



## DEVELOPING A NEW COLOR DIAGRAM FOR THE EGYPTIAN COTTON VARIETIES

 made  
 in  
 Germany

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## 1. INTRODUCTION

- The classing of the Egyptian cotton is still made by cotton classer's, no HVI's are used for classing till now.
- CATGO tries to realize such a classification of the Egyptian cotton according to USDA recommendations for US-PIMA cotton varieties, but in fact it fails completely.
- The possible reason is that parameters of the Egyptian cotton in fact are different to US-Upland cotton.
- So the color diagrams of the American Upland cottons and that of the American-Egyptian Pima cottons are not applicable to the Egyptian cottons.



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- The A research team at CRI started 2015 to develop a new color grade diagram for the Egyptian cotton varieties. This was not a simple task.
- At least it was a linkage of the organo-leptic-visual evaluation of the cotton colors by experienced classer's to the measured values  $R_d$  (Whiteness degree) and  $+b$  (yellowness degree).
- The measurements have been done with the CCS-FIBROCOLOR Station of the CCS-Version 5 at Cotton Research Centre Giza.



## 2. CONSIDERATIONS

For the development of the new diagram the following ideas have been considered:

- The color classes for the Egyptian cottons should reflect differences in intrinsic, but not the extrinsic color.
- The intrinsic colors are the genuine original colors which are genetically controlled. Accordingly, the intrinsic colors are in fact varietal characters which depend basically on the genotype of each variety.
- The conception was that the different color classes of the proposed color diagram for Egyptian cottons would be used to define precisely the intrinsic colors of the commercial Egyptian cotton varieties as well as the promising hybrids.



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- The precise definition of the intrinsic colors of the different genotypes would help a lot to control clearly the problem of color non-uniformity of some commercial Egyptian cotton varieties and promising hybrids.
- Within each of the proposed color classes of the Egyptian cottons, the degree of lightness / darkness of color in terms of percent reflectance ( $R_d$  %) would be used to define the grade of cotton. Lightness or darkness of color ( $R_d$  %) depends essentially on the amount and nature of foreign matter (trash) present in cotton. In other words it depends on the degree of cleanliness of cotton which is a fundamental criterion determining the grade of cotton.



## 3. PLANING OF EXPERIMENTS

The development of the new diagram includes the following working steps:

- First step : Selection of cotton varieties for the

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Denomination Lint Grade (LG)	LG - Code	LG - No.
Extra	EX	1
Fully Good	FG	2
Good	G	3
Fully Good Fair	FGF	4
Good Fair	GF	5
Fully Fair	FF	6
Fair	F	7

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- The Third step: organo-leptic evaluation of the samples by using eyes and hands to find correct Lint grades by using available Lint Grade etalons in Cotton Research Center Giza.
- Fourth step: preparation of list for all assessed samples, marked with the related Lint Grade found by the cotton classer's
- Fifth step: testing of all classified samples statistically at CCS\_FIBROCOLOR Station. Noticed test results: average values for  $L^*$ ,  $b^*$ ,  $a^*$  (CIE Lab) as well as  $R_d$  and  $+b$  for all tested samples.
- Sixth step: Reduction of enormous amount of obtained data to find a correlation between the measured data and the visual assessment of the samples.





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- **NOTE 1:**

To create the correlation, the statistical data average  $X$  and standard deviation  $SD$  will be taken in consideration for the values  $L^*$ ,  $a^*$ ,  $b^*$ ,  $R_d$  and  $+b$  for defined Lint Grades.

- **NOTE 2:**

To exclude wrong evaluated samples, only a limited data range ( $X \pm SD$ ) for the measured values of the tested cotton varieties (Giza 85, Giza 80, Giza 86, Giza 90 and Giza 92) is correlated with the defined Lint Grades. This ensures a high accuracy, i.e. outliers are automatically excluded from further evaluation.





## 4. INTERPRETATION OF RESULTS

- Destination : to find position of the area for the Lint Grades within the new diagram on base of correlation between the visual evaluated Lint Grades and measured values for the tested samples.
- An accurate definition of the borders between the defined color – and Lint Grades is required !
- For finding the location of the area for Lint Grade “j”, the limits for the measured values  $L^*$  and  $b^*$  needs to be calculated accurately: the center of the color grade area for variety “i” and Lint Grade “j” in the color diagram is defined by  $[X(L^*(i,j)); X(b^*(i,j))]$ , where :



