi harvested from the same farm to assure a high degree of uniformity of inherent fiber qualities. In the testing procedure two seed cotton cleaning setups were used at each of three levels of lint cleaning. Carding rates of 10, 25, and 40 pounds per hour were used each with and without crusher rolls. After being carded, all spinning lots were processed alike into 40s yarn using 1.25 hank roving, 3.71 yarn twist multiplier, and 11,000 r.p.m. spindle speed.

Effects of overhead and lint cleaning treatments on fiber, processing, and yarn qualities were not statistically significant in most cases. In the ginned lint only foreign matter was significantly affected by the degree of cleaning at the gin. Use of the crusher rolls at the card resulted in a 1.5 higher average nep count in card web, 16 fewer ends down during spinning (a 28 percent reduction), fewer imperfections in yarn, and slightly higher yarn appearance index than did processing without use of the rolls. Differences in quality of yarn produced with and without use of card crusher rolls were not large and would not influence greatly the market prices received for yarn. Results from the study indicate (a) that card crusher rolls can be used to substantially reduce manufacturing costs and (b) additional information is needed concerning rates of production so that specific statements can be made concerning the economic effects of crusher rolls in processing. Results indicate two potential means of reducing manufacturing costs by use of high-production carding: (1) high-speed carding can produce a 50 percent reduction in EDMSH without apparent damage to yarn quality, and (2) rates of production of up to 40 pounds per hour on a high-production carding system appear to be attainable without damage to spinning performance or yarn quality.

Results indicate that each additional stage of lint cleaning generally reduced bale weights and improved grades but had little effect on staple length. After allowing for the differences in bale weight, and with the narrow market price differentials for grade prevailing in 1961, bale values of cotton grading Middling White before lint cleaning remained about constant or tended downward with each successive addition of lint cleaners. Bales of lower quality prior to lint cleaning generally increased in value after cleaning. Length uniformity, percentage of short fibers, and neps in cord web were adversely affected by the use of lint cleaners.

Mangialardi, Gino J., Jr. and Griffin, Anselm C., Jr. Lint Cleaning at Cotton Gins--Effects of Fiber Moisture and Amount of Cleaning on Lint Quality, Technical Bulletin No. 1359, Washington: U. S. Department of Agriculture, Agricultural Research Service, August 1966, 24 pages.

The principal purpose of this study was to determine the combined effects of fiber moisture and amount of lint cleaning on fiber properties and to separate the effects of moisture and lint cleaning from those of the gin stand. The experimental procedure consisted of passing ginned lint at 12 levels of fiber moisture through 0, 1, 2, 3, and 4 lint cleaners.

Results from the study indicate that the cleaning efficiency of lint cleaners is decreased with increases in fiber moisture content at lint cleaning. Increasing the number of lint cleaners decreased the foreign matter in lint in an exponential relationship. Decreases in fiber moisture and increases in the number of lint cleaners tended to result in higher grades and shorter staple length. The maximum removal of foreign matter commensurate with the least change in classer's staple length was obtained at a fiber moisture of about 7.0 percent.

Mangialardi, Gino J., Jr. and Griffin, A. Clyde. Moisture Restoration to Cotton at the Gin: Effects on Fiber and Spinning Properties, Marketing Research Report No. 708, Washington: U. S. Department of Agriculture, Agricultural Research Service, August 1965, 10 pages.

The objective of this study was to establish the merit of commercial methods that are available and can be used at gins for restoring moisture to seed cotton after it has been dried and passed through overhead cleaning equipment but before the seed cotton reaches the gin stand. The study was based on both the vapor method and the spray method of restoring moisture to cotton from the 1961 and 1962 crops.

In both years more moisture was added to and retained by cotton through use of the spray method than by the vapor method. Both systems were found to be suitable for restoring moisture if dispersion and absorption times are properly controlled. Restoration of the moisture tended to increase the average staple length, increase length uniformity, decrease short fiber content, increase fiber strength, reduce ends down in spinning, and decrease yarn imperfections.

