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GENEVA

TECHNICAL COMMITTEE**Thirty-second Session
Geneva, October 18 to 20, 1995**

MATTERS ARISING FROM THE 1995 SESSIONS OF THE
TECHNICAL WORKING PARTIES, INCLUDING THE BMT,
TO BE DEALT WITH BY THE TECHNICAL COMMITTEE

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1. This document summarizes, in its Annex, matters arising from the 1995 sessions of the Technical Working Parties and the BMT which have to be dealt with by the Technical Committee (hereinafter referred to as "the Committee"). They comprise important subjects discussed or decisions taken by the Technical Working Parties and the BMT, which are communicated to the Committee

- (i) for information;
- (ii) for information and for a possible decision to be taken by the Committee;
- (iii) for a decision to be taken by the Committee;

The headings of the different items are listed on page 1 of the Annex.

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MATTERS ARISING FROM THE 1995 SESSIONS OF THE
TECHNICAL WORKING PARTIES, INCLUDING THE BMT,
TO BE DEALT WITH BY THE TECHNICAL COMMITTEE

I. MATTERS FOR INFORMATION

Cooperation with Breeders in the Testing of Varieties

1. The TWA and TWV noted that the Committee had asked that the survey on the involvement of breeders or applicants in the testing of varieties be repeated so as to cover non-agricultural species also in order to have full details of the testing systems of the individual member States. They furthermore noted that under Circular U 2268 a new questionnaire, including the replies received so far, had been distributed, asking for information on all types of crops. As a deadline for answers, the end of June had been fixed. They invited all of its members to reply to that Circular.

2. A breeder present in the session raised personal doubts as to whether applicants would be able to handle the whole test with the numerous example varieties. In his personal view it was not possible for an applicant to handle the whole reference collection of agricultural crops.

(See TWA/24/13 Prov., paragraphs 45 and 46, and TWV/29/15 Prov., paragraph 16).

3. The Committee is invited to note the above information.

List of Species in Which Practical Technical Knowledge has Been Acquired

4. The TWA and TWV noted that the Committee had requested that the present document TWO/27/13, comprising a list of species of ornamental plants tested in the UPOV member States, should be extended to cover all species in which practical knowledge has been acquired in the member States and noted that a new questionnaire had been sent out (Circular U 2279).

(See TWA/24/13 Prov., paragraph 11, and TWV/29/15 Prov., paragraph 14).

5. The Committee is invited to note the above information.

Transgenic/GMO Varieties

6. The TWV noted that additional restrictions had to be observed with respect to transgenic varieties and that the transgenic varieties would also create problems for the correct naming of the species to which the variety belonged. It will prepare a questionnaire for discussion during its coming session. The TWA noted that, with respect to applications of a GMO variety, it was

important that the applicant should state the fact that his variety was a GMO and that it had passed the national clearance authority.

(See TWA/24/13 Prov., paragraph 4, and TWV/29/15 Prov., paragraph 4).

7. The Committee is invited to note the above information.

UPOV Central Computerized Database

8. The TWA, TWC and TWV noted the latest stage of preparation of the UPOV central computerized database on CD-ROM as set forth in Circular U 2229 dated February 24, 1995. The Office of UPOV had invited all member States to submit data for the envisaged UPOV-ROM Demonstration Disc by April 15, 1995. It had received data from 15 States (Argentina, Austria, Canada, Denmark, France, Germany, Hungary, Israel, Japan, Netherlands, New Zealand, Spain, Sweden, United Kingdom, United States of America (PVPO and PTO). The Office of UPOV, with the help of experts from WIPO, had checked the data received and had requested, where necessary and possible, corrections from some countries. Afterwards all data were submitted to JOUVE for further checking and for the preparation of the above-mentioned UPOV-ROM demonstration disc. They also noted Circular U 2277 containing a list of open questions on the UPOV-ROM Demonstration Disk. All experts were therefore invited to send their comments or proposed answers to the Office of UPOV.

(See TWA/24/13 Prov., paragraphs 13 and 14, TWC/13/19 Prov., paragraphs 5 and 6, and TWV/29/15 Prov., paragraph 18).

9. The Committee is invited to note the above information.

List of Species Admitted for Certification but for Which no UPOV Test Guidelines as yet Exist

10. The TWA pointed out that the Organisation for Economic Co-operation and Development (OECD) had discussed the question of new agricultural species on the list of species admitted for certification, but for which no UPOV Test Guidelines yet existed. It also noted that, while the list was a rather long one, the number of species on it for which ten or more varieties were mentioned amounted to 24 species only. The TWA further noted that the Committee had requested it to consider whether it would be useful to establish UPOV Test Guidelines for certain of those species. It finally agreed that, because of its tight agenda for the further session, it could only plan to establish Test Guidelines for *Bromus* and for *Lotus*.

(See TWA/24/13 Prov., paragraph 8).

11. The Committee is invited to note the above information.

Electrophoretic Characteristics

12. The TWA and TWV noted the decision of the Committee concerning the use of a characteristic derived by electrophoresis that should only be used as a complement to other differences in morphological or physiological characteristics.

(See TWA/24/13 Prov., paragraph 15, and TWV/29/15 Prov., paragraph 9).

13. *The Committee is invited to note the above information.*

14. Potato: The TWA referred to document TWA/23/9 containing a survey prepared by experts from Germany on the use of electrophoresis in potatoes and some additional information on that document given by the electrophoresis expert from Germany. It also noted that a subgroup meeting on potato had been planned to be held in Hanover, Germany, on November 22 and 23, 1994. Due to a lack of sufficient interest and few announced participants, the meeting had finally been canceled. The TWA noted that only Germany used characteristics derived by electrophoresis for distinctness purposes although so far no variety had been granted protection on the basis of electrophoretic characteristics alone. Some other countries used electrophoresis only for identification purposes. While the experts from Germany reported that they had obtained agreement from the German breeders to their procedure, the breeder present during the session was opposed to the use of electrophoresis for distinctness and especially to its routine use. It should only remain as a last resort.

(See TWA/24/13 Prov., paragraph 16).

15. Poa pratensis: The TWA referred to explanations on the use of electrophoresis in *Poa pratensis*. *Poa pratensis* being an apomictic species, although propagated as seed could be compared to vegetatively propagated species. The report concluded that for *Poa pratensis* an electroferogram (i) could be regarded as a unique combination of characteristics and (ii) could be used as an identification label for selecting similar reference varieties. Morphological characteristics had a better distinguishing ability and thus for distinctness electrophoresis was not necessary. The combination of morphological characteristics with electrophoretograms gave strong evidence of the variety identity. The TWA finally concluded that for *Poa pratensis* electrophoresis was not needed at present for the distinguishing of varieties.

(See TWA/24/13 Prov., paragraphs 18 and 21).

