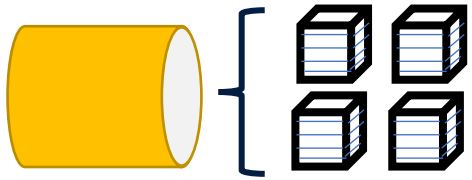
Module Averaging

American Cotton Shippers Association Defining and Supporting Module Averaging Plus Ongoing Industry Fungibility Initiatives for U.S. Cotton

Definition: Beginning in 1991, module averaging is a voluntary program to improve the reproducibility of the HVI measurements of cotton strength, length, length uniformity, and micronaire that is offered through the U.S. Department of Agriculture (USDA). Improved reproducibility and accuracy enhances the credibility of the U.S. classification system and allows all parties to trade U.S. cotton with greater confidence in the quality measurements. This program is offered at no additional charge.

Procedure: Module averaging does not require a new sampling procedure. It utilizes the current procedure of obtaining a sample from each side of every bale. With module averaging, the fiber qualities for the bales within a module are determined by obtaining the average of all of the individual bale measurements of strength, length, length uniformity, and micronaire within a module and assigning that average to each bale. This average serves as the final quality measurement value. For example, the individual strength readings for each bale in the module are added together and divided by the number of bales in the module unit. The result is the module average for strength and that value is then assigned as the strength reading to each bale in the module unit.



Improving Accuracy/Reproducibility: Traditionally, samples of cotton are drawn from each side of the bale and both sides combined and sent to the USDA for testing. Both sides of the sample are tested to attain the fiber quality measurements for the bale. To obtain the true average of the fiber quality within the bale, additional tests are needed but would be too costly and time consuming on a bale-by-bale basis. Since fiber quality variability within a bale of cotton is about the same as it is within a module of cotton, a module of cotton can serve as the test unit just as reliably as a bale of cotton. By using all the bales of cotton from a module as the test unit, enough samples can be economically tested to obtain the true average of the unit. The module average is a better representation of the true fiber quality of the bale, as is demonstrated below by the greater reproducibility of module average values over single test values based on retesting at the USDA - AMS, Cotton Program's Quality Assurance Branch.

Table 1: Five Year Reproducibility Study (2011-2015)

Factor	Single Test vs. QA	MA vs. QA	Percent Improvement
Micronaire	85.4	86.9	1.5
Strength	80.8	93.3	12.6
Length	79.5	91.4	11.9
Uniformity	79.5	94.1	14.5

Degree of Variability Within a Module: Studies have proven that bales from modules do not have significantly greater variability than that of the module as a whole. However, exceptions do occur occasionally. "Outliers" are bales that have quality measurements outside of the preestablished module average tolerances. When an outlier occurs, its value is removed from the module average and the average is re-calculated using the remaining bales.

- **Tolerance Levels:**
  - Micronaire > +/- 0.3
  - Strength > +/- 3.0
  - Length > +/- 0.04
  - Uniformity > +/- 2.0
- **Processing:** Outliers are removed, then the USDA averages the remaining bales and then applies back to outliers unless they are an exception. Exception include:
  - First and/or last bale number submitted in the module
  - Less than 4 bales were submitted in the module

Source: The U.S. Department of Agriculture – Agricultural Marketing Service, Cotton & Tobacco Program

- More than 20% of bales submitted in the module are identified as outliers
- 3 or more consecutive bales were identified as outliers

Fungibility Initiative: Module averaging builds into the cotton industry's greater initiative of fungibility. The National Cotton Council's Cotton Fungibility Working Group's directive is to investigate fungibility, a grouping of bales having the same quality that can be interchangeable in the warehouse while retaining individual bale identity and data. Utilize and implement modern techniques to increase efficiencies in warehouse bale selection, while also smoothing out the overall quality of each laydown to increase production and efficiencies of mills.

