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GENEVA

TECHNICAL COMMITTEE

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**MATTERS ARISING FROM THE 1997 SESSIONS OF THE TECHNICAL WORKING
PARTIES TO BE DEALT WITH BY THE TECHNICAL COMMITTEE**

Document prepared by the Office of the Union

1. This document summarizes, in Annex I, matters arising from the 1997 sessions of the Technical Working Parties (hereinafter referred to as the "TWPs"), 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 TWPs, communicated to the Committee

- (a) for a decision to be taken by the Committee;
- (b) for information and for a possible decision to be taken by the Committee;
- (c) for information;
- (d) for discussions planned by the Committee under separate agenda items.

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

2. To shorten references to the various TWPs and the BMT in this document, use is made of the following codes that designate their documents:

TWA: Technical Working Party for Agricultural Crops;
TWC: Technical Working Party on Automation and Computer Programs;
TWF: Technical Working Party for Fruit Crops;
TWO: Technical Working Party for Ornamental Plants and Forest Trees;
TWV: Technical Working Party for Vegetables;
BMT: Working Group on Biochemical and Molecular Techniques and DNA Profiling in Particular.

[Three annexes follow]

TC/34/3

ANNEX I

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PARTIES TO BE DEALT WITH BY THE COMMITTEE**

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

The Committee is invited to take the necessary decisions of the following:

Application of COYD and COYU Analysis

1. The different TWPs noted that the Committee approved a revised version of the Combined-Over-Years Distinctness (COYD) criterion and the Combined-Over-Years Uniformity (COYU) criterion as contained in document TC/33/7 which replaces the version contained in document TC/30/4 and noted that the version would become part of a revised General Introduction to Test Guidelines. However, the TWF saw little use in the field of fruit species as most tests were not randomized and contained few measurements, and some were only for one year. As this criterion was only exceptionally used for DUS testing of vegetable species, the TWV also decided to recommend to the Committee that paragraphs 31 and 32 of the present General Introduction to Test Guidelines should not be deleted, but kept as an alternative to the use of COYU.
2. The TWC noted document TWC/15/6 on the Use of COYD and COYU. Following the last TWC session, 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 negative 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. The TWC proposed that as more member States apply COYD and COYU it would be of help for this document to be up-dated to accurately reflect the current operational status of the over year distinctness and uniformity criteria.
3. According to the inquiry made by the TWC, 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.
4. The expert from Israel in the TWC 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.
5. The expert from Denmark in the TWC 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 of the TWC 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 giving information on actual practice even if it did not fully conform to the UPOV recommendations.

(See documents TWA/26/11 Prov., paragraph 6, TWC/15/18, paragraphs 16 to 20, TWF/28/10 Prov., paragraph 21, TWO/30/12 Prov., paragraph 23, and TWV/31/12 Prov., paragraph 38).

Guide to Help in Finding the Right Method to be Used

6. The TWC noted document TWC/15/13 on Constructing a Reference Set of Cultivars for Testing Distinctness. It recalled that the current criterion for distinctness was 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 simply because it is a reference and therefore 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%.

7. The expert from Germany explained some reflections in his country as reproduced in Annex III to the report on the TWC session. 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.

8. That gave rise to questions in the TWC on how to decide which method was the right or 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 TWC 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 of the TWC.

9. The TWA and the TWF noted document TWC/15/15 on balanced α and β risk tables (single sampling). Document TWC/11/16 was a help in finding the right sample size on the basis of the population standard. However, that document gave rise to some problems when trying to extend it to all species. Document TWC/15/15 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 from cross-fertilized species. It further questioned whether it was right for UPOV to 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.

(See documents TWA/26/11 Prov., paragraph 11, TWC/15/18, paragraphs 21 to 23, and TWF/28/10 Prov., paragraph 25).

Improvement of Document TWC/11/16 on the Testing of Uniformity of Self-fertilized and Vegetatively Propagated Species

10. The TWC noted 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 TWC agreed to present the document for approval to the Committee. 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 Committee would not prevent continuing the discussions on the philosophy raised in document TWC/15/15 (see paragraph 9 above) by the Spanish expert who will produce an improved document for the next session of the TWC. (See also paragraph 73). The version to be approved by the Committee is reproduced in document TC/34/5.

(See document TWC/15/18, paragraphs 29 and 30).

Population Standards for Hybrids of Open-pollinated Species

11. The TWV noted document TWV/31/6 on the population standards to be applied for the assessment of uniformity of hybrid varieties of open-pollinated species. The TWF concluded that for the assessment of uniformity of hybrids of self-pollinated or mainly self-pollinated species, paragraph 33 of the General Introduction to Test Guidelines, document TG/1/2, relative to single hybrid varieties, should be applied. It noted, however, that in the case of single hybrids of open-pollinated varieties in vegetable species, high degrees of inbred depression or non-uniform parent lines vegetatively maintained could be found, causing a low

degree of uniformity in their hybrids. In such cases, only relative uniformity standards should be applied. The TWV decided to recommend the Committee to include a new paragraph in revised General Introduction to Test Guidelines with the following wording: "In single hybrids of open-pollinated species with high inbred depression or non-uniform parent lines maintained vegetatively only relative uniformity standards should be applied."

(See document TWV/31/12 Prov., paragraph 40).

Definition of Off-type, Admixtures

12. The TWPs noted that the Committee had considered that the definition of off-type was not clear. The previously proposed word "significant" had a statistical connotation and also, significance in leaves is different from that in fruits. The word "clear" was more restricted to what can be seen visually, while "significant" included much more than seeing. It was important to point out that the work done is to distinguish a variety, so the word to be chosen should be considered in relation to distinctness. The TWPs also noted the different positions on the concept of admixture in relation to off-type. It was mentioned that an admixture was a plant which did not belong to the variety and was not clearly an off-type. In other words, a barley seed within wheat was an admixture which might have been caused by mixing or in other ways, while an off-type belongs to and comes from the variety through a genetic difference expressed in the phenotype. The TWPs further noted that the TWF and the TWO had discussed the question of off-types and admixtures.

13. The TWF and TWO could agree to the following definition of off-type: "Any plant is to be considered an off-type if it differs in the expression of any characteristic, of the whole plant or of part of the plant, from that of the variety, taking into consideration the particular species." The TWO proposed to add the sentence: "An admixture is considered to be an off-type." to clarify the handling of admixtures. The TWF could not agree to that addition. It agreed that admixtures should be treated the same way as other off-types and their number should be included in the number of off-types tolerated, but it had difficulties in calling them "off-types." The TWF therefore proposed a rewording of the last sentence as follows: "An admixture has to be considered an off-type."

14. The TWA could, however, not follow the TWF and TWO with respect to the first sentence of the definition of off-type. It could not accept that any characteristic would be able to make a plant an off-type. With the new methods differences could be found in all existing varieties and therefore all varieties could be rejected for lacking uniformity. The TWA preferred to stay closer to the text of the UPOV Convention and copy part of the wording of Article 7 of the 1991 Act. By this the TWA wanted to make clear that for off-types the same "yardstick" is used as for distinctness. In general only off-types in the characteristics normally used for DUS testing would be considered. The interpretation was clearly left to the crop expert. It would not only cover the fact that it was not possible to emphasize any characteristic but also that not only the characteristics included in the Test Guidelines would be taken into account. The TWA finally proposed the following wording: "Any plant is to be considered an off-type if it is clearly distinguishable from the variety, taking into consideration the particular species." With respect to admixtures, the TWA also took a different position to that of the TWF and the TWO. In their opinion admixtures were off-types but would not be counted as such in the assessment of uniformity. Because of the

different interpretation among the different TWPs it was finally agreed to add a sentence to clarify any doubts. As the term admixture would first require a definition it was preferred to avoid that term. While still looking for a better wording for presentation to the Committee, the TWA provisionally agreed to the following sentence: “Plants being very different from those of the variety could be disregarded as long as their number does not interfere with the test.” This text would cover not only admixtures but for example also the situation in the Test Guidelines for Maize where for out-crossed plants in hybrids an additional tolerance was indicated.

15. The TWV decided to follow the first part of the definition of off-types given by the TWA, which reads as follows: “Any Plant is considered an off-type if it is clearly distinguishable from the variety, taking into consideration the particular species.” It also adopted the position of the TWO in considering that an admixture is considered an off-type. Admixtures would thus be taken into consideration for the judgment of uniformity.

(See documents TWA/26/11 Prov., paragraphs 26 to 29, TWF/28/10 Prov., paragraphs 13 to 16, TWO/30/12 Prov., paragraphs 13 and 14, and TWV/31/12 Prov., paragraphs 34 and 35).

Prescreening of Varieties

16. The TWA noted document TWA/26/5 containing thoughts on the setting-up and use of reference collections for DUS testing. It especially discussed the following possible principles:

- Choose a set of descriptors not or little subject to environmental effects enabling separate groups of varieties to be made up whatever the origin of the data used. The grouping characteristics as defined in the UPOV Guidelines would constitute an initial basis for defining groups of varieties but other descriptors may also be considered, without them being necessarily included in the guidelines, including descriptions of protein polymorphism revealed by electrophoresis and that of DNA resulting from molecular analysis, being characteristics that are generally independent of the growing environment of the plant.
- Define a methodology that permits an approach in terms of distance that is based on several characteristics so that, beyond a given value to be estimated, two varieties judged to be different on the basis of this combination of characteristics not necessarily recognized by UPOV are effectively different in one or more characteristics chosen for distinctness testing.

It was necessary to show, by using a few examples, that this methodology can effectively enable the varieties to be compared to be separated by using a tool that differs from that chosen for examining distinctness between varieties and that was not included in the UPOV Guidelines. The document suggested

- putting together comparison indexes including the phenotypical characteristics that are most stable over the years or with regard to the places and defining the thresholds beyond which the varieties would not have to be directly compared in the field (e.g. for the maize species)

- setting up comparative indexes including the molecular characteristics revealed by the use of a perfectly defined, standardized “tool box” available to everyone, and defining thresholds for the molecular distances.

17. The TWA also noted document TWA/26/10, Prescreening of Varieties, a Case Study on *Poa pratensis*. The document referred to document TWA/25/7 and the discussion during the TWA meeting in 1996. It reported that (a) the testing of the electrophoretic database for *Poa* has been delayed due to technical problems; (b) the first experience had shown a major problem as the comparison of similar lanes on different gels was not accurate enough; (c) another difficulty had been the low intensity of some bands and that (d) a possible improvement may be reached by using a computer system in which the conformity of the electrophoretic patterns was calculated. The following procedure was therefore proposed for next spring: (a) the candidate varieties are put in the electrophoretic database; (b) seedling characteristics are recorded and fed into a database, which contains the characteristics of all varieties; (c) the candidate varieties are compared on the basis of the seedling characteristics with all varieties in the database; (d) the electrophoretic lanes of these close reference varieties are compared with the candidate varieties. If the electrophoretic differences are clear and support the (small) differences recorded in the seedling characteristics, the reference variety may be omitted in the spaced plant trial. In this way the “grouping” would be based on the seedling characteristics. The electrophoretic characteristics may be regarded as “supportive” or “complementary” characteristics. This approach may prevent the complication of using non-guideline or non-routine characteristics for grouping. A similar approach may be tested for potatoes, using lightsprout characteristics in combination with electrophoresis.

18. One group of experts in the TWA agreed that it was not possible to use all characteristics used for distinctness purposes also for screening varieties. In addition variety descriptions depended on year(s) and location(s). Characteristics independent of the environment were therefore of considerable help. Therefore electrophoresis or other new methods would be of great assistance in screening all varieties. One was never sure whether the reference collection covered all relevant varieties. There was always a risk that some varieties were missing, and 100% safety could never be guaranteed. In the past, the reference collection had comprised mainly local, national or regional varieties with, in total, a reduced number. With the 1991 Act of the UPOV Convention and the coverage of all species of the plant kingdom the setting-up of reference collections had become more difficult. Nowadays, varieties in far away countries had also to be considered. To find in that large number the closest varieties with electrophoresis or other new methods was considered of more help than restricting the comparisons with traditional characteristics to regional reference collections only. The whole screening had to be a balanced risk between what was ideally to be done and what was financially possible.

19. Other experts in the TWA warned again of using electrophoretic characters for screening varieties. UPOV had taken the view that those characteristics might be useful but that they might not be sufficient on their own to establish distinctness. Use for grouping meant a *de facto* introduction into the Table of Characteristics and use as any other characteristic or even as the first characteristics to be applied for distinctness. Normally, only the most reliable characteristics would be used for grouping. A risk therefore existed that some reference varieties placed in another group would never be compared with the candidate

variety. Otherwise if they should be used for screening they should be included before in the Test Guidelines for use for DUS testing. UPOV had insisted in the past that all characteristics used for distinctness had also be tested for uniformity and stability. That principle had also to be applied for characteristics for prescreening. Otherwise breeders would be free to change uniformity and stability.