16. Timothy: The TWA noted a report on the use of electrophoresis in timothy. In studying the possible use of the esterase method, it appeared that timothy was a rather difficult species. It was a cross-fertilized species and only bulk samples could be used. So far the method could only be used as a control. Forty-one bands would be available and not only the absence or presence but also the band intensity could be used. So far in France 50 to 60 varieties of timothy existed which could all be separated by that method. If the number were to increase (e.g. to 200), difficulties could arise. The TWA noted that there were three possible uses of electrophoresis: (i) As a help in the organization of the trials; (ii) as a means of preselection to limit the number of reference varieties in the trial and (iii) for DUS purposes. With respect to the use for DUS purposes several experts repeated the decision taken by the Committee. Some experts considered that several problems

preventing use on its own for distinctness were rather questions or problems related to the principle whether monogenetic characteristics should be acceptable or not as single characteristics to establish distinctness. The problem, however, was that many morphological characteristics were also monogenetic, but for many of them genetic knowledge was still lacking. However, that should be no reason not to discuss that possibility. Otherwise the whole system of plant variety protection might be in danger of being destroyed. The expert from France agreed to prepare a new paper for the next session.

(See TWA/24/13 Prov., paragraphs 33 to 35).

17. *The Committee is invited to note the above information.*

List of Statistical Documents Prepared by the TWC

18. Discussions in the TWC were based on documents TWC/13/2 and TWC/13/2 Rev., Documents Produced by the Technical TWC on Automation and Computer Programs. The TWC will continue the updating of that list which made it easier to find a particular document on a given subject.

(See TWC/13/19 Prov., paragraph 65).

19. *The Committee is invited to note the above information.*

Use of the COYD Analysis Including Long-term LSD (to give information to the breeder after the first year of test)

20. Discussions in the TWC were based on document TWC/13/7, Analysis of Single Year Trial Results Using Long-term LSD's for Herbage Species. The document gave results of the application of the long-term LSD to herbage species. It used two ways of comparison: (i) the within trials LSD based on plot variation; (ii) comparison of the same variety means using an LSD derived from a varieties x years analysis covering several years. Because of missing varieties in the latter approach, a fitted constant analysis had been used. A practical difficulty encountered with this comparison was the lack of consistency in the characteristics measured from year to year. Hence, the two methods had been contrasted using the set of characteristics which were common to all years.

21. The document concluded that a long-term LSD calculated at 1 per cent would provide similar stringency to the within year LSD determined at 0.1 per cent. Since from theoretical considerations the long-term LSD would be expected to provide the better indication of distinctness using COYD after two to three years, it was therefore recommended that the long-term LSD evaluated at the 1 per cent level be used at the year one stage. However, when some characteristics changed from year to year the use of the long-term LSD posed some practical difficulties in its application necessitating the most recently introduced characteristics to be evaluated using the within trial LSD.

22. The TWC noted that the method was at present used in the United Kingdom to warn breeders, after the first year, on varieties which potentially may have difficulties in being distinguished after the second year. The level of stringency was therefore set in a way to prefer a longer list of varieties even if many of them finally could be distinguished. The method had already been included in the DUST tool, but so far it had only been applied by the United Kingdom. It was not at all used for taking decisions on distinctness.

(See TWC/13/19 Prov., paragraphs 17 to 19).

23. *The Committee is invited to note the above information.*

Use of Document TWC/11/16 for the Testing for Off-types Over More Than one Year

24. Discussions in the TWC were based on document TWC/13/8, Homogeneity Testing over More Than One Year. The document dealt with the question that had arisen during the last TWC session as to what might happen to the risks involved if the tests for off-types were made independently in two or three successive years and the candidate variety was rejected if both years (or two out of three years) showed too many off-types. As an alternative it was suggested that the data from the individual years be combined in one test, calculating the total sample size over the years, that the same (or lower) alpha-risk be chosen to get a better balance of the two risks and that the final decision be based on this aggregate sample. Also, the use of a sequential test procedure was discussed as an alternative. This paper compared the above-mentioned methods. The document raised the following questions: (i) Do we accept basing decisions concerning off-types on one year only? - or do we for reasons other than statistical risk always require at least two years when testing for off-types? (ii) Was a true probability of off-types equal to five times the population standard a reasonable criterion to be used? (iii) Was it reasonable to fix the alpha-risk *a priori* and then minimize the beta-risk or should some other criterion such as alpha squared plus beta squared be minimized; (iv) Were there non-statistical arguments to take into account when choosing between two (or three) independent tests and a combined (or two-stage) test? The document concluded that the use of two (or three) independent tests without adjusted acceptance probabilities would result in tests with low alpha-risks and often with unacceptable high beta risks. Using adjusted acceptance probabilities would result in tests with beta-risks which were much lower and closer to the beta-risks of a combined test. A combined test (or two-stage test) would give a beta-risk which in many cases was much smaller than those which could be reached by a test in only one year. When the sample size was large, a two-stage test might often yield final results after only one year. A two-stage test might in some cases give a beta-risk which was slightly smaller than that obtained by a combined test. The TWC noted that the questions raised in the document were not limited to tests over two years but applicable to all cases where more than one test was made.

25. The TWC mentioned that document TWC/11/16 had been developed for one test only. It was silent on how to decide if there was more than one test. The TWC would therefore have to continue discussing the subject during its next session and consider further possibilities. It will prepare another paper for that purpose on possibilities of the handling of data from more than one test or more than one year.

(See TWC/13/19 Prov., paragraphs 24 to 26).

26. The Committee is invited to note the above information.

Selection of the Right Population Standard

27. The discussions on document TWC/11/16 had raised several outstanding questions connected with the definition of the population standard. The TWC noted that the Committee will further discuss the balance of the risks of wrongly rejecting a uniform variety as heterogeneous and of wrongly accepting a heterogeneous variety as uniform, as well as the influence of the sample size on these risks. Some experts stated that in many cases the expert would not be aware of the population standard but would only know from his experience the number of off-types he could accept in a given sample. There was a need for a program that could be handled more easily than the tables in document TWC/11/16. Others pointed out that the table in document TWC/11/16 had been prepared for the experts in the Technical Working Parties for use at the time of preparation of the Test Guidelines to help them fix the population standard in the Test Guidelines. They were not intended for use by individual countries to fix an individual population standard at the national level. The expert from Germany in the TWC offered to check, together with the Chairman, the draft Test Guidelines prepared by the individual Technical Working Parties, at the time of their presentation to the professional organizations for comments, not only on the right use of states of expressions but also on the right indication of statistical aspects and especially of the population standard.

28. The TWC agreed to continue its discussion on this subject during its next session. Several experts will prepare papers for discussion during the next session of the TWC.

(See TWC/13/19 Prov., paragraphs 27 to 34).

29. The Committee is invited to note the above information.

Detection of Outliers by Multivariate Analysis to the Validation of Data

30. Discussions in the TWC were based on document TWC/13/4, Checking for Outliers in Herbage DUS Data. The document stated that the use of data loggers in the field could eliminate errors due to keying from field cards and should therefore be employed whenever possible. They could also be programmed to draw the operator's attention to any value outside a pre-set range on each characteristic. However, such a check should be relatively crude since the pre-set range on a characteristic should be sufficiently wide to accommodate all varieties and a value which may be abnormal for a variety having small values on a characteristic may be quite normal for a variety having large values on the same characteristic. Another possibility was the determination of plot ranges for all characteristics. The examination of the ten largest plot ranges in rank order could provide a record validation check since any excessive range relative to other ranges could draw attention to a possible outlying plant for further investigation. That method had the advantage over

the previous method by referring each plant measurement to the other plant measurements of the same plot and thus would eliminate the effect of varieties.

