



A Prospective for a New Leaf Grade by HVI

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Trash is a measure of the amount of non-lint materials in cotton, such as leaf and bark from the cotton plant. The instruments work on two principles either gravimetric based i.e., Advanced Fiber Information System "AFIS" or geometric or surface scanner, i.e., HVI. The percentage of the surface area occupied by trash particles (percent area) and the number of trash visible (particle count) are calculated as well.



USDA Leaf Grade depends on Trash Area percent and ignores the size of trash particles and trash count, the smaller the trash area percent the higher the grade and the lower trash area percent the lower the grade, however that's not the best classification for the spinner as the big trash particles are easier to remove than the small ones and the extra small ones (pepper) are hard to remove and can cause neps and unevenness in the yarn.

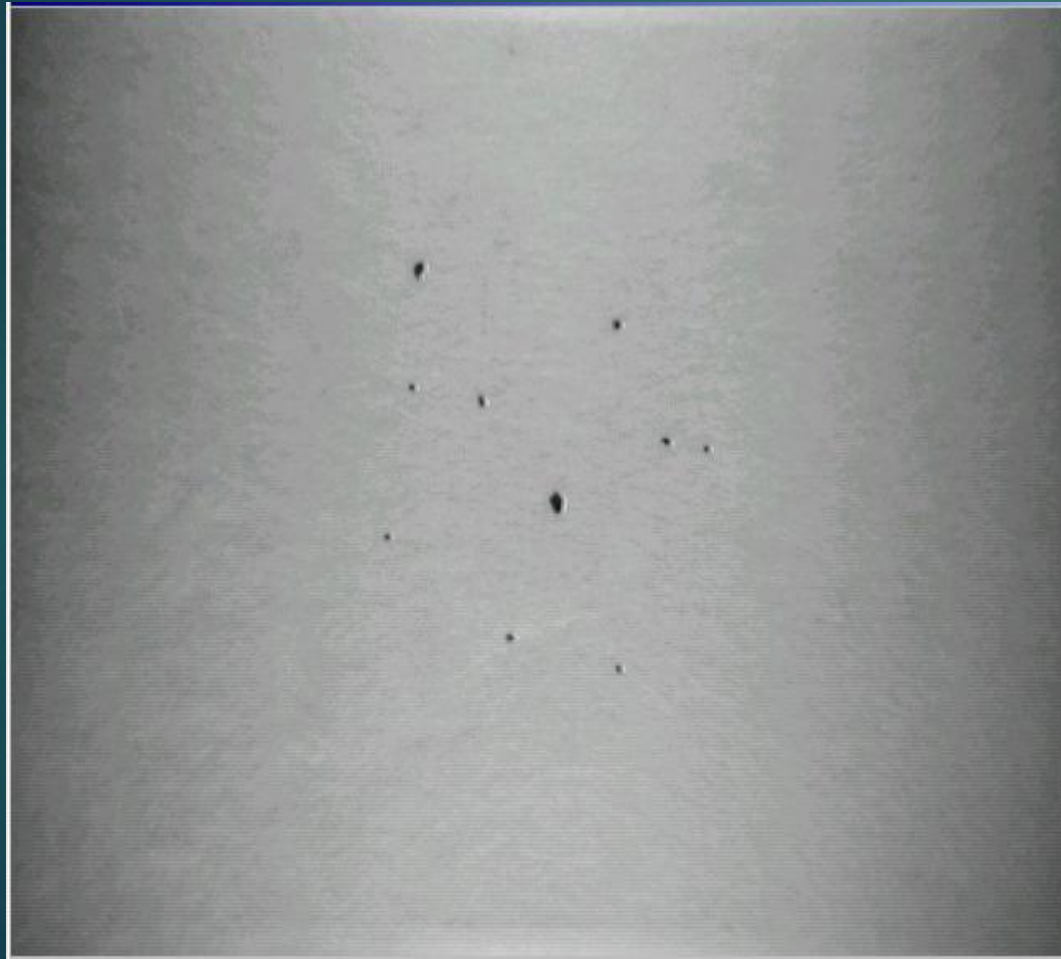
Leaf Grade

Trash Measurement (Area%)	Leaf Grade
0.13	1
0.20	2
0.34	3
0.51	4
0.72	5
1.00	6
1.25	7
1.57	8



