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UPOV

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

TECHNICAL WORKING PARTY ON AUTOMATION AND COMPUTER PROGRAMS

Eighteenth Session
Kyiv, June 12 to 15, 2000

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 Working Party") held its eighteenth session in Kyiv, Ukraine, from June 12 to 15, 2000. The list of participants is reproduced in Annex I to this report.

2. The session was opened by Mr. Wieslaw Pilarczyk (Poland) who welcomed the participants. On behalf of the Working Party, Mr. Pilarczyk thanked Mr. Talbot, who would be retiring, for all he had done for the TWC.

Adoption of the Agenda

3. The Working Party adopted the agenda as reproduced in document TWC/18/1, after having agreed to change its order, as proposed by the Chairman.

Overview of the Ukrainian System of Plant Variety Protection

4. Mrs. Liubov P. Bochkarova, Head of the DUS Test Department from the State Commission of Ukraine for Testing and Protection of Plant Varieties, gave an overview of the

plant variety protection system of Ukraine. She said that they were working on updating their national test guidelines to be more in line with the UPOV Test Guidelines. At the moment there were protected varieties for 10 crops and a new project would extend the possibility for protection to 150 crops. She said that the Commission had three DUS Testing Stations, that 528 cultivars were under tests and that for 43 of them an application had been made for plant breeder's rights. She concluded saying that their main task at the moment was the development of their reference collection and the training of their crop experts.

Report on Subjects of Special Interest to the Working Party Raised During the Thirty-sixth Session of the Technical Committee

5. The Office of the Union gave a brief report on major points of discussion in the Technical Committee. It recommended reading the full report of the Technical Committee, which would be available in due course (TC/36/11 Prov.).

6. The Working Party noted that the Technical Committee had held its thirty-sixth session in Geneva from April 3 to 5, 2000.

7. Test Guidelines: The Working Party noted that the Technical Committee had adopted the following Test Guidelines after having agreed to changes proposed orally by the Editorial Committee:

TG/15/2(proj.): Pear/Poirier/Birne/Peral
TG/77/8(proj.): Gerbera/Gerbera/Gerbera/Gerbera
TG/81/5(proj.): Sunflower/Tournesol/Sonnenblume/Girasol
TG/173/2(proj.): Witloof, Chicory/Chicorée, Endive/Zichorie/Endivia
TG/174/2(proj.): Iris (bulbous)/Iris (bulbeux)/Iris (zwiebelbildende)/Lirio (bulboso)
TG/175/2(proj.): Kangaroo Paw/Anigosanthe de Mangles/Kängurublume/ Anigozanthos
TG/176/2(proj.): Osteospermum/Osteospermum/Osteospermum/Osteospermum

8. General Introduction to Test Guidelines. The Working Party noted that the Technical Committee had discussed the Revision of the General Introduction to Test Guidelines (TG/1/2) and noted the documents TC/36/5, TC/36/6 and TC/36/7. It noted that the Technical Committee had decided that the Enlarged Editorial Committee should discuss the documents in detail and send the outcome to all the Technical Working Parties and also to the Administrative and Legal Committee of UPOV for discussion during year 2000.

9. UPOV ROM. The Working Party took note that the Technical Committee had noted the full acceptance by the Technical Working Parties of the inclusion of technical information in the UPOV ROM and that the Technical Committee had agreed to include the information of item 5 of the Technical Questionnaire of the Test Guidelines and to take actions to include the UPOV Taxon Code as well.

10. Supporting evidence. The Working Party noted that the Technical Committee had discussed the possible use of supporting evidence for the assessment of DUS and that the Technical Committee had considered that it could be used only if the expert was convinced and if clear rules were established. It also noted that the Technical Committee had heard the position of ASSINSEL against the use of supporting evidence in cross-fertilized crops and that the Vice Secretary-General had suggested that, from a legal point of view, it was not

acceptable to consider supporting evidence as something different from a DUS characteristic, where the proof of Distinctness is based on supporting evidence.

11. Consequences of the introduction of new characteristics in already existing varieties. The Working Party noted that the Technical Committee had discussed the consequences of introducing new characteristics in the DUS examination and in particular the possibility that existing varieties might not be uniform for that new feature. The Working Party noted that the Technical Committee had discussed the following points related to this issue: the possibility of plagiarism; that both new and already existing varieties should be uniform for the characteristics used for distinctness; that a longer list of characteristics could be a burden for the maintenance of the variety; that further breeding from existing varieties should not be forbidden.

12. Management of reference collections. The Working Party was informed that the Technical Committee had noted that the UPOV Convention required consideration of DUS assessment on a worldwide basis, and that the Technical Committee was aware of the importance of an appropriate reference collection of varieties and of developing tools and procedures that would allow for a selection of the closest varieties to the candidate with reasonable confidence. The Technical Committee expected that the Technical Working Parties would continue discussing this issue as part of the complementary documents (TGP/4 and TGP/12) for the New General Introduction to Test Guidelines.

