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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS
GENEVA

**TECHNICAL WORKING PARTY ON AUTOMATION AND
COMPUTER PROGRAMS**

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ADDENDUM

TRANSFORMATION OF MEASURED CHARACTERISTICS INTO NOTES FOR
DESCRIPTION PURPOSES

Document prepared by experts from France



UPOV TWC

Twenty-sixth Session
Jeju, Republic of Korea, September 2 to 5, 2008

Transformation of measured characteristics into notes for description purpose

Experts from France



This presentation deals with variety description. Before describe methods we used in France to transform measured characteristics into notes, I would like to remain some general considerations.


Table 1: Definition of different view levels to consider characteristics

View level	Description of the view level
1	characteristics as expressed in trial
2	data for evaluation of characteristics
3	variety description

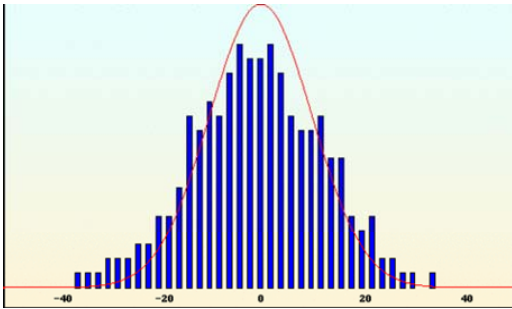
Source : UPOV section TGP/8.4: Types of Characteristics and Their Scale levels



Level 1: characteristics as expressed in trial



Level 2: data for evaluation of characteristics



Level 3: variety description

8. (*) (+)	Plant: time of inflorescence emergence MS A MGB	Plante : époque d'épaison	Pflanze: Zeitpunkt des Erscheinens der Blütenstände	Planta: época de la desputadura de las inflorescencias		
QN	early	précoce	früh	temprana	Suliso	3
	medium	moyenne	mittel	media	Prior	5
	late	tardive	spät	tardia		7
9. (+)	Plant: natural height at inflorescence emergence MS A	Plante : hauteur naturelle à l'épaison	Pflanze: natürliche Höhe bei Erscheinen der Blütenstände	Planta: altura en la época de la desputadura de las inflorescencias		
QN (b)	short	basse	niedrig	baja	Prior	3
	medium	moyenne	mittel	media	Perun	5
	tall	haute	hoch	alta	Felina	7

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- A variety description is used to:
 - Plant Variety Protection;
 - Management of reference collection in the DUS trials;
 - Post control examination in certification seed process.
- When a Variety description is used, it is compare to another description.

