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HIGH VOLUME INSTRUMENT COTTON CLASSING: THE ECONOMIC IMPACTS ON MISSISSIPPI COTTON PRODUCERS

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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by
Mary Helen Forrester* and Dr. David H. Laughlin**

The Research Problem

In recent years the U.S. textile industry has been faced with increasing competitive pressure from foreign textile manufacturers in low-wage countries and from textile manufacturers significantly improving their spinning technology. In order to compete, the US textile industry must maintain a high level of productivity and at the same time continue to produce high quality yarns that meet increasingly more stringent end-use specifications.

Probably the most important factor toward this end has been the tremendous advancement and adoption of spinning technologies and computer software.

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Traditionally, textile mills used ring spinning equipment to process raw fiber into yarn. However, since the introduction of open-end rotor spinning many mills have begun replacing old ring spinning equipment with the new rotor spinning equipment.

To compensate for the loss in yarn strength that occurs with the use of rotor spinning, textile mills are demanding stronger, finer cotton fibers. Much work has been done by cotton breeders to develop varieties with high strength, good maturity, and greater fineness. However, these varieties often are not as high-yielding as other varieties currently available. Furthermore, the Commodity Credit Corporation loan program has not effectively incorporated these newer quality features and hence send the message to producers to grow the qualities of cotton demanded by textile mills. Consequently, growers are not adequately responding to the demand for stronger fibers.

Cotton Incorporated has developed the Engineered Fiber System (EFS), a computer software program designed to blend different bales of cotton in the spinning process into yarn with specific characteristics. In 1989, more than 3.5 million bales of cotton were processed using EFS software, up from 1.5 million bales in 1987 [Hahn]. According to J. Nicholas Hahn, President and CEO of Cotton Incorporated, [August 1990, p.24] usage is expected to reach five million bales in 1990.

In order for textile mills to utilize the EFS software, information about the raw cotton fiber properties is needed. Measurements of fiber properties such as strength, length, micronaire, and uniformity are used to determine the optimum blend of bales that produce yarn with specific characteristics. The specific characteristics are determined by the yarn's end-use.

The increased use of rotor spinning equipment combined with the development and use of EFS software has created the need for stronger, finer cotton fibers. It has also made expanded fiber property knowledge extremely important. Textile mills contend that under the traditional cotton classing system, knowledge of the three fiber properties measured (grade, staple, and micronaire), is not sufficient to determine the spinnability of cotton fibers. Thus, the fiber property measurements must be expanded to include measurements of the fiber properties about which mills want to know, particularly strength and fineness. The use of High Volume Instrument (HVI) cotton classing has somewhat remedied this problem.

Since 1980, the USDA Cotton Classing Division has been moving toward a more sophisticated cotton classification system with the use of HVI classing machines. HVI machines measure strength, fiber length, length uniformity, micronaire, trash, and color.

HVI was first offered to cotton growers in the Lamesa, Texas area in 1980. During the 1980 crop year, 305,000 bales, or three percent of the total US cotton crop, were classed using HVI machines. In 1988, roughly one half of the US crop of 14.9 million bales was classed on HVI lines [USDA, 1980].

In order to adequately address the problems of inadequate fiber property assessment and the failure of the CCC loan program to reward quality cotton, the USDA has established the National Advisory Committee on Cotton Marketing (NACCM). This committee is composed of representatives of each of the cotton industry's seven segments. The purpose of the NACCM is to review the cotton marketing system and make recommendations as necessary. Particular emphasis is to be placed on areas

impacted by USDA programs such as cotton classing, cotton standards, and the CCC price support loan structure. The following recommendations were made and accepted [Moore]:

1) Federal laws will be modified by 1991 to allow quality factors other than grade, staple, and micronaire to be included in the price support structure.

2) HVI will become the official cotton classification system for price support loan purposes effective with the 1991 crop.

3) The loan structure will include a schedule of premiums and discounts for strength effective with the 1991 crop with a base strength of 24 to 25 grams per tex.

4) A premium range for micronaire of 3.7 to 4.2 will be added to the price support loan schedule. The micronaire base would be 3.5 to 3.6 and 4.3 to 4.9.

5) Cotton grades will be replaced with separate measurements of color and trash. Also, trash and color will be measured by instruments, rather than the classer, as soon as accurate technology is available.

6) USDA will study the potential for using length uniformity index in predicting the value of cotton fiber.

7) USDA will move forward rapidly to develop instruments for measuring maturity and fineness, which will be reflected with appropriate premiums and discounts in the price support loan schedule.

8) USDA will collect marketing data on HVI quality factors.

9) USDA will develop statistical models that will indicate premiums and discounts being paid for various fiber properties.

10) Transportation differentials will be studied to determine their equity and necessity.

The most important recommendations for the purposes of this paper are those that deal with the inclusion of quality factors other than grade, staple, and micronaire in the

CCC price support structure. Also of importance are the discount, base, and premium ranges established for strength and micronaire.

The Commodity Credit Corporation

The CCC publishes premium and discount schedules each year are used to calculate the value of each unit of cotton commodity placed in the loan program. Current premium and discount schedules use grade, staple, and micronaire as the basis for calculating cotton value. Tables 1 and 2 show the 1988 and 1989 premium/discount schedules for Upland cotton. Included in the tables are the premium and discount ranges for grade, staple, and micronaire, and the actual premium and discount values associated with each measurement.

It should be noted that there are no premiums for micronaire on the CCC loan schedules. However, the NACCM has recommended that premiuums for micronaire and premiums and discounts for strength be included in the CCC loan schedules. The micronaire range would be adjusted to include premiums for micronaire readings between 3.7 and 4.2. The base range for strength would be between twenty-four and twenty-five. Premiums would be given for cotton with strengths higher than twenty-five.

The Schlafhorst Study

At the 1989 Beltwide Cotton Production Conference, Helmut Deussen of American Schlafhorst Company and Ludwig Neuhaus of W. Schlafhorst and Company proposed a fiber property valuation system that more accurately reflects the relative

Table 1. CCC premium/discount in points per pound for Upland cotton, 1988.

Grade	Code	13/18 (28) through 23/32 (23)	15/16 (30)	31/32 (31)	Staple length (Inches) (32)	1-1/32 (33)	1-1/16 (34)	1-3/32 (35)	1-1/8 (36)	1-5/32 (37) & longer
WHITE:										
SM & better	(11 & 21)	-705	-550	-360	-210	-60	+175	+225		
MID PLUS	(30)	-725	-573	-385	-240	-75	+180	+210	+220	+335
MID	(31)	-735	-580	-335	-253	-90	+145	+200		+320
SLM PLUS	(40)	-775	-630	-445	-315	-183	+55	+105	+120	+225
SLM	(41)	-805	-780	-470	-383	-213	BASE	+50	+65	+120
LM PLUS	(50)	-890	-833	-575	-485	-545	-195	-185	-140	-115
LM	(51)	-850	-835	-675	-620	-470	-350	-325	-300	-250
SGO PLUS	(60)	-1175	-1110	-1050	-1050	-940	-855			
SGO	(61)	-1285	-1200	-1185	-1163	-1015	-970	-955	-890	-900
GO PLUS	(70)	-1505	-1305	-1505	-1505	-1355	-1355	-1355	-1300	-1255
GO	(71)	-1575	-1575	-1575	-1575	-1425	-1425	-1425	-1390	-1345
LIGHT SPOTTED:										
SM & better	(12 & 22)	-785	-615	-425	-300	-150	+55	+105	+125	+240
MID	(32)	-800	-650	-470	-363	-215	-5	+45	+55	+115
SLM	(42)	-865	-745	-575	-305	-355	-260	-225	-213	-215
LM	(52)	-1055	-855	-975	-905	-753	-753	-753	-753	-753
SGO	(62)	-1385	-1350	-1350	-1350	-1200	-1200	-1200	-1200	-1200
SPOTTED:										
SM & better	(13 & 23)	-985	-890	-820	-785	-575	-400	-370	-355	-345
MID	(32)	-1090	-1000	-925	-915	-783	-685	-660	-650	-533
SLM	(42)	-1225	-1175	-1175	-1175	-1025	-1025	-1025	-1025	-1025
LM	(52)	-1055	-955	-905	-905	-755	-755	-755	-755	-755
SGO	(62)	-1385	-1350	-1350	-1350	-1200	-1200	-1200	-1200	-1200
TINGED: 1/										
SM	(24)	-1830	-1545	-1520	-1520	-1370	-1315	-1305	-1300	-1300
MID	(34)	-1890	-1605	-1600	-1450	-1450	-1420	-1415	-1405	-1405
SLM	(44)	-1735	-1685	-1685	-1685	-1535	-1535	-1535	-1535	-1535
LM	(54)	-1905	-1900	-1900	-1900	-1750	-1750	-1750	-1750	-1750
LIGHT GRAY:										
SM & better	(18 & 26)	-965	-795	-625	-485	-310	+15	+70	+95	+1.5
MID	(36)	-1095	-960	-800	755	-605	-440	-395	-315	280
SLM	(46)	-1315	-1245	-1240	-1240	-1090	-1055	-1000	-885	-845
GRAY:										
SM & better	(17 & 27)	-1085	-950	-810	-790	-840	-535	-490	-415	-395
MID	(37)	-1320	-1245	-1240	-1240	-1090	-1055	-1000	-885	-845
SLM	(47)	-1875	-1875	-1875	-1875	-1525	-1525	-1485	-1480	-1435

