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# Cotton Insights Newsletter

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### Deep Dive into Fiber Quality Series – Length Uniformity Index

- Fiber length is measured by high volume instrument (HVI) machines and is defined by USDA-Agricultural Marketing Service (AMS) as “the average length of the longer half of the fibers.” This can be restated as “upper half mean length.” For more on fiber length, see the October 31 newsletter.
- When performing the HVI length measurement, a sample is measured by passing a “beard” of parallel fibers through an optical sensing point.
- The beard is formed when fibers from a sample are automatically grasped by a clamp, then combed and brushed into parallel orientation.
- Fiber length is measured in 100ths inch, and then converted to staple in 32nds inch using the corresponding fiber length conversion relationships.
- **Length uniformity index** (or simply uniformity) is a calculated value that is a measure of the variability of the length of the fibers in the beard.
- Uniformity is defined as the ratio of the mean length (average length) of all fibers and the upper half mean length (average length of the 50 percent longest fibers), expressed as a percentage.
- If all fibers in the sample were the same length, then the value would theoretically be 100, since the mean length and upper half mean length would be equal. Since cotton is a natural fiber, the length of individual fibers varies considerably.
- Short fiber content (SFC) is defined as the percentage of the fibers that is less than one-half inch long, but this is not evaluated in our current USDA-AMS classing system. Research machines such as Advanced Fiber Information System (AFIS) must be used to determine SFC. High SFC is undesirable from a spinning perspective.

- Uniformity is related to SFC. A low uniformity value is likely to be a result of a high amount of SFC in the sample.
- Uniformity affects the spinning process and ultimately yarn qualities such as evenness and strength. Higher uniformity cotton improves spinning performance and yarn quality.
- Uniformity is not necessarily directly controlled by genetics, but it can be affected by fiber strength which has a large genetic component. Weaker fibers tend to break more during processing, which thus increases SFC, potentially reducing uniformity.
- Immature fibers found in low micronaire cotton also tend to be weaker and may break during processing which could also decrease uniformity.
- Field weathering can affect uniformity. A 3-year replicated commercial date-of-harvest experiment was conducted at Lubbock about 20 years ago, with harvests ranging from October through January. Results indicated that extended weathering reduced uniformity values by about 1.25%. This was likely due to microbial degradation and photodegradation of the fibers, making them more brittle and prone to breakage during processing.
- Harvest method can also affect uniformity. Picker and stripper harvester comparisons conducted in the Texas High Plains over several site-years indicated that the spindle picker system resulted in somewhat less than 1% increase in uniformity values when compared to the stripper harvester system.

**USDA-AMS Descriptive Designations for Uniformity**

| Descriptive Designation | Length Uniformity (%) |
|---|---|
| Very high | Above 85.4 |
| High | 82.5 to 85.4 |
| Average | 79.5 to 82.4 |
| Low | 76.5 to 79.4 |
| Very Low | Below 76.5 |

- For an excellent explanation of the US classing system, click on the Cotton Incorporated link below: https://www.cottoninc.com/wp-content/uploads/2017/02/Classification-of-Cotton.pdf
- For a companion document from USDA-AMS that discusses classing data, click on the link below: https://www.ams.usda.gov/sites/default/files/media/Cotton%20DB%20Understanding%20the%20Data.pdf

**Impact of Uniformity on Loan Value**

- Commodity Credit Corporation (CCC) loan values are affected by uniformity. The range of premiums is fairly low for higher uniformity (82% and higher), but higher discounts are encountered for low uniformity cotton (77.9% and lower).
- Premiums and discounts (in points per pound) for uniformity are noted in the table below.

| Uniformity (%) | Points per pound |
|---|---|
| 86.0 and above | 30 |
| 85.0 to 85.9 | 25 |
| 84.0 to 84.9 | 15 |
| 83.0 to 83.9 | 10 |
| 82.0 to 82.9 | 5 |
| 81.0 to 81.9 | 0 |
| 80.0 to 80.9 | 0 |
| 79.0 to 79.9 | -50 |
| 78.0 to 78.9 | -60 |
| 77.9 and lower | -105 |