13. Example varieties. The Working Party was informed that the Technical Committee had noted that, with an increasing number of UPOV member States, it was becoming more difficult to reach universal agreement on the example varieties in the Test Guidelines and that the Technical Committee had requested the Technical Working Parties to discuss a paper prepared by the expert from France and to continue discussing this issue at the next session.

14. DUS testing in hybrid varieties. The Working Party noted that the Technical Committee had discussed the possibility of using the parental formula for DUS testing in hybrids and noted that there already was an agreed position on that in some TG documents. It noted a comment from the Vice Secretary-General that the UPOV Convention provided special treatment for hybrids in the definition of Stability and that access to parental lines was necessary when examining hybrids.

15. Duration of DUS Tests, early decision. The Working Party noted that the Technical Committee had discussed the possibility of making decisions using information from more than one location, to shorten the period of testing, and that the Technical Committee had concluded that it was open to such shortening of the DUS testing period, provided that clear rules were laid down to ensure the quality of the results.

16. Testing seed-propagated varieties of ornamental species. The Working Party was informed that the Technical Committee had noted the discussions at the TWO and at a meeting with crop experts and ASSINSEL on DUS assessment of seed-propagated varieties of ornamental species and that the Technical Committee had requested the TWO to continue the discussion on that issue and to provide further information.

17. Documents in electronic format. The Working Party noted that the Technical Committee had welcomed the creation of additional pages in the UPOV Web site containing documents in electronic format and their advance submission by electronic mail and proposed to continue with this development.

18. Possible use of molecular techniques for DUS testing. The Working Party noted that the Technical Committee had been informed of the main issues discussed in the sixth session of the Working Group on Biochemical and Molecular Techniques and DNA-Profiling in Particular (BMT) and had approved the proposal to create *Ad hoc* subgroups for the following species: Wheat, Oilseed Rape, Tomato, Maize and Rose.

19. Program for the thirty-seventh session of the Technical Committee. The Working Party noted that the thirty-seventh session of the Technical Committee would take place in Geneva from April 2 to 4, 2001. It was planned that the following items would be discussed during the session: progress reports and questions presented by the Technical Working Parties, revision of the General Introduction to Test Guidelines, reports from the *Ad hoc* advisory group on the possible use of molecular techniques for DUS testing. In addition, the Technical Committee would take decisions on the Test Guidelines submitted by the Technical Working Parties for final adoption.

Report on New Developments in Member States

20. The Working Party received short reports on plant variety protection from a number of countries. The expert from Ukraine reported that they had developed a new DUS program based on Excel 97. The experts from the United Kingdom said that they were extending the use of the COY approach to all agricultural crops, and extending the VISOR program of image analysis to more crops. They were also moving to cyclical planting of the reference collection in herbage crops. The expert from Denmark said that they had developed a new version of the administrative database on FOX-PRO VI. They were working on how to improve the validation of data, looking for ways to save work by reducing the sample size and also examining the discriminating power of characteristics used in DUS testing. The expert from Croatia mentioned that there had been a new Seed Institute in his country since January 2000. The expert from Germany reported that they had changed their Unix system to Windows NT. The expert from the Czech Republic reported on a program they use for plant variety data processing for DUS purposes. The expert from France reported on the change of the COY programs from FORTRAN to the SAS system and that they kept an NT version for any expert who wanted to use this format. He also referred to the extension of the COY approach to self-pollinated species and the translation of COY into French. He also mentioned the implementation of a system that would make full administrative and technical information available to every expert, modification in the VCU database and a system for recording data for those institutions that cooperate with the National Authority in VCU trials. Finally he mentioned the development of a program to relate phenotype and genotype (not used for DUS yet) and their work in quality assurance. The expert from Poland mentioned that a new law for the protection of new plant varieties was in the process of enactment and that it contained a provision for the extension to the protection of every species. They added that at that moment protection had been granted to plant varieties of 132 species. The expert from Greece reported on the development of an Internet page that would include information about plant variety protection and give the national list. Experts from Mexico mentioned the development of test guidelines for opuntia, tagetes, dahlia and maize.

New General Introduction to the Assessment of Distinctness, Uniformity and Stability in New Varieties of Plants

21. Discussions at the Working Party were based on document TC/36/8 “Revised Working Document for a New General Introduction to the Assessment of Distinctness, Uniformity and

Stability in New Varieties of Plants" (hereinafter referred to as "the revised General Introduction"), which resulted from discussions at the thirty-sixth session of the Technical Committee and the meeting of the Enlarged Editorial Committee held in April 2000, and on documents TC/36/5 and TC/36/7.

