UPOV

International Union for the Protection of New Varieties of Plants

E

Technical Committee **TC/53/21**

Fifty-Third Session **Original:** English
Geneva, April 3 to 5, 2017 **Date:** March 1, 2017

NUMBER OF GROWING CYCLES

Document prepared by the Office of the Union

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EXECUTIVE SUMMARY

1. The purpose of this document is to report on the consideration of the number of growing cycles in DUS examination.

2. The TC is invited to:

(a) consider the presentations made by experts to the TWPs, at their sessions in 2016, simulating the impact of using different numbers of growing cycles on DUS decisions using actual data, as set out in the Annexes to this document; and

(b) note the offers by members of the Union to make presentations to the TWPs, at their sessions in 2017, on the impact of using different numbers of growing cycles on DUS decisions using actual data.

3. The structure of this document is as follows:

4. The following abbreviations are used in this document:

TC: Technical Committee
TC-EDC: Enlarged Editorial Committee
TWA: Technical Working Party for Agricultural Crops
TWC: Technical Working Party on Automation and Computer Programs
TWF: Technical Working Party for Fruit Crops
TWO: Technical Working Party for Ornamental Plants and Forest Trees
TWPs: Technical Working Parties
TWV: Technical Working Party for Vegetables

BACKGROUND

5. The TC, at its fifty-second session, held in Geneva from March 14 to 16, 2016, received the following presentations on variety descriptions and the role of plant material, including minimum number of growing cycles for DUS examination (in order of presentation):

Variety descriptions and the role of plant material, including minimum number of growing cycles for DUS examination	France (Mr. Richard Brand)
Development and use of variety descriptions	Germany (Ms. Beate Rücker)
Minimum number of growing cycles	Netherlands (Mr. Kees van Ettekoven)
Using variety descriptions and length of testing – A New Zealand perspective	New Zealand (Mr. Chris Barnaby)

6. The TC considered the discussion on the number of growing cycles in DUS examination and agreed to invite members of the Union to simulate the impact of using different numbers of growing cycles on DUS decisions using actual data and to report on their results at the TWP sessions in 2016 and at the fifty-third session of the TC (see document TC/52/29 Rev. “Revised Report”, paragraph 204).

PRESENTATIONS TO THE TWPS AT THEIR SESSIONS IN 2016

7. On April 12, 2016, by means of Circular E-16/095, the TC and TWP experts were invited to make presentations to the TWPs, at their sessions in 2016, to simulate the impact of using different numbers of growing cycles on DUS decisions using actual data and to report on their results at the TWP sessions in 2016 and at the fifty-third session of the TC.

Technical Working Party on Automation and Computer Programs

8. The TWC considered documents TWC/34/15, TWC/34/15 Add. and TWC/34/21 (see document TWC/34/32 “Report”, paragraphs 106 to 112).

9. The TWC received a presentation by the expert from Finland on “Number of growing cycles in DUS examination - simulation of impact on DUS decisions”, a copy of which is reproduced in document TWC/34/15 Add.[1] and by an expert from the Netherlands on “Minimum number of growing cycles”, a copy of which is reproduced in the Annex to document TWC/34/21[1] .

10. The TWC noted that for some members DNA tests were being considered for reducing the number of growing cycles while retaining decisions based on a growing trial.

11. The TWC noted the experience of an expert of Argentina that, in the case of vegetatively propagated and self-pollinated crops, a second growing cycle would not be necessary in cases where distinctness was confirmed with clear differences between varieties (e.g. disease resistance characteristics) in a first growing cycle.

[1] A copy of this presentation is presented as an annex to this document: see paragraph 32.

12. The TWC welcomed the offers by France, Germany and the Netherlands to simulate the impact of using different numbers of growing cycles on DUS decisions using actual data to be reported to the TWC at its thirty-fifth session.

13. The TWC noted that, for cross-pollinated varieties, for some UPOV members a third growing cycle was used to examine distinctness, such as in meadow fescue, red clover, timothy, turnip rape and white fescue in Finland.

Technical Working Party for Ornamental Plants and Forest Trees

14. The TWO considered documents TWO/49/15 and TWO/49/15 Add. (see document TWO/49/25 Rev. "Revised Report", paragraphs 53 to 56).

15. The TWO received a presentation by an expert from Germany, as reproduced in the Annex to document TWO/49/15 Add.[1]. The TWO noted the results of the simulation on the impact of using two growing cycles on DUS decisions using actual data for vegetatively propagated ornamental varieties and noted that decisions did not differ from those taken after one growing cycle.

16. The TWO noted the conclusion that a variety description was linked to the circumstances of the DUS examination, for example because the observed notes for some quantitative characteristics could fluctuate between growing cycles. The TWO agreed that for vegetatively propagated ornamental varieties DUS examination was usually based on side-by-side comparison between candidate and most similar varieties facilitating decisions on DUS after a single growing cycle.

Technical Working Party for Vegetables

17. The TWV considered documents TWV/50/15 and TWV/50/15 Add. (see document TWV/50/25 "Report", paragraphs 76 to 81).

18. The TWV received presentations on "Minimum number of growing cycles", by an expert from France and by an expert from the Netherlands, copies of which are provided in document TWV/50/15 Add. [1].

19. The TWV agreed that it was necessary to consider the minimum number of growing cycles on a case by case basis in order to design a DUS examination in the most efficient and effective way. It noted that the quality of information provided by the applicants in the Technical Questionnaire could affect the choice of minimum number of growing cycles and agreed that possibilities might be explored to provide guidance (e.g. on photographs) and incentives for applicants to provide accurate and reliable data, for example by offering the prospect of a reduced number of growing cycles. The potential of molecular data to improve the selection of similar varieties was also considered as a possible means of reducing the minimum number of growing cycles in some situations. It was also noted that a second growing cycle for a particular variety might not be required if a variety was very clearly distinct from all varieties of common knowledge after a single growing cycle, although a second cycle might be required for uniformity, stability and description purposes (see TGP/7/4, chapter 4.1.2).

20. The TWV agreed that a reduction of the number of the cycles in DUS examination might have an impact on the accuracy of the variety description and that increase of the use of reduced number of growing cycles could have an important increase on the examination cost per cycle.

21. The TWV noted that the United Kingdom planned to simulate the impact of using different numbers of growing cycles on DUS decisions using actual data and to report on their results at the fifty-third session of the TC. On January 25, 2017, the expert from the United Kingdom informed the Office of the Union that it would not be possible to report on the results of the simulation to the TC at its fifty-third session.

Technical Working Party for Agricultural Crops

22. The TWA considered documents TWA/45/15 and TWA/45/15 Add. (see document TWA/45/25 "Report", paragraphs 59 to 62).

23. The TWA noted that the TC, at its fifty-second session, had agreed to invite members of the Union to simulate the impact of using different numbers of growing cycles on DUS decisions using actual data and to

[1] A copy of this presentation is presented as an annex to this document: see paragraph 32.

report on their results at the TWP sessions in 2016 and at the fifty-third session of the TC. The TWA agreed that the simulation of impact of using different numbers of growing cycles on DUS decisions should take into consideration the quality of variety descriptions.

24. The TWA received a presentation by an expert from the Netherlands, as reproduced in the Annex to document TWA/45/15 Add.[1].

25. The TWA welcomed the offers from France, Germany, the Netherlands, Poland and the United Kingdom to simulate the impact of using different numbers of growing cycles on DUS decisions and the quality of variety descriptions using actual data and to report on their results at the TWA at its forty-sixth session.

Technical Working Party for Fruit Crops

26. The TWF considered document TWF/47/15 (see document TWF/47/15 "Report", paragraphs 74 to 80).

27. The TWF received a presentation on the "Number of growing cycles in DUS Examination for fruit species" by an expert from France. A copy of this presentation is provided in Annex I to document TWF/47/15 Add.[1]

28. The TWF received a presentation on "Variability of assessment data over years in apple" by an expert from Germany. A copy of this presentation is provided in Annex II to document TWF/47/15 Add.[1].