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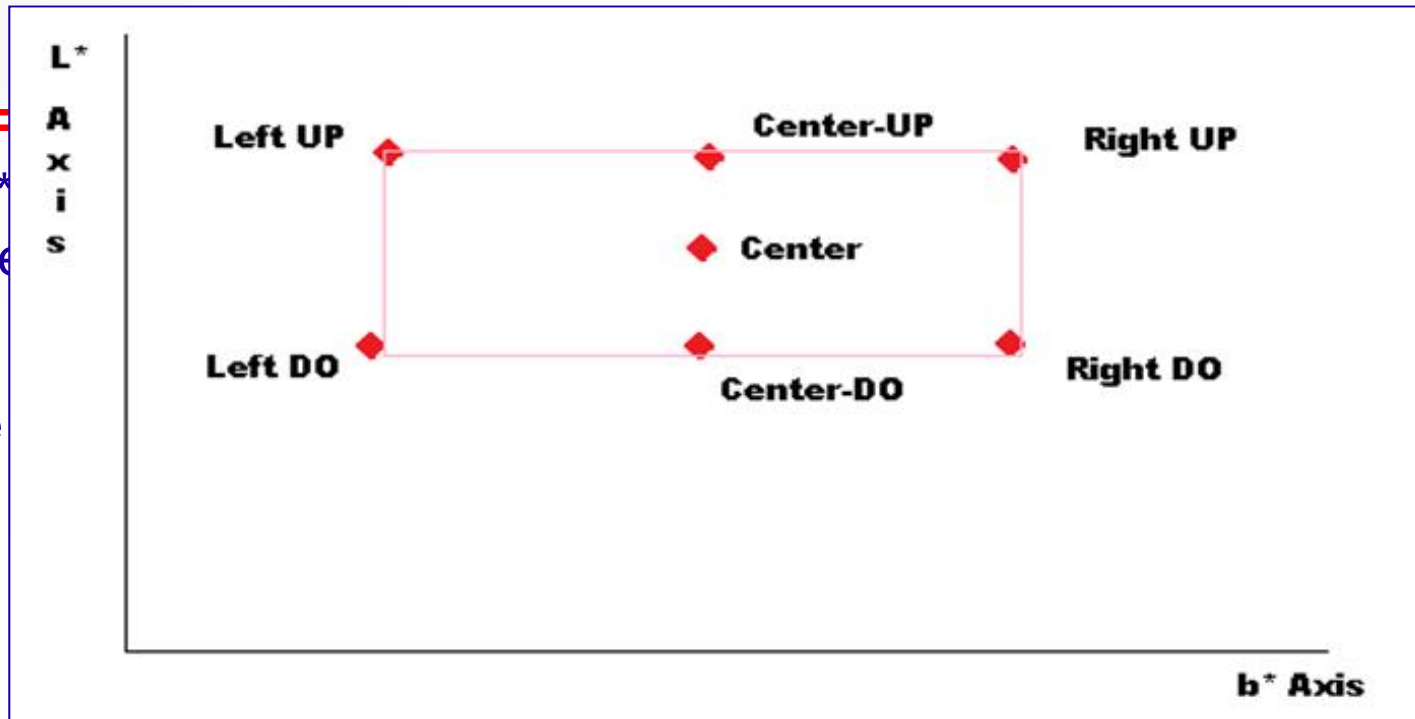
- **DEFINITION 1:**

$X(L^*(i,j))$  is the average value for  $L^*$ , calculated from all values for variety "i" and Lint Grade "j" what have been classified in to Lint grade "j"; and

- **DEFINITION 2:**

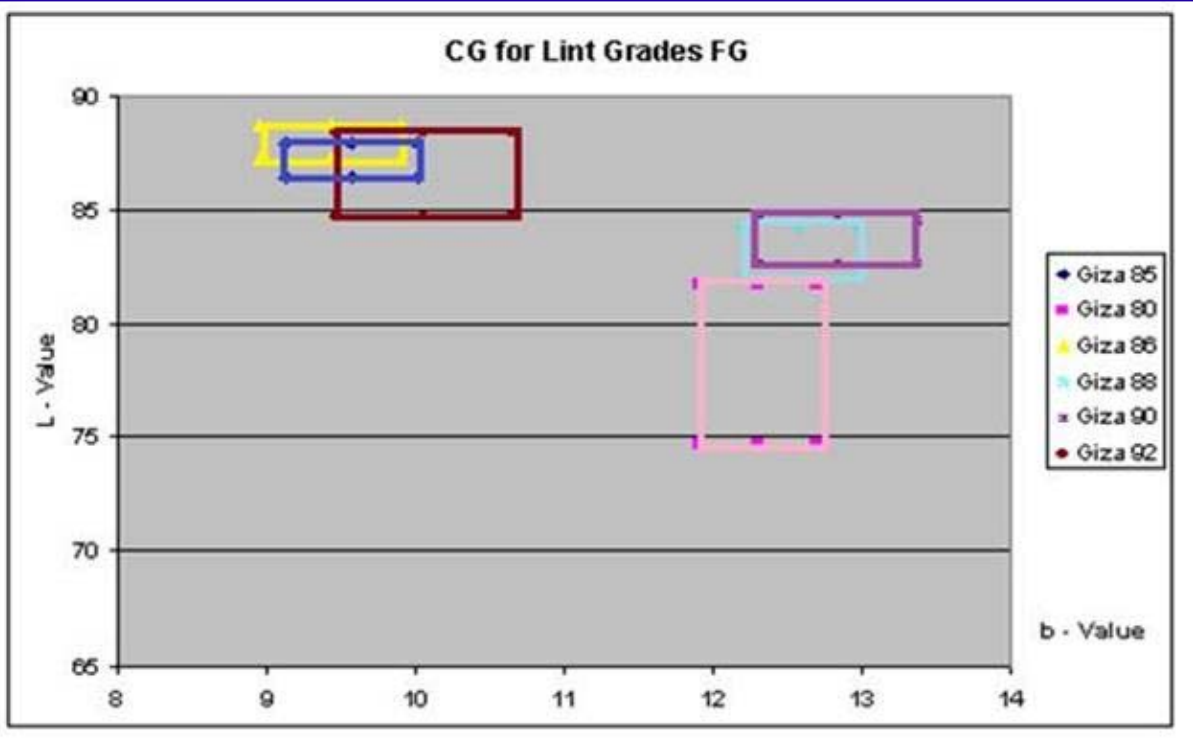
$X(b^*(i,j))$  is the average value for  $b^*$ , calculated from all values for variety "i" and Lint Grade "j" what have been classified in to Lint grade "j"; and

