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UPOV

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

TECHNICAL WORKING PARTY ON AUTOMATION AND COMPUTER PROGRAMS

Fifteenth Session
Budapest, June 3 to 5, 1997

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 fourteenth session in Budapest, Hungary, from June 3 to 5, 1997. The list of participants is reproduced in Annex I to this report.

2. Dr. László Bódis, Deputy Director General of the National Institute for Agricultural Quality Control (COMMI), welcomed the participants to his institute in Budapest. The session was opened by Mr. John Law (United Kingdom), Chairman of the Working Party.

Adoption of the Agenda

3. The Working Party adopted the agenda as reproduced in document TWC/15/1, after having agreed to change its order, as proposed by the chairman, to delete items 6(b) Possibilities of Using Biometry to Help in the Establishment of Guidelines with Respect to Visually-assessed Characteristics, 11(d) List of Statistical Documents Containing Recommendations and 11(e) Glossary of Definitions, and to add the items (a) Electrophoresis in Ryegrass and (b) Spatial Dependence.

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

4. Mr. M.-H. Thiele-Wittig gave a brief report on the main items discussed during the previous session of the Technical Committee and referred participants needing further details to the full report reproduced in document TC/33/11.

Questions Raised by Other Technical Working Parties and Image Analysis

5. Mr. M.-H. Thiele-Wittig gave a short report on the discussions held in the Technical Working Party for Ornamental Plants and Forest Trees (TWO) and its Subgroup on Image Analysis which met at Hanover, Germany, on October 1 and 2, 1997. The information was complemented by Dr. Laidig (Germany). The original idea to try to harmonize the hardware and software used was no longer possible as member States had already gone rather far in choosing different hardware and software. It was now aimed to standardize the capturing conditions and storing the data. A ring test on roses was agreed upon between France, Germany, the Netherlands and the United Kingdom to harmonize and compare recording methods and the quality of color images. A description of that combined rose experiment is reproduced in Annex II to this report. The Working Party expressed its wish to be informed of the progress in that ring test and offered its help if statistical questions arose.

UPOV-ROM Plant Variety Database

6. The Working Party noted the latest stage of preparation of the UPOV Plant Variety Database on CD-ROM (UPOV-ROM) and that on June 2, 1997, UPOV-ROM 97/02 has been distributed by Circular U 2534. The disc will cover data from 26 member States. The data from some States, however, would be data already sent in 1996 or earlier. In the near future the UPOV-ROM would also include the data from the OECD List. The Office of UPOV had already received the data in the UPOV format and was only awaiting the official approval from the Organisation for Economic Co-operation and Development (OECD) to incorporate the data. It was expected that the UPOV-ROM would be issued at two-month intervals. It was hoped that UPOV could offer the UPOV-ROM to the general public in the coming month. The Office of UPOV had invited all its member States to submit comments for improvement with Circular U 2505 of February 17, 1997, and in a further Circular (U 2539 of May 16, 1997).

7. Dr. M.-H. Thiele-Wittig gave a short demonstration of the content of the UPOV-ROM with its three parts, the combined database with the taxon information, the text part in pdf (portable document file) format with information from the member States on their data, all texts of the different Acts of the UPOV Convention, the Recommendations on Variety Denominations, the General Information Brochure, the lists of addresses of national PVR Offices, the list of UPOV publications and various other information. Many experts admitted that they had not been aware of the existence of the UPOV-ROM and that information on the UPOV-ROM and the disc itself often remained within the administrative offices without reaching the possible end user. Several experts asked for copies to be sent also to specified technical experts.