29. The TWF received a presentation on "Interpreting Variety Descriptions for Apple – Environmental influence on Quantitative Characters" by an expert from New Zealand. A copy of this presentation is provided in Annex III to document TWF/47/15 Add.[1].

30. The TWF agreed on the importance of the variety collections, in order to have reliable data when comparing varieties during DUS examination.

31. The TWF agreed that some characteristics are more efficient than others to examine distinctness.

SIMULATIONS ON THE IMPACT OF USING DIFFERENT NUMBERS OF GROWING CYCLES ON DUS DECISIONS USING ACTUAL DATA PRESENTED TO THE TWPS AT THEIR SESSIONS IN 2016

32. The following simulations on the impact of using different numbers of growing cycles on DUS decisions using actual data presented to the TWPs, at their sessions in 2016, are reproduced as Annexes to this document (in English only):

Presentation title:	Reference documents:
Number of growing cycles in DUS examination: simulation of impact on DUS decisions (Annex I to this document) Presentation by an expert from Finland	TWC/34/15 Add.
Minimum number of growing cycles (Annex II to this document) Presentation by an expert from the Netherlands	TWC/34/21; TWV/50/15 Add.; and TWA/45/15 Add.
The impact of using different numbers of growing cycles on DUS decisions of vegetatively propagated ornamental varieties (Annex III to this document) Presentation by an expert from Germany	TWO/49/15 Add.
Minimum number of growing cycles for DUS examination (Annex IV to this document) Presentation by an expert from France	TWV/50/15 Add.
Number of growing cycles in DUS examination for fruit species (Annex V to this document) Presentation by an expert from France	TWF/47/15 Add.
Variability of assessment data over years in apple (Annex VI to this document) Presentation by an expert from Germany	TWF/47/15 Add.
Interpreting variety descriptions for apple: Environmental influence on quantitative characteristics (Annex VII to this document) Presentation by an expert from New Zealand	TWF/47/15 Add.

[1] A copy of this presentation is presented as an annex to this document: see paragraph 32.

33. The TC is invited to:

(a) consider the presentations made by experts to the TWPs, at their sessions in 2016, simulating the impact of using different numbers of growing cycles on DUS decisions using actual data, as set out in the Annexes to this document; and

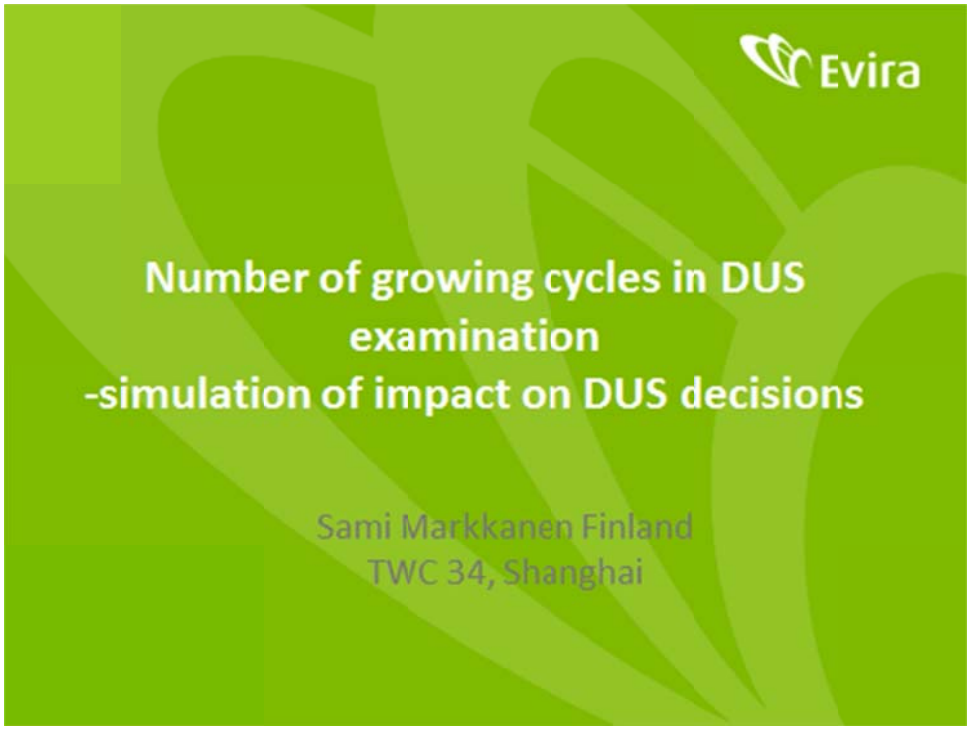
(b) note the offers by members of the Union to make presentations to the TWPs, at their sessions in 2017, on the impact of using different numbers of growing cycles on DUS decisions using actual data.

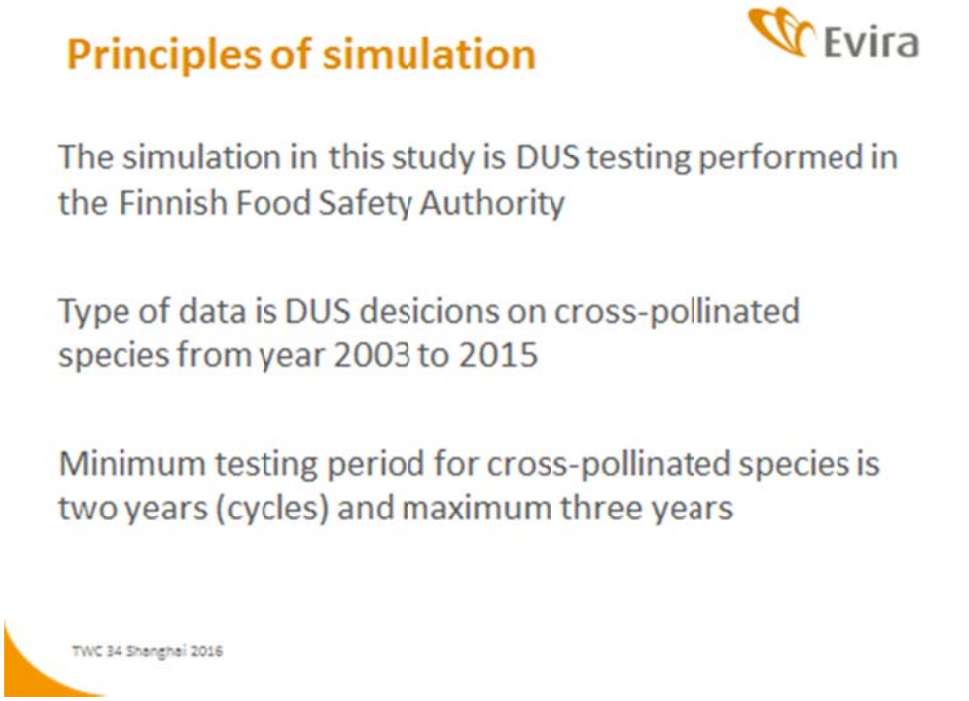
[Annexes follow]

ANNEX I

NUMBER OF GROWING CYCLES IN DUS EXAMINATION -SIMULATION OF IMPACT ON DUS DECISIONS (IN ENGLISH ONLY)

Presentation by an expert from Finland at the thirty-fourth session of the Technical Working Party on Automation and Computer Programs





Species reported and methods used in DUS testing

Evira

Species

- Timothy (*Phleum pratense, TG/34/6*)
- Meadow fescue (*Festuca pratensis, TG/39/8*)
- Red clover (*Trifolium pratense, TG/5/7*)
- White clover (*Trifolium repens, TG/38/7*)
- Turnip rape (*Brassica rapa* var. *silvestris, TG/185/3*)

Methods used in DUS Testing

- COYD/COYU method (DUSTNT program)
- Chi square method
- Data from plot observations (MG,VG)

Evira

Question

How many growing cycles are needed for DUS desicion?

- Two or three?

