2004 BELTWIDE COTTON CONFERENCES, SAN ANTONIO, TX – JANUARY 5-9

THE MILL-LEVEL PRICE OF QUALITY COTTON IN THE U.S.

Conrad P. Lyford, Sangnyeol Jung, and Don E. Ethridge
Texas Tech University
Lubbock, TX

Abstract

In order to develop information about the price of cotton quality, the price-quality relationships of U.S. cotton are investigated by examining the cotton basis attributable to the quality characteristics such as color and leaf grade, staple length and strength, and micronaire for several major production regions. By using data from daily cotton contracts, a hedonic price model is estimated for the implicit price of heterogeneous cotton quality characteristics. In this study, the information on the estimated implicit prices is merged with the information from earlier analyses to show evolving regional price-quality relationships in U.S. cotton over several recent marketing years.

Introduction

According to U.S. National Cotton Council (NCC), annual cotton production is valued at more than $3 billion at the farm gate and the resulting business revenue generated by cotton in the U.S. economy exceeds $100 billion, making cotton the largest U.S. value-added agricultural crop. As such, the cotton industry is an important part of the U.S. economy.

Cotton fiber, the major product from cotton production, is the raw input for the textile manufacturer, who transforms cotton into yarn or fabric for apparel, household goods or industrial products. Depending on product type, cotton quality needs are quite varied. Quality specifications commonly include color and leaf grade, staple length and strength, micronaire, foreign matter content, and variety or region of growth. The quality differences affect price and the value that manufacturers get from the cotton.

To get desired quality, textile manufacturers are willing to pay based on their needs and the relative scarcity of fiber characteristics. In turn, producers and marketers respond to price incentives. As such, cotton price-quality information plays an important role in the efficiency of the overall cotton market. Developing better information about these price-quality interactions is the focus of this study.

To capture the evolving price-quality relationships, it is useful to have information over a substantial period of time that shows the implicit prices of cotton quality characteristics. As we understand the changes in cotton quality pricing, this provides knowledge on how market prices of each quality characteristic change over time.

This study uses data from cotton contracts by mill buyers when the contract is established. Data used in this study include information that is not publicly available and represents the value of raw cotton at the last stage prior to its transformation into textile products (e.g. yarn, towels, etc.). Using these data, price-quality relationships are evaluated using regional hedonic models for three marketing years. This study builds upon previous research and is combined with information from earlier literature (Chakraborty et al., 1999, Ethridge and Chen, 1997, Ethridge et al., 2000, Karaky et al., 1998).

Data

The data set in this study is from individual contracts for cotton within three recent marketing years--2000/01, 2001/02 and 2002/03. In each contract record, information on date of purchase, amount of cotton purchased in bales, price paid by mill buyers, premium (or discount) in points, quality specifications, and required location of production is recorded. Within the analysis the quality characteristics of color and leaf grade, staple length and strength, micronaire, and specified region of growth are used. These contracts represent over 45 percent of total U.S. milling capacity for the relevant marketing years.

The cotton purchase prices for mill contracts were analyzed to evaluate the effect of quality upon prices paid. To accomplish this, one important aspect was to limit the effect that changes in the general level of cotton prices which was consistent with how the contracts were written. This was accomplished based upon how the contracts were written.

Most of the contracts were written based on a price basis (ρ) relative to New York futures prices nearby to the expected delivery date of the cotton. That is, the price of the cotton could be considered to be the futures price plus a basis to meet contract specifications. Given that the futures price is for a set standard quality specification, this basis is considered to be the differential amount paid for quality. This basis is the dependent variable in our analysis.

Contracts were also written for net free on board (fob) cash mill price. The prices in these contracts were converted to be equivalent to the basis contracts using the following method. At the date that the fob cash mill price was established there is

a recorded market price for cotton of base quality from that region. The difference between the contract case price and the price for base quality was the basis (ρ) for these observations.

Overall, the variables used for the analysis are defined in Table 1. Algebraic transformations of quality specifications in the contracts are used to establish positive expected relationships between each explanatory variable and the dependent variable. For example, since the grayness of fiber (C1) negatively affects the purchase price of cotton, this variable is transformed into an indicator of whiteness, indicating an expected positive relationship between the attribute and the cotton contract price. That is, the basis (ρ) should increase as the cotton fiber becomes whiter. This is accomplished by using the formula for GC1 as indicated in Table 1 to change the negative attributes of grayness in cotton fiber to a positive one (whiteness). Similarly, C2 (yellowness) and LF (low leaf grade or trash content) are transformed into GC2 and GLF.