20. In order to make more progress and to come to a common understanding, the TWA agreed that it was important to obtain a better exchange of existing information in the individual member States and to start with some concrete cases, either a bilateral or multilateral level, to find out how these new characteristics or a combination with characteristics from the Test Guidelines could facilitate the screening of varieties, because the volume of work and the means available had to be somehow balanced.

21. Several experts of the TWA stated that at present UPOV applied for distinctness a characteristic-by-characteristic approach to find a clear-cut difference. For prescreening, other possibilities should be checked for possible use, for example those based on the distance between varieties, e.g. by the combination of characteristics. The objectives for prescreening were different. There was a need to take one or more examples and gain experience on the possibilities and consequences of such a system. A start could be made with *Poa* where “centralized” testing existed in Europe and where an inventory could be made on the concrete proposals possible. The same could be done with potato where the experts from the Netherlands and Germany could exchange data and try to reach a common approach. Prescreening was considered by many experts to be different from grouping. It was mainly used to get an idea of the structure of the reference collection and to make its use more efficient through the application of certain techniques.

22. The other TWPs noted the discussions on the screening of varieties in the Committee and its request to study the subject and give a report of the discussions to its next session. The TWO noted that at present in its field of competence there was no use made of electrophoresis or DNA markers for the screening of varieties and the selection of varieties to be grown in the open or in the glasshouse. The TWO was in principle against such use, but did not want to exclude it completely. The use had, however, to make sense. The TWF and TWO agreed that these methods should only be admitted for screening if a strong correlation existed between the characteristic in question (e.g. the band or bands in the case of electrophoresis) and morphological or physiological characteristics used in the Test Guidelines. If that was not the case and there was no connection to an expression in the plant, the screening by these means should not be admitted. (See also paragraphs 28(b) and 30).

(See documents TWA/26/11 Prov., paragraphs 30 to 37, TWF/28/10 Prov., paragraph 19, and TWO/30/12 Prov., paragraph 17).

Testing of Seed Propagated Varieties of Ornamental Species

23. The TWO heard a short introduction to the system of Fleuroselect which covered almost all breeders of seed propagated varieties. It explained why the breeders of seed produced varieties wanted to have closer contacts with UPOV and try to achieve cooperation. The Fleuroselect system worked well but it was more of a gentleman’s agreement or a commercial deal. Moreover, an advantage was seen if it could be combined with legal protection. More

information on the Fleuroselect trials is reproduced in Annex V to the report of the TWO session.

24. The TWO noted that the Committee had discussed the comparative trials of new varieties undertaken by breeders of Fleuroselect. Circular U 2448, dated August 5, 1996, gave more details on these trials. Experts from several countries had visited Fleuroselect's trial fields. They had been in good shape, had a good reference collection and showed good variety knowledge. The criteria used by Fleuroselect seemed, however, rather close to agronomic value. In the eyes of most experts it was important for plant variety protection that, although the growing of the plants would be on the premises of the applicant, at least the official observations had to be made according to a protocol established by the national authority and by officials from the national authorities. Several experts considered it impossible for the applicant to test his own varieties. Also, legal aspects had to be considered. Fleuroselect was a breeders' association but it did not cover all breeders: testing was available only for members. The whole subject needed much more study before a decision could be taken on the form of involvement of Fleuroselect.

25. The TWO agreed, however, that Fleuroselect could offer help in supplying information, especially on reference varieties. The TWO noted that the novelty register was open to everybody and was also available on Internet. It would have to be studied whether a Fleuroselect trial could be used as a second trial and through its information could shorten the testing period. As different countries applied different testing systems in the end the cooperation could only take place within the legal limits of the individual national laws.

26. The TWO discussed briefly the problems they had encountered when, in a species in which so far varieties had been propagated vegetatively, the first applications for seed propagated varieties had been received. As there existed no seed propagated varieties, how would one decide what was a reasonable uniformity level in the case of a cross-pollinated variety when according to UPOV rules only relative uniformity was required or in the case of a hybrid?

27. The TWO asked the Committee to give guidance on the criteria to be used to reach a decision on a reasonable uniformity level which would neither block new developments in plant breeding if it were too strict nor allow too heterogeneous varieties from which selections for vegetatively propagated varieties could be made too easily. How would one be able to know the level of breeding and whether it was possible for the applicant to make his variety more uniform, or whether the uniformity level existing was the highest possible in that species and any request for a higher level would close the way for protection of seed propagated varieties in that species? Would a stable percentage of different markings in one characteristic be acceptable? Would there be different uniformity levels e.g. less strict in a white color, where any other color marking is more easily seen, than for example in a red or pink color where small markings are easily overshadowed and more difficult to be detected? As specific cases, the TWO mentioned applications for F₁-hybrids and F₅ or F₆ generations in *Pelargonium peltatum* where so far only vegetatively propagated varieties had been protected (See also document TC/34/8).

(See document TWO/30/12 Prov., paragraphs 36 to 40).

II. MATTERS FOR INFORMATION AND FOR A POSSIBLE DECISION TO BE TAKEN BY THE COMMITTEE (INCLUDING REMARKS FROM THE COUNCIL AND THE ADMINISTRATIVE AND LEGAL COMMITTEE)

The Committee is invited to note the following information and to consider possible steps to be taken:

Remarks of the Council on the Progress on the Work of the Committee, the TWPs and the BMT

28. During its thirtieth ordinary session in October 1997, the Council noted the work of the Committee and the TWPs as described in document C/30/10 and its addendum and approved the programs of work for the forthcoming sessions, following a discussion in which the Delegation of Germany criticized three aspects of the work of UPOV's technical bodies:

(a) Those bodies should concentrate on drawing up standards, recommendations and guidelines for examining distinctness, homogeneity and stability and for variety description for the purposes of protection; everything that was "supplementary information"—and therefore not accepted for establishing distinctness—was in no need of harmonization and should not be dealt with by those bodies which, as a general rule, should not act as a scientific forum.

(b) It was in no way appropriate to make a selection of varieties prior to examination using characteristics and methods that had not been chosen for examining distinctness; consequently, UPOV bodies should not seek to make proposals or recommendations in that field.

(c) As far as mentioning trade names used for a variety in the forms supplied by the applicant was concerned, the application heading relating to novelty and the technical questionnaire heading relating to any other useful information for examining the variety were sufficient. (See also paragraphs 38 and 39).

29. In response to the first comment, the Delegations of France and Spain stated that the technical bodies of UPOV should be able to work in a broader context. Their activities should not be limited to setting up common standards for decisions on the grant of protection; on the contrary, they should extend to studying all methods capable of use in variety examination to enable the competent authorities to understand them, to assess them from the scientific, technical, operational and financial points of view and, finally, to adopt them (after possible adaptation and development) or to reject them (on the basis of full arguments to back up their decision).

30. In response to the second comment, the Delegation of France pointed out that the aim was to define a rational examination arrangement by grouping the varieties that were closely related *a priori* from a genetic point of view; it was therefore a question of method and had no effect on the final decision other than to make it easier to take.

31. The Delegation of Denmark commented on the fact that the attention of the technical experts had to be drawn to the need to maintain minimum differences between varieties if the concept of variety was to keep its meaning. Some producers were complaining of the fact that

differences had become too small and that was leading to problems in the running of their businesses.

(See document C/30/17 Prov., paragraphs 22 to 26).

Questions Raised in the Administrative and Legal Committee (CAJ) by the (Technical) Committee

General

32. Discussions were based on document CAJ/36/3.

Interpretation of “the expression of the characteristics resulting from a given genotype or combination of genotypes”

33. The CAJ endorsed the position suggested by the Office of the Union in paragraph 6 of document CAJ/36/3 which reads as follows:

“The Office of the Union suggests that the Administrative and Legal Committee

(a) reaffirm the position set out in paragraph 15 of document CAJ/32/10-TC/29/9,

(b) state that the words “the expression of the characteristics resulting from a given genotype or combination of genotypes” appearing in Article 1(vi) of the 1991 Act do not conflict with the use of characteristics based upon the features of genetic material (in particular “DNA profiles”),

(c) state that the question of deciding whether a characteristic based upon the features of genetic material and resulting from the use of a well-established method of analysis (a “DNA profile”) can be used within the framework of the examination of distinctness should be addressed in each particular case by applying the criteria which have already been established in relation to “traditional” characteristics (including characteristics resulting from the use, for example, of electrophoresis), and

(d) underline that the extension of protection to essentially derived varieties ought not to result in a weakening of the criteria for decisions on distinctness (at the above-mentioned joint session, the Committees also examined the relationship between Articles 1(vi) (definition of variety) and 7 (distinctness), on the one hand, and Article 14(5)(b) (definition of essentially derived variety), on the other hand).”

34. The Delegation of Denmark, however, required confirmation that “the features of genetic material” had to be functional features if it was to subscribe to that position.

35. In the course of the discussion, the following comments were made on matters of substance by the Delegations of France and Germany and by the Vice Secretary-General:

(a) “Expression of characteristics” should not be understood in the genetic sense. A “characteristic” was an element, in the abstract, of the description of a variety, and the “expression” was the specific form that the element assumed; for instance, the words applied equally well to the length of a stem as they did to a gene (expression being the allele in that case).

(b) The question whether “directly-read characteristics of the genome” could be taken into account was not settled by the Convention, which did not pronounce on the nature of the characteristics to be considered.

(c) The question had to be settled case by case according to the usual criteria, which included the requirement of clearness of the difference noted and the need to abide to the essential purpose of the protection system.

(d) It would in particular be contrary to that purpose to allow the protection of one plant group that was too close to another. It would be wrong to conclude from the position set forth in paragraph 6 of document CAJ/36/3 that the use of biochemical characteristics was sufficient for determining distinctness. The 1991 Act did not rule out the use of new technological solutions, but did not validate those solutions either.

It was sometimes suggested that distinctness was associated with the phenotype and the concept of essentially-derived variety with the genotype. The problem was, however, that Article 1(vi) (on the definition of the variety), and Article 14(5)(b) of the 1991 Act used the same terminology. (See also document CAJ/38/3).

Types of characteristic

36. The CAJ endorsed the opinion proposed by the Office of the Union in paragraph 10 of document CAJ/36/3 which reads as follows:

“The Office of the Union is of the view that characteristics should all be evaluated from the standpoint of establishing a clear distinction between varieties for the practical purposes of a plant variety protection system which, to be effective, must strike a proper balance between the interests of the applicant and the interests of the owners of existing varieties. Characteristics are either acceptable for this purpose or not. The Office doubts whether the “last resort characteristics,” as currently defined, meet the requirements. It questions in particular the references to the agreement of the applicant (or, for that matter, any other interested party).”

37. On the subject of “last resort characteristics,” the Delegation of Argentina pointed out that their use broke the equality prevailing between breeders, and that the category should therefore be removed unless there was some way of restoring that equality. The Delegation of Germany made a similar comment in connection with “additional/supplementary characteristics.” In its opinion, the TWPs and the Committee should concern themselves with

defining those characteristics that could be used to determine distinctness and the conditions governing their use. Any characteristic that did not feature in the UPOV Test Guidelines should, for the sake of the transparency of the protection system, be included in another list and appear in the variety descriptions. Furthermore, those same bodies should not work towards harmonization for “complementary characteristics.” Consequently, the attempted classification of characteristics should, in its opinion, stop at “additional/supplementary characteristics,” with the proviso mentioned. The Delegation of France would exclude them, but would include “complementary characteristics.” On a proposal by the Chairman, the CAJ decided not to take the discussion any further. (See also paragraph 76 and document TC/34/6).

Variety denominations and trademarks

38. The CAJ shared the view expressed by the Office of the Union in paragraph 14 of the reference document which reads as follows:

“There may be no wholly satisfactory solution to the confusion caused by trademarks and trade names, other than to reassert the obligation under the Convention to use the denomination in relation to selling and marketing, and to persuade all other persons associated with varietal evaluation and commentaries to use the denomination as well as any trade mark in their literature.”

39. The Delegation of Germany mentioned that information could be obtained, in part, by way of the question in the application form concerning novelty; the competent authorities could also specify under the “other information” heading of the Technical Questionnaire that information on trade designations is requested. Finally, it did not consider it wise to contemplate the creation of a register of denominations and the corresponding trademarks.

Question, in the Technical Questionnaire, on the status of the variety under the legislation on the protection of the environment and on human and animal health

40. The CAJ agreed that it was necessary to add a heading in the Technical Questionnaire so that the competent authority could ensure that it (or another authority) could cultivate the variety. Opinions differed, however, on the way ahead at UPOV level, and the following alternatives were mentioned: the use of just a general remark, with every competent authority wording the heading according to its national circumstances; the inclusion of a question on the objective nature of the variety (is it a genetically modified organism?), whereupon the competent authority could ask direct, more searching questions; in view of the fact that authorizations for release could be required for other types of variety, querying whether such an authorization was required, and if so asking for the authorizations received to be produced. The CAJ agreed to entrust the Committee with the drafting of the appropriate heading in the Technical Questionnaire. It was pointed out that in any event the question should relate to release into the environment and not to marketing. (See document TC/33/11).

