

## Technical Committee

TC/60/3

Sixtieth Session  
Geneva, October 21 and 22, 2024

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**MATTERS ARISING FROM THE TECHNICAL WORKING PARTIES**

*Document prepared by the Office of the Union*

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**EXECUTIVE SUMMARY**

1. This document compiles matters not expressly covered by specific agenda items arising from the 2024 sessions of the Technical Working Party on Testing Methods and Techniques (TWM)<sup>1</sup>, Technical Working Party for Vegetables (TWV)<sup>2</sup>, Technical Working Party for Ornamental Plants and Forest Trees (TWO)<sup>3</sup>, Technical Working Party for Agricultural Crops (TWA)<sup>4</sup> and Technical Working Party for Fruit Crops (TWF)<sup>5</sup>.

2. This document is presented in two sections. The first section, "Matters for information and for a possible decision to be taken by the Technical Committee (TC)", identifies matters which may require a decision to be taken by the TC. The Office of the Union (Office) has highlighted aspects where the TC may wish to take a decision by introducing a proposed decision paragraph. The second section, "Matters for information", is provided for the information of the TC but does not require decisions at this stage.

3. The TC is invited to:

(a) consider the invitation from the TWV to the Office of the Union to provide information on challenges and opportunities for disease resistance characteristics in Test Guidelines, for consideration at the fifty-ninth session of the TWV, as set out in paragraph 7 of this document; and

(b) note developments in the TWPs concerning:

- (i) Implementation of Purdy's notation for pedigrees in UPOV PRISMA;
- (ii) DUS tests: one site in two years versus two sites in one year;
- (iii) Number of growing cycles and concluding examination of fruit crops;
- (iv) Procedures for assessment of characteristics with single record (MG) and a number of individual records (MS) for a group of plants or parts of plants;
- (v) Experiences with new types and species;
- (vi) Male sterility in Cauliflower (TG/45/7);
- (vii) Developing new characteristics for Barley variety examination;
- (viii) Information on mutant varieties of apple useful for DUS examination;
- (ix) Image analysis and new technologies in DUS examination;
- (x) Software and statistical analysis methods for DUS examination; and
- (xi) Phenotyping and image analysis

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<sup>1</sup> TWM, at its second session, held via electronic means, from April 8 to 11, 2024.

<sup>2</sup> TWV, at its fifty-eighth session, held via electronic means, from April 22 to 25, 2024.

<sup>3</sup> TWO, at its fifty-sixth session, held via electronic means, from April 29 to May 2, 2024.

<sup>4</sup> TWA, at its fifty-third session, held via electronic means, from May 27 to 30, 2024.

<sup>5</sup> TWF, at its fifty-fifth session, held via electronic means, from June 3 to 6, 2024

4. The following abbreviations are used in this document:

TC:	Technical Committee
TWA:	Technical Working Party for Agricultural Crops
TWF:	Technical Working Party for Fruit Crops
TWM:	Technical Working Party on Testing Methods and Techniques
TWO:	Technical Working Party for Ornamental Plants and Forest Trees
TWPs:	Technical Working Parties
TWV:	Technical Working Party for Vegetables

5. The structure of this document is as follows:

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#### MATTERS FOR INFORMATION AND FOR A POSSIBLE DECISION TO BE TAKEN BY THE TECHNICAL COMMITTEE (TC)

##### Assessing distinctness in disease resistance characteristics

6. The TWV received an oral report from the Office of the Union on disease resistance characteristics in Test Guidelines. The TWV noted the challenges arising from the frequent partial revision of Test Guidelines for the inclusion of new races and strains, along with complex explanations and concepts preventing machine translation. The TWV noted the opportunities for further discussing the special features of disease resistance characteristics, including intersessional crop subgroup meetings, enabling the participation of phytopathologists and the open discussion session to be held at the sixtieth session of the Technical Committee (see document TWV/58/11 "Report", paragraphs 37 to 53).

7. The TWV agreed to invite the Office of the Union to provide information on challenges and opportunities identified for disease resistance characteristics in Test Guidelines, for consideration at its fifty-ninth session.

##### *Disease resistance characteristics: states of expression and scales of notes*

8. The TWV considered documents TWV/58/3 and TWV/58/3 Add., presented by experts from France and the Netherlands (Kingdom of).