The focus is on distinctness, uniformity problems are rarely present in this data

Summary table

Evira

Amount of growing cycles needed for making the DUS decision

Species	Candidates D after 2 cycles	Candidates D after 3 cycles	total amount of varieties
Timothy	10 (34%)	19 (66%)	29
Meadow fescue	6 (35%)	11 (65%)	17
Red clover	13 (69%)	6 (31%)	19
White clover	3 (75%)	1 (25%)	4
Turnip rape	13 (72%)	5 (28%)	18

Note: there were not distinct varieties after 3 years in all species, but these were not included in the table, because 3 years is the maximum time allowed for DUS test

Conclusions

Evira

For timothy and meadow fescue three growing cycles are usually needed for making the distinctness decision.

Red clover, white clover and turnip rape are more commonly distinct after two growing cycles.

This could indicate that varieties of red and white clovers and turnip rape are more genetically isolated which shows in the phenotype, reflected by characteristics present in the TG.

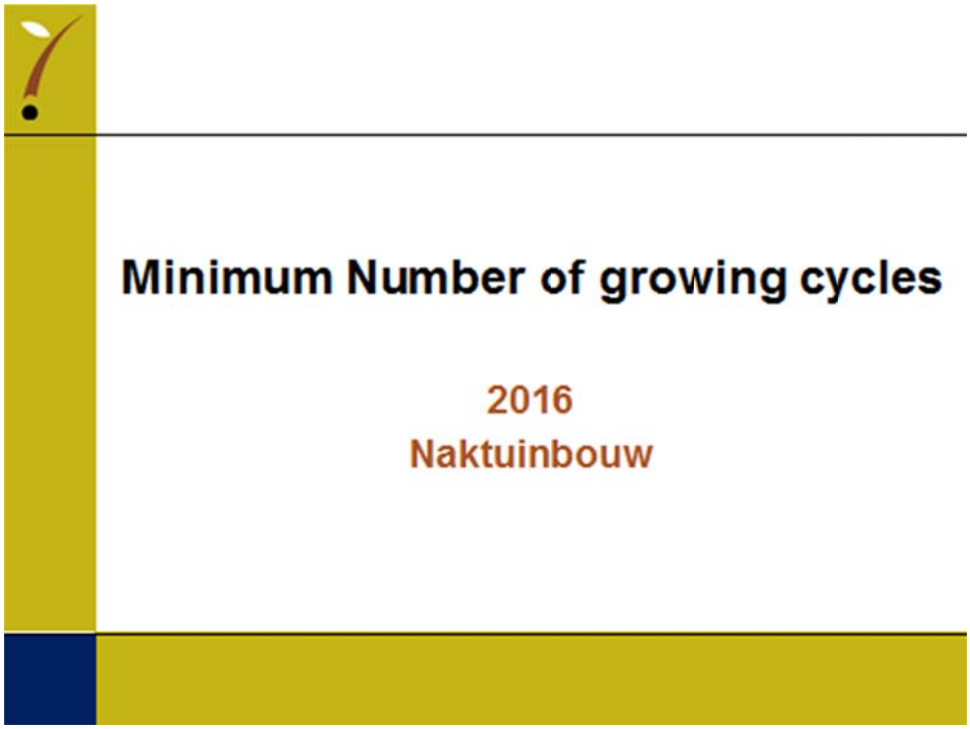
Still, within the species, the amount of growing cycles needed for DUS desicion is mostly connected with the characteristics of the candidate variety compared to the reference varieties.

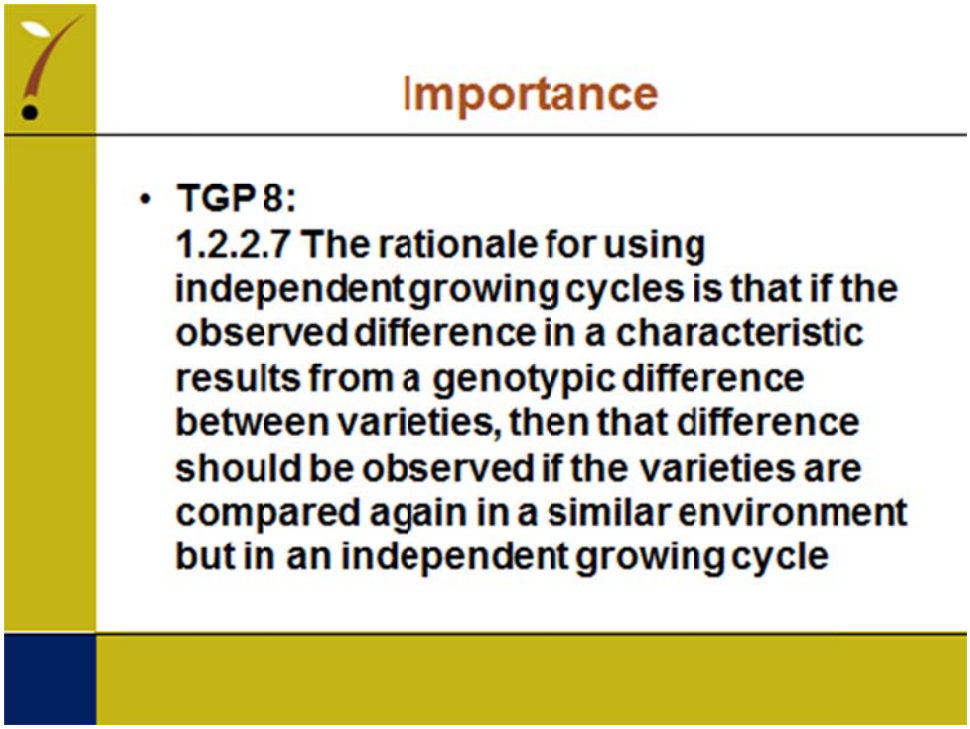
[Annex II follows]

ANNEX II

MINIMUM NUMBER OF GROWING CYCLES (IN ENGLISH ONLY)

Presentation by an expert from the Netherlands at the thirty-fourth session of the Technical Working Party on Automation and Computer Programs, at the fiftieth session of the Technical Working Party for Vegetables and at the forty-fifth session of the Technical Working Party for Agricultural Crops





Importance

- In TGP 8 solely linked to Distinctness
- Also important for high quality stable descriptions!

Number of growing cycles

- Mentioned in TG's based on factors:
  - the number of varieties to be compared in the growing trial,
  - the influence of the environment on the expression of the characteristics, and
  - the degree of variation within varieties,
  - the features of propagation of the variety e.g. whether it is a vegetatively propagated, self-pollinated, cross-pollinated or a hybrid variety.

Independent growing cycles

- When a characteristic is observed in a growing trial in two independent growing cycles, it is generally observed in two separate plantings or sowings.

  However, in some perennial crops, such as fruit trees, the growing cycles take the form of one trial observed in two successive years.

