



TWC/21/10

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**INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS**  
GENEVA

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

**Twenty-First Session  
Tjele, Denmark, June 10 to 13, 2003**

REPORT

*adopted by the Technical Working Party on Automation and Computer Programs*

Opening of the Session

- 1.\* The Technical Working Party on Automation and Computer Programs (hereinafter referred to as “the TWC”) held its twenty-first session in Tjele, Denmark, from June 10 to 13, 2003. The list of participants is reproduced in Annex I to this report.
- 2.\* The TWC was welcomed by Mr. Ole Olsen, Director of the Danish Institute of Agricultural Science. Mr. Olsen gave a report on the activities of the Institute.
- 3.\* The session was opened by Mr. Uwe Meyer (Germany), Chairman of the TWC, who welcomed the participants and, in particular, new participants to the TWC.

Adoption of the Agenda

- 4.\* The TWC adopted the agenda as reproduced in document TWC/21/1 Rev., after having agreed to follow the work plan proposed by the Chairman.

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\* The asterisked paragraphs in this draft report are reproduced from document TWC/21/9 (Report on the Conclusions).

Short Reports on Developments in Plant Variety Protection(a) Reports from members and observers

5.\* The TWC received oral reports from the participants on developments in plant variety protection in their respective countries.

6. Experts from Germany reported on the development of a new program for transferring field data into the computer directly by using the data logger. They also reported on some reorganization within the Bundessortenamt to centralize DUS testing of all crops in one department. The expert from the Czech Republic reported on the introduction of a new program for statistical analysis and on the development of a new program for seed storage. The expert from Hungary reported that, in order to reduce costs and improve the services provided, a website was being developed, as well as new tools for data storage. The expert from Slovakia reported on the development of a new computer system for barley. The expert from Uruguay reported on a cooperation agreement between the European Union and the Government of Uruguay to develop the seed sector. The expert from Mexico reported on the work made by experts from his country in the preparation of the UPOV Test Guidelines for Husk Tomato, *Opuntia* and Avocado. He also reported that Mrs. Enriqueta Molina had been appointed Director of the National Service of Seed Inspection and Certification (SNICS) and that SNICS has been entrusted to support research projects dealing with the development and use of plant genetic resources. Experts from the United Kingdom reported on the extension of the use of image analysis for DUS testing on varieties of peas with the aim of reducing costs whilst increasing the number of characteristics examined and reported that it was planned to extend the use of image analysis to varieties of parsnip in the near future. Experts from Romania reported on the progress made to bring the Romanian legislation for plant breeders' rights and the national list in line with the relevant regulations of the European Union. They also reported on the restructuring of the Seed Quality Institute, which had 24 testing stations, the development of a database that will include information on different crops and the possible acquisition of a new server to incorporate the data from all testing stations. The expert from Poland reported on the acquisition of new data loggers, the work to put the national legislation in line with the regulations of the European Union and the organization of a workshop on statistical methods for DUS testing, adding that a further workshop was planned within three years. The expert from Denmark reported that incomplete block design for DUS testing had been extended to more crops and that they were interested in using the GAÏA software. The experts from France commented that the introduction of quality assurance in DUS testing implied the development of protocols for quality assurance. They further reported on developments in their database systems which made crop data from the eight testing locations available in each place and utilized a more user-friendly screen. The new database allowed the experts to manage the information according to their needs and ensured that the data for all the crops had the same type of data structure. Finally, they reported on future developments for the seed testing system; in some cases commercial software could be used and in other cases specific software should be developed.

(b) Reports on developments within UPOV

7.\* The TWC received an oral report from the Office of the Union on the latest developments in the UPOV Council, Administrative and Legal Committee (CAJ), Technical Committee (TC) and Technical Working Parties.

Molecular Techniques(a) Report on developments

8.\* The TWC received an oral report from the Office of the Union on the latest developments at the Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular (BMT), the *Ad Hoc* Crop Subgroups on Molecular Techniques and the BMT Review Group.

(b) Statistical method for data produced by biochemical and molecular methods

9.\* Mr. Sylvain Grégoire (France) introduced document TWC/21/3. He explained, in particular, the differences between PREDIP and GAÏA.

10. The TWC discussed the possible use of PREDIP for Option 1(b) “Use of a set of molecular characteristics which can be used reliably to estimate traditional characteristics; e.g. quantitative trait loci (QTL)” or Option 2 “Calibration of threshold levels for molecular characteristics against the minimum distance in traditional characteristics” concerning the use of molecular markers in DUS testing (see document TC/38/14). The expert from France clarified that, even if there were no QTL linked to the expression of the characteristic, it was a reliable and repeatable way to select reference varieties to be included in a DUS trial and added that the result could be improved using phenotypic data (e.g. grouping characteristics). In reply to questions raised by several experts, the expert from France explained that it was possible to use data from different countries provided that it was possible to consider the year/location effect. The TWC noted that the output from PREDIP was dependent on the crop and the characteristics and molecular markers used in the analysis. The TWC agreed that the methods used in PREDIP were to be viewed as methods under development.

Project to Consider the Publication of Variety Descriptions (documents TWC/21/5 and TWA/29/19)

11. The TWC considered document TWC/21/5, introduced by the Office of the Union, and document TWA/29/19, introduced by Mr. Gerhard Deneken (Denmark). Discussions focused on the description and characteristics which should be considered for publication. Some experts noted that not all varieties in the collection were grown every year and consequently not all descriptions were renewed at the same time. One expert from Denmark considered that some administrative information should also be attached to the description as well as data validation made.

12.\* In response to the request in document TWC/21/5 to comment on the proposed program for the development of the model study the TWC made the following recommendations:

(a) where practically possible, the study should be conducted on all characteristics included in the UPOV Test Guidelines;

(b) contributors of variety descriptions should be requested to provide their “official” descriptions of the varieties concerned i.e. the description resulting from the DUS examination of the variety. In making this recommendation it noted that the description may have been re-

calibrated in the meantime, but considered that if such changes could not be accommodated in the comparison of variety descriptions the aims of the project could not be met;

(c) in the case of authorities wishing to contribute variety descriptions for which they did not have “official” descriptions, e.g. for varieties which had been acquired for their reference collections, the description to be provided should be that produced at the end of the first complete cycle of testing in which the variety was included;

(d) contributors should be requested to specify the reference of the UPOV Test Guidelines on which the description had been developed; and

(e) contributors should be requested to provide the variety denomination, breeder’s reference, breeder and applicant for each variety to verify, as far as possible, whether varieties were the same or different.

13.\* With regard to advice on the management of data, it was agreed that the Chairman of the TWC should, after consultation with the members of the TWC, develop guidance on how to present the variation in the states of expression between different descriptions of the same variety.

#### UPOV Databases

14. Documents TC/39/13 and TC/39/14–CAJ/47/5 were introduced by the Office of the Union. Most experts of the TWC considered that a clear procedure for the prompt inclusion of codes for new species was necessary, including those cases where a given species was split. The expert from Romania considered it useful to link the UPOV code with the recommended classes for variety denomination and an expert from France proposed including further information such as the UPOV Technical Working Party responsible for that crop or UPOV Test Guidelines, if they existed.

15.\* With regard to the UPOV code proposed in document TC/39/13, the TWC agreed with the structure of the code and the proposed program for its introduction. The TWC agreed that if members had any comments after further consideration of the codes, these would be sent to the Office of the Union by the end of September 2003. It recommended that the database should indicate which Technical Working Party would be responsible for checking the validity of each code. It also agreed that, where appropriate, the database should indicate the relevant Test Guidelines for each code and, furthermore, that the third element of the code should be used to generate different codes for different types of varieties of the same species or sub-species, which were covered by different Test Guidelines. The TWC agreed that new codes created by the Office of the Union could be used immediately but such new codes should be reviewed by the relevant TWP at their annual sessions.

16.\* The TWC agreed that the code should, in general, not be changed as a result of a change in the Latin name of a species. However, it recognized that a change in the structure and content of a genus may require a change in the UPOV code to ensure that the first element of the code could be used to sort species into the correct genus.