1/ Cotton classed as "Yellow Stained" (Middling and better grades) will be eligible for loan, if otherwise eligible at a discount 200 points greater than the discount applicable to the separable quality in the color group "Tinged."

Table 15. CCC loan discounts in points per pound for micronaire differences for upland cotton, 1988.

Micronaire reading	Points per pound Staples 32 (1") & shorter	Staples 33 (1-1/32") & longer	Micronaire reading	Points per pound Staples 32 (1") & shorter	Staples 33 (1-1/32") & longer
5.3 and above	-225	-205	3.0 through 3.2	-345	-435
5.0 through 5.2	-125	-115	2.7 through 2.9	-555	-705
3.5 through 4.9	0	0	2.8 and below	-980	-1095

United States Department of Agriculture, Agricultural Stabilization and Conservation Service

Table 2. CCC premium/discount in points per pound for Upland cotton, 1988.

Grade	Code	13/18 (28) through 23/32 (23)	15/16 (30)	31/32 (31)	Staple length (Inches) (32)	1-1/32 (33)	1-1/16 (34)	1-3/32 (35)	1-1/8 (36)	1-5/3 (37) & longer
WHITE:										
SM & better	(11 & 21)	-710	-585	-415	-250	-85	+190	+240	+250	+380
MID PLUS	(30)	-730	-610	-440	-275	-100	+180	+225	+240	-355
MID	(31)	-740	-615	-450	-295	-110	+185	+220		+355
SLM PLUS	(40)	-785	-660	-500	-375	-195	+85	+115	+130	+220
SLM	(41)	-815	-690	-530	-425	-255	BASE	+45	+60	+100
LM PLUS	(50)	-945	-825	-650	-580	-415	-215	-185	-163	-150
LM	(51)	-1020	-920	-780	-705	-530	-350	-325	-300	-275
SGO PLUS	(60)	-1315	-1230	-1220	-1195	-1040	-940	-915	-870	-810
SGO	(61)	-1395	-1333	-1290	-1270	-1115	-1060	-1045	-995	-950
GO PLUS	(70)	-1650	-1633	-1630	-1580	-1425	-1420	-1415	-1370	-1350
GO	(71)	-1715	-1700	-1700	-1650	-1495	-1495	-1495	-1460	-1440
LIGHT SPOTTED:										
SM & better	(12 & 22)	-775	-650	-460	-360	-190	+55	+90	+115	+205
MID	(32)	-805	-685	-520	-425	-260	0	+45	+55	+95
SLM	(42)	-875	-780	-630	-580	-425	-270	-240	-255	-225
LM	(52)	-1110	-1025	-975	-975	-820	-820	-820	-820	-820
SGO	(62)	-1475	-1440	-1435	-1435	-1280	-1280	-1280	-1275	-1275
SPOTTED:										
SM & better	(13 & 23)	-1075	-980	-910	-860	-690	-580	-550	-535	-530
MID	(33)	-1175	-1080	-1005	-980	-825	-785	-735	-740	-685
SLM	(43)	-1300	-1245	-1245	-1245	-1090	-1090	-1090	-1080	-1080
LM	(53)	-1505	-1500	-1500	-1500	-1345	-1345	-1345	-1340	-1340
SGO	(63)	-1670	-1670	-1670	-1670	-1515	-1515	-1515	-1510	-1510
TINGED: 1/										
SM	(24)	-1650	-1565	-1550	-1550	-1395	-1340	-1330	-1330	-1330
MID	(34)	-1725	-1640	-1640	-1640	-1485	-1455	-1450	-1445	-1445
SLM	(44)	-1785	-1740	-1740	-1740	-1585	-1585	-1585	-1585	-1585
LM	(54)	-1960	-1955	-1955	-1955	-1800	-1800	-1800	-1800	-1800
LIGHT GRAY:										
SM & better	(16 & 26)	-920	-785	-630	-510	-350	+10	+45	+60	+90
MID	(36)	-1100	-990	-833	-790	-635	-410	-360	-310	-295
SLM	(46)	-1550	-1485	-1440	-1385	-1230	-1140	-1100	-1005	-970
GRAY:										
SM & better	(17 & 27)	-1110	-1000	-859	-810	-640	-465	-430	-385	-375
MID	(37)	-1450	-1380	-1350	-1330	-1175	-1130	-1090	-1015	-995
SLM	(47)	-1790	-1775	-1775	-1745	-1590	-1585	-1585	-1535	-1525

1/ Cotton classed as "Yellow Stained" (Middling and better grades) will be eligible for loan, if otherwise eligible at a discount 200 points greater than the discount applicable to the comparable quality in the color group "Tinged".

Table 17. CCC loan discounts in points per pound for micronaire differences for upland cotton, 1988.

Micronaire reading	Points per pound: Staples 32 (1") & shorter	Staples 33 (1-1/32") & longer	Micronaire reading	Points per pound: Staples 32 (1") & shorter	Staples 33 (1-1/32") & longer
5.3 and above	-285	-230	3.0 through 3.2	-365	-480
5.0 through 5.2	-200	-145	2.7 through 2.9	-620	-
3.5 through 4.9	0	0	2.6 and below	-1130	-1185
3.3 through 3.4	-185	-220			

United States Department of Agriculture, Agricultural Stabilization and Conservation Service

importance of fiber properties to the textile industry. Referring to the HVI fiber property measurements, Deussen commented, "we have offered a model to assess the value of a given cotton on the basis of such a property profile." Their model was determined after extensively testing thousands of cotton samples from all over the world.

Eleven fiber properties were evaluated by the Schlafhorst study included: 1) micronaire, 2) fineness, 3) length, 4) maturity, 5) short fiber content, 6) color, 7) trash content, 8) dust content, 9) strength, 10) elongation, and 11) stickiness. Micronaire would be used until separate measurements of fineness and maturity could be made. The traditional grade measurement would be replaced by color, short fiber content, trash, and dust measurements. Also, if stickiness could be measured quickly and accurately, it should be added to the value system. Schlafhorst premiums and discounts are calculated as a percentage of the loan base price. According to this study, these premiums and discounts "reflect the advantages or disadvantages for any spinner regardless of what yarn-making method he employs" [Deussen].

The Schlafhorst valuation system for micronaire, strength, trash, and length is shown in Figure 1. The zero base line represents the average values for all the fiber samples tested in the Schlafhorst laboratories. Premiums and discounts are scaled to reflect the "increase or decrease of value of each property to the consumer" [Deussen].

Objectives

The general objective of this study was to analyze the economic impact of HVI classing on Mississippi cotton producers. More specific objectives included:

Mike Range	Premium/Discount
above 5.0	-25
5.0	-20
4.8	-15
4.6	-10
4.4	- 5
4.2	0
4.0	+ 5
3.8	+10
3.6	+15
3.4	+20
3.2	+25
3.0	+30
below 3.0	+35

Strength Range	Premium/Discount
below 16	-25
16	-20
18	-15
20	-10
22	- 5
24	0
26	+ 5
28	+10
30	+15
32	+20
above 32	+25

Trash Range	Premium/Discount
6.0 or above	-14
5.5	-12
5.0	-10
4.5	- 8
4.0	- 6
3.5	- 4
3.0	- 2
2.5	0
2.0	+ 2
1.5	+ 4
1.0	+ 6
.5 or below	+ 8

Length Range	Premium/Discount
.80 and above	-12
.85	-10
.90	- 8
.95	- 6
1.00	- 4
1.05	- 2
1.10	0
1.15	+ 2
1.20	+ 4
1.25	+ 6
1.35	+10
1.40 and above	+12

Figure 1. Schlafhorst premium, base, and discount ranges for micronaire, strength, trash, and length.