Independent growing cycles

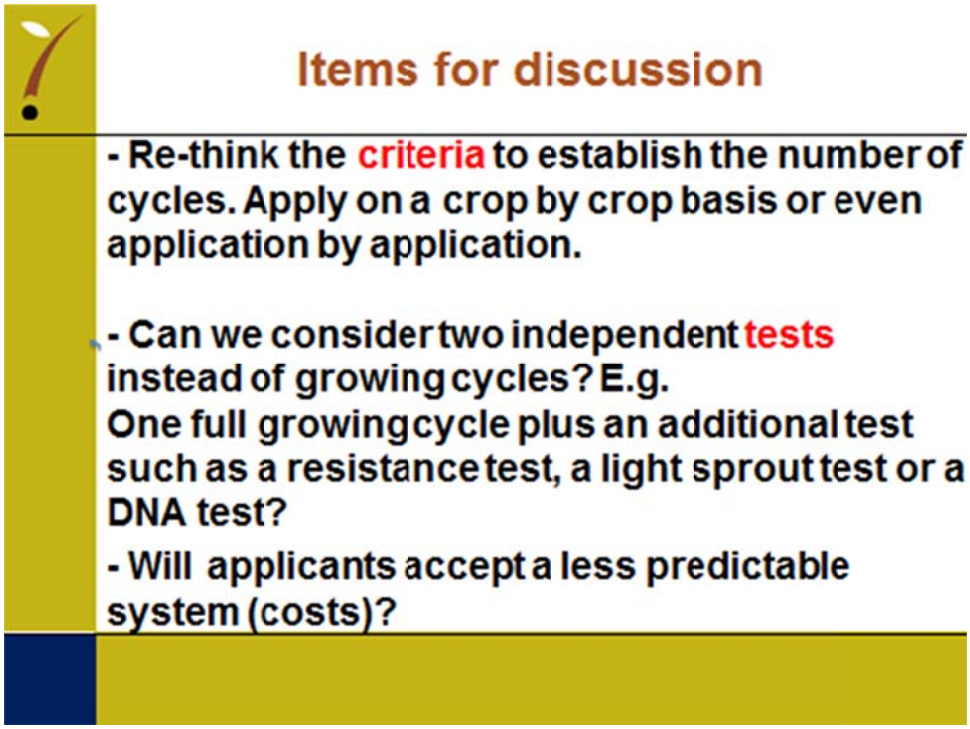
- Two cycles in same place
  - Usually two years to have comparable environment. Two plantings in one place in one year is possible with sufficient time between plantings.
- Two cycles in different places in one year
  - Possible with sufficient distance between places, but risk to introduce new variation

Practice

- Roughly the present UPOV practice:
- Seed propagated agricultural and vegetable crops: two independent growing cycles
- Fruit crops: two independent growing cycles
- Vegetatively propagated ornamentals: one growing cycle

Full growing cycles?

- Bolting characteristics in separate trial once, also for crops with two cycles
- Disease resistant tests in separate trial once, also for crops with two cycles
- Some additional tests as Light Sprout tests in potato separate from normal growing trial
- Can DNA test replace one year of growing trial?



[Annex III follows]

ANNEX III

THE IMPACT OF USING DIFFERENT NUMBERS OF GROWING CYCLES ON DUS DECISIONS OF VEGETATIVELY PROPAGATED ORNAMENTAL VARIETIES (IN ENGLISH ONLY)

Presentation by an expert from Germany at the forty-ninth session of the Technical Working Party for Ornamental Plants and Forest Trees

Bundessortenamt

TWO/49/15

NUMBER OF GROWING CYCLES IN DUS EXAMINATION

The Impact Of Using Different Numbers Of Growing Cycles On DUS Decisions

Of Vegetatively Propagated Ornamental Varieties

Presentation by Andrea Menne, Germany

In most of the TGs for ornamental varieties **one year of testing** is recommended.

For the DUS test one year of testing is in most cases sufficient for vegetatively propagated ornamental varieties, because

- The differences between the varieties are big compared to environmental effects and the variation within varieties.
- The decision on distinctness is based on a side-by-side visual comparison in the growing trial.
- The detection of off-types is normally not influenced by the environment.

But: The growing cycle may have an impact on the variety description due to differences in the expression of characteristics between growing cycles.

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Example: Pelargonium variety, description of 2013 and 2014

	One note difference compared to 2013		2 notes difference compared to 2013

	Characteristic	State of Expression	**2013**		**2014**
1	Plant: growth type	upright	1		1
2	Plant: height of foliage	medium to tall	6	tall to very tall	8
4	Plant: width	medium to broad	6		6
5	Stem: color	green	2		2
6	Stem: anthocyanin coloration	medium to strong	4	medium	3
7	Leaf blade: length	long	7	medium to long	6
8	Leaf blade: width	medium to broad	6		6
9	Leaf blade: depth of sinus	shallow to medium	4	medium	5
10	Leaf blade: undulation of margin	medium	5	weak to medium	4
11	Leaf blade: base	slightly open	3	slightly open to closed	4
12	Leaf blade: variegation	absent	1		1
13	Leaf blade: main color	dark green	6		6
16	Leaf blade: conspicuous. of zone	medium to strong	6		6
17	Leaf blade: position of zone	in middle	2		2
18	Leaf blade: relative size of zone	small	1		1
19	Peduncle: length	medium to long	6		6

4

	Characteristic	State of Expression	**2013**		**2014**
20	Peduncle: anthocyanin coloration	strong to very strong	8		8
21	Inflorescence: height	tall to very tall	8	medium to tall	6
22	Inflorescence: width	broad	7	medium	5
23	Inflorescence: no of open flowers	medium to many	6		6
24	Inflorescence: length of largest fl.	short to medium	4	medium	5
25	Inflorescence: width of largest flower	medium to broad	6		6
26	Inflorescence: length of pedicel	long	7	medium to long	6
27	Pedicel: anthocyanin coloration	strong	7	strong to very strong	8
28	Pedicel: swelling	absent	1		1
29	Flower: type	double	2		2
31	Flower: number of petals	medium	5		5
32	Flower: cross section in lateral view	flat	2		2
33	Flower: presence of stripes	absent	1		1
36	Sepal: reflexing	absent or weak	1		1
37	Sepal: anthocyanin coloration	medium	5	medium to strong	6
38	Upper petal: width	medium	5	medium to broad	6
39	Upper petal: shape	spatulate	4		4
40	Upper petal: margin at apex	entire	1		1
41	Upper petal: color of margin	red	50A	red	46C
42	Upper petal: color of middle	red	50A	red	46C

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	Characteristic	State of Expression	**2013**		**2014**
43	Upper petal: color of lower side	red	43B	red	43A
44	Upper petal: conspicuou. of marking	absent or very weak	1		1
45	Upper petal: type of marking	stripes only	1		1
48	Upper petal: zone at base	absent	1		1
51	Lower petal: color of margin	red	46C	red	50A
52	Lower petal: color of middle	red	50A	red	50A
53	Lower petal: color of lower side	red	46C	red	43B
54	Lower petal: conspicuou. of marking	absent or very weak	1		1
57	Lower petal: zone at base	absent	1		1
60	Inner petal: colour of upper side	red	46C	red	46C

- Out of 46 characteristics only 3 deviate from one year to the next by two notes.
- 10 characteristics deviate by one note.

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Consequences

- When taking a decision on distinctness the expert needs to be aware which characteristics are sensitive to the environment.

  Environmental effects have to be considered for:

  (a) The comparison of similar varieties in the same growing trial (side-by-side comparison).

  (b) The exclusion of clearly distinct varieties from the growing trial (comparison with descriptions in the variety collection).

  (c) The test for stability/identity (comparison side-by-side with previous sample or with description).

<u>It is very important to emphasize that the variety description is linked to the year of testing.</u>

Question: Are all varieties in the same trial reacting in the same way on the environmental conditions?

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Example: Two varieties of Impatiens New Guinea Group

	One note difference compared to 2010		2 notes difference compared to 2010

			Variety One			Variety Two		
		Characteristic	2010	2012	2013	2010	2012	2013
1	QN	Plant: height of foliage	5	5	5	6	7	5
2	QN	Plant: width	**3**	5	5	**6**	6	6
3	QN	Shoot: anthocyanin coloration	6	6	6	8	8	8
4	QN	Petiole: length	3	5	4	4	5	4
5	QN	Petiole: anthocyanin coloration	3	3	3	6	6	6
6	QN	Leaf blade: length	5	5	5	6	5	6
7	QN	Leaf blade: width	4	5	5	4	5	5
8	QN	Leaf blade: length/width ratio	6	5	6	6	6	7
11	QN	Leaf blade: anthocyanin coloration	3	2	2	2	2	2
15	QN	Pedicel: length	4	4	4	6	6	6
16	QN	Pedicel: anthocyanin coloration	5	5	5	8	8	8
18	QN	Flower: width	6	6	6	7	7	6
26	QN	Upper petal: width	6	7	7	7	7	7
27	QN	Lateral petal: width	5	5	5	5	4	4
28	QN	Lower petal: length	5	6	6	6	6	6
24	QN	Flower: size of eye zone	4	4	4	4	4	4

8

			Variety One			Variety Two		
		Characteristic	2010	2012	2013	2010	2012	2013
12	QL	Leaf blade: color of lower side between veins	1	1	1	1	1	1
14	QL	Leaf blade: color of veins on lower side	2	2	2	2	2	2
17	QL	Flower: type	1	1	1	1	1	1
19	QL	Flower: number of colors	1	1	1	1	1	1
23	QL	Flower: eye zone	9	9	9	9	9	9
20	PQ	Flower: main color of upper side	N30A	N30A	N30A	N30A	N30A	N30A
25	PQ	Flower: main color of eye zone	46B	46B	45A	46B	46B	45A

9

General Observations

- In particular, the state of expression of quantitative characteristics can be more variable over the years.
- Some quantitative characteristics react more sensitive to the environment than others.
- Not all varieties react in the same way to changes of the environment.
- If a variety is observed in one growing period only, the possible variation in the state of expression is unknown.

