

**PRELIMINARY REPORT ON 1998
HVI COLOR GRADE PILOT PROJECT**
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Abstract

The USDA, AMS, Cotton Program conducted a pilot project during the 1998 classing season to implement an adjustment to the existing High Volume Instrument (HVI) color grades in an effort to make them more closely match the Universal Cotton Standards used by classers for official color grade determination. The Cotton Program developed this pilot project over the past several months in conjunction with the National Cotton Council Quality Task Force with the goal in mind of improving the HVI color grade determinations. The project produced positive results using the 1998 crop data resulting in a promising outlook for future instrument color classification.

Introduction

History of HVI Classification

Cotton classification data by High Volume Instrument (HVI) was first issued in 1976 through a pilot project conducted in Lubbock, TX. Over the next several years, as HVI testing continued to evolve and improve, it was offered on a voluntary basis throughout the Cotton Belt. Beginning in 1991, HVI testing became the official grading method for all U.S. Upland cotton for fiber length, strength, length uniformity and micronaire. Since 1982, both the official classer grade and the HVI color grade have been included in the USDA classification data. In the past, these two color determinations have sometimes differed, causing confusion to arise in the marketplace.

Classer Determination

The official color grade, leaf grade, and extraneous matter are assigned by cotton classers trained by the USDA Cotton Program. The classer determines the color grade by a visual comparison of the cotton sample to the Universal Cotton Standards which are prepared by the USDA and reviewed and approved by the Universal Standards Advisory Committee. This committee is composed of representatives of each segment of the U.S. cotton industry as well as each of the international organizations signatory to the Universal Standards Agreement.

HVI Color Measurement

The HVI measures two components of color: reflectance and yellowness. The reflectance, or brightness, is represented by a value known as "Rd", while the yellowness is represented by a value known as "+b". The HVI color

grade is determined by plotting the Rd and +b values on the Nickerson-Hunter color diagram, a chart formulated in the 1950's to correlate instrument measurements, namely the colorimeter, to physical grade standards. The color diagram shows the Rd values on a vertical axis and the +b values on a horizontal axis. The intersection point of the Rd and +b values on the color diagram determines the HVI color grade. In some cases, a point will fall very close to the borderline between color grades or grades within the same color group.

Area of Difference

The majority of disagreement between the HVI color grade and the Universal Color Grade Standards occurs in quadrants 3 and 4 of the white grades on the Nickerson-Hunter color diagram. Differences also occur along the borders between grades within the same color group. The official definition of a color grade in the Code of Federal Regulations is described as color that is within the range of a physical set of standards. An example of a definition is as follows:

Strict Low Middling color is color which is within the range represented by a set of samples in the custody of the United States Department of Agriculture, in a container marked "original official cotton standards of the United States, American Upland, Strict Low Middling, effective July 1, 1987."

Pilot Project Objectives and Procedures

The pilot project came about as a result of the National Cotton Council Quality Task Force investigating different options available for improving the HVI color grade determinations. There were several options discussed but two were concluded as being the most feasible for consideration. The first option was to revise the Universal Standards to match the Rd and +b conversion points. The second option was to modify the Rd and +b conversion points to correlate with the established Universal Standards. The second option was determined to be the most practical option to pursue. The task force then asked the Cotton Program to evaluate the impact of this modification.

The goals for the 1998 pilot project were: 1) develop an adjustment to the current HVI color grades that would allow them to more closely match the Universal Cotton Standards currently used by the classer to determine official color grade; and 2) analyze 1998 classing data using the adjusted HVI color grades to draw conclusions regarding the validity of the adjustment.

In order to more closely match HVI color grade measurements to the Universal Standards, a slight modification was made to the points used for converting the Rd and +b values to actual grades. The principle area of difference was in the white to light spotted grades. USDA regulations state that cotton which has more color than the

white color grade standards but less color than the spotted color grade standards will be designated as light spotted. The data points observed in the pilot project were plotted on the color diagram and compared to the color measurements for the sixth color position of the 1986 Universal Cotton Standards for white grades. The 1986 standards were the last to be revised and have served as the guide for all subsequent sets formulated since 1986. Based on the 1986 standards, any cotton with more color than the sixth position should be designated as light spotted. Also, any cotton that is designated as being more dull than the sixth position should be classified as the next lowest grade within that color group.

The HVI color data points that fell outside the range of the 1986 white color standard measurements were regrouped to be included in the appropriate light spotted grades or lower grades within the same color group. This regrouping of data points in relation to the locations of the 1986 standards on the color diagram became the adjustment to the Rd/+b conversion used for this pilot project.

