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UPOV

TWC/III/13
ORIGINAL: English
DATE: 1985-10-30

NTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

TECHNICAL WORKING PARTY ON AUTOMATION AND COMPUTER PROGRAMS

Third Session
Wageningen, Netherlands, May 8 to 10, 1985

REPORT

adopted by the Technical Working Party on Automation and Computer Programs

Opening of the Session

1. The third session of the Technical Working Party on Automation and Computer Programs (hereinafter referred to as "the Working Party") was held in Wageningen, Netherlands, from May 8 to 10, 1985. The list of participants appears in Annex I to this report.

2. Mr. Hijink, of the Rijksinstituut voor het Rassenonderzoek van Cultuurgewassen (RIVRO) at Wageningen, welcomed the participants at his office. The session was opened by Mrs. V. Silvey, Chairman of the Working Party.

Adoption of the Agenda

3. The Working Party adopted the agenda for its third session as reproduced in document TWC/III/1.

Report on the Twentieth Session of the Technical Committee

4. Dr. M.-H. Thiele-Wittig reported on the previous session of the Technical Committee, restricting himself to the main subjects of interest to the Working Party. The full report of that session is reproduced in document TC/XX/12 Prov.

Combined Over-years Analysis for the Testing of Distinctness

5. The discussions were based on documents TWC/III/3, TWC/III/5, TWC/III/6 and TWC/III/8.

6. At the beginning of the discussion, the Working Party repeated that it considered the combined over-years analysis (in the following called COY analysis) to be the most suitable method and to be the best option for the testing of distinctness. There were mainly three practical problems which would have to be studied before the present UPOV criteria could be replaced by COY analysis:

(i) the present differences between countries in the estimation of the standard error based on the analysis of variance of single plants or of the plots

(ii) the need to keep the continuity of distinctness decisions when introducing COY analysis and

(iii) to keep the present possibility of deciding on distinctness after two years of test.

7. Mr. Royer (France) introduced document TWC/III/3, which contained a comparative study on the methods for the interpretation of DUS tests on grasses in different member States. France, the Federal Republic of Germany , the Netherlands, Spain and the United Kingdom had sent detailed information, while Belgium, Denmark, Ireland and Sweden had answered in general terms.

8. Dr. Weatherup (United Kingdom) introduced document TWC/III/6, which described the experience gained in the operation of the COY criterion in the United Kingdom. The Working Party came to a general agreement to respect the United Kingdom's experience, which proposed that to reach a reasonable number of degrees of freedom there should be at least 10 varieties available for a three year test or 20 varieties available for a two year test. Thus, COY analysis would mainly be useful for larger scale tests. It was not excluded for a smaller number of varieties, but the required t values might become too high because of the fewer degrees of freedom.

9. Mr. Baltjes (Netherlands) introduced document TWC/III/8 which contained a simulation of COY analysis. He stressed that the balance between statistical evidence and the findings of the variety expert in the field is the matter of the utmost importance and that there has to be a close cooperation between variety experts and statisticians. He concluded from his study that COY analysis was better than the present UPOV criterion on the basis of his experience. Mr. Baltjes recommended the use of COY for orthogonal sets of data, and expressed some reservations about COY analysis of non-orthogonal data.

10. The discussions then concentrated on finding a way to apply the COY analysis to three years of data which would still maintain continuing with the level of distinctness decisions taken by the respective member States using their present methods of distinctness assessment. As an actual example of this problem, the system applied in the Federal Republic of Germany and for some crops in Denmark was introduced. This used statistical analysis of individual plants, rather than of plot means, and therefore established distinctness more easily than by use of the COY analysis. Introduction of the COY analysis would reduce the number of distinctness decisions in these member States and made the essential continuity in level of distinctness decisions difficult to achieve. One possible solution to this problem could be to apply a less strict significance level i.e. 5% instead of 1%. As a result of these discussions, the Working Party agreed on the following two recommendations when applying the COY analysis:

(i) All varieties with a 1% significance level for distinctness should be accepted as distinct varieties.

(ii) All varieties which do not reach the 5% significance level for distinctness should be rejected as not distinct.