Source: Deussen, 1989.

1) Develop a database for cotton classed in Mississippi using the HVI classing system for 1988 and 1989.

2) Use descriptive statistical techniques to determine the fiber quality characteristics of the 1988 and 1989 cotton crops in Mississippi.

3) Determine the economic impacts of current and alternative quality premium/discount loan schedules on Mississippi cotton growers for 1988 and 1989.

Methods and Procedures

Objective one was to develop a data base for cotton classed using the HVI classing system. The data base for this research consisted of USDA bale records that were HVI classed in Mississippi for 1988 and 1989. In the spring of 1989 release of information letters were sent to key personnel at each gin involved in the research. After all the necessary releases were received, the data were received from the Greenwood classing office and were read into the MSU mainframe computer system.

The 1988 data set consisted of a total of 169,299 bales from fourteen gins across the Mississippi Delta. The 1989 data set consisted of 203,357 bales from twenty gins across the Mississippi Delta.

Each bale record consisted of all the classing information for one bale. The data consisted of gin code number, bale number, producer account number, grade, staple, micronaire, strength, color code measurements; followed by reflectance (Rd), yellowness (+b), trash, length, length uniformity, and date classed.

Objective two was to statistically describe the 1988 and 1989 data sets. The Statistical Package for the Social Sciences (SPSS-X) was used to specify frequency distributions for grade, staple, micronaire, strength, color, length, length uniformity, and, for the 1989 data set, trash [SPSS-X User's Guide]. These distributions were used to calculate what percentages of the 1988 and 1989 bales that fell into premium, base, and discount ranges for each fiber property. The ranges used were those determined by the Commodity Credit Corporation, the National Advisory Committee on Cotton Marketing, and Helmut Deussen of American Schlafhorst and Ludwig Neuhaus of W. Schlafhorst and Company.

Objective three was accomplished through the use of a FORTRAN program that was developed to calculate the value of a bale of cotton based on its property measurements. As a bale record is read into the FORTRAN program, its property measurements are compared to established values within the program. Premiums and discounts that have been specified within the program are applied to that bale based on how its property measurements compare with the established values. The premiums and discounts were then added to the base price and applied to an assumed five hundred pound bale to determine the value for each bale. The total value of the crop is determined by adding the value per bale for all bales.

Analyses were made of current and alternative schedule valuations as calculated by the FORTRAN program. Current loan schedules are those schedules which contain CCC premiums and discounts for grade and staple, and discounts for micronaire. Alternative loan schedules are schedules which contain all possible combinations of CCC

premiums and discounts for grade and staple,and Schlafhorst premiums and discounts for micronaire, strength, length, and trash.

For both the 1988 and 1989 data sets, current and alternative loan schedule values were calculated using the FORTRAN program. Comparisons of the value of the crop under each schedule were made.

The economic impacts of the alternative schedules were estimated by using the 1988 and 1989 data sets. The 1988 data set represented roughly nine percent of the 1988 total Mississippi cotton crop and the 1989 data set represented roughly thirteen percent of the 1989 crop. These estimations were made under the assumption that the remainder of both crops would be similar to the data sets used in this study. Therefore, alternative schedule values calculated for the 1988 and 1989 data sets were used to estimate the economic impacts of alternative schedules on the total cotton crops in Mississippi.

The 1988 CCC base price was 51.9 cents per pound, and the 1989 CCC base price was 50.75 cents per pound. To calculate the value of a bale of cotton, the base price per pound was multiplied by the appropriate percentages of premiums or discounts. These percentages depended upon the fiber property measurements as shown in Figure 1. Assuming a five hundred pound bale, the adjusted base price was then multiplied by five hundred to calculate the value per bale.

Results and Discussion

Frequency Distributions

Because the 1988 trash measurements were not made by a trashmeter, trash ranges were not relevant to this data set. The trash distribution for 1988 was divided into ranges corresponding to a grade with four as the first digit. However, the 1989 trash measurements were made by a trashmeter. Consequently, the distribution of 1989 trash values was compared to the Schlafhorst discount, base, and premium ranges for trash.

Color and length uniformity were not compared to discount, base, and premium ranges because these ranges are not currently used. However, the color distributions were divided into ranges corresponding to a Strict Low Middling grade of forty-one. Length uniformity distributions were divided into ranges corresponding to descriptive designations such as "Average - 80-82", "High - 83-85".

Grade Distributions

The 1988 grade distribution was heavily concentrated within the CCC base range of forty-one. A small percentage, 14.8, classed in the discount range of below forty-one. Slightly more than fifty-two percent of the 1989 grade values classed within the base range while approximately thirty percent of the grade values classed within the discount range. Figure 2 contains the 1988 and 1989 grade distributions as related to CCC standards.

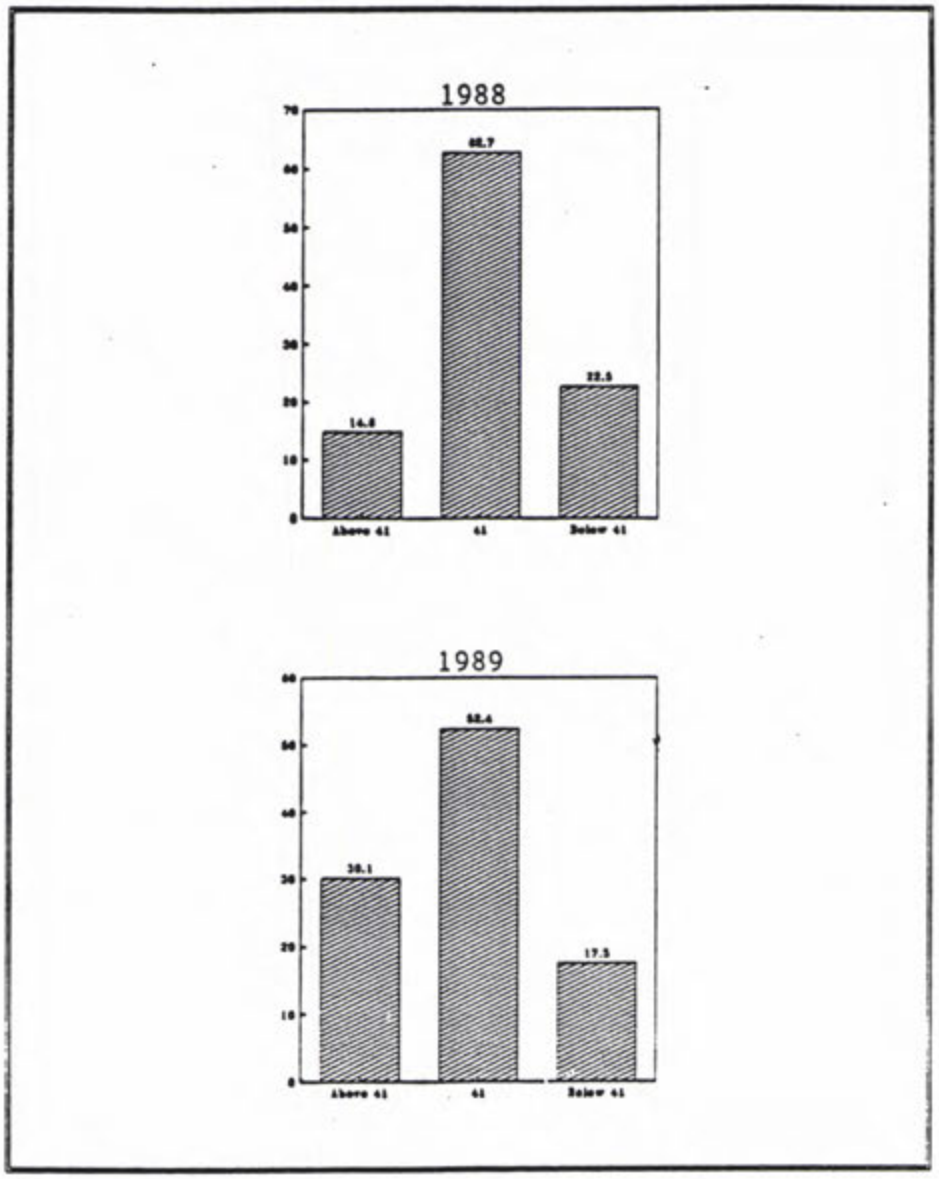

Figure 2. 1988 and 1989 frequency distributions for grade as related to CCC standards.