(See document CAJ/36/6 Prov., paragraphs 13 to 22).

Testing the first variety in a species

41. The TWO noted document TWO/30/4 which pointed out that New Zealand had quite some experience in the testing of first varieties in a species. It explained the assumption with which the testing would start, the definition of variety, especially as there was no comparable variety existing for that species, the problem of newness as the material might have been marketed without a specific denomination, the special problems and difficulties if the taxon had so far not been present in the country concerned and the identification of varieties of common knowledge. It then gave an example of how New Zealand had tested a first variety in the species *Lavandula dentata*. It concluded that national authorities which tested new varieties should aim at achieving an acceptable compromise between the absolute requirements of the UPOV Convention and the practical realities of testing. This ideal balance was tested in cases involving a first variety in a species. In such cases, the testing authority had no experience with the species but was required to make a technically sound DUS recommendation. The experience that a testing authority lacked could be held by the breeder. It is important with first varieties in species that the breeder and the testing authority had some level of working cooperation. There was always a risk that a variety of common knowledge had been missed or that a discovery from the wild was not actually a new variety. The ability to later nullify or cancel a breeder's right could correct an earlier error. However, this should only be used as a last option.

42. The TWO further noted that the main aim of writing the document had been to raise the question and make experts reflect on what was a variety of common knowledge and what was to be considered the first variety in a new species, especially in the case where a clonal propagation of a plant material was sold under the species name. Many experts agreed that clonal material even if sold under the species name without its own denomination had to be considered a variety. Several experts reported that in the past there had not been so much international trade in varieties but at present many ornamental varieties were sold worldwide. Today plant hunters would use the Internet to find new varieties in any part of the world. Thus world common knowledge would be required although it was impossible to know all varieties grown in a backyard of any country.

(See document TWO/30/12 Prov., paragraphs 28 and 29).

Applications for Breeders' Rights in a New Species

43. The TWO noted document TWO/30/7 which stated that in the Netherlands most cases of new species would arise for ornamental species. From the 1150 applications yearly for 75 to 100 different species, about one to five cases had to be handled yearly, mostly clones from wild material. The first problem would be to check the botanical name. Thereafter it was necessary to get an idea of the variation inside the taxon by asking for additional information from the breeder or even seeing the variety in his nursery or other experts in that taxon. Varieties can be easily obtained through selection but it is difficult to check whether that selection had not already been marketed somewhere on a local market in a faraway country from which it was difficult to obtain information. The document then gave some examples for *Pipremnum* (Araceae), *Calathea* (Marantaceae) and *Calochortus* (Liliaceae). It concluded that as the office would have no experience in the growing of the species, tests might preferably be done on the premises of the applicant. As no experience of the

description was available it was difficult to establish Test Guidelines and the first varieties would have a description following more the classical Linnaean way.

44. Several experts of the TWO agreed that they also would follow a similar procedure and the first variety description would be more a botanical description as there was no variety with which the first variety would have to be compared. If the material was found in the wild, the experts would contact botanists to find out about the variation inside the species concerned. Here also better cooperation between experts from other national authorities in other member States could be envisaged. However, each case might require a different approach.

45. The TWO had lengthy discussions on how much selection or breeding work was necessary to enable plant material collected in the wild to be protected. It could not reach a final conclusion. It noted that a similar situation arose when selections were made out of landraces which were heterogeneous populations. Several experts considered that the selection of seed from a population in the wild or in a landrace, its sowing and the selection of a clone from that sowing was sufficient to enable protection of that clone. Others considered that to be insufficient as no recombination of genes had taken place. Several experts were worried whether it were possible to select a plant in the wild and ask for protection of clonal material from that plant. All agreed that if the plant material was collected from a local market where plant material was sold, such clones would lack novelty and could thus no longer be protected. The problem was, however, to know the exact origin of the variety.

(See document TWO/30/12 Prov., paragraphs 30 to 33).

Judgments of Vectors

46. The TWO noted that in DUS trials on *Euphorbia* there had been cases where the difference in varieties had only been caused by the presence of a vector. It recalled that several years ago a similar case had arisen for *Pelargonium* where the difference was caused by a vector transferred only by grafting. At that time opinions in UPOV had been split. Some member States had considered the vector similar to a virus infection. As a virus-infected variety was not considered to be distinct from the same virus-free variety, the presence of a vector would not lead to a different variety. Others had considered that the vector had become a part of the genome and that a different variety therefore existed. Similar differences existed in other fields, e.g. cytoplasmic male sterility. While some States considered the sterile form to be part of the fertile variety, others considered the sterile form to be a separate distinct variety. In the past the case of *Pelargonium* had solved itself as the variety was refused protection because of lack of uniformity and no final decision was reached in UPOV on the question of the vector. As the matter had now come up again for *Euphorbia*, the Committee and possibly the CAJ were asked to give advice on how to handle those cases. The experts from Germany and the Netherlands would prepare a separate paper explaining the details of the problem to the Committee. (See document TC/34/7).

(See document TWO/30/12 Prov., paragraph 35).

Electrophoresis in Ryegrass

47. The TWC noted paragraphs 25 to 36 of document TWA/25/13 reporting on the discussions held on that subject in the 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 TWC was not in a position to give an immediate answer. It 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.

48. The TWA referred back to document TWA/25/5 containing a proposal to include in an Annex to the Test Guidelines for Ryegrass characteristics on electrophoresis in the same way as already done for maize, barley and wheat and with the same reservations on the usefulness of those characteristics and that during its last session it had finally agreed (a) to present the legal questions on possible additional requirements for the breeder of the similar earlier variety to the Committee and to the CAJ; (b) to continue further discussions on uniformity as uniformity could not be applied but only stability of frequencies; (c) to ask for advice from the TWC on the number of plants in tetraploid varieties to be observed and whether the chi-squared test was at all applicable; (d) to obtain the opinion of breeders; (e) to rediscuss the meaning of "significantly different" and "reasonably stable"; (f) to rediscuss the question of example varieties and of a ring test; (g) to ask the expert from the United Kingdom to prepare a new document as a result of the above discussions.

49. The expert from ASSINSEL in the TWA reported that breeders were completely opposed to the use of electrophoresis for DUS tests in cross-fertilized crops such as ryegrass. The Office of UPOV had received the position of ASSINSEL in writing asking to forward it to the Committee. If electrophoresis were accepted it would open the door to more plagiarism and more litigation as it was easy to change the frequency of alleles. Even if electrophoresis characteristics were only included in an annex to the Test guidelines which stated in its introduction that they "may ...", "this would be considered as an encouragement to use those characteristics. (See document TC/34/6).

50. Some experts in the TWA recalled that the UPOV Test Guidelines were not exhaustive and that further characteristics could be added. But there were some basic technical requirements which had to be fulfilled before a characteristic could be added. In the case of electrophoresis, in addition to the other requirement, there had to be a well defined method, a genetic knowledge on the bands used, a set of standards varieties and a positive result of a ring test with several states.

51. Other experts in the TWA warned of the consequences such a step would have. Even though there was quite some information at the technical level, there was still a need to check the obtaining of consistent results between different laboratories. Another problem to be solved was the checking of uniformity in a bulk sample and in frequencies of alleles. Therefore, at present, use could not be accepted but special studies should be made. In addition there was a question of policy which would go beyond the technical questions. The TWA therefore decided to set up a special subgroup to further advance the question. Moreover, an exchange of information between experts and breeders should take place. The Subgroup should meet in Geneva for one day, either before or after the coming session of the

Committee. Ryegrass should only be used as a model for a more general question of the use of electrophoresis in cross-fertilized crops.

(See documents TWA/26/11 Prov., paragraphs 38 to 41, and TWC/15/18, paragraph 28).

UPOV-ROM Plant Variety Database

52. The TWPs noted the latest stage of preparation of the UPOV Plant Variety Database on CD-ROM (UPOV-ROM) as set forth in Circular U 2594 dated October 21, 1997, distributing the fifth disc in 1997. The Office of UPOV aimed at issuing an updated disk every second month. The UPOV-ROM 97/05 already included the 1996 OECD List of Cultivars Eligible for Certification. The UPOV-ROM 97/06 will already include—not in the database itself but in a separate pdf (portable document) file the list of protected varieties from the Community Plant Variety Office of the European Union (CPVO). Discussions were under way to include in the UPOV-ROM also the European Union Catalogue. It was expected that the UPOV-ROM will obtain several improvements before the end of the year and especially enable its use on a local network. It was also expected that soon it will be offered to the private sector at an annual subscription price of 750 CHF.

53. Several experts had had a chance to study the UPOV-ROM and expressed their satisfaction. Some experts proposed that the UPOV-ROM should include the public descriptions of the varieties. The TWPs invited all the experts to contact their respective colleagues at national level for them to also see and assess the information on the disc and make any comments for further improvement. As several experts had not seen the UPOV-ROM, a short demonstration was given 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 and the part containing the original data (password protected) from the member States.

54. At the request of the Office of UPOV, the TWC discussed various details of the UPOV-ROM. 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.

55. Several experts in the TWO expressed the wish that, once the periodic publication was well under way, possible improvements helpful in the ornamental sector should also be

considered. The expert from Israel agreed to prepare for the next session a document on possible future steps and invited all experts to send him any comments or wishes to be included in that document. At present the use of different Latin names was very confusing. The Office of UPOV explained that that confusion would be solved as soon as the UPOV Code was ready, hopefully in the near future. The TWO also invited more States to include trade names which as present was done by very few States only.

56. The expert from France in the TWV expressed his concern in the sense that for verification of denominations, production of the UPOV-ROM was not fast enough, as national Offices require up-to-date information much faster. The TWV noted that a possible approach to this problem would be to have access to national Offices' information on-line.

(See documents TWA/26/11 Prov., paragraphs 19 to 22, TWC/15/18, paragraphs 6 to 8, TWF/28/10 Prov., paragraphs 9 to 11, TWO/30/12 Prov., paragraphs 46 to 48, and TWV/31/12 Prov., paragraphs 30 to 32).

List of Varieties Under Test

57. The TWO referred to a former decision to exchange tables with lists of varieties under test in the individual member States. It questioned whether, in view of the UPOV-ROM, that exchange of lists still served a purpose. It appeared that several experts were not at all aware of the existence and exchange of such lists. The TWO finally proposed to the Committee to consider abandoning such exchange as most of the information could be obtained from the UPOV-ROM. If needed, UPOV should increase the number of copies given free of charge to each member State.

(See document TWO/30/12 Prov., paragraph 49).

UPOV Documents in Electronic Form

58. The different TWPs noted that the Committee had considered the usefulness of documents in electronic form. It also noted that in the TWF a second distribution of technical reports had been made on discs. The TWF and TWO again strongly supported making available the UPOV documents in electronic form. This should not be restricted to Test Guidelines but should cover various other documents, especially reports of meetings and other important documents. Availability in electronic form would especially facilitate searches for certain subjects in existing documents or reproducing parts for new documents. The TWPs noted that the UPOV Test Guidelines may be available in electronic form by the end of the year. The TWF asked that the report of its last session be made available via E-mail to those experts that had given their E-mail address in the list of participants. Once the UPOV home page was established, the UPOV-Test Guidelines should also be available on the WWW in parallel to a possible CD-ROM.

(See documents TWA/26/11 Prov., paragraph 23, TWF/28/10 Prov., paragraph 26, and TWO/30/12 Prov., paragraph 21).

Assessment of Distinctness in Species with Low Source of Genetic Variation

59. The TWV discussed how distinctness could be assured with regard to varieties for species for which no sexual reproduction is possible, which means that apart from mutations there is no source of genetic variation, as in the case of garlic. It decided to present the question to the Committee for consideration.

(See document TWV/31/12 Prov., paragraph 23).

Submission of Samples

60. The TWV agreed that in principle there should be only one single submission of material by the applicant for DUS testing and that the wording in the Test Guidelines should state that fact in paragraph 1 of the Chapter on the Material Required.

(See document TWV/31/12 Prov., paragraph 25).

DUS Testing of the Parent Lines

61. The TWV discussed whether in applications for hybrids of open-pollinated varieties, the parent lines should also be tested for DUS. Some experts reported that parent lines are not tested in vegetable species. One expert from the UPOV Office questioned that if the genetic nature of the hybrid is not verified how a different population standard than that for open-pollinated varieties could be applied to them. Some experts argued that when there is no big inbred depression, parent lines of open-pollinated species are generally more stable, and for those hybrids, uniformity standards were easily fulfilled. In cases of less uniform parent lines, relative uniformity was applied to the hybrids. In the description of the variety the hybrid nature was only mentioned as claimed by the breeder but not verified by the Office. One of the experts from the Netherlands reported to the TWV that there is a considerable increase in the applications for parent lines with a decrease in the number of applications for hybrids.