11. While the first recommendation was accepted unanimously, for the second recommendation some experts raised doubts whether it could be applied in such a strict way without any exceptions, especially by States which already applied for certain species a lower significance level than the 1% level recommended by UPOV.

12. For the varieties falling between the 1% and the 5% significance level, no common recommendation could be reached as the present situation in the individual member States and the opinions differed too much.

13. The Working Party therefore agreed to study the question further on the basis of further experience gained in the individual member States in the application of COY analysis to varieties of a given grass species. The study would concentrate on identifying the problems and attempting to find solutions. It was to include (i) the grouping of the varieties according to obvious characteristics in order to form groups of varieties of a similar type, (ii) the separation of varieties which would be distinct at a 1% significance level, (iii) the separation of varieties that would have to be rejected as not distinct for failure to reach the 5% significance level and (iv) problems and possible solutions for the treatment of varieties falling between the 1% and the 5% significance level.

14. Mention was made, as possible solutions to be studied and reported upon, of the addition of information (more years, more varieties, combination of characteristics, etc.) or the elimination of part of the information (deletion of suspect stock, elimination of varieties not of similar type, etc.). The study was to include application of the F_3 test and of the Bartlett test. It would be based on the program to be circulated by Dr. Weatherup (United Kingdom).

15. Several experts expressed reservations as to the retrospective use of the possible solutions mentioned. The adding or deleting of data would have to be decided before starting the tests for the sake of honesty. In general, the use of additional information was preferable to the elimination of information.

16. Dr. Weatherup (United Kingdom) introduced document TWC/III/5, which contained results of the application of COY analysis after two years of testing. To reach roughly the same reliability as with three years data, the significance levels of 1% and 5% for three years of data would have to be changed to 0.1% (which would be a little more stringent) and to 10%. The Working Party agreed to enlarge the planned study (see paragraph 14) to include the application of COY analysis to two years of data only and also the calculation of distinctness for different levels of significance, namely for 10%, 5%, 1%, 0.5% and 0.1%.

17. The Working Party agreed that Mrs. Silvey would report to the Technical Committee that the Working Party had confirmed the position taken at its second session, that, compared with the present UPOV distinctness criteria, COY analysis was the more appropriate method, but that the practical implications of changing to that method and application to two years of data had still to be checked further and thus the member States would at present apply it on an experimental basis to all varieties of at least one grass species to gain experience and to search for solutions to the remaining questions.

Testing of Homogeneity in Cross-Fertilized Plants

18. Mr. Talbot (United Kingdom) introduced document TWC/III/10, in which he proposed a new criterion for the testing of homogeneity. The new criterion would make it possible to use all varieties in the tests. It would thus eliminate the influence of the selection of groups of comparable varieties on the decision as to homogeneity. In the proposed method, the linear regression of variety log SDs of reference varieties on variety means was used to adjust both reference and candidate variety log SDs for differences in characteristic means. This would eliminate the distortion of the tests by varieties whose SD differed greatly from the median of reference varieties. The Working Party agreed to study this new suggestion on the basis of the program to be supplied by Mr. Talbot and to compare the results with those of the present UPOV criteria.

Intercommunication Network

19. Mr. Talbot (United Kingdom) introduced document TWC/III/11 which contained information on the current use of the electronic mail box system and the packet switching system in the United Kingdom and Denmark. Mr. Duyvendak (Netherlands) gave additional information on the possible links in the Netherlands. At present only the offices of those three member States had facilities to receive electronic mail.

20. The Working Party agreed to ask the experts to investigate further the possibility of installing an electronic mail box system, which, although slow and without control of the data transmitted, was nevertheless less expensive and could serve a large number of purposes as, for example, the transmission of information on variety denominations, on variety descriptions, on lists of varieties under test, on computer programs if there was a wish to share them with other offices as well as a lot of other information, especially if the information had to be transformed subsequently. At international level, it could be used for the exchange of information between stations, departments, institutes, etc., namely for the transmission of information, texts, reports or data and computer programs.