17.\* The TWC received a presentation from the Office of the Union, based on document TC/39/14–CAJ/47/5, on the review of the UPOV-ROM plant variety database. It agreed that

consideration should be given to the creation of a field to indicate whether the variety denomination is in the form of a “code”, rather than a “fancy name.”

### TGP Documents

(a) TGP documents the Technical Committee invited all Technical Working Parties to consider at their sessions in 2003

(i) *TGP/7 Development of Test Guidelines (document TGP/7 Draft 3)*

18.\* The TWC considered document TGP/7 Draft 3 and recommended the following changes:

#### Annex I: TG Template

Cover page (page 27):

In the first sentence of the highlighted section on the cover page, “document TG/1/3” should be inserted after “the General Introduction.”

Section 3.1 (page 30):

The title of this section should be changed to “Number of independent growing cycles.” With regard to the first sentence, the TWC questioned whether this should be retained (see comments on section 4.1.2 Consistent Differences) but, if retained, agreed that it should read as “The consistency of differences between varieties is supported by observations made in different independent growing cycles.”

Section 3.2 (page 31):

The highlighted section should be replaced by the following sentence: “Where considered appropriate, the variety may be tested at an additional location.”

Section 4.1.2 (page 31):

The TWC considered that this section should be retained, as the need to ensure that any differences in a characteristic are sufficiently consistent was the basis for determining the minimum duration of the tests.

#### Annex II: Additional Standard Wording (ASW)

ASW 7 (page 45):

First sentence to read “Where the COYD method is used for examining distinctness and it is applied to a characteristic, a difference between varieties should be considered to be clear and consistent if it is greater than the COY LSD for distinctness at the level of {e.g. 1% } after two or three growing cycles. The Chairman of the TWC will consult with the members of the TWC to verify if the words “, or equal to,” should be added after “greater than” and notify the Office accordingly.”

ASW 8(e) (page 46):

The Chairman of the TWC, in consultation with the members of the TWC, to develop new wording for this section and supply to the Office for incorporation into document TGP/7 draft 4. It was agreed that the “Note” forming the second paragraph should be developed into a Guidance Note (GN) and included in Annex 3 of TGP/7.

*(ii) Explanation of the “Schematic overview of TGP/3 (Varieties of Common Knowledge), TGP/4 (Management of Variety Collections) and TGP/9 (Examining Distinctness)”*

19.\* Document TC/39/6 was introduced by the Office of the Union.

20.\* The TWC recommended the following changes concerning the structure of TGP/9 presented in TC/39/6:

TGP/9.4

Title to be changed, since the whole of TGP/9 concerned methods for examining distinctness.

TGP/9.4.3

The TWC agreed that the word “Recommended” should be deleted from the title. It also agreed that, in addition to COYD, the long-term LSD method should be added to the statistical methods and noted that other suitable methods could be added even after the initial adoption of TGP/9.

TGP/9.5

TGP/9.5 to be placed before TGP/9.4 and the sections to be renumbered accordingly.

21.\* With regard to the proposed program for the development of TGP documents presented in Annex II of document TC/39/6, the TWC agreed the following:

TGP/10.1

The first draft of TGP/10.1 “Considering the application of statistical methods” to be produced for the first complete draft of TGP/10, scheduled to be prepared for the TC in 2005.

TGP/10.3

It was agreed that the word “Recommended” should be deleted from the title.

TGP/10.3.3

The Chairman of the TWC to discuss the development of a first draft of document TGP/10.3.3 “Recommended statistical methods: Segregation ratios” with Mr. John Law (United Kingdom).

TGP/10.3.4

TGP/10.3.4 “Relative tolerances in the number of off-types” to be deleted and the section to be incorporated into TGP/10.3.2 “Off-types.”

TGP/14.3

It was agreed that, subject to the agreement of Mr. Tanvir Hossain (Australia) being obtained by the Office of the Union, a second draft of document TGP/14.3 “Statistical terms” would be developed by Mr. Adrian Roberts (United Kingdom) for discussion at the twenty-third session of the TWC.

(b) TGP documents to be prepared by TWC experts

*TGP/8.2 Validation of Data and Assumptions*

22. Mr. Kristian Kristensen (Denmark) introduced document TGP/8.2 Draft 2. He explained that that document was a revision of TGP/8.2 Draft 1, presented to the TWC at its twentieth session, and incorporated the comments made by the TWC at that session. The Chairman noted that, in the introduction to the document, reference to TGP/8.4 had been made but was not reflected further in the document. He proposed to include the references to TGP/8.4 in the rest of the document. Some experts wondered whether reference to additivity of block was useful for crop experts. Experts from Denmark and the United Kingdom considered that it was useful for trial design and added that a large interaction would result in a low efficiency of the test. Experts from the Netherlands and the United Kingdom noted that, in cases of interaction, modified regression analysis could be used. Experts from France mentioned that they used their models systematically for value for cultivation and use (VCU) trials but not for DUS testing and proposed keeping the document simple in order to facilitate crop experts’ reading and understanding of the need for data validation.

23.\* The TWC agreed that a new document should be prepared by experts from Denmark and the Netherlands. In accordance with the proposal from an expert from France, the TWC agreed to keep the document as simple as possible in order to make it more useful for crop experts. It agreed to modify paragraph 12, because it considered that it was not the observed raw data which should be normally distributed. It also agreed that the third sentence of paragraph 13 of the document should read as follows:

“For a formal description of the model see TGP 8.5 Two-way ~~anova~~ ANOVA ~~aline~~ paragraph 7.”

*TGP/8.4 Types of Characteristics and Their Scale Levels*

24. Mr. Uwe Meyer (Germany) introduced document TGP/8.4 Draft 2. He noted that this draft incorporated the comments made by the TWC during its twentieth session. The TWC considered some questions sent by Mrs. Elise Buitendag (South Africa), coordinator for TGP/7. The TWC welcomed the comments which expressed some general issues for crop experts on the document. The TWC replied as follows:

25. In reply to a question on whether the definition of “ordinal scale” in the document was in line with what was agreed as qualitative and quantitative characteristics in the General Introduction (TG/1/3), the TWC noted that Table 1 on page 8 referred to quantitative characteristics but to qualitative data. The TWC agreed to reword the corresponding box to say

“qualitative data with underlying quantitative characteristic” instead of “underlying variable”. Continuing with questions about the definition of normal scale, another question was whether the fact that a note was assigned to each state of expression, meant that the definition (see paragraph 26 of TGP/8.4 Draft 2) was applicable to all characteristics included in UPOV Test Guidelines,. The TWC noted that the question referred to what, in TGP/8.4, was qualified as “level 3” (variety description, see Table 1 of TGP/8.4 Draft 2) and the definition of “ordinal” referred to the scale of data (i.e. level 2 of Table 1 of TGP/8.4 Draft 2). Mrs. Buitendag also expressed doubts about paragraph 27 of the document, which stated that “distances between the discrete categories of an ordinal scale are not exactly known and not necessarily equal”. She considered that measurements could be made, if considered necessary by the crop experts, but in general that type of characteristic (e.g. anthocyanin coloration, content of juice) was visually assessed. The TWC agreed and decided that a link between paragraphs 27 and 38 should be made. Mrs. Buitendag requested some clarification on what was meant by “absolute measurements” in Table 2 on page 6 of the document. The TWC agreed to include an explanation. In relation to the “absolute zero point” (see paragraphs 16, 20 and 21), Mrs. Buitendag expressed some concern about the examples, for which she considered further explanations were needed. Another concern related to paragraph 14 of the document, which stated that, for discrete quantitative data, there were no real values between two neighboring units but it was acceptable to compute an average between those units. The TWC clarified that it was real data which could not have intermediate values between units, and that further calculations might allow for an average to be computed, e.g. an average of counting. Mrs. Buitendag asked for further clarification to relate the “scale levels” of section 8.4.4 to the “process levels” described in section 8.4.2 of the document.