8. At the request of the Office of UPOV, the Working Party discussed various details of the production disc. Several experts replied that the main use was in the end to replace copying information from the national Gazettes. For that purpose some experts would, however, need a monthly production. The checking of the variety denominations was the main use. For that purpose some countries needed to incorporate the data into their own national database. As the main improvement needed was mentioned the inclusion of data from the CPVO of the EU. Furthermore were needed the possibility to use the UPOV-ROM in the national network, the final development of the UPOV code for the different genera and species and more user-friendly routines to extract data. The time between the supply of data and the distribution of the UPOV-ROM should also be reduced. As further subjects for consideration, the acceptance of special characters of other languages was mentioned, as well as the reconsideration of the minimum information, whether to include variety descriptions and to consider offering the information on Internet.

Report on New Developments in Member States

9. The Working Party received from some of its experts short reports on recent developments in their countries. The expert from Denmark reported on the project to reduce the LSD values by increasing the number of replicates to three and the use of the incomplete block design. The expert from Romania reported on the preparation of a new law in conformity with the provisions of the UPOV Convention. The experts from Korea expected to start protection in their country by the end of 1997 and thus needed to collect useful information from other member States on the running of the PVR system.

Handling of Visually-Assessed Characteristics, Ways to Analyze Visually-Assessed Characteristics

10. The expert from the Netherlands introduced document TWC/15/14 Rev. on Analyzing Visually Observed Data in Two Grass Species. He recalled that in document TWC/14/12 methods were proposed to analyze visually observed data. In that paper, threshold models were introduced that were claimed to be useful for assessing both distinctness and uniformity. Two small data sets were analyzed to show how the theory could be applied. However, the routine application of complex statistical theory could sometimes be quite different from calculations on a small example set. Therefore, it was useful to see how the theory worked under routine conditions. For that purpose, two real life data sets collected in the everyday practice of DUS testing for grasses at GEVES were analyzed. He then presented the experience thus gathered. An important aspect would be how to work with categories in such a way that the threshold model was applicable while retaining a feeling for the meaning of the categories. The assumptions of the applicability of the method were (a) that the underlying continuous response should be unimodal (one peak only) and (b) that the difference between varieties was independent of the categories observed. An alternative method might be ANOVA.

11. The Working Party agreed that it would need further study on the use of threshold models. It agreed to create another special interest group for the testing of uniformity of visually-assessed characteristics and invited experts from Denmark, France, Germany, Israel,

the Netherlands, Poland and the United Kingdom to send data sets to facilitate the study to the Chairman. About 20 sets of data would be needed.

12. The expert from Hungary introduced a proposition to compare the thresholds of distinctness applied for different types of characteristics in the DUS tests of varieties as reproduced in Annex VII to this report. The Working Party noted the report and agreed that there was a problem from where to gain preliminary information on a variety of which the variety description was used and which was compared with test results of a candidate variety thereby comparing original test data with data from a standardized description. The situation would become even worse if, in the meantime, the Test Guidelines had changed.

Testing of Uniformity

Finding the Right Population Standard and Decision Rule for Different Sample Sizes

13. The expert from Spain introduced document TWC/15/15 on Balanced α and β Risks Tables (Single Sampling). He referred to document TWC/11/16 as a help to find the right sample size on the basis of the population standard. That document gave, however, rise to some problems when trying to extend it to all species. He then listed the problems as (a) the population standard is often not known, (b) especially in new species it leads to small p errors but very large 2 p (consumer risk) errors, (c) the population standard for testing may be different to that required by other authorities, (d) self-fertilized species are treated differently to crop-fertilized species. He further questioned whether it was right that UPOV should impose a certain population standard for all varieties in a given species. If the population standard was necessary, UPOV needed to develop methods to estimate it from the acceptable number of off-types. He then proposed to calculate from the reference collection OC (Operating Characteristic) Curves.

14. The expert from Germany introduced a question on uniformity raised by the TWA as reproduced in Annex V to this report. The TWA asked for advice on how to fix the limit to decide on the basis of data from measurements in self-fertilized species whether the variety was an off-type or not and which method to use to evaluate the data. Should the COYD analysis be used or did exist a better method for self-fertilized species? How could the crop expert combine results from visual assessments (e.g. a clear off-type) with data from the calculations on measured data?

