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Deep Dive into Fiber Quality Series – HVI Trash, Leaf Grade, and Extraneous Matter

- Trash, leaf grade and extraneous matter are all factors that are important in classing cotton. These are used to evaluate the non-lint content in the bale.
- USDA-Agricultural Marketing Service (AMS) uses the high volume instrument (HVI) machine digital camera system (trash meter) to determine trash and leaf grade whereas extraneous matter is determined by the classer.
- The HVI trash measurement is the non-lint materials in cotton which can include leaf, bark and extraneous matter.
- For the HVI trash measurement, the cotton sample is scanned by the HVI digital camera and the image is analyzed by the computer. Software determines the trash surface area (percent area) and the number of trash particles counted (particle count) in the sample.
- In this measurement, trash particles include extraneous matter such as grass, bark, etc. but these contaminant types are not distinguished from one another using this procedure.
- The **HVI trash** value is reported as percent area by AMS. The particle count is determined but is NOT reported by AMS.
- **Leaf grade** was formerly called by classers, but after extensive research and evaluations by AMS**, a calculated leaf grade based on HVI trash and particle count measurements** was introduced in 2011.
- Physical standards are still maintained by AMS, with grades ranging from 1 through 7. A value of 8 is assigned to all samples having leaf grade greater than 7. Larger leaf grade values indicate lower quality.

- Many factors affecting leaf grade are under the control of growers. Leaf grade can be impacted by planted variety (e.g. leaf and bract hairiness can be problematic in some years), harvest aid efficacy (e.g. defoliation level), and harvesting methods (e.g. picker harvesting can improve leaf grade compared to stripper harvesting).
- Other factors include plant conditions during harvest, and moisture content of bur cotton during harvesting, module construction, and storage. When stripper harvesting, any residual leaves on plants should "crunch" and disintegrate when grasped. This insures that moist, pliable leaves are not introduced into the module which can result in poorer leaf and color grades and possibly contribute to module heating during storage.
- Ginning methods and equipment can also impact leaf grade. Modern gins are constructed with machinery components to produce the best leaf grade possible with respect to the incoming condition of the cotton. Windstar affiliated gins are leaders in this respect.
- In some years leaf grades can be inherently high (lower quality) across the board, and reasons for this are poorly understood.
- All leaf content is considered waste and has to be removed from the cotton bale during processing and yarn spinning. Therefore there are deeper discounts as leaf grades increase (lower quality). Smaller leaf particles called "pepper trash" are harder to remove than larger particles, so this can be a concern at textile mills.
- Discounts for leaf grade varies depending upon color grade and staple. For example, 2019-2020 Commodity Credit Corporation (CCC) premiums and discounts (in points per pound) for various color and leaf grade combinations for a 35 staple cotton are noted in the table below.

Leaf Grade	1 or 2	3	4	5	6	7
Color Grade 11 or 21	290	230	145	60	-225	-320
12 or 22	145	100	50	-95	-350	-465
13 or 23	-215	-240	-290	-415	-500	-605
24	-465	-465	-565	-690	-880	-4000

- **Extraneous matter is a "classer's call."** It is anything identified in the cotton sample by the classer other than fiber or leaf. Examples include bark, grass, spindle twist, seed coat fragments, dust, plastic, oil, etc.
- Extraneous matter calls are assigned either as Level 1 (light) or Level 2 (heavy) contamination.
- Beginning in 2018, AMS introduced a new extraneous matter designation for plastic, with the designation codes of 71 for Level 1 and 72 for Level 2.
- Contaminants are a significant problem during subsequent lint processing by mills and care should be taken to reduce contamination potential.
- Various materials that are picked up by strippers and carried through the ginning process can end up in the bale of cotton, and ultimately impact the quality of yarn and fabric products.
- During fiber laydown at the mill, one contaminated bale could affect as many as 25 to 50 other bales, resulting in considerable financial losses.
- Major types of contaminants include plastic, rubber, grease and oil, apparel or other fabrics, and other materials. Pieces of plastic from irrigation tubing (polypipe) can be gathered with the cotton during harvesting and become a source of contamination.
- Trash from adjacent urban or farmstead areas (plastic bags, sacks, etc.) can also be picked up during the stripper harvesting process. Pieces of old inner tubes or tires can also be a source of contamination.
- Grease can be derived from poor handling of grease guns, cartridges, etc., which should be avoided.
- Grease rags have been noted as another source of contamination.
- Hydraulic fluid leaks, and other similar problems can contribute to fiber impurities.
- 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
- The table below indicates the codes used for various extraneous matter types, possible sources of the problem, and the 2019-2020 CCC loan chart discounts in points per pound.

AMS Code Used	Classer's Extraneous Matter Call	Comments and Possible Sources	2019-2020 CCC Loan Discount In Points Per Pound
01	Prep Level 1	Defined as degree of smoothness or roughness of ginned lint, roping or knotting of immature fibers	-195
02	Prep Level 2	"	-650
11	Bark Level 1	Most often associated with aggressive stripper harvesting; plant bark slivers in ginned lint.	TX/NM/OK/KS -345
12	Bark Level 2	"	TX/NM/OK/KS -520
21	Grass Level 1	Contaminant identifiable as grass contamination in sample.	-460
22	Grass Level 2	"	-705
31	Seed Coat Fragments Level 1	Broken seed coats with fiber attached. Seed coat damage can occur when vacuuming bur cotton piles into boll buggies. Also can arise from weathered or immature seed and may be variety related due to thin seed coat.	-460
32	Seed Coat Fragments Level 2	"	-705
41	Oil Level 1	Can be sourced from leaking hydraulic cylinders as modules are constructed.	-460
42	Oil Level 2	"	-705
51	Spindle Twist Level 1	Associated with improperly adjusted or maintained spindle picker harvester row units.	-460
52	Spindle Twist Level 2	"	-705
61	Other Level 1	Identified contamination that does not fit into other designated categories.	-460
62	Other Level 2	"	-705
71	*Plastic Level 1	Plastic arising from round module wrap, plastic grocery bags, irrigation polypipe, etc.	-510
72	*Plastic Level 2	"	-775

*Implemented with the 2018 crop. Unlike plant-based extraneous matter such as bark, grass, or seed coat fragments, plastic extraneous matter is generally not uniformly distributed throughout a plastic-contaminated bale. Therefore, a sample from a plastic-contaminated bale submitted for classification may or may not have plastic extraneous matter present.