31. The discussions raised the problem of how to separate an outlier from a real off-type. It would be easy if the plant could be revisited and the observation repeated, however, it would be difficult if that was impossible and if it could not be proved whether there was a real off-type or only a wrong observation or note of observation. The discussions made it also clear that the COYU method foresaw no mechanisms and no possibility to consider a clear off-type outside the calculations as the method had been prepared for cross-fertilized species.

(See TWC/13/19 Prov., paragraphs 46 to 48).

32. The Committee is invited to note the above information.

Application of Multivariate Analysis to Small Samples in Connection With Electrophoretic Tests

33. The TWC noted document TWC/13/15 on the Application of Statistical Analysis to Small Samples in Connection with Electrophoretic Tests. It pointed out that the statistical basis for distinguishing true and non-true varieties under test was the binomial distribution and that for distinguishing all types of spectra presented in electrophoretic gels in the same analytical sample, the statistical basis for analysis was the multinomial distribution. The experimenters usually met the following statistical problems with electrophoretic results: (i) Problems of tolerances and confidence intervals for testing of trueness to cultivars; (ii) problems of comparison of results of two or more independent analyses of the same sample and the reproducibility of analysis; an objective testing criterion was needed to compare results of two or more analytical samples; (iii) problems of the representativity of an analytical sample, and the determination of the coefficient of representativity; the sample size (analytical sample) used for electrophoretic tests of variety testing and seed testing was usually between 20 and 100 seeds and thus the level of representativity of the analytical sample was very significant for a correct evaluation of analytical data. The big advantages of electrophoretic methods were simple quantification of the electrophoretic spectra, good possibilities for mathematical processing of these spectra and possibility of using the single-grain analyses versus multi-grain (bulk) analyses of seeds. It then explained the use of different formulas for single-grain sample versus bulk sample and the formula for the calculation of the coefficient of representativity.

(See TWC/13/19 Prov., paragraphs 49 to 54).

34. The Committee is invited to note the above information.

Multivariate Analysis: The Mahalanobis' Generalized Distance D^2 Between two Varieties

35. Discussions in the TWC were based on document TWC/13/5, Multivariate Evaluation of United Kingdom Problem Pairs in 1992/1994 (Ryegrass Varieties). The document noted that during the last session of the TWC it had been agreed that if distinctness using D^2 could not be

obtained by combining the two characteristics, or at most three characteristics, it was unlikely to be obtained by combining the full set of measured characteristics. Accordingly, the search for a distinct characteristic combination needed only to involve two or three characteristics. Thus multivariate distances D^2 could be used to assist in the separation of problem pairs in variety pairs not distinct using COYD on measured characteristics. However, its application was limited to the determination of characteristic combinations involving just two characteristics on which distinctness could be established using a normal univariate COYD test. Further, only agronomically meaningful characteristic combinations were permitted in the COYD test. Consideration needed to be given to the requirements that characteristic combinations must be agronomically important before they could be used in distinctness. There was no statistical reason why other combinations might not be used but there was a difficulty in providing an explanation in agronomic terms for the existence of such statistical differences. The implications for uniformity also needed to be taken into account. Could uniformity on a characteristic combination be inferred from the uniformity of its constituent characteristics? If not, should the uniformity of all varieties be established on the combined characteristics?

36. The TWC also recalled that the D^2 analysis was only an intermediate tool. For a decision the expert would go back to the data plant by plant. The characteristic should not immediately become a routine characteristic. The additional effort and the use of these characteristics should only be made when the crop expert was convinced of the candidate being distinct but so far had no other tool to prove that distinctness. It was just intended to support the opinion of the crop expert. It was not at all foreseen or proposed that any combination of characteristics be accepted.

(See TWC/13/19 Prov., paragraphs 41 and 42).

37. The Committee is invited to note the above information.

Use of Disease Resistance Characteristics in Distinctness Testing

38. The TWA and TWV noted that the Committee had agreed that disease resistance and tolerance characteristics were acceptable for the establishing of distinctness if they fulfilled the same requirements for acceptance as any other characteristic. It was, however, of importance that any such characteristic be well defined and that an accepted, standardized method exist for its evaluation.

(See TWA/24/13 Prov., paragraph 12, and TWV/29/15 Prov., paragraph 15).

39. The Committee is invited to note the above information.

Example Varieties

40. The TWV noted that the Committee had asked all Technical Working Parties to rediscuss the handling of example varieties and report to it during its next session. It agreed that it would try to

reduce the number of varieties by making more frequent use of selected varieties for as many characteristics as possible.

(See TWV/29/15 Prov., paragraph 12).

41. *The Committee is invited to note the above information.*

II. MATTERS FOR INFORMATION AND FOR A POSSIBLE DECISION TO BE TAKEN BY THE COMMITTEE

Test Guidelines for French Bean

42. The TWV noted a mistake in characteristic 48 of document TG/12/8 where characteristic 48.1 should apply to "US race 1" and characteristic 48.2 to "US race 2." It will also check whether an additional characteristic 48.3 with a European race would have to be added. The expert from Germany will inform the Office of UPOV in August to enable it to prepare a correction and a possible addendum to the above document TG/12/8.

(See TWV/29/15 Prov., paragraph 17).

43. *The Committee is invited to note the above information and to consider possible steps to be taken.*

Use of Electrophoresis for Identification

44. In the Netherlands an inventory for the existing varieties of *Poa pratensis* with respect to their electroferograms had been made to facilitate the selection of the correct reference varieties and to reduce their number and thus the costs of the test. Electrophoresis would thus facilitate the organization of the trials. The expert from Germany reported that electrophoretic characteristics of *Poa pratensis* had been recorded as routine and so far they had not yet been used for distinguishing but only for checking stability. They are broadly used in commerce. It was his opinion that the tools used to identify a variety after the granting of protection should be the same as the tool used for the testing and granting of the right. Several experts considered that question not to be technical but legal only. The use of tools for post control and certification of a variety should not be the concern of UPOV. The variety was defined by the description established at the time of granting the right and by the plant material. If, after the grant, additional characteristics were used as routine, the variety description would have to be extended for those characteristics. The description would thus change all the time at any introduction of a new characteristic. What was protected was the variety represented by the plant material and not the description. The use of electrophoresis for identification purposes for the layout of the trials in the field or for the elimination of certain reference varieties to cut down the cost of testing would require further studying, especially with respect to what data would be used, how and what distance inside a given characteristic was applied. Therefore two papers were planned for the next session of the TWA: one on the use of electrophoresis in the layout of tests and in the testing of maize, and another one

on the use of electrophoresis in the layout of tests and in the handling of the testing of *Poa pratensis* and of potato, including the procedures, the limitations and the precautions taken.

(See TWA/24/13 Prov., paragraphs 19 to 22).