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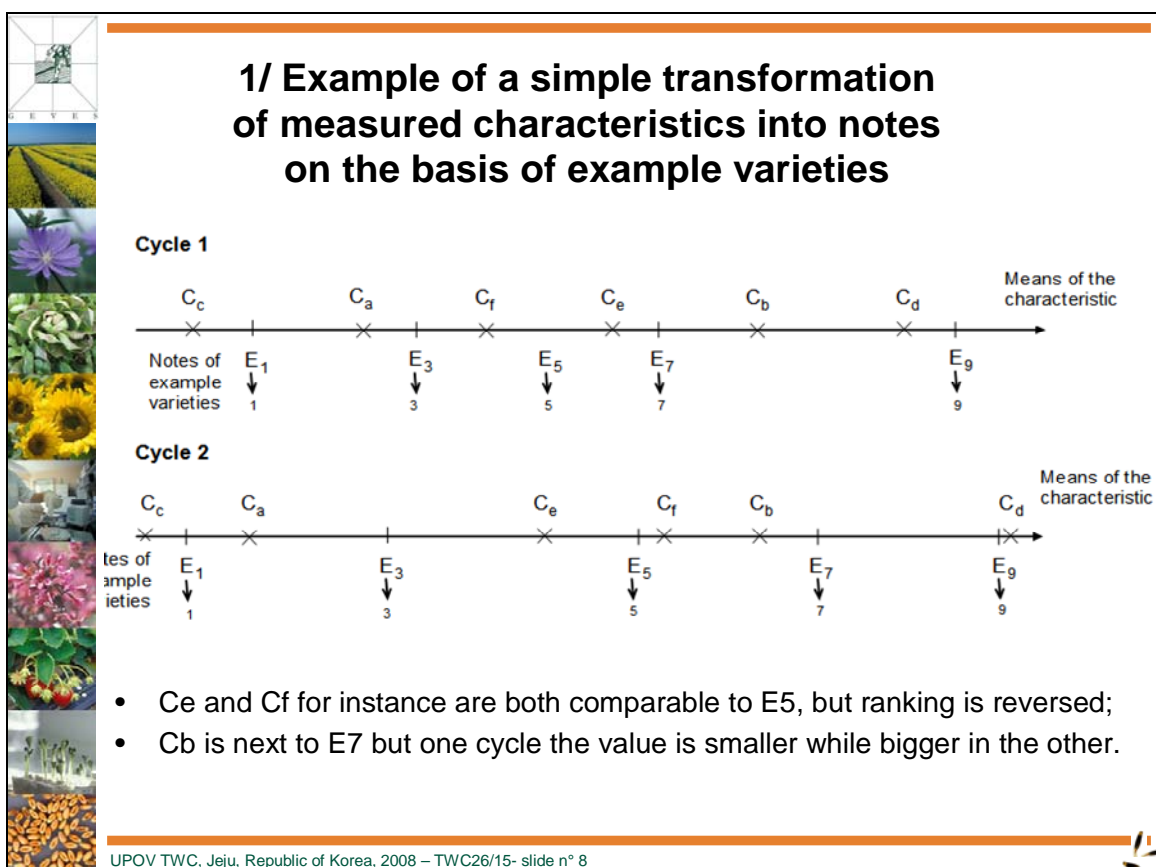
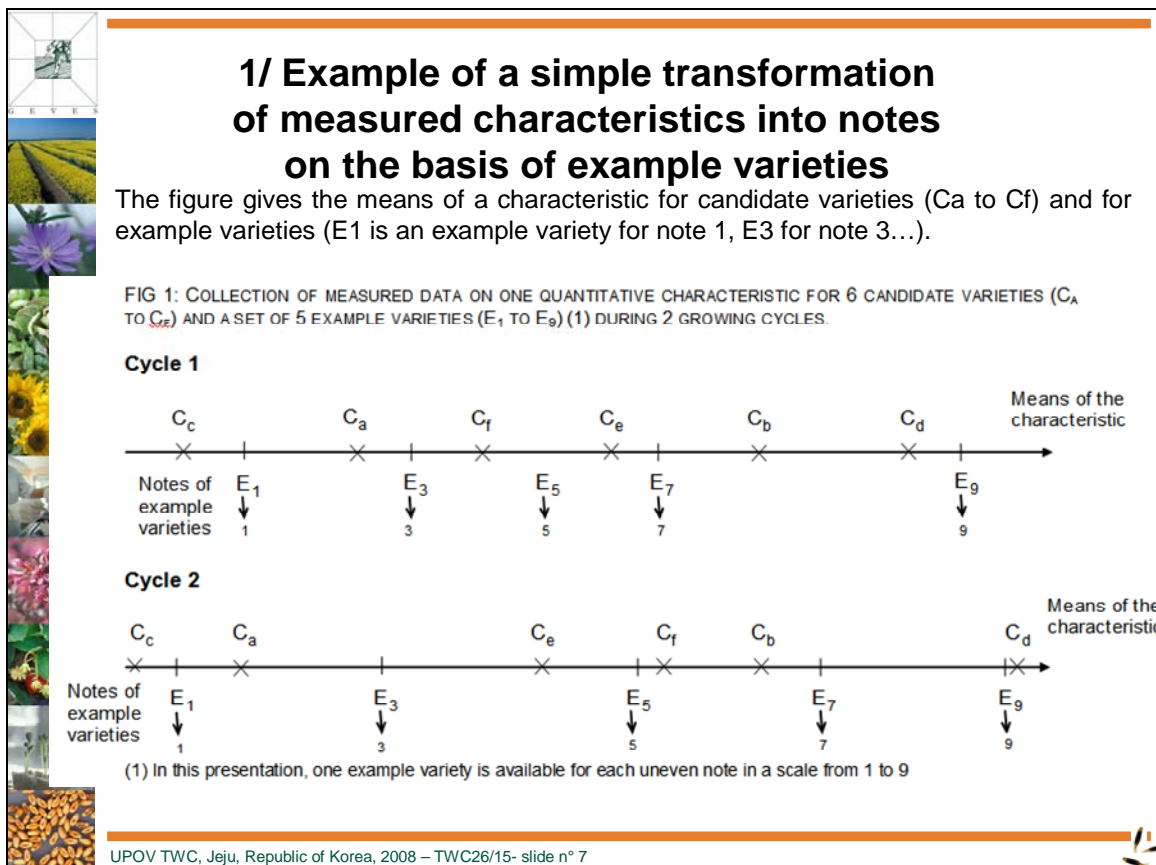
In consequence:

- A variety description must make possible comparison of varieties tested in different environments and years;
- That is to say, take into account the environmental effect and the interaction between variety and environment;
- And if possible give a “permanent” note.



I will present 3 different ways to transform measured characteristics (MS or MG) into notes:

- The first example is done without computation, but used example varieties;
- The 2nd one is used in DUS of Maize in France. It is done with simple statistics;
- The 3rd example is used for cross-pollinated varieties. It is done with a linear regression.





1/ Example of a simple transformation of measured characteristics into notes on the basis of example varieties

The final notes given to the candidate varieties take into account the position of the notes in each growing cycle in relation to the example varieties and notes.

TAB 1: FINAL NOTES GIVEN TO THE CANDIDATE VARIETIES

Candidate variety	Description note	Explanation
Ca	2	one time close to E3, one time close to E1
Cb	7	one time about 8, one time less than E7
Cc	1	each time smaller than E1
Cd	9	each time close to E9
Ce	5	one time between E5 and E7, one time between E3 and E5
Cf	5	two times around E5



2/ Use of simple statistics

Example of Characteristic 15: Time of silk emergence of Maize lines
Data from Le Magneraud, 2002.

Guide line TG/3/6 Maize, Maïs, Mais

Characteristics Caractères Merkmale	Stage ¹⁾ Stade ¹⁾ Stadium ¹⁾	English	français	deutsch	Example Exemples Beispiel.
15. Ear: time of silk emergence (50% of plants) Epi: époque d'apparition des soies (50% des plantes) Kolben: Zeitpunkt des Erscheinens der Narbenfäden (50% der Pflanzen)	65	very early	très précoce	sehr früh	
		very early to early	très précoce à précoce	sehr früh bis früh	
		early	précoce	früh	F7
		early to medium	précoce à moyenne	früh bis mittel	F259
		medium	moyenne	mittel	W117
		medium to late	moyenne à tardive	mittel bis spät	A632
		late	tardive	spät	M017
		late to very late	tardive à très tardive	spät bis sehr spät	B73
		very late	très tardive	sehr spät	



2/ Use of simple statistics

Example of Characteristic 15: Time of silk emergence of Maize lines
Data from Le Magneraud, 2002.

Tab : Mean (days) per note of example varieties

Note	UPOV Example varieties	Mean
2	KW1069	197
3	F7	203
4	F259	208,5
5	W117	212
6	MO17	221
7	A632	222,5
8	B73	226



2/ Use of simple statistics

Example of Characteristic 15: Time of silk emergence of Maize lines
Data from Le Magneraud, 2002.

Tab : Mean (days) per note of the reference collection (1311 lines).

Note	Mean	Number of variety
1	197,6	5
2	201,06	31
3	204,52	210
4	208,32	246
5	212,56	347
6	218,58	384
7	223,08	66
8	228,38	18

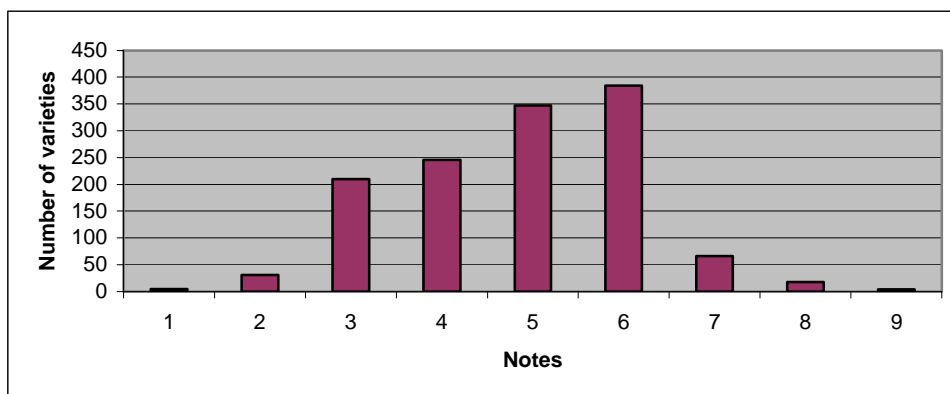




2/ Use of simple statistics

Example of Characteristic 15: Time of silk emergence of Maize lines
Data from Le Magneraud, 2002.