Besides the growing conditions during the testing period also other factors can influence the expression of the plant characteristics, e.g. the conditions under which the mother plants were kept, or the position on the mother plant where the cutting was taken.

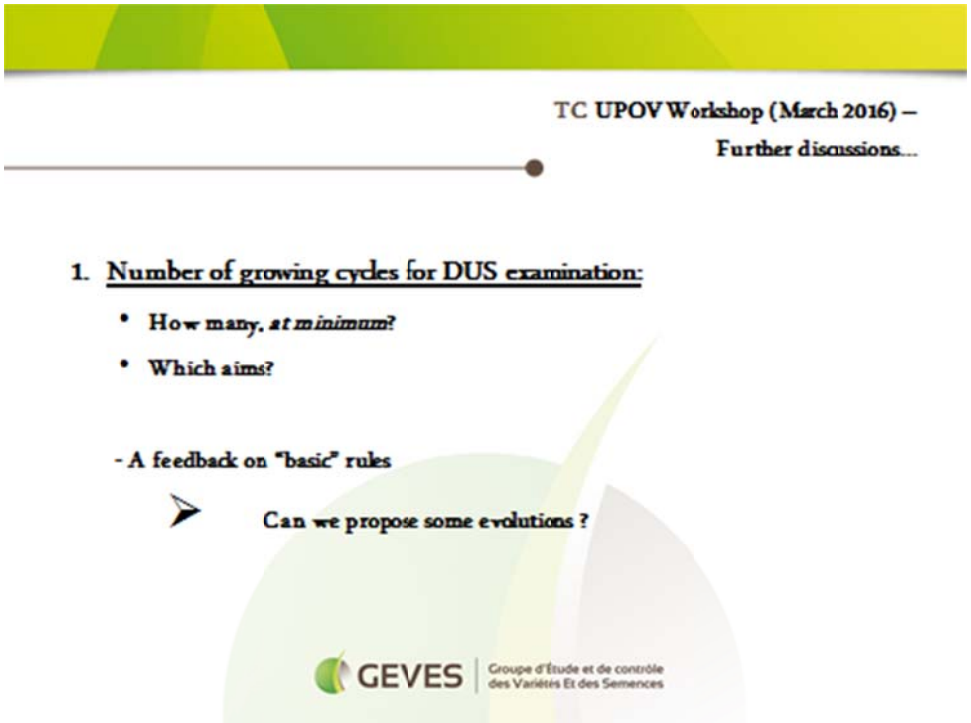
[End of document]

[Annex IV follows]

ANNEX IV

MINIMUM NUMBER OF GROWING CYCLES FOR DUS EXAMINATION (IN ENGLISH ONLY)

Presentation by an expert from France at the fiftieth session of the Technical Working Party for Vegetables



1- Number of growing cycles for DUS exam

So, today, to validate « sufficiently consitent differences »:

➢ « Only» the following options(depending on the crops)

-field crops 2 DUS cycles

-vegetables 2 DUS cycles

-fruits 2 DUS cycles + opening to 1 DUS cycle (cost)

-ornamentals 1 DUS cycle + species with 2 DUS cycles

➢ Where is the logic of these guidances?

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1- Number of growing cycles for DUS exam

TGP/8/2: PART I: 1. DUS TRIAL DESIGN

1.2 Growing cycles

UPOV Framework

1.2.1.2 The UPOV Test Guidelines, where available, specify the recommended number of growing cycles. When making the recommendation, the experts drafting the UPOV Test Guidelines take into account factors such as the number of varieties to be compared in the growing trial, the influence of the environment on the expression of the characteristics, and the degree of variation within varieties, taking into account the features of propagation of the variety e.g. whether it is a vegetatively propagated, self-pollinated, cross-pollinated or a hybrid variety.

Yes, BUT ... NO absolute rules

- Better controled conditions under glasshouse ? Not really
- Sexual/Vegetatively reproduced ? A lot of exceptions
- Autogamy/Allogamy ? Too many significative exceptions

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1- Number of growing cycles for DUS exam

Consistency of the DISTINCTION... "at least 2 independent GROWING cycles"

TGP/8/2: PART I: 1. DUS TRIAL DESIGN

1.2 Growing cycles[1]

UPOV Framework

1.2.1 Introduction

1.2.1.1 A key consideration with regard to growing trials is to determine the appropriate number of growing cycles. In that respect, document TGP/7, Annex I: TG Template, section 4.1.2, states:

"4.1.2 Consistent Differences

"The differences observed between varieties may be [redacted] In addition, in some circumstances, the [redacted] is not such that more than a sirgle growing cycle is required to provide assurance that the differences observed between varieties are sufficiently consistent. [redacted] in a characteristic, observed in a growing trial, i[redacted] is to examine the characteristic in at leas[redacted]"

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1- Number of growing cycles for DUS exam

Consistency of the DISTINCTION... "at least 2 independent GROWING cycles"

1.2.2 Independent growing cycles

1.2.2.1 As indicated in section 1.2.1.1, one means of ensuring that a difference in a characteristic, observed in a growing trial, is sufficiently consistent is to examine the characteristic in at least two independent growing cycles.

1.2.2.2 In general, the assessment of independence is based on the experience of experts.

1.2.2.3 When a characteristic is observed in a growing trial in two independent growing cycles, it is generally observed in two separate plantings or sowings. However, in some perennial crops, such as fruit trees, the growing cycles take the form of one trial observed in two successive years.

1.2.2.4 When field or greenhouse crop trials are planted/sown in successive years, these are considered to be independent growing cycles.

1.2.2.5 Where the two growing trials are in the same location and the same year, a suitable time period between plantings may provide two independent growing cycles. In the case of trials grown in greenhouses or other highly controlled environments, provided the time between two sowings is not "too short", two growing cycles are considered to be independent growing cycles.

1.2.2.6 Where two growing cycles are conducted in the same year and at the same time, a suitable distance or a suitable difference in growing conditions between two locations may satisfy the requirement for independence.

1.2.2.7 The rationale for using independent growing cycles is that if the observed difference in a characteristic results from a genotypic difference between varieties, then that difference should be observed if the varieties are compared again in a similar environment but in an independent growing cycle.

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1- Number of growing cycles for DUS exam

Consistency of the DISTINCTION... "at least 2 independent GROWING cycles"

- Severals available arrangements (TGP/8/2, 1.2.2)
- Independance based on the **experts' experience**

→Why?

Robustness on distinction, and regularly on QUALITATIVE characteritics

→ Which cycle?

Different seasons, years, places, conditions (openfield/ greenhouse)

→ How?

Different sowings, or only one planting during several years

but same materiel (trees)

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1- Number of growing cycles for DUS examination

Check Uniformity

For somes species or varieties, we assess uniformity based on the off-type approach

... it exits UPOV tables which take care already of the risks

(especially the risk to exam on unique sample and eventually one cycle)

→One cycle may be enough

And, for species or varieties not suitable for the off-type approach, and for candidate varieties where there are doubts (interection with environnement), **it is necessary to continue the U examination**

→Additional cycle(s) needed

with eventually descendance to be considered.