22. Procedures of revision undergone up to the present. The Office of the Union explained the procedure that had been followed from the beginning of the revision of the General Introduction up to the present time. It was explained that in December 1998, the first draft New Revised General Introduction (document TC/35/5) was sent for comments. The comments received resulted in a draft New Revised General Introduction (document TC/35/9) which was sent for discussion at the thirty-fifth session of the Technical Committee from March 22 to 24, 1999. During that session, the Technical Committee agreed to ask the Editorial Committee, enlarged by the Chairmen of the Technical Working Parties, to hold a meeting after its thirty-fifth session. The Technical Committee also agreed to have the New Revised General Introduction split into two documents, the first one to contain the general principles for DUS testing, which should remain unchanged for a long time, and the second one to contain detailed procedures and explanations, which could be updated regularly (a set of so-called TGP documents.)

23. The Enlarged Editorial Committee met after the Technical Committee session and again on May 10 and 11, 1999. As a result of those meetings, another draft New Revised General Introduction was prepared (document TC/35/13) and sent to the Working Parties who discussed it during their meetings held between June and September 1999. The comments made by the Technical Working Parties during their meetings in 1999 were considered in a new meeting of the Enlarged Editorial Committee in October 1999. As a result of that meeting, another draft New Revised General Introduction was prepared (document TC/36/6).

24. During the thirty-sixth session of the Technical Committee, April 3 to 5, 2000, the following schedule was decided: (1) in the middle of April 2000, documents TC/36/5 and TC/36/7 would be sent to all Technical Working Parties for comments by mid-May 2000; (2) a Circular would be sent to the Technical Committee asking for comments on open points by the end of April 2000; (3) by May 15, 2000, updated document TC/36/6 (TC/36/8) would be prepared and sent, together with comments from the Technical Committee on open points and a summary of changes to TC/36/6, to the Technical Committee and all Technical Working Parties for information; (4) comments received on TC/36/5 and TC/36/7 would be sent to all Technical Working Parties by May 20, 2000; (5) the new updated version of the draft New Revised General Introduction would be ready by September 15, 2000, for presentation at the Administrative and Legal Committee (CAJ) session in October 2000; (6) by February 1, 2001, the updated version of the draft New Revised General Introduction containing comments or proposals for rewording of some paragraphs made by the CAJ would be ready for presentation at the TC session in April 2001 and at the Council session either in April 2001 (if the Council meets in April) or in October 2001.

25. After the session of the Technical Committee, Circular U 2953 was sent asking for comments on the complementary ("TGP") documents to the draft New Revised General Introduction. Circular U 2954 was sent attaching a draft of the revised General Introduction (document TC/36/8), and asking for comments. Circular U 2976 was then sent containing the comments on the draft New Revised General Introduction and its complementary documents for discussion at all the Technical Working Parties during their meetings in year 2000.

Comments on the General Introduction to the Assessment of Distinctness, Uniformity and Stability in New Varieties of Plants

26. The Working Party agreed to the following changes in document TC/36/8:

p 66 To insert "For more information about characteristics and their scale levels see TGP/8".

p 67 Replace the example by "sex of plant".

p. 70 To be deleted.

p 71 to read "Provided that the combination is biologically meaningful, characteristics that are assessed separately may subsequently be combined, for example the ratio of length to width. Combined characteristics are treated in the same way as other characteristics."

p 100 To make reference to TGP/7 only.

p 112 to read "Cases can arise in which differences between two varieties may be observed in several separately assessed characteristics. They may subsequently be combined, provided that the combination is biologically meaningful, for example the ratio of length to width. Combined characteristics are treated in the same way as other characteristics."

P 123 To make the reference to Chapter 6.5.2 instead of Chapter 6.5.2.1.

Comments on the Open Points and on the Draft Complementary Documents to the General Introduction, Documents TC/36/5 and TC/36/7

27. The Working Party decided to discuss the following open points:

1.3 Selection from within a protected variety. The expert from France suggested introducing the subject in a different way in order to avoid giving the impression that this activity was encouraged by UPOV. The expert from Germany suggested avoiding mixing the concept of essentially derived variety with DUS testing. She added that the General Introduction was for DUS Testing and not for the assessment of essential derivation. Experts from Poland considered that reselection should be allowed provided that changes in the genetics of the variety were made as well. The expert from Mexico agreed to that and clarified that it was possible to change the expression of a characteristic by changing the allele frequency of a population.

1.4 Reference collections. The expert from France considered that there were two different things to be considered. On the one hand the reference collections, and on the other hand the notion of common knowledge. Most experts agreed to that.

1.5 Application of quantitative data. Several experts wondered if that was a real open point to the General Introduction.

1.7 Example varieties. Experts at the Working Party decided not to discuss this issue at the moment.

Documents Complementing the General Introduction ("TGP" documents)

28. Experts at the TWC discussed some general aspects of the complementary documents to the General Introduction. The expert from France suggested having guidance in how to prepare the complementary documents to the General Introduction to know what was expected from the experts working on them. An expert from the United Kingdom proposed that each TGP should have an overview document. Most experts agreed to the proposal.