Fig: Number of varieties per note of the reference collection (1311 lines).



2/ Use of simple statistics

Example of Characteristic 15: Time of silk emergence of Maize lines Data
from Le Magneraud, 2002.

**Tab : comparison of the mean of the example varieties
and the mean of the reference collection varieties.**

Note	Mean of example varieties	Mean of reference collection varieties
1		197,6
2	197	201,06
3	203	204,52
4	208,5	208,32
5	212	212,56
6	221	218,58
7	222,5	223,08
8	226	228,38
9		231,25





2/ Use of simple statistics

Example of Characteristic 15: Time of silk emergence of Maize lines Data from Le Magneraud, 2002.

Tab : Calculation of the minimal and maximum value of the classes of each note.

Note	Mean	Mini	Maxi
1	197.60		199.32
2	201.06	199.33	202.78
3	204.52	202.79	206.41
4	208.32	206.42	210.43
5	212.56	210.44	215.56
6	218.58	215.57	220.82
7	223.08	220.83	225.72
8	228.38	225.73	229.81
9	231.25	229.82	

Minimum (note 2) = [Mean (note 1) + Mean (note 2)] / 2

Minimum (note 2) = [197.60 + 201.06] / 2

Minimum (note 2) = 199.33



2/ Use of simple statistics

Example of Characteristic 15: Time of silk emergence of Maize lines Data from Le Magneraud, 2002.


Tab : Calculation of the minimal and maximum value of the classes of each note.

Note	Mean	Mini	Maxi
1	197.60		199.32
2	201.06	199.33	202.78
3	204.52	202.79	206.41
4	208.32	206.42	210.43
5	212.56	210.44	215.56
6	218.58	215.57	220.82
7	223.08	220.83	225.72
8	228.38	225.73	229.81
9	231.25	229.82	

If for example, the mean of a candidate = 217

Then, the description note = 6






3/ Use of a linear regression for the description.
Example of “height at inflorescence emergence” for tall fescue

Guide line TG/39/8 MEADOW FESCUE, TALL FESCUE

TG/39/8
 Meadow Fescue, Tall Fescue/Fétuque des prés, Fétuque élevée/Wiesen-, Rohrschwinkel/Festuca pratense, Festuca alta
 2002-04-17
 -9-

Plot ¹⁾ Parcelle ¹⁾ Parzelle ¹⁾ Parcela ¹⁾	English	français	deutsch	español	Example Varieties Exemples Beispielsorten Variedades ejemplo	Note/ Nota
10. A MS	<u>Plant: natural height at inflorescence emergence</u>	<u>Plante: hauteur naturelle à l'épiaison</u>	<u>Pflanze: natürliche Höhe bei Erscheinen der Blütenstände</u>	<u>Planta: altura a la emergencia de la inflorescencia</u>		
	short	basse	niedrig	baja	Eldorado (F.a.), Bundy (F.p.)	3
	medium	moyenne	mittel	media	Adventure (F.a.), Cosmos 11 (F.p.)	5
	long	haute	hoch	alta	Ibis (F.a.), Preval (F.p.)	7

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3/ Use of a linear regression for the description.
Example of “height at inflorescence emergence” for tall fescue

- We use a linear regression from the adjusted means of 2 or 3 cycles provided by the COY D program;
- The graph next slide shows the regression from the adjusted means to the description note.