(See document TWV/31/12 Prov., paragraphs 19 and 20).

Distinctness of Inbred Lines in Oil Seed Rape

62. The TWA noted a report on a case in oil seed rape where male sterility in inbred lines could be restored in one case and in another case not. The lines would otherwise not be distinguishable through morphological characteristics. It discussed whether that difference could be sufficient for distinctness between the two lines. Several experts referred to other cases where distinctness could only be observed through the reaction from outside as for example in the case of resistance to diseases. In the case of diseases the reaction would, however, be visible on the same generation, while the restoring of fertility could be observed only in the following generation. It was important to collect the views of breeders and also refer the question to the Subgroup of the CAJ. The expert from Germany would prepare a paper for the next session of the TWA.

(See document TWA/26/11 Prov., paragraph 70).

Uniformity in Oil Seed Rape

63. The TWA noted a report on a case where in inbred lines and in three-way hybrids half of the plants would show male sterility and half would be fertile. How should the uniformity of such lines or hybrids be judged? The experts from the breeders clarified that in the case in question half of the plants could easily be destroyed by a herbicide. The judgment should therefore be made after the application of the herbicide.

64. The TWA also noted a report on a study on uniformity between inbred lines, single hybrids, double hybrids and three-way hybrids in oil seed rape. According to that report in front of a given plot in the field it was not possible to say to which of the above groups the plants belong. This was also reflected in the results shown on several diagrams using the leaf length, leaf width and total plant length. One expert questioned to which of the groups a relative uniformity or a given population standard should be applied. A possibility would be to treat all grains in the same way and apply the COYU analysis to all groups. The expert from Germany would prepare a paper for the next session of the TWA.

(See document TWA/26/11 Prov., paragraphs 71 and 72).

Contents of the Technical Questionnaire

65. One expert in the TWV suggested that a longer list of characteristics, or even the complete Table of Characteristics of the UPOV Test Guidelines, should be included in the Technical Questionnaire of the application forms so as to dispose of all available information from the breeder before designing a trial. Another expert supported this view and added that when large reference collections were managed, this was the best way to test varieties in a cost-effective manner. It was pointed out that care should be taken when using some information provided by the breeder, particularly in relation to the declaration of most similar varieties. In addition, information on some VCU characteristics was very useful. New applicants who were not familiar with the nature of these questions might, however, find a longer Technical Questionnaire extremely complicated. The TWV noted that in the UPOV member States national systems were established based on either the plant material being testing by the national authority or by the applicant. It also noted that a system could be questionable for the applicants in which high fees had already to be paid to national authorities for testing the plant material in the field or glasshouse and at the same time applicants were required to provide a complete description of the variety. The TWV finally agreed to continue with the current system.

(See document TWV/31/12 Prov., paragraph 4).

Disease Resistance Characteristics

66. The different TWPs noted the request from the Committee and the preliminary answers received on a questionnaire as reproduced in document TWO/30/11. The TWF and TWO also

noted that in their field of competence very little experience existed in the use of resistance characteristics. They therefore abstained from commenting on the document. The TWA stated that the use of resistance characteristics should be adapted to the species concerned. Resistance characteristics should only be used if ring tests had been made to ensure comparable results. UPOV should, however, agree to a general uniform overriding principle. It should be avoided that decisions in one TWP could have negative effects on another TWP through the creation of precedents. It confirmed that resistance characteristics should only be used if other characteristics failed to establish distinctness.

67. Some experts reported to the TWV the need to harmonize the methods for the testing of disease resistance characteristics in UPOV member States. The Chairman of the TWV suggested to harmonize the methods on a species-by-species basis in parallel with the preparation or revision of the particular Test Guidelines. The expert from France in the TWV introduced a document issued by GEVES describing methods for the testing of 62 disease resistances in different species. The TWV asked the Office of UPOV to prepare and distribute a circular to the national authorities requesting information on tested resistances for national applications and the tests that national authorities would be prepared to run on behalf of third countries (see Circular U 2666).

68. The expert from Spain in the TWV stressed that care should be taken when using as grouping characteristics the resistance characteristics as declared by the applicant. He informed the TWV that in Spain when distinctness between two varieties was solely based on these characteristics, differences in two resistance characteristics was considered the minimum distance to consider the varieties distinct. One expert from the Netherlands reported that complaints have been received from the users on the lack of uniformity for resistance characteristics in protected varieties.

69. One expert from the Netherlands informed the TWV that the Netherlands General Inspection Service for Vegetable and Flower Seeds (NAKG), has started a project to gather information on new diseases or new strains of known diseases, in particular of *Bremia*, in cooperation with the breeders, the Phytosanitary Institute and the Inspection Service for Vegetables. The expert from France in the TWV reported that 12 strains of *Bremia* are being tested in France, four of which have been found to be new. The expert from Poland announced that in his country there is a pathogen bank that could provide useful information.

(See documents TWA/26/11 Prov., paragraph 54, TWF/28/10 Prov., paragraph 18, TWO/30/12 Prov., paragraph 16, and TWV/31/12 Prov., paragraphs 8 to 11).

Application of Recommendations of Variety Denominations

70. The TWV noted that harmonization is needed in the application at national level of the UPOV recommendations on variety denominations. It was informed that, at EU level, the UPOV recommendations had been accepted for the varieties listed in the Common Catalogue. One expert from the Netherlands reported that in the comparative trial for tomatoes organized by the European Union and performed by the NAKG, it was shown that some varieties were listed in different member States under different names. To avoid this situation in the future, a system for the exchange of technical questionnaires through electronic mail between interested EU Member States has been proposed in parallel with an EU project to exchange

information on-line between Member States and the Commission using Internet facilities with the aim of creating a Community database with the descriptions of the varieties included in the Common Catalogue.

(See document TWV/31/12 Prov., paragraphs 18 and 22).

Example Varieties

71. On the occasion of the discussions on the Test Guidelines for Citrus, the TWF noted the difficulty experienced to cover in one single document all 18 different groups inside the citrus fruit trees. For certain characteristics it was not possible to know for each of the different groups whether it would be applicable and to indicate example varieties. Therefore no example variety existed for many characteristics and in many characteristics. On the other hand the TWF did not want to split the document and prepare separate Test Guidelines for different groups. To find a solution to the problem, the TWF decided to ask the expert from South Africa to prepare a list of characteristics without example varieties and to only mark each characteristic for the groups to which it could be applied. In a separate list for one or two main groups a list of example varieties could be prepared.

(See document TWF/28/10 Prov., paragraphs 46 and 47).

Testing of Rootstocks

72. The TWF noted document TWF/28/3 containing the results of a questionnaire issued. As the answers differed it was not easy to draw general conclusions. The Chairman made a summary of his findings as reproduced in Annex IV to the report of the session of the TWF. As the total number of applications per rootstock varieties was low, there was only limited need for Test Guidelines for Rootstocks. It resulted from the discussions, that in the end the question of whether to establish one single document including rootstock varieties or two separate documents would have to be decided species by species. If a separate rootstock document were prepared that document should not repeat flower and fruit characteristics from the fruit Test Guidelines but should merely make reference to those fruit Test Guidelines if those characteristics were necessary to establish distinctness of a rootstock variety.

(See document TWF/28/10 Prov., paragraph 38).

Statistical Methods: Ear Rows/Drilled Plots

73. The TWA recalled the situation reported upon in the last sessions. It also referred to the different population standards applied in the Working Paper for revised Test Guidelines for Rye. The population standard would depend on how the plants were observed, on the accuracy with which the observer would make his observations. In ear rows, each ear would be harvested; the characteristics could express themselves more clearly; many more characteristics would be observed, the observer would look more precisely, a difference would be expressed more clearly and be more obvious. Some experts added that if, in a row, one seed was an off-type the whole row would be considered an off-type while in a plot one

seed would lead to one off-type plant. Others stated that, in rows, closer observation would lead to detection of residual segregation while, in plots, only obvious off-types would be spotted. In plots, longer plants would be detected easily, shorter plants not. One expert wondered whether the concept of population standard was the right concept as it was a concept of the quality of a sample and was therefore not affected by different lay-outs of a trial. What was done at present in practice was good and practical but the mathematic concept was wrong. In addition there was no sufficient balance between the α and β risks. This might create problems for some crops in the future.

(See document TWA/26/11 Prov., paragraphs 48 to 50).

New Alleles in Cereals

74. The TWA noted certain difficulties of including additional alleles in the Test Guidelines for Barley due to the fact that at least for certain hordeins an additional method (Acid PAGE) had been accepted in the past which would not be able to identify the new alleles sufficiently. More discussions would be necessary before a decision could be taken which as a consequence might have to allow only the SDS PAGE method which was more reliable, faster and now apparently also more discriminative.

75. The expert from France in the TWA expressed his concern on the continuous amendments of Test Guidelines each time a new allele was detected which each time would lead to an additional state of expression of a given characteristic. He proposed to set up an agreed procedure (beyond the presently required ring test) for the handling of these new alleles. He offered to prepare a paper for the text session of the TWA.

(See document TWA/26/11 Prov., paragraphs 45 to 47).

Definition of Categories of Characteristics And the Conditions of Their Use For the Description of Varieties

76. The TWA noted the discussions in the Committee and the need to have a clearer understanding and a definition of the different categories of characteristics used. It noted the draft presented during the Committee session and reproduced in paragraph 64 of documents TC/32/7, TC/33/3, paragraphs 140 to 143 and TC/33/11, paragraph 68. It agreed that there was a need for rediscussion of the categories. The expert from ASSINSEL agreed to the need for rediscussion and will send the position of ASSINSEL for presentation to the Committee. (See document TC/34/6).

(See document TWA/26/11 Prov., paragraph 8).

Standardization of Test Guidelines

77. The TWPs noted that the Committee had taken note of document TC/33/8 of Annex II to TC/33/3 and of the discussions held at the TWF, the TWO and the TWV on the harmonization of expression and Notes for different characteristics. On a proposal from the Editorial Committee, the Committee had agreed that the expert from South Africa would

amend document TC/33/8. In connection with the above document, the General Introduction to Test Guidelines (TG/1/2) would also be revised and the first task for preparing a preliminary draft for a revised version would be carried out in a group consisting of members of the Editorial Committee, the Chairmen of all the TWPs and the Chairman and Vice-Chairman of the Committee. The Office of UPOV will collect the information on which part of the General Introduction to Test Guidelines should be revised by the members of the above group. The TWPs noted the new document TWF/28/7 prepared by experts from South Africa and a collection of certain rules provisionally agreed upon by the Editorial Committee as reproduced in document TWF/28/9. The expert from South Africa or the Office of UPOV gave in the different sessions a short explanation of the basic principles of the document and explained the different cases appearing on the basis of a summary as reproduced in Annex II to this document and examples from document TWF/28/7. The TWPs praised the expert from South Africa for that excellent document which for the first time clearly laid down the different cases. All experts were invited to study the documents TWF/28/7 and TWF/28/9 and apply the rules to new drafts they would prepare for the next session. If they encountered questions or had proposals for further improvements these should be sent to the expert from South Africa. The experts in the TWA needed more time to study the document in more detail before being able to express their ideas on the document.

(See documents TWA/26/11 Prov., paragraphs 24 and 25, TWF/28/10 Prov., paragraphs 42 and 43, TWO/30/12 Prov., paragraphs 26 and 27, and TWV/31/12 Prov., paragraphs 36 and 37).

III. MATTERS FOR INFORMATION

The Committee is invited to note the following information:

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

78. The TWC noted a proposition to compare the thresholds of distinctness applied for different types of characteristics in the DUS tests of varieties as reproduced in the Annex to the report on the session of the TWC. The TWC noted the report and agreed that there was a problem in obtaining 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.

79. The TWC also noted document TWC/15/14 Rev. on Analyzing Visually Observed Data in Two Grass Species. 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. An alternative method might be ANOVA. The TWC agreed that it would need further study on the use of threshold models. It agreed to create a 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.

(See document TWC/15/18, paragraphs 10 to 12).

Measurements in Self-fertilized Species

80. The TWA had 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 there 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?

81. The TWC 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 TWC 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.

(See document TWC/15/18, paragraphs 13 to 15).

Spatial Dependence

82. The TWC noted document TWC/15/4 on Spatial Dependence in Spaced Plant Herbage Trials. It 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 TWC 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 of the TWC were asked to check their testing practices in this respect.

(See document TWC/15/18, paragraph 39).

A New Version of the DUSTX Package and a Prototype DUSTX for Windows

83. The TWC noted document TWC/15/5 on DUST9 and DUSTW—A New Version of the DUSTX Package and a Prototype DUSTX for Windows. It 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 characteristics 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 characteristics and, optionally, new characteristics 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.

84. The TWC noted 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 experts in the TWC were invited to study the prototype and make comments on its usefulness.

85. 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 TWC 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 TWC considered whether in future other programs also applicable inside UPOV could be included in that package.