21. It was agreed that the experts from the Netherlands and the United Kingdom would try an exchange of proposed variety denominations via electronic mail and would report on the experience gained at the next session of the Working Party.

Exchange of Software

22. Mr. Talbot (United Kingdom) introduced document TWC/III/2, which contained guidelines for programming in FORTRAN used in the United Kingdom and document TWC/III/12 containing a summary of the comments received on those guidelines. Although it was mentioned that drawing up guidelines would not be the task of the Working Party, the majority of the experts regarded the guidelines to be very useful and recommended that they be followed as far and wherever possible. The Working Party furthermore asked Mr. Talbot to prepare a draft for "General Principles for the Writing of Computer Programs," which would be independent of the languages used.

23. The Working Party agreed to prepare an updated inventory of software used by the offices of the member States, which should also contain those developed during the last two years. The list of software used should specify which programs were most commonly used and which of them were exchangeable.

24. Mrs. Campbell (United Kingdom) introduced document TWC/III/4, which presented the results of the survey on hand-held data capture devices. The list was amended by further information supplied during the meeting. The amended list is reproduced in Annex II to this document. The list will furthermore be up-dated for the next session and all member States were asked to inform Mrs. Campbell before March 1, 1986, of changes which would occur in the meantime.

Questions Raised by the Other Technical Working Parties

25. The Working Party noted that the Technical Working Party for Vegetables planned to prepare during its coming session some questions which might then be presented to the Technical Working Party on Automation and Computer Programs during its fourth session.

Standardization of Entries

26. Mr. Duyvendak (Netherlands) introduced document TWC/III/7, which contained updated information on the items to be included in the annual list of varieties under test. It was repeated that the member States should try to further harmonize the lists according to the recommendations made during the preceding session of the Working Party. The Working Party did not consider it necessary to try to harmonize the format of these lists also. Mr. Duyvendak will again prepare an up-dated list before the next session of the Working Party.

27. Some experts repeated that the distribution of the lists at national level should be made according to last years recommendations to ensure that the expert really working on a given species would receive the respective parts of those lists. To identify the lists more readily, they should always contain the full title "Annual List of Varieties Under Test" and indicate the Species, the State issuing the list and the year to which the list applied.

Checking of Variety Denominations

28. During its second session, the Working Party had envisaged a trial for the standardization of the list of variety denominations in view of a possible paperless exchange of proposed variety denominations. As this trial had not met with any response, the Working Party did not follow it up and agreed that at present there was no need for a standardization of those lists. The experts from the Netherlands and the United Kingdom agreed, as already mentioned under paragraph 21, to exchange their proposed variety denominations via electronic mail and report on their experience during the next session.

29. The experts from the Netherlands demonstrated during the session their system of checking proposed variety denominations by computer against denominations registered in the national list and in the OECD list. In this system, each denomination was converted into individual phenomes according to the Dutch language.

Description of Varieties

30. Mr. Law (United Kingdom) introduced document TWC/III/9, containing a revised proposal for a form for the preparation and exchange of variety descriptions together with several specific questions which the Working Party studied and discussed in detail during the session.

31. The Working Party agreed that efforts should be made to arrive at one single form for the different purposes, namely:

(i) test reports at national level

(ii) variety descriptions at national level

(iii) exchange of test reports on the basis of bilateral agreements

(iv) variety descriptions for national certification offices (with a possible addendum for the special needs of those offices).

32. In answer to the specific questions, the Working Party agreed on the following:

(i) It would recommend the draft form in its amended version as reproduced in Annex III to this report.

(ii) Characteristics should be listed chronologically according to the number in the UPOV Test Guidelines. Characteristics with asterisk (*) should therefore not be grouped together. Additional characteristics should be added at the end of the list.

(iii) Example varieties should not be indicated for each state of expression.

(iv) Quantitative characteristics should always be converted to the 1 to 9 scale and no actual figures should be indicated. As some experts considered that actual figures, as for example the 1000 seed weight, might be useful at national level, the experts will study how reliable such information could be and whether, if considered reliable, it should be added and report back to the Working Party during its next session.