15. The Working Party noted that in cross-fertilized species one would observe genetic variation and environmental variation while in self-fertilized species genetic variation would be almost zero and mainly environmental variation would be observed. The Working Party agreed that it was necessary to study the question on the basis of some real data in order to find a solution. The experts from France, Germany, Poland and the United Kingdom would look for some data to be sent to the Chairman. It will be tried to have a first consensus before the end of September to enable the TWA to be informed during its coming session in November of this year.

Guide to Help in Finding the Right Method to be Used

16. The expert from the United Kingdom introduced document TWC/15/6 on the Use of COYD and COYU. Following the last TWC, a questionnaire was drawn up and circulated to all UPOV member States to gain detailed information on COYD and COYU. The main areas where information was requested were: (a) Which species are using COYD/COYU in your country and at what level of probability, (b) Reasons for not using COYD and COYU and (c) Have any difficulties been encountered in the use of COYD/COYU? Suggestions for improvements. Detailed replies have been received from five member States (Denmark, France, Germany, Spain, the United Kingdom) with null replies also received from four countries. Results are summarized in tables, one showing the range of species currently using COYD or both COYD and COYU with probability levels for COYD of about 1% and for COYU 0.1 - 0.2%, another table collating comments on the reasons for not applying COYD/COYU and a third table setting out some of the difficulties encountered with the routine application of COYD/COYU. He proposed that as more member States apply COYD and COYU it would be of help that this document be up-dated to accurately reflect the current operational status of the over year distinctness and uniformity criteria.

17. The main reasons for not using COYD and COYU were as follows: (a) too few varieties in test; (b) not applicable to self-fertilized species (c) no complete variety x characteristic x year matrix, (d) large variety x year interactions, (e) difficult to set probability levels.

18. The Working Party asked that the information contained in document TWC/15/6 be distributed also to the TWA.

19. The expert from Israel reported that in his country the approach was different from several other countries. It was not possible to fix a method beforehand and to apply only one method to all cases. Therefore, first the difference would be detected and thereafter it had to be explained to the applicant whether it was acceptable or not.

20. The expert from Denmark reported that for many years where a difference was observed in several characteristics, but below the 1% level, it was considered too strict to reject the variety if the difference in several characteristics was significant at the 5% level. Several experts recalled discussions on the same problem in the past within UPOV. The Chairman proposed to the Danish expert to consider the possibility to lower the required level from 1% to say or 2% lower or further instead of using more than one characteristic. All experts agreed that it was important to know what their colleagues in the other UPOV member States actually did and encouraged all to continue informing on actual practice even if it did not fully conform with the UPOV recommendations.

21. The expert from the Netherlands introduced document TWC/15/13 on Constructing a Reference Set of Cultivars for Testing Distinctness. He recalled that the current criterion for distinctness was the Combined-Over-Years-Distinctness (COYD) based on a variety-by-year table of means of candidate and established varieties tested in two or three consecutive years. A critical distance between two varieties was calculated with the varieties-by-years mean square and a Student *t* value (Watson et al. 1996). The Student *t* value was taken as a probability, subject to the UPOV recommendations on individual species. Subsequently, candidate varieties were admitted and entered the reference set. As a result, the set got larger

and larger. This made testing costly, not only by the area of the trial, but also by the huge amount of data that had to be collected. It was of interest to see if this area and amount of data could be reduced. The question was whether one could reduce the size of the reference-set without losing essential information. Candidate varieties had to be tested for three years, but did all the reference varieties have to be tested every year, as COYD requires? Years could be very different (genotype-environment interaction) resulting in different ranges and average levels between the years. Also when a reference variety was left out in one or more years the set became unbalanced which made it difficult to compare varieties. However nowadays mixed-models could be of help. Mixed models allowed the combination of information on varieties in trials of different years. The basic approach was to split the reference set in three groups, one for each year of testing, and use the supplementary data from previous years to estimate characteristics and the precision of the estimates. Reducing the reference set was not straightforward just because they are the reference; so unique in at least one characteristic**.** The first analysis was a Principal Component Analysis (PCA), carried out on standardized data**.** The feasibility of the proposed scheme had still to be evaluated. The procedure could be easily simulated on the historical data at hand. It could be applied on cohorts of data and compared with the actual outcome. The preliminary analysis showed the usefulness of this approach which would allow a considerable cost reduction of more than 50%.