(See documents TWA/26/11 Prov., paragraph 11, TWC/15/18, paragraphs 34 to 36, TWF/28/10 Prov., paragraph 22, and TWO/30/12 Prov., paragraph 26).

Actual Uptake/Use of COYD/COYU

86. The TWC noted document TWC/15/7 on Users' Notes for Combined-Over-Years Distinctness and Uniformity Procedures. It 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. As document TWC/15/7 was rather similar to document TC/33/7 adopted by the Committee in October 1997, the TWC 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.

(See document TWC/15/18, paragraphs 40 and 41).

Telecommunications, Exchangeable Software and Contacts

87. The TWC noted documents TWC/15/9 on Electronic Mail Addresses of Participants of UPOV Technical Working Parties, TWC/15/8 on Database Management Systems in Use in UPOV Member States and TWC/15/10 on Exchangeable Software. The TWC 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 be sent by E-mail to Mr. Talbot, United Kingdom (E-mail: m.talbot@bio.sari.ac.uk).

(See document TWC/15/18, paragraphs 31 and 32).

Changes in the Number of Applications

88. The TWO noted that in a number of countries there had been a change in the number of applications for protection in ornamental species. While the number of applications had risen considerably (by 20%) in New Zealand, it had dropped considerably in the Member States of the European Union, sometimes by more than half or even up to 70% due to the applicants applying for a European right instead of national rights. National applications were made mainly for varieties for which the applicant saw a market possibility in only two to three countries.

(See document TWO/30/12 Prov., paragraph 5).

Centralized Testing

89. The experts from Australia and Canada reported in the TWO on the start of central testing under the auspices of breeders. So far, in Canada one center for the testing of Canola had been set up and in Australia five central testing accreditations had been issued, one for ornamental plants, the others for single species, sugar cane, Canola, etc. As it was the first year of operation, the new development needed still to be evaluated. Applicants using this central testing would obtain reductions in fees, as the office would make savings in its travel expenses.

(See document TWO/30/12 Prov., paragraph 5).

Developments on the World Wide Web

90. The TWPs noted that in the TWC the importance of E-mail on the World Wide Web and the future trends had been discussed. With respect to UPOV, the situation was as follows: (a) the UPOV office in Geneva already had plans well advanced for the establishment of a Web Site; the Site 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, (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 was available in six languages and which could be accessed at <http://www.bioss.sari.ac.uk/smart/unix/smart.html>.

91. The TWC and TWF had welcomed the offer made by the expert from the United Kingdom to set up an E-mail discussion group open to all TWC experts which would be used for discussion of certain subjects by the three special interest groups on visually-assessed characteristics, on BMT data, and on uniformity. It was also asked whether it could be useful

to have Internet structures which facilitated electronic communications 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 TWC 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. The TWF recommended that its Chairman should take part in the interest group on uniformity.

(See documents TWA/26/11 Prov., paragraphs 12 and 13, TWC/15/18, paragraphs 37 and 38, TWF/28/10 Prov., paragraphs 23 and 24, TWO/30/12 Prov., paragraph 25, and TWV/31/12 Prov., paragraph 33)

Sequential Analysis

92. The TWC noted the rather negative reaction of the TWF, the TWO and the TWV reported upon in the 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 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.

93. The TWA noted an updated document (TC/32/6) on sequential analysis prepared by the TWC and noted that the Committee had recommended that each of the TWPs should act in connection with the TWC and look further into the sequential analysis method as one of the possible approaches for the future, which aimed at reducing the sample size to be used in the testing of uniformity in order to avoid the rejection of good varieties or acceptance of bad varieties. The TWA recalled, however, that the document still did not help towards the original objective of looking for cost efficient small samples. It needed even smaller samples (e.g. 20 seeds) than foreseen in that document. The sequential analysis was therefore at present no solution for the given problem to reduce the higher β risk than actually found in practice. However, the TWA might come back to further study the sequential analysis on a later occasion in the future.

(See documents TWA/26/11 Prov., paragraphs 51 to 52, and TWC/15/18, paragraph 24).

List of Species in Which Practical Technical Knowledge has Been Acquired

94. The TWV noted an updated version of the document of the list of species in which practical technical knowledge has been acquired, document TC/33/5. It invited the experts to submit information to the Office of UPOV to keep the document regularly updated. An updated version is reproduced in document TC/34/4.

(See document TWV/31/12 Prov., paragraph 29).

Granting Procedures

95. Following a request made by the expert from Poland, the TWV noted a report on the various granting procedures in member States. One expert from the Netherlands explained that in his country there is a Plant Breeder's Rights Board that grants protection on the recommendation of the examiners independently of the Ministry of Agriculture. In this Board, in principle only negative recommendations and appeals are discussed. One expert from Germany explained that in Germany, the examiner makes the description and takes the final decision. Appeals are heard in a Council where the examiner has no vote. The expert from France explained that in France, a panel observes and makes proposals to a Plant Breeder's Rights Board which will take the final decision. This Board is formed of ten people belonging to both the private and the public sectors. The expert from Spain explained that in his country a Plant Breeder's Rights Commission formed of researchers, breeders and officers with no vote takes final decisions on the granting of protection. The expert from the CPVO explained that four Commissions specialized in groups of species take final decisions after recommendations of a CPVO expert called the "case holder".

(See document TWV/31/12 Prov., paragraph 21).

Preparation of Documents for Coming Sessions

96. The TWPs noted that the Committee had decided that in future one month before a given session the Office of UPOV had to check which planned documents had been prepared and circulate a new draft agenda, deleting all items from the agenda for which no planned documents had been received at the Office of UPOV. The TWF, TWO and TWV welcomed that discussion and agreed that they would even aim at preparing the documents at least two months before the next session.

97. In order to advance discussions on Test Guidelines, the TWF, TWO and TWV also agreed to select for each of the species for which Test Guidelines were prepared or revised one leading expert and to ask the other countries whether they have a special interest in that species and would be willing to cooperate with the leading expert by correspondence in the preparation of a more advanced document. The document would then only be discussed in the full session if it was at a fairly final stage and only a few changes might be required before its presentation to the professional organizations for comments. The leading expert would also check his draft against the documents TWF/28/7 and 9. It would be aimed at sending the final document to the Office of UPOV at least two months before the next session. The Office of UPOV was asked to prepare a Circular inviting experts from States which had not participated in the sessions to express their interest and send comments and remarks to the leading expert.

(See documents TWF/28/10 Prov., paragraph 52, TWO/30/12 Prov., paragraphs 20 and 57, and TWV/31/12 Prov., paragraph 61).

Extended Testing on the Initiative of the Testing Office

98. In connection with discussions on the testing of rootstocks, the experts of the TWF confirmed that for fruit varieties there existed at the national level no fixed list of routine characteristics tested each year. If the candidate variety was not sufficiently distinct from an existing variety the testing office would, on its own initiative, and without special request from the applicant do further tests and look for additional characteristics to establish distinctness and thus help the applicant who often does not know in which characteristic his variety was different from other similar varieties. Experts in the TWF who also tested ornamental varieties confirmed that in the testing of ornamental varieties the office would also on its own initiative enlarge the test to find additional characteristics if otherwise the candidate variety would have to be declared not distinct. In fruits and ornamental species the expert would not check a list of characteristics fixed at the starting of the testing but look at the whole plant and observe any difference he may see irrespective of whether the characteristic was listed or not. That would apply in the same way for distinctness as it applied for uniformity.

(See document TWF/28/10 Prov., paragraph 39).

Image Analysis

99. The TWO noted that in Germany as from next year the measuring of *Pelargonium* and *Impatiens* by hand of leaf length and width would be replaced by measurements through image analysis. The same would be studied for African violet and Elatior Begonia. The TWO also noted a report on studies on image analysis on the variegation of *Ficus* leaves. Of seven *Ficus* varieties, on two plants each, nine measurements had been taken on 10 leaves each with in total 180 leaves per variety from branches from the top, the middle and the base of the tree. The idea was to measure the size of the features, to detect the different kinds of green and to quantify the green level pattern. The results showed that it was possible to distinguish all seven varieties with that method. By using the relative amount of green levels it was possible to increase the discrimination. By using the distribution of the green color, the expert would have less ambiguous way of describing the variety. The TWO welcomed the explanations but agreed that the whole methods should only be used to describe differences seen by the eye of the expert. The results should not become a part of a variety description but only additional information.

100. The TWPs noted the report of the Subgroup Meeting on Image Analysis of the TWO as reproduced in document TWO/29/17. The next meeting of that Subgroup would be held in Antibes, France, at the end of 1998. The Subgroup would not be limited to experts from the TWO. As the original idea of trying to harmonize the hardware and software used was no longer possible the main aim of the research was to achieve comparable results in the measuring of existing characteristics, despite different hardware and software used. So far there was no aim to obtain new characteristics. The experts from France, Germany, the Netherlands and the United Kingdom reported that in their country image analysis would already be used in practice to measure some of the characteristics as length and width of leaves, petals or other organs. In all cases it would measure only characteristics already existing in the Test Guidelines. Contrary to electrophoresis or DNA techniques, the image analysis was therefore mainly a different tool for what was already done by other tools. In

addition, image recording was also used to collect images in order to build up a database of images as a memory of the varieties for other uses (e.g. prescreening).

101. The TWF also noted a short report from the United Kingdom on the program on the use of image analysis for the measuring of starch amount in apples by measuring after an iodine test the black area compared to the white area. A written summary of that program will be prepared for the next session of the TWF.

(See documents TWA/26/11 Prov., paragraph 53, TWC/15/18, paragraph 5, TWF/28/10 Prov., paragraphs 31 and 32, and TWO/30/12 Prov., paragraphs 7 to 10 and paragraph 58).

Relative Observations of Length, Width and Size

102. The TWF noted a problem occurring in the preparation of Test Guidelines for a genus with many groups (e.g. Citrus) where especially for the size of fruits only the observation of a relative length, width or size compared to another length, width or size could be observed. Similar problems existed in *Prunus*. The TWF considered whether it might be necessary to prepare separate documents for the different groups but then the problem existed of where to place hybrids between the groups. This problem apparently existed only in fruit species and not in ornamentals. Several experts agreed that separation into several documents might be preferable even if doubtful varieties would have to be tested according to two different documents.

(See document TWF/28/10 Prov., paragraph 6).

Instability in Vegetatively Propagated Crops

103. The TWF noted results on research on instability in vegetatively propagated species made in Belgium. It recalled that the term mutation originally only meant a change in the DNA sequence but that it was now often used to cover many more sources of variation. It noted that by using new methods it was now possible to calculate the frequency of mutations even though many mutations could not be separated by DNA methods. These mutations were not caused through changes of genes (gene mutations) but through other sources. In UPOV, experts would, however, examine changes expressed in the phenotype and hence look also at non-gene mutations.

104. To explain the higher frequency of non-gene mutations the TWF recalled that in seed propagated species at each crossing, recombination and resetting of genes and repair would take place simultaneously and many abnormalities of the cell would be eliminated. In vegetative propagation these repairs would not take place and the cells would age and accumulate abnormalities as there were gene duplication, gene deletion, differences in the structure through transposable elements, which would finally have an effect on the phenotype. Although they also affected other characteristics they were most visible in the flower and fruit or the response to pathotypes or to stress as those characteristics were essential for survival. As the cell had no possibility of repairing itself and resetting during a crossing, it had to search for other repair possibilities. Therefore some of the mutations resulting from those

abnormalities in the cell were unstable and could change or remutate to the original version. Phenotypic changes could be caused by gene mutations, transposons, epigenetic effects and transgenetics. While only gene mutations would be detectable with DNA fingerprinting, new methods using RNA fingerprinting could also detect some non-gene mutations (epimutations). The TWF finally heard some definitions of genotype, phenotype, epigenotype and epiphenotype, whereby the epigenotype covered all information on the genetic information of the totality of interactions of genes, between genes and the environment of the cell, much more than the DNA alone. As methods for obtaining transgenetic plants, mention was made of the bombardment of the cell with a new gene or its introduction with *Agrobacterium tumefaciens*. Also mentioned were gene silencing and the importance of gene-gene interactions which could lead to lower or higher expressions of a gene, or genes of opposite direction which would hybridize and thus suppress the expression of that gene.

105. The report concluded that in view of the existing difficulties the prospects were rather pessimistic with respect to possibilities to control uniformity and stability. Too many different mechanisms would influence the phenotype. Therefore vegetative propagation should be kept as short as possible, before going back to seed propagation. As certain phenotypic expressions were commercially very important and would be lost in a crossing, this was very contradictory. One basic fact that had to be kept in mind was that the rules for generative propagation would not apply for vegetative propagation. Genemarkers had very little use in vegetative propagation as, although they gave a certain picture of the genome, they only picked out certain points. Thus, even with 450 markers, the chances that one marker would find a changed gene were less than 1×10^5 . As in epigenetic mutations no change of a gene existed, no genetic difference could be detected at all.

(See document TWF/28/10 Prov., paragraphs 35 to 37).