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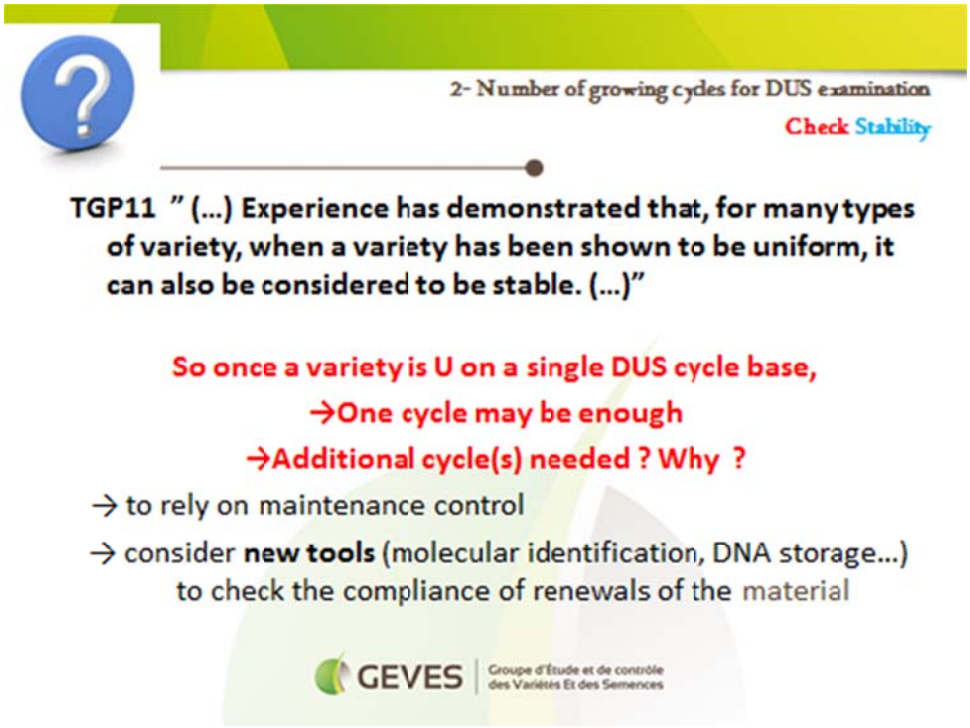

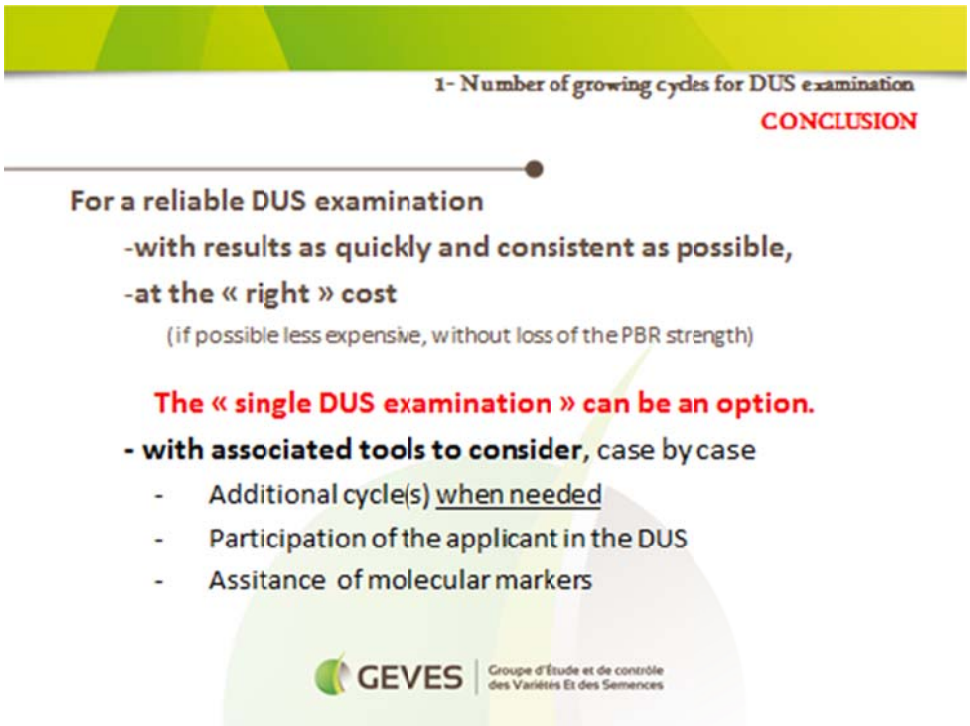

[Annex V follows]

TC/53/21

ANNEX V

NUMBER OF GROWING CYCLES IN DUS EXAMINATION FOR FRUIT SPECIES (IN ENGLISH ONLY)

Presentation by an expert from France at the forty-seventh session of the Technical Working Party for Fruit Crops

GEVES
Expertise & Performance

Can we evolve on minimum number of DUS growing cycles ?

GEVES | Groupe d'Étude et de contrôle des Variétés Et des Semences

Number of growing cycles in DUS examination

Today, to validate « sufficiently consistent differences »:

-field crops 2 DUS cycles
-vegetables 2 DUS cycles
-fruits 2 DUS cycles + opening to 1 DUS cycle
-ornamentals 1 DUS cycle + species with 2 DUS cycles

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Number of growing cycles in DUS examination

CPVO R&D Project « reducing the number of obligatory observation periods in DUS testing for candidate varieties in the fruit sector », 2013, (Brand, Palau, Gandelin for GEVES France)

Influence of the reduction of the number of observation periods on **Distinctness**, **Uniformity** and **description**

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Number of growing cycles in DUS examination

For France, investigation on candidate varieties that have their DUS test ended between 2007 and 2011: **154 peach** varieties, **40 apple** varieties, either seedling or mutants.

- the second year of observation revealed a possible **problem of distinctness**
- the second year of observation revealed a possible **problem of uniformity**
- **some characteritics are affected** by the second year of observation

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Number of growing cycles in DUS examination

Results

Peach:

148 hybrids studied: all of them could have been declared D and H after 1 year of observation.

But none could have been fully described after only one year.

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Number of growing cycles in DUS examination

Results

Apple:

19 mutants studied: 7 revealed problems of distinctness during the first year, 2 during the second year.
No problem of Uniformity revealed during the second year.
None could have been fully described after only one year.

19 hybrids studied: all of them could have been declared D and H after 1 year of observation.
2 of them got a full description after 1 year of observation.

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Number of growing cycles in DUS examination

Results

Between 2007 and 2011, the examiners knew that they had 2 years to describe the variety: in some cases, the description should probably have been done in 1 year.

→ **in some cases, it is possible to reduce the number of observation cycles**

We don't forget that some characters can evoluate beween third and four leaves, especially for Peach.

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Number of growing cycles in DUS examination

in 2015, first year that France proceeded with **1 significant fruit production observation**, if:

- this is a **hybrid** variety
- the observations of the first fruits and the first significant production are **consistant**
- the variety is **clearly Distinct**
- the examiner manages to produce a **full description**

→ **4 hybrids for Apple**
1 hybrid for Pear

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Number of growing cycles in DUS examination

Highly valuable for the **applicant** (quicker valorization of innovation, reducing costs) and for the **examiner** (reducing time of work on very simple cases).

If here is any doubt, proceed to a second year of observation !

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[Annex VI follows]

ANNEX VI

VARIABILITY OF ASSESSMENT DATA OVER YEARS IN APPLE (IN ENGLISH ONLY)

Presentation by an expert from Germany at the forty-seventh session of the Technical Working Party for Fruit Crops

Bundessortenamt

Variability of assessment data over years in apple

Erik Schulte, Bundessortenamt
UPOV-TWF 2016

Bundessortenamt

DUS examination in apple

- Records since 1992
- Large living collection (2016: 550 varieties)
- Datas stored in database (2016: 600 varieties)

- Long term data comparison revealed variation over years:

  What are the reasons? How to deal with?