After transformations all independent variables have positive sign expectations for the effects on the cotton contract price, except the square of the average of micronaire (M2). The micronaire (M) indicates both fitness (density) and maturity of cotton fiber. As the micronaire gets higher, the cotton premium should increase at a decreasing rate. Thus, there is an expected quadratic relationship between micronaire and price (Ethridge et al., 2000).

Regional definitions in this study follow the previous studies specified as: South, Southwest, Desert Southwest, and West (Lyford et al., 2003). Each region is as follows. South covers those Southern and Southeast states of the U.S. (NC, SC, VA, TN, GA, AL, and FL) and North and South Delta states (MO, AR, LA, MS). Southwest represents Texas and Oklahoma regions. Desert Southwest consists of New Mexico and Arizona, and West includes California and Nevada regions. These regional definitions are useful to determine the regional difference inherent in cotton price-quality relationships. Summary statistics for the data by region and marketing year is provided in Table 2.

Model

A hedonic price differential model was developed, using the basis price paid for quality (ρ). In this, the effect of quality factors and other variables is evaluated in relationship to their effect upon price differentials or premiums (or discounts). Because of the typical declining marginal productivity of most attributes in manufacturing processes, a non-linear semi-log specification is used. For the regional effects of cotton prices in the contract, each geographical region of cotton is run as a separate regression by marketing year. An economic model for the analysis is:

$$\rho = f(\textit{Color, Leaf Grade, Staple Length, Strength, Micronaire})$$

And, its corresponding econometric model for each region is specified as:

$$\rho = \beta_0 + \beta_1 \log GC_{it} + \beta_2 \log GLF_{it} + \beta_3 \log LTH_{it} + \beta_4 \log STR_{it} + \beta_5 M_{it} + \beta_6 M2_{it} + \varepsilon_t$$

where variables are defined in Table 1 as discussed earlier. Regional equations are used to develop price-quality relationships in U.S. cotton for the last three marketing years by region using ordinary least squares estimation.

Results

The overall statistical results of the regressions for the marketing years 2000/01, 2001/02 and 2002/03 by region is presented in Table 3. The overall explanatory power of the regressions (R^2) is varies from 0.51 to 0.88. All the variables have the theoretically expected signs. These statistical results have been applied to typical quality specifications to understand practically the effect of region and different quality specifications on price. It should be noted that a regional model was not developed for the Southwest region due to lack of sufficient data.

One of the most consistent contract specifications is region of growth. Different regions typically grow region-specific cotton varieties and are affected by separate climate and other growing conditions. In the three regions studied, a consistent relationship between the regions is shown for a base quality of color grade 41, leaf 4, micronaire 3.5~4.9, strength 24~25 and length 34. The West region emerged as having the highest value followed by the South and then the Desert Southwest as shown in Table 4. This result is essentially for the same graded quality of cotton and suggests that reputation and other quality factors typically not included in contracts have an enduring influence on price. It should be noted that the difference between the South and West regions were quite small in 2000/01 and 2001/02 but increased towards historical levels in 2002/03.

The estimates of the model have been applied to typical quality specifications to understand practically the effect of region and different quality specifications on price. The statistically estimated effect of different quality specifications is found in Tables 5-10. Interpretations of these tables are provided below.

The average premiums and discounts from base for the C1, the first digit of color grade, are shown by region and year in table 5. As expected, the better the grade, the higher the price. Color grade affected the price from roughly a 300 to 500 increase to a 400 to 600 decrease in price for the 2002/03 marketing year. That is, the premium or discounts due to C1 directs about 6 to 14 percent on cotton price compared to the price for the base quality. The San Joaquin Valley/West (SJV) cotton had smaller C1 premiums and discounts than the other two regions in 2002/03. This may be attributable to the relative abundance of white cotton (absence of grayness) in the SJV region compared to the other regions.

The discounts for the C2, the second digit of color grade, are shown in Table 6. As expected, the lower the grade, the higher the discounts. Changes in discounts for C2 in the South region over the marketing years are prominent, showing about 6 percent of discounts on average for the low C2 with grade 3. The reason why the SJV in 2002/03 had smaller C2 discounts than the South is probably due to the whiter (absence of yellowness) cotton being more abundant in SJV than the South.

Table 7 shows the effect of leaf grade on price. The leaf grade of 3 receives premiums and that of 5 gets discounts from the base grade of 4. The magnitude of premiums and discounts for leaf grade over the marketing years in South shows that the ranges are relatively narrower than other quality characteristics, which reaches less than 4 percent of the overall value.