Effective August 17, 1998, the Cotton Program implemented this conversion and began reporting an “adjusted” HVI color grade for use in this pilot project. The adjustment had no effect on the official color grade assigned by the classer or the actual HVI measurements for Rd and +b widely used for mill laydown mixes. The data collected for the 1998 crop was then compiled and analyzed. The original HVI color was also formulated by applying the Rd and +b measurements back to the original color chart locations.

Results

In order to determine the impact of the modified conversion of Rd and +b to color grades, the adjustment was applied to all 1998 crop data. The results were grouped by region and also as a whole for the entire Cotton Belt. The results are discussed below and shown in Tables 1-2.

Table 1 shows the percentage of the 1998 U.S. Upland crop assigned white grades by the classers, the HVI color adjustment, and the original HVI color. The classers assigned white color grades to 73% of the crop. The adjusted HVI color assigned white grades to 80% while the original HVI color would place 90% in the white grade category.

Turning attention to light spotted grades, Table 2 shows the percentage of the 1998 U.S. Upland crop assigned light spotted grades by classers, adjusted HVI color, and original HVI color. The classers assigned light spotted grades to 26% of the crop. The adjusted HVI color assigned light spotted grades to 18% while the original HVI color would place 9% in the light spotted category.

Light Spot Exceptions

The present colorimeter used by HVI equipment produces a blended color based on the measurements of all colors present on the cotton sample. It is possible for a sample containing a small number of dime-sized spots (usually three or less) against a dominant white background to be called white by the colorimeter. The classer would typically classify this type of sample as light spotted. Of the samples classified during the 1998 season, approximately 26% were classified as light spotted by the classers. This was a larger number than usual as 1998 was the second largest light spotted crop since 1984. Of these samples classified as light spotted, only about 3% would fall into the category of containing three or less dime-sized spots against a dominant white background. This would represent less than 1% of the overall crop.

Color Grade Reproducibility

For the 1998 crop, the reproducibility for HVI color grades between the classing offices and the Quality Assurance Unit in Memphis was 74%. The reproducibility for the classer color grades was 75%. These numbers indicate that the reproducibility was virtually the same for both methods during the season. Therefore, any error included within the two methods would be considered negligible regardless of the method used.

Conclusions

The 1998 HVI color pilot project was the result of a cooperative effort between the USDA, AMS, Cotton Program and the National Cotton Council Quality Task Force. The project’s objective was to implement an adjustment to the conversion of Rd and +b HVI color measurements to make them more closely match the Universal Cotton Standards used by classers to assign the official color grade for cotton. The adjustment was based on the locations of the 1986 Universal Cotton Standards on the Hunter-Nickerson color diagram. The Cotton Program then investigated the impact of the adjustment by analyzing the white and light spotted grades assigned during the 1998 season.

This pilot project showed a decrease in white grades and an increase in light spotted grades using the adjusted HVI color grade compared to the original HVI color grade classification. In addition, the adjustment brought the HVI color grades much closer to the Universal Cotton Standards used by the classers to make color determinations.

The Cotton Program successfully fulfilled the objectives of the pilot project. A feasible adjustment to the HVI color grade was applied to the 1998 classing data and the impact on the grades assessed. The result was an HVI color grade that more closely matched the Universal Cotton Standards for color. The adjusted HVI color also produced improved agreement between the classer grades and the HVI color grades. The Cotton Program feels this is a positive step

toward instrument color classification. The information regarding the pilot project will continue to be shared with various industry groups over the next several weeks and months.

References

Color Diagram, Nickerson-Hunter Cotton Colorimeter, 1963.

7 - Code of Federal Regulations, Parts 28.401 through 28.482, Office of Federal Register, 1998.

Table 1. Percent of 1998 Crop Assigned White Grades by Classer, Adjusted HVI, and Original HVI.

Region	Classer	HVI (adjusted)	HVI (original)
U.S.	73	80	90
Southeast	71	81	90
Mid-South	65	71	85
Southwest	72	82	91
Far West	93	96	97

Table 2. Percent of 1998 Crop Assigned Light Spotted Grades by Classer, Adjusted HVI, and Original HVI.

Region	Classer	HVI (adjusted)	HVI (original)
U.S.	26	18	9
Southeast	27	17	8
Mid-South	33	27	13
Southwest	27	16	7
Far West	6	3	2