9. The TWV considered the proposal of a new type of expression for disease resistance characteristics, similar to a quantitative (QN) characteristic but with two states of expression and particular features.

10. The TWV noted the explanation from the experts from France and the Netherlands (Kingdom of) that some QN disease resistance characteristics had no example varieties for high-level of resistance and their range of expression was divided into two states only (e.g. “absent or low / medium or high”). The TWV noted that other disease resistance characteristics were only partially continuous, having no example varieties for part of the range of variation.

11. The TWV recalled that guidance on the requirement for example varieties in QN characteristics in document TGP/7 “Development of Test Guidelines”, Guidance Note 28, section 2.4, stated that “in general, it is necessary to provide example varieties for more than one state of expression and in the case of QN characteristics:

- (i) “1-9” scale: to provide example varieties for at least three states of expression (e.g. (3), (5) and (7)), although, in exceptional cases, example varieties for only two states of expression may be accepted;
- (ii) “1-5” / “1-4” / “1-3” scales: to provide example varieties for at least two states of expression.”

12. The TWV considered whether example varieties could be provided for two states of expression for some QN disease resistance characteristics and agreed to invite the experts from France and the Netherlands (Kingdom of) to check whether that approach could be used when no example varieties for high-level of resistance or part of the range of variation were available.

13. The TWV considered the division of the range of expression of QN disease resistance characteristics into notes and could not reach an agreement on whether to use the existing types of expression, such as quantitative or pseudo-qualitative.

14. The TWV noted that the new type of expression proposed for QN disease resistance characteristics aimed at establishing distinctness based on a one-note difference for selecting varieties for the growing trial (grouping characteristics). The TWV noted that document TGP/7, GN 13 “Characteristics with specific functions”, paragraph 3.6, stated that:

“GN 13(4)(b) explains that ‘TQ characteristics selected from the Table of Characteristics should, in general, receive an asterisk in the Table of Characteristics’. Certain characteristics, particularly disease resistance characteristics, which are potentially useful as grouping characteristics might not be indicated with an asterisk in the Table of Characteristics. In the case of disease resistance characteristics, for example, there may be obstacles to the use of the characteristic for a number of members of the Union because of technical or quarantine requirements. Those same obstacles might also make it difficult for applicants to provide information on those characteristics. Therefore, disease resistance characteristics not indicated with an asterisk at the Table of Characteristics and not used as grouping characteristic may be presented in Section 5 of Technical Questionnaires (TQ) with the addition of a state of expression ‘not tested’.”

15. The TWV agreed that the use of QN disease resistance characteristics as grouping characteristics in Test Guidelines would normally lead to a compulsory request for that information from applicants.

16. The TWV noted that document TGP/9 “Examining Distinctness” Section 2, provided guidance for selecting varieties for the growing trial, including the use of grouping characteristics, characteristics in combination and the GAIA method. The TWV noted that Section 5 of that document provided guidance on assessing distinctness based on the growing trial (e.g. assessing distinctness of varieties in the same trial). The TWV agreed to invite experts to check whether the methods provided in Section 2 could support the analysis on the use of QN disease resistance characteristics for selecting varieties for the growing trial.

17. The TWV considered the scale of symptoms provided with the explanations for QN disease resistance characteristics and agreed to request further information on how the observations of the different numbers of plants in each class were used to convert observations to notes for the variety description.

18. The TWV noted that guidance in document TGP/8 “Trial Design and Techniques Used in the Examination of Distinctness, Uniformity and Stability”, Part I, Section 2.3.2.19 stated that “The distances between the discrete categories of an ordinal scale are not exactly known and not necessarily equal. Therefore, an ordinal scale does not fulfil the condition to calculate arithmetic mean values, which is the equality of intervals throughout the scale.” The TWV agreed to invite the experts from France and the Netherlands (Kingdom of) to check whether QN disease resistance characteristics data would be discrete and not continuous, identifying categories with scales not necessarily equally distant.

19. The TWV noted that document TGP/8, Part II, Section 5, provided guidance on the use of contingency tables with number of plants counted in nine different classes of infection for a QN disease resistance characteristic, using the Pearson's chi-square test for assessing distinctness.

20. The TWV noted that the software PATHOSTAT was used by France and utilized contingency tables with number of plants counted in different classes of infection for QN disease resistance characteristics, also referring to the use of Pearson's chi-square test.