List of Statistical Documents Prepared by the TWC

106. The different TWPs noted that the TWC had prepared document TWC/15/2 containing a list of its documents and document TWC/15/3 containing a topic index to those documents. They appreciated the updating of those lists and especially the topic index which made it easier to find a particular document on a given subject. The TWC also proposed to make the documents in future available on the World Wide Web, but also continue for some years with updating of printed documents.

(See documents TWA/26/11 Prov., paragraph 15, TWC/15/18, paragraph 33, TWF/28/10 Prov., paragraph 20, TWO/30/12 Prov., paragraph 22, and TWV/31/12 Prov., paragraphs 39).

Cooperation With the TWC

107. The TWA recalled the need for a better transfer of information from the TWC to the other TWPs. Some experts wondered whether an action list summing up the main decisions could facilitate that transfer. A short summary list was always reproduced in the report of the Committee summing up all work done by all TWPs. The TWA observed that the best transfer of information would be achieved if more crop experts attended sessions of the TWC when they took place in their country. This also applied to sessions of other TWPs.

IV. MATTERS FOR PREPARATION FOR DISCUSSIONS PLANNED BY THE COMMITTEE UNDER SEPARATE AGENDA ITEMS: NEW METHODS, TECHNIQUES AND EQUIPMENT IN THE EXAMINATION OF VARIETIES INCLUDING THE PROGRESS REPORT ON THE WORK OF THE BMT (ITEM 6 OF THE DRAFT AGENDA)

Short Presentation of Research Results on Different Species

112. At the start of its session the BMT had recalled that the new techniques for DNA profiling were a powerful tool to provide detailed information on the relationship between varieties, that they supplied considerable background on a variety and were also very useful for the identification of existing varieties, and that they would be very useful for the estimation of essential derivation together with other sources of data (e.g. breeding history). It recalled furthermore that it favored the approach of ASSINSEL which was to keep the judgment of essential derivation as far as possible separate from the DUS testing and that the criteria of essential derivation had to be judged species by species. It also recalled that the Council had requested it to concentrate on methods for DUS testing but it agreed with the Committee that first a method had to be studied and well understood before one could decide on whether it could be used for DUS tests. So far the BMT had not been in a position to recommend the use of DNA profiling for distinctness purposes and it therefore had proposed that the Committee not recommend these methods for DUS purposes before all open points had been clarified or before harmonized protocols had been established (if its use was ever accepted for DUS testing). UPOV should not feel under pressure to accept the new methods just for fear of being regarded as old-fashioned. It had to be careful to avoid the introduction of new methods creating more problems than they solved. It had the task of defending the effectiveness of the plant variety protection system and of defending it against the introduction of unsuitable tools which might affect its functioning.

113. After having summarized its last session, the BMT was given short reports on research done in the meantime on azalea, carnation, maize, oil seed rape, peach, potato, ryegrass and tomato.

(See document BMT/4/21, paragraph 4 to 18).

Comparison of Methods

114. The BMT noted that now many new methods are available and are studied. While during the third session of the BMT the majority of the reports mainly centered on the RAPD (Randomly Amplified Polymorphic DNA) and RFLP (Random Fragment Length Polymorphism) methods, the reports during the present session mainly centered on AFLP's (Amplified Frequent Length Polymorphisms) and especially on the PCR based analysis of molecular markers based on Simple Sequence Repeats (SSR) or microsatellites and Sequence Tagged Sites (STS) or Sequence Tagged Microsatellite Sites (STMS). The RAPD method was obviously left aside with very little interest remaining. Compared with the RAPD method, the AFLP method was considered of better repeatability and more reliability. Its capacity to produce data seemed to have no limits. It could produce new primers. With the RAPD method one did not know from which part of the genome the band resulted, whether from the expressed or the non-expressed part. The same band could also result from different

loci. Compared with RFLP's, the use of AFLPs and SSRs made it possible to avoid the use of radioactive material and was thus better for the environment. Results from RFLPs were frequently used as a basis for comparison with other techniques. RFLPs and SSRs could cover the whole genome. The SSRs would, however, be more discriminative, more reliable, more repeatable; there already existed good hardware and software for the method, SSRs were repetitive in more than one base pair, and could potentially be standardized more easily. The development of each of the methods as well as the search for new methods is going very fast. It cannot be stopped. In a few years new tools will be available which will require our own techniques to be adapted.

(See document BMT/4/21, paragraphs 20 to 23).

Costs

115. The BMT noted that costs apparently did not pose a problem. The development of primers for microsatellites could be expensive. Often microsatellites discovered on a random basis are used, but as part of the search for new primers, existing databases or literature were searched. Also primers from other species are studied for possible use, especially in species where so far no primers had been developed. Many laboratories are producing new primers. Thus, in future, microsatellites would be increasingly usable. The new tools would, however, add to the normal cost of testing and would lead to an increase in testing fees unless at the same time the use of traditional characteristics (morphological and physiological characteristics) decreased.

116. If the traditional characteristics had to be decreased, where would the end point, the limit, be? Would it be possible to stop using morphological or physiological characteristics and to rely exclusively on DNA characteristics? All experts in the BMT rejected that possibility. Morphological and physiological characteristics would always be needed to be tested. In part, this was true because they would be needed for practical reasons in the handling of the material. Description of the morphological and physiological characteristics would be needed for the use of the variety in its growing and in certification, and also in part to check the uniformity and stability. The DNA characteristics would remain supplementary to morphological and physiological characteristics.

(See document BMT/4/21, paragraphs 24 to 26).

Use of Data

117. The BMT noted that most reports were silent on the use of data. They also used different terms without definition. Some spoke of distinction, others of separation, identification, discrimination, differentiation, description, some of separation of varieties, others only of separation of species. Others considered its use for prescreening varieties, others for the study of evolution. No report considered the question of uniformity or stability.

(See document BMT/4/21, paragraph 27).

Distance Between Varieties

118. The BMT noted that while some experts expressed themselves against making a difference between the use of a characteristic for identification and for distinctness testing, the majority saw a difference between the two terms. In normal language or in general terms there may be no difference but in the framework of UPOV discussions the term “distinct” is reserved for varieties which are sufficiently different to be eligible for protection. If any small difference were acceptable to establish a new variety the two terms would have the same meaning. But this was not the case. Articles 1 and 7 of the 1991 Act of the UPOV Convention makes a clear distinction between plant groupings which are mere “varieties” and plant groupings which constitute “protectable varieties.” “Varieties” can exist which are not sufficiently distinct from an existing variety to be protectable. It was suggested that it should be proven that the expression of a certain genetic sequence exists before it can be used for distinctness purposes. A characteristic useful only for identification may be used thereafter to prove that certain plant material belongs to that variety. Several experts warned against the danger of decreasing with these tools the value of distinctness, thereby reducing the minimum distance between varieties as well as the scope of protection. The use of molecular techniques might create more problems than it would solve.

(See document BMT/4/21, paragraphs 28 and 29).

Tasks of the BMT

119. The BMT noted that several experts described the main task of the BMT as the studying and checking of methods for their usefulness in DUS testing. They considered that the BMT had not so far tackled the main tasks as the reports had not approached the question of uniformity and stability. Most reports were silent on the sampling of material. Some spoke of the use of one single plant, others used bulk samples making it impossible to judge uniformity. All agreed that for the next session all reports had to consider the question of variability within a variety as well as variability within a species. These two questions should be included as separate items of the Agenda for the next session.

(See document BMT/4/21, paragraphs 30 and 31).

Effect of the Methods

120. The BMT noted that several experts were worried about the influence of the chosen method on the results. Depending on which method was used, different results could be obtained. It was therefore not enough to develop a well repeatable and reproducible method. For data to be useful one needed to know what the data meant. The interpretation of the data was important.

(See document BMT/4/21, paragraph 32).

Knowledge of Genetic Background

121. The BMT noted that DNA data can only be interpreted if sound knowledge of the genetic background of the species concerned is available. Any use of data without that knowledge carries many risks of wrong interpretation. That was the reason why in electrophoresis of proteins for certain cereals (maize, wheat, barley), electrophoretic characteristics were only accepted if knowledge of the relevant genetics was available. For wheat, electrophoretic characteristics of glutenin were accepted, but electrophoretic characteristics of gliadins were refused, because it was not possible to genetically interpret the gliadin bands. Before starting a test one had to reflect what was to be done and define the tasks. It was dangerous to apply a method without knowing what the presence or absence of a given band meant. A band could be separately and independently controlled by completely different genes. This was even more important if the method took into account different degrees of presence of a band (weak, strong intensity).

(See document BMT/4/21, paragraphs 33 and 34).

Improvement of Methods

122. The BMT noted that, apart from enabling genetic interpretation of its results, a satisfactory method for UPOV purposes needed to be robust, repeatable and precise. It had to recognize individual gene loci. It had to avoid any overloading of the gel that could make certain bands appear or any too low concentration that could make less intense bands disappear. There should be a standardized naming of the alleles and not, as for several methods at present, different naming depending on the gel used or on the laboratory running the test. There should, if possible, be tests for DNA markers in parallel with the traditional morphological and physiological characteristics and the results should be studied for their correlation with respect to the distance of the varieties from each other. It was necessary to compare the classical characteristics with the DNA characteristics and discuss the results with breeders and get their opinion, as they would have to maintain their varieties uniform and stable within the characteristics used for DUS testing.

(See document BMT/4/21, paragraphs 35 and 36).

Statistical Methods

123. The BMT noted documents BMT/3/7 Rev., BMT/4/8 and BMT/4/9 and the fact that different statistical methods gave different results and that the choice of the measure of distance had an important influence on the results. It was therefore of utmost importance to start all applications of statistical methods by defining clearly the right question and by verifying whether a given method was justified. In this field, close cooperation between the TWC and the BMT was necessary. The BMT was concerned about the wrong application of dendrograms. It agreed that a dendrogram was not an end product but only the first visualization of data. It should not be applied when there was no hierarchical model. A two-dimensional presentation was not supported by the test results. It may thus not show an objective comparison, nor show the shape or the density of clusters. It should only be used where the grouping was known. It regretted that many scientific publications required authors

to submit their results as dendrograms. The TWC was asked to search for tools which could replace misleading dendrograms by other more correct presentations of results.

(See document BMT/4/21, paragraphs 37, 41 and 42).

Correlation and Causal Linkage Between DNA Markers and Morphological Traits and Relationship Between Genetic Distance and Morphological Distance Between Varieties

124. The BMT noted document BMT/4/19 on “Statistical Methods for Assessing and Interpreting Genetic Distance and Genetic Diversity,” document BMT/3/6 on the “Estimation of Molecular Genetic Distance in Maize or DUS and ED Protocols” and the discussions on that document as reproduced in document BMT/3/18, paragraphs 11 to 13. It also noted a short report on the work on maize carried out in France in which varieties were screened with DNA markers and, in parallel, with a set of morphological characteristics in the field. Although a correlation could not be established between a given marker and a given morphological characteristic there seemed to be a good correlation between the total results of all morphological characteristics observed and the total result of all DNA markers.

125. Several experts and breeders in the BMT expressed their concern at the above methods of comparison. There was no clear correlation between morphological expression and DNA markers. There was a big difference in approach between the use of morphological differences and of genetic differences. These were two different concepts. Molecular markers were not linked with phenotypic expressions and therefore the two concepts should not be mixed even globally as that would give the impression that there was a link. Other experts expressed their view that in certain cases correlations may be established between a certain phenotypic expression, e.g. a resistance to a disease and a given marker, especially if the resistance was introduced in a GMO variety. Others warned again that in those cases a DNA marker may show the presence of the resistance gene but it would give no guarantee whether the gene would also work and express itself in the plant. Other experts stated that if a correlation was proved between a given marker and a specific morphological characteristic, the DNA marker would be used only as a tool to establish the presence of the morphological characteristic. Some experts insisted that despite the above reservations it was interesting to establish whether a global description via DNA markers would give comparable results in separating varieties to a description based on traditional characteristics.

(See document BMT/4/21, paragraphs 43 to 49).

Position of the Breeders vis-à-vis DNA Profiling, the Use of DNA Profiling Methods by Expert Witnesses in Disputes on Essential Derivation and Effect of Different Plant Breeding Schemes with Evaluation of Percentages Between Them

126. The BMT noted document BMT/4/6, a “Position Paper on the Use of DNA Profiling for Assessing Genomic Conformity,” adopted by the General Assembly of ASSINSEL on May 24, 1996, and also document BMT/4/17 on “The Model Study on Essential Derivation of ASSINSEL Using Tomato as a Crop.” It noted again the position of the breeders which was to separate the testing of DUS from the testing of essential derivation and also to use different tools for these two approaches. If one did not separate the tools, sooner or later the two

concepts would be mixed and this would weaken the plant variety protection system as a whole. The work of DUS testing was designed to describe the phenotype of the variety and to check whether it fulfilled the minimum distance decided upon in order to enable it to be protected. The concept of essential derivation was not only based on genetic distance but also involved several other questions such as evidence of the use of the other variety to develop the new variety and the aim of the second breeder to come as close as possible to the initial variety, etc. The decision on DUS was taken by the competent national PVR authorities, the decision on the second concept was taken by arbitrators or courts and not by the PVR offices.