- The



## 4.1 LOCATION OF LINT GRADE FG (Fully Good)

Color Value	Lint grades	Giza 85	Giza 80	Giza 86	Giza 88	Giza 90	Giza 92
L*	FG AVE	87,15	78,23	87,99	83,11	83,59	86,19
	Left Down	86,4					
	Right UP	87,9					
	Left UP	87,9					
	Right Down	86,4					
	Center UP	87,9					
	Center Down	86,4					
	FG SD	0,75					
	b*	FG AVE	9,57				
Left Down		9,13					
Right UP		10,01					
Left UP		9,13					
Right Down		10,01					
Center UP		9,57					
Center Down		9,57					
FG SD		0,44					



- Tab. 1 : Calculated bo
- Dia. 1 : 2 clusters: The white colored varieties Giza 86, Giza 85, Giza 92 forming the “White” cluster . The creamy colored varieties Giza 80, Giza 88 and Giza 90 forming the “Creamy” cluster.

## 4.2 Intrinsic color of Egyptian Cottons

- The distribution of the intrinsic colors for Egyptian cotton has the range from white over creamy to dark creamy color.

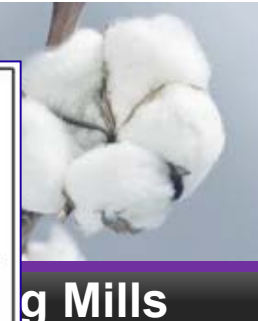
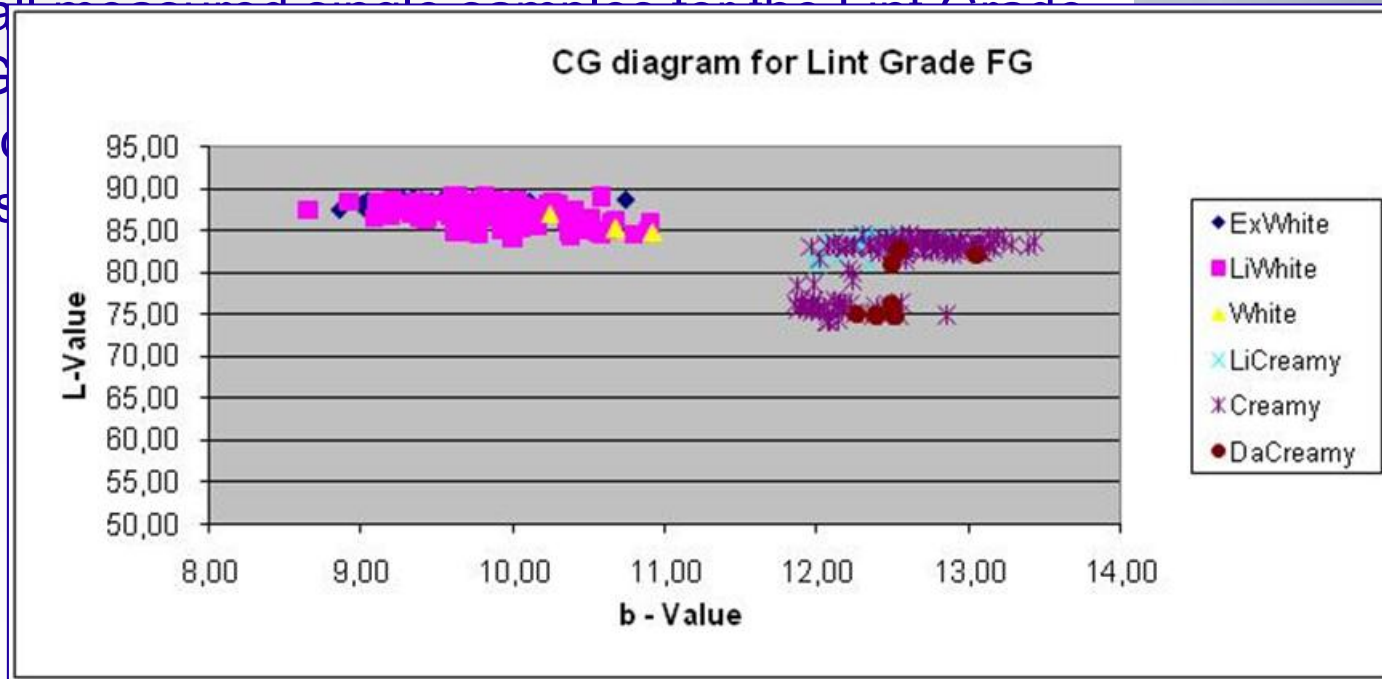


