CHANGING TECHNOLOGY IN COTTON CLASSING

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For most of this century, USDA has been heavily involved in assessing the quality of cotton produced in the United States. About 98 percent of each year's crop carries an official USDA grade. A significant portion of the crop is traded sight unseen with traders relying solely on the USDA grade to establish the price at which the cotton will be traded.

Until recently, the method of assessing the quality of cotton had changed very little over the years, relying primarily on the human senses of touch, sight and smell. However, in order to put the cotton to its best end use and to minimize processing difficulties, manufacturers need to know more about the cotton than the human senses can tell them so the information provided by the USDA grade has been supplemented to some degree with quality information obtained from laboratory tests. The slow speed and high cost of laboratory tests limit their usefulness in selecting individual bales of cotton for optimum mill mixes, giving rise to the need for laboratory type instruments that are faster and more economical to use. Several years ago, USDA undertook an assignment to develop such instruments and as a result, we now have high volume, precision instruments (HVI) capable of measuring five of the six quality factors considered most important in the manufacturing process. The five factors are: length, strength, color, micronaire and length uniformity. The sixth factor is trash, for which we do not yet have a rapid measuring device but research and development is underway and we expect to have a working model before too long. The relatively high speed and low cost at which these instruments can be operated make it practicable to use them in measuring the quality characteristics of every 500 lb. bale of cotton produced. Those measurements can be made while the cotton is still in the grower's possession, allowing the entire marketing chain to benefit from the additional quality information provided.

The importance of the six quality factors as identified by manufacturers is confirmed by spinning data developed at our AMS laboratory in Clemson, which show that a change in the quality of any of the six fiber properties will cause a change in the spinning efficiency of the fiber or in the quality of the end product. In our laboratory evaluation, the degree of change attributable to each quality factor was obtained by using regression equations. We determined the combined effect of all quality changes in the fiber properties as measured by the HVI and by the traditional class upon a given yarn property or spinning process and then compared the ability of the two grading systems to predict the quality of the yarn to be produced or the spinning efficiency of the fiber. This information is presented below.

Yarn Property	Percent of Change in Yarn Quality Explained by:		Predictability of Yarn Quality Improved By:
	Traditional Class 1/ (%)	HVI Class 2/ (%)	(%)
Yarn Strength	58	82	41
Spinning Potential	57	79	39
Yarn Appearance	23	33	43
Yarn Neps	21	30	43
Waste	43	48	12

1/ Combined effect of grade, staple and micronaire.
2/ Combined effect of length, length uniformity, strength, micronaire, color and trash (trash by visual assay).

For example, by using the HVI system, it is possible to improve the predictability of yarn strength by 41 percent over the traditional method of cotton classing. The remaining variation unexplained by HVI measurement is due to quality factors not measured, and variations in cotton fiber and processing equipment.

These figures clearly show the superiority of the HVI system over the traditional in predicting manufacturing results.

Fiber length is the only component of both classing systems where a direct comparison of quality measurements can be made. One way of making this comparison is to examine the Lamesa (HVI) and Lubbock (traditional) length statistics for the 1980 crop. This data is shown below:

Comparison of Lamesa and Lubbock
Fiber Length Statistics, 1980 Season

Fiber Length (32nds)	Lamesa (Pct of Crop)	Lubbock (Pct of Crop)
28 & Shorter	3	0
29	8	2
30	16	8
31	23	24
32	16	38
33	12	19
34	8	6
35	7	2
36	5	1
37	2	0
Average length (32nds)	31.9	31.9

Historically, these two territories are quite similar in fiber length. Note that the average length is the same in this particular year for both areas. However, the HVI called more of the fiber longer and more of the fiber shorter than did the traditional classing in Lubbock. This tends to confirm the theory held by many that with traditional class, the length as determined by the classer is biased toward the average length grown in that area.

The greatest advantage of the HVI over the traditional classing system, however, is its ability to provide information on other important quality factors, especially strength, that the traditional method cannot provide. The Plains area of Texas is not noted for its high-strength cotton but there is a lot of high-strength cotton grown in that region as indicated by Lamesa quality statistics for the 1981 crop.