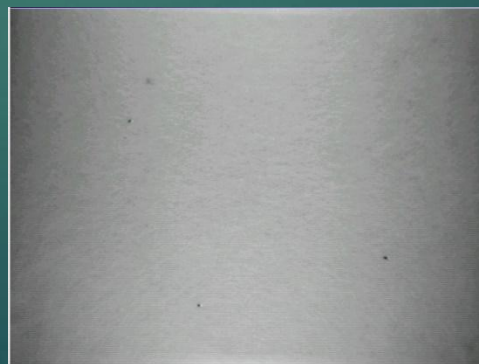
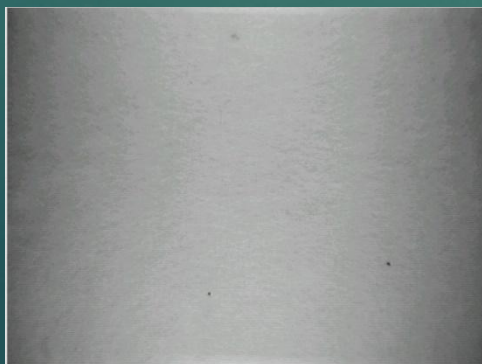
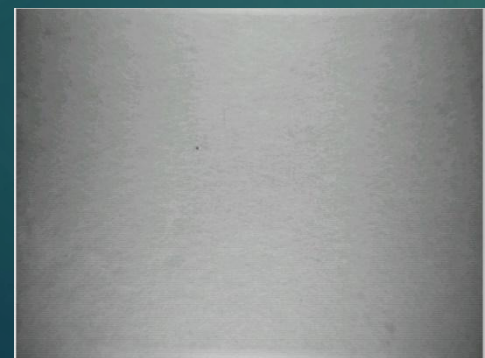
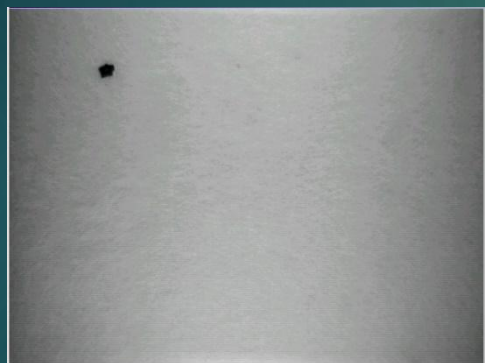
Trash area solely is not enough for determining leaf grade while a ratio between percent area of trash and trash particle count is a good indicator of the average particle size in a cotton sample. A low percent area combined with a high particle count indicates a smaller average particle size than does a high percent area with a low particle count.

Big count small area and small count big area trash particles





Cotton Trash Samples were created using a number of cotton trash particles removed from cotton and added to zero trash cotton samples, those trash particles are divided into three categories Big particles (B), Medium particles (M) and Small particles (S). Those Cotton Trash Samples that contains specific number and size of trash were examined using the HVI 1000 (Zellweger Uster).



Trash Particles Combination Samples

Big Particles (B) Medium Particles (M) Small Particles (S)

B0 M0 S0	B1 M1	B1 S1	M1 S1
B1 M0 S0	B1 M2	B1 S2	M1 S2
B2 M0 S0	B1 M3	B1 S3	M1 S3
B3 M0 S0	B1 M4	B1 S4	M1 S4
B4 M0 S0	B2 M1	B2 S1	M2 S1
B0 M1 S0	B2 M2	B2 S2	M2 S2
B0 M2 S0	B2 M3	B2 S3	M2 S3
B0 M3 S0	B2 M4	B2 S4	M2 S4
B0 M4 S0	B3 M1	B3 S1	M3 S1
B0 M0 S1	B3 M2	B3 S2	M3 S2
B0 M0 S2	B3 M3	B3 S3	M3 S3
B0 M0 S3	B3 M4	B3 S4	M3 S4
B0 M0 S4	B4 M1	B4 S1	M4 S1
	B4 M2	B4 S2	M4 S2
	B4 M3	B4 S3	M4 S3
	B4 M4	B4 S4	M4 S4

Trash Particles Combination Samples

Big Particles (B) Medium Particles (M) Small Particles (S)