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Definition of Color	a* Value
Extra White	< 0,5
Light White	0,5 .... 1,0
White	1,0 .... 1,5
Light creamy	1,5 .... 2,0
Creamy	2,0 .... 2,5
Dark creamy	> 2,5

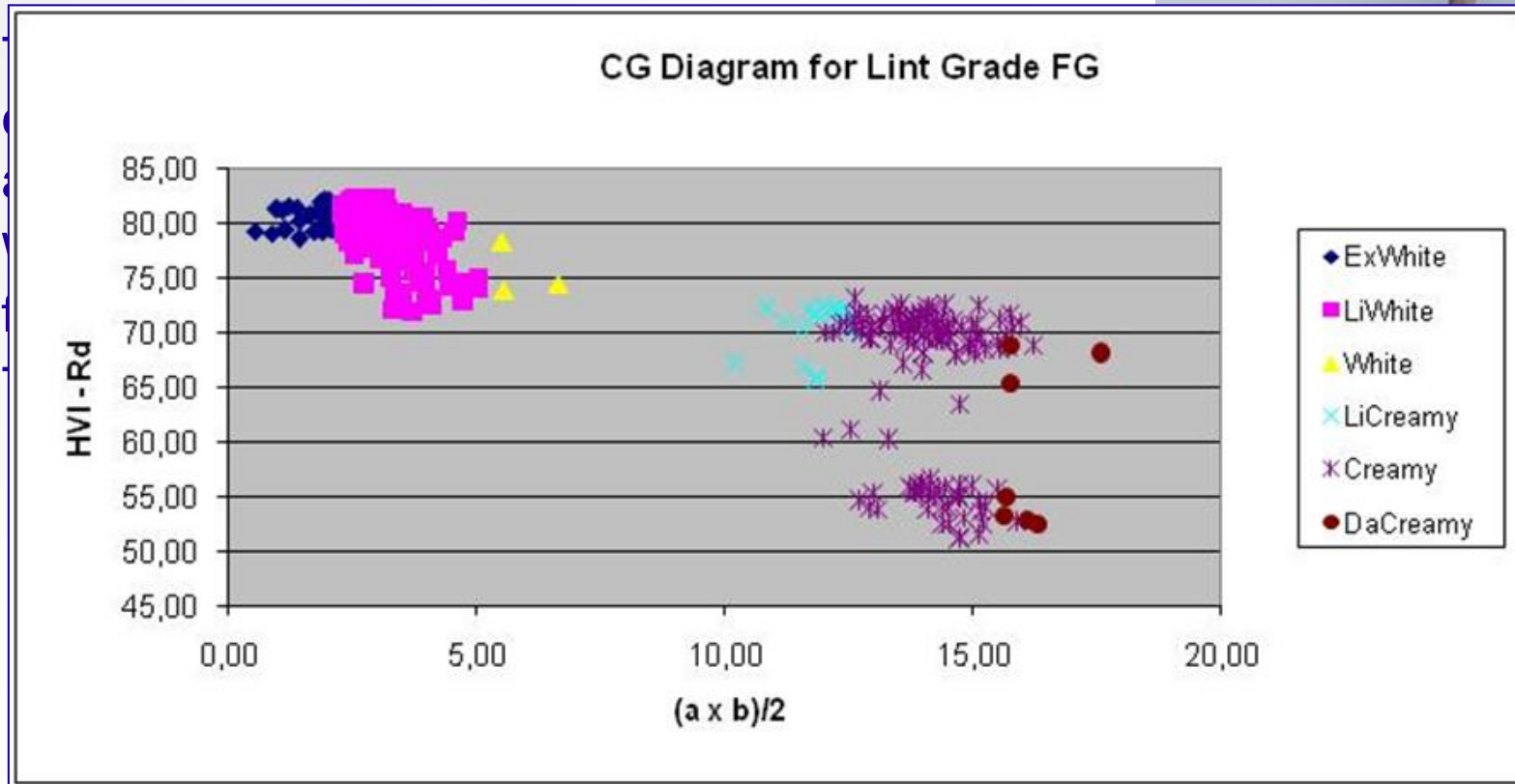
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- If all ...  
FG ...  
and ...  
is s ...



- Dia. 2 : CG Diagram for Lint Grade FG
- Colors are overlapping, i.e. “creamy” and “light creamy” samples cannot be distinguished from each other. The same situation exists for “Extra White” and “White” colors.
- **CONCLUSION** : New x-axis definition required !!