22. The expert from Germany explained some reflections in his country as reproduced in Annex III to this report. In certain cases, where some varieties were tested for two years and others for three years, there could arise–from the rule to apply the long-term LSD when less than 20 degrees of freedom were available–a need to test in the same year some varieties with the COY method and others with the long-term LSD. He explained his comparison of the long-term unbalanced method, the three years' unbalanced method, the three years' balanced method and the two years' balanced method and proposed to consider, instead of the LSD, the three years' unbalanced method.

23. That gave rise to questions on how to decide which method was the right or the better method. While some experts considered the method with the highest number of degrees of freedom the better one, the German expert considered it a higher risk if the historical data were too far away from the date of decision. The Working Party finally agreed to continue the study and come back to the subject during its next session. The whole question needed to be broadened to cover the use of unbalanced sets and questions of differences between member States caused by the differences in the use of one or two locations, the use of breeders' data and own testing data. Some experts should, if possible, offer to prepare documents for the next session.

Sequential analysis (TC/32/6)

24. The Working Party noted the rather negative reaction of the Technical Working Party for Fruit Crops (TWF), the Technical Working Party for Ornamental Plants and Forest Trees (TWO) and the Technical Working Party for Vegetables (TWV) reported upon in the Technical Committee to the means of applying the sequential analysis method. The Chairman of the TWC had highlighted again the usefulness of sequential analysis for the purpose of reducing work and the possibility of creating greater certainty by reducing the sample size to be used in the testing of uniformity. The Technical Committee had confirmed the necessity of looking further into sequential analysis. It had asked the TWC to do more educational work

on sequential analysis to explain the tool better and to examine more the possibility for its use. The individual experts were asked to study the question further at the national level.

Items Resulting From the Last Session of the Working Group on Biochemical and Molecular Techniques and DNA Profiling in Particular (BMT)

25. Mr. Grégoire (France) gave a brief report on the main items discussed during the last session of the BMT. The full report will be reproduced in document BMT/4/19 Prov., which is expected to be completed in a few weeks' time.

26. The expert from Belgium introduced document BMT/15/16 on the identification of ryegrass (*Lolium* spp.) cultivars by means of AFLP Markers. She explained the tests done, the AFLP method and the results obtained. She concluded that the results showed that AFLP markers were a powerful tool for identification purposes even for outcrossing crops. As expected in the case of outcrossers, the AFLP markers analysed were highly polymorphic among cultivars, but also within cultivars. Nevertheless, it was possible to differentiate clearly among cultivars and the differentiation was clearer as more markers were included in the analysis. Apparently, the number of markers included had a big influence on the capacity of discrimination of the analysis. To determine a threshold for 'minimum genetic distance' it was necessary to perform a detailed analysis of the genetic distances between the cultivars that were currently accepted as different based on morphological characteristics. The results should be taken with some reservation because they were based only on one primer combination and it could not predict the result of the inclusion of more markers (obtained from other primer combinations) in the analysis. The Working Party welcomed the explanations and asked for the data to be included in the data set of the special interest group (see next paragraph).