29. Glossary of Statistical Terms. The Working Party noted document TWA/29/9. Most experts agreed that it was a good document. An expert from the United Kingdom highlighted the target audience of the document and considered that in spite of some amendments the general approach of the document should be kept.

30. The Combined-Over-Years Distinctness and Uniformity Criteria. The expert from the United Kingdom introduced document TWC/18/10. The document was an updated version of document TWC/15/7. The Working Party agreed that the document could be split into distinctness, which should go to TGP/9, and uniformity, which should go to TGP/10. The Working Party also agreed to revise the document based on the previous TC/33/7 instead of TWC/15/7.

31. Image and Image Analysis. The expert from France introduced document TWC/18/3. The document was intended to be the basis for document TGP/12. The document contained some definitions of image, digital image and image analysis. It considered the possible use of images and image analysis. He pointed out that the use of image analysis was not very different from visual assessment or other measurements obtained in the field or in the laboratory. In the first part of the document he explained that image and image analysis could be useful for giving the examiner an idea of the type of material submitted. The images could be kept as a record of the object measured and could be used for publications like National Gazettes. Digital images had several advantages: they were easy to copy and exchange, easy to enhance and manipulate, easy to store in databases, they allowed automatic measurements and comparison and image retrieval. He also considered that they improved efficiency, and that classical measurements could be made easily. It was also possible to analyze color and distribution. He mentioned the possibility of comparing electrophoretic gels, the possibility of comparing varieties when data was recorded in standard conditions and its use in post-control identification. He proposed the following steps for recording and using image analysis: (a) preparation of the object, (b) visual check of the object, (c) image acquisition, (d) image processing (non-specific and specific) and (e) interpretation.

32. An expert from UPOV recalled that the TWF and TWO would support the future development of these methods. An expert from the United Kingdom mentioned that they had found a way to standardize color measurement.

33. The Working Party agreed to include document TWC/18/3 in TGP/12 but considered that it should also contain contributions from the other TWPs.

34. Good Statistical Practices for DUS Assessment (TGP/8), Testing Distinctness (TGP/9) and Testing of Uniformity (TGP/10). Mr John Law, coordinator of TGP/8, TGP/9 and

TGP/10 introduced the approach to the preparation of these documents. He proposed that the documents used for the Workshop on Data Handling held in Kyiv on June 9 and 10, 2000, could be the basis for these documents and proposed the following structure for TGP/8:

1. Design and Layout of an Experiment

Julia Borys
Research Centre for Cultivar Testing, Slupia Wielka, Poland

Topics covered and related topics.
- Which statistical design to use?
- Resources required?
- Issues of the reference collection.

2. Planning the Data Recording

Beate Rücker
Bundessortenamt, Hanover, Germany

Topics covered and related topics.
- Does the species under examination have UPOV Test Guidelines?
- How are the characteristics to be considered e.g. quantitative, pseudo-qualitative, etc?
- Scale of recording (e.g. mm, cm or m for measured characters).
- Are individual plants to be grown and recorded and does this match with the appropriate UPOV (or National) Test Guidelines for both the distinctness and uniformity components of the DUS test?

3. Practical Recording Issues

Topics covered and related topics.
- Between recorder errors – use single recorder for recording a characteristic on all plots or if this is not possible then for at least whole replicates with a minimum time interval for completion of the characteristic recording.
- Where required record identified individual plants.
- Where plants are selected from within a plot, selection should be of material "… representative of the variety…"
- Recording of "missing" plants (i.e. -1 in the DUST system).
- Record variant plant material.

4. Outlier Detection and Data Validation

Erik A. Lawaetz
Department of Variety Testing, Danish Institute of Agricultural Sciences, Denmark

Topics covered and related topics.
- Material recorded clearly not "… representative of the variety …". Effects on both distinctness and uniformity assessments.
- Units of recording.
- Gross recording error or data transposition.
- Systematic trends e.g. recorder fatigue.

- Graphical methods – histograms within a variety; boxplots.
- Re-examination of the identified potentially aberrant observations.

5. Checking Assumptions

Topics covered and related topics.
- Check skewness, kurtosis, "normality".
- Role of Central Limit Theorem – for large n the mean of the sample will become progressively more "normally" distributed and n increases in size irrespective of the underlying distribution of the individual raw observations.
- Graphical methods (e.g. for detection of bi-modal or multi-modal distributions).
- What action(s) can be taken when assumptions are not met.
- Data transformations.

6. Use of Non-parametric Methods

Topics covered and related topics.

7. Similar Varieties

Wieslaw Pilarczyk
Agricultural University of Poznan and Research Centre for Cultivar Testing at Slupia Wielka, Poland

It was agreed by the Working Party that item 6 (above) "Use of Non-parametric Methods" and item 7 (above) "Similar Varieties" should go to TGP/12 "Non-traditional Non-morphological Characteristics and Methods for Variety Testing". Several experts considered that the documents from the Workshop on Data Handling should be expanded and in some cases rewritten to be in context with the General Introduction and some authors were willing to do so. One expert considered that since the TGP documents were addressed to the crop experts, they should follow their way of working. The Working Party also agreed to prepare a document called "Frequently Asked Questions".