Bundessortenamt

Factors with influence on DUS characteristics:

- **Alternate bearing** (effect on e.g.: type of bearing, shoot thickness, leaf [green] coloration)
- **Age of tree** (e.g. type of bearing, tree habit, internode length, fruit size)
- **Climatic conditions** (e.g. ballon stage color, anthocyanin coloration, fruit over color, fruit russetting, stalk length, all phenological data)
- **Shoot thickness** (e.g. shoot pubescence [shoot thickness itself depends on fruit set])
- **Pollination** (e.g. fruit ratio length/width)
- **Flower set** (e.g. flower diameter)
- **Fruit set** (e.g. tree vigor and habit, shoot thickness, leaf [green] coloration, fruit ground and over color, fruit size, fruit ribbing)
- **Fruit maturity** (e.g. fruit skin and flesh color, fruit firmness, greasiness of skin)

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Bundessortenamt

Can this be proved?

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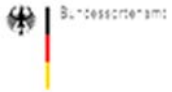
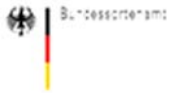


(to focus on:)

- **Age of the trees**
- **Alternate bearing effect**



(to focus on:)

- **Age of the trees**

Bundessortenamt

Influence of age of tree on fruit size

(variety 'Elstar', plantation in 1993 and 2003)

year	fruit set (note)	fruit size (note)
1995	2	7
1996	5	6
1997	5	5
1998	5	5
1999	3	4
2000	4	4
2001	4	3
2002	4	5
2005	3	6
2006	5	5
2007	4	4
2008	7	5

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(to focus on:)

- Age of the trees
- **Alternate bearing effect**

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Influence of year and alternate bearing on flower diameter

(variety 'Ingrid Marie')

testing year	flower set (note)	flower diameter [mm]	mean value (all varieties) [mm]
1996	7	44	47
1997	4	56	49
2000	2	64	59

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Thickness of shoot

with yield without yield

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Variation of characteristic assessments

(exam. years 2011+2012, 56 varieties)

TG/14/9																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
+ 5 notes																														
+ 4 notes																												1		
+ 3 notes							1	1				1									1			1				2		
+ 2 notes	1		1	1	5	5	2	4	5		3	5		2	7	3	1	3	1	5				9	3	3	2	1	2	
+ 1 note	13		17	12	17	17	9	9	13	5	23	15	10	8	8	19	14	10	10	21	6	6	22	8	11	6	9	2	6	5
0 notes	18	56	33	37	16	28	30	22	20	41	19	33	28	28	37	32	29	16	42	16	34	44	21	24	23	29	32	34	41	40
- 1 note	18		5	5	12	4	11	10	14	10	9	13	15	20	4	2	11	19	4	11	17	7		13	15	19	10	4	8	11
- 2 notes	6			1	6	2	1	7	5		2		3	3			1	6		2				7	3	1	3	1	1	
- 3 notes							2	1						1				2							1			1		
- 4 notes								2																1				6		
- 5 notes																												3		

green = no, or very low, variation between 1st and 2nd exam. year
yellow = variation in > 50% of varieties

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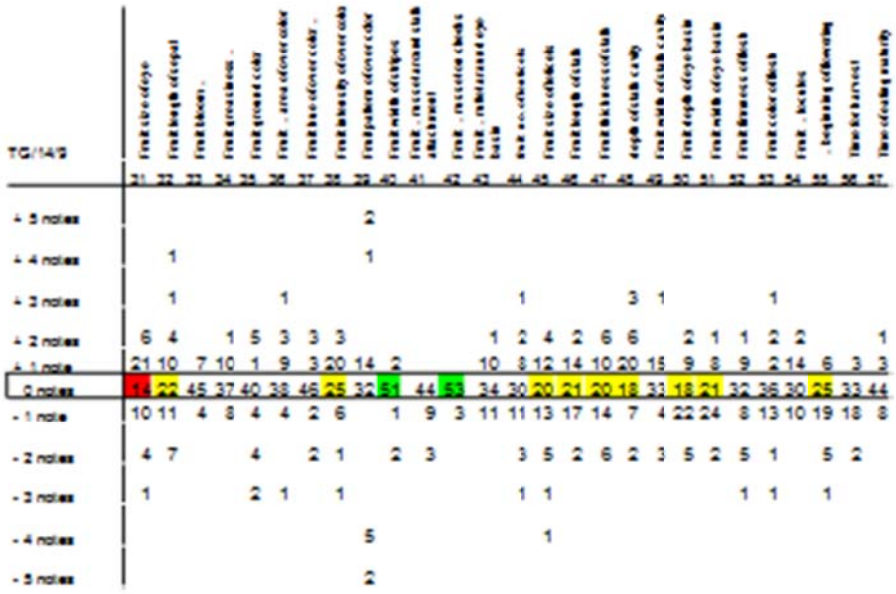
(part 2)



green = no, or very low, variation between 1st and 2nd exam. year
yellow = variation in > 50% of varieties
red = variation in > 75% of varieties

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Conclusions:

- apply Equal treatment (pruning, fertilization etc.)
- try to reduce Alternate bearing effect (by thinning, pruning etc.),
- minimize Environmental effect + Age effect on final description by testing >1 year

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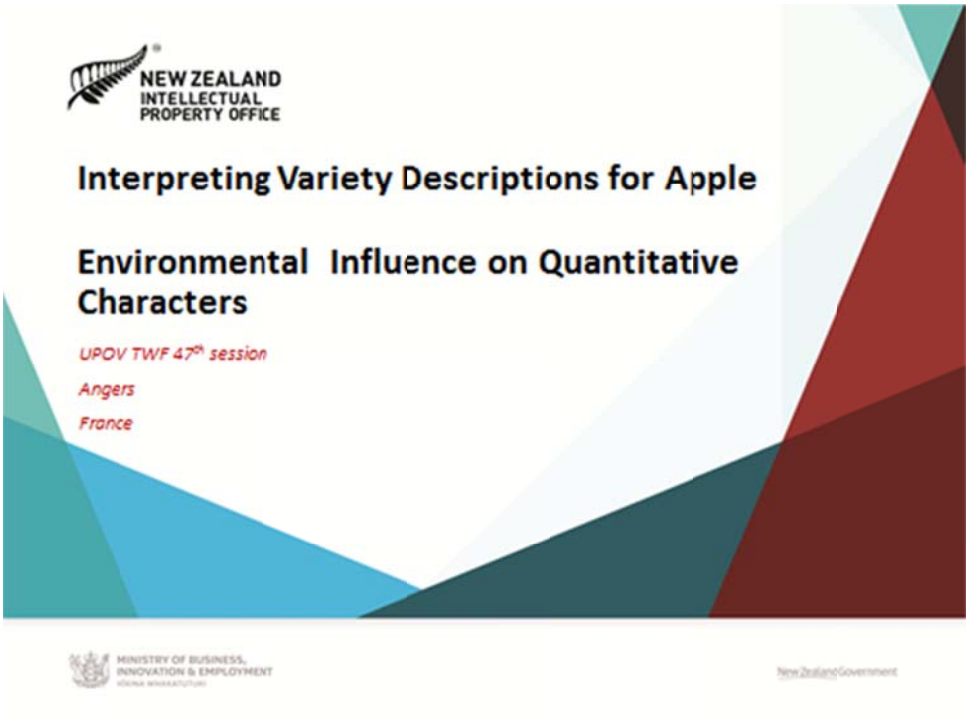
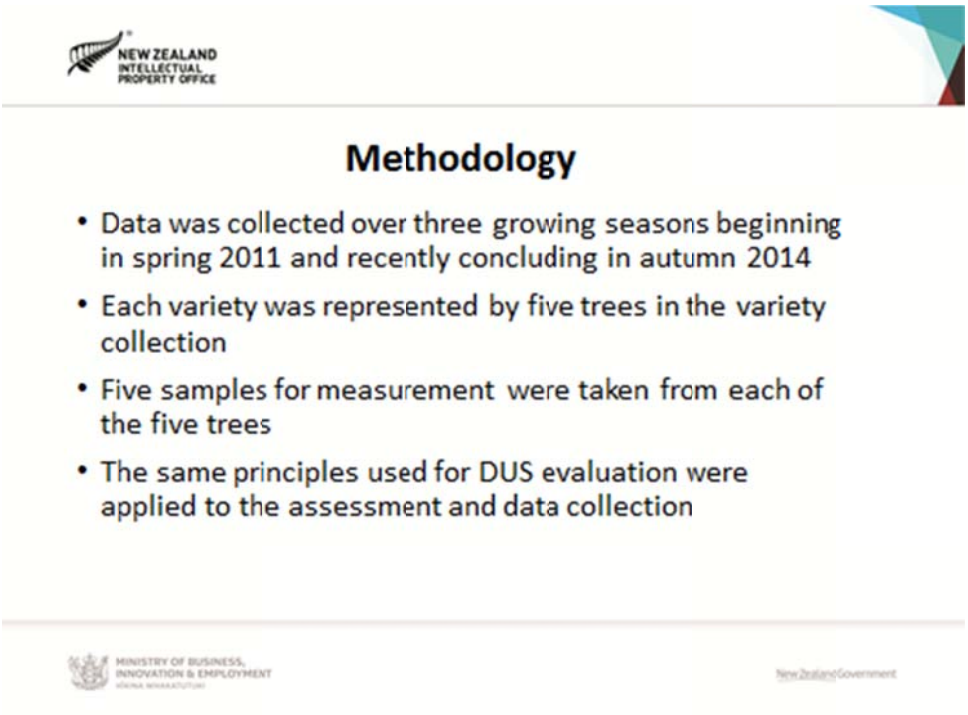
[Annex VII follows]