(available at: [https://www.upov.int/it\\_resources/en/exchangeable\\_software.html](https://www.upov.int/it_resources/en/exchangeable_software.html)).

21. The TWV considered the cut-off points between states of expression to be included in the trials ("threshold controls"). The TWV agreed to invite experts to provide further information on the level of difference required to demonstrate a clear difference between the expression of a characteristic of two varieties that were close to the same border line (e.g. high end of one note and low end of the next), including the use of statistical analysis to establish distinctness.

22. The TWV noted that document TGP/8, Part I, Section 2 "Data to be recorded" provided guidance on scale levels for variety description and agreed to invite the experts from France and the Netherlands (Kingdom of) to check whether it would be useful to distinguish between different process levels for the use of QN disease resistance characteristics as grouping characteristics (e.g. trial data process level 2; variety description process level 3).

23. *The TC is invited to consider the invitation from the TWV for the Office of the Union to provide information on challenges and opportunities for disease resistance characteristics in Test Guidelines, for consideration at the fifty-ninth session of the TWV, as set out in paragraph 7 of this document.*

## MATTERS FOR INFORMATION

### Implementation of Purdy's notation for pedigrees in UPOV PRISMA

24. The TWM, TWV, TWO, TWA and TWF received a presentation from a representative of the International Seed Federation (ISF) on "Implementation of Purdy's notation for pedigrees in UPOV PRISMA", a copy of which is provided in document TWP/8/3 (see documents TWM/2/21 "Report", paragraph 8, TWV/58/21 "Report", paragraph 34, TWO/56/9 "Report", paragraph 30, TWA/53/9 "Report", paragraph 33, TWF/55/9 "Report", paragraph 40).

25. The TWM agreed that it would be useful to have a guided interface to help users providing information and checking the correctness of information submitted using the Purdy's notation (a "wizard") (see document TWM/2/21 "Report", paragraphs 9 to 13).

26. The TWM noted that UPOV members could have different requirements on providing parentage information in breeders' rights application forms.

27. The TWM noted that the possibility to use Purdy's notation in online application forms available in UPOV PRISMA would be useful for applicants due to the reduction of the number of data fields required to provide parentage information for authorities requesting that information.

28. The TWM agreed to invite the Office of the Union to provide information on any implications of utilizing the Purdy's notation in the online application forms of participating UPOV members available in UPOV PRISMA or UPOV guidance.

29. The TWM noted that the same presentation would be made for the other TWPs, at their sessions in 2024, and reported to the Technical Committee (TC).

30. The TWV noted the proposal to enable providing pedigree information in UPOV PRISMA using the Purdy's notation. The TWV noted that the same pedigree information required by authorities could be provided using the Purdy's notation as a harmonized standard (see document TWV/58/21 "Report", paragraphs 35 and 36).

31. The TWV agreed that the development of an interface (“wizard”) would be required to convert information provided using Purdy’s notation into the different formats currently required by authorities. The TWV agreed to invite experts to evaluate the possible use of Purdy’s notation according to their national or regional requirements, including any training or information for applicants.

32. The TWO noted that the pedigree information required by authorities could be provided using Purdy’s notation in a reduced number of data fields to be completed in application forms. The TWO noted that the proposal included the development of a wizard to guide users providing information through Purdy’s notation and transforming data to the formats required by different authorities (see document TWO/56/9 “Report”, paragraph 31).

33. The TWA noted that the use of Purdy’s notation enabled providing parentage information for any crop in a standard format, avoiding the need to program individual application forms in online systems (see document TWA/53/8 “Report”, paragraphs 34 and 35).

34. The TWA noted that there would be cost implications related to developing a wizard to guide applicants providing information using Purdy’s notation and converting the information to the format required by different authorities.

35. The TWF noted that discussions on the use of Purdy’s notation for UPOV PRISMA included the development of a wizard to guide applicants providing information and provided an opportunity to harmonize how information was provided in technical questionnaires for different crops (see document TWF/55/9 “Report”, paragraph 40).

#### DUS tests: one site in two years versus two sites in one year

36. The TWA received a presentation on “DUS tests: one site in two years versus two sites in one year” from an expert from Denmark. A copy of the presentation is provided in document TWA/53/7 (see document TWA/53/9 “Report”, paragraphs 30 to 32).