26.\* The TWC agreed that a new document would be prepared for the following TWC session. That new document would include a more comprehensive explanation of the different process levels presented in section 8.4.2 and clarify the meaning of “absolute measurement” and “absolute zero point”. For these purposes, the TWC considered it useful to include examples to help crop experts to understand the document.

#### *TGP/8.5 Statistical Methods for DUS Examination*

27.\* Mrs. Sally Watson (United Kingdom) introduced document TGP/8.5 draft 2. She noted that document TGP/8.5 draft 2 was an updated version of the document considered by the TWC during its session in 2003.

28.\* The TWC proposed that, once agreed, the decision rule for comparisons of means should be included at the end of paragraph 31. It was agreed that the expert from the United Kingdom would check the criteria in the COY procedure and amend paragraph 14 of Appendix A2 accordingly.

29.\* The TWC noted that the numbering of the columns in the tables of paragraphs 2 and 3 of Appendix A3 should be amended.

30.\* In relation to the content of TGP/8 as a whole, the TWC agreed to restructure the content of the document as follows:

TGP/8.1	Introduction (former TGP/8.1)
TGP/8.2	Experimental Design Practices (former TGP/8.3)



- TGP/8.3 Types of Characteristics and Their Scale Levels (former TGP/8.4)
- TGP/8.4 Validation of Data and Assumptions (former TGP/8.2)
- TGP/8.5 Statistical Methods for DUS Examination (former TGP/8.5)
- TGP/8.6 Examining DUS in Bulk Samples (former TGP/8.6)

*TGP 9.4.1 Examining distinctness in different types of varieties: General*

31.\* Mrs. Beate Rücker (Germany) introduced document TGP/9.4.1 draft 2. She pointed out the remark in paragraph 3 noting that, according to the document TG/1/3 (General Introduction), guidance for the handling of quantitative characteristics should be provided in document TGP/9. She wondered in what section of document TGP/9 it should be included.

32.\* The TWC made no particular proposals for amendments to this document.

*TGP/9.7 Recommended Statistical Methods*

33.\* Mrs. Sally Watson (United Kingdom) introduced document TGP/9.7 draft 2. She noted that document TGP/9.7 draft 2 was an updated version of the document considered by the TWC during its session in 2003. She pointed out that this draft 2 included reference to long-term LSD in the main part of the document (see paragraphs 17 and 18) instead of having them in the Annex, which had been the case for draft 1 of document TGP/9.7.

34.\* The TWC agreed the following amendments:

- (a) In paragraph 12 of the document, the order of the criteria for recommending the use of COYD should be:
- the characteristic is quantitative;
  - there are some differences between plants (or plots) of a variety;
  - observations are made on a plant (or plot) basis over two or more years.
- (b) A separate section on long-term LSD to be introduced.

35.\* The TWC agreed that paragraph 20 should only mention Mrs. Sally Watson as the contact person for obtaining the DUST package for statistical analysis of DUS data and that, in the last paragraph of figure 1, “or equal” has to be checked by the Chairman of the TWC after consultation with other members of the TWC.

*TGP/10.2 Assessing Uniformity According to the Features of Propagation*

36. Mrs. Beate Rücker (Germany) introduced document TGP/10.2 Draft 2. She noted that a request from the Technical Working Party for Vegetables (TWV) to include the assessment of uniformity without the use of statistical method was still pending for inclusion. The Chairman of the TWV explained that, in DUS testing for vegetable varieties, the use of a small number of plants was normal practice, hence mean and standard deviations were not calculated. One expert from the United Kingdom asked for improvement of the wording of paragraph 9, and

some comments were made on paragraphs 1, 4 and 5 by experts from the United Kingdom and the Office of the Union, which resulted in the agreed changes below.

37.\* The TWC agreed the following amendments:

paragraph 1: first sentence to read: “The variation in the expression of characteristics within varieties is the critical consideration in the ~~judgment~~ assessment of uniformity.”

paragraph 4: to take the wording of paragraph 6.4.1.1 from the General Introduction to define off-type;

paragraph 5(b): to amend the text for consistency with the text of the General Introduction and to elaborate on the notion of “comparable varieties” and the reference to TGP/13 should be clarified;

*TGP/10.3.1 Recommended Statistical Methods: COYU*

38. Mr. Adrian Roberts (United Kingdom) introduced document TGP/10.3.1 Draft 2. He noted that the document incorporated the comments made by the TWC during its twentieth session. An expert from Germany requested an explanation concerning the probability values presented in paragraph 33. An expert from France proposed that those figures could be presented as an example and that a document on recommendations for probability levels could be prepared, whilst an expert from the Office of the Union noted that it had been agreed to include the recommendation in TGP/10.1. In relation to the 9-point moving average proposed in paragraph 17, experts from France and Germany wondered whether it was the best option for every situation and proposed that studies should be made to be able to make a better recommendation. An expert from the United Kingdom considered that the current recommendation could be explained and that a new paper would be necessary to allow the recommendation to be changed. An expert from Germany highlighted the need for recommendations on how to determine the number of plants to be measured in a trial. An expert from France explained that it would not be an easy task because it might vary from characteristic to characteristic. An expert from Denmark reported that, in his country, for winter wheat varieties, 60 plants were measured for candidate varieties but for reference varieties, the number could be reduced to 30 plants. An expert from the United Kingdom wondered about the reaction of the breeders if their varieties were tested using 30 plants instead of 60. The Chairman considered that a paper could be prepared using past data.

39. The TWC agreed that a paper should be prepared by experts from Germany to reconsider if the 9-point moving average was still appropriate in all cases. It also agreed that a paper on the determination of the minimum number of plants to be used when measuring characteristics should be prepared by experts from Denmark and Germany for the twenty-second session of the TWC. In reply to a comment raised by the expert from Kenya, the TWC noted that, in formula  $SD_j$  in paragraph 15, the divisor “n” should, theoretically, read “ $n_j$ ”, but for practical purposes the divisor should continue to read “n”. With regard to paragraph 35 of the document, it agreed that this should read:

“The program will operate with a complete set of data or will accept some missing values, e.g. when a variety is not present in a year.”

40.\* In response to comments received from Mr. H.P. Piepho (University of Hohenheim, Germany), the TWC agreed to invite Mr. Piepho to prepare a document for the TWC to describe alternative approaches within the COYU method.

41.\* The TWC pointed out that, in paragraph 33, the notation of TGP/7, page 46, should be used (probabilities as examples).

42.\* As a result of discussions on document TWC/21/7, the TWC agreed that the next draft of TGP/10.3.1 should include an explanation concerning the possible acceptance of varieties after two years of tests in a three-year testing system.

#### *TGP/10.3.2 Recommended Statistical Methods: Off-Types*

43.\* Mr. Adrian Roberts (United Kingdom) introduced document TGP/10.3.2 draft 2. He noted that the document incorporated the comments made by the TWC during its session in 2003.

44.\* The TWC agreed that the subject of relative tolerances in the number of off-types, which was intended to be presented in TGP/10.3.4, should be incorporated into a section within TGP/10.3.2. It also agreed that the next draft of TGP/10.3.2 should address the determination of off-types by measurements, as referred to section 6.4.1.2 of the General Introduction.

#### *TGP/10.3.3 Recommended Statistical Methods: Segregation Ratios*

45.\* The TWC agreed that the Chairman of the TWC would contact the drafter of TGP/10.3.3 to clarify whether a version of that document would be provided for the next session of the TWC.

#### Incomplete Block Design

46.\* Mr. Kristian Kristensen (Denmark) introduced document TWC/21/6. Discussions focused on the efficiency and limitations of  $\alpha$ -designs, especially for grouping purposes, which is a requirement from crop experts.