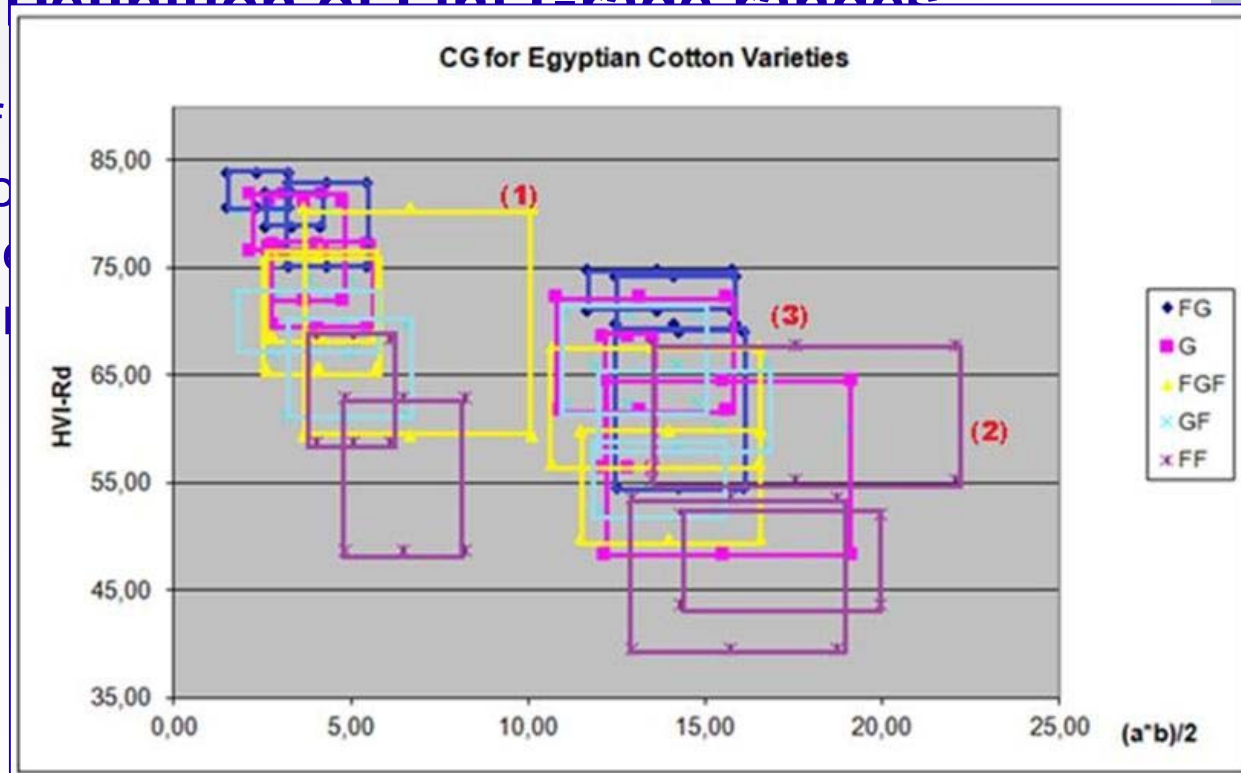
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- Dia. 3 : CG Diagram for Lint Grade FG with new x-axis
- Varieties within the “white” and the “creamy” cluster are now clearly to distinguish !!

## 4.3 Definition of Lint Grade ranges

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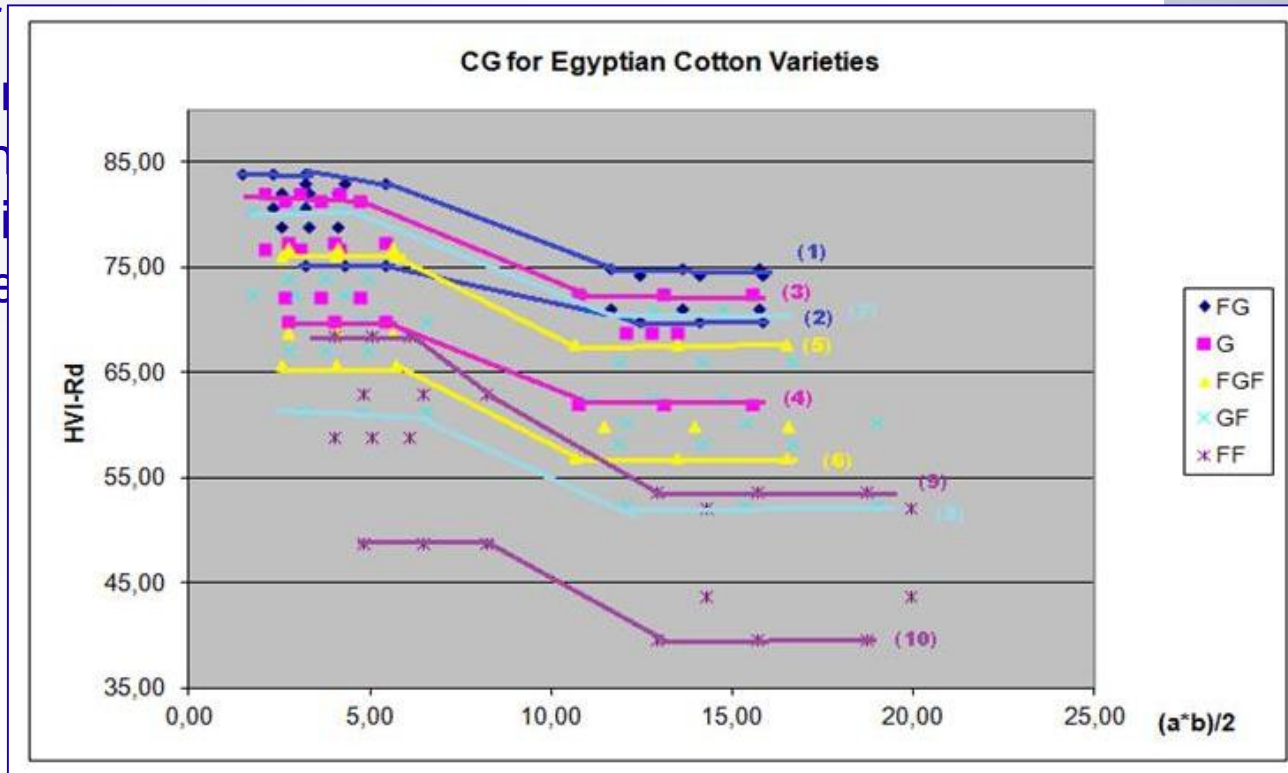