127. The BMT agreed that the question of essential derivation was not for the PVR offices to decide. Several experts stated, however, that courts needed the guidance of technical experts and would probably approach PVR offices for advice. In the Diplomatic Conference, UPOV had thus been requested to establish Guidelines on essential derivation. It was therefore reasonable for UPOV experts to be involved in the establishment of thresholds for essential derivation. Several other experts insisted, however, that the question of essential derivation was in the first instance a question for breeders to agree upon. UPOV experts should be willing to cooperate with breeders but should stick to technical questions only and not get involved in legal discussions.

(See document BMT/4/21, paragraphs 50 and 51).

The Use of DNA Profiling for Prescreening as a Possible Tool in DUS Testing

128. The BMT noted a study on *Poa pratensis*, an apomictic species which could be considered to be vegetatively propagated. The large number of existing varieties called for efforts to reduce the number of reference varieties to be grown in the field. The question was whether it was possible to use DNA profiling or other characteristics not accepted for DUS testing for the prescreening of the whole reference collection in order to avoid growing varieties which were genetically too far from the candidate variety to be compared with it in the field test.

129. While some experts considered *Poa pratensis* to be a very special case in which such tools may be acceptable they warned at the same time against extending such a procedure to other species. Other experts completely rejected the possibility of using for prescreening any characteristic which is not accepted for DUS testing. Prescreening was a kind of grouping as the discarded reference varieties would never be compared with the candidate variety. UPOV had strengthened its requirements for grouping characteristics. Not all characteristics accepted for DUS would be admitted for grouping. Grouping characteristics needed to be absolutely reliable, uniform and stable. When a grouping was made, a variety of one group would never be compared with a variety of another group. Therefore one must be absolutely certain that a variety was not in the wrong group. Other experts stated that in the future for prescreening one had to change the approach. For distinctness a characteristic-by-characteristic approach was used while in prescreening a multivariate approach would be adopted using information from traditional morphological characteristics together with new methods. Some breeders warned that while they would not be opposed in principle to prescreening, care had to be taken. In prescreening the requirements for uniformity and stability were not the same.

130. The BMT finally realized that more discussions were necessary on the question of prescreening and that a paper should explain in detail how groups could be established without the use of DUS characteristics. The Chairman of the BMT therefore asked the experts to offer papers for the next BMT session. He also asked the TWC whether it could offer its help on this subject. It was, however, necessary first to define the problem and to define the parameters for solving the problem. This was very important because some of the solutions might well be outside these parameters. The Chairman of the BMT stressed that the discussions should not be limited to agricultural species but also cover ornamental species where varieties in many species are propagated vegetatively.

(See document BMT/4/21, paragraphs 52 to 56).

Control of Uniformity in Characteristics Obtained With Biochemical or Molecular Markers

131. The BMT noted document BMT/4/14 on “The Effect of Non-Uniformity and Non-Stability on the Correctness of the Varietal Identification of Seed and Commercial Lots in Cereals,” and a report on the discussions on uniformity in ryegrass held during the last session of the TWA. In the last mentioned report it was regretted that so far the BMT had only looked into differences between varieties and the variation between varieties but not into uniformity or the variation within a variety. While the question of identification may be discussed without looking at uniformity (and even that was contested by some experts), the question of distinctness could only be looked at together with the question of uniformity. Unfortunately most reports did not tackle uniformity, they either used one single plant or a bulk sample. For the next session, uniformity should be the main question to be studied in relation to DNA markers. This was most important if one moved from vegetatively propagated species to cross-fertilized species such as ryegrass. In these populations with differing genotypes the stability of a variety was normally based on its relative uniformity.

132. When the BMT was provocatively asked whether it was possible to ignore a lack of uniformity in molecular markers if the variety proved to be uniform in morphological characteristics, several experts immediately responded that if UPOV wished to keep its notion of the “characteristic,” it had to maintain the requirement that any characteristic used for distinctness must also be checked for its uniformity and stability. If a characteristic was not uniform, it had to be rejected for distinctness. Uniformity was, however, related to the mode of propagation and in cross-fertilized species such as ryegrass only a relative uniformity was required. If one attempted to deviate from this basic rule, one would create more problems for the future than one would solve. The BMT regretted that the reports for the present session had left out the question of uniformity and stability. The documents and reports for the next session would have to correct that situation and specifically concentrate on these two requirements.

(See document BMT/4/21, paragraphs 57 to 60).

Possibilities and Consequences of the Introduction of DNA Profiling Methods for DUS Testing

133. The BMT noted document BMT/4/13 on “The Harmonized Presentation and Documentation of Protein and DNA Polymorphisms as Pre-Condition for the Introduction of Biochemical and Molecular Biological Methods for DUS Testing,” which confirmed the need for a good knowledge of genetic control and a clear definition of alleles.

134. The BMT also noted a report of the Vice Secretary-General of UPOV who referred to the language and interrelationships between Article 1, Article 7 and Article 14(5)b of the 1991 Act of the UPOV Convention which had been the subject of discussion in the CAJ of UPOV on two separate occasions. The subject had been discussed at a joint session of the CAJ and the Committee in April 1993 (see documents CAJ/32/3, TC/29/3 and the report of the session, documents CAJ/32/10 and TC/29/9) and at a session of the CAJ of UPOV in October 1996 (see document CAJ/36/3 and the report of the session, document CAJ/36/6). The discussions in the documents and session reports should be studied in detail since they were not readily summarized. However the discussions supported *inter alia* the following propositions:

(a) “Article 1 defined the variety concept, but remained silent on whether or not a variety was eligible for protection; the reference to the genotype was intended to make it clear that the existence of a variety merely presupposed the possibility of defining it according to genetically determined criteria, and not necessarily by characteristics appearing in lists drawn up for the purposes of the grant of breeders’ rights. The genotype was neither defined nor even specified in the course of the discussions. There was nevertheless the underlying hypothesis that a variety could not be defined otherwise than by its genes; in that sense, no substantive difference was made between the genotype and the phenotype.” (Last three lines of page 3 and first seven lines of page 4 of document CAJ/32/10).

(b) “Article 7 dealt only—and that was already clear from its inclusion in Chapter III—with the circumstances in which a variety may be protected, in view of the fact that it was not eligible for protection by virtue of the mere fact of its being a variety. Article 7 therefore contained stricter conditions than Article 1. To qualify for protection, a variety had to be “clearly” distinguishable. The word “clearly” had not been defined, and it was important to point out that the Diplomatic Conference had not wanted to introduce specific restrictions. Article 7 did not refer to the characteristics to be taken into account, not even from the point of view of their importance or their essential nature. It was therefore for the examining authority to determine the characteristics or combinations of characteristics that it would use in examination. The Article also did not specify when a difference was clear, so it was for the authority to decide, for instance, whether a single difference was sufficient, assuming that it was great enough, or alternatively whether one needed only note the existence of a number of differences that were not clear, provided that they could be combined to give a clear difference. The Convention left all these options open.” (Paragraph 15(iii), document CAJ/32/10, page 4).

(c) “The words “the expression of the characteristics resulting from a given genotype or combination of genotypes” appearing in Article 1(vi) of the 1991 Act do not conflict with the use of characteristics based upon the features of genetic material (in particular “DNA profiles”).” (Paragraph 6(b) of CAJ/36/3, page 6).

(d) “The question of deciding whether a characteristic based upon the features of genetic material and resulting from the use of a well-established method of analysis (a “DNA profile”) can be used within the framework of the examination of distinctness should be addressed in each particular case by applying the criteria which have already been established in relation to “traditional” characteristics (including characteristics resulting from the use, for example, of electrophoresis).” (Paragraph 6(c) of CAJ/36/3, page 6).

(e) “The extension of protection to essentially derived varieties ought not to result in a weakening of the criteria for decisions on distinctness.” (Paragraph 6(d) of CAJ/36/3, page 6).

(f) “The question whether “directly-read characteristics of the genome” could be taken into account was not settled by the Convention, which did not pronounce on the nature of the characteristics to be considered.” (Paragraph 15(b) of CAJ/36/6, page 4).

(g) “The question had to be settled case by case according to the usual criteria, which included the requirement of the clearness of the difference noted and the need to abide by the essential purpose of the protection system.” (Paragraph 15(c) of CAJ/36/6, page 4).

(h) “It would in particular be contrary to that purpose (*the essential purpose of the protection system*) to allow the protection of one plant group that was too close to another. It would be wrong to conclude from the position set forth in paragraph 6 of document CAJ/36/3 that the use of biochemical characteristics was sufficient for determining distinctness. The 1991 Act did not rule out the use of new technological solutions, but did not validate those solutions either.” (Paragraph 15(d) of CAJ/36/6, page 4).

(i) “It was sometimes suggested that distinctness was associated with the phenotype and the concept of essentially-derived variety with the genotype. The problem was, however, that Article 1(vi) (on the definition of the variety), and Article 14(5)(b) of the 1991 Act used the same terminology.” (Paragraph 15(e) of CAJ 36/6, page 4).

135. The Vice Secretary-General of UPOV continued that for purposes of the BMT the most important views expressed by the CAJ were:

(a) It was for the Authority to decide whether a single difference were sufficient ... or alternatively whether one needed only note the existence of a number of differences that were not clear, provided they could be combined to give a clear difference. The Committee left these options open in CAJ/32/10 paragraph 15(iii).

(b) The question had to be settled case by case according to the usual criteria which included the requirement of the clearness of the differences noted and the need to abide by the essential purpose of the protection system (paragraph 15(b), page 4 of CAJ/36/6, and paragraph 15(iii), page 4 of CAJ/32/10).

136. The last two proposals perhaps suggest how to reconcile any eventual use of the new technology with the need to avoid damaging the existing protection system. The use of a minimum number of molecular characteristics, well distributed through the genome would, when compared with some phenotypic characteristics in current use, increase rather than

decrease the so-called minimum distance. The closer examination of intra-varietal variability in the next session of the BMT would considerably clarify the impact of using molecular techniques on the UPOV protection system.

137. The BMT noted that breeders and technical experts from national offices who responded to the above report by the Vice Secretary-General expressed reservations on the interpretation made by the CAJ. The whole question would need to be carefully discussed again in the Committee and also in the TWPs and the views of those present during the Diplomatic Conference should be obtained and the preparatory documents as well as the records of the Diplomatic Conference studied in the light of any new insights which emerge as practical work progresses. If, as a result of those discussions and studies, the interpretation of the CAJ was confirmed, an appropriate UPOV approach to these new methods would need to be developed.

(See document BMT/4/21, paragraphs 61 to 65).

138. During its session in October 1997, the CAJ discussed the question under the heading "Interpretation of the expression of characteristics resulting from a given genotype or combination of genotypes." An extract of document CAJ/37/3 and of the report of that session is reproduced in Annex III to this document. As a result of the discussions, a CAJ Subgroup will meet on February 12 and 13, 1998, in Geneva to further advance the matters.

Chairmanship

139. The BMT noted that the chairmanship of Mr. Joël Guiard, France, was to end at the next ordinary session of the Council. It unanimously proposed to prolong the chairmanship of Mr. Guiard to cover at least the next session of the BMT. During that session the progress of the BMT would have to be evaluated and a decision taken on whether the work would require further sessions of BMT as a separate working group or whether the discussions on the subject could be continued in the Committee and the TWPs. [During its ordinary session in October 1997, the Council approved the extension of Mr. Guiard's chairmanship].

(See document BMT/4/21, paragraph 66).

Remarks From Other TWPs

140. The TWPs noted the discussions held in the BMT and that the next session of the BMT is scheduled to take place under the extended chairmanship of Mr. Joël Guiard, France, in Washington, D.C., United States of America, from September 28 to 30, 1998. During that session, discussions are planned on the following subjects: (a) Short presentation for research results or their follow-up on different species; (b) assessment of variability within varieties; (c) assessment of variability between varieties; (d) statistical methods: confidence intervals and accuracy of distance estimates; alternative to dendrograms; refinement of the analysis of molecular variance (AMOVA) for distinctness studies and tools to assess uniformity; combination of information from diverse data types (AFLP, SSR, morphological data, etc.); (e) position of the breeders vis-à-vis DNA profiling; (f) the use of DNA profiling methods by expert witnesses in disputes on essential derivation; (g) the use of DNA profiling for

prescreening as a possible tool in DUS testing; (h) possibilities and consequences of the introduction of DNA profiling methods for DUS testing; (i) definition of variety; (j) future program of the BMT (date and place of the next session if any).

141. The TWC noted document BMT/15/16 on the identification of ryegrass (*Lolium* spp.) cultivars by means of AFLP Markers. The document explained the tests done, the AFLP method and the results obtained. It 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 TWC welcomed the explanations and asked for the data to be included in the data set of the special interest group created by the TWC.