45. *The Committee is invited to note the above information and to consider possible steps to be taken.*

Application of Electrophoresis to Ryegrass

46. The TWA noted document TWA/24/5 on Possible Application of Electrophoresis to the Registration of Ryegrass Varieties and document TWA/24/7 on SGE Method for Analysis of Isoenzymes from *Lolium perenne* and *Lolium multiflorum* prepared by experts from France. While document TWA/24/7 described the SGE method mentioned, document TWA/24/5 discussed the possibilities with respect to ryegrass, examining some of the important principles particularly with respect to uniformity, setting out the advantages and disadvantages of the application of electrophoretic examinations to the crop and finally considering systems and methods which might be acceptable to UPOV for variety registration purposes. Unlike wheat and barley (self-fertilized) or maize (F1 hybrid) for which UPOV had already accepted electrophoretic methods, varieties of ryegrass, a cross-fertilized crop, were in effect populations of plants kept within limits true to description by careful initial selection and delineation of their founder populations within specific ranges of variation for a number of characteristics. Careful isolation and limitation of the number of generations during multiplication were then also necessary to maintain genetic stability and varietal identity. The concept of uniformity as applied to clonal and self-fertilized crops, to F1 hybrids and even to apomictic crops was therefore not appropriate. The document made a comparison of the uniformity concept applied to various broad groupings of crop types according to crop type, nature of varieties and uniformity/disuniformity: (i) Vegetatively propagated crops with clones and identical plants or off-types; (ii) apomictically propagated crops with clones and identical plants or off-types; (iii) F1 hybrids with F1 generation and identical plants or off-types; (iv) self-fertilized crops with inbred lines and identical plants or off-types; (v) cross-fertilized crops with populations and limits to variability.

47. While for *Poa pratensis* (an apomictic crop) the conventional uniformity standards and principles already defined for clonal self-fertilized and F1 hybrid crops could probably be applied without difficulty, for ryegrass the consideration of the use of electrophoresis for the registration of varieties involved a decision of principle. The concept of uniformity within ryegrass had so far been applied only to discontinuous morphological or physiological characteristics. The only presence/absence characteristics used for ryegrass were those applied solely for classification or grouping purposes and could not be used for distinctness purposes as no varieties were considered to be totally uniform.

48. The examination of uniformity was made, at least partly, to ensure that any variety which showed a distinctive characteristic for registration would maintain that distinctive feature during multiplication and commercialization. Thus, in this respect it could be claimed that it was stability or genetic equilibrium of the characteristics rather than their absolute uniformity which was essential. Most, if not all, problems with electrophoresis would arise for ryegrass if the need for

absolute plant-by-plant uniformity was rigidly required. If the principle was accepted that no cross-fertilized variety was absolutely uniform either electrophoretically or morphologically, the recognition that repeatability of the differences between varieties was more important than plant-by-plant uniformity could lead to the acceptance that distinctness could be established between varieties with different but stable proportions of different genotypes. If this proposal were accepted then there would be opportunities for the use of certain electrophoretic methods in variety registration in cross-fertilized crops such as ryegrass, possibly in a similar "last resort" situation as had been accepted for certain other crops.

49. One additional aspect which particularly applied to crops such as ryegrass was the possible danger of reducing the minimum (genetic) distance between varieties and leaving open the possibility of plagiaristic selection by breeders of electrophoretic variants out of existing varieties. The views of breeders organizations would therefore be of particular importance in arriving at a conclusion on the application of electrophoretic methods to these crops.

50. The main advantages for the acceptance of electrophoresis for ryegrasses were: (i) More distinctness problems resolved even if only used as "last resort"; (ii) potentially more rapid and less expensive testing system; (iii) permanent descriptions provided - independent of environment; (iv) "bred-in" distinctness possible. The main disadvantages were: (i) possible erosion of genetic distance and breeders' protection; (ii) replacement of existing systems not possible - morphological uniformity required; (iii) extra uniformity requirements through to maintenance in some cases. The methods used could be classified into two main types: (i) General protein examinations (storage proteins); (ii) specific protein loci examinations (isozymes).

51. As a conclusion it was recommended that PGI/2 genotype frequencies be used as a means, in a last resort situation, of distinguishing between varieties for registration purposes, subject to the satisfactory resolution of the minimum distance, essential derivation and plagiarism concerns. At the same time consultation with ASSINSEL should begin in order to determine their views on these issues. The breeder present during the session reported that the question of plagiarism had been discussed during the last ASSINSEL Congress in Argentina. A pilot study had been made for tomato and another one may be made for ryegrass. The TWA finally concluded that the use of electrophoresis for cross-fertilized species should follow exactly the same rules as agreed for wheat, barley and maize. The characteristics obtained by the use of electrophoresis would be placed in an annex to the respective Test Guidelines. They would be additional characteristics of a special category with certain restrictions (e.g. they would only be used to confirm a difference seen by the crop expert and they would not be sufficient alone to establish distinctness and would not be used as a routine characteristic). A draft on those lines will be prepared for an Annex to be added to the Test Guidelines for Ryegrass. The draft should then follow the same procedure as draft Test Guidelines normally follow.

(See TWA/24/13 Prov., paragraphs 23 to 31).

52. The Committee is invited to note the above information and to consider possible steps to be taken.

New Alleles in Wheat, Barley and Maize

53. The TWA noted that new alleles had appeared in new varieties and it was thus necessary to amend or complete some of the electrophoretic characteristics in the recently published Test Guidelines for Wheat. The TWA reconfirmed the procedure envisaged in the past by the Cereal Subgroup for such cases. The existence of any new allele had to be confirmed through ring tests on the same plant material by at least three laboratories. Thereafter, a draft Addendum to the adopted Test Guidelines for the species concerned would have to be prepared containing: (i) a standard sample; (ii) a photo of the new allele and (iii) a description of the bands concerned. That draft addendum should then follow the normal procedure for drafts for revised or new Test Guidelines. The expert from Germany would prepare by the end of the year a first draft of new alleles of wheat for discussion during the next session. The expert from the United Kingdom will prepare a similar draft with new alleles of barley and the expert from France with new alleles of maize.

(See TWA/24/13 Prov., paragraph 36).

54. The Committee is invited to note the above information and to consider possible steps to be taken.

Characteristics For Use as a Last Resort

55. In the TWA the question arose of the meaning of last resort. Was it meant as opposed to routine characteristics or was it meant--as opposed to a characteristic standing on its own--to be additional information which on its own would not be sufficient for distinctness purposes? Several experts mentioned the decision of the Committee on the special status of electrophoretic characteristics which the majority had considered unable to distinguish alone a variety. The expert from France referred to their weighting of characteristics in maize which would not enable the distinguishing of varieties on electrophoretic characteristics alone.

(See TWA/24/13, paragraph 17).

56. The Committee is invited to note the above information and to consider possible steps to be taken.

Electronic Form

57. The TWC noted a short report on the increased use of e-mail facilities and raised the question whether certain UPOV documents, e.g. the COYD and COYU methods once reworded or document TWC/11/16 or other documents like the UPOV Convention or the UPOV Test Guidelines should be placed on the Internet to be accessible by e-mail. The TWC agreed that it was time to consider such a step, but it was also necessary to carefully reflect which documents should be made accessible and in which format. It finally recommended the Committee to consider the subject and offered its help in the study of possibilities. It was of the opinion that access to

certain documents via e-mail as well as transfer of data via e-mail was not only of help to the TWC but also to other Technical Working Parties and also to the Committee and other bodies of UPOV.

(See TWC/13/19 Prov., paragraphs 63 and 64).

58. The TWA noted the proposal of the TWC to the Committee that UPOV should make available Test Guidelines in electronic form via e-mail and supported that suggestion.