ANNEX VII

INTERPRETING VARIETY DESCRIPTIONS FOR APPLE: ENVIRONMENTAL INFLUENCE ON QUANTITATIVE CHARACTERISTICS (IN ENGLISH ONLY)

Presentation by an expert from New Zealand at the forty-seventh session of the Technical Working Party for Fruit Crops





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Over years variability measured by standard deviation

Characteristic	Leaf length			Leaf width			Petiole length		
Year	2011/12	2012/13	2013/14	2011/12	2012/13	2013/14	2011/12	2012/13	2013/14
Astec	6.6	8.5	8.9	5.4	6.5	5.7	2.5	4.6	3.3
Burkitt Gala	11.9	8.3	10.3	6.4	6	4.1	5.7	3.6	3.8
Cripps Pink	8.2	6	8.9	5.2	5.9	7	2.9	1.6	2.7
Delblush	10.7	7.7	10.1	8.5	6.3	6.4	5.9	4.1	3.9
Granny Smith	9.8	6.7	7	7	4.3	6.2	3.1	8.1	2.5
Honeycrisp	8.5	5.6	7.1	5.3	5.9	5.2	3.8	3.4	3.4
Marin Red	8.2	8.9	8.4	5.6	5.9	3.3	3.3	4.6	3.9
Pinova		10.7	8.7	7.2	6.8	5.4	4.5	3.8	4.1
Royal Gala	9.8	8.7	10.4	6.5	4.6	6.9	4.2	4.8	5.1
Sunrise	7.4	8.2	7.4	5.2	5.6	4.9	3.2	3.6	3.9
Cox Orange	6.4	6.9	9.3	4.7	4.3	5.3	4.6	3.3	3.4
Influence of environment	low to medium			low to medium			low to medium		

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NEW ZEALAND INTELLECTUAL PROPERTY OFFICE

Over years variability measured by standard deviation

Characteristic	Fruit weight			Fruit height			Fruit width		
Year	2011/12	2012/13	2013/14	2011/12	2012/13	2013/14	2011/12	2012/13	2013/14
Astec	26.6	25.2	46.8	3.9	4	5.8	2.5	3.5	6.4
Burkitt Gala	14.5	26.6	13.6	3.1	3.8	3.3	2.8	3.1	2.8
Cripps Pink	36.2	25.8	31	2.8	4	3.4	5.6	3.5	4.1
Delblush	15.1		21	3	3.5	4.4	2.1	3.4	2.6
Granny Smith	18.9	24.3	27.3	3.5	3.9	3.1	2.7	2.8	3.5
Honeycrisp	17.8	25.2	22.3	3.7	2.8	3.3	1.8	3.5	2.9
Marin Red	18.8	36.1	29.2	4.2	6	4.5	2.7	4.1	3.3
Pinova	16.4	31.4	24.7	4.1	3.4	2.7	3.6	13.3	3.5
Royal Gala	12	23.9	23.9	2.3	4.8	3.7	2.9	4.4	3.5
Sunrise	27.4	18.2	20.8	4.2	3.5	3.1	4.1	3.1	4.6
Cox Orange	22.5	31.4	31.2	2.7	3.4	4.1	4.8	3.8	4.2
Influence of environment	very high			very low			medium		

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Over years variability measured by standard deviation

Characteristic	Fruit height/width ratio			Stalk length			Stalk cavity depth		
Year	2011/12	2012/13	2013/14	2011/12	2012/13	2013/14	2011/12	2012/13	2013/14
Astec	0.03	0.05	0.06	2.4	3.3	2.7	5.4	2.8	2.5
Burkitt Gala	0.03	0.04	0.04	3.8	4.5	2.9	1.9	1.8	1.9
Cripps Pink	0.06	0.03	0.04	5.4	5.8	4.2	1.5	3	2.7
Delblush	0.03	0.04	0.05	2.5	2.5	3.6	1.9	2.1	2.3
Granny Smith	0.04	0.03	0.04	2.1	2.6	3.6	1.7	2.1	1.8
Honeycrisp	0.04	0.02	0.02	4.4	2.7	2.1	2.1	2.2	1.8
Maxi Red	0.06	0.06	0.05	2.8	2.8	3.5	1.5	2.7	2.2
Pinova	0.04	1.6	0.03	3.3	4.6	5.4	1.8	1.9	2.5
Royal Gala	0.04	0.05	0.04	3.9	3.9	5.1	1.5	2.4	2.2
Sunrise	0.04	0.03	0.04	4	2.5	4.1	2.5	1.3	1.4
Cox Orange	0.05	0.04	0.03	3.4	3.5	3.7	1.5	17.2	1.5
Influence of environment	very low			low			low to medium		

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Over years variability measured by standard deviation

Characteristic	Stalk cavity width			Eye basin depth			Eye basin width		
Year	2011/12	2012/13	2013/14	2011/12	2012/13	2013/14	2011/12	2012/13	2013/14
Astec	2.7	3.2	3.3	1.1	1.7	1.8	2.7	2.7	2.6
Burkitt Gala	6.3	2.1	1.6	1.8	2.2	1.5	3	2.3	2.1
Cripps Pink	3.7	2.5	2.5	1.3	1.8	1.4	2.5	2	1.9
Delblush	1.6	2.7	1.8	1.6	1.8	1.7	1.7	2.7	1.8
Granny Smith	2.3	2.4	2.6		1.9	1.1	2.3	1.8	2.1
Honeycrisp	2.1	2.4	2.3	1.7	1.5	1.4	1.8	3.2	2.3
Maxi Red	2.1	2.3	2.6	1.5	1.6	1.3	2.3	2.4	2.2
Pinova	1.8	1.8	2.4	1.5	1.9	0.97	1.7	2.4	2.8
Royal Gala	1.9	2.2	2.1	1.5	1.5	1.9	2.3	3.4	2.4
Sunrise	2.4	2.1	2.3	2.8	1.5	1.6	2.8	1.9	2.2
Cox Orange	3.1	3.1	3.1	1.4	1.9	1.2	2.4	2.1	2.4
Influence of environment	low to medium			low			very low		

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[End of Annex VII and of document]