37. The TWA noted the comparison of results from variety examinations conducted in different locations with different agroclimatic zones during the same year and examinations conducted in the same location in different years. The TWA noted that examinations conducted in similar agroclimatic conditions during the same year could generate results closer to those conducted in the same location in different years, when compared to examinations conducted in different agroclimatic conditions during the same year.

38. The TWA noted that the examination of varieties in different locations during the same year would benefit from calibration and harmonization of procedures among examiners.

#### Number of growing cycles and concluding examination of fruit crops

39. The TWF received a presentation on “Number of growing cycles and concluding examination of fruit crops” from an expert from the European Union. A copy of the presentation is provided in document TWF/55/4 (see document TWF/55/9 “Report”, paragraphs 33 to 37).

40. The TWF noted that the number of growing cycles in Test Guidelines for fruit crops was usually two. The TWF noted that the standard wording for such cases stated that “the minimum duration of tests should normally be two independent growing cycles.”

41. The TWF noted that the choice of number of growing cycles for fruit crops was a subject of discussion by the interested experts and the TWF. The TWF noted the experiences reported by Canada and France on assessments conducted after one satisfactory crop of fruits.

42. The TWF considered the standard wording “the testing of a variety may be concluded when the competent authority can determine with certainty the outcome of the test” and whether it could be contradictory to the standard wording that “the minimum duration of tests should normally be two independent growing cycles.”

43. The TWF agreed to invite the experts from France with the support of Canada, European Union, Germany, New Zealand, Republic of Korea and CIOPORA to develop proposals on the number of growing

cycles for fruit crops, such as reducing the duration of tests to one growing cycle for fruit crops and the meaning of “a satisfactory crop of fruit”.

Procedures for assessment of characteristics with single record (MG) and a number of individual records (MS) for a group of plants or parts of plants

44. The TWF received a presentation from the Office of the Union on guidance on types of records of characteristics in document TGP/9 “Examining Distinctness”. The TWF noted that the presentation would be made available as document TWF/55/8 (see document TWF/55/9 “Report”, paragraphs 38 and 39).

45. The TWF considered examples of assessment of different quantitative characteristics in fruit crops, as presented by the experts from France, Germany and South Africa. The TWF noted the situations when records were made for individual parts of plants and then used to calculate a variety mean, as opposed to situations when one plant part was recorded as representing the variety. The TWF agreed to further consider examples during discussions on the individual draft Test Guidelines.

Experiences with new types and species

*Geum*

46. The TWO received a presentation on “New expression of characteristics in Geum” from an expert from the United Kingdom, a copy of which is provided in document TWO/56/3 (see document TWO/56/9 “Report”, paragraphs 32 and 33).

47. The TWO noted that applications for plant variety protection had been filed in the United Kingdom and European Union for a variety with modified flower stamens (flower petaloid stamen). The TWO noted that cooperation was envisaged between the authorities.

*Heliconia*

48. The TWO received a presentation on “New Experiences on Heliconia” from an expert from Mexico, a copy of which is provided in document TWO/56/3 Add. (see document TWO/56/9 “Report”, paragraphs 34 to 36).

49. The TWO noted that Mexico had developed national test guidelines for DUS examination of *Heliconia uxpaniensis*, *H. latispatha* and hybrids between *H. uxpaniensis* and *H. latispatha*, which was available for UPOV members at the following direction:  
[https://www.gob.mx/cms/uploads/attachment/file/858504/GUIA\\_HELICONIA\\_070923\\_1\\_.pdf](https://www.gob.mx/cms/uploads/attachment/file/858504/GUIA_HELICONIA_070923_1_.pdf)

50. The TWO noted that the development of the test guidelines had benefited from the cooperation among different experts in Mexico and included international cooperation with the Netherlands (Kingdom of).

*Appending information to the UPOV codes of fruit crops used as rootstock*

51. The TWF noted the report from the European Union on the filing of applications for rootstock varieties of different fruit crops (see document TWF/55/9 “Report”, paragraphs 46 to 48).

52. The TWF considered a proposal to append information to the UPOV codes of fruit crops used as rootstock. The TWF agreed to further explore this approach and invited the expert from the European Union to develop proposals for the individual UPOV codes concerned.

53. The TWF considered whether the information on the variety use as rootstock could cause confusion regarding grouping and organizing of trials. The TWF noted that certain varieties could be used for different purposes (dual-purpose varieties) and agreed that further discussion would be required on this matter.