(v) The provision of further information under the heading "Additional Data" may be helpful. It should be left to the Technical Working Party establishing the Test Guidelines for the species concerned to specify the types of additional information that could be useful (origin, breeding history, photographs, diagrams, shadowgraphs, variants and off-types likely to appear, etc.)

(vi) There was no common opinion on whether to indicate also those characteristics of the UPOV Test Guidelines which had not been tested. However, it was agreed that preprinted forms should not be used.

33. Since there was not sufficient time for discussing the outstanding problems, all members were requested to answer these questions and to send them to Mr. Law by the end of November 1985. For this purpose, the questions are once more reproduced in Annex IV to this document.

34. Mr. Duyvendak (Netherlands) would collect before the end of December 1985 all solutions used up to now in variety descriptions in those cases where in continuous characteristics the 1 to 9 scale had been found insufficient to describe the variety in that characteristic.

35. The Working Party noted that the experts from the Federal Republic of Germany had been asked by the Technical Committee to prepare a draft for a revised form for a test report and that the Technical Committee planned to discuss that draft during its coming session. It therefore asked the Chairman to inform the Technical Committee on the relevant proposals (see paragraphs 31 and 32) of this Working Party.

Reference Books and Documents

36. Since the basic reading list so far established did not seem to be sufficient, all members of the Working Party were requested to supply the Office of UPOV with an additional list of useful books and documents. The languages should not be confined to English or to the official UPOV languages alone. The information received by the Office of UPOV by the end of July 1985 is attached to this document (Annex V).

Future Program, Date and Place of Next Session

37. The Working Party agreed to hold its fourth session at Hanover, Federal Republic of Germany, from May 21 to 23, 1986. The meeting would start at 9 a.m. on May 21 and close at 1 p.m. on May 23, 1986. During its session, the Working Party would continue discussions or start new discussions on the following items:

(i) Report on Subjects of Special Interest to the Technical Working Party Raised During the Twenty-first Session of the Technical Committee and on Questions Raised by Other UPOV Technical Working Parties
(Discussions will depend on the questions raised, a paper can be expected from the Technical Working Party for Vegetables.)

(ii) Over-Years Analysis (COY)
(Dr. Weatherup (GB) will circulate the COY program and a set of data with a completed analysis to the experts from DK, ES, FR, GB, IR and NL. All experts will apply the program on their computer and inform Dr. Weatherup by mid-February 1986 of their experience with the program during its application to all varieties of a grass species or, in the case of Spain, another species, especially as to the problems that arise and the possibilities of solving them. The study should include the experience gained on data from three years as well as on data from two years. It should comprise the calculation of the λ -values and the F_3-test. Dr. Weatherup will prepare a summary to be circulated via the Office of UPOV.)

(iii) Testing of Homogeneity in Cross-Fertilized Plants
(Mr. Talbot (GB) will circulate the program described during the current session to the experts from DE, DK, ES, FR, GB, IR and NL. All experts will apply the program and compare it with the UPOV criteria and send their results and comments to Mr. Talbot before the end of December 1985. Mr. Talbot will then prepare a summary to be circulated via the Office of UPOV.)

(iv) Testing of Homogeneity in Self-Fertilized Plants
(Mr. Talbot (GB) and Dr. Weatherup (GB) will prepare a questionnaire to be circulated before the end of December 1985, asking for information to be sent to Dr. Weatherup before March 1986.

Dr. Weatherup will prepare a summary for distribution via the Office of UPOV.)

(v) Annual List of Varieties Under Test
(Mr. Duyvendak (NL) will prepare shortly before the next session a new updated table on the items included in the Annual Lists of Varieties Under Test (TWC/III/7).)

(vi) Description of Varieties
((a) Each member State will send its answer to the questions set out in Annex IV to this report to Mr. Law (GB) before the end of November 1985. Mr. Law will prepare a summary to be circulated via the Office of UPOV.)

(b) Mr. Duyvendak (NL) will collect before the end of December 1985 the different solutions applied in cases where in a quantitative characteristic the present nine states of expression were not sufficient for the description of varieties and will circulate them via the Office of UPOV.)