27. Mr. J. Law (United Kingdom) referred to Circular U 2532 of April 28, 1997, listing the proposed plans as a result of the above session. He recalled that there will be another session of the Working Party before the Working Group on Biochemical and Molecular Techniques and DNA Profiling in Particular (BMT) would meet in 1998. What the BMT needed was not a cookbook, but in fact a monograph which would guide the expert through questions to the most appropriate method to be applied. At present ad hoc methods were applied, each of them not totally appropriate and leading to different results. To enable the Working Party to give useful advice, sets of data accompanied to their necessary information were needed which could then be studied in a special interest group in more detail. The experts from Belgium, France, Germany, Israel, the Netherlands and the United Kingdom agreed to consider supplying molecular example data sets to the Chairman for study in order to be in a better position to continue discussions during the next session. The chairman stressed the need to come to some substantive conclusions to the specific points (U2532) to aid the discussions within the BMT.

Electrophoresis in Ryegrass

28. The Chairman introduced paragraphs 25 to 36 of document TWA/25/13 reporting on the discussions held on that subject in the Technical Working Party for Agricultural Crops (TWA). The main questions raised by the TWA were: (a) Is the χ^2 analysis an appropriate method for the evaluation of frequencies and (b) how many samples would be needed for

tetraploid ryegrass varieties? The Working Party was not in the position to give an immediate answer. The Working Party proposed to start using the analysis of molecular variance for the calculations. The expert from the Netherlands agreed to study the question at home and try to indicate upper and lower numbers for the sample size.

Improvement of Communication

Improvement of Statistical Documents

29. The expert from Denmark introduced document TWC/15/12 on Testing of Homogeneity of Self-Fertilized and Vegetatively Propagated Species using Off-Types which comprised a revised version of document TWC/11/16. After discussions, the Working Party agreed to present the document for approval to the Technical Committee. The Working Party appreciated the efforts made by the Danish expert in obtaining that improved document. The document was clearer, well written and would facilitate its use by the crop experts.

30. For the possibility of the use of data of more than one year or more than one testing place, the document recommended that the crop expert approach his or her national statistic expert. The presentation to the Technical Committee would not prevent continuing the discussions on the philosophy raised in document TWC/15/15 by the Spanish expert who will produce an improved document for the next session.

Telecommunications, Exchangeable Software and Contacts

31. The expert from the United Kingdom introduced document TWC/15/9 on Electronic Mail Addresses of Participants of UPOV Technical Working Parties. The document was noted with appreciation. He invited more countries to supply information and to check the information they had given in the past and report all changes by E-mail to Mr. Talbot (United Kingdom) (E-mail: m.talbot@ bioss.sari.ac.uk.).

Telecommunications, Exchangeable Software and Contacts

32. The expert from the United Kingdom introduced documents TWC/15/8 on Database Management Systems in Use in UPOV Member States and document TWC/15/10 on Exchangeable Software. The Working Party regretted that only a small number of member States had supplied information. More countries were invited to supply information and to check the information they had given in the past. Changes and new information should also be sent by E-mail to Mr. Talbot (see preceding paragraph). The expert from Slovakia gave some further information reproduced in Annex VI to this report.

List of statistical documents prepared by the TWC

33. The expert from France introduced document TWC/15/2 containing a list of documents produced by the Technical Working Party on Automation and Computer Programs and TWC/15/3 containing a Top Index to Documents Produced by the Technical Working Party

on Automation and Computer Programs. The Working Party appreciated the updating of those lists and especially the topic index which made it easier to find a particular document on a given subject. It proposed to make the documents in future available on the World Wide Web, but also continue for some years with updating of printed documents.