Male sterility in Cauliflower (TG/45/7)

54. The TWV considered document TWV/58/8, presented by an expert from Germany (see document TWV/58/11 “Report”, paragraphs 28 to 33).

55. The TWV noted that the partial revision of the Test Guidelines for Cauliflower presented in document TC/59/13 had been adopted by the Technical Committee in 2023. The TWV agreed that discussion on male sterility should consider whether a new partial revision would be appropriate in the future.

56. The TWV agreed that male sterility was a useful characteristic for distinctness in Cauliflower and *Brassica oleracea*, in general. The TWV agreed that the characteristic should be kept in the Test Guidelines.

57. The TWV considered the states of expression and description of percentage of plants expressing the characteristic. The TWV noted a question on whether the expression of the characteristic would be due to segregation between the states absent and present. The TWV noted the explanations from France and the Netherlands (Kingdom of) that the segregation was observed in varieties and remained stable after repeated cycles of propagation.

58. The TWV agreed to invite the Netherlands (Kingdom of) to prepare a proposal for the partial revision of the Test Guidelines for Cauliflower to address the characteristic male sterility, for consideration at its fifty-ninth session. The TWV agreed that the revision should address the states of expression and explanation on the percentage of plants expressing the characteristic, clarify the effect of segregation in genic male sterility (GMS) and the relevance of explanations on genetic background for assessing the characteristic. The TWV agreed that the revision should include the addition of the characteristic in the Technical Questionnaire.

59. The TWV noted the report from the Netherlands (Kingdom of) that the molecular marker had been provided to other UPOV members and was useful to avoid an additional growing cycle to assess the characteristic. The TWV agreed that the use of the protected marker should not provide an advantage to individual breeders.

#### Developing new characteristics for Barley variety examination

60. The TWA received a presentation on "Exploring new characteristics for Spring Barley variety examination" from an expert from the United Kingdom, a copy of which is provided in document TWA/53/5 (see document TWA/53/9 "Report", paragraphs 39 to 45).

61. The TWA noted the characteristics considered by the experts from the United Kingdom for potential use in DUS examination, which included 16 ear characteristics. The TWA noted the reports from the Czech Republic and Slovakia on prior consideration of characteristics such as grain: wrinkling and grain: rachilla length, which were not used in routine examinations.

62. The TWA received a presentation on "Possible new characteristics for Spring Barley variety examination" from an expert from France, a copy of which is provided in document TWA/53/5 Add..

63. The TWA noted the proposal of the following three additional characteristics for barley:

- Leaf: width (growth stage 25-29);
- Awn: length of smooth part of median nerve;
- Grain: spiculation of outer lateral nerves of dorsal side of lemma.

64. The TWA considered the explanations provided for the assessment of inner and outer lateral nerves of dorsal side of lemma and agreed that they should be further considered in case the spiculation of outer lateral nerves was proposed for inclusion in the Test Guidelines.

65. TWA agreed to invite the experts from France and the United Kingdom to report progress on the assessment of the proposed characteristics at its fifty-fourth session.

66. The TWA agreed to invite members of the Union to consider the characteristics presented in documents TWA/53/5 and TWA/53/5 Add. for possible future inclusion in the Test Guidelines for Barley.

#### Information on mutant varieties of apple useful for DUS examination

67. The TWF considered document TWP/8/2, paragraphs 18 to 21 (see document TWF/55/9 "Report", paragraphs 42 and 43).

68. The TWF noted that the TC had agreed that authorities should continue to cooperate in variety examination of apple mutants, including exchange of information on bilateral basis. The TWF noted that the TC had agreed that the TWF should continue discussions to support DUS examination of mutant varieties of apple.

#### Image analysis and new technologies in DUS examination

69. The TWA received a presentation on “UAV-Based Field Phenotyping in the United Kingdom Agricultural DUS testing” from an expert from the United Kingdom, a copy of which is provided in document TWA/53/3 (see document TWA/53/9 “Report”, paragraphs 36 and 37).

70. The TWA noted the work reported and agreed to invite the expert from the United Kingdom to report developments at its fifty-fourth session.