Fiber Strength Distribution,
Lamesa Area, 1981 Crop Year

Strength (grams/tex)	Percent of Crop
18-19	6
20-21	24
22-23	36
24-25	21
26-27	11
28-29	2
Average (grams/tex)	23

Since 22-23 grams per tex is considered to be average strength, one-third of Lamesa's 1981 crop was above average in strength. Note that 13 percent of the crop had strength values of 26 grams per tex or higher. This level of strength is normally associated with cotton grown in the San Joaquin Valley of California which normally commands a premium. With the HVI, the individual bales of cotton produced in West Texas with above average strength can now be identified and their owners rewarded accordingly.

1983 will be the fifth year that we have used the HVI system to class all cotton in the Lamesa, Texas area, a territory which produces about 500,000 bales of cotton annually. In 1982 we expanded HVI classing into the Altus and Lubbock areas, classing a portion of the crop in these areas by HVI. During this same period we also used the HVI in our Grading Section in Memphis as an aid in our national classing supervision program, and in our Clemson Laboratory where it is an integral part of our ongoing fiber testing and evaluation program. In 1983 we expanded HVI to all of Texas and Oklahoma and we estimate that approximately 75 percent of all the cotton produced in these two states this year will be classed by this method. HVI classing is offered to growers in these areas on a voluntary basis with the grower paying $1.60 per bale compared to $1.15 for the traditional class. The amount of cotton classed by HVI from its first significant year of operation in 1979 through 1983 is as follows:

Volume of Cotton Classed by HVI

Crop	Bales Classed	Percent of U.S. Crop (%)
1979	98,000	1
1980	306,000	3
1981	868,000	6
1982	870,000	8
1983 (estimated)	2,100,000	27

Under the traditional classing system, there is little incentive for the grower to produce a stronger or more uniform fiber. A grower producing high-strength cotton in an area generally noted for producing low strength cotton is quite likely to receive the same price as his neighbors unless there is a means of identifying the strength characteristics of each bale. Where individual bales are not so identified, buyers will protect themselves by buying cotton in that area on the basis of the average strength, or possibly even the lowest strength cotton normally produced there. In such a situation, a grower is not likely to be greatly concerned about the strength of the fiber he is growing. HVI provides the incentive growers need for producing the high-strength cotton so desired by manufacturers.

At the present time, whenever we use the HVI for classing we continue to use the classer to provide the traditional "grade". Although the HVI system provides the two major components of "grade" (color and trash), the market is not accustomed to pricing these two quality factors separately. So, for the time being, we will continue to provide a classer's grade in order to prevent a major disruption in the marketing system. However, at some point the market will need to switch to pricing these two factors separately if the benefits of instrument classing are to be fully realized.

This will be a very difficult and complex task. It will mean the abandonment of internationally-used grade standards as we now know them and the establishment of new ones. It will mean a revision of the present method for determining the value of cotton and a restructuring of CCC loan pricing mechanisms and policies.

To make these changes the entire cotton industry must become deeply involved. Toward this end, the Secretary has established an Advisory Committee on Instrument Standards. This Committee is providing systematic input from those segments of the industry directly affected.

The HVI system is proving to be a reliable, economically feasible method of classifying cotton in a production environment. Many growers have already shown their preference for the new system by having their cotton classed in this manner. Others are giving thoughtful consideration and we anticipate continued expansion. Textile mills are learning how to use HVI data in selecting their mill mixes. This learning process is being aided by a Federal-State cost-sharing project now being carried out by Clemson University, to demonstrate how HVI data can be used to maximize spinning efficiency and product quality. Similar work has been going on at Texas Tech for a number of years now, especially in the area of open end spinning.

Clear signals between the producer and the manufacturer are absolutely essential if the grower is to be responsive to the manufacturer's quality needs. The HVI classing system provides the vehicle for this vital communication. Manufacturers needing high-strength fiber can send growers a signal to produce such cotton by offering a premium. Such premiums are now being widely offered in Texas and Oklahoma where the HVI system is identifying high-strength cotton on a bale-by-bale basis and growers are responding by switching to varieties of cotton with high-strength characteristics.