47. An expert from France requested clarification on the circumstances in which, in some cases, the use of  $\alpha$ -designs showed an improvement in the precision of the test whilst in other cases it could be the other way round. The expert from Poland clarified that  $\alpha$ -designs allowed for a return to a complete randomized design, if that was necessary for a more efficient design for the test. Experts from Germany and the United Kingdom noted that crop experts preferred grouping varieties side-by-side and wondered whether it could be possible using  $\alpha$ -designs. The expert from Poland explained that it could be possible to use restricted randomization but, nevertheless, too much restriction would not allow the use of  $\alpha$ -designs. An expert from France considered grouping varieties to be useful for self-pollinated varieties, but not for cross-pollinated varieties, where grouping was not used. An expert from Germany explained that grouping varieties, by reducing the residual variability due to a lower neighbor effect, increased the efficiency of the test. The expert from Poland added that, in  $\alpha$ -designs, it was assumed that there was no neighbor effect.

48.\* The TWC agreed to delete the word “almost” in paragraph 6 of the document and to change the wording of paragraph 17 from “(but never negative)” into “(only in a few cases slightly negative)”.

#### Efficiency of Incomplete Block Designs in DUS Herbage Trials

49. Mrs. Sally Watson (United Kingdom) introduced document TWC/21/8. She explained that the document was an interim report on the use of incomplete block designs in the eight United Kingdom DUS herbage trials planted in 2001 and 2002. It was reported that most characteristics had shown evidence of being affected by the environment, in that incomplete blocks analysis had given greater control of variation than had complete blocks analysis. She added that results had shown, however, that in only a few of the characteristics did the gain in efficiency through control of variation by the incomplete blocks outweigh the loss in efficiency caused by comparisons of varieties across different blocks, and that those characteristics had tended to be the ones that measured the overall dimensions of the plant.

50. The Chairman noted the benefit of having the tables with errors, LSD and means included in the document and that the conclusions were similar to those of previous papers presented at the TWC. He wondered whether it was possible for the TWC to draw some recommendations on the use of resolvable incomplete block designs (i.e.  $\alpha$ -designs) for DUS testing. An expert from France considered that the use of the design for DUS testing was possible. An expert from the United Kingdom noted that, if the alternative design was a randomized complete block design, there was no disadvantage in using  $\alpha$ -design. An expert from Germany noted that, even though it was important to encourage experts to use  $\alpha$ -designs, she considered it difficult for crop experts to relinquish the grouping of varieties when designing DUS trials. She asked whether it was possible to fix the order of the plots of the first replication, which would provide at least one replication with grouping, whilst the other would be randomized. The expert from Poland explained that there was a special software which allowed that practice. An expert from Denmark explained that, in that country, the residual variance was calculated by post-blocking to check the potential impact of introducing  $\alpha$ -designs before it was introduced for DUS testing. The expert from Mexico proposed that the TWC submit the information to the other Technical Working Parties to encourage crop experts to use  $\alpha$ -designs. The expert from Hungary suggested preparing a clear explanation of  $\alpha$ -design. An expert from the United Kingdom noted that the aim of using  $\alpha$ -designs was to increase the efficiency of the tests.

51.\* The TWC concluded that resolvable incomplete block designs could be used for DUS testing. It agreed that further studies were necessary to make a more detailed recommendation and that experts from Denmark, Poland and the United Kingdom would prepare a paper on recommendation for the use of  $\alpha$ -designs in DUS testing for the following TWC session.

#### Chi Square Distribution

52. Mr. Vincent Gensollen (France) introduced document TWC/21/2. An expert from the United Kingdom considered that, for the second example included in Annex II, instead of merging states as proposed in paragraph 11 of that Annex, it was possible to change the type of test. He noted that the principle of “2 out of 2, or 3 out of 3” referred to in paragraph 8 of the document was an old principle which was no longer applied and clarified that generalized linear models should be used when there was year/location interaction. This was supported by the

expert from Kenya, who offered to prepare a paper on generalized linear models. The Chairman further noted that, when empty cells were found, exact methods could be used. An expert from Denmark highlighted that the proposed method did not take into account variability caused by other sources and that, in paragraph 11 of Annex II, the wording should be “less than 5”, meaning an absolute value of 5, instead of “less than 5%”. The expert from France explained that the test was used for testing disease resistance, in which case COY could not be used and clarified that stability was tested by comparing the mean values of the new sample against the mean values of the original sample previously tested. The expert from Germany explained that, in her country, the values of the old sample were used as expected values in cases of segregating characteristics of three-way hybrids, but those characteristics were not used for the assessment of distinctness. She explained that, as crop expert, she would like to have a recommendation from the TWC of one, or maybe more than one, method to be used, as well as what should be taken into account to select the proper method.

53.\* The TWC agreed that for the following session a revised version of document TWC/21/2 would be prepared taking into account the fact that uniformity could not be assessed. The revision should include a comparison of Chi square and exact tests. It also agreed that the expert from Kenya would prepare a document on the use of generalized linear models in cases described in document TWC/21/2.

#### Uniformity Standards for COYU

54. The Office of the Union introduced document TWC/21/7. Most experts considered that it was necessary to clarify the procedure by which decisions were taken, and the probability used in each case, by means of a diagram. An expert from France wondered whether the aim of the document was to make a recommendation for cases where an agreed probability value was possible, or to report what was being used by all the countries, an aspect he considered might be more helpful and easier to update.

55.\* The TWC agreed that a new document on probability levels for COY should be prepared for the twenty-second session. The Office of the Union was requested to collect the information and to prepare the document. The TWC agreed that an explanation on the way decisions are taken when using the COY approach should be included in the request and that the replies should be organized by type of decision. Annex II to this report contains the agreed explanation to be included in the request. With regard to the recommendation for probability levels, the TWC agreed that the first step would be to make recommendations for those crops where there was already a harmonized level. For other crops, the different levels could be presented and the possibility to develop a recommended level discussed by the TWC.

56.\* The TWC considered that, once agreed, this information would be included in the relevant sections of TGP/9 and TGP/10.

#### Calculation of Phenotypic Distances

57. Mr. Sylvain Grégoire and Mr. Christophe Chevalier (France) presented document TWC/21/4 and made a presentation on the GAÏA software. Experts from Germany explained that they were testing the program and considered that the user’s manual was very good. They added that the program offered several possibilities for use and they considered that good

recommendations on the conditions for its use should be prepared, especially when building up morphological distances, for which experience in DUS testing was necessary.

58.\* The TWC noted that the use of this software required careful consideration by crop experts and, in particular, attention was needed in the weighting attributed to differences in each characteristic and the combination of data from different years and locations. The TWC agreed that the Office of the Union should issue a questionnaire to all recipients of the GAÏA software, requesting information on the crops to which the software was being applied, with the outcome to be reported to the TWC at its next session.

59.\* It was agreed that the user guide for the GAÏA system and contact details for obtaining the GAÏA CD-ROM should be posted on the first restricted area of the UPOV Website. It noted that a Website hotline might be established by the experts from France if the uptake of the software justified such a feature.

60.\* The TWC agreed that methods used in GAÏA were to be viewed as methods under development and that this should be clarified in the UPOV Website.

#### List of Statistical Documents

61.\* The TWC agreed to update the list of statistical documents and to post this on the TWC section of the UPOV Website.