(See TWA/24/13 Prov., paragraph 7).

59. The TWV saw at present no need for Test Guidelines for the species of its competence to be made available via e-mail. It saw, however, a need for an exchange of variety descriptions in electronic form.

(See TWV/29/15 Prov., paragraph 10).

60. The Committee is invited to note the above information and to consider possible steps to be taken.

UPOV Central Computerized Database

61. The experts from the breeders present during the session of the TWA asked that UPOV should make available the UPOV-ROM Demonstration Disk to breeders also.

(See TWA/24/13 Prov., paragraphs 13 and 14).

62. The Committee is invited to note the above information and to consider possible steps to be taken.

Definition of Off-Type

63. The TWA noted that the Committee had agreed with the conclusion of the TWO that each plant which showed a mutation in parts of its organs was considered an off-type. It also noted that the TWO had reported to the Committee that it would make no difference between admixtures and other off-types but disagreed with that decision as far as the crops of their group were concerned. Genetically unrelated plants or plants very clearly not belonging to the variety would not be counted as off-types.

(See TWA/24/13 Prov., paragraph 9).

64. The Committee is invited to note the above information and to consider possible steps to be taken.

Rape Seed

65. The TWA noted document TWA/24/2 explaining the different subjects treated by the Subgroup on Rape Seed and that it had agreed to leave open which system of testing (plant rows or individual plants) should be used as it had not been possible to agree on one single variety model for rape seed. It discussed at length what was more important for the definition of a variety and its testing, the genetically fixed way of reproduction of the species or the method used by the breeder to develop the variety. In rape seed four different variety models were possible: (i) hybrids; (ii) inbred lines for hybrids; (iii) self-fertilized varieties; (iv) narrow populations. The testing would depend on the model of the variety. The different ways of testing were mainly a question of different historical development. It was expected that with the development of hybrid varieties the differences would be reduced.

(See TWA/24/13 Prov., paragraphs 48-51).

66. The Committee is invited to note the above information and to consider possible steps to be taken.

Varietal Association

67. The TWA discussed how to handle a varietal association where a male sterile hybrid for the production of the final crop was mixed with another pollinator. While several experts were of the opinion that the varietal association was not a variety but a mixture of two varieties or a plant breeding kit, some experts asked for more detailed reflection on the question before taking a final decision. The whole matter was in addition more a legal than a technical question. The expert from Germany repeated his proposal to consider, in the case of a varietal association, the variety itself, the sterile hybrid, its lines and the pollinator. The DUS of the variety could be substituted by the DUS test of the sterile hybrid. It should be aimed at having, for variety protection, the same definition of variety as for national listing.

(See TWA/24/13 Prov., paragraphs 52 and 53).

68. The Committee is invited to note the above information and to consider possible steps to be taken.

Application of the COY Analysis to a Not Totally Self-fertilized Species

69. The TWC noted document TWA/24/6 prepared by experts from France for the TWA and reporting on DUS trials of *Bromus* varieties in France. Although *Bromus* was self-fertilized, France proposed that it should be treated as a cross-fertilized crop with spaced plants and with the application of the COYD and COYU analyses as (i) *Bromus* was not totally self-fertilized and (ii) breeders were the same as for perennial fodder crops (mainly synthetic varieties of cross-fertilized species) and treated *Bromus* varieties in the same way. Thus it was not possible to require complete uniformity but only a relative one compared with already known existing

varieties. The document compared several examples of *Bromus* and *Dactylis*. It concluded that the COYD and COYU criteria as well as other statistical tests could be appropriate to check distinctness and uniformity of *Bromus* varieties even though they involved an extra workload due to the plant-by-plant assessment of characteristics. The examples presented in the document showed that it was a good method to take into account the relative uniformity of the varieties and to facilitate the decision on distinctness.

70. Some experts of the TWC took the view that the fact that, if treated as a self-fertilized crop, too many *Bromus* varieties would have to be rejected, as lack of uniformity was not necessarily something that had to be attributed to the species but that the breeder might just not have done his homework and left a mixture of lines. While there was less of a problem in applying COYD to all species, including self-fertilized ones (although studies with past data would be necessary to find the right level of stringency), COYU was only to be applied to cross-fertilized and partly cross-fertilized species.

(See TWC/13/19 Prov., paragraphs 20 to 22).

71. The TWA noted documents TWA/23/13 and TWA/24/6 prepared by experts from France and reporting on DUS trials of *Bromus* varieties in France. The expert from France explained the reasons for the use of the COY analysis as laid down in document TWA/24/6. When testing *Bromus* varieties one had not only to take into account the reproduction method of the species in question but also the fact that the varieties were no more uniform than other cross-fertilized grass varieties as breeders would handle them in a similar way. The way of breeding had thus to find its reflection in the testing. Breeders would introduce sister lines or group lines not fully identical. Some experts proposed applying electrophoresis to single grains to find out whether they were real mixtures. Others questioned whether the reduced uniformity resulted from the type of breeding or only from the mixing which may not form part of the type of breeding. Others raised the question whether the COYU analysis was applicable as those varieties were not in equilibrium but mixtures which the breeder had not selected stringently enough. Breeders should be asked to produce more uniform varieties. The expert from France will prepare an updated draft for Test Guidelines for *Bromus* for the next session by the end of the year. That draft will also include *Bromus auleticus*, a real cross-fertilized species. The expert from Uruguay will supply the French expert with information on the species and a proposal for a list of characteristics to be tested.

(See TWA/24/13 Prov., paragraphs 58 - 60).

72. The Committee is invited to note the above information and to consider possible steps to be taken.

Perception of Statistical Documents and Improvement of Existing Documents

73. The TWC noted document TWC/13/19, Perception of Statistical Documents and Means to Improve Communication of Information. The document held a critical view on the work and role of the statisticians. It pointed to ambiguities of terms in common language, to misunderstandings of common statistical terms, to missing translations of statistical interference into common language, to an imperfect description of problems and to the misunderstanding of the role of

statisticians. While the TWC appreciated the highlighting of the subject to raise awareness of the possible difficulties, several experts disagreed with various statements made in that document. The TWC agreed that it was necessary to set up a glossary of statistical terms to facilitate understanding of documents by non-statisticians.

74. The TWC noted that a questionnaire had been circulated to the Chairmen of the other Technical Working Parties to inquire about the improvement of the acceptance of documents prepared by the TWC. The answers led to the conclusion that there was less need to ask the other Technical Working Parties what was needed, nor was there a need to prepare extracts from existing documents. There was a need to inquire which questions needed an answer (e.g. which agronomic question led to the preparation of the method, how did the method work, comparison of new and old methods). There was also a need to supplement methods with examples and to explain the purpose of the method. The TWC agreed that the quality of the paper was essential for a good understanding and acceptance of a method; that did apply to any method and not only to the COYD and COYU methods or document TWC/11/16. It was thus necessary to improve documents in general. A difference had to be made between documents for discussion in a TWC session and documents prepared for other Technical Working Parties or the Committee. The latter needed to be complete in themselves, be illustrated by examples, with explanations of the text, with clear and precise notes on the diagrams, with consistent terminology (e.g. not changing between alpha and beta risk, risk type one, type two or risk of breeder, risk of user) with a clear structure of the document (e.g. assumptions of the method, why the method was needed, where it was used, how it worked, examples) with an overview of the paper, a short description in common language (not statistical language) followed by a more detailed description.