Staple Distributions

Staple values for 1988 classed roughly eighty percent within the CCC premium range of above thirty-four. Only 4.3 percent of the staple values classed within the CCC discount range of below thirty-four. Only 2.6 percent of the 1989 staple values classed within the CCC discount range. Slightly more than eighty-six percent classed within the CCC premium range of above thirty-four. The 1988 and 1989 staple distributions as related to CCC standards are contained in Figure 3.

Micronaire Distributions

The 1988 micronaire values classed roughly ninety-three percent within the CCC base range of 3.5 - 4.9. Slightly less than ninety-two percent of the 1989 micronaire values classed within the CCC base range. CCC premium ranges for micronaire do not exist.

The CCC base range was adjusted by the National Advisory Committee on Cotton Marketing to allow for a premium range for micronaire of 3.7 to 4.2. Micronaire values in 1988 classed roughly fifty-six percent within this premium range. Thirty-seven percent of the 1988 values classed within the adjusted base ranges of 3.5 to 3.6 and 4.3 to 4.9. The 1989 micronaire values classed nearly forty-three percent within the adjusted base range and forty-eight percent within the premium range. Nine percent classed within the discount range.

The 1988 micronaire values as compared to Schlafhorst standards were more evenly distributed. More than forty-five percent classed within the premium range,

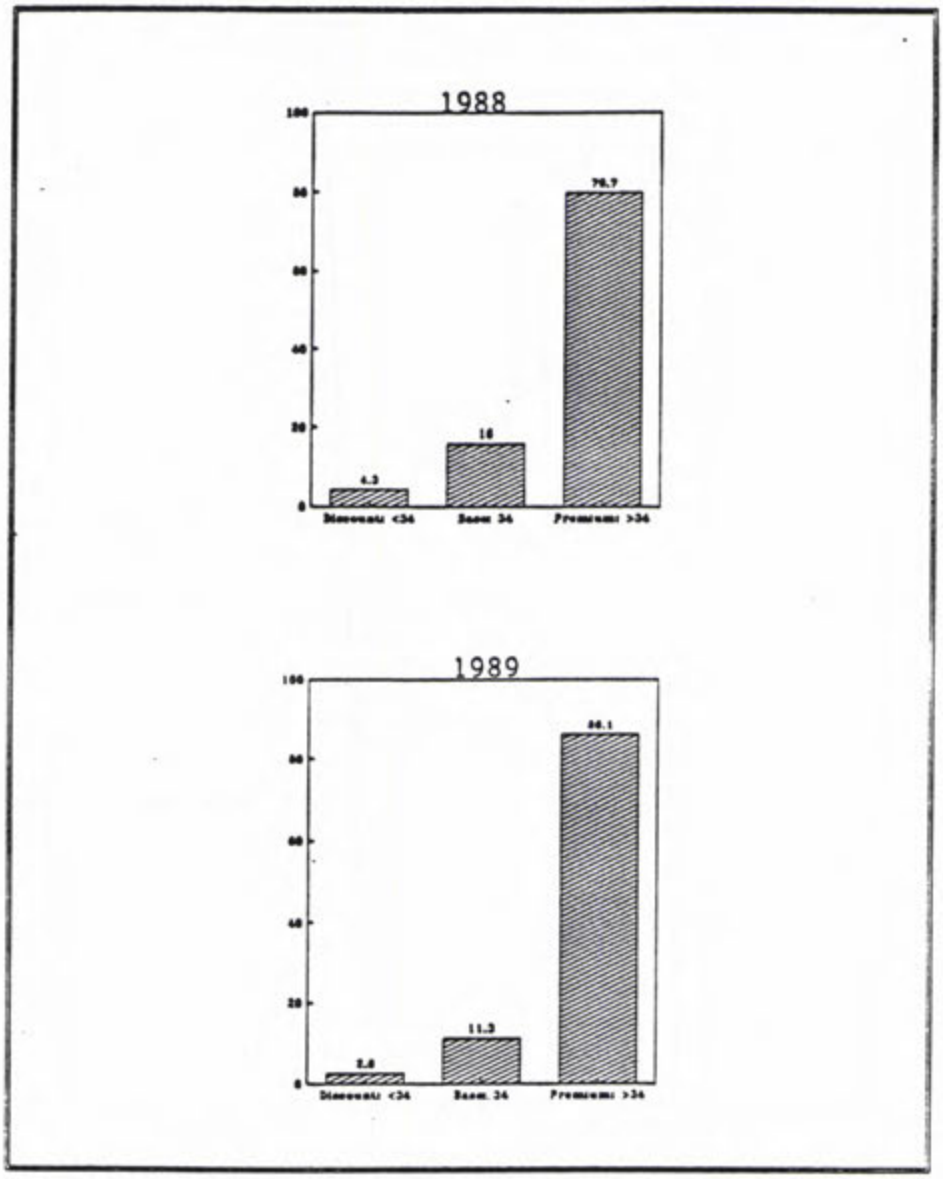

Figure 3. 1988 and 1989 frequency distributions for staple as related to CCC standards.

nearly thirty-one percent classed within the discount range, and close to twenty-four percent classed within the base range. The 1989 micronaire values were similarly distributed. Roughly forty-three percent classed within the premium range while slightly more than thirty-seven percent classed within the discount range. Only twenty percent classed within the base range. Figure 4 contains the 1988 and 1989 distributions of micronaire values as related to CCC, NACCM, and Schlafhorst standards.

Strength Distributions

Strength ranges as specified by the NACCM were identical to those specified by Deussen and Neuhaus of Schlafhorst. Results of the 1988 and 1989 strength distributions are contained in Figure 5. 1988 strength values classed slightly more than forty-five percent within the base ranges of twenty-four to twenty-five. Roughly twenty-three percent classed within the discount range of below twenty-four. 1989 strength values classed more than seventy percent within the premium range. Nearly twenty-six percent classed within the base range, and only 3.8 percent classed within the discount range.

Color Distributions

The 1988 color measurements classed 62.6 percent around a value of forty-one. This value corresponds to a Strict Low Middling White grade of forty-one. The 1989 color measurements classed 64.3 percent below a value of forty-one. Figure 6 contains the 1988 and 1989 color distributions as related to a grade 41.