Benefits for All Segments of the Cotton Industry: Module averaging has consistently improved the reliability of HVI fiber quality measurements of strength, length, length uniformity, and micronaire over the years and will be even more important as a prerequisite requirement to achieve the desired outcomes of our industry's fungibility initiatives. Statistical studies performed each year since 1991 have continued to reinforce the concepts behind module averaging. Module averaging is a voluntary program that is customer driven.

- Producers/Ginners: Receive monetary benefit from module averaging yielding increased loan values and supply chain efficiency. (See Table 2)
- Merchants: Obtain benefit from cotton being more fungible, enhancing inventory management, without compromising the value of the unique class and creating flexibility to sell as a marketing unit or individually.
- Warehousers: Gain picking efficiency with 4 bales per location.
- Mills: Potential gain from lower variability within laydowns.
- Industry-Wide: Collectively, module averaging compounded with the developing industry fungibility initiatives will enhance U.S. cotton's competitiveness by reducing costs to market and enhancing its overall uniformity and spinning efficiency.

Marketing Your Cotton: If you are wondering if module averaging will affect the way you market your cotton, the answer is no. Each bale of cotton will still be identified and sold individually regardless of whether it carries its individual bale classification for strength, length, length uniformity, and micronaire or if it carries the module averaged values for these factors.

Gin Manager's Role: Gin managers have a very important role in module averaging. The ginner submits the module data to the Classing Office prior to classification. This data consists of module identification numbers and the bale numbers of all bales within each module. Only those modules that the gin manager submits prior to classing are module averaged. The gin manager may provide this data by telecommunications, fax, or other acceptable means.

Participating in the Program: ACSA would like to thank USDA - AMS, Cotton & Tobacco Program for providing portions of the supporting data for this handout. If you have any additional questions, we encourage you to contact Ronnie Robbins, Associate Deputy Administrator, at ronald.robbins@usda.gov or (901) 384-3000.

Table 2: Benefits for Module Averaging for the 2021-2022 Upland Cotton Crop, Comparing Classing Offices

	Points					Average Gained Per 500 Lb. Bale	Bales Module Averaged	Total Gained for Module Averaged Bales	Total Classed	Percent Module Averaged	Estimated Gain if All Bales Module Averaged
	Strength	Length	Uniformity	Mike	Total						
Florence	1.1	4.6	2.6	1.5	9.8	$0.49	791,627	$387,897.23	1,317,171	60.1%	$645,413.79
Macon	1	3.8	4.1	2.3	11.2	$0.56	1,160,926	$650,118.56	2,708,947	42.9%	$1,517,010.32
Rayville	0.9	2.1	1.1	3.2	7.3	$0.37	258,381	$94,309.07	280,360	92.2%	$102,331.40
Dumas	1.9	1.5	1.1	4.1	8.7	$0.44	504,052	$219,262.62	1,001,880	50.3%	$435,817.80
Memphis	1.1	2.2	1.1	3.1	7.5	$0.38	2,123,967	$796,487.63	2,656,989	79.9%	$996,370.88
Abilene	3.6	4.6	2.4	4	14.6	$0.73	964,800	$704,304.00	1,518,649	63.5%	$1,108,613.77
Corpus	1.5	4.1	2.7	2.6	10.8	$0.54	895,505	$483,572.70	1,747,049	51.3%	$943,406.46
Lubbock	2.4	5.3	2.2	2.5	12.4	$0.62	730,373	$452,831.26	3,433,788	21.3%	$2,128,948.56
Lamesa	4.3	5.6	1.5	3.6	14.9	$0.75	1,047,563	$780,434.44	1,682,392	62.3%	$1,253,382.04
Visalia	1.3	3.7	3.2	3.4	11.7	$0.59	332,674	$194,614.29	425,385	78.2%	$248,850.23
Total	1.9	3.8	2.2	3.0	10.8	$0.54	8,809,868	$4,763,831.79	16,772,610	52.5%	$9,380,145.24

Source: The U.S. Department of Agriculture – Agricultural Marketing Service, Cotton & Tobacco Program