71. The TWF received a presentation on “Image Analysis in Plant Variety Test for Fruit Crops (apricot, peach, apple)” from an expert from the Republic of Korea. A copy of the presentation is provided in document TWF/55/5 (see document TWF/55/9 “Report”, paragraphs 44 and 45).

72. The TWF noted the automated procedures for the assessment of characteristics from the Test Guidelines for Apricot (11 characteristics); Peach (7 characteristics); and Apple (11 characteristics). The TWF noted that the amount of time required for the assessment of each variety was expected to be reduced from six to three hours. The TWF agreed to invite the expert from the Republic of Korea to report developments at its fifty-sixth session.

#### Software and statistical analysis methods for DUS examination

##### *Statistical tools and methods for DUS examination*

- (i) The Combined-Over-Years Uniformity Criterion (COYU)
- (ii) Development of software for the improved COYU method (splines)
- (iii) Extrapolation in relation to COYU

73. The TWM considered document TWM/2/3 and received a presentation from Mr. Adrian Roberts (United Kingdom) on “The Combined-Over-Years Uniformity Criterion (COYU)”, a copy of which was provided in document TWM/2/3 Add. (see document TWM/2/21 “Report”, paragraphs 14 to 16).

74. The TWM noted that the DUSTNT software had been improved to facilitate the introduction of the new COYU module with splines. The TWM noted that the new version of DUSTNT would be made available for UPOV members evaluation from May 2024, before its launch in May 2025. The TWM agreed to invite UPOV members to participate in the test campaign for the new DUSTNT software and to report outcomes to the expert from the United Kingdom.

75. The TWM agreed to invite the United Kingdom to report developments on the evaluation exercise for the new DUSTNT software, including the new COYU module, and the draft guidance on extrapolation at its third session.

- (iv) Comparison of results obtained for COYD and COYU procedures using different software  
Extrapolation in relation to COYU

76. The TWM received a presentation from Mr. Frédéric Lafayette (France) on “Comparison of software for COYD”, a copy of which is reproduced in document TWM/2/20 (see document TWM/2/21 “Report”, paragraphs 17 to 19).

77. The TWM noted that the software compared produced the same results for COYD analysis. The TWM noted that the software comparison would continue and that the results of comparison for COYU would be presented to the TWM at its third session.

78. The TWM noted the invitation from China for the comparison exercise to be extended to other methods, such as the Fisher’s Exact Test.

(v) Development of Big Data platform for DUS examination

79. No documents were received for this agenda item. The TWM agreed to invite China to report developments at its third session (see document TWM/2/21 "Report", paragraph 20).

Phenotyping and image analysis

(a) *Assessment of color characteristics using image analysis*

A method for calibration of size and color used in image analysis

80. The TWM received a presentation from Mr. Kun Yang (China) on "A method for calibration of size and color used in image analysis", a copy of the presentation is provided in document TWM/2/10 (see document TWM/2/21 "Report", paragraphs 25 and 26).

81. The TWM noted the research on color calibration using different light sources, beyond the standard provided in Test Guidelines (CIE Standard of Preferred Daylight D 6500).

(b) *Application of Imaging Analysis on DUS Testing*

(i) UAV-based field phenotyping in the United Kingdom agricultural DUS testing

82. The TWM received a presentation from Mr. Alex Talibudeen (United Kingdom) on "UAV-based field phenotyping in the United Kingdom agricultural DUS testing", a copy of the presentation is provided in document TWM/2/8 (see document TWM/2/21 "Report", paragraphs 27 to 30).

83. The TWM noted developments on the introduction of UAV-based field phenotyping in the United Kingdom and that a compared analysis using image analysis and manual observations was being conducted.

84. The TWM noted new types of characteristics assessed using image analysis, such as growth profiles and vegetative index.

85. The TWM noted that assessments using image analysis could provide in some cases higher precision levels than manual assessments. The TWM agreed that the consequences of increased precision levels on DUS examination should be further considered as characteristic assessments using image analysis were introduced in routine procedures.

(ii) Application of Imaging Analysis on DUS Test

86. The TWM received a presentation from Ms. Yanfang Liu (China) on "Application of Imaging Analysis on DUS Test", a copy of the presentation is provided in document TWM/2/13 (see document TWM/2/21 "Report", paragraphs 31 and 32).

87. The TWM noted the use of image analysis for the automation of assessments for several characteristics in Maize and the use of image analysis to assess additional characteristics, such as seed vigor.

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