Type of Characteristic and their Level of Scale

35. The Working Party noted document TWC/18/9 introduced by the expert from Germany. The expert considered that the present way of classification of characteristics into "truly qualitative", "quantitative" and "pseudo-qualitative" made no clear separation between the characteristics type, the scale for the assessed data and transformation of these data into a variety description. He considered that there were three situations from the description of the characteristic point of view. One was the way the characteristic was expressed in the trial, with a high level of information. Secondly the data recorded for the evaluation of the characteristic, with a medium level of information, and finally the data used for variety description, which had a low level of information. In the paper he considered the second and third situation. He explained that on the one hand crop experts distinguished between qualitative and quantitative characteristics on the basis of the way the characteristic was expressed in the field trial, and not in the scale level of data recorded in the trial. On the other hand, statisticians used to consider quantitative data, which could be continuous or discrete and expressed in a ratio or interval scale, as denoting quantitative characteristics and

qualitative data, which could be expressed in an ordinal or nominal scale, as denoting qualitative characteristics. He concluded that the above-mentioned UPOV categorization of characteristics made no clear separation between the scale levels of the underlying characteristics, the recorded data and the data transformed for the variety description, which could be misleading. He proposed that the TWC discuss the terminology and its definition in order to develop a harmonized proposal for discussion at all TWP's.

36. Experts from the United Kingdom supported the proposal and asked for diagrams to be included to clarify it. The expert from France also suggested that the paper could be part of the complementary document "Good Statistical Practices for DUS Assessment", TGP/8 of the General Introduction, and that the possibility that the same characteristic could be assessed either by measurements or by visual observation could be included in the document. The expert from the Czech Republic asked about the possibility of using the COY approach with less than twenty degrees of freedom. An expert from the United Kingdom replied that there were some general rules, but in some specific situations there was a recommendation about the minimum number of degrees of freedom. Nevertheless, he added, if there was experience in the crop, a lower number of degrees of freedom could be used at the proper level of confidence.

37. Some experts proposed drafting a table linking the position of the crop experts and the position of the statisticians in relation to the type of characteristics and type of data. One expert from Denmark proposed not to use the word quantitative and qualitative for the type of data because these two words already had a strong meaning for UPOV. The expert from Poland explained that the words "quantitative" and "qualitative" had also a clear meaning in genetic science. The expert from Germany agreed to change the name used to identify the type of data but he explained that it was necessary to have a clear definition of the new one. The expert from Mexico added that it was also necessary to highlight that the proposal related to the data and not to the type of characteristics.

38. A group of experts from Croatia, France, Germany, United Kingdom and Poland met to discuss possible improvement to document TWC/18/9. They focused on listing the statistic methods available for DUS assessment according to the different types of scales. They made the following table:

<table>
<tr><th colspan="2">Type of scale</th><th>Distinctness</th><th>Uniformity</th></tr>
<tr><td rowspan="2">Ratio</td><td>Continuous</td><td rowspan="4">COYD
Long terms LSD
Other methods
(2 out of 3)</td><td rowspan="4">COYU
2 out of 3
$S^2 \leq 1.6\ S^2$</td></tr>
<tr><td>Discrete</td></tr>
<tr><td rowspan="2">Interval</td><td>Continuous</td></tr>
<tr><td>Discrete</td></tr>
<tr><td>Ordinal</td><td>Discrete</td><td>(threshold model)</td><td>(threshold model)</td></tr>
<tr><td rowspan="2">Nominal</td><td>Discrete = 2</td><td rowspan="2">Decision table approach</td><td>Off-types approach</td></tr>
<tr><td>Discrete > 2</td><td>Decision table approach</td></tr>
</table>

39. Conclusion. The Working Party agreed that the expert from Germany would prepare a new version and circulate it to the participants of the meeting for comments and that the new paper should form part of TGP/8.

Incomplete Block Design Analysis

Efficiency of Incomplete Block Design in Winter Rape, Spring Rape and Yellow Mustard

40. The Working Party noted document TWC/18/4 introduced by the expert from Denmark. The document was an updated version of document TWC/17/8 and described the efficiency of three Danish trials with incomplete block designs in 1999 and some further comparisons of the efficiency from applying COY-D to data from trials which were laid out as incomplete block designs. Results were from 3 trials (1997, 1998 and 1999) with yellow mustard and spring rape and two trials with winter rape. The data from each trial had been analysed using three models: A) the model for a randomized block design, B) the model from an incomplete block design assuming that the block effects were fixed and C) the model for an incomplete block design assuming that the block effects were random. The calculations based on winter rape, spring rape and yellow mustard showed that the use of incomplete block design yielded lower COY-D LSD for most characteristics than complete block designs. The expert concluded that the results indicated that the use of incomplete block designs yielded better separations than complete block designs for most characteristics when using COY-D, although the benefit was generally small.