The premium estimates for staple length shows the increasing price from longer staple (Table 8). The premium for staple length 36 is from 206 points to 275 points in 2002/03 which amounts to about 4 to 6 percent of the overall price. Relatively, the premiums for staple length were smaller for SJV probably because of its perceived staple length which averaged well over the base length of 34.

The price for strength is shown in Table 9. The calculated strength premiums and discounts for SJV are smaller than that for the South. This may be because the mills are relatively less concerned about strength in the West.

Table 10 shows the value of micronaire derived from the estimates. The estimated value increases as the micronaire goes up, and then decreases after micronaire surpasses an optimal level. Mill buyers discounted very heavily on low micronaire in 1994/96 for SJV and quite heavily on low micronaire in 2001/02 for the South region. In the 2002/03 marketing year the discount for low micronaire in the South was not statistically significant. The recent result for the South may be the result of ongoing increases in average micronaire levels in the South.

Summary and Conclusion

The analysis developed in this paper shows the evolving nature of cotton price-quality relationships at the mill level. Statistical results were generated for three regions. Overall the analysis shows that there are enduring differences in price based upon region. This indicates that cotton producing regions, their reputation and their efforts to improve quality produced have an important effect on economic outcomes.

The results in this study show the effect of quality on price at the last stage before cotton is transformed into textile products. As such, the value for cotton at this level most closely reflects the real value of cotton attributes over the time period of study. One potential use for these results is that they can be utilized by cotton geneticists and breeders in their efforts to improve cotton quality to achieve higher value for cotton produced. Future efforts will be directed towards comparing these attribute prices with those prices paid at earlier stages in the marketing chain, (e.g. the loan rate, AMS price data) so that we can better understand the effectiveness of the marketing system in communicating mill users' needs.

Acknowledgements

The authors acknowledge the assistance of cooperating firms in providing data to the study. This research was supported by Cotton Incorporated and the Cotton Economics Research Institute at Texas Tech University.

References

Chakraborty, K., and D. Ethridge. 1999. "Cotton Quality Price Differentials From Textile Mill's Perspective: An Update," *1999 Beltwide Cotton Conferences Proceedings*. Cotton Economics and Marketing Conference, National Cotton Council, Memphis, TN. pp 256-259.

Chen, C., D. Ethridge, and S. Fletcher. 1997. "Textile manufacturers' market valuation of cotton fiber attributes," *J. Agric. Appl. Econ*. 29 (1):185–195.

Ethridge, D., and C. Chen. 1997. "Values Placed on US Cotton-Fiber Attributes by Textile Manufacturers," *J. Text. Inst.* 88 (1):4-12.

Ethridge, D., S. Swink, and K. Chakraborty. 2000. "Cotton Quality Price Differentials From Textile Mill's Perspective: An Update," *2000 Beltwide Cotton Conferences Proceedings*. Cotton Economics and Marketing Conference, National Cotton Council, Memphis, TN. pp 382-385.

Karaky, R., D. Ethridge, and H. Floeck. 1998. "Cotton Quality Price Differentials Paid by U.S. Textile Mills," *1998 Beltwide Cotton Conferences Proceedings*. Cotton Economics and Marketing Conference, National Cotton Council, Memphis, TN. pp 370-373.

Lyford, Conrad P., Sangnyeol Jung, and Don E. Ethridge. 2003. "Price-Quality Relationships in U.S. Cotton at the Mill Level," *2003 Beltwide Cotton Conferences Proceedings*. Cotton Economics and Marketing Conference, National Cotton Council, Memphis, TN. pp 383-387.

U.S. Department of Agriculture. 2003. *Cotton and Wool Situation and Outlook Yearbook*. Economic Research Service.

Table 1. Variable Definitions and Expected Signs.