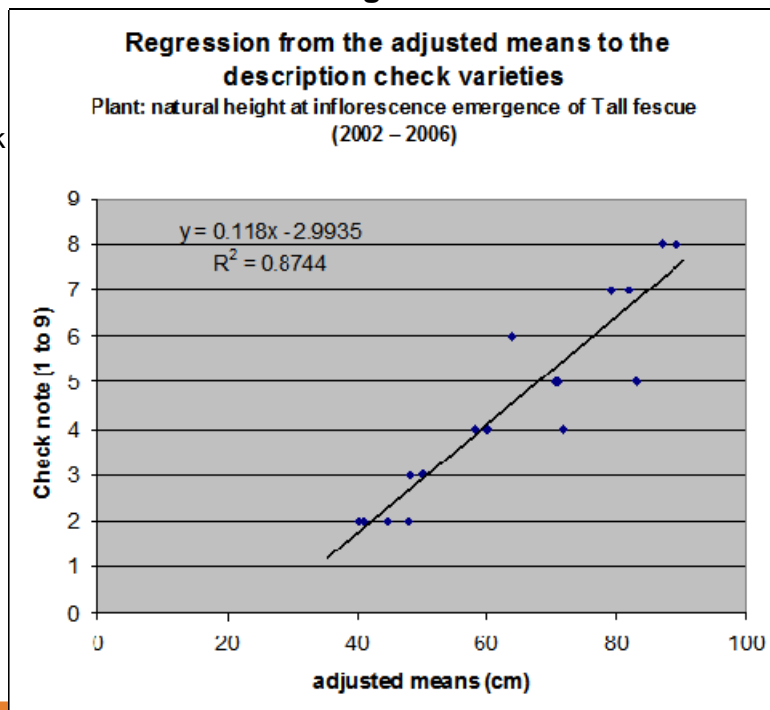
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3/ Use of a linear regression for the description. Example of “height at inflorescence emergence” for tall fescue

- Fig. 2: Linear Regression from the mean to the description check variety

- In this case 4 varieties had been described with the note 2,
- 2 varieties with note 3...

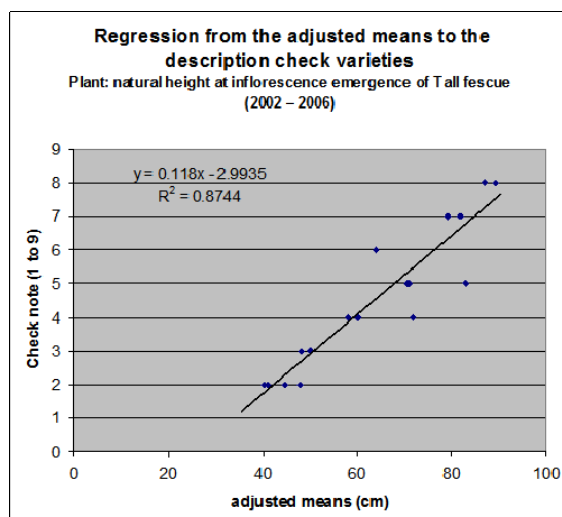


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3/ Use of a linear regression for the description. Example of “height at inflorescence emergence” for tall fescue

Fig. 2: Linear Regression from the mean to the description check variety



- Regression square (R^2) = 0.8744.
- The regression is valid if $R^2 > 0.6$.
- Predicted note = $0.118 \times \text{adjusted mean} - 2.9935$.

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3/ Use of a linear regression for the description. Example of “height at inflorescence emergence” for tall fescue

- From predicted note = 0.118 x adjusted mean - 2.9935, we can compute the description note.
- Tab 3: Adjusted mean and description note for the characteristic natural height at inflorescence emergence of tall fescue varieties.

Variety name	Adjusted mean (cm)	Check description note	Predicted note	Description note
C1	35.50	.	1.19423	1
BONAPARTE	44.71	2	2.28068	2
ELDORADO	47.90	2	2.65699	3
C2	48.15	.	2.68648	3

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Conclusion

- For the transformation of measured characteristics into notes, it is important to take into account description example varieties and a valid method.
- The example description varieties may be:
 - either the set defined in UPOV test guidelines;
 - or, if it is possible, a larger set of example varieties;
 - when necessary, an example variety can be replaced by a new one.

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Conclusion

- More sophisticated methods exist, such as in the DUST program.
- If UPOV recommended method doesn't exist, maybe it could be a way of harmonisation to have some?
- The choice of a method results from discussion between crop experts, statisticians and IT. It is a compromise between the needs, the variability, and user friendly use.

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Thank you for your attention

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