(vii) Intercommunication Network
((a) The experts from the member States will report on changes with respect to the possibility of contacting them via electronic mail or packet switching.

(b) The experts from the Netherlands and the United Kingdom will report on their experience gained in the planned exchange of proposed variety denominations via electronic mail.)

(viii) Exchange of Software
((a) Mr. Talbot (GB) will prepare before the end of January 1986 a draft for general principles for the writing of programs for circulation via the Office of UPOV.

(b) The experts from DE, DK, ES, FR, GB, IR and NL will send before October 1, 1985, to Mrs. Campbell (GB) their lists of programs most frequently used as well as details of their exchangeable programs. Mrs. Campbell will prepare a summary of the information received for circulation via the Office of UPOV.

(c) Before the end of the year, all experts will be reminded to send in further information on hand held data capture devices or information on changes that have occurred in the meantime to Mrs. Campbell before March 1, 1986. Mrs. Campbell will prepare a summary of the information received for circulation via the Office of UPOV).)

(ix) Reference Books and Documents
(Annex V to the present document contains information received by the Office of UPOV before the end of July 1985.)

Visit and Demonstrations

38. In the afternoon of the first day of the session, the telecommunication system available at RIVRO was introduced and demonstrated. In the afternoon of the second day, the experts of the Working Party visited the trial fields and the data processing system where the variety denomination check system at RIVRO was demonstrated. There was furthermore a short lecture on the electrophoresis method applied to the checking of distinctness in potatoes.

39. This report has been adopted by correspondence.

[Annex I follows]

ANNEX I

LIST OF PARTICIPANTS
IN THE TECHNICAL WORKING PARTY ON AUTOMATION AND COMPUTER PROGRAMS
WAGENINGEN, NETHERLANDS, MAY 8 TO 10, 1985

I. MEMBER STATES

BELGIUM

Mr. D. REHEUL, Ministerie van Landbouw, Dienst tot Bescherming van de Kweek-produkten, 14e verd., Bolwerklaan, 21, 1000 Brussels (tel. (02) 2117211)

DENMARK

Mr. K. KRISTENSEN, Dataanalytisk Lab., Lottenborgvej 24, 2800 Lyngby

FRANCE

Mr. C. HUTIN, Directeur de recherches, INRA/GEVES, GLSM, La Minière, 78280 Guyancourt (tel. 0033 3 043 8113)

Miss F. BLOUET, INRA/GEVES, GLSM, La Minière, 78280 Guyancourt (tel. 0033 3 043 8113)

Mr. F. ROYER, Unité de calcul, INRA/GEVES, GLSM, La Minière, 78280 Guyancourt (tel. 0033 3 043 8113)

GERMANY, FEDERAL REPUBLIC OF

Dr. G. FUCHS, Bundessortenamt, Osterfelddamm 80, 3000 Hanover 61 (tel. 0511-57041)

Dr. F. LAIDIG, Bundessortenamt, Osterfelddamm 80, 3000 Hanover 61 (tel. 0511-57041)

IRELAND

Mr. D.T. MURPHY, Department of Agriculture, Room 26, 23 Upr. Merrion St., Dublin 2 (tel. (01) 789211, ext. 333)

NETHERLANDS

Mr. H. ADDING, RIVRO, Postbus 32, 6700 AA Wageningen (tel. 08370-19056)

Mr. H. VAN ARKEL, Secretary of the Board for Plant Breeders' Rights, Postbus 104, 6700 AC Wageningen (tel. 08370-19031)

Mr. H.J. BALTJES, RIVRO, Postbus 32, 6700 AA Wageningen (tel. 08370-19056)

Mr. A.M. VAN DER BURGT, RIVRO, P.B. 32, 6700 AA Wageningen (tel. 08370-19056)

Mr. R. DUYVENDAK, Botanical Research, Agricultural Crops, RIVRO, P.B. 32, 6700 AA Wageningen (tel. 08370-19056)

Mr. M. HIJINK, Director, RIVRO, Postbus 32, 6700 AA Wageningen (tel. 08370-19056)