Mangialardi, Gino J., Jr. and McCaskill, Oliver L. Effects of Grid-Bar Air Wash on Efficiency of Lint Cleaners and Fiber Quality of Cotton, Production Research Report No. 97, Washington: U. S. Department of Agriculture, Agricultural Research Service, August 1967, 20 pages.

The primary objective of this study was to determine the effect of lint cleaner grid-bar air wash on the removal of foreign matter from ginned lint and on the fiber length distribution of cleaned lint. During the 1965 season, 18 test lots of cotton, divided into 54 sub-test lots, were ginned and put through one stage of saw-cylinder lint cleaning involving three air wash treatments at the lint cleaner.

Results from the study indicate that a slight but significant decrease occurred in the foreign matter content on cleaned lint when an air wash of 2,000 c.f.m. was used instead of no air wash. However, no significant differences were shown in the cleaning efficiencies, grade indexes, or grades. Staple length and length distribution were not affected by the use of the lint cleaner air wash. The study concluded that the use of large volumes of air for lint cleaner grid-bar wash and foreign matter removal was not a necessity in commercial gin plants.

Newton, Franklin E., Calkins, E. W. S., and Griffin, Anselm C. Fiber and Spinning Properties of Cotton as Affected by Certain Harvesting and Ginning Practices, Marketing Research Report No. 656, Washington: U. S. Department of Agriculture, Agricultural Marketing Service, Economic Research Service, and Agricultural Research Service, June 1964, 27 pages.

The objectives of this study were to determine the effects of fiber lint moisture resulting from drying, seed-cotton cleaning, and lint cleaning during ginning on cotton fiber properties and mill-processing performance and to compare the quality of mechanically harvested and hand-picked lots of cotton. Results were based on an analysis of 93 bales of Deltapine 15 cotton, grown in the Delta section of Mississippi in 1959.

The effects of seed-cotton cleaning were found to be relatively small. Either increasing the amount of lint cleaning or decreasing the lint moisture during ginning were associated with changes in quality. These practices (1) increased bale values when adjusted for the wide premiums and discounts observed in 1959, (2) produced adverse effects on fiber length and length distribution, (3) caused no change in fiber strength or micronaire readings, and (4) caused adverse quality effects in spinning performance and fabric quality. The only consistent differences between hand-picked and machine-picked cottons were that the hand-picked lots had less foreign matter and were classed higher than machine-picked cottons. These results indicate that the fiber and spinning quality of cotton properly harvested by mechanical pickers (spindle type) is equal to cotton harvested by hand.

Ross, John E., Leonard, Clarence G., and Shanklin, Edward H. Cotton Fiber and Spinning Properties as Affected by Certain Ginning Practices, San Joaquin Valley, California, Season 1958-59, Marketing Research Report No. 486, Washington: U. S. Department of Agriculture, July 1961.

Ross, John E. and Shanklin, Edward H. Some Effects of Gin Drying and Cleaning of Cotton on Fiber Length Distribution and Yarn Quality, Marketing Research Report No. 666, Washington: U. S. Department of Agriculture, Economic Research Service, Agricultural Marketing Service, July 1964, 12 pages.

The objective of this study was to determine the effect of gin drying and double lint cleaning upon fiber length and yarn quality. Results from three previous tests run in the USDA Pilot Plant at Clemson were reanalyzed in terms of this objective. Results suggest that long and short fiber segments should be considered in evaluating cotton quality and in predicting yarn quality. In the test involving rain-grown cotton, the amount of fibers shorter than one-half inch increased from 7.8 to 11.2 percent by drying from 6 to 2.6 percent moisture in the ginned lint and double lint cleaning. About two-thirds of the increase was caused by drying alone. Yarn strength was reduced by approximately 225 break factor units by both practices. About 85 percent of this reduction was caused by over-drying.

In the test involving irrigated cotton, short fibers increased from 7.6 to 9.8 percent and long fibers decreased from 68.4 to 60.6 percent by drying and double lint cleaning. Drying accounted for one-half of this change in both short and long fibers. Drying and double lint cleaning reduced the break factor 246 units. Drying accounted for one-half of this decrease.