(See TWC/13/19 Prov., paragraphs 59 and 60).

75. The Committee is invited to note the above information and to consider possible steps to be taken.

Rewriting of Documents TC/30/4 and TWC/11/16

76. The TWC noted that the COYD and COYU methods and document TWC/11/16 should be rewritten in a form such as to become at a later stage apart of a revised General Introduction to Test Guidelines. While the document on the COYU analysis did not so far require substantial changes, the document on the COYD method should be reviewed, the comparisons with other methods removed, the figures improved and explanations to the figures added. Document TWC/11/16 would have to be reworded to stand on its own; it would have to be extended to cover more than one test, the drawings should be presented with actual points, not in continuing curves; specific cases should be added, especially for very low sample sizes (e.g. four or six plants in case of vegetatively propagated species). All documents should comprise a definition of the statistical terms used in the document.

(See TWC/13/19 Prov., paragraph 61).

77. The Committee is invited to note the above information and to consider possible steps to be taken.

COYD and COYU Program on Diskettes

78. The TWC noted the inclusion of the DUST program prepared by Mr. C. Weatherup, United Kingdom, covering the COYD and COYU methods including the long-term LSD calculation in the computers of several member States, its translation into their national language and its application. The experts were reminded that the program was available from the expert of the United Kingdom.

79. The TWC also noted the inclusion on one diskette of the COYD and COYU program together with files and data which could be run on the national computers to check whether in the process of translation and integration of the DUST program into the different national systems the program had not been changed and would lead to the same results, as included on the diskette.

(See TWC/13/19 Prov., paragraphs 7 and 23).

80. The Committee is invited to note the above information and to consider possible steps to be taken.

Request for the Facultative Use of the COYD and COYU Analyses

81. The TWV received a detailed explanation on the COYD and COYU analyses from the Netherlands on the basis of document TC/30/4. It repeated its critical position vis-à-vis those methods. Several experts repeated their position that they did not like methods being imposed on them which they did not need, which were not appropriate in their field with often small plots, few plots with little interaction, few varieties changing from year to year, many characteristics observed on all varieties and few measured characteristics and few cross-pollinated species. The application of the COYU analysis would only create more work, require more replicates, more field space, etc. The TWV finally concluded its discussion in asking the Committee to be informed that it would not like these methods to be made mandatory. The experts should be given a free choice of applying them or not. In most cases of difficulties of distinctness in a measured characteristic it was easier to find another characteristic to distinguish a given candidate than to follow the COYD and COYU methods. In vegetable species, the methods were not needed and not routinely used. If no other possibilities for distinctness existed, only then would COYD and COYU be used. For that purpose, however, an easier explanation and a cookbook-style recipe presentation with a selected example followed through all calculations should be prepared. An open question remaining would also be how to combine data from the COYU analysis with other visual observations, e.g. an off-type in another characteristic observed visually.

(See TWV/29/15 Prov., paragraph 19).

82. The Committee is invited to note the above information and to consider possible steps to be taken.

Application of the COYD and COYU Analyses to Self-Fertilized Crops

83. The TWC recalled that the Committee will follow the study of the TWA together with the TWC as to whether the COYD analysis developed for cross-fertilized species could also be applied to self-fertilized species. In order to get a clearer picture on the decisions with respect to the use of COYD, COYU and the inclusion of the long-term LSD already taken by the Committee, the Office of UPOV was asked to include in an Annex to the report of its session (TWC/13/19 Prov.) a summary of decisions already taken with respect to these methods.

(See TWC/13/19 Prov., paragraph 22, and its Annexes).

84. The TWA had a lengthy discussion on whether the COYD and COYU analyses developed for cross-fertilized species could also be applied to self-fertilized species. Some experts saw no difficulty in applying the COYD method to self-fertilized species but not the COYU method. As both methods should be applied in parallel it foresaw problems. The statistical expert from Germany explained that the situation between cross-fertilized and self-fertilized species was different. In cross-fertilized species a higher number of plants was observed with replications and there was a genetic variation from plant to plant and a variation caused by environment. In self-fertilized species there were rather uniform plants, only environmental variation, only one replication and only few plants, in general less than 20. It was not possible to calculate a valid LSD with one replication only.

85. The TWA concluded that the present way of handling agricultural self-fertilized species would not allow the application of statistical methods. Moreover, it was difficult to apply statistics if the trial plots were not randomized. In agricultural self-fertilized crops the decision was taken on the basis of the knowledge of the crop expert from side-by-side comparisons and clear differences seen by the eye and not by statistical data. In practice, no country represented in the session really applied statistical methods in self-fertilized crops. Some of the non-represented member States may, however, apply statistics to varieties of those species. The TWA thus finally concluded that for self-fertilized crops statistical methods were not needed.

(see TWA/24/13 Prov., paragraphs 40 and 41).

86. The Committee is invited to note the above information and to consider possible steps to be taken.

Telecommunications, Exchangeable Software and Contacts

87. Discussions in the TWC were based on documents TWC/13/11, UPOV Technical Working Parties Electronic Mail Addresses, TWC/13/12, Database Management Systems in Use in UPOV Member States and TWC/13/13, Exchangeable Software. It was proposed to include the above

information in future in one single document. More countries were invited to supply information on exchangeable software and to check the information they had indicated in the past as some information looked rather outdated.

(See TWC/13/19 Prov., paragraph 62).

88. *The Committee is invited to note the above information and to consider possible steps to be taken.*

Most Similar Variety

89. The TWC pointed out that indication of the most similar variety was part of the variety description recommended by UPOV although some member States had so far not followed that recommendation. Discussions were based on document TWC/13/6, Evaluation of Most Similar Variety. The document described two approaches to the choice of the most similar variety:

(i) t-value method (determination of the over-years t-values between the entrant variety and each of the control varieties on all characteristics. For each variety pair comparison determination of the largest t-value, regardless of sign, over all characteristics. The most similar variety was then defined as the one with the smallest maximum t-value, i.e. the variety with the smallest maximum characteristic difference over all characteristics);

(ii) D^2 method (determination of the over-years Mahalanobis generalized distance D^2 between the entrant variety and all other varieties and selection of the most similar variety to be the control variety with the smallest value with respect to the entrant variety).

90. The document concluded that, of these two approaches, D^2 was likely to be the more suitable method as it included the differences on all characteristics weighted according to their correlations while the t-value method was dependent on the result from a single characteristic and hence might not reflect the total difference over all characteristics. In practice, both methods gave similar results. In the United Kingdom, the most similar variety was evaluated using the module MOSTX in the DUSTX package. Before the MOSTX module was run information on variety means, SE's and distances were provided.

91. The TWC expressed the hope that with the spreading of the DUST package which included the above D^2 method more countries would calculate the most similar variety.

(See TWC/13/19 Prov., paragraphs 43 to 45).