#### Future Program, Date and Place of the Next Session

62.\* At the invitation of the expert from country, the TWC agreed to hold its twenty-second session in Japan, from June 14 to 17, 2004. During the twenty-second session, the TWC planned to discuss or re-discuss the following items:

1. Opening of the session
2. Adoption of the agenda
3. Short reports on developments in plant variety protection
  - (a) Reports from members and observers (oral reports by the participants)
  - (b) Reports on developments within UPOV (oral report by the Office of the Union)
4. Molecular Techniques
  - (a) Report on developments (oral report by the Office of the Union)
  - (b) Statistical methods for data produced by biochemical and molecular methods
5. Project to consider the Publication of Variety Descriptions (document to be prepared by the Office of the Union)

6. UPOV Databases (document to be prepared by the Office of the Union)
7. TGP document

*TGP/8 Use of Statistical Procedures in DUS Testing*

- TGP/8.1 Introduction (document to be produced by the experts from France and the Netherlands)
- TGP/8.2 Validation of Data and Assumptions (document to be produced by the experts from Denmark and the Netherlands)
- TGP/8.3 Experimental design Practices (document to be produced by the experts from Germany and the Netherlands)
- TGP/8.4 Types of Characteristics and Their Scale Levels (document to be produced by the expert from Germany)
- TGP/8.5 Statistical Methods for DUS Examination (document to be produced by the experts from the United Kingdom)
- TGP/8.6 Examining DUS in Bulk Samples (document to be prepared by the experts from Denmark)

*TGP/9 Examining Distinctness*

(document to be compiled by the Office of the Union in conjunction with the relevant drafters of the individual sections of TGP/9)

*TGP/10 Examining Uniformity*

- TGP/10.2 Assessing Uniformity According to the Features of Propagation (document to be produced by the expert from Germany)
- TGP/10.3.1 Recommended Statistical Methods: COYU (document to be produced by the experts from the United Kingdom)
- TGP/10.3.2 Recommended Statistical Methods: Off-Types (document to be produced by experts from Germany and the United Kingdom)
- TGP/10.3.3 Recommended Statistical Methods: Segregation Ratios

8. Assessment of distinctness for segregating characteristics (document to be produced by experts from France and the United Kingdom)
9. Incomplete block design (document to be produced by the experts from Denmark, Poland and the United Kingdom)
10. Efficiency of incomplete block designs in DUS herbage trials (document to be produced by the expert from United Kingdom)
11. Generalized linear models (logistic regression approach) (document to be produced by the expert from Kenya)

12. Standard probability levels for COY (document to be produced by the Office of the Union)
13. COY: the selection of the optimum number of plants (document to be prepared by experts from Denmark and Germany)
14. COYU Methodology (document to be prepared by Mr. Piepho from Germany)
15. COYU: moving average (document to be prepared by the expert from Germany)
16. Calculation of phenotypic distances (document to be produced by the Office of the Union)
17. Image analysis in peas (document to be prepared by the expert from the United Kingdom)
18. Date and place of the next session
19. Future program
20. Report on the conclusions of the session (if time permits)

*63. This report has been adopted by correspondence.*

[Annex I follows]



ANNEX I

LIST OF PARTICIPANTS

I. MEMBERS

CZECH REPUBLIC

Lydie ČECHOVÁ (Mrs.), Central Institute for Supervising and Testing in Agriculture, Ustřední kontrolní a zkušební ústav zemědělský, 56901 Hradec Nad Svitavou (tel.: +420 461 535 003, fax: +420 461 22 748, e-mail: lydie.cechova@ukzuz.cz)

DENMARK

Gerhard DENEKEN, Head, Department of Variety Testing, Danish Institute of Agricultural Sciences, Ministry of Food, Agriculture and Fisheries, Postbox 7, Teglvaerksvej 10, Tystofte, 4230 Skaelskoer (tel.: +45 58 160601, fax: +45 58 160606, e-mail: gerhard.deneken@agrsci.dk)

Jens Henrik BADSBERG, Biometry Research Unit, Department of Animal Breeding and Genetics, Danish Institute of Agricultural Sciences, Post Box 50, 8830 Tjele (tel.: +45 89 99 16 60, fax: +45 89 99 13 00, e-mail: jenshenrik.Badsberg@agrsci.dk)

Kristian KRISTENSEN, Biometry Research Unit, Department of Animal Breeding and Genetics, Danish Institute of Agricultural Sciences, Post Box 50, 8830 Tjele (tel.: +45 89 99 12 09, fax: +45 89 99 13 00, e-mail: kristian.kristensen@agrsci.dk)

Erik LAWAETZ, Department of Variety Testing, Postbox 7, Teglvaerksvej 10, 4230 Skaelskoer (tel.: +45 5816 06 03, fax: +45 5816 06 06, e-mail: erik.lawaetz@agrsci.dk)

ESTONIA

Anna VARES (Mrs.), Viljandi Variety Testing Centre, P.O. 71024, Viljandi (tel.: +372 433 4054, fax: +372 433 4406, e-mail: sordi@tmkk.ee)

FINLAND

Sami MARKKANEN, KTTK Seed Testing, P.O. Box 111, 32201 Loimaa (tel.: +358 2 76056251, fax: +358 2 76056222, e-mail: sami.markkanen@kttk.fi)

## FRANCE

Christophe CHEVALIER, SNES, rue G. Morel, 49071 Beaucouze Cedex  
(tel.: +33 02 41 22 58 19, e-mail: christophe.chevalier@geves.fr)

Vincent GENSOLLEN, Groupe d'étude et de contrôle des variétés et des semences (GEVES),  
711 rue J.F. Breton, 34090 Montpellier (tel.: +33 4 67 04 35 85, fax: +33 4 67 63 37 58,  
e-mail: vincent.gensollen@geves.fr)

Sylvain GRÉGOIRE, Groupe d'étude et de contrôle des variétés et des semences (GEVES),  
Ministère de l'agriculture (INRA), 78995 Guyancourt Cedex (tel.: +33 1 30 83 3600,  
fax: +33 1 30 57 0147, e-mail: sylvain.gregoire@geves.fr)

## GERMANY

Uwe MEYER, Referatsleiter Informationstechnologie, Referat 111, Bundessortenamt,  
Postfach 61 04 40, 30604 Hannover (tel.: +49 511 9566 689, fax: +49 511 563 362,  
e-mail: uwe.meyer@bundessortenamt.de)

Beate RÜCKER (Mrs.), Referatsleiterin DUS-Prüfung, Bundessortenamt, Osterfelddamm 80,  
30627 Hannover (tel.: +49 511 956 6639, fax: +49 511 5633 62,  
e-mail: beate.ruecker@bundessortenamt.de)

## HUNGARY

Zoltán VERESS, National Institute for Agricultural Quality Control (OMMI), Keleti K. u. 24,  
1024 Budapest II (tel.: +36 1 212 3127, fax: +36 1 212 5800,  
e-mail: veressz@ommi.hu)

## JAPAN

Koichiro TANAKA, 828-402, 3-2-1 Azuma, Tsukuba City, Ibaragi 3050031  
(tel.: +81 298 51 7665, fax: + 81 298 51 7665, e-mail: kouichi@ncss.go.jp)

## KENYA

John M. NGENY, Biometrician, Plant Variety Protection Office, Kenya Plant Health  
Inspectorate Service (KEPHIS), P.O. Box 49592, Waiyaki Way, Nairobi  
(tel.: +254 02 444 0087, fax: +254 02 444 8940, e-mail: kephis@nbnet.co.ke)

## MEXICO

Porfirio RAMÍREZ Vallejo, Breeder and Professor-Investigator, Colegio de Postgraduados  
(CP), Km. 36.5 Carretera México-Texcoco, 56230 Montecillo (tel.: +01 595 9520200 ext. 1590,  
fax: +52 55 5804 5962, e-mail: ramirez@colpos.mx)

## NETHERLANDS

Jac THISSEN, Biometris, Plant Research International, Veldheimweg 40, 6871 CD Renkum (tel.: +31 317 476 936, fax: +31 317 418 094, e-mail: Jac.Thissen@wur.nl)

Kees VAN ETTEKOVEN, Responsible for PBR and Registration of Vegetable Varieties, Naktuinbouw, Sotaweg 22, Postbus 40, 2370 AA Roelofarendsveen (tel.: +31 71 332 6128, fax: +31 71 332 6363, e-mail: c.v.ettekoven@naktuinbouw.nl)

## POLAND

Wieslaw PILARCZYK, Expert Statistician, Centralny Ośrodek Badania Odmian Roslin Uprawnych (COBORU) Research Center for Cultivar Testing, 63-022 Słupia Wielka (tel.: +48 61 285 2341, Ext. 224, fax: +48 61 285 35 58, e-mail: wpilar@owl.au.poznan.pl)