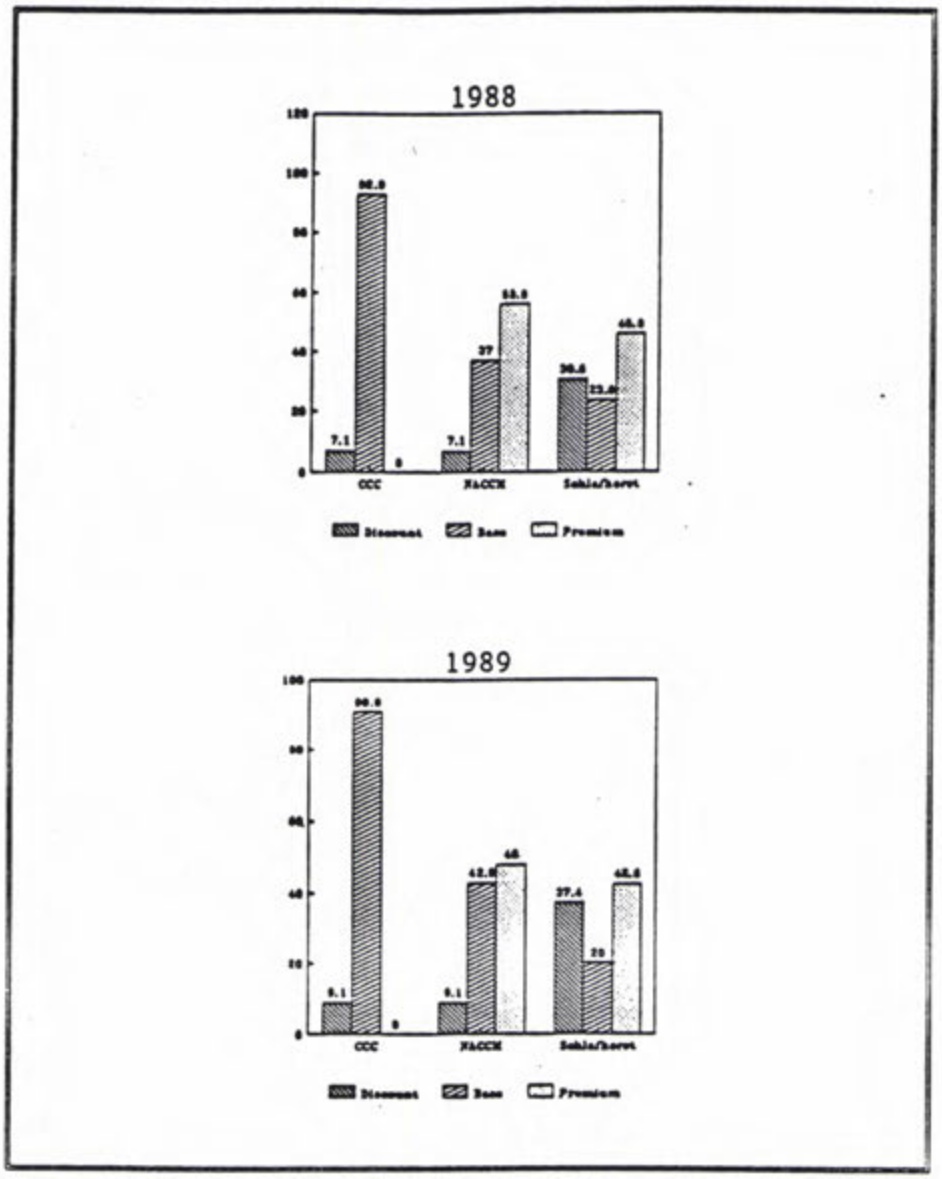

Figure 4. 1988 and 1989 frequency distributions for micronaire as related to CCC, NACCM, and Schlafhorst standards.

CCC Standards:
- Discount: Below 3.5 & Above 4.9
- Base: 3.5 - 4.9
- Premium: NA

NACCM Standards:
- Discount: Below 3.5 & Above 4.9
- Base: 3.5-3.6 & 4.3-4.9
- Premium: 3.7 - 4.2

Schlafhorst Standards:
- Discount: Above 4.2
- Base: 4.1 - 4.2
- Premium: Below 4.1

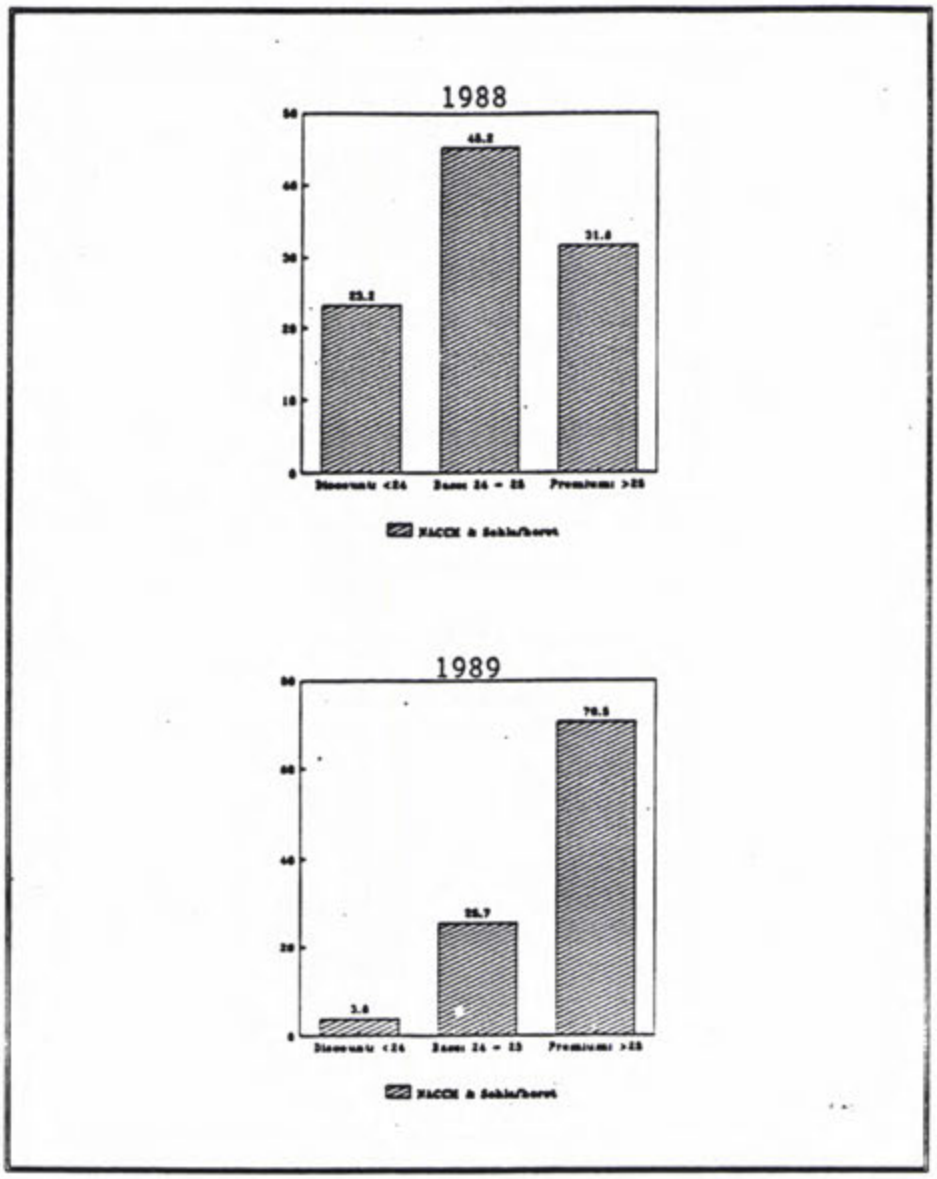

Figure 5. 1988 and 1989 frequency distributions for strength as related to NACCM and Schlafhorst standards.