- Dia. 4 : Color Diagram ranges
- There are a lot of overlapping ranges, especially for upper whiteness (HVI Rd) values. For lower whiteness values the Lint Grades limits are clearly to see.



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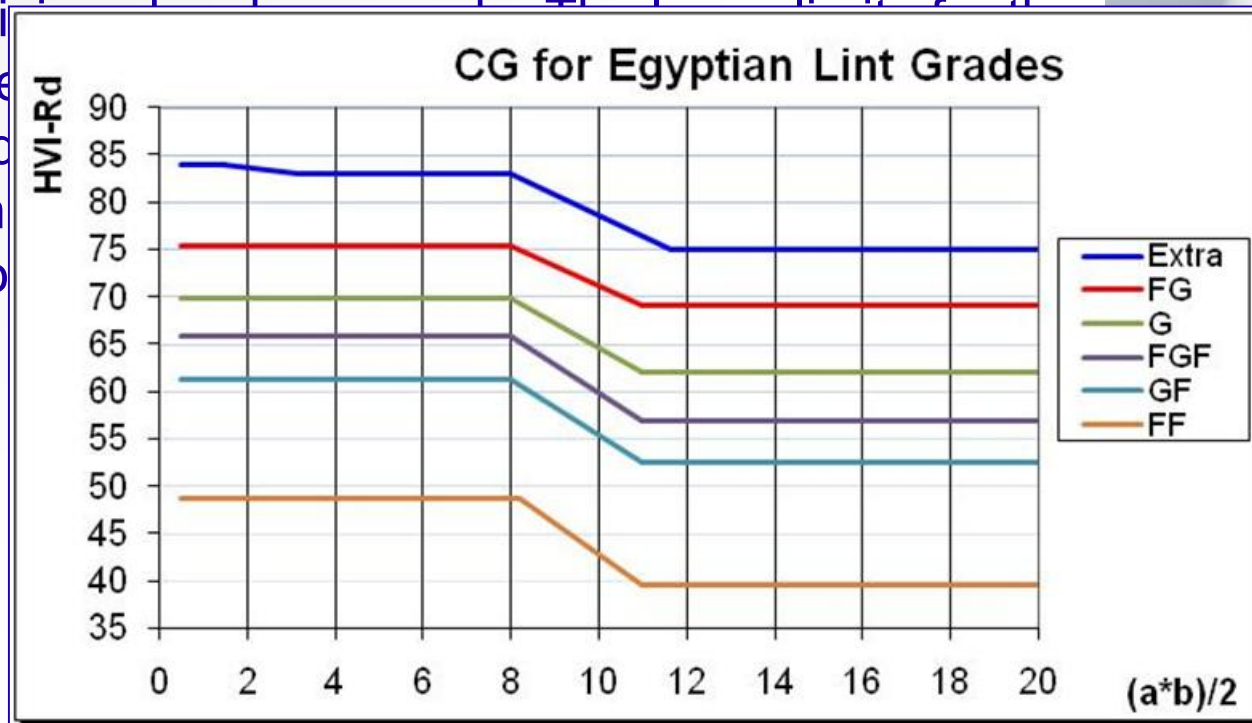
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- Dia. 5 : CG Diagram – upper & lower limits for all Lint Grades
- There are a lot of overlapping ranges. For the Grade FG the line (1) is the upper and the line (2) is lower limit for example. Within this range also parts of Lint Grade G is located.