## ROMANIA

Eugenia NICOLAE (Mrs.), IT Specialist, State Office for Inventions and Trademarks, 5, Ion Ghica Sector. 3, Bucharest (tel.: +40 21 314 2102, fax: +40 21 1 312 3819, e-mail: jeni.nicolae@osim.ro)

Adriana PARASCHIV (Mrs.), Head, State Office for Inventions and Trademarks (OSIM), 5, Ion Ghica, Sector 3, 70018 Bucharest (tel.: +40 21 3155698, fax: +40 21 3123819, e-mail: adriana.paraschiv@osim.ro)

## RUSSIAN FEDERATION

Sergej GERASSIMOV, State Commission of the Russian Federation for Selection Achievements Test and Protection, Orlicov per. 1/11, 107139 Moscow (tel.: +70 95 204 49 26, fax: +70 95 207 86 26, e-mail: desel@agro.aris.ru)

## SLOVAKIA

Lubomir HORVATH, Central Institute for Control & Testing in Agriculture, Matúskova 21, 83316 Bratislava (tel.: +421 2 6446 2089, fax: + 421 2 6446 2089, e-mail: horvath@uksup.sk)

## UNITED KINGDOM

Adrian M.I. ROBERTS, The University of Edinburgh, Biomathematics & Statistics Scotland (BioSS), James Clerk Maxwell Building, The King's Buildings, Edinburgh EH9 3EP (tel.: +44 131 650 4893, fax: +44 131 650 4901, e-mail: adrian@bioss.ac.uk)

Sally WATSON (Ms.), Biometrics Division, DARD, The Queen's University of Belfast, Newforge Lane, Belfast BT9 5PX (tel.: +44 2890 255 292, fax: +44 2890 255 008, e-mail: sally.watson@dardni.gov.uk)

URUGUAY

Mariela Ibarra Dutra (Mrs.), Instituto Nacional de Semillas (INASE), C. Bertolotti S/No y Ruta 8, km. 29, CC 7731, Pando-Canelones (tel.: +598 2 288 70 99, fax: +598 2 288 70 77, e-mail: inasemid@adinet.com.uy)

II. OBSERVER

INTERNATIONAL SEED FEDERATION (ISF)

Kurt HJORTSHOLM, Danish Association of Plant Breeders, Noerremarksvej 67, Sejet, 8700 Horsens (tel.: +45 75 68 21 77, fax: +45 75 68 21 04, e-mail: KHJ@sejet.dk)

III. OFFICER

Uwe MEYER, Chairman

IV. OFFICE OF UPOV

Peter BUTTON, Technical Director, 34, chemin des Colombettes, 1211 Geneva 20, Switzerland (tel. +41-22-338 8672, fax +41-22-733 03 36, e-mail: peter.button@upov.int, Website: <http://www.upov.int>)

Raimundo LAVIGNOLLE, Senior Counsellor, 34, chemin des Colombettes, 1211 Geneva 20, Switzerland (tel. +41-22-338 9565, fax +41-22-733 0336, e-mail: raimundo.lavignolle@upov.int)

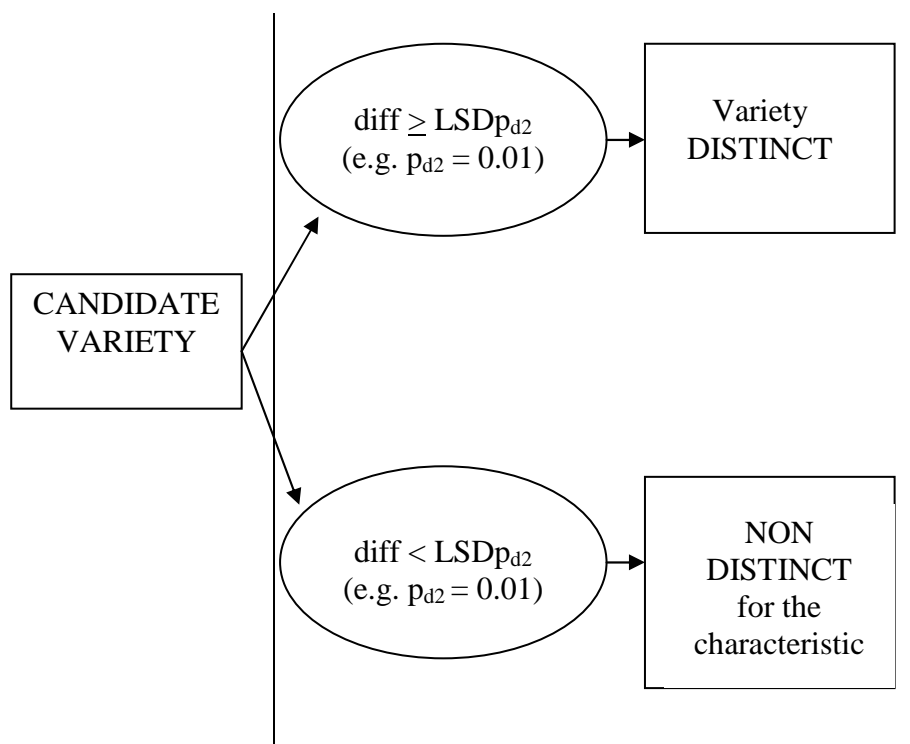
[Annex II follows]



Figure 1. COYD and COYU decisions and standard probability levels ( $p_i$ ) in Case A

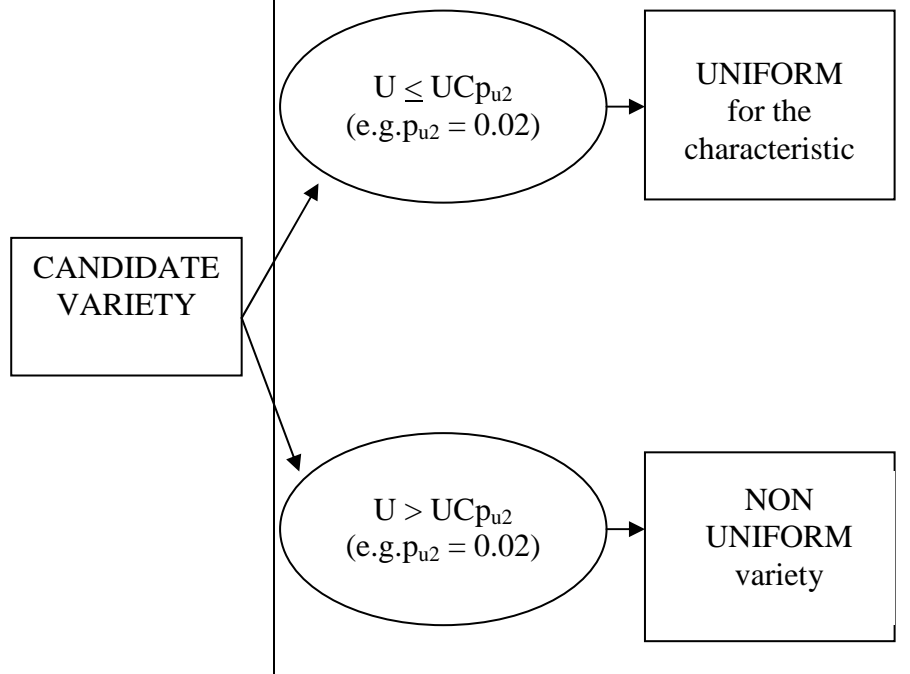
a) COYD

Decision after 2<sup>nd</sup> cycle



b) COYU

Decision after 2<sup>nd</sup> cycle



NOTE:-

“diff” is the difference between the means of the candidate variety and another variety for the characteristic.