Shanklin, Edward H., Semrau, Konrad and LaFerney, Preston E. Comparative Effects of an Experimental and a Conventional Seed Cotton Drying System on Cotton Fiber Properties, Marketing Research Report No. 733, Washington: U. S. Department of Agriculture, Agricultural Research Service, April 1966, 11 pages.

The purpose of this study was to evaluate a controlled-humidity drying system developed by the Stanford Research Institute. This system was designed to dry cotton uniformly to a predetermined moisture content without using an air temperature high enough to damage the cotton. The experimental drier was operated with an air temperature of 110° Fahrenheit and a relative humidity of 50 percent. The three-stage commercial drier was operated at such air temperatures as were necessary to reduce the final lint moisture content to 6 percent.

The differences between the fiber properties as affected by the two dry systems were small and inconsistent. When the initial moisture level was 13 percent, quality differences were significant and in favor of the experimental drier. At the higher moisture level the experimental drier yielded cotton of higher grade index and fewer short fibers. Relevant factors other than quality and performance of cotton from the two driers were not considered.

St. Clair, James and Roberts, Arthur L. Effects of Lint Cleaning of Cotton--An Economic Analysis at California Gins, Marketing Research Report No. 238, Washington: U. S. Department of Agriculture, May 1958.

Stedronsky, V. L., Ross, John E., and Shanklin, Edward H., Jr. Drying and Cleaning Cotton at the Gin--Effect on Fiber Properties and Spinning Performance, San Joaquin Valley, 1959-60, Marketing Research Report No. 710, Washington: U. S. Department of Agriculture, Agricultural Research Service, Economic Research Service, December 1965, 18 pages.

Williamson, E. Buford, Shaw, Charles S., Looney, Zolon M., and Shanklin, Edward H., Jr. Comparative Effects of Mechanical Picking Spindles and Hand Picking on Cotton Quality and Spinning Performance in Mississippi, 1960-63, Marketing Research Report No. 730, Washington: U. S. Department of Agriculture, January 1966.

V. FIBER TESTING PRACTICES AND COTTON QUALITY RELATIONSHIPS

Brooks, R. Charles. Cost of Performing Fiber Strength Tests on Cotton, Miscellaneous Publication No. 18, Raleigh: North Carolina State University, Department of Economics, May 1965, 9 pages.

The purpose of this study was to provide (a) information on the investment and operating costs of cotton fiber strength testing equipment and (b) a method for marketing firms to evaluate their individual situations and adopt the most economical method of obtaining fiber strength measurements, whether it be from using custom testing or establishing individual testing facilities. Assuming that building space is already available, the investment requirement for establishing a strength testing operation was estimated at $5,400 and annual cost would amount to approximately $6,000.

The estimated cost per sample declined from $2.38 when operating ten weeks per year to $0.50 per sample when operating time is increased to 50 weeks per year. If a custom fiber strength testing service is available at 75 cents per sample, an annual volume of more than 7,373 samples would be required in order to justify the establishing of a fiber strength testing operation within a cotton marketing firm. A $1.00 per sample custom charge reduced the break-even volume to 5,555 samples.

Carpenter, Frances. Evaluation of the Fibrosampler and the Digital Fibrograph for Sampling Cotton Fibers and Measuring Length Characteristics, Marketing Research Report No. 775, Washington: U. S. Department of Agriculture, Agricultural Research Service, March 1967, 14 pages.

The purpose of this study was to evaluate the Fibrosampler as a sampling device and the Digital Fibrograph for measuring length and length distribution and to relate these measurements to processing performance and product quality. Three series of samples were tested in the study. Series I consisted of 25 samples having a wide range of fiber properties and representing several varieties of cotton. Series II consisted of 25 samples from a ginning-spinning study and varied in length and length distribution due to harvesting and ginning treatments. Series III consisted of 69 samples from another ginning-spinning study.