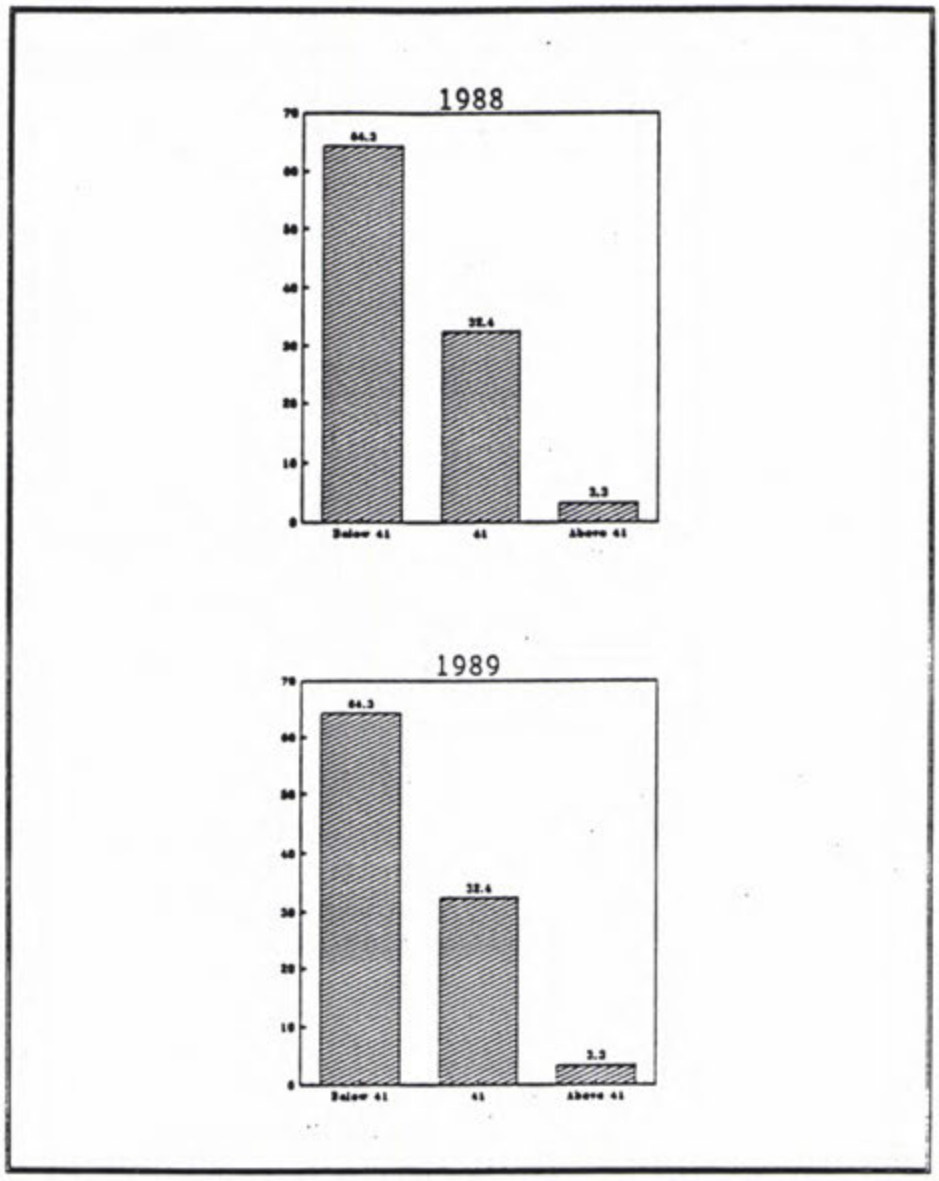

Figure 6. 1988 and 1989 frequency distributions for color as related to grade 41.

Trash Distributions

The 1988 trash distribution was fairly even between the below four and four ranges. The trash range corresponds to a grade value that has four as its first digit. Roughly half of the trash values classed below four. Slightly more than forty-five percent of the trash values were exactly four. 1989 trash values classed one hundred percent within the premium range of below 2.5. 1988 trash distributions as related to a grade with a "4" as the first digit and 1989 trash distributions as related to Schlafhorst standards are contained in Figure 7.

Length Distributions

Figure 8 contains the 1988 and 1989 length distributions as related to Schlafhorst standards. 1988 length values classed 47.2 percent within the base range of between 106 and 110. Slightly more than forty-five percent classed within the premium range of above 110. The 1989 length values were similarly distributed with 44.6 percent classing within the base range and 50.9 percent classing within the premium range.

Length Uniformity Distributions

The 1988 length uniformity values classed sixty-six percent within the average range of between eighty and eighty-two. Only 5.1 percent of the values were considered to be above average. The 1989 length uniformity values classed roughly sixty percent within the average range. The percentage classing above average increased to 27.1 percent in 1989. Figure 9 contains the 1988 and 1989 length uniformity distributions.

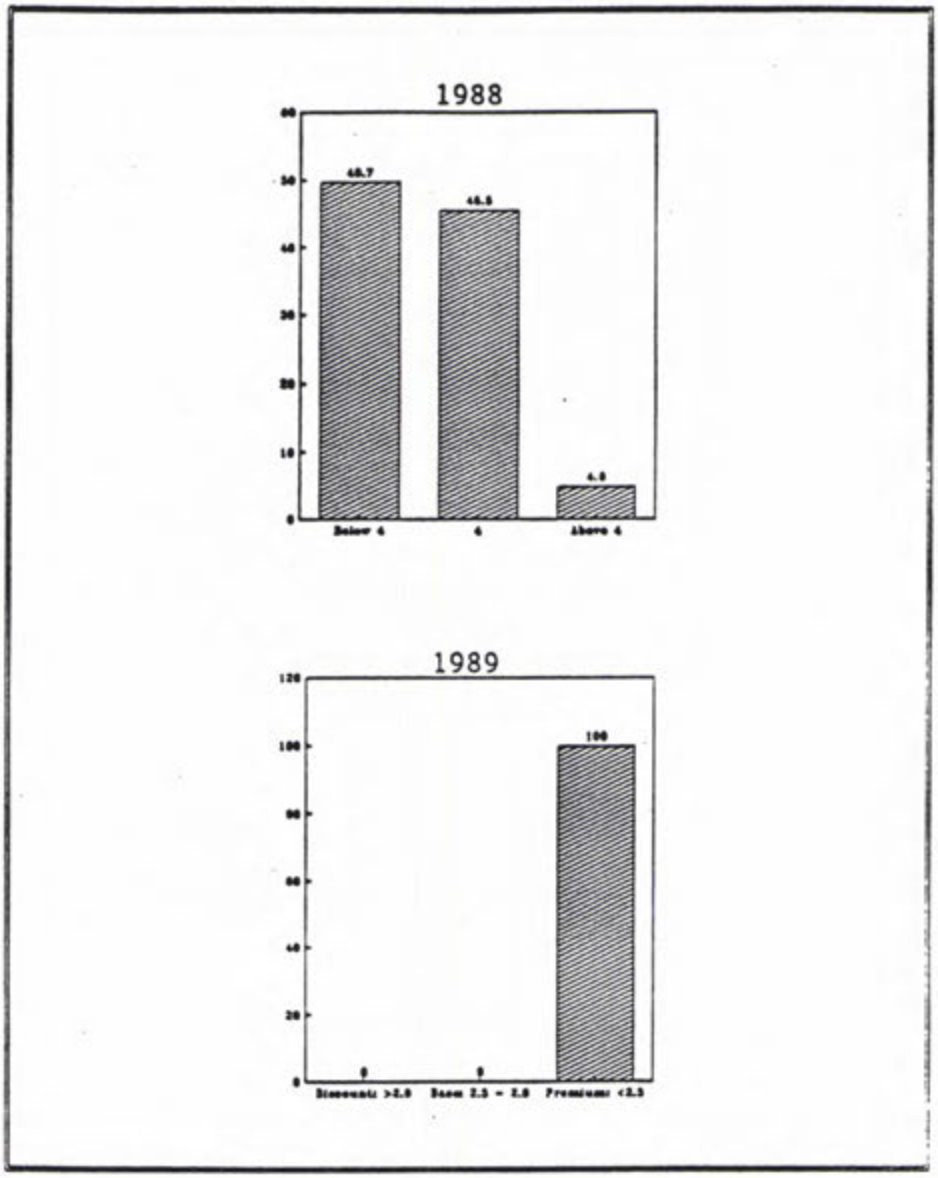

Figure 7. 1988 frequency distribution for trash as related to grade with "4" as the first digit and 1989 frequency distribution for trash as related to Schlafhorst standards.