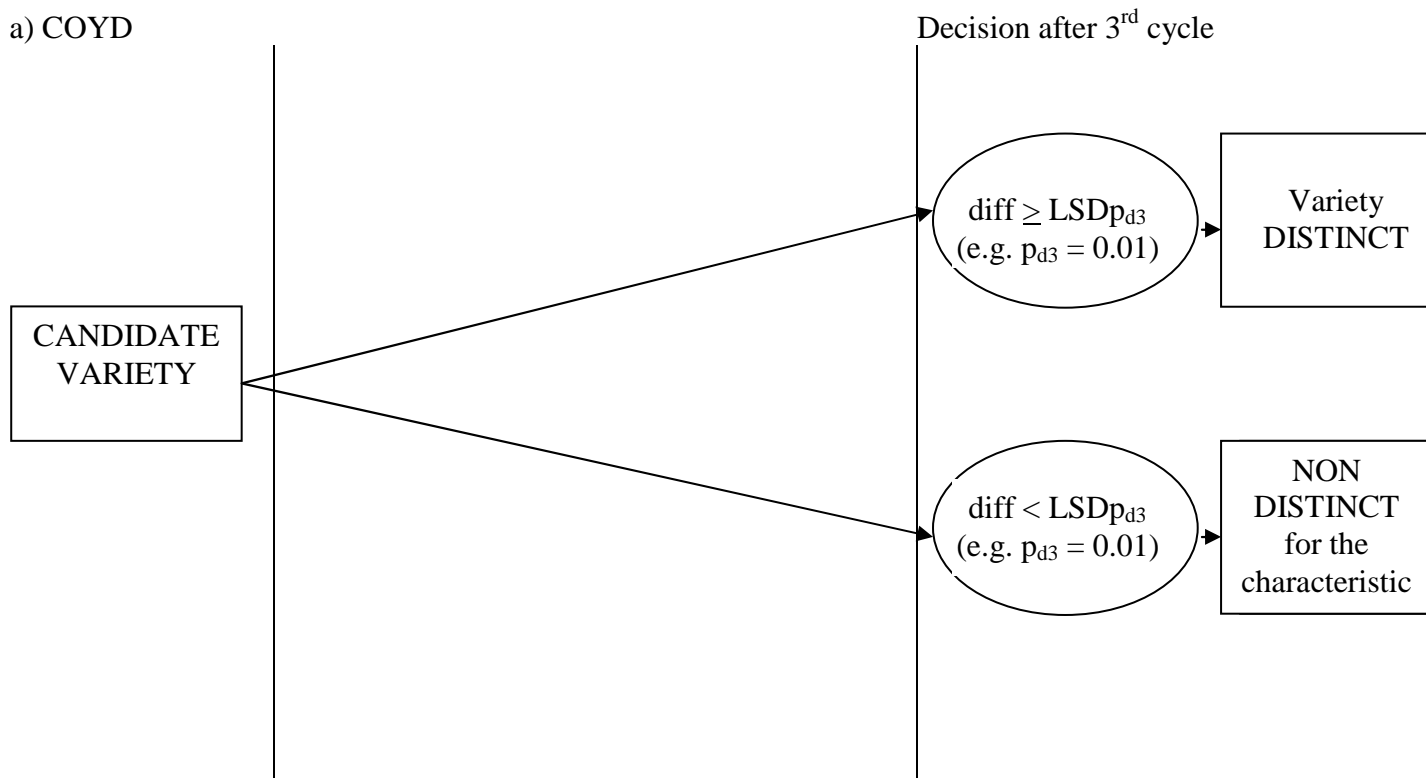
LSD<sub>p</sub> is the COYD criterion calculated at probability level p.

“U” is the mean adjusted log(SD+1) of the candidate variety for the characteristic.

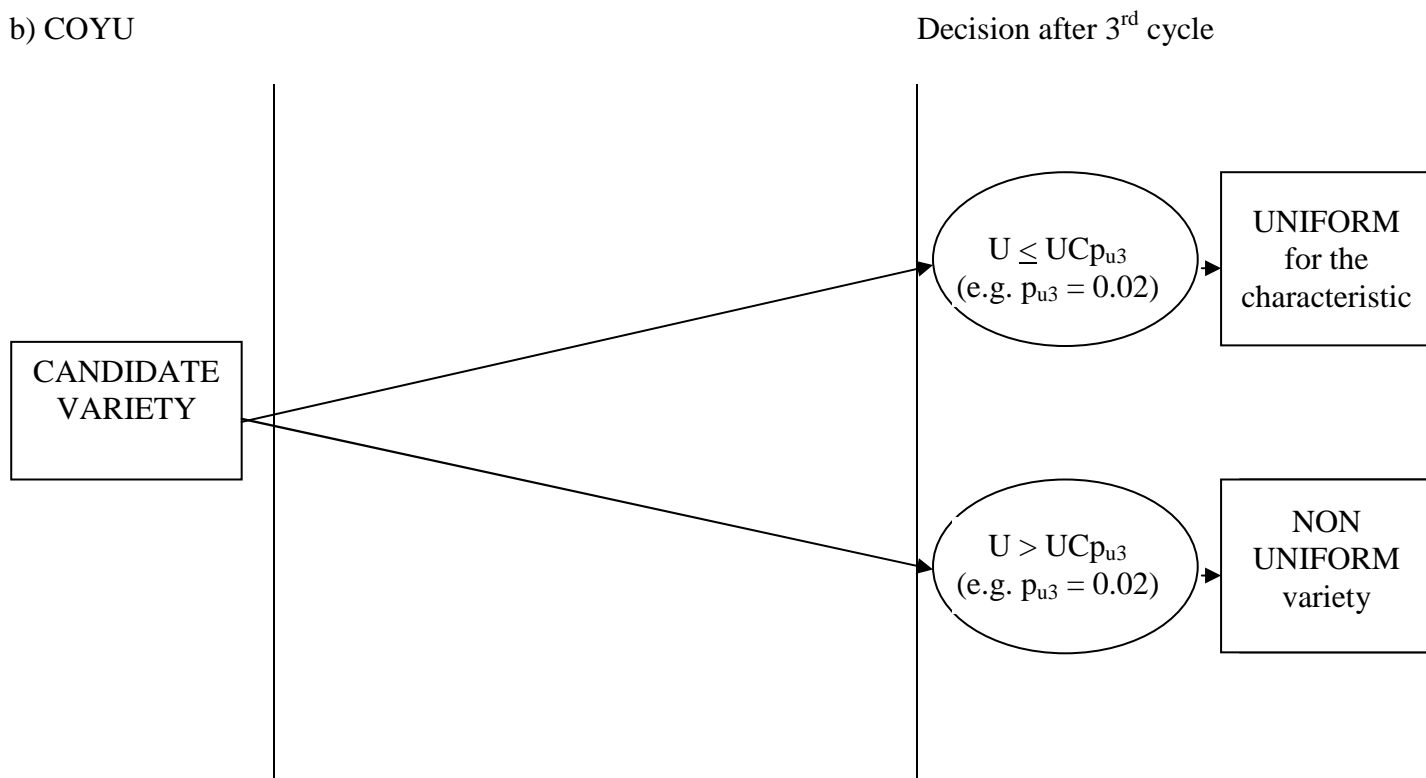
UC<sub>p</sub> is the COYU criterion calculated at probability level p.