B1 M1 S1	B2 M1 S1	B3 M1 S1	B4 M1 S1
B1 M1 S2	B2 M1 S2	B3 M1 S2	B4 M1 S2
B1 M1 S3	B2 M1 S3	B3 M1 S3	B4 M1 S3
B1 M1 S4	B2 M1 S4	B3 M1 S4	B4 M1 S4
B1 M2 S1	B2 M2 S1	B3 M2 S1	B4 M2 S1
B1 M2 S2	B2 M2 S2	B3 M2 S2	B4 M2 S2
B1 M2 S3	B2 M2 S3	B3 M2 S3	B4 M2 S3
B1 M2 S4	B2 M2 S4	B3 M2 S4	B4 M2 S4
B1 M3 S1	B2 M3 S1	B3 M3 S1	B4 M3 S1
B1 M3 S2	B2 M3 S2	B3 M3 S2	B4 M3 S2
B1 M3 S3	B2 M3 S3	B3 M3 S3	B4 M3 S3
B1 M3 S4	B2 M3 S4	B3 M3 S4	B4 M3 S4
B1 M4 S1	B2 M4 S1	B3 M4 S1	B4 M4 S1
B1 M4 S2	B2 M4 S2	B3 M4 S2	B4 M4 S2
B1 M4 S3	B2 M4 S3	B3 M4 S3	B4 M4 S3
B1 M4 S4	B2 M4 S4	B3 M4 S4	B4 M4 S4



Using the formula: $(T.C)^2/T.A(m)$ and applying the same USDA Leaf Grade scale

Would allow us to determine the Leaf Grade not only upon the trash area (%) but also upon the trash size and count as well.

Also that would improve the accuracy of the HVI trash reading as follows.

	Trash Count	Trash Area(%)	HVI Trash Grade	(T.C)2/T.A(m)	New Leaf Grade
B0M0S0	0	0.03	1	0	1
B1M0S0	1	0.22	3	0.08	1
B2M0S0	2	0.44	4	0.16	2
B3M0S0	3	0.68	5	0.23	3
B4M0S0	4	0.93	6	0.30	3
B0M1S0	1	0.13	2	0.13	1
B0M2S0	2	0.20	2	0.34	3
B0M3S0	3	0.31	3	0.50	4
B0M4S0	4	0.43	4	0.64	5
B0M0S1	1	0.03	1	0.57	5
B0M0S2	2	0.04	1	1.72	8
B0M0S3	3	0.04	1	3.88	8
B0M0S4	4	0.04	1	6.89	8

	Trash Count	Trash Area(%)	HVI Trash Grade	(T.C)2/T.A(m)	New Leaf Grade
B1M1	2	0.52	5	0.13	1
B1M2	3	0.61	5	0.25	3
B1M3	4	0.74	5	0.37	4
B1M4	5	0.81	6	0.53	5
B2M1	3	0.88	6	0.18	2
B2M2	4	1.00	7	0.28	3
B2M3	5	1.07	7	0.40	4
B2M4	6	1.02	7	0.61	5
B3M1	4	1.20	7	0.23	3
B3M2	5	1.26	8	0.34	3
B3M3	6	1.45	8	0.43	4
B3M4	7	1.19	7	0.71	5
B4M1	5	0.96	6	0.45	4
B4M2	6	1.10	7	0.56	5
B4M3	7	1.23	7	0.69	5
B4M4	8	1.38	8	0.80	6

	Trash Count	Trash Area(%)	HVI Trash Grade	(T.C)2/T.A(m)	New Leaf Grade
B1S1	2	0.42	4	0.16	2
B1S2	3	0.43	4	0.36	4
B1S3	4	0.44	4	0.63	5
B1S4	5	0.36	4	1.20	7
B2S1	3	0.79	6	0.20	2
B2S2	4	0.79	6	0.35	4
B2S3	5	0.80	6	0.54	5
B2S4	6	0.58	5	1.07	7
B3S1	4	1.02	7	0.27	3
B3S2	5	1.10	7	0.39	4
B3S3	6	1.10	7	0.56	5
B3S4	7	0.73	6	1.16	7
B4S1	5	0.88	6	0.49	4
B4S2	6	0.89	6	0.70	5
B4S3	7	0.86	6	0.98	6
B4S4	8	0.91	6	1.21	7

	Trash Count	Trash Area(%)	HVI Trash Grade	(T.C)2/T.A(m)	New Leaf Grade
M1S1	2	0.14	2	0.49	4
M1S2	3	0.15	2	1.03	6
M1S3	4	0.16	2	1.72	8
M1S4	5	0.14	2	3.08	8
M2S1	3	0.30	3	0.52	5
M2S2	4	0.31	3	0.89	6
M2S3	5	0.30	3	1.44	8
M2S4	6	0.22	3	2.82	8
M3S1	4	0.45	4	0.61	5
M3S2	5	0.46	4	0.94	6
M3S3	6	0.84	4	0.74	6
M3S4	7	0.30	3	2.81	8
M4S1	5	0.35	4	1.23	7
M4S2	6	0.36	4	1.72	8
M4S3	7	0.37	4	2.28	8
M4S4	8	0.38	4	2.90	8