Dependent Variable		**Definition**	
ρ		Basis price (cents per pound) as specified in the contract for the expected delivered quality relative to base quality	
Independent Variable	**Formula**	**Definition**	**Expected Sign**
GC1	8-C1	*Absence of grayness; i.e., whiteness.* C1 is the first digit of the grade code which varies from 1 through 7; Since C1 has a maximum value of 7, subtracting from 8 converts C1 from an indicator of grayness to an indicator of whiteness.	+
GC2	6-C2	*Absence of yellowness; i.e., whiteness.* C2 is the second digit of the grade code which varies from 1 through 5; Since C2 has a maximum value of 5, subtracting from 6 converts C2 from an indicator of yellowness to an indicator of whiteness.	+
GLF	8-LF	*Leaf grade*, the third digit of grade code varying from 1 through 7; Since LF has a maximum value of 7, subtracting from 8 converts LF from an indicator of a low grade to an indicator of a high grade.	+
LTH		*Staple length*, the fourth and fifth digit of grade code; The fiber length in 32nd's of an inch and indicates the uniformity of fiber length.	+
STR		*Strength*, the minimum Grams per Textile (GPT). The average strength is about 28.	+
M		*Average micronaire*	+
M2	M*M	*Squared Average micronaire*.	-

Table 2. Summary Statistics for the Data Used for Analysis by Region.

a. South Region

	2000-01				2001-02				2002-03			
Variables	**Mean**	**St. Dev.**	**Min**	**Max**	**Mean**	**St. Dev.**	**Min**	**Max**	**Mean**	**St. Dev.**	**Min**	**Max**
ρ	-13.27	167.87	-400.00	250.00	-66.45	205.44	-500.00	375.00	-9.06	285.50	-800.00	1455.00
C1	4.56	0.80	4.00	7.00	4.41	0.76	4.00	7.00	4.01	0.16	3.00	5.00
C2	1.39	0.49	1.00	2.00	1.65	0.48	1.00	2.00	1.43	0.49	1.00	2.00
LF	4.32	0.56	3.00	5.00	4.04	0.75	3.00	5.00	3.88	0.49	3.00	5.00
LTH	34.31	0.95	32.00	36.00	34.35	0.94	31.67	36.33	34.72	0.92	32.00	36.00
STR	27.55	0.51	26.00	28.00	27.41	0.83	25.00	30.10	27.97	0.58	26.00	30.00
M	4.12	0.13	3.20	4.30	4.30	0.35	3.85	5.23	4.49	0.41	4.05	5.20
M2	16.99	1.01	10.24	18.49	18.64	3.23	14.82	27.30	20.29	3.82	16.40	27.04

b. Desert Southwest Region

	2000-01				2001-02				2002-03			
Variables	**Mean**	**St. Dev.**	**Min**	**Max**	**Mean**	**St. Dev.**	**Min**	**Max**	**Mean**	**St. Dev.**	**Min**	**Max**
ρ	-290.16	336.17	-950.00	150.00	-160.16	325.26	-1150.00	300.00	-207.56	403.41	-1970.00	300.00
C1	2.60	0.83	1.00	5.00	2.65	0.75	1.00	5.00	2.67	0.78	1.00	5.00
C2	1.09	0.29	1.00	2.00	1.02	0.14	1.00	2.00	1.01	0.11	1.00	2.00
LF	2.43	0.58	1.00	4.00	2.66	0.80	1.00	5.00	2.56	0.83	1.00	5.00
LTH	34.91	1.06	32.00	37.00	35.14	0.79	32.00	36.00	35.25	1.00	32.00	38.00
M	4.58	0.59	1.45	5.10	4.46	0.41	4.20	5.10	4.49	0.61	1.45	5.10
M2	21.35	4.81	2.10	26.01	20.05	3.80	17.64	26.01	20.48	4.96	2.10	26.01

c. San Joaquin Valley/ West Region

	2000-01				2001-02				2002-03			
Variables	**Mean**	**St. Dev.**	**Min**	**Max**	**Mean**	**St. Dev.**	**Min**	**Max**	**Mean**	**St. Dev.**	**Min**	**Max**
ρ	-147.92	237.59	-895.00	300.00	-94.72	242.47	-1215.00	190.00	-131.91	326.00	-1750.00	200.00
C1	3.10	0.92	1.00	5.00	2.86	0.90	1.00	5.00	2.68	0.93	1.00	6.00
C2	1.02	0.20	1.00	3.00	1.05	0.30	1.00	3.00	1.09	0.32	1.00	3.00
LF	2.98	0.85	1.00	5.00	2.91	0.83	2.00	6.00	2.87	0.74	2.00	5.00
LTH	35.52	0.97	33.00	39.00	35.73	0.88	34.00	41.00	35.79	0.91	34.00	40.00
STR	25.85	2.15	24.50	31.00	26.91	3.02	4.00	38.00	25.98	2.15	24.50	32.00
M	4.33	0.14	3.20	4.35	4.34	0.08	3.20	4.35	4.28	0.44	1.45	4.35
M2	18.78	1.09	10.24	18.92	18.88	0.59	10.24	18.92	18.49	2.59	2.10	18.92

Table 3. Hedonic Cotton Price Model Estimates for Three Marketing Years by Production Regions.