41. Some experts at the Working Party asked the expert whether he had not had problems with the randomization or whether he had also worked with grouping characteristics. The expert from Denmark replied that he did not have problems with the randomization and did not use grouping characteristics. In response to several queries the expert said that the different types of varieties, hybrids, inbred lines or open pollinated varieties had been sown all together in the same trial and that he considered it would even be possible to reduce the plot size. An expert from the Office of the Union asked what the advantages of the method were. The expert from Denmark replied that he considered that the use of incomplete block design was worthwhile when there were a large number of varieties but it was more difficult to evaluate the advantages of this design when working with grouping characteristics. In some crops or for some characteristics there were no advantages in the use of incomplete block design and that with the randomized incomplete block design it was not possible to see any difference in the field. The expert from France highlighted the difference in the different effect of the incomplete block design for characteristics shown in Table 3 of the document. It was explained that that was due to different genotype-environment interaction among the characteristics. Characteristic 6 was less influenced by the environment.

The Efficiency of Different Designs in DUS Trials on Pea Varieties

42. The Working Party noted document TWC/18/6 introduced by the expert from Poland. The document examined the efficiency of different designs on pea varieties. The experiment was performed in row column design comparing 120 varieties with two replications. The expert explained that data from seven characteristics had been used and for every characteristic the analysis of variance was performed according to five different models of observations: (a) completely randomized design – CB, (b) randomized completed block – RCB, (c) incomplete block with rows as blocks – IB-rows, (d) incomplete blocks with

columns as blocks - IB-columns, and (e) incomplete row-column design – IB-(R+C). The expert concluded that, for that set of characteristics of pea varieties, the experiment showed that the incomplete block design showed no clear advantage over randomized complete block or completely randomized designs. The expert was rather surprised with the results because incomplete block design had proved to be a very effective tool in VCU trials.

43. The expert from France mentioned that they had found the same results and added that it could be due to the higher influence of the environment in the VCU characteristics than in the case of DUS characteristics. An expert from Poland added that the results were surprising because pea was highly influenced by the environment. An expert from the United Kingdom mentioned that alpha design worked better in characteristics that showed the productivity of the varieties, which was the case of the characteristics used in the document TWC/18/4. Several questions were raised about the possible influence of the use of grouping characteristics in the varieties under study. The expert explained that to get the maximum efficiency of the alpha design a full randomization was required.

The Possibility of Application on Incomplete Block Designs in the DUS Trials with Groups of Genotypes

44. The Working Party noted document TWC/18/5 introduced by the expert from Poland. The paper considered the use of incomplete block designs when genotypes were divided into several groups. For these cases (varieties divided into groups) some restriction in the randomization was imposed. The expert added that for DUS trials researchers grouped varieties trying to get some of them in neighbouring plots in order to facilitate a direct comparison of similar ones. This was a different situation when compared to VCU trials, where incomplete block designs proved to be useful. He proposed two situations. The first was the design for “independent” groups of treatment. This was when there was no interest in making comparisons between treatments assigned to different groups. They were first randomly allocated and subsequently the varieties were grouped within blocks. The comparisons were limited to inter-treatments and when one or several groups consisted of a large number of genotypes, incomplete block design could be used, while for smaller groups randomized block design was more appropriate. The second design considered by the expert was the design limiting the in-between groups influence. This design was used when high neighbour influence could be expected to avoid placing selected varieties side by side. The so-called “interference groups” were formed with these varieties and some methods for the arrangement of the trials were mentioned. The efficiency of this design was smaller than that of alpha design with the same block size with no additional limitations in the randomization. The efficiency of these trials was highly dependent on the proper selection of the “interference groups”, a wrong selection possibly leading to a larger interference than with a standard design.

45. Some experts wondered about the usefulness of the second set of methods because for DUS trials all varieties of a group were randomly allocated. The expert from Poland agreed with that observation.

Design and Analysis of DUS Special Tests

46. The Working Party noted document TWC/18/7 introduced by an expert from the United Kingdom. He proposed statistical principles for the use of non-routinely examined

characteristics in the differentiation of a candidate variety. The document showed results from two trials with a very small difference occurring in the first trial and a clear difference in the second trial. The expert explained that two sources of variety-by-environment interaction were operating, both important, but the between-trials source was more important because it was not easy to limit the effect of it through increased replication of the trials and this source of variation determined how well the results would be replicated (robustness). He added that appropriate analysis in that case was one that combined the data from the two trials. He concluded that for the assessment of distinctness the statistical procedure should estimate the probability that the difference between the candidate variety and close neighbour might have occurred by chance and there was no difference between the varieties. Several factors should be considered, such as the adequate replication, effective blocking, randomization, appropriate analysis, a significance test and a significance level. He proposed that uniformity should be checked by comparison with the closest neighbour. He finally added that, in practice, in a special test it was not possible to have the same rigor as for standard characteristics.