Mr. H. KOSTER, RIVRO, Postbus 32, 6700 AA Wageningen (tel. 08370-2982)

Mr. N.P.A. VAN MARREWIJK, RIVRO, Postbus 32, 6700 AA Wageningen (tel. 08370-19110 or 19056)

Mr. H. SCHUITEMAKER, RIVRO, Postbus 32, 6700 AA Wageningen (tel. 08370-19056)

SPAIN

Mr. M. DEL FRESNO ALVAREZ-BUYLLA, Registro de Variedades, INSPV, 56, José Abascal, 28003 Madrid (tel. 01-4418199)

Mr. F. MARTINEZ FONTELA, Instituto de Relaciones Agrarias (IRA), 56, José Abascal, 28003 Madrid (tel. 01-4428211)

SWITZERLAND

Dr. W. GFELLER, Leiter des Büros für Sortenschutz, Bundesamt für Landwirtschaft, Mattenhofstrasse 5, 3003 Bern (tel. 031 612586)

UNITED KINGDOM

Mrs. A. CAMPBELL, National Institute of Agricultural Botany, Huntingdon Road, Cambridge CB3 0LE (tel. 0223 276381)

Mr. J.R. LAW, National Institute of Agricultural Botany, Huntingdon Road, Cambridge CB3 0LE (tel. 0223 276381)

Mrs. V. SILVEY, National Institute of Agricultural Botany, Huntingdon Road, Cambridge CB3 0LE (tel. 0223 276381)

UNITED KINGDOM (continued)

Mr. M. TALBOT, Agricultural and Food Research Council (AFRUS), Unit of Statistics, University of Edinburgh, James Clerk Maxwell Building, Mayfield Road, Edinburgh EH9 3JZ (tel. (031) 667-1081)

Dr. S.T.C. WEATHERUP, Biometrics Division, Department of Agriculture for Northern Ireland (DANI), Newforge Lane, Belfast BT9 5PX (tel. 0232 661166)

Mr. P.J. WINFIELD, Department of Agriculture and Fisheries for Scotland (DAFS), Agricultural Scientific Services, East Craigs, Edinburgh EH12 8N (tel. (031) 339-2355)

II. OFFICER

Mrs. V. SILVEY, Chairman

III. OFFICE OF UPOV

Dr. M.-H. THIELE-WITTIG, Senior Counsellor, 34, chemin des Colombettes, 1211 Geneva 20, Switzerland (tel. 022 999152)

Mr. M. TABATA, Associate Officer, 34, chemin des Colombettes, 1211 Geneva 20, Switzerland (tel. 022 999297)

[Annex II follows]