92. *The Committee is invited to note the above information and to consider possible steps to be taken.*

Image Analysis

93. The TWA, TWC and TWV noted that the Committee had requested that a survey should be made of what had already been done in the field of image analysis and what problems had been encountered with that tool in variety testing. They noted Circular U 2220, containing a summary of 26 answers received on the questionnaire on image analysis. The Circular concluded that at that time some countries had already started the application of image analysis in their routine variety testing. In addition, several other countries indicated their interest in the application of image analysis in the near future. As already been concluded by the TWC at its meeting in April 1994, it would be most profitable to cooperate and standardize before research and applications of members started to diverge. It could be concluded that there had already been a divergence in the choice of hardware and software in the respective UPOV member States. However, it was thought that at that time it was still possible to standardize the equipment (more or less), using the criteria stated in document TWC/12/6. If waited until more countries had implemented image analysis, it would be much more difficult although some experts felt that it already seemed to be unrealistic. It might be more realistic to establish a library of tools. The Circular proposed also to form a UPOV working group on image analysis. This Working Group could also expand on the work done by a previous sub-group on color measurements. Fifteen experts who replied had said that they were prepared to join such a working group. That working group should be responsible for the standardization of image analysis applications and for the dissemination of results from the various countries. From the answers to the questionnaire it could be concluded that there were three criteria for selecting crops for standardization of image analysis applications: (i) a crop of which characteristics were already measured with image analysis; (ii) a crop that was already under investigation; (iii) a crop that was mentioned as of great interest.

94. The TWC also noted document TWC/13/16, prepared by experts from Denmark, the Netherlands and the United Kingdom and containing information on a research proposal for the European Communities written as a result of Circular U 2220, a Questionnaire on Image Analysis in Variety Testing. The project was submitted to the FAIR program of the European Communities in March 1995 under the acronym VISOR. The objectives of the project were:

(i) to establish best practice guidelines in applying image analysis to testing for distinctness, uniformity and stability;

(ii) to develop computer systems which automate the production of scores for characteristics that are currently visually assessed;

(iii) to develop an image database system for plant varieties which can take an image of one variety and compare it with other images of varieties of the same species in order to identify the closest visual match.

95. The TWC concluded that although the VISOR project was restricted to European Union member States, the approaches could be beneficial to all UPOV member States.

(See TWC/13/19 Prov., paragraphs 37 to 40).

96. The TWV stressed that image analysis should not be neglected vis-à-vis other new techniques such as molecular techniques. At present, in the view of the TWV, there was no need

to make a special survey in the field of vegetables. Other questions were of much higher importance.

(See TWV/29/15 Prov., paragraph 13).

97. In the TWA some delegates had warned that it may be difficult, especially for the system of breeders' testing, to make mandatory any characteristic which could only be observed with image analysis. This should also apply to any other methods which breeders themselves may find difficult to apply not only before applying for breeders' rights but also in the maintenance of the variety after the granting of protection. The TWA also noted that the TWO will discuss the subject on September 4, 1995, and a proposal for a European Union project had been prepared as well. The TWA agreed that it was important to standardize the taking of measurements, the storage of data and their interpretation.

(See TWA/24/13 Prov., paragraph 43).

98. *The Committee is invited to note the above information and to consider possible steps to be taken*

Image Analysis: Application of Multivariate Analysis

99. Discussions in the TWC were based on document TWC/13/10, Plant Variety Color Assessment Using a Still Video Camera. The document described two experiments to investigate the use of a still video camera to distinguish plant varieties on the basis of color differences. In one experiment the color of seven varieties of celery was measured at the seedling stage. Using the color image data, it was possible to discriminate between varieties (with $p < 0.01$) in 19 per cent of the variety pair comparisons. In a second experiment with images of plants of Brussels sprouts growing in the field, 86 per cent of differences between pairs were significant at the 1 per cent level. Three-dimensional histograms were obtained from each image. From these data, summaries of the color of each image were obtained. Simple summaries included the average intensity in each of the three color components and the proportion of pixels for which a color component exceeded a given value. The histograms also allowed measures to be obtained of the overall difference in color distribution between two images. First, cumulative color histograms were calculated. Then, in order to assess which particular varieties could be distinguished, multivariate analysis of variance was used on five variables (average green intensity, average red intensity, average blue intensity, proportion of pixels whose green intensity exceeded 200, proportion of pixels whose green intensity exceeded 225) which summarized the color distribution of those pixels whose green value exceeded 170 (for celery seedlings) or 140 (for Brussels sprouts). The document concluded that results showed that the still video camera had potential for measuring color differences between varieties both in the field and at the seedling stage. In particular, the use of color differences at the seedling stage could help to identify those control varieties which were dissimilar from candidate varieties, thereby reducing the size and cost of registration trials. Although it would be optimistic to expect that all varieties possessed characteristic color properties that could be recognized at the seedling stage, some variety separation was possible. If color assessment of seedlings was to be used on a routine basis, then consideration should be given to seedling management practices and to measures for standardization of lighting conditions.

100. The TWC noted that the method had a large potential and had been able to separate 80 per cent of all varieties of Brussels Sprouts. It would have the advantage of collecting data of a whole new dimension. It had a good reproducibility over sites and years, although it was confronted with all the difficulties of capturing colors under field situations. More research was, however, needed on the influence of the environmental factors. The TWC agreed that a subgroup should further concentrate on that subject. If the European Union project on image analysis were approved, that group of experts could form the core group to which others could feed their information. If not, an ad hoc subgroup should be created to advance research and discussions. For that subgroup also experts from the TWO should be involved, this especially in view of the discussions on image analysis planned in the TWO for September 4, 1995.

(See TWC/13/19 Prov., paragraphs 55 to 58).

101. The Committee is invited to note the above information and to consider possible steps to be taken.

Sequential Analysis

102. The TWC noted document TWC/13/17 and the background of the study on sequential analysis, starting in the TWA with the possible application to electrophoresis data, over the several documents prepared for last year's session, the discussions during that session and the request of the Committee for a document to be prepared by the TWC. In preparing document TWC/13/17 it had been intended to avoid formulas, to stick to the principal of one page and one example with more information in independent parts and different levels. The goal was to check samples of varieties for off-types whereby rejection of good varieties or acceptance of bad ones had to be avoided. Pages 3 and 4 of the document contained the document requested by the Committee with information on the principle of the sequential analysis method and giving an illustration of that analysis with an example. The document then discussed in detail general considerations on UPOV work which set out the basic practice of the work carried out in UPOV and which were important to be kept in mind when discussing the methodology. It thereafter made a comparison of different approaches with examples illustrating the sequential analysis and other common practices such as "study during one year with a fixed sample size" It finally contained supplements corresponding to the different approaches with information for those who wished to know how the figures for the different examples had been obtained.

103. The expert from the Czech Republic foresaw difficulties in understanding the fact of not fixing one limit between good and bad varieties but two limits (good = 0-1 per cent off-types, bad = 5 per cent off-types or more). The TWC approved pages 3 and 4 with some minor changes. Several experts considered the middle part of the document to be of lesser importance and that, for the Committee, it could be omitted. Others were not sure whether it should be completely deleted. The TWC therefore requested several of its experts to inform their national colleagues in the TWA, to check the document and to inform them or the Chairman of their impressions and of the usefulness of the different parts for discussions on the subject in the Committee. On the basis of those comments the Chairman would prepare a revised draft document for circulation to the commenting experts before preparing a final document and distributing it to the Committee.