	Trash Count	Trash Area(%)	HVI Trash Grade	(T.C)2/T.A(m)	New Leaf Grade
B1M1S1	3	0.52	5	0.30	3
B1M1S2	4	0.53	5	0.52	5
B1M1S3	5	0.54	5	0.80	6
B1M1S4	6	0.48	4	1.29	8
B1M2S1	4	0.62	5	0.44	4
B1M2S2	5	0.69	5	0.62	5
B1M2S3	6	0.68	5	0.91	6
B1M2S4	7	0.59	5	1.43	8
B1M3S1	5	0.79	6	0.55	5
B1M3S2	6	0.78	6	0.79	6
B1M3S3	7	0.78	6	1.08	7
B1M3S4	8	0.75	6	1.47	8
B1M4S1	6	0.80	6	0.78	6
B1M4S2	7	0.81	6	1.04	7
B1M4S3	8	0.82	6	1.34	8
B1M4S4	9	0.82	6	1.70	8

	Trash Count	Trash Area(%)	HVI Trash Grade	(T.C)2/T.A(m)	New Leaf Grade
B2M1S1	4	0.69	5	0.40	4
B2M1S2	5	0.71	5	0.61	5
B2M1S3	6	0.71	5	0.87	6
B2M1S4	7	0.75	6	1.13	7
B2M2S1	5	0.79	6	0.55	5
B2M2S2	6	0.81	6	0.77	6
B2M2S3	7	0.83	6	1.02	7
B2M2S4	8	0.83	6	1.33	7
B2M3S1	6	0.92	6	0.67	5
B2M3S2	7	0.94	6	0.90	6
B2M3S3	8	0.94	6	1.17	7
B2M3S4	9	0.95	6	1.47	8
B2M4S1	7	1.06	7	0.80	6
B2M4S2	8	1.06	7	1.04	7
B2M4S3	9	1.07	7	1.30	8
B2M4S4	10	1.11	7	1.55	8

	Trash Count	Trash Area(%)	HVI Trash Grade	(T.C)2/T.A(m)	New Leaf Grade
B3M1S1	5	0.87	6	0.49	4
B3M1S2	6	0.84	6	0.74	6
B3M1S3	7	0.84	6	1.00	6
B3M1S4	8	0.98	6	1.12	7
B3M2S1	6	0.98	6	0.63	5
B3M2S2	7	0.96	6	0.88	6
B3M2S3	8	0.97	6	1.14	7
B3M2S4	9	1.05	7	1.33	8
B3M3S1	7	1.10	7	0.77	6
B3M3S2	8	1.09	7	1.01	7
B3M3S3	9	1.11	7	1.26	8
B3M3S4	10	1.17	7	1.47	8
B3M4S1	8	1.30	8	0.85	6
B3M4S2	9	1.27	8	1.10	7
B3M4S3	10	1.25	8	1.38	8
B3M4S4	11	1.26	8	1.65	8

	Trash Count	Trash Area(%)	HVI Trash Grade	(T.C)2/T.A(m)	New Leaf Grade
B4M1S1	6	1.10	7	0.56	5
B4M1S2	7	1.07	7	0.79	6
B4M1S3	8	1.07	7	1.03	7
B4M1S4	9	1.12	7	1.25	7
B4M2S1	7	1.04	7	0.81	6
B4M2S2	8	1.04	7	1.06	7
B4M2S3	9	1.04	7	1.34	8
B4M2S4	10	1.20	7	1.44	8
B4M3S1	8	1.06	7	1.04	6
B4M3S2	9	1.07	7	1.30	8
B4M3S3	10	1.07	7	1.61	8
B4M3S4	11	1.07	7	1.95	8
B4M4S1	9	1.13	7	1.23	7
B4M4S2	10	1.13	7	1.52	8
B4M4S3	11	1.17	7	1.78	8
B4M4S4	12	1.48	8	1.68	8



By applying the new Leaf Grade on the HVI readings for a pre-classed cotton samples we found that the new Leaf Grade was in line with the classer's grade and meets the spinner's preference concerning trash size and count.

THANK YOU