The Fibrosampler has a tendency to select long fibers; however, hand-combed specimens of long cotton were longer than Fibrosampler specimens of the same cotton. In spite of the careful application of the techniques used

in operating the Fibrosampler, a significant difference in sampling variation was found between technicians.

The Digital Fibrograph, Model 230, was found to be a highly efficient and stable instrument which can measure one specimen per minute when readings are made at the 2.5 percent and 50 percent span lengths. Repeatability for 50 consecutive readings was 0.10 percent for each of these span lengths, and repeatability over a nine-month period was 0.18 percent for the 2.5 percent span length and 0.45 percent for the 50 percent span length.

The Fibrosampler-Digital Fibrograph combination was found to be very efficient for measureing cotton fiber length. Test efficiency, as used in this study, involved sensitivity to sample differences and the repeatability of the measurements. When range of length was small, the 2.5 percent span length was a more efficient test than array upper quartile length. The 50 percent span length seemed to be more highly related to spinning performance than the 50/2.5 uniformity ratio.

Cooper, Maurice R. and Harris, William F. Recent Developments in Testing and Pricing Cotton for Fineness and Strength, Marketing Research Report No. 699, Washington: U. S. Department of Agriculture, Economic Research Service, March 1965, 33 pages.

This study was concerned with (a) the practices of cotton shippers in Texas during the 1961-62 season with regard to testing and pricing cotton for fineness and other measurable properties and (b) exploratory efforts to establish and evaluate price differentials for fineness for a few selected quality combinations and for specified periods during the 1962-63 season. Personal interviews and questionnaires to shippers were used to obtain the basic data used in the study. Firms represented in the study handled approximately 60 percent of the 1961 production of Texas, Oklahoma, and New Mexico.

Results obtained from the study indicate that all shippers were using one or more types of information on fineness as a guide in buying and selling some of their cotton. Shippers were also using data on fiber strength, but to a smaller extent than data on fineness. More than two-thirds of the respondents favored (a) including data on fineness in the Smith-Doxey cotton classification program and (b) including price differentials for fineness in market quotations and in loan rates.

Raskopf, B. D. Micronaire Tests for Cotton and Cotton Quality Relationships, Bulletin 410, Knoxville: The University of Tennessee, Department of Agricultural Economics, September 1966, 47 pages.

The purpose of this study was to show: (1) the development of micronaire testing of cotton and its economic importance in the industry; (2) the variation in micronaire tests of cotton in Tennessee and other states for specified years; (3) the varietal and environmental factors affecting or relating to the micronaire of cotton; and (4) the relationship of the micronaire of cotton to other fiber properties important in cotton mill processing. It is shown that for the crop years 1959 to 1965, the micronaire average among ten cotton varieties differed by 0.8 micronaire units. The micronaire test of individual bales of cotton, within one variety in the same locations, or combining locations, had a range of 3.2 micronaire units. Wide variations existed in cotton micronaire test averages among states in the same year, and within states by years.

Results from the study show that the micronaire reading is higher early in the ginning season and declines as the ginning season advances. During the years 1959 to 1965, when the micronaire reading of cotton produced in Tennessee fell below 3.5, there was a general decline from annual average in raw cotton grade, staple length, length uniformity, and fiber strength; an increase in nonlint content and picker and card waste; a decrease in yarn strength and yarn appearance grade; and an increase in yarn imperfections or neppiness. When the micronaire readings tested above 5.1, the cotton was above average in staple length and length uniformity but tested lower in grade, fiber strength, yarn strength, and yarn appearance grade, and there was some increase in picker and card waste, and yarn imperfections.

Micronaire readings were (a) good indicators of the processing tests of yarn appearance grade and yarn imperfections, (b) fair indicators of picker and card waste, and (c) poor indicators of yarn strength. It was found that micronaire readings tend to follow a pattern of normal distribution.

Rouse, Joseph T. Short Fiber Content of Cottons in Relation to Other Quality Measurements, AMS-462, Washington: U. S. Department of Agriculture, Agricultural Marketing Service, January 1962, 11 pages.