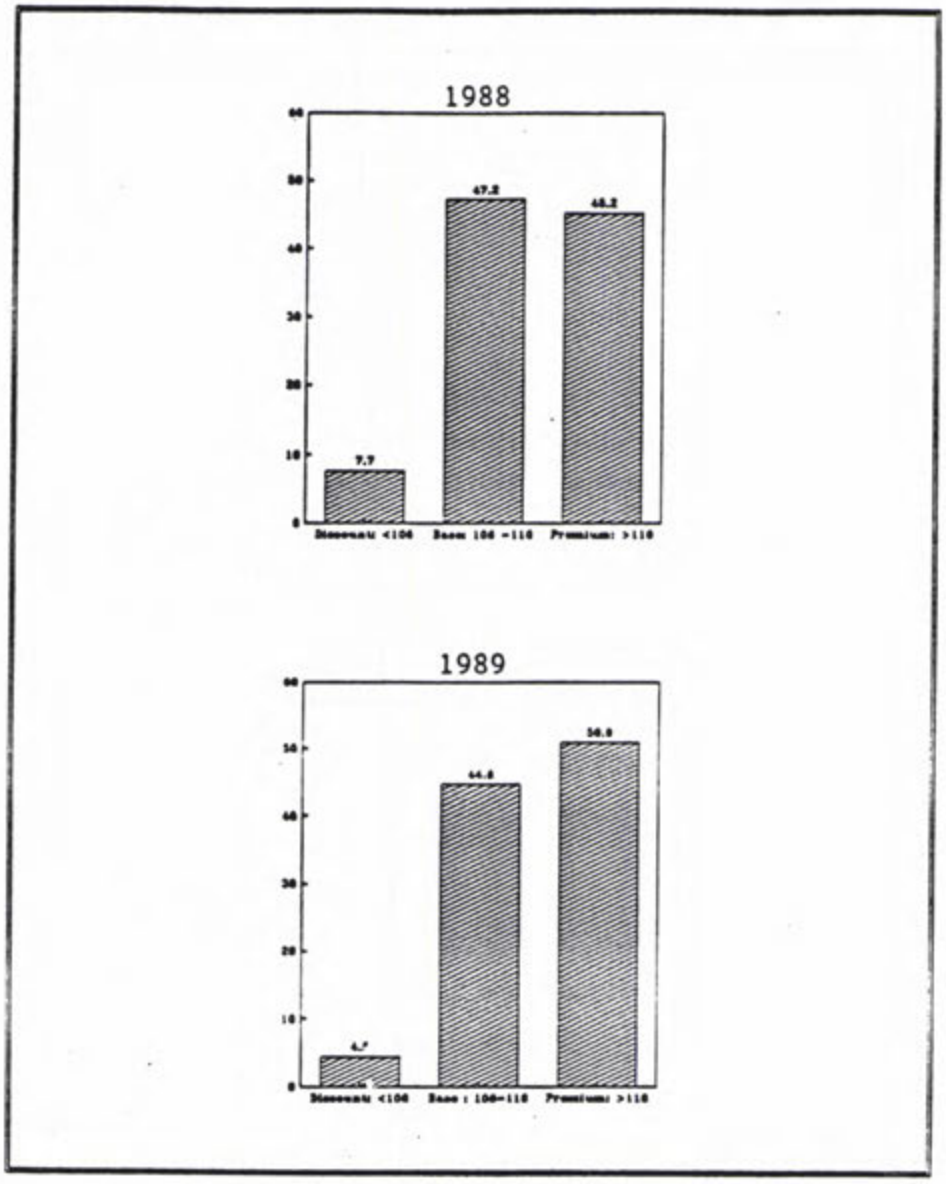

Figure 8. 1988 and 1989 frequency distributions for length as related to Schlafhorst standards.

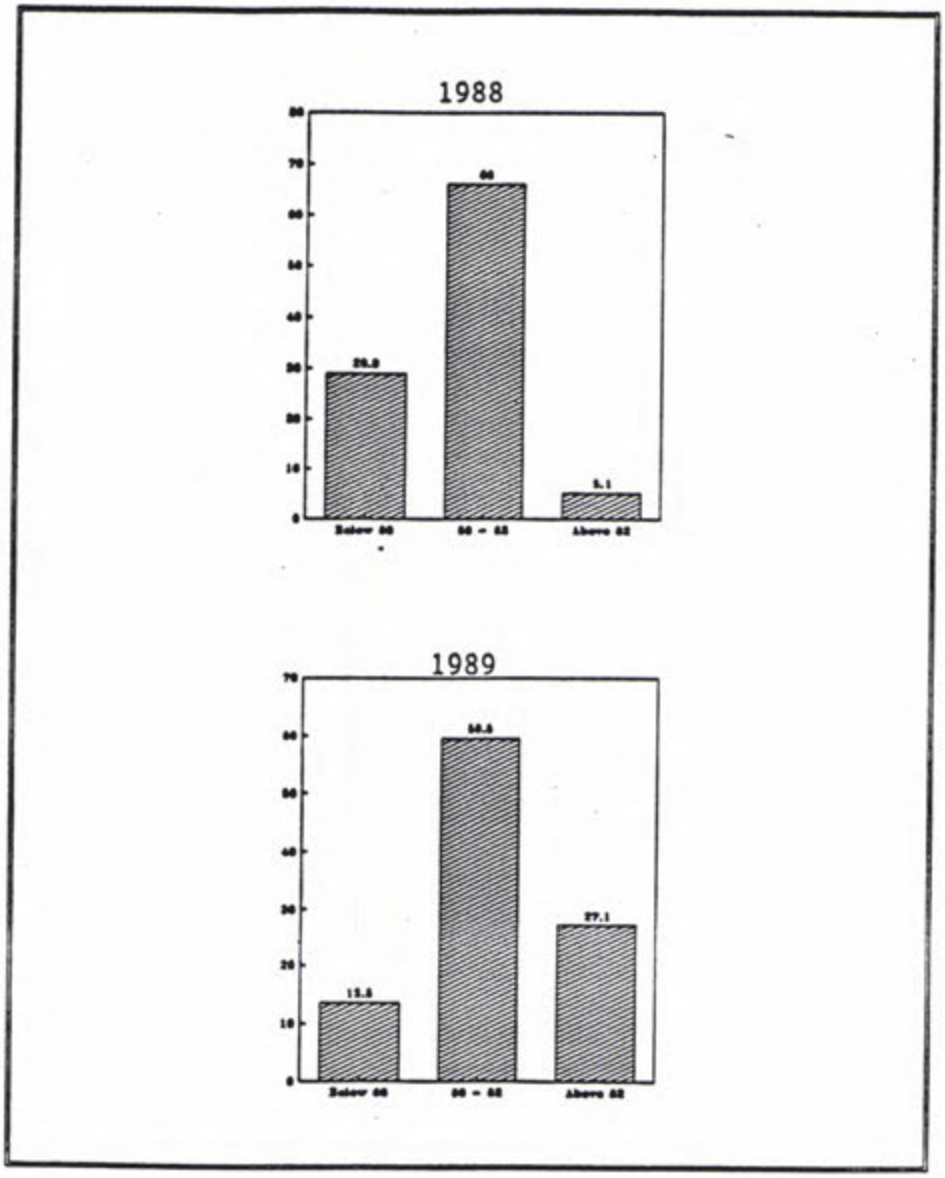

Figure 9. 1988 and 1989 frequency distributions for length uniformity as related to below 80, 80-82, and above 82 descriptive designations.

Economic Analysis

The 1988 and 1989 data sets were used to analyze the economic impacts of various premium and discount scenarios. The 1988 analysis was conducted for current and alternative schedules. Current schedule analysis was conducted using Commodity Credit Corporation premiums and discounts for grade and staple and discounts for micronaire. Alternative schedule analyses were conducted using all possible combinations of Commodity Credit Corporation premiums and discounts for grade and staple combined with Schlafhorst premiums and discounts for micronaire, strength, and length. Again, as 1988 trash readings were not made by a trashmeter, the trash premiums and discounts were not applied to this data set. There were sixteen possible combinations of alternative schedules. Results of the 1988 analysis are presented in Table 3.

The 1989 analysis was also conducted on current and alternative schedules. 1989 current schedules are the same as those used in 1988.

Alternative schedules include the same premiums and discounts as the 1988 data analysis plus Schlafhorst premiums and discounts for trash. There were thirty-two possible combinations of alternative schedules. Results of the 1989 analysis are presented in Table 4.

Current schedule values are calculated by adding or subtracting the appropriate CCC premiums or discounts for grade, staple, and micronaire to the CCC base price. The adjusted base price is then multiplied by an assumed five hundred pound bale to calculate the value per bale.

Table 3. Results of the 1988 analysis of current and alternative premium and discount schedules.

Schedule	Sample Value per Pound (cents)	Sample Value per Bale* (dollars)	Total Sample Value** (thousand dollars)	Economic Impact (thousand dollars)
Current	51.77	258.83	43,798.3	NA
Base	51.90	259.50	43,912.1	1,227.2
G,S,M,ST,L	54.08	270.39	45,754.9	21,113.2
M,ST,L	53.96	269.80	45,655.4	20,038.6
G,S,M,L	53.71	268.53	45,439.3	17,706.9
G,S,M,ST	53.65	268.25	45,393.4	17,211.6
M,L	53.59	267.94	45,339.7	16,632.3
M,ST	53.53	267.67	45,293.8	16,140.0
G,S,M	53.28	266.39	45,077.7	13,805.2
M	53.16	265.80	44,978.1	12,730.6
G,S,ST,L	52.82	264.09	44,688.9	9,609.8
ST,L	52.70	263.50	44,589.3	8,535.2
G,S,L	52.45	262.23	44,373.2	6,203.5
G,S,ST	52.39	261.95	44,327.3	5,708.1
L	52.33	261.64	44,273.6	5,128.9
ST	52.27	261.37	44,227.7	4,633.5
G,S	52.02	260.09	44,011.7	2,301.8

*Assumes a 500 pound bale.