Figure 2. COYD and COYU decisions and standard probability levels ( $p_i$ ) in Case B

a) COYD



b) COYU



NOTE:-

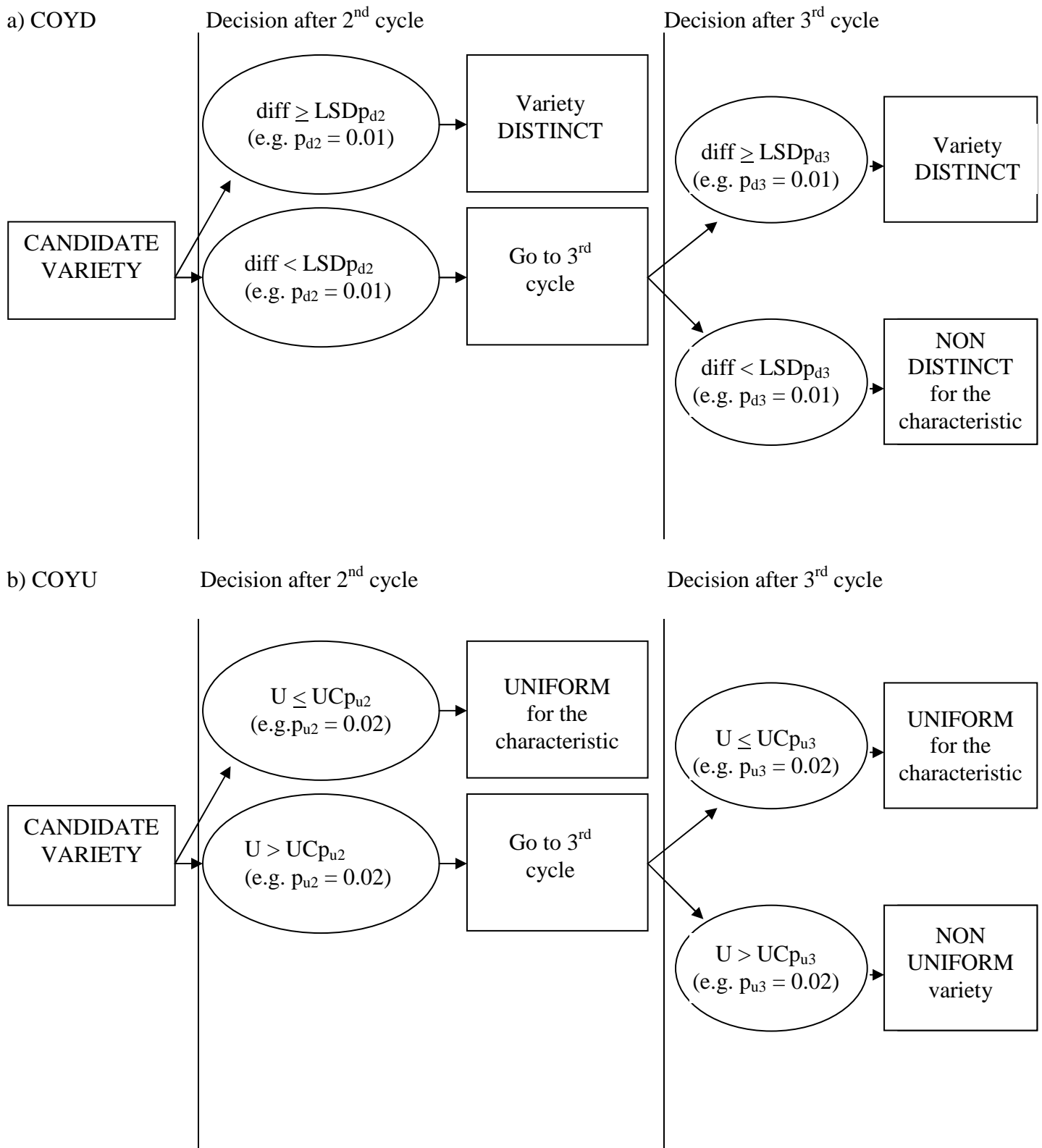
“diff” is the difference between the means of the candidate variety and another variety for the characteristic.

LSD $p$  is the COYD criterion calculated at probability level  $p$ .

“U” is the mean adjusted  $\log(\text{SD}+1)$  of the candidate variety for the characteristic.

UC $p$  is the COYU criterion calculated at probability level  $p$ .

Figure 3. COYD and COYU decisions and standard probability levels ( $p_i$ ) in Case C



NOTE:-

“diff” is the difference between the means of the candidate variety and another variety for the characteristic.

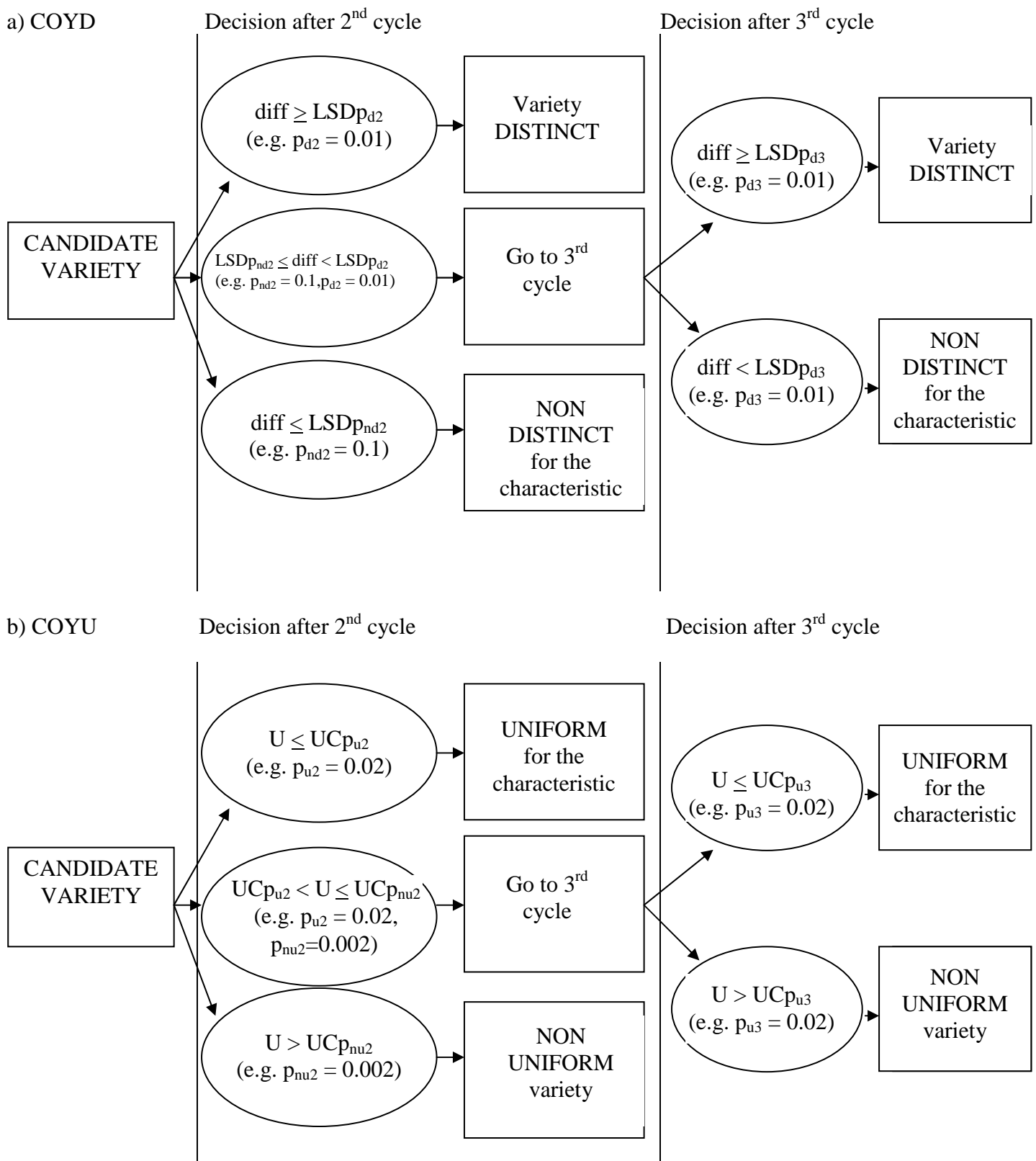
LSDp is the COYD criterion calculated at probability level p.

“U” is the mean adjusted  $\log(\text{SD}+1)$  of the candidate variety for the characteristic.

UCp is the COYU criterion calculated at probability level p.



Figure 4. COYD and COYU decisions and standard probability levels ( $p_i$ ) in Case D



NOTE:-

“diff” is the difference between the means of the candidate variety and another variety for the characteristic  
LSDp is the COYD criterion calculated at probability level p.

“U” is the mean adjusted  $\log(SD+1)$  of the candidate variety for the characteristic.

UCp is the COYU criterion calculated at probability level p.

[Annex III follows]