This report contains an analysis of the relationship of short fiber content to other cotton quality measurements. Data on quality characteristics were obtained on samples of cotton from bales used in the grade and staple standards and on samples of cotton included in the annual cotton quality survey for the 1960 crop. Results from 554 samples indicated that short fiber content was associated with other fiber characteristics. Lower short fiber content was associated with the higher grades, longer staple length, higher micronaire reading, higher Pressley fiber strength measurement,

longer upper quartile length and lower coefficient of length variation measurements. The author found that although short fiber content is an important fiber characteristic, its measurement is impractical for most routine test evaluations because it adds nothing to the quality evaluations obtained with other measurements which are more easily performed. The use of length uniformity in association with length was found to be a more practical procedure for evaluating short fibers.

Webb, Robert W. Interrelationships among Five Cotton-Quality Factors, Including Fiber Strength 1/8-Inch vs. 0 Gauge, as Related to Yarn Strength at Three Staple-Length Levels, Marketing Research Report No. 684, Washington: U. S. Department of Agriculture, Agricultural Research Service, May 1965, 89 pages.

In this study a pioneering investigation was made to explore, disentangle and demonstrate the role of interrelationships identified with certain cotton fiber measures; and to point the way for making cotton quality evaluations more objective, more reliable, and more meaningful in the future than they have been in the past. One of the major contributions of the study was the development of a coupling and weighting technique for certain statistical values obtained from conventional multiple and simple correlation analyses. These results increase the ability to measure the contribution that fiber interrelationships make in yarn-strength variance.

The effects of the interactions between various pairs of cotton-fiber measures on explainable yarn-strength variance are shown to be important and, in some cases, more enlightening than the effects of the fiber measures acting independently. Evaluations of the interactional effects provide a basis for explaining many inconsistencies noted in correlation results with cotton fibers and yarn strength over the years. This report includes correlation values for six sets of analytical conditions identified with skein strength of 22s carded yarn spun from American upland cotton, representing three staple-length levels. In terms of estimated yarn-strength variance explained by the fiber-measure interrelationships, it is concluded that fiber strength at the 1/8 inch gauge was a relatively "pure" measure of fiber strength for the short staple (15/16) cottons while the 0 gauge was a "purer" measure of fiber strength for the long staple (1 3/32) cottons.

Wells, Chester M., Hudson, James F., and others. Use of Cotton Fiber Tests in Marketing Cotton, Bulletin No. 72, Southern Cooperative Series, Southern Regional Cotton Marketing Research Committee, March 1960, 23 pages.

The purposes of this study were (a) to summarize the findings of the Use of Cotton Fiber Tests by United States Cotton Shippers, Southern Cooperative Series Bulletin 62, June 1959 and the Use of Cotton Fiber Tests by United States Cotton Mills, Southern Cooperative Series Bulletin 70, December 1959 and (b) to appraise the effect of the use of fiber tests on cotton marketing. It was found that the demand by mills for fiber test information has made it imperative that shippers use fiber tests in their merchandising operations.

The most important of the fiber tests being used were fiber fineness, maturity, tensile strength, and length uniformity. Tests for most of the other known fiber properties were found to be used primarily for experimental purposes. Less than 2 percent of the mill contracts with shippers specified fiber properties other than fineness and strength. Shippers had access to fiber fineness data on approximately 60 percent of their interior purchases and mills had fiber fineness data on 75 percent of their direct purchases from local markets. Fiber fineness data were available on 86 percent of the cotton purchased by mills from shippers.

Strength test data were obtained on 13 percent of the interior purchases made by shippers, and none of the interior purchases made by mills involved strength tests. Strength specifications were included in contracts for about 10 percent of the cotton bought by mills from shippers.

VI. OTHER

Anderson, Robert F. Consumption of Cotton by Georgia Mills, Season of 1964-65, Research Bulletin 6, Athens: University of Georgia, Department of Agricultural Economics, May 1967, 31 pages.