	South			Desert Southwest			San Joaquin Valley/ West		
Variable	**2000/01 Coefficient**	**2001/02 Coefficient**	**2002/03 Coefficient**	**2000/01 Coefficient**	**2001/02 Coefficient**	**2002/03 Coefficient**	**2000/01 Coefficient**	**2001/02 Coefficient**	**2002/03 Coefficient**
Constant	-14705.000*	-17572.000*	-30004.000*	-18206.000*	-31143.000*	-19994.000*	-16766.000*	-9383.100*	-19610.000*
	(-21.568)	(-9.343)	(-8.884)	(-7.433)	(-11.261)	(-5.916)	(-8.248)	(-5.703)	(-8.804)
LGC1			766.720*	215.340*		902.320*	611.920*	149.230	585.850*
			(2.637)	(1.739)		(3.302)	(8.002)	(1.368)	(5.477)
LGC2	725.470*	860.550*	622.270*	171.030					336.130*
	(16.025)	(14.189)	(5.110)	(0.503)					(1.716)
LGLF	776.250*	458.170*	141.010		800.870*	963.930*		644.890*	397.300*
	(24.780)	(11.967)	(1.176)		(7.275)	(3.570)		(5.674)	(3.037)
LLTH	3560.000*	3000.300*	4818.900*	4788.200*	8558.400*	4585.800*	4226.400*	2348.100*	3605.500*
	(19.010)	(11.852)	(9.882)	(6.721)	(11.003)	(4.855)	(7.726)	(4.611)	(5.874)
LSTR			2883.000*				389.970*	128.300*	668.830*
			(4.664)				(2.073)	(1.745)	(3.618)
M		2390.700*	835.190	892.670*		525.120*			1973.900*
		(3.431)	(0.599)	(4.789)		(2.041)			(3.363)
M2		-283.000*	-130.480	-146.080*		-67.504*			-299.990*
		(-3.739)	(-0.865)	(-6.286)		(-2.153)			(-2.998)
R-square	0.878	0.772	0.612	0.768	0.537	0.651	0.524	0.509	0.674
Observation	231	292	232	68	160	84	125	219	176

* denotes significance level at the 5% level.

[a] represents t-statistics.

Table 4. Base Price for U.S. Cotton (cents/lb), by Region.

Region	1994/96	1997/98	1998/99	2000/01	2001/02	2002/03
South	77.74	76.32	68.46	56.96	40.06	51.31
Southwest	78.87	69.95	63.15	-	-	-
Desert Southwest	82.84	-	-	54.02	33.07	43.72
San Joaquin Valley/West	88.97	79.75	75.12	57.95	42.04	56.00

Table 5. Premiums and Discounts (Points/lb) from Base Quality for First Digit of Color Grade.

South

Color	1994/96	1997/98	1998/99	2000/01	2001/02	2002/03
1	-	-	-	-	-	429
2	-	318	-	-	-	311
3	-	170	-	-	-	171
4	-	0	-	-	-	0
5	-	-203	-	-	-	-221
6	-	-458	-	-	-	-531

Desert Southwest

Color	1994/96	1997/98	1998/99	2000/01	2001/02	2002/03
1	-	-	-	121	-	505
2	-	-	-	87	-	366
3	-	-	-	48	-	201
4	-	-	-	0	-	0
5	-	-	-	-62	-	-260
6	-	-	-	-149	-	-625

San Joaquin Valley/West

Color	1994/96	1997/98	1998/99	2000/01	2001/02	2002/03
1	-	-	-	342	84	328
2	-	-	-	248	61	238
3	-	71	147	137	33	131
4	-	0	0	0	0	0
5	-	-86	-713	-176	-43	-169
6	-	-196	-	-424	-103	-406

Table 6. Discounts (Points/lb) from Base Quality for Second Digit of Color Grade.

South

Color	1994/96	1997/98	1998/99	2000/01	2001/02	2002/03
1	0	0	0	0	0	0
2	-64	-213	-218	-162	-192	-139
3	-152	-480	-	-371	-440	-318

Desert Southwest

Color	1994/96	1997/98	1998/99	2000/01	2001/02	2002/03
1	-	-	-	0	-	-
2	-	-	-	-38	-	-
3	-	-	-	-87	-	-

San Joaquin Valley/West

Color	1994/96	1997/98	1998/99	2000/01	2001/02	2002/03
1	0	-	-	-	-	0
2	-699	-	-	-	-	-75
3	-1591	-	-	-	-	-172

Table 7. Premiums and Discounts (Points/lb) from Base Quality for Leaf Grade.