47. Upon request from the expert from France, it was explained that the two trials had been planned from the beginning and that they had been done in a greenhouse to save time. The expert from Germany considered that uniformity should be assessed for every characteristic used for distinctness, including any special trial and that to increase the number of varieties would be more aligned with the usual way of testing varieties. An expert from the United Kingdom added that crop experts had experience in the examination of the varieties and they should know if there were problems with the uniformity of the variety and that they would repeat the trial with six different sowings. The expert from Mexico highlighted the importance of having knowledge about genotype-environment interaction. Another expert from the United Kingdom clarified that the use of special trials was in line with the use of supporting evidence and that a scientific board would examine the results. Several experts agreed to that.

48. The Working Party concluded that it had been well established that for characteristics strongly linked to the yield, the use of more efficient trial designs were beneficial where large number of varieties were tested. For some years the TWC had been exploring the potential gains from enhanced designs analysis for field DUS trials. A number of papers dealing with design issues had been presented at the eighteenth session of the Working Party. Documents TWC/18/4, TWC/18/5 and TWC/18/6 looked at the potential gain in trial efficiency from the use of alpha design in a range of crops and situations. Further work was still required to quantify all gains in trial efficiency and under what circumstances such gains may be achieved. The document TWC/18/7 dealt with special tests. The TWC would welcome comments and information from other Technical Working Parties on the existing use of these approaches.

Population Standard in Hybrids of Out-Breeding Species

49. The expert from the United Kingdom introduced document TWC/18/12, which was intended to raise some concerns in the procedure for the assessment of uniformity by fixing a population standard for off-types to hybrids of out-breeding species as stated in UPOV document TG/1/2, which was under revision at that moment. In the paper he proposed that, rather than using a fixed population standard, the assessment of uniformity should be based on relative tolerance limits based on hybrids of similar genetic make-up. This proposal had

already been considered under the revision of document TG/1/2 (see document TC/36/8, paragraph 140).

50. Most experts at the Working Party agreed to the proposal as mentioned in paragraph 140 of document TC/36/8. The expert from Poland explained that for vegetable varieties the parental lines were not tested therefore it was not easy to know whether the variety under test was a hybrid or not. She added that that was a problem for the testing authority. The expert from Germany said that it was very difficult to work without knowing whether the variety was a hybrid or not.

Supplement to the Special Applications of DUS Varieties Descriptions

51. The expert from Hungary introduced document TWC/18/14. The document is a continuation of document TWC/17/12 "Special Applications of DUS Variety Descriptions". The objective of the paper was to study the types of data and the distance functions involved in the study of variety descriptions, comparisons of evaluations made on variety descriptions for a period of years and comparisons of different versions of method (each characteristic has the same importance vs. the weighting of the characteristics). In the proposed method, the first step was to calculate the similarities, and secondly the calculation of the histogram of frequencies of similarities of the similarities. Most similar variety pairs would tend to zero distance in the frequency histogram. A control variety description was built up under certain conditions. When a histogram of that control variety approached the x axis, it was considered as the limit of the "similarity interval", the values of the varieties pairs falling under that value could be considered not to be distinct by chance and that point was the limit. He added that the repeatability was good. Up to that moment the method had only been applied to winter barley varieties. The procedure would be applied to varieties of other crops to get a more general statement.

52. The expert from France asked about the aim of the study. It was replied that the aim was to place similar varieties next to each other.

53. The Working Party asked the expert to continue the research with the method.

Use of COY-D and COY-U Approach in More Than One Location in Forage Crops

54. The expert from France introduced the document TWC/18/2. He recalled that DUS trials were usually carried out in one testing station and decisions taken after two or three years of testing. He considered that there were several reasons to explore other approaches for DUS trials than the previously mentioned, such as the existence of more than one testing station for a given crop, the possibility to have a decision within a shorter time, possible cooperation between two different countries and the possibility of carrying out more than one trial in the same year. He proposed the use of combined information from two testing centres according to the principles set out in the UPOV Convention and the COY approach could be used as well. In this case, soil and climatic conditions would be different and different situations might occur: (a) differences between locations were smaller than same location between years, in which case the examination would tend to be more lenient in distinctness if the same alpha level was kept; (b) differences between locations were of the same order as at the same locations between years, in which case the test was similar to the usual practice and

(c) when differences between locations were bigger than on the same location between years, in which case the test would tend to be more strict than the usual practice. Therefore he gave several examples and graphical representation to show differences between varieties and the interaction between locations and years. He concluded that, although currently not acceptable, when information was available and locations sufficiently different, the use of combined data from more than one testing centre could be used for the assessment of distinctness. The advantages would be more data and information on the consistency of the differences in different environmental conditions.