TWC/III/13

ANNEX II

SURVEY OF HAND-HELD DATA CAPTURE DEVICES

	MODEL AND MANUFACTURER	MICRONIC M445L	MICRONIC 203	MICROFIN	HUSKY HUNTER	EPSON HX-20	DATAMYTE
	Weight (kg)	0,45	0,15	0,9	1,15	1,7	1,5
	Dimensions (cm)	4 x 9 x 17	2 x 7 x 14	5 x 11 x 25	3 x 17 x 22	4 x 22 x 29	4 x 25 x 33
	Portable	x	x	x	x	x	x
Display	N. chars	16	12	16 16	32	20	16
Display	N. lines	1	1	1 2	8	4	1
Display	LED	-	-	x	-	-	-
Display	LCD	x	x	x	x	x	x
Display	Alphanumeric	-	-	x	x	x	x
Display	Graphics	-	-	-	x	x	-
	Programmable Language	assembler PASCAL	adapted	MDS	PASCAL, FORTRAN, BASIC	BASIC	adapted
	OS	-	-	-	CP/M	-	-
	ROM	6	16	-	48	32	-
	RAM	12 - 24		32	88-264	16	64
	+ RAM	x	-	-	-	x	-
	Data Storage	BCD	ASCII	BCD, ASCII	ASCII, HEX	ASCII	ASCII
	Memory Partition	-	-	x	x	-	x
Integral Devices	Cassette	-	-	-	-	x	-
Integral Devices	Printer	-	-	-	-	x	-
Integral Devices	RS 232	x	x	x	x	x	x
Integral Devices	INTERFACE WITH	IBM 370 - 3081 CP/M Micros	PDP-11/44	CTL 8066 CBM PET APPLE II SIRIUS	IBM PC SOLAR 16/85 CROMENCO SIRIUS	PRIME 550 VAK 750 IBM PC CROMENCO APPLE II	CROMENCO
Batteries	Recharge	x	-	x	x	x	x
Batteries	Renew	x	x	by manufacturer	x	x	x
Batteries	Memory back-up	x (2000 h)	x (2000 h)	x	x (50 hrs)	x	x (1 month)
Peripherals	Bar code	x	x	x	x	x	x
Peripherals	Weighhead	x	-	-	x	x	-
Peripherals	Ex-printer	x	-	x	x	x	-
Peripherals	Others	-	-	-	-	-	-
Locations	Field	x	x	x	x	x	x
Locations	Shed	x	x	x	-	x	-
Locations	Laboratory	x	-	x	x	x	x
Locations	Weatherproof	x (with coat)	-	x	x	-	x
	Robust	x	x	x	x	x	x
	Countries Used and Software Available [Number, Price]	DK [25+3 (in order), 10,000 Dan.Kr.] Routines exist for: 1) data entry 2) search 3) transmission 4) utility details available	NL [10, 1,800 Fls.]	UK (England) [28+8 (in order), Pound St. 1,000] Many DUS recording programs customised for individual use. One general purpose VCU recording program	FR [7], UK (Scotland) [10, Pound St. 1,500-2,000] Single Plant recording, capture and store, description of varieties	UK (Scotland), UK (N.Ireland) [20, Pound St. 500 + 100 (Memory)] Capture program for input, storage and transmission of data from balances or keyboard. Capture program for DUS recording. NL1	UK (Scotland) [4, Pound St. 2,000]

x = yes
- = no

[Annex III follows]

ANNEX III

UPOV VARIETY DESCRIPTION FORM
(proposal made by the Technical Working Party on Automation and Computer Programs during its third session using Vicia faba as an example)

Species: Vicia faba L., Broad Bean, Field Bean

UPOV Test Guidelines document No. TG/8/4, dated 1984-11-07
(quote document number and date)

Testing Place: NIAB, Cambridge, United Kingdom
Years of Testing: 1982 and 1983
Proposed Variety denomination or Breeder's reference: Troy
Application No. and Reference No.: AFP 33/33
Date of preparation of description: April 3, 1984

UPOV No.	NIAB No.	CHARACTERISTICS	STATES OF EXPRESSION	NOTE	WORDING OF EXPRESSION	REMARK
		Grouping Characteristics used: (to be repeated in the proper place)				
		Characteristics included in the UPOV Test Guidelines				
1	03	Seed: tannin	1 absent/9 present	-		
(*) 2	50	Plant: height	1 very low/3 low/5 medium/ 7 high/9 very high	5	medium	
(*)13	10	Time of flowering (50% of plants with at least one flower)	3 early/5 medium/ 7 late	4	early to medium	
(*)15	22	Wing: melanin spot	1 absent/9 present	9	present	
(*)17	23	Standard: anthocyanin coloration	1 absent/9 present	9	present	
18	24	Standard: extent of anthocyanin coloration	3 slight/5 medium/7 much	2	very slight to slight	
20	41	Pod: attitude	1 erect/3 semi-erect/5 horizontal/7 semi-pendulous/ 9 pendulous	-		
(*)21	42	Pod: length (without beak)	1 very short/3 short/ 5 medium/ 7 long/9 very long	3	short	
25	48	Pod: number of ovules (including seeds)	3 few/5 medium/ 7 many	-		
28	64	Seed: shape of cross section	1 narrow elliptic/2 elliptic/ 3 broad elliptic	1	narrow elliptic	mainly 1
(*)29	63	Seed: 1000 seed weight	1 very small/3 small/5 medium/ 7 large/9 very large	-		562 g
(*)30	65	Seed: color of testa (immediately after harvest)	1 beige/2 green/3 red/4 violet/ 5 black	2	green	
31	66	Seed: black pigmentation of hilum	1 absent/9 present	9	present	
		Characteristics not included in the UPOV Test Guidelines:				
	81	Plant: winter hardiness	1 absent/9 present	1	absent	