Several experts expressed their satisfaction that document TWC/13/17 had already considered several of the remarks made to improve the acceptance of TWC documents.

(See TWC/13/19 Prov., paragraphs 35 and 36).

104. The TWA noted that the TWC had prepared a preliminary document (TWC/13/17) on sequential analysis at the request of the Committee and will await the final document.

(See TWA/24/13 Prov., paragraph 42).

105. The Committee is invited to note the above information and to consider possible steps to be taken.

Possibilities of Biometry to Help in the Establishment of Guidelines

106. Discussions in the TWC were based on document TWC/13/14. It pointed out that when preparing Test Guidelines four questions were important: (i) Are the number of states of expressions, as specified in the Test Guideline for individual characteristics, still appropriate? The data may show that only some states occur in practice; (ii) Which characteristics are strongly correlated, and if so, which of them can possibly be dropped? (iii) Which characteristics have a low discriminative power and are better not included in the Test Guidelines? (iv) How large should the minimum distance of a visually-observed quantitative characteristic be in order to establish distinctness, e.g. should the distance cover two or three notes, when the underlying scale is in the range from one to nine? The study was made on dwarf French beans as an example, on data from six years using as methods: (i) Histograms of individual characteristics to illustrate the relative frequencies of Notes over all years and varieties; (ii) pooled sample correlation coefficients within years and between characteristics having a one-to-nine scale to check whether any characteristic should be eliminated because of strong correlation with another; (iii) a two-way analysis of variance (ANOVA) with the factors years and varieties as the results needed to be interpreted with caution because the dependent variables were only on an ordinal scale. (iv) an empirical minimum distance (MD); a question arose whether the LSD values could help the crop expert to check if the empirically found MD was appropriate as LSD and MD values have quite different meanings when applied as a measure of minimum distance; (v) a percentage of distinct variety pairs (%D) was calculated from six individual years and the empirical minimum distance MD applied. It concluded that the conclusions drawn from this study were only based on data from one country and a specific set of years. The evaluation of individual characteristics in other countries could lead to different results. The Test Guidelines could be considered a compromise over many countries. Therefore a statistical evaluation from other countries needed to be considered too. This study showed that analysis of past data was of valuable help for the revision of guidelines. It was recommended that this information be used in the future. The benefits were a contribution to reducing the workload in DUS testing and improving the reliability of decisions.

107. The TWC concluded that the discussion had shown that the method applied could provide useful help in checking Test Guidelines and trying to evaluate the usefulness of given characteristics. However, statistics would only be a help and care should be taken when applying them. It will ask the TWA to select a species for which it foresaw a revision of the Test Guidelines

and to apply the above procedure in document TWC/13/14 applied for French Bean to that species. (The TWA chose Soya bean for that purpose).

(See TWC/13/19 Prov., paragraphs 10, 11 and 15).

108. The TWA noted that during its last session the TWC had discussed possibilities for helping in the selection of useful visually-observed characteristics at the time of revising existing Test Guidelines, in ensuring the appropriate states of expressions in detecting correlations between characteristics and the discriminatory power of individual characteristics. So far past data from wheat and French bean had been used. It had been proposed to select one agricultural species for which the Test Guidelines were planned to be revised to demonstrate the usefulness of the method. The TWA agreed to use the revision of the Test Guidelines for Sunflower and to accept the help of the TWC in the right selection of characteristics and their states of expression. The experts from France and Spain will approach their national experts in the TWC and supply them with the necessary data on the past testing of sunflower varieties, discuss the results with the statistical experts and report to the TWA during its next session

(See TWA/24/13 Prov., paragraph 44).

109. The Committee is invited to note the above information and to consider possible steps to be taken.

Handling of Visually-Observed Characteristics in the Decision Making Process

110. Discussions in the TWC were based on document TWC/13/9, Homogeneity Criterion for Visually-Assessed Characteristics in Turnip Rape. The document recorded steps taken in the United Kingdom to prepare guidelines on uniformity in some detail with respect to turnip rape. Three possible approaches had been considered:

(i) Totalling the number of off-types amongst the established varieties and form a two-way table to which a chi squared test was applied with 1 degree of freedom. This method did not take account of variation from test to test in off-type rates and so may represent too severe a criterion.

(ii) Application of the analysis of variance to the percentage off-types for established varieties. Since the range of percentages was small, an analysis of the untransformed data seemed reasonable. An LSD was then calculated to compare the candidate with the established varieties.

(iii) Analysis of the binary data to fit a linear logistic model drawn from the broad class of models known as generalized linear models (GLM). Because of the comparison of a candidate with the control, the data for the candidate variety must be included in the analysis. The GLM model was then constructed to include a contrast term which represents a comparison between the candidate and the mean of the established variety

111. The TWC went along with the conclusion of the document that, in principle, method three was the preferred procedure since it involved a model which most closely reflected the underlying processes. It agreed to prepare a paper reviewing the different methods applicable to visually-

observed characteristics on their usefulness in assisting crop experts in taking decisions. Furthermore the experts from the United Kingdom and Denmark would apply method (iii) (GLM, United Kingdom) and the population standard method (Denmark) to real cases and add the appreciation of the crop expert to their document.

(See TWC/13/19 Prov., paragraphs 12 to 15).

112. *The Committee is invited to note the above information and to consider possible steps to be taken.*

III. MATTERS FOR A DECISION TO BE TAKEN BY THE COMMITTEE

Possible Invitation of the European Union to Attend TWC Sessions

113. The TWC noted the report on a meeting of the European Union in Brussels discussing the best way of establishing a computer system for the handling of the administrative data of the new PVR office. It recommended in that connection to the Committee that the European Union be invited to future sessions of the TWC.

(See TWC/13/19 Prov., paragraph 8).

114. *The Committee is invited to take the necessary decisions.*

Presentation of Characteristics in the Test Guidelines

115. The TWV noted on several occasions that, for the characteristics size and weight or length and width, different decisions were taken in different Test Guidelines for the same or similar situations. In some cases, the characteristic was called size but the weight was observed. In other cases, instead of the size, the length and width were observed. In others, the ratio of length/width was also added, sometimes even in addition to the characteristic on size, which several experts considered to be double observation of the same fact. It will prepare a paper with proposals for harmonized handling in the Test Guidelines. The TWV also discussed the different naming of attitude characteristics on the basis of document TWV/29/7. Some experts considered that no more than five states could ever be identified for attitude. Others considered that the specific situation of a crop should also play a role. Breeders often dealt with only one or a few crops and would have difficulties in understanding strange situations with respect to their crops, but which were of overall concern.

116. The TWV finally agreed to propose to the Committee that attitude characteristics should always have the same states of expression as follows: erect (1), semi-erect (3), horizontal (5), semi-pendulous (7), pendulous (9). The TWV was aware of the fact that in certain cases only the range from 0 to 90° was covered whereas in other cases the whole range from 0 to 180° was applicable. This fact should not, however, effect using the same wording as above. If only 0 to 90° applied, only half of the scale from 1 to 5 should be presented in the Test Guidelines.

(See TWV/29/15 Prov., paragraphs 5 to 7).

117. *The Committee is invited to take the necessary decisions.*

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