142. The TWA also noted Circular U 2532 of April 28, 1997, listing the proposed plans as a result of the BMT session. It recalled that there will be another session of the TWC before the 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 TWC to give useful advice, sets of data accompanied with 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 of the TWC stressed the need to come to some substantive conclusions on the specific points (U2532) to aid the discussions within the BMT.

143. The TWF noted that at the moment those methods still showed big discrepancies and offered no immediate help in the fruit sector. They seemed to be good for identification purposes but of limited use for distinctness. However, the TWF had to keep its mind open for the future.

144. The TWO noted that at the last BMT session there had been too many presentations of papers by scientists with little knowledge of the UPOV philosophy. Many crop experts when asking question had been left without an answer as the scientists were unable to give an answer. The research results were mostly scientific results only to identify varieties. The BMT should nevertheless continue its discussions to avoid only big firms using developments in that field. However, more should be done to improve the knowledge of crop experts in the TWPs on those methods. To advance in that direction it asked that for its next session either an expert in these new methods from the country where the session would take place or even better in addition to him the Chairman of the BMT should be asked to explain those methods and the problems involved.

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145. The TWV noted a presentation on the application of DNA profiling techniques, and RAPD technique in particular, to the identification of varieties, using the Spanish reference collection of Cucumber (*Cucumis sativa*) as an example and that promising results were obtained in the identification of varieties. It also noted however, that some divergence on the grouping of varieties based either on DNA profiles or on morphological traits was found. The TWV agreed discussions of these results should be continued at the next meeting of the BMT.

(See documents TWA/26/11 Prov., paragraphs 16 and 17, TWC/15/18, paragraphs 25 to 27, TWF/28/10 Prov., paragraphs 27 to 30, TWO/30/12 Prov., paragraphs 42 to 45, and TWV/31/12 Prov., paragraph 27).

[Annex II follows]

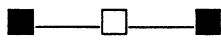
ANNEX II

SUMMARY OF STATES OF EXPRESSION

1. QUALITATIVE1.1 TRUE QUALITATIVE1.2. NON-TRUE QUALITATIVE1.2.1 *Only two states*1.2.2 *More than two states***2. QUALITATIVE EXPRESSED QUANTITATIVE**2.1. CONDENSED QUALITATIVE EXPRESSED TRUE QUANTITATIVE2.1.1 *Only lower extreme fixed*2.1.2 *Medium state fixed*

2.2. QUALITATIVE EXPRESSED NON-TRUE QUANTITATIVE

2.2.1 *CONDENSED — Both extremes at limit*



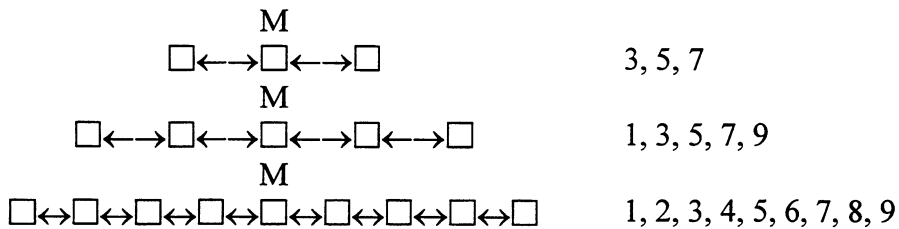
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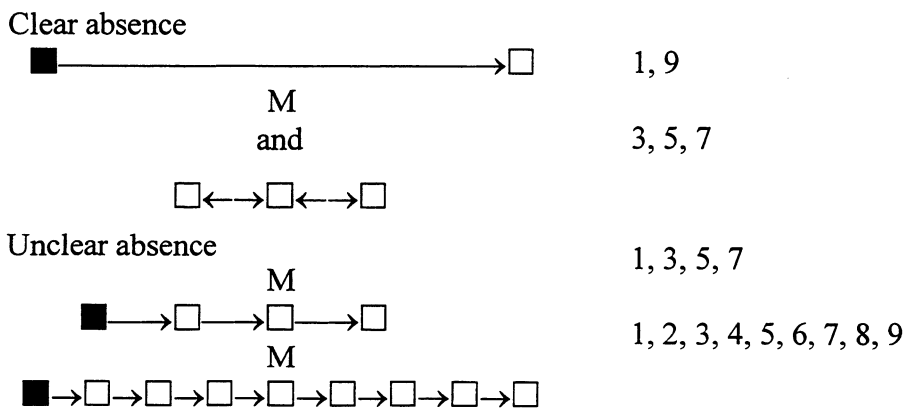
3. QUANTITATIVE

3.1. TRUE QUANTITATIVE

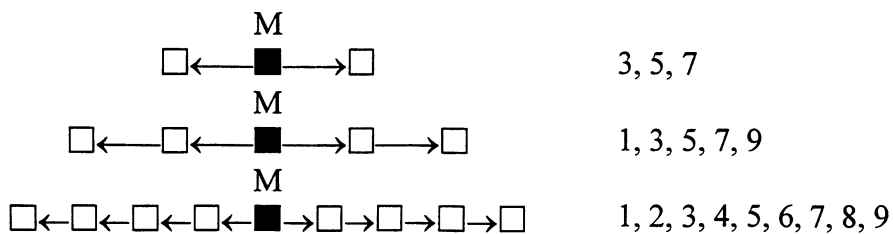
3.1.1 *No states fixed*



3.1.2 *Only lower extremity fixed*

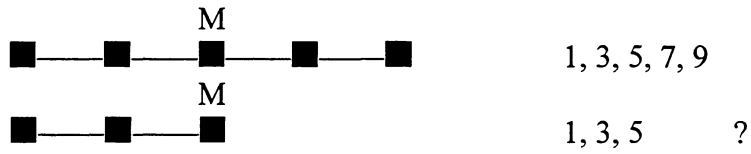


3.1.3 *Only medium fixed*



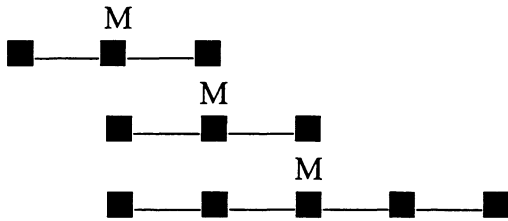
3.2. NON-TRUE QUANTITATIVE

3.2.1 *Obvious limit definable for both extreme ends*

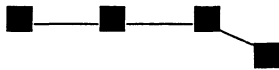


Often qualitatively expressed

3.2.2 *Without obvious limit to each extreme end*



Symmetry easily distorted often qualitatively expressed, may become qualitative merely by addition of states not in the linear range



[Annex III follows]

ANNEX III

Extract from CAJ/37/3

THE INTERPRETATION OF "THE EXPRESSION OF THE CHARACTERISTICS
RESULTING FROM A GIVEN GENOTYPE OR COMBINATION
OF GENOTYPES"*Document prepared by the Office of the Union*

1. The words "the expression of the characteristics resulting from a given genotype or combination of genotypes" appear in Article 1(vi) (definition of "variety") and in Article 14(5)(b)(i) and (iii) (definition of an essentially derived variety) of the 1991 Act. Their meaning has been discussed in a joint session of the Administrative and Legal and Technical Committees in April 1993 (see document CAJ/32/3-TC/29/3 and the report of the session, document CAJ/32/10-TC/29/9) and in the Administrative and Legal Committee ("the Committee") in October 1996 (see document CAJ/36/3 and the report of the session, document CAJ/36/6).
2. The interpretation of the above-mentioned words and their practical application to the plant variety protection system continues to be a matter of concern in UPOV technical circles. It was discussed in the fourth session of the Working Group on Biochemical and Molecular Techniques, and DNA-Profiling in Particular ("the BMT"), held from March 11 to 13, 1997. Paragraphs 62 to 65 of the report of that session (document BMT/4/21) are set out in the Annex.
3. The attention of the Committee is drawn, in particular, to paragraph 65 of the report.
4. It would seem that some technical specialists are concerned that unless the words "the expression of the characteristics resulting from a given genotype" are interpreted so as to exclude from distinctness testing genetic information that is not known to be expressed or reflected in the phenotype, varieties which are sufficiently uniform in their phenotypic characteristics may nonetheless be variable in respect of apparently unexpressed DNA sequences and vulnerable to reselection. Some also think that if apparently unexpressed DNA sequences, whose presence is revealed only by one or other form of genetic probe, are used as the basis for distinctness decisions, the "minimum distance" between varieties will be unacceptably reduced.
5. In the light of paragraph 65 of the aforementioned report of the fourth session of the BMT, the Office of the Union has examined the records of the discussions in the 1991 Diplomatic Conference and of the preparatory meetings prior to the Conference. The discussions throw no specific light on the interpretation of the words in question.
6. The purpose of this document is to bring the concerns of technical circles to the attention of the Committee.

Extract from Document CAJ/37/6

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Interpretation of Words “Expression of the Characteristics Resulting from a Given Genotype or Combination of Genotypes” in Articles 1(vi) and 14(5)(b) of the 1991 Act of the UPOV Convention

14. Discussions were based on document CA/37/3.

15. The Delegation of the Netherlands emphasized that any interpretation of the 1991 Act of the Convention must necessarily take into account the state of the art at the time the Act was adopted and subsequent developments. To the extent that it was possible to plagiarize a variety by inserting a genetic sequence, the existence of a difference in the DNA could not be a decisive criterion, and techniques for analyzing DNA could only be complementary tools.

16. The Delegation of the European Community said that the Committee had not taken any binding decision at its previous sessions (one of which had been held jointly with the Technical Committee) because, in the Committee’s view, the issue should be resolved on a case-by-case basis by the authorities dealing with applications for protection. The dissatisfaction shown by some technical experts therefore had no objective basis. It was also necessary to ensure that decisions taken in each particular case by the various authorities were uniform.

17. Regarding the substance, the Delegation recalled that Article 7(1) of the Regulation of the Council of the European Union was a combination of Articles 1(vi) and 6 of the 1991 Act and required that the variety should be “clearly distinguishable by reference to the expression of the characteristics that results from a particular genotype or combination of genotypes.” Consequently, the granting of protection required the existence of a phenotypic difference; a difference in the genotype would not be acceptable if it was not also to be found in the phenotype. More generally, accepting differences that could only be perceived at the level of the DNA would condemn the protection system.

18. The Delegation of Japan shared the views expressed by the Delegation of the European Community and added that, with the current stage of knowledge, it was not possible to use DNA analytical tools to examine varieties.

19. The Delegation of the United States of America also shared this view. It noted, however, that the tools in question yielded useful information and that it was necessary to consider how they could be used in an appropriate manner. For example, they made it possible to distinguish, in certain cases, differences due to the environment from those due to the genotype, or to compare a new variety to a variety that had disappeared but whose DNA profile still existed. UPOV should in any event refrain from adopting positions that might prove restrictive and unfounded with progress in scientific and technical knowledge. The Delegation of France recalled in this connection that the task of the Working Group on Biochemical and Molecular Techniques was precisely to consider the possibilities for utilizing biotechnical and molecular tools.

20. The Chairman noted that, at the present stage of the discussion, it could justifiably be asked what type of characteristics could be used in examining varieties, and that it was up to the Committee to make recommendations and ensure that there were no different practices in administering the protection system leading to the creation of “minisystems.” He also recalled that use of a particular method depended on the ultimate objective; for example, a method used for the purposes of distinction could be required to show a difference in the DNA expressed, while this condition was not necessary when establishing the identity of infringing material.

21. The Delegation of Germany warned against any attempt to make the 1991 Act say something that had not been the original intention. It recalled that the phenotype was the expression of the genotype (taking into account the effects of the environment) and that, in the case of protection (and in general), one would limit oneself to a description of the phenotype without trying to ascertain how it was obtained. It proposed that it be stated that the Convention did not say anything about the types of characteristics liable to be utilized for the examination of varieties and that the characteristics to be used should be defined according to the customary criteria, and noted that this should exclude “minisystems” of protection. In general, the options available should not be restricted by a narrow legal interpretation for which there was no basis in the Convention.

22. The Delegation of ASSINSEL said that the basic question was whether or not molecular markers could be used in examining distinctness. For ASSINSEL, such a use would be premature because there was not enough information on the behavior of “varieties” defined by using such markers from the point of view of uniformity and stability. The “traditional” morphological and physiological characteristics should therefore continue to be used, bearing in mind however that molecular markers could be tools to help in taking decisions. ASSINSEL hoped that UPOV would take a decision on this issue as soon as possible with a view to guaranteeing the security of breeders and users of varieties.

23. A discussion was then held on the procedure to be followed for future work. It was suggested that the objective was to define the types of characteristics and tools that could (or could not) be used and the criteria for decisions. It was decided to convene a Working Group to establish a basis for discussion for the next session of the Committee. The Office of the Union would decide on the membership of the Working Group.

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[End of document]