Results of the Run of the COYD Program Distributed on Diskette During the TWC Session to Check Whether National Implementations are in Concordance With the Latest Version of DUST

34. The expert from the United Kingdom introduced document TWC/15/5 on DUST9 and DUSTW–A New Version of the DUSTX Package and a Prototype DUSTX for Windows. She explained that the DUSTX package comprises a suite of programs for the analysis of data from DUS trials using a PC. It included facilities for COYD and COYU analyses and a wide range of multivariate analysis techniques. The original DUSTX programs, which were written in the FORTRAN 77 programming language, had been amended, added to and rewritten using FORTRAN 90. The resulting DUST9 programs would run on a 386, 486 or Pentium PC using Windows 3.1 or Windows 95 (for PCs using an SX chip, a maths coprocessor was recommended). The main advantage of the DUST9 programs over their DUSTX predecessors was that there were no size limitations on the numbers of varieties, replicates and characters that might be analysed. Apart from removing minor inconsistencies, the amendments to the programs included: (a) all input to the programs was through control files set up by the user and not by interactive prompts from the program. Thus all input and output file names and all parameter inputs were specified in these control files; (b) the user had control of the naming of all output files. This reduced the chance of the user accidentally overwriting output files; (c) the maximum length of file names had been increased to 80 characters. This allowed the user to make full use of the subdirectory structure of PC hard disks; (d) the width of output files was specified through the control files to 120 characters (for line printer) or 80 characters (for laser printer). This would make it easier for the output to be word processed for reports etc.; (e) the maximum length of variety names had been increased to 12 characters (the maximum length of character names remained at 8 characters). The following new programs had been added to the package: (a) RMRG9 which allowed individual plant data to be merged from files containing data on different characters and, optionally, new characters to be calculated. There was no need to specify the varieties common to all files; (b) DMRG9 which operated in the same way as RMRG9, except that instead of operating on files containing individual plant data, it operated on files containing plot mean data. The DUST9 version of the DUSTX package and its documentation were available from Ms. Sally Watson, Biometrics Division, DANI, Newforge Lane, Belfast, BT9 5PX, United Kingdom.

35. She further explained that as part of a pilot study into the production of a Windows version of DUSTX, the general DUS data analysis package for the PC, a prototype program DUSTW had been produced. The prototype included the DUSTX programs: CHOSX, MERGX, ANALX, TESTX, TVRPX and UNSLX. It would run on 386, 486 and Pentium PC's under Windows 3.1 or Windows 95 (where an SX chip was used, a maths coprocessor is recommended). Whereas DUSTX was run from within MSDOS, the majority of today's software was run from within Windows. With DUSTW, or DUSTX for Windows, the appearance of the program was more familiar to today's users and together with the greater interactive capabilities of Windows technology, the program was simpler to use and to learn. DUSTW was written with the DUSTX programs at its core, using the same control files to

pass input and output file names and parameters to the programs. With DUSTW, instead of the user needing to edit the control files as necessary with DUSTX, the information was gathered by the program guiding the user to select filenames and options from windows displaying lists of filenames and options (including variety and character names where relevant). When the full version of DUSTW, or DUSTX for Windows, was produced the user will be able to use data from Excel spreadsheets as well as from the carefully formatted ASCII files currently required by DUSTX. The program would also be capable of being run in languages other than English but adapt amendments still in English. In addition to the user-manual being available in conventional printed form it would be accessible though the Internet where it would include detailed examples and help facilities. The prototype version of DUSTW, or DUSTX for Windows, is available from Ms. Sally Watson, Biometrics Division, DANI, Newforge Lane, Belfast, BT9 5PX, United Kingdom. All were invited to study the prototype and make comments on its usefulness.

36. In order to better disseminate the free availability of the DUST Program, document TWC/15/17 reproduced the content of the manual for the DUSTW prototype with a simplified introduction. The Working Party welcomed the availability of the DUST program in its Window version which enabled the COY analysis to be applied on a PC. Several experts asked for a copy for study. The Working Party considered whether in future other programs also applicable inside UPOV could be included in that package.