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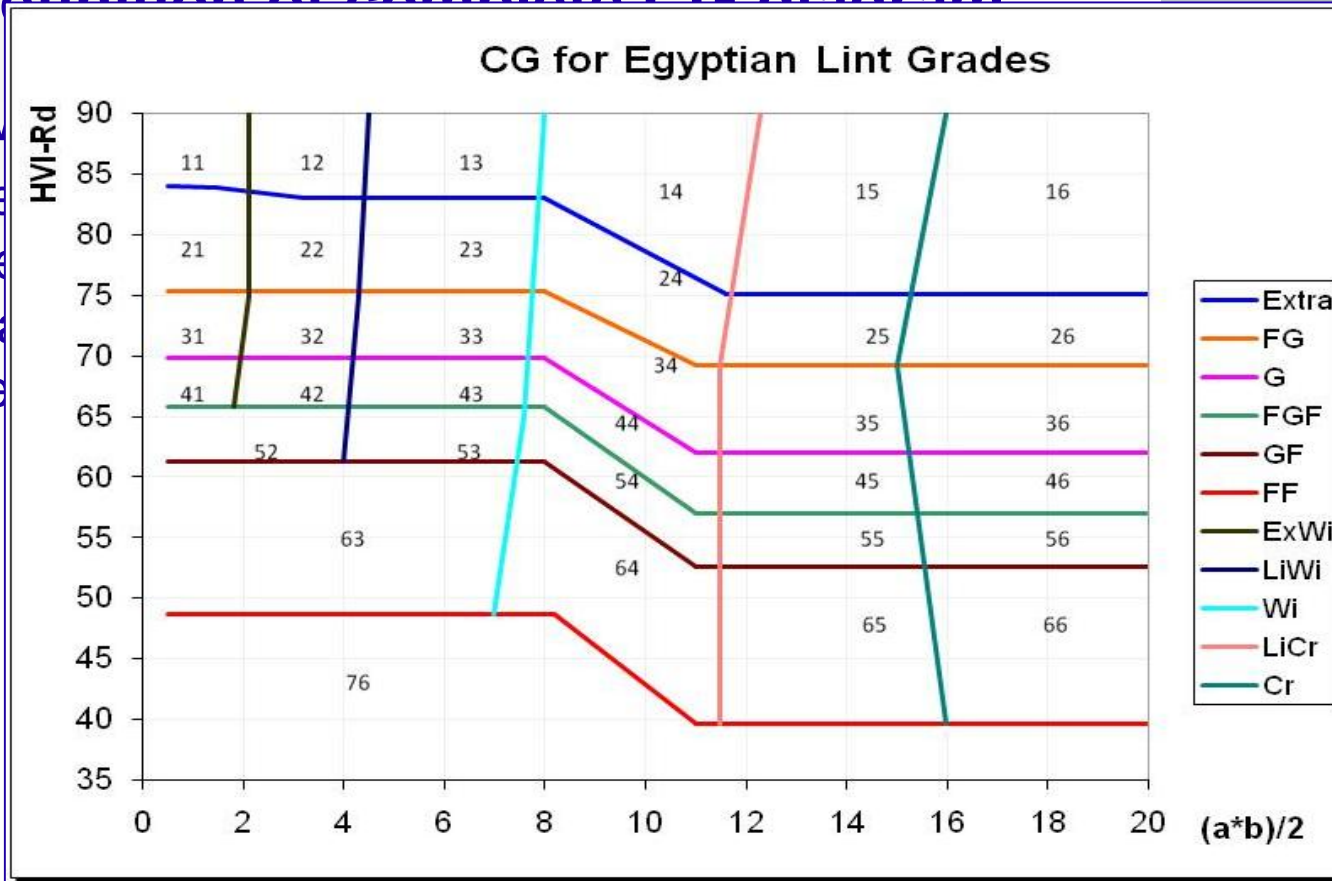
- To define the limits for the color grades, following decision tree, the following limits for the color grades were defined. The limits for the color grades with HVI-Rd are as follows.



- Dia. 6 : CG Diagram for all Egyptian Lint Grades
- For the Lint Grade of all varieties we have now clear limits for the color diagram Rd –  $(a^*B)/2$  !!

## 4.4 Definition of complete CG diagram

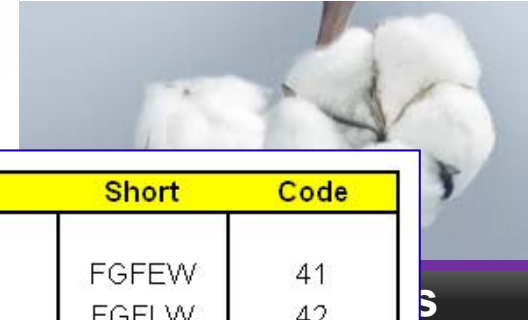
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- Dia. 7 : Complete Color Diagram for Egyptian Cotton varieties

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- Now depending on the above defined Lint and Color Grades, the following table shows the



Classers Grade	Short	Code	Classers Grade	Short	Code
<b>EXTRA</b>			<b>FGF (Fully Good Fair)</b>		
Extra-Extra White	EEW	11	FGF-Extra White	FGFEW	41
Extra-Light White	ELW	12	FGF-Light White	FGFLW	42
Extra-White	EW	13	FGF-White	FGFW	43
Extra-Light Creamy	ELC	14	FGF-Light Creamy	FGFLC	44
Extra-Creamy	EC	15	FGF-Creamy	FGFC	45
Extra-Dark Creamy	EDC	16	FGF-Dark Creamy	FGFDC	46
<b>FG (Fully Good)</b>			<b>GF (Good Fair)</b>		
FG-Extra White	FGEW	21	GF-Extra White	GFEW	51
FG-Light White	FGLW	22	GF-Light White	GFLW	52
FG-White	FGW	23	GF-White	GFW	53
FG-Light Creamy	FGLC	24	GF-Light Creamy	GFLC	54
FG-Creamy	FGC	25	GF-Creamy	GFC	55
FG-Dark Creamy	FGDC	26	GF-Dark Creamy	GFDC	56
<b>G (Good)</b>			<b>FF (Fully Fair)</b>		
G-Extra White	GEW	31	FF-Creamy	FFC	65
G-Light White	GLW	32	FF-Dark Creamy	FFDC	66
G-White	GW	33	<b>F (Fair)</b>		
G-Light Creamy	GLC	34	Fair	F	76
G-Creamy	GC	35			
G-Dark Creamy	GDC	36			