55. When asked about the criteria for selecting two locations, the expert from France replied that the aim was to have consistency in the results between the locations. Some experts from the United Kingdom wondered about the real need for more than one location and also expressed some concerns on how to get a description of the variety with information from two different environments. An expert from Ukraine mentioned that they used two centres for DUS testing. An expert from the Office of the Union mentioned that information from different locations was used when accepting the technical report from another testing authority. The expert from Denmark considered that to be a different situation because in that case it was agreed to take up the report, whilst having more than one location gave more chances to the variety to be considered distinct. He highlighted that when DUS trials were made in two locations, special care should be taken in order to avoid taking some characteristics from one location and others from the second location.

Telecommunications, Exchangeable Software and Contacts

56. The Working Party noted document TWC/18/11 on telecommunications, exchangeable software and contacts. The document is an update of the previous TWC/17/4. It contained information downloaded from the Web site http//www.bioss.sari.ac.uk/upov: an e-mail list of participants in the different UPOV Technical Working Parties, exchangeable software used by member States, database management systems in use, a COYD on line demonstration and an index of TWC papers from 1986 to 1999. The document also contained the links from the UPOV Web page, the e-mail address list, and the JAVA version of the COYD program, which allows an exploration of COYD on line.

57. The expert from the United Kingdom wondered about continuing with the e-mail bulletin board. At that moment, there were 37 members registered, 13 related to UPOV and very few messages had been received. He said that they would continue hosting the electronic e-mail board for one year, but he considered that with the development of the Web page from the Office of the Union it would be better if UPOV could host it. The expert from France supported the idea that the Office of the Union could host it as it could also do the same for other Technical Working Parties. He also thanked the experts from Germany for providing information that enabled French experts to check their new computer programs.

Developments in DUST for Windows

58. The Working Party noted document TWC/18/13 introduced by the expert from the United Kingdom. The most important developments were an expansion of the main module for COYD, and development of INTR9, a Windows version of the MSDOS module DUS9 used to compare two specific varieties within a year or over years and now able to work with

"cyclic control" type data. Finally, improvements in the selection for analysis of varieties belonging to maturity groups to the candidate one by means of a filter file were mentioned.

Workshop Report

59. Mr. Kristian Kristensen, coordinator of the Workshop on Data Handling which took place on June 9 and 10, 2000, in Kyiv, gave a brief report on that activity. He thanked the lecturers for their participation and mentioned that thirty-one participants from seventeen different countries had attended the Workshop. The main objective was to introduce the main statistical principles used in DUS testing and to give some expertise in the use of the COY program. He recommended repeating the activity in the future.

60. The Working Party thanked Mr. Kristensen and the other experts involved in the organization of the Workshop and agreed to repeat the activity if possible.

Future Program, Date and Place of the Next Session

61. At the invitation of the expert from the Czech Republic, the Working Party agreed to hold its nineteenth session in Prague, from June 4 (9 a.m.) to 7, 2001 (5 p.m.). During the nineteenth session, the TWC plans to discuss or re-discuss the following items:

(a) Report on subjects of special interest to the Working Party raised during the thirty-sixth session of the Technical Committee

(b) Questions raised by other Technical Working Parties

(c) Report on new developments in member States (oral reports)

(d) UPOV ROM Plant Variety Database (oral report)

(e) Revision of the General Introduction to Test Guidelines

(f) Summarized paper on image analysis

(g) Spatial dependency and block designs (the expert from the United Kingdom to prepare a document)

(h) Long-term alpha design trial on sugar beet (experts from the United Kingdom to prepare a document)

(i) Incomplete block design – new results of pea (the expert from Poland to prepare a new document)

(j) Report on developments by the subgroups on molecular techniques

(k) Telecommunications, exchangeable software and contacts (the expert from the United Kingdom to receive updated information and prepare updated versions of documents)

(l) Developments in the World Wide Web

(m) List of statistical documents prepared by the TWC

(n) List of statistical documents containing recommendations or methods of possible interest to the Technical Working Parties

(o) Design and analysis of DUS Special Tests (the expert from the United Kingdom to prepare a new document)

(p) Assessment of uniformity in bulk samples (the expert from Denmark to prepare a document)

(q) Review of multivariate approach of distinctness and uniformity (the expert from France to prepare a document).

Retirement

62. The Working Party noted that Mr. Mike Talbot would be retiring and that this was the last meeting in which he would participate. Mr. Talbot had been participating in the TWC since its first session. The Working Party thanked him for his fruitful work at the TWC and wished him a happy retirement.

Visits, Demonstrations

63. In the afternoon of June 14, 2000, the Working Party visited the Ukrainian Museum of Folk Architecture and Peasant Homes. The State Commission for Testing and Protection of Plant Varieties of Ukraine offered a dinner.

64. This report has been adopted by correspondence.

[Annex I follows]

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[End of Annex II and of document]