Developments on the World Wide Web

37. The expert from the United Kingdom introduced document TWC/15/11 on UPOV and the Internet. He explained the importance of E-mail on the World Wide Web and the future trends. With respect to UPOV, he reported that: (a) the UPOV Office in Geneva already had plans well advanced for the establishment of a Web server; the server would initially provide basic information about UPOV; its history, objectives, membership, structures, principal officers and in time, some of the formal documents, e.g. text of Conventions, Test Guidelines, would be placed on the server for access in electronic form; (b) an EU Fourth Framework FAIR Program proposal had recently been submitted by CPRO/NIAB/BioSS/GEVES to develop variety image database structures which might allow access from Web browsers and (c) the use of the Web for the provision of on-call training in science and technology was becoming increasingly important. An example of interest to crop specialists was the SMART system, a collaborative initiative aiming to provide user-friendly training in quantitative methods for scientists and technical specialists. The SMART system was available in six languages and could be accessed at http://www.bioss.sari.ac.uk/smart/unix/smart. html. He proposed that, for the less formal and more developmental aspects of UPOV technical work, e.g. producing guidelines or evaluating new techniques, it would be useful to have Internet structures which facilitated electronic communication and provided an information resource. These might include: (a) an E-mail discussion list where queries and news items might be posted; (b) one or more Web links on UPOV technical matters could be established; this could provide access to the working group documents as well as facilitating links between collaborating centers and individuals; (c) for short meetings involving small groups of individuals the possibility of using video conferencing facilities should be considered.

38. The Working Party welcomed the offer made by the expert from the United Kingdom to set up an E-mail discussion group. It should not be restricted in access but open to all TWC

experts. Experts should, however, check first whether certain confidential information needed to be coded to avoid misuse if the circle of the group is not limited. That discussion group could also be used by the three special interest groups (visually-assessed characteristics, BMT data, uniformity) for the discussion of certain subjects.

Spatial Dependence

39. The expert from the United Kingdom introduced document TWC/15/4 on Spatial Dependence in Spaced Plant Herbage Trials. She explained that spaced plant herbage trials conducted to determine varietal distinctness, uniformity and stability (DUS) were currently based on experimental designs and methods of analysis which ignored any spatial dependence between observations. If spatial dependence were to occur, it would reduce the trial's effectiveness in DUS terms. In document TWC/15/4 data from three types of ryegrass spaced plant variety trials were investigated for signs of spatial dependence. Spatial dependence was observed most frequently in variates measuring the overall dimensions of the plants, with differences in form occurring where there were differences in the magnitude of the variates. There was also some evidence that it was stronger in late season variates compared to early season ones. The implications of the spatial dependence observed in the spaced plant variety trials were discussed in the context of efficient trial design and analysis. The document concluded that the present practice and lay-out was in order and did not need to consider additional spatial variation. The Working Party appreciated the explanations. In the discussions it became apparent that frequently similar varieties were placed in the testing together and close comparisons would be made. It would have to be studied further whether in those cases spatial dependence existed which had to be taken into account. All experts were asked to check their testing practices in this respect.

Actual Uptake/Use of COYD/COYU

40. The expert from the United Kingdom introduced document TWC/15/7 on Users' Notes for Combined-Over-Years Distinctness and Uniformity Procedures. She summarized that to distinguish varieties on the basis of a measured character it was needed to establish a minimum allowable distance between varieties so that a pair of varieties showing a difference greater than the minimum might be regarded as 'distinct' in respect of that character. There were several possible ways of establishing minimum distances from Distinctness, Uniformity and Stability (DUS) trials data. Document TWC/15/7 described what was known as the Combined-Over-Years Distinctness (COYD) criterion. The COYD method involved: (a) for each character, taking the variety means from the two or three years of trials for candidates and established varieties and producing over-year means for the varieties; (b) applying the technique of analysis of variance to the variety-by-years table in order to calculate a least significant difference (LSD) for comparing variety means; (c) if the over-years mean difference between two varieties was greater than the LSD then the varieties were said to be distinct in respect of that character. The main advantages of the COYD method were: (a) it combined information from several seasons into a single criterion in a simple and straightforward way; (b) it ensured that judgments about distinctness would be reproducible in other seasons; in other words, the same genetic material should give similar results within reasonable limits from season-to-season; (c) the risks of making a wrong judgment about distinctness were constant for all characters.