The objectives of the study were (a) to show the consumption of cotton by Georgia mills in specified textile products and groups of products, (b) to determine the production areas of cotton used by Georgia mills and the factors influencing the mills' choice of cotton by areas, and (c) to present quantitative measurements of cotton fiber properties used in the manufacturing of textile products in Georgia mills. Data were obtained from interviews with officials of 42 textile firms in Georgia. These firms operated 65 mills in the state during the 1964-65 season and consumed over 1.3 million bales of cotton in that season.

The wide variety of end-products manufactured by Georgia mills was divided into three groups based on the finest yarn numbers used in the products. It was assumed that the finest yarn numbers spun would largely determine the fiber qualities of cotton used in the product. Almost one-half of the cotton consumed by the mills surveyed went into the production of 20s-34s yarn count. This category of products includes work clothing, wearing apparel, and sheeting material. Coarse yarn (1s-19s) products which include much of the industrial and household products accounted for 43 percent of the cotton consumed in Georgia. Only a small volume of cotton was reported for fine (35s and over) yarn products.

Minimum fiber breaking strength of 77,000 to 83,000 pounds per square inch were specified for 65 percent of the cotton consumed in the state. In 1964-65, Georgia mills obtained 50 percent of their cotton from the Central Belt, 25 percent from the Southeast, 21 percent from the Southwest, and 4 percent from the West. Price of the cotton and fiber strength were the two factors listed most often by mills as influencing their selection of cotton for specific uses. Twenty of the 42 firms were blending man-made fibers with cotton in some or all of their products.

Cable, C. Curtis, Jr., Smith, Harvin R., and Looney, Zolon M. Changes in Quality and Value of Cotton Bales and Samples during Storage, Marketing Research Report No. 645, Washington: U. S. Department of Agriculture, Economic Research Service and Agricultural Marketing Service, February 1964, 58 pages.

The purpose of this study was to determine the changes in quality and value of cotton bales and samples during storage. The study included ten lots of cotton with 100 bales in each lot. Five of the lots were from California, two lots were from the Texas High Plains, and two lots were from the Delta area of Mississippi. Flat bales, gin standard density and compress standard density bales were included in the analysis.

Results from the study indicate that cotton grown in relatively dry areas tends to deteriorate less when in the area of growth rather than when stored in humid areas. The study also showed that extra samples drawn at the time bales are placed in storage will, on the average, accurately reflect changes in grade and value of bales for up to six months if the samples are stored under the same conditions as the bales.

Changes in yellowness were responsible for both positive and negative changes in market value of bales held in storage for two years. For some lots, increases in yellowness were sufficiently large to adversely affect grade, color, and market value. For other lots, increases in yellowness were just enough to make the cotton more creamy in appearance and to improve the average grade. Changes in staple and fiber length, percent nonlint and manufacturing waste, fiber and yarn strength, micronaire, neps, yarn appearance, and spinning potential were minor and inconsistent for a majority of the lots.

Calkins, E. W. S. and Spurlock, H. C. Factors Affecting Use of Southeastern Cotton and Competing Fibers, Bulletin 532, Clemson: Clemson University, Department of Agricultural Economics, February 1967, 80 pages.

The purpose of this study was to obtain information needed on opportunities for cotton producers in the Southeast to adjust their production practices to meet the specific needs of the textile industry. The specific objectives of the study were: (1) to identify major factors, including quality characteristics, prices, and marketing facilities and practices affecting domestic textile manufacturers' demand for cotton and (2) to relate the demand conditions to adjustment needs of southeastern cotton producers. Survey data were obtained through interviews with representatives of 98 textile firms using more than 5 million bales each year. Current fiber utilization, desired cotton fiber qualities, and characteristics of the cotton marketing system were studied.

It was found that southeastern cotton was used chiefly in medium-coarse yarn numbers. When mill mixes were classified according to the finest yarn number spun from each mix, the study found that approximately 30 percent of the fiber used to produce yarns ranging from 17s and coarser to 29s and coarser was southeastern cotton. These yarns were used in fabrics in which quality requirements (especially strength) were not extremely high. Southeastern cotton made up only 10 percent of the fiber used in yarns from 30s to 45s and less than 2 percent in yarns finer than 45s.