**Due to missing data, 169,218 bales were used.

G: Grade
S: Staple
M: Micronaire
ST: Strength
L: Length

Table 4. Results of the 1989 analysis of current and alternative premium and discount schedules.

Schedule	Sample Value per Pound (cents)	Sample Value per Bale* (dollars)	Total Sample Value** (thousand dollars)	Economic Impact (thousand dollars)
Current	49.75	248.76	50,518.0	NA
Base	50.75	253.75	51,529.8	7,747.2
M,ST,L,T	55.75	278.75	56,607.2	46,627.0
M,ST,T	55.19	275.97	56,042.6	42,303.2
G,S,M,ST,L,T	55.14	275.68	55,984.1	41,855.5
ST,L,T	54.99	274.97	55,839.7	40,750.1
M,ST,L	54.67	273.36	55,511.9	38,239.7
G,S,M,ST,T	54.58	272.90	55,419.4	37,531.7
ST,T	54.44	272.19	55,275.1	36,426.3
G,S,ST,L,T	54.38	271.91	55,216.6	35,978.6
M,ST	54.12	270.58	54,947.2	33,915.9
G,S,M,ST,L	54.06	270.29	54,888.8	33,468.1
ST,L	53.92	269.58	54,744.4	32,362.8
G,S,ST,T	53.82	269.12	54,652.0	31,654.8
G,S,M,ST	53.50	267.51	54,324.1	29,144.4
ST	53.36	266.80	54,179.8	28,039.1
G,S,ST,L	53.30	266.51	54,121.3	27,591.3
M,L,T	53.14	265.70	53,957.2	26,335.1
G,S,ST	52.75	263.73	53,556.6	23,267.5
M,T	52.58	262.92	53,392.6	22,011.3
G,S,M,L,T	52.53	262.64	53,334.1	21,563.6
L,T	52.38	261.92	53,189.8	20,458.2
M,L	52.06	260.31	52,861.9	17,947.8
G,S,M,T	51.97	259.85	52,769.5	17,239.8
T	51.83	259.14	52,625.1	16,134.5
G,S,L,T	51.77	258.86	52,566.6	15,686.7
M	51.51	257.53	52,297.3	13,624.0
G,S,M,L	51.45	257.24	52,238.8	13,176.3
L	51.31	256.53	52,094.4	12,070.9
G,S,T	51.22	256.08	52,002.0	11,363.0
G,S,M	50.89	254.46	51,674.1	8,852.6
G,S,L	50.69	253.46	51,471.3	7,299.4
G,S	50.14	250.68	50,906.6	2,975.7

*Assumes a 500 pound bale.

**Due to missing values, 203,073 bales were used.

G: Grade
S: Staple
ST: Strength
L: Length
M: Micronaire
T: Trash

Alternative schedule values are calculated by multiplying the CCC base price by appropriate Schlafhorst premium or discount percentages for micronaire, strength, length, and trash. The appropriate CCC premiums or discounts for grade and staple are then added to or subtracted from the adjusted base price to calculate a price per pound. This price is multiplied by an assumed five hundred pound bale to calculate the value per bale.

Current Schedule Analysis

The 1988 current schedule analysis yields an average value of approximately $258.83 per bale or 51.77 cents per pound, which is lower than the value of any of the alternative combinations. This amount is also lower than the CCC established base price of 51.9 cents per pound.

The 1989 current schedule analysis yields an average value of approximately $248.77 per bale or 49.75 cents per pound. Again, this value is lower than the value of any of the alternative combinations as well as the value of the base price of 50.75 per pound.

Alternative Schedule Analysis

Alternative schedule analysis for 1988 determined that the highest returns resulted from a combination of grade, staple, micronaire, strength, and length. The average value of this combination was $270.39 per bale or 54.08 cents per pound. The lowest return resulted from just the CCC established base price of 51.9 cents per pound. The difference between the highest and lowest returns was 2.18 cents per pound.

The combination of micronaire, strength, length, and trash resulted in the highest returns for 1989. The average value of this combination was $278.75 per bale or 55.75 cents per pound. The lowest returns resulted from a combination of grade and staple at $250.68 per bale or 50.14 cents per pound. The difference between the highest and lowest returns was 5.61 cents per pound.

Combinations that included strength tended to yield a higher return than combinations that did not include strength. It is reasonable to assume that this is due to the high strength values that occurred in 1989.

Economic Impacts

The economic impact on Mississippi cotton producers associated with each alternative schedule combination was estimated by multiplying the total number of bales harvested in Mississippi by the difference between the alternative value per bale and the current value per bale. This, of course, assumes that the sample of HVI bales accurately represents the entire Mississippi cotton crop for these years. In addition to previously described information, Tables 3 and 4 also contain the estimated economic impacts associated with each alternative schedule combination.

To further illustrate how this impact is calculated, consider the following examples:

Total bales harvested in Mississippi in 1988: 1,825,999
1988 current schedule value per bale: $258.83
1988 alternative (G,S,ST,L) schedule value/bale: $264.09

($264.09 - $258.83) x 1,825,999 = $9,609,797.28

Total bales harvested in Mississippi in 1989: 1,555,000
1989 current schedule value per bale: $248.76
1989 alternative (G,S,ST,L) schedule value/bale: $266.51

($266.51 - $248.76) x 1,555,000 = $27,591,296.52

These estimates represent the increases in the total values of the 1988 and 1989 cotton crops that could have occurred using the alternative schedule combination of grade, staple, strength, and length described by Schlafhorst.

The largest increase in the value of the 1988 cotton crop was $21.1 million and occurred with the alternative schedule combination of grade, staple, micronaire, strength, and length. The smallest increase was $12.3 million and was observed with an alternative schedule combination of grade and staple.

The largest increase in the value of the 1989 cotton crop in Mississippi was $46.6 million and occurred with the alternative schedule combination of micronaire, strength, length, and trash. The smallest increase was $29.7 million and was observed with an alternative schedule combination of grade and staple.

Regardless of the alternative schedule combination used, the total value of the 1988 and 1989 Mississippi cotton crops would be increased by using the Schlafhorst premiums and discounts.

Limitations

The results of this study were limited by some of the assumptions made regarding CCC loan schedule analysis. No distinction was made between loan program and non-loan program bales within the 1988 and 1989 data sets. Normally, not all of the growers whose cotton was classed at the Greenwood classing office would be loan program

participants. Thus, loan schedule analysis was conducted on bales whose loan program status was not known.

The bale values calculated in this study do not necessarily reflect the value of the cotton crop in Mississippi. If the market price were above the loan price then the bale values would have been determined by the market price. Analysis was not conducted using any prices other than base prices as established by the Commodity Credit Corporation.

It was also assumed that premiums and discounts included in the CCC schedule for quality factors other than grade, staple, and micronaire would be those developed by Deussen and Neuhaus of Schlafhorst. The USDA would probably develop its own premiums and discounts which may or may not be similar to those developed at Schlafhorst.

Conclusions

Fiber property means were similar to the base ranges for each fiber property indicating that appropriate range values are being used. However, a large percentage of 1989 strength and micronaire readings were in the premium ranges. This could be attributed to 1989 growing season conditions such as rainfall, temperature, production practices, harvesting practices, etc.

Economic analysis of current and alternative loan program schedules revealed that any combination of premiums and discounts for the given data sets resulted in higher returns than would be received under the current schedule. The current schedule for 1988 returns totaled 51.77 cents per pound as compared to an alternative schedule

combination of grade, staple, micronaire, strength, and length worth 54.08 cents per pound. When fiber properties were compared individually, a schedule of only micronaire premiums and discounts resulted in the highest return of 53.16 cents per pound.

Current and alternative economic analysis for 1989 revealed that current schedule returns totaled 49.75 cents per bale as compared to an alternative schedule of micronaire, strength, length, and trash worth 55.75 cents per pound. The highest returns on a per fiber property basis were realized with strength at 53.36 cents per pound. Regardless of which combination of fiber properties was used, alternative schedules resulted in a higher price per pound than would have been received under current CCC loan schedules given these data sets.

Economic impact analysis revealed that in 1988 the largest increase in the total value of the Mississippi cotton crop was $21.1 million and occurred with an alternative schedule combination of grade, staple, micronaire, strength, and length. The largest increase in total value in 1989 was $46.6 million and resulted from an alternative combination of micronaire, strength, length, and trash.

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