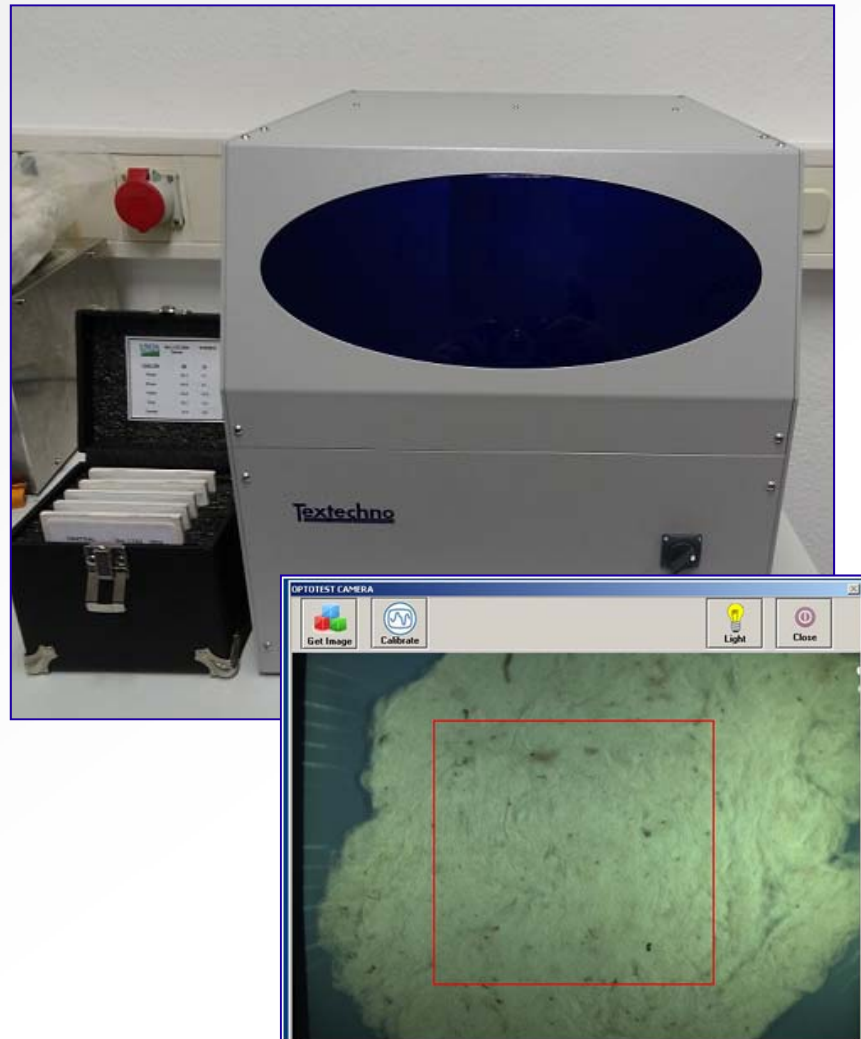
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- The new CG Diagram for Egyptian Cotton has been integrated in to the FCS-OPTOTEST Station of the TEXTECHNO FCS-BALEXPERT Version V5-4





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## Features FCS-OPTOTEST:

- Measures Whiteness Rd, Yellowness +b, Color grade CG, leaf grade LG, Trash count TrCnt and Trash area TrArea
- In combination with MDTA 4 : it measures quantity of neps, Seed coat neps, trash parts per 1 gram fiber material
- Also Non-lint content, dust content and fibre fragments in gram and percent can be tested


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ANALYZE WINDOW

Data Manipulations

CAMERA From File Analysis Print Q-Control Close

Digital Analyze



Calculation of the NonLint Content

Type	Mean	CV%	Dev	Max	Min	R
Tr.Area	0.44	0		0.44	0.44	0
Tr.DNT	80.00	0		80.00	80.00	0
Leaf Grade	4.00	0		4.00	4.00	0
Fid	0	0		0	0	0
+b	0	0		0	0	0
CG	0	0		0	0	0
L*	0	0		0	0	0
a*	0	0		0	0	0
b*	0	0		0	0	0
ECG	0	0		0	0	0

Calculation

	Tr.Area	Tr.DNT	Leaf Grade	Fid	CG	L*	a*	b*	ECG
1	0.44	80.00	4.00	0	0	0	0	0	0
2									
3									

DataName: 2018\_02\_20-0 Lot Name: NONE Org Image size: 762 / 758 Acq Image size: 762 / 758 ST: Ready Detected as LayDown



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