In answer to a question on quality improvements needed in southeastern cotton, 51 of the 98 textile firms called for greater fiber strength, 27 wanted longer staple, and 14 desired greater uniformity of fiber length. Thirty-one buyers complained that southeastern cotton was not available in large, even-running lots. There were also complaints concerning difficulties in redeeming cotton from the loan, poor warehouse services, excessive warehouse charges, and unreasonable delays in getting cotton out of warehouses.

Donald, James R., Lowenstein, Frank, and Simon, Martin S. The Demand for Textile Fibers in the United States. Technical Bulletin No. 1301, Washington: U. S. Department of Agriculture, Economic Research Service, November 1963, 150 pages.

The purpose of this study was to identify and measure the effects of the principal economic forces that cause variation in textile fiber consumption in the United States. Estimating equations were developed which explain from 87 to 95 percent of the variation in fiber consumption. Aggregate data from regularly published sources were analyzed for the period 1920-1960.

The first part of the report presents trends in consumption and in the trade balance of textile fibers and discusses the development of new statistical series required for the statistical analyses. The second part of the report is concerned with the analysis of factors affecting domestic consumption of textile fibers. Factors found to affect total fiber consumption most were level of real disposable consumer income, year-to-year changes in the level of real income, prices of textile fibers, deviations from the norm of product stocks relative to unfilled orders, and trend. These factors explained more than 96 percent of the variation in total domestic fiber consumption. The single factor found to exert the most influence on total domestic consumption was the level of real disposable income. Results from the study indicate that a 1 percent change in real disposable income per capita would result in a 1 percent change in the same direction of per capita total domestic fiber consumption.

Hudson, James F. and Jones, Lonnie L. Variations in Fiber Quality in Louisiana Cotton, D.A.E. Research Report No. 348, Baton Rouge: Louisiana State University, Department of Agricultural Economics and Agribusiness, December 1965, 62 pages.

The purpose of this study was to analyze fiber quality data obtained from the 1963 Louisiana Fiber Quality Report to determine the variability in raw cotton quality among geographical areas, parishes, gin communities, and harvest periods throughout the harvest season. Fiber test results of samples from more than five thousand bales of the 1963 cotton crop in Louisiana were used in the analysis. Each of the samples had been tested for fiber fineness, strength, length, and length uniformity. The analysis of variance technique was used to analyze the mean differences among harvest periods, weeks within periods, production areas, and parishes within areas. Orthogonal comparisons were used to test for differences among individual means of periods and areas.

Highly significant differences were found in fiber fineness, fiber length uniformity, and length among harvest periods. Seasonal reports on quality characteristics were found to be more accurate when reported on a weekly basis as compared to longer periods. Highly significant differences were found in fiber fineness and fiber strength among production areas but length and length uniformity measurements were not statistically different among production areas.

Menzie, Elmer L., Firch, Robert S., and Stutts, Harold M. Relationships between Cotton Quality and Commodity Credit Corporation Pricing, Technical Bulletin 165, Tucson: The University of Arizona, Department of Agricultural Economics, November 1965, 30 pages.

The major objective of this study was to test the proposition that government pricing policies for cotton substantially reflect the relative values for various grades and staples. Other objectives were to trace some of the effects of the government programs for cotton on the sale for domestic use and export and the differential effects on the various producing regions.

Results from the study indicate that the lag introduced in the CCC pricing system creates distortions in the market with respect to the relative values of particular grades and staples. The authors found that the action by CCC, of establishing premiums and discounts on a year-to-year basis, produced influences on market valuations. During the period under study, 1952-59, there was a tendency for CCC stocks of the short staples to be over-priced relative to market demand. The authors conclude that a major part of the domestic market bias could be removed by adding flexibility to the establishment of premiums and discounts to a daily or weekly basis. Similar flexibility could also be used in the export subsidy program of the type in use during the 1950's.

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