South						
Leaf Grade	**1994/96**	**1997/98**	**1998/99**	**2000/01**	**2001/02**	**2002/03**
3	129	170	0	173	102	31
4	0	0	0	0	0	0
5	-164	-203	-189	-223	-132	-41
Desert Southwest						
Leaf Grade	**1994/96**	**1997/98**	**1998/99**	**2000/01**	**2001/02**	**2002/03**
3	-	-	-	-	179	215
4	-	-	-	-	0	0
5	-	-	-	-	-230	-277
San Joaquin Valley/West						
Leaf Grade	**1994/96**	**1997/98**	**1998/99**	**2000/01**	**2001/02**	**2002/03**
3	0	71	147	-	144	89
4	-699	0	0	-	0	0
5	-1591	-86	-713	-	-186	-114

Table 8. Premiums (Points/lb) from Base Quality for Staple Length.

South						
Staple Length	**1994/96**	**1997/98**	**1998/99**	**2000/01**	**2001/02**	**2002/03**
34	0	0	0	0	0	0
35	187	82	91	103	87	140
36	373	164	181	204	171	275
Desert Southwest						
Staple Length	**1994/96**	**1997/98**	**1998/99**	**2000/01**	**2001/02**	**2002/03**
34	0	-	-	0	0	0
35	149	-	-	139	248	133
36	296	-	-	274	489	262
San Joaquin Valley/West						
Staple Length	**1994/96**	**1997/98**	**1998/99**	**2000/01**	**2001/02**	**2002/03**
34	0	0	-	0	0	0
35	120	281	-	123	68	105
36	239	564	-	242	134	206

Table 9. Premiums and Discounts (Points/lb) from Base Quality for Strength.

South						
Strength	**1994/96**	**1997/98**	**1998/99**	**2000/01**	**2001/02**	**2002/03**
23	-	-21	-	-	-	-182
24.5	-	0	-	-	-	0
25	-	6	-	-	-	58
26	-	20	-	-	-	171
27	-	33	-	-	-	280
28	-	45	-	-	-	385
29	-	57	-	-	-	486
San Joaquin Valley/West						
Strength	**1994/96**	**1997/98**	**1998/99**	**2000/01**	**2001/02**	**2002/03**
23	-	-	-	-25	-8	-42
24.5	0	-	-	0	0	0
25	0	-	-	8	3	14
26	309	-	-	23	8	40
27	378	-	-	38	12	65
28	476	-	-	52	17	89
29	511	-	-	66	22	113

Table 10. Premiums and Discounts (Points/lb) from Base Quality for Micronaire.

South

Micronaire	1994/96	1997/98	1998/99	2000/01	2001/02	2002/03
2.1	-	-	-	-	-1276	-28
2.4	-	-	-	-	-941	47
2.55	-	-	-	-	-793	75
2.8	-	-	-	-	-574	109
3.1	-	-	-	-	-357	129
3.35	-	-204	-19.2	-	-216	127
3.45	-	-121	0	-	-169	122
4.2	-	0	-68.5	-	0	0
4.75	-	-	-449	-	-78	-183
5.1	-	-1053	-	-	-217	-340

Desert Southwest

Micronaire	1994/96	1997/98	1998/99	2000/01	2001/02	2002/03
2.1	-	-	-	58	-	-210
2.4	-	-	-	129	-	-143
2.55	-	-	-	154	-	-115
2.8	-	-	-	182	-	-74
3.1	-	-	-	191	-	-36
3.35	-	-	-	179	-	-13
3.45	-	-	-	169	-	-7
4.2	-	-	-	0	-	0
4.75	-	-	-	-228	-	-43
5.1	-	-	-	-419	-	-92

San Joaquin Valley/West

Micronaire	1994/96	1997/98	1998/99	2000/01	2001/02	2002/03
2.1	-	-	-	-	-	-176
2.4	-	-	-	-	-	11
2.55	-	-	-	-	-	84
2.8	-1925	-	-	-	-	176
3.1	-1383	-463	-	-	-	238
3.35	-1037	-160	-	-	-	247
3.45	-673	-70	-	-	-	241
4.2	0	0	-	-	-	0
4.75	-	-	-	-	-	-391
5.1	-34	-	-	-	-	-734