Similar varieties and differences from these varieties:

Denomination of Varieties:	Differences (only characteristics to be indicated which show sufficient differences to establish distinctness)
Herz Fraya	Troy has narrower leaflets, broader pods, a shorter stem length and a higher seed weight
Pavane	Troy has longer, narrower leaflets and slightly fewer seeds and ovules per pod

Additional Information:

Additional data:
- specific additional information which would be useful for certain species, to be fixed by the Technical Working Parties when establishing the Test Guidelines concerned, e.g. Origin, Breeding History, Photograph, Diagram, Shadowgraph
- information which might be of interest to the certification authorities

Comments:
- Seed dimple (ornamentation) mixed 1 and 9

[Annex IV follows]

ANNEX IV

OUTSTANDING PROBLEMS TO BE STUDIED BY THE MEMBERS OF THE TECHNICAL WORKING PARTY ON AUTOMATION AND COMPUTER PROGRAMS

(answers to be sent to Mr. Law (United Kingdom)
before the end of November 1985)

(a) Should continuous quantitative characteristics be converted to 1-9 score within each year or only using over-year means? Should UPOV example varieties define the 1-9 scores?

(b) Missing data. Should means be based only on available data or adjusted for missing observations?

(c) Variety descriptions may change over successive generations. When is such a 'drift' large enough to cause serious problems (e.g. certification)?

(d) What data should be transmitted between testing authorities so that exchanged data can be useful?

[Annex V follows]

ANNEX V

BASIC READING LIST

At the date of printing the present document, the Office of the Union had received the following information on the standard books and documents considered important by the experts of the Technical Working Party on Automation and Computer Programs:

DE: Schulze, H.H., 1978: "Lexikon zur Datenverarbeitung", rororo-Taschenbuch Nr. 6220

DE: Linder/Berchtold, 1979: "Elementare statistische Methoden", Uni-Taschenbücher; 796, Birkhäuser

DE: "Biometrisches Wörterbuch", 1969, Band I und II, 2. unveränderte Auflage, VEB Deutscher Landwirtschaftsverlag, 1040 Berlin, Reinhardtstrasse 14

DK: Cochran, W.G. & Cox, G.M., 1957: "Experimental Designs", second edition, John Wiley & Sons, New York, 611+5 pp.

DK: Kristensen, K., 1980: "Statistisk analyse af data fra selvstaendigheds- og ensartethedsunders#gelse af sorter" Tidsskrift for Planteavls Specialserie, Statens Planteavlskontor, Lyngby, Danmark, 133+29 pp., in Danish

DK: LeClerg, E.L., 1966: "Significance of Experimental Design in Plant Breeding", p. 243-313, In Frey, K.J. (ed.), 1966: "Plant Breeding", The Iowa State University Press, Ames, Iowa, 430 pp.

DK: Patterson, H.D. & Weatherup, S.T.C., E.A., 1984: "Statistical Criteria for Distinctness Between Varieties of Herbage Crops", Journal of Agricultural Science, Cambridge, 102, 59-68

DK: Patterson, H.D., Williams, E.R. & Hunter, E.A., 1968: "Block Designs for Variety Trials", Journal of Agricultural Science, Cambridge, 90, 395-400

DK: Patterson, H.D. & Silvey, V., 1980: "Statutory and Recommended List of Crop Varieties in the United Kingdom" (with Discussion), Journal of the Royal Statistical Society, Series A.143, 219-252

DK: Snedecor, G.W. & Cochran, W.G., 1967: "Statistical Methods", sixth edition, The Iowa State University Press, Ame, Iowa, 593 pp.

DK: Weatherup, S.T.C., 1980: "Statistical Procedures for Distinctness, Uniformity and Stability Trials", Journal of Agricultural Science, Cambridge, 94:31-46

[End of Annex V and of document]