41. As the document TWC/15/7 was rather similar to document TC/33/7 adopted by the Technical Committee in October 1997, it was agreed to review the document and highlight the parts where it had been changed to facilitate its incorporation as an annex to a revised General Introduction.

Future Program, Date and Place of the Next Session

42. At the invitation of the expert from Belgium, the Working Party agreed to hold its sixteenth session at Merelbeke, Belgium, from June 16 to 19, 1998. During that session, the TWC plans to discuss or rediscuss the following items: report on subjects of special interest to the Working Party raised during the thirty-fourth session of the Technical Committee; questions raised by other Technical Working Parties; report on new developments in member States; UPOV-ROM Plant Variety Database; image analysis; handling of visually-assessed characteristics; testing of uniformity; items resulting from the fourth session of the Working Group on Biochemical and Molecular Techniques and DNA Profiling in Particular (BMT) and from the special interest group; incomplete plot design, reduction of reference collection; improvement of communication; telecommunications, exchangeable software and contacts: list of statistical documents prepared by the TWC, list of statistical documents containing recommendations or methods of possible interest to the Technical Working Parties, development of computer programs for DUS testing (responses on DUST9, DUSTW and other possible programs), developments on the World Wide Web.

Visits, Demonstrations

43. In the afternoon of June 2, 1997, the Working Party received from Mr. F. Firtha and Mr. L. Baranyai (Hungary) an introduction to the study on image analysis done at the University of Horticulture at Budapest. A collection of information shown with an overhead projector is reproduced in Annex IV to this report. Further details are also included in the publications on “Colour Evaluation of Fruit Aided by PC-Based Vision System” by J. Felfoldi, F. Firtha and E. Gyori, prepared for the International Conference held at the University of East Anglia from June 25 to 28, 1995, “Color Analysis of Fruits and Vegetables Aided by PC-Based Vision-System” and “Colour Evaluation of Fruit Aided by PC-Based Vision System,” a paper given at the International Conference at the University of East Anglia, Norwich, United Kingdom, from June 25 to 28, 1995, by J. Felföldi, F. Firtha, E. Györi, University of Horticulture and Food, Budapest, and “Computer Vision for Fruit and Vegetable Quality Assessment” by A. Fekete, J. Felföldi, F. Firtha and E. Györi, written for presentation at the 1996 Annual International Meeting (July 14-18), Phoenix, Arizona, from July 14 to 18, 1996, and “Fruit Shape and Color Analysis by Image Processing” by A. Fekete, J. Felfóldi, F. Firtha and E. Györi, University of Horticulture and Food, Budapest, Hungary, a paper presented at the Fifth Conference on Image Processing, held at Edinburgh, United Kingdom, from July 4 to 6, 1995.

43. Dr. Pál Korányi (Hungary) also reported on the use of gel electrophoresis for the detection of isoenzymes and extract fractions of seed storage proteins making reference to the methods reproduced in the annexes of the UPOV Test Guidelines for Wheat, Barley and Maize as well as the detection of gliadin in wheat which UPOV had not been able to recommend as the genetic background had not been sufficiently clear to approve its use. The

data obtained would at present, however, only be used as complementary data and not for decisions on distinctness for the granting of protection.

44. This report has been adopted by correspondence.

[Seven annexes follow]

ANNEX I

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[Annex II follows]

ANNEX II

[Annex III follows]

ANNEX III

[Annex IV follows]

ANNEX IV

[Annex V follows]

ANNEX V

[Annex VI follows]

ANNEX VI

[Annex VII follows]

ANNEX VII

A proposition to compare the threshold of distinctness applied for different types of characteristics in the DUS tests of